



Initial Environmental Examination

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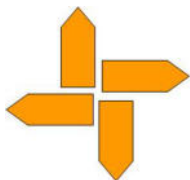
April 2020

SRI: Integrated Road Investment Program Improvement, Rehabilitation and Maintenance of Nittambuwa (39.710km) - Kadugannawa (100.000km) section of Colombo – Kandy (A001) Highway

Prepared by the Road Development Authority, Ministry of Roads and Highways for the Asian Development Bank.

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Asian Development Bank



**Ministry of Roads and Highways
Road Development Authority**



SRI: Integrated Road Investment Program

Road Management Contract

**Rehabilitation of
Nittambuwa – Kadugannawa section of Colombo – Kandy (A001)
Road**

Initial Environmental Examination (IEE)

Final Report

April 2020

**Prepared & Submitted by
Environmental and Social Development Division
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Table of Contents

CHAPTER 1: INTRODUCTION	1
1.1. Background	1
1.2. Objectives of the proposed project	3
1.3. Objectives of the Initial Environmental Examination	3
1.4. Approach, Methodology and Personnel Involved	4
CHAPTER 2: DESCRIPTION OF THE PROJECT	6
2.1. Location of the project	6
2.2. Need of the Project	6
2.3. Analysis of Alternatives	7
2.4. Magnitude of Operations	8
CHAPTER 3: POLICY AND LEGAL FRAMEWORK	12
3.1. Legal Framework	12
3.2. Policy Framework	19
CHAPTER 4: DESCRIPTION OF EXISTING ENVIRONMENT	22
4.1. Existing land use along the road	22
4.2. Physical Environment	25
4.3. Ecological Environment	32
4.4. Occurrence of Natural Disasters in the Project Area	34
4.5. Socio - Economic Environment	34
4.6. Archaeological and cultural sites located in the project area	39
CHAPTER 5: ANTICIPATED ENVIRONMENTAL IMPACTS AND PROPOSED MITIGATION MEASURES	41
5.1. Pre construction phase	41
5.2. Construction phase	43
5.3. Operational Phase	52
CHAPTER 6: CLIMATE CHANGE IMPACTS AND RISKS	55
CHAPTER 7: INSTITUTIONAL ARRANGEMENT AND ENVIRONMENTAL MANAGEMENT PLAN AND GRIEVANCE REDRESS MECHANISM	58
7.1. Institutional arrangements	58
7.2. Environmental Management Plan and Monitoring	58
7.3. Grievance Redress Mechanism	60
CHAPTER 8: PUBLIC CONSULTATION AND INFORMATION DISCLOSURE	62
8.1. One on one interviews	62
8.2. Focus Group Discussions (FGDs)	62
CHAPTER 9: CONCLUSION AND RECOMMENDATIONS	67

LIST OF APPENDIXES

Appendix 1.1	REA Checklist
Appendix 2.1	Location map of the road
Appendix 2.2	Proposed cross sections
Appendix 4.1	List of flora and faunal species in the project area
Appendix 7.1.	EMP
Appendix 7.2	EMC
Appendix 7.3	EMOP
Appendix 8.1	Public consultation and their views

LIST OF TABLES

Table 1.1:	National road sections which are proposed for development
Table 1.2:	Locations of water quality measurement
Table 1.3:	Locations of noise measurements
Table 1.4:	FGDs conducted along the road
Table 2.1:	Administrative divisions of the project road
Table 2.2:	Material Requirement for A001 Road
Table 3.1:	Applicable National Laws and Regulations for the Investment Program
Table 3.2:	Applicable Approvals required for the Investment Program
Table 4.1:	Climatic characteristics of candidate roads
Table 4.2:	Surface water bodies located along the candidate road section
Table 4.3:	Results of water quality measurements
Table 4.4:	National ambient air quality standards
Table 4.5:	Measured ambient noise levels
Table 4.6:	Noise sensitive receptors
Table 4.7:	Administrative divisions of Nittambuwa - Kadugannawa road section of Colombo-Kandy (A001) Road
Table 4.8:	Distribution of population of project located DSDs by gender
Table 4.9:	Distribution of population by the ethnicity
Table 4.10:	Percentage of employment distribution by major industry group - 2015
Table 4.11:	Poverty Headcount Index of affected districts
Table 4.12:	Principle type of lightning the occupied housing units
Table 4.13:	Source of Drinking water
Table 5.1:	Typical construction equipment used in road construction, unobstructed at obstructed noise level 7m from the source
Table 6.1:	Input parameters for TEEMP model for two sections of A001 road
Table 6.2:	CO ₂ emission at PAU, Project & induced traffic and Project without induced traffic
Table 6.3:	CO ₂ saving due to rehabilitation of A001 road
Table 8.1:	The summary of attendance to FGDs
Table 8.2:	Summary of Key points discussed in FGDs with photographs

LIST OF FIGURES

- Figure 4.1: Starting point at Nittambuwa (39.71km)
Figure 4.2: Road side vendors selling Cashew at Kajugama
Figure 4.3: Road side vendors selling cane products
Figure 4.4: Road entering Warakapola Town
Figure 4.5: Ambepussa Junction at 59.5km
Figure 4.6: Entrance to Dadly Senanayake School, Tholangamuwa
Figure 4.7: St. Joseph Girls School at 77km
Figure 4.8: Road across Kegalle township
Figure 4.9: Kadugannawa Tunnel
Figure 4.10: Rainfall and temperature variation of Gampaha District
Figure 4.11: Rainfall and temperature variation of Kegalle District
Figure 4.12: Rainfall and temperature variation of Kandy District
Figure 4.13: Mangalagama Ambalama at 85km
Figure 4.14: Kadugannawa Ambalama at 97.15km
Figure 4.15: Captain Dowson's Tower (To the reverse direction)
Figure 7.1: GRM process
Figure 8.1: Interviewing a school teacher
Figure 8.2: Interviewing a traditional cane business man and a woman

LIST OF ABBREVIATIONS

AC	asphalt concrete
ADB	asian development bank
BIQ	basic information questionnaire
BOQ	bill of quantities
CBO	community based organizations
CEA	central environment authority
CEB	ceylon electricity board
DMC	disaster management center
DO	dissolved oxygen
DS	divisional secretariat
DWLC	department of wildlife conservation
EA	executing agency
EARF	environmental assessment and review framework
EIA	environmental impact assessment
EMC	environmental monitoring checklist
EMoP	environmental monitoring plan
EMP	environmental management plan
EPL	environmental protection license
ESDD	environmental and social development division
FGD	focus group discussions
GN	grama niladari
GOSL	government of sri lanka
GRC	grievance Redress Committee
GRM	grievance redress mechanism

IA	implementing agency
IEE	initial environment examination
IML	industrial mining license
KHG	kandyan home gardens
LHS	left hand side
ME&WLR	ministry of environment and wild life resources
MFF	multi tranche financing facility
MoRH	ministry of roads and highways
NBRO	national building research organization
NEA	national environmental act
NWS&DB	national water supply and drainage board
PAA	project approving agency
PD	project director
PIC	project implementation consultant
PIU	project implementation unit
PPE	personnel protective equipment
RDA	road development authority
REA	rapid environmental assessment
RHS	right hand side
RMC	road management contracts
ROW	right of way
SAPE	survey and preliminary engineering
SPS	ADB, safeguards policy statement 2009
SSEMAP	site specific environmental management action plan
TDS	total dissolved solids
TL	team leader

EXECUTIVE SUMMARY

1. **Background:** Road based transport is the main land based transportation mode in Sri Lanka. The current road network of the country comprises around 170 km of expressways (in operation), 4,200 km of “A class” roads and 8,000 km of “B class” roads (source: Annual Report of RDA, 2015). The length of the provincial roads maintained by provincial councils is approximately 16,000 km. Although the country’s road density is comparatively high in relation to the other countries in the region, it needs uplifting to serve the emerging demand. Thus, development of rural roads and continuous maintenance in national roads is necessary to maintain a good road network.
2. Taking initiative in this regard, road development authority (RDA) under ministry of roads and highways (MoRH) introduced an investment program where an efficient road transport will be established between rural communities and socio-economic centers. The program includes rehabilitation and upgrading of both rural and national roads. The program is implemented under a multi tranche financing facility (MFF) obtained from asian development bank (ADB). The program is officially termed as “Integrated Road Investment Program” or simply iRoad Program. The investment program will deliver two outputs: (i) improved road conditions between rural communities and socioeconomic centres, and (ii) enhanced capacity of RDA in inclusive road operation and development.
3. Under iRoad program, five (5) national roads have been selected for rehabilitation and improvements of which the total length will be around 300km. And this includes a length of 60.29km from Nittambuwa – Kadugannawa section of Colombo – Kandy (A001) road. These national road sections will be developed as road management contracts (RMC) where the rehabilitation and improvement works will be carried out for a period of two (2) years and maintained for another five (5) years.
4. During survey and preliminary engineering (SAPE) works for iRoad, an environmental assessment and review framework (EARF) was prepared to guide screening and selection of roads, environmental assessments and to monitor implementation of environment safeguards during project implementation. EARF complies with ADB safeguards policy statement (SPS), 2009 as well as the national laws and regulations with respect to environmental management and conservation.
5. As per the project classification on environment aspects in SPS, 2009, the RMC falls within the scope of category B thus, initial environment examinations (IEE) should be carried out for each candidate road. This document presents the findings of the IEE conducted for the road section from Nittambuwa (39.71km) to Kadugannawa (100.0km) of Colombo - Kandy (A001) road.
6. The broad objective of this project is to improve the transport efficiency of Colombo – Kandy (A001) road which ultimately assist socio – economic development of the area affected by the road while conserving the nature. Passing lanes shall also be introduced to the road section where the ROW is adequate.

7. The IEE report provides the baseline conditions of physical, biological and social environments found along the candidate road section from Nittambuwa to Kadugannawa. Anticipated environmental and social impacts that shall be generated due to implementation of the project over the identified existing environments are assessed and feasible mitigation measures in order to avoid, minimize or manage identified impacts are also provided in the IEE report.

8. The IEE report was carried out by environmental and social development division (ESDD), RDA. Under the methodology of the IEE, the existing Right of Way (ROW) is set as the primary impact zone as the all road improvement activities will be within the existing ROW. A secondary impact zone is set as 100m from the centreline of the road to both sides which is defined as the study area in order to identify;

- Presence of any environmentally sensitive sites
- Hydrological aspects
- Sensitive receptors to environmental and social impacts
- Presence of archeologically protected sites
- Presence of areas prone to landslides
- Views of the public and stakeholders

9. The proposed road section of A001 traverses through Gampaha, Kegalle and Kandy Districts of Western, Sabaragamuwa and Central Provinces respectively.

10. An alternative analysis was carried out under the IEE and with project alternative including rehabilitation of 60.29km section of A001 road to all-weather standard including passing lanes at required locations is justified.

11. **Proposed improvement:** Under RMC of iRoad, 60.29km length from Nittambuwa (39.71km) to Kadugannawa (100.0km) section of A001 road will be rehabilitated and maintained. And it has been proposed to rehabilitate the particular section in to standard two lanes configurations within the existing ROW. On the other hand, passing lanes (of 3.5m each) shall also be constructed along the road sections where existing ROW is adequate. The project will not involve acquisition of additional lands and all improvement activities will be restricted to the existing ROW. The proposed typical cross section consists of carriageway, hard shoulder, soft shoulder and side drains where necessary.

12. The scope of work proposed under the RMC include the following: clearing and grubbing; road excavation; channel excavation; excavation and backfill of structures; embankment construction; sub bases, capping layers, and bases; shoulder construction, asphalt overlay; roadside and lead away drains; cleaning, de-silting, and repairing of culverts.

13. Material required for construction will be explored from the project area. Existing sites which are operating with relevant licenses and approvals will be used especially for extraction of soil, metal and sand.

14. **Existing environment along the road section:** In general, the land use of the project area could be categorized in to home gardens, townships, agricultural lands, water bodies such as streams. Generally the entire road section has a ribbon type development comprised of both residential and commercial buildings. Specific land uses observed within candidate road section is summarized as below.
15. Based on major climatic zones of the country, the A001 road section falls entirely within the low country and intermediate wet zone of Sri Lanka.
16. Attanagallu Oya and Maha oya are the river basins which are crossed by the road section from Nittambuwa to Kadugannawa. ESDD measured water quality of surface water bodies found along the road trace and results of the measured parameters are within the standard limits as specified for class III waters in proposed inland water quality standards of CEA. However, the baseline dissolved oxygen (DO) values are slightly higher than the respective standard levels.
17. Air quality in the town areas such as Nittambuwa, Warakapola, Kegalle, Mawanella and Kadugannawa is generally observed to be in a dilapidated condition mainly due to high levels in exhaust emission resulting from traffic congestions.
18. ESDD measured ambient noise levels also during the daytime in a sunny day during the environmental assessment and results range from 74 to 81dB (A).
19. Ecologically, the road section of A001 road from Nittambuwa to Kadugannawa does not fall into any protected area or declared forest area.
20. Mainly two types of natural disasters observed in the project area i.e. slope failures and localised drainage congestions. The area around the road section near Warakapola town from 56.72km to 57.00km gets inundated during the heavy rains due to overflowing of Kuda Oya however A001 road within this section is not inundated. Kegalle area (77 to 78km) and Pahala Kadugannawa (96 - 97km) are such areas prone to modest level of landslide risk as per the national building research organizations (NBRO) maps of landslide hazard zones. Based on the information provided by provincial RDA officers, slope failures are possible at 86km post to 87/1 culvert, 98.8 to 98.9km. Further, as per the field investigation conducted by ESDD minor slope failures could be observed at; 77 to 78km, 96 - 97km and 98-99km along the road trace.
21. According to Department of Census and Statistics, in 2016, estimated midyear population of Gampaha, Kegalle and Kandy districts were 2,372,000, 869,000 persons and 1,434,000 persons respectively. In 2012, majority of population in these three districts are living in rural areas, i.e. 84.3% in Gampaha, 91.3% in Kegalle and 81.4% in Kandy.
22. In 2012, total population of above mentioned DSDs is 923,068 persons. Highest population is reported from Attanagalla DSD and it is 179,565 persons. The second highest population is in Mirigama DSD, which has a population of 164,580 persons.

23. A ribbon type development can be observed all along the road section while township areas such as Nittambuwa, Warakapola, Kegalle, Mawanella and Kadugannawa are densely populated.

24. With regard to ethnicity, majority of population in eight DSDs is Sinhalese i.e. Rabukkana 95.38%, Kegalle 95.79%, Galigamuwa 94.47% etc. The second highest population in eight DSDs is Moor i.e. Mawanella 30.28%, Attanagalla 12.27%, Yatinuwara 7.16% etc.

25. The livelihood of the people in the project area are mainly based on agriculture, industries and services.

26. In 2009/2010, poverty head count index of the Gampaha, Kegalle and Kandy districts was 3.9, 10.8% and 10.3% respectively and in 2016 it has decreased up to 2.0%, 7.1% and 5.5% respectively.

27. During the assessment, three sites which are archaeologically protected were observed. They are, Mangalagama ancient rest house located at 85km of the road on LHS, Kadugannawa ancient rest house at 97.15km on LHS and Captain Dowson's Tower located near 100km on RHS.

Anticipated environmental and social impacts

28. Following impacts on the existing environment and social setup during pre-construction, construction and operational stages could be anticipated from the project.

29. **Pre-construction phase:** Shifting of temporary developments on the existing ROW, natural hazards aggravated by the project and impacts to the road (landslide and flood impacts), alteration of surface water bodies, impacts to archaeologically protected monuments and sites and relocating of utility supply lines.

30. **Construction phase:** Increase of local air pollution, noise and vibration, disruption to traffic flow, deterioration of surface and ground water quality due to silt runoff, emissions and spoil from labour camps, impacts to archaeological sites, flood impacts, landslide impacts, social and environmental impacts due to establishment of labour camps, biological impacts (loss of trees and vegetation, adverse impacts on terrestrial fauna, impact on aquatic fauna and flora, ecological disturbances by workers and their camp operations), impacts due to extraction and transportation of construction materials, alteration of surface water hydrology of waterways, requirement of lands for the road upgrading, safety of workers and public and loss of access to houses, commercial activities and public utilities.

31. **Operational Phase:** Impacts on water resources, disposal of waste material generated during maintenance operations, extraction of material for repairing and maintenance works, pedestrian and commuter safety, air quality and noise

Climate Change Adoption

32. Rehabilitation of the road section from Nittambuwa - Kadugannawa section of A001 road will facilitate 14,288.73 Tons of CO₂ reduction per year within the particular section.

Institutional Requirements and Environmental Management Plan and Grievance Redress Mechanism

33. Institutional Arrangements: The ministry of roads and highways (MoRH) is the executing agency (EA) for the program. RDA will be the implementing agency (IA). A Project implementing unit (PIU) will be setup headed by a project director (PD) for carrying out Road Maintenance Contracts. The PIU will be assisted by a project implementing consultant (PIC) who will be responsible to review and approve designs prepared by contractor, supervise civil works of contractor and review and certify bills submitted by contractor. A team of experts including engineers, quantity surveyors, environment and social experts will be working in the PIC headed by a team leader (TL). Safeguard team of PIU, PIC and the contractor is primarily responsible for safeguards compliance of all activities carried out for rehabilitation and maintenance of the candidate section of A001 road.

34. Environmental Management Plan and Monitoring: The EARF as well as the Environmental Safeguards Manual of RDA, outlines the requirements for an environmental management plan (EMP) which is presented as a matrix developed based on best practices for environmental management. The contractor will be responsible for preparation of site specific environmental management action plan (SSEMAP) based on the EMP given in this IEE. Separate SSEMAPs will be prepared for each contract packages if the A001 road will be contractually subdivided. All costs for implementing the mitigation measures must be included in the bill of quantities (BOQ) by the contractor.

32. Monitoring of EMP implementation will be carried out during the preconstruction, operation and maintenance stages of the project. As specified in the EARF (chapter VII), environmental monitoring checklist (EMC) should be prepared by the PIC based on the EMP for each of these stages.

33. In addition, there will be an environmental monitoring plan (EMOP) based on the project cycle to monitor effectiveness of EMP implementation by measuring environmental parameters.

34. Grievance Redress Mechanism: Grievances from the affected people on social and environmental issues during project implementation will be addressed mainly through the grievance redress mechanism (GRM) as recommended in the EARF (Chapter V – C) which is to be formed using existing local administrative system.

Public consultation and information disclosure

35. In order to understand viewpoints of stakeholders and to respond to their concerns and suggestions during the early stages of the project and to incorporate valuable suggestions to the designs and reducing objections to the project, public and stakeholder consultation was carried out for the project. One on one interviews and focus group discussions (FGD) were conducted along the proposed sections to be developed in A001.

36. The key stakeholders of the project consulted during the field survey included divisional secretaries, Grama Niladaries, government officers and public. The Divisional Secretaries and other government officers expressed that this development is good and they highlighted the main concerns that need to be addressed during project implementation.

37. The FGDs were conducted to get the ideas of the community. Seven FGDs were conducted with government officers and public in road section to be developed.

Conclusion and recommendations

38. This Initial Environmental Examination report discuss various aspects of the proposed rehabilitation and maintenance of nearly 60.29km of road section from Nittambuwa (39.71km) to Peradeniya (100.0km) of Colombo – Kandy (A001) highway under of iRoad program implemented by RDA under ADB financing. Under RMC package, contractors are liable to keep the roads in operational status for approximately 5 years after rehabilitation.

39. As discussed, candidate A001 road section will be rehabilitated and maintained under the project and all construction and maintenance activities will be restricted to the available ROW therefore no land acquisition shall be required. The road will be improved to standard two lanes status with hard shoulders, drains and other road furniture. Passing lanes shall also be constructed at locations where existing ROW is adequate and free from any encroachments. Design will be carried out accordingly along the flood prone areas of the road in order to cater hazardous conditions and as well as to minimize road induced flood impacts.

40. The candidate road section of A001 road does not cross or located adjacent to protected forest or wildlife areas. However, the project traverses adjacent to three archeological sites. These sites will not be directly affected as all project activities will be strictly implemented within the existing ROW. However, special considerations will need to be taken to reduce the indirect impacts such as vibration impacts at these locations.

41. The project induced social impacts are also negligible as the project does not allow acquisition of lands for the road rehabilitation. Indirect impacts to environmental and social set up of the project area will be minimized with effective mitigation measures as given in the chapter 5 of the report and EMP.

42. An EMP, EMC and EMOP have been prepared as part of this report. These are required to be updated and incorporated in to tender documents and converted into contract package specific documents before the commencement of construction activities.

43. The proposed improvement for A001 Road will increase the transportation efficiency and also will boost economic activities in the Western, Sabaragamuwa and Central provinces including potential growth in industries, tourism, and agriculture in lagging rural areas which will be a positive step to the socio economic development of the country.

CHAPTER 1: INTRODUCTION

1.1. Background

44. Sri Lanka is an island nation having approximately 65,000 km² of land located in the Indian Ocean. The country which was affected by a near 30 year civil conflict is now showing a positive economic growth, there is an upward trend in urbanization where the standard of living has also improved significantly. Even with these developments, about 85% of the country's population still live in peri-urban and rural areas. And out of this population it has been estimated that around 85% is considered as poor. Poverty is mostly concentrated in areas where habitations, crop lands etc... are inefficiently connected with major socio-economic centres where facilities of markets, health, education and administrative are available.

45. Road based transport is the main land based transportation mode in Sri Lanka. The current road network of the country comprises around 170 km of expressways (in operation), 4,200 km of "A class" roads and 8,000 km of "B class" roads (source: Annual Report of RDA, 2015). The length of the provincial roads maintained by provincial councils is approximately 16,000 km. Although the country's road density is comparatively high in relation to the other countries in the region, it needs uplifting to serve the emerging demand. Thus, development of rural roads and continuous maintenance in national roads is necessary to maintain a good road network.

46. Taking initiative in this regard, road development authority (RDA) under ministry of roads and highways (MoRH) introduced an investment program where an efficient road transport will be established between rural communities and socio-economic centers. During the initial studies for the program it was agreed that around 1,000 rural communities would be connected to socio-economic centers. The program includes rehabilitation and upgrading of both rural and national roads. The program is implemented under a multi tranche financing facility (MFF) obtained from asian development bank (ADB). The program is officially termed as "Integrated Road Investment Program" or simply iRoad Program. The investment program will deliver two outputs: (i) improved road conditions between rural communities and socioeconomic centres, and (ii) enhanced capacity of RDA in inclusive road operation and development.

47. The iRoad program is currently implemented in rural roads in Southern, Central, Sabaragamuwa, North Central, North Western Provinces and Kalutara District in Western Province. Civil work contractor in Uva, eastern and northern provinces have mobilized under second iRoad program.

48. Under iRoad program five (5) national roads have been selected for rehabilitation and improvements. Total length of these road sections will be around 300km. The roads are listed in table 1.1 below with the respective lengths proposed for rehabilitation and improvements.

Table 1.1: National road sections which are proposed for development

No.	Road	Road Section	Package	Length of
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			Name	the Road Section (Km)
01	Colombo – Kandy (A001) Road	Nittambuwa (39.71km) to Kadugannawa (100.0km)	RMC-01	60.29
02	Maradankadawela – Habarana – Tirikondiadimadu (A011) Road	Maradankadawala to Habarana Section (0.0km to 25km)	RMC-03	25.0
03	Pelmadulla – Ambilipitiya – Nonagama (A018) Road	Pelmadulla to Padalangala section	RMC-04	66.0
04	Thalawa – Kekirawa – Dachchahalmillewa		RMC-05	90.22
05	Galle package roads	Karapitiya – Labuduwa – Wanduramba – Nagoda – Udugama – Hiniduma - Thawalama		51.92

Source: PIU, iRoad

49. These national road sections will be developed as Road Management Contracts (RMC) where the rehabilitation and improvement works will be carried out for a period of two (2) years and maintained for another five (5) years. This type of contract significantly expands the involvement and responsibility of private sector civil contractors in infrastructure development, from a simple execution of civil works to management and conservation of national assets (in this case the road infrastructure).

50. During the contract period the contractor is responsible for environmental and social safeguards compliance as specified in the contractual agreements and necessary mitigation measures should be implemented to minimize any adverse impacts resulted due to road rehabilitation and maintenance activities.

51. During survey and preliminary engineering (SAPE) works for iRoad, an environmental assessment and review framework (EARF) was prepared to guide screening and selection of roads, environmental assessments and to monitor implementation of environment safeguards during project implementation. EARF complies with ADB safeguards policy statement (SPS), 2009 as well as the national laws and regulations with respect to environmental management and conservation such as national environmental act (NEA) and Fauna and Flora Protection Act etc...

52. As per the project classification on environment aspects in SPS, 2009, the RMC falls within the scope of category B (please refer rapid environmental assessment (REA) checklist attached in Appendix 1.1). Thus, initial environment examinations (IEE) should be carried out for each candidate road.

53. This document presents the findings of the Initial Environmental Examination conducted for the road section from Nittambuwa (39.71km) to Kadugannawa (100.0km) of Colombo - Kandy (A001) Road. This IEE report also discusses the possible impacts that would arise due to proposed development and maintenance works on the proposed A001

road section. The IEE Report is prepared based on the guidelines given in the EARF of iRoad and is prepared by an expert staff from environmental and social development division (ESDD) of RDA. The IEER has also taken insights from Environmental Safeguards Compliance Manual of RDA.

1.2. Objectives of the proposed project

54. The broad objective of this project is to improve the transport efficiency of Colombo – Kandy (A001) Road which ultimately assist socio – economic development of the area affected by the road while conserving the nature.

55. Specific objectives of this project are;

- To improve, rehabilitate, and maintain Nittambuwa (39.71km) to Kadugannawa (100.0km) section of A001 Road
- To introduce passing lanes where Right of Way (ROW) is available in order to facilitate a smooth traffic flow
- To improve cross and side drainage of the road
- To rehabilitate the candidate road section of the road ensuring a sustainable development

1.3. Objectives of the Initial Environmental Examination

56. This IEE is prepared for the proposed improvement, rehabilitation and maintenance of Nittambuwa (39.71km) to Kadugannawa (100.0km) section of A001 road. The IEE report provides the baseline conditions of physical, biological and social environments found along the candidate road section from Nittambuwa to Kadugannawa. Anticipated environmental and social impacts that shall be generated due to implementation of the project over the identified existing environments are assessed and feasible mitigation measures in order to avoid, minimize or manage identified impacts are also provided in the IEE report. The IEE also presents an environmental management plan (EMP) which is a summary of impacts and mitigation measures. The EMP shall guide project implementation unit (PIU), project implementation consultant (PIC) of iRoad and respective Contractors to comply with environmental and social safeguards during project period. environmental monitoring plan (EMoP) is also an appendix of the IEE which assess the effectiveness of the implementation of the EMP. This report also proposes a grievance redress mechanism (GRM) to address public grievances resulted due to implementation of the project.

1.4. Approach, Methodology and Personnel Involved

57. As mentioned above, a REA checklist (Appendix 1.1) was prepared for the rehabilitation project of Nittambuwa – Kadugannawa section of A001 Road in order to determine the category of the project and accordingly the project is categorised under category B. Subsequently an IEE is required to assess the impacts resulted by the project and to propose mitigation measures to mitigate the impacts. This IEE report while complying with the requirements stipulated in the EARF, it also follows the environmental and social safeguards manuals of RDA.

58. Under the methodology, the existing right of way (ROW) is set as the primary impact zone as the all road improvement activities will be within the existing ROW. A secondary impact zone is set as 100m from the centreline of the road to both sides which is defined as the study area in order to identify;

- Presence of any environmentally sensitive sites
- Hydrological aspects
- Sensitive receptors to environmental and social impacts
- Presence of archeologically protected sites
- Presence of areas prone to landslides

59. As part of the environmental assessment, water quality and noise measurements were obtained at selected locations along the candidate road section of A001 road. Water sampling locations included four surface water sources (streams). However, ground water quality was not measured during the study. Noise was measured at five locations along the candidate road section of A001 Road.

Table 1.2: Locations of water quality measurement

Code	Water body	Location Details	
		Coordinates	
		Latitude	Longitude
SWQ 1	Stream	7° 12.943'N	80° 10.997'E
SWQ 2	Stream	7° 14.197'N	80° 17.617'E
SWQ 3	Stream	7° 15.094'N	80° 20.097'E
SWQ 4	Ma oya	7° 15.074'N	80° 26.506'E

Table 1.3: Locations of noise measurements

Code	Location	Location Details	
		Coordinates	
		Latitude	Longitude
N1	Nittambuwa junction	7° 8.645'N	80° 5.733'E
N2	N2 (Home garden, No:58,Bataleeya, Pasayala)	7° 10.995'N	80° 7.907'E
N3	Near Warakapola hospital	7° 13.486'N	80° 11.766'E
N4	Tholangamuwa Central school	7° 14.265'N	80° 14.068'E

Code	Location	Location Details	
		Coordinates	
		Latitude	Longitude
N5	Near St/Joseph college-Kegalle	7° 15.125'N	80° 20.360'E

60. In compliance with the EARF, the study team conducted public consultation and focus group discussions (FGD) in order to understand the views of the public and officers of stakeholder government agencies over the proposed project and to disclose information about the project. FGDs were conducted as follows;

Table 1.4: FGDs conducted along the road

Item No.	Date	Location	Target Group	Total number of participants
1	2017/01/04	Mirigama Divisional Secretariat Office	Government officers	08
2	2017/02/09	Radawadunna Grama Niladari (GN) Division,	Public	43
3	2017/02/09	House located in Bataleeya GN Division	Public	17
4	2017/01/06	House located in Kongasdeniya GN Division	Public	14
5	2017/02/01	Molagoda GN Division	Public	11
6	2017/02/09	Shop located in Galigamuwa-Ambanpitiya GNDivision	Public	9
7	2017/02/09	Shop located in Ganethanna GN Division	Public	26
8	2019/03/25	Section from Ambepussa to Kadugannawa of A001 highway	Public	47 (one on one interviews)

61. The environmental assessment and report preparation was carried out by trained multidisciplinary team including including Hydrologist, Environmental and Social Safeguards Officer, Chemist, Ecologist, Social Impact Awareness Officer, Field Monitoring Assistant (Hydrology), Field Monitoring Assistant (Social Dimensions) and GIS and map production expert of ESDD, RDA. This core team was supported by assistant staff members of environment and social dimensions. The support and guidance given by Director and Deputy Directors of ESDD, Project Director and staff of iRoad and the staff of RDA is highly appreciated.

CHAPTER 2: DESCRIPTION OF THE PROJECT

2.1. Location of the project

62. The proposed road section of A001 traverses through Gampaha, Kegalle and Kandy Districts of Western, Sabaragamuwa and Central Provinces respectively. The administrative divisions including Divisional Secretariat (DS) Divisions falling within particular section of the A001 road is presented in table 2.1 below while the location map of the candidate section is presented in Appendix 2.1.

Table 2.1: Administrative divisions of the project area

Province	District	DSD
Western	Gampaha	Attanagalla
		Mirigama
Sabaragamuwa	Kegalle	Warakapola
		Galigamuwa
		Kegalle
		Rambukkana
		Mawanalla
Central	Kandy	Yatinuwara

2.2. Need of the Project

63. RDA has already commenced improving and rehabilitating rural road system in Sri Lanka through iRoad program with the financial assistance of ADB. Under the investment program, rural community hubs will be selected based on the population, development potentials and the distance to trunk roads. Selected national roads, provincial and local authority roads including feeder roads will be rehabilitated to ensure the connectivity to the selected rural hubs. The program will improve road connectivity to the rural hubs.

64. Improvement of rural access roads to all-weather conditions will result in significant social benefits and poverty reduction, such as increased agriculture productivity since farmers will be able to get goods to market faster, better access to health services and education, and easier access to jobs.

65. Subsequently, improvement of rural roads in six provinces namely; Southern, Sabaragamuwa, Central, North Western, North Central and selected roads in Western Provinces are underway. Most of the rural roads of Sabaragamuwa and Central Provinces connect with the A001 road, which is commonly known as the Kandy Road, the first modern highway in the island which traverses through three provinces viz Western, Sabaragamuwa and Central. Therefore, in order to obtain the expected outcome of the improvement of rural roads, rehabilitation of A001 is a must.

66. On the other hand, A001 Road is one of the main links which serve important interprovincial link as this road directly connects with Western, Sabaragamuwa and Central provinces. Also A001 road feeds other trunk roads which connect North Western, North Central, Northern and Eastern Provinces. Therefore, a considerable traffic including public

transport busses, heavy vehicles which transport goods and also traffic which bring pilgrims to Kandy world heritage city could be observed along the road throughout the day. Smooth transportation is frequently disturbed along the A001 Road due to slow moving heavy vehicles because space for overtaking of such vehicles are lacking. This situation is badly observed when the road climbs up hills such as Galigamauwa – Kegalle, Uthuwankanda and Kadugannawa hills. Therefore, queuing up of vehicles after slow moving heavy vehicles is a common observation along particular sections as well as along flat narrow sections.

67. Thus, under this project, RDA is aiming at rehabilitating the road section from Nittambuwa to Kadugannawa to standard two lanes facility with Asphalt Concrete surface and improved drainage. The improvements also intend to introduce passing lanes at required locations in order to facilitate smooth traffic flow.

2.3. Analysis of Alternatives

2.3.1. No Project Alternative

68. If the candidate road section of A001 road is left as it is, the road will not be able to serve the increasing traffic flow therefore the transportation efficiency will further be reduced resulting increase in travel time and transportation cost. This situation will badly affect the socio-economic status of the affected DS Divisions therefore the no project alternative is not viable. Further the present road surface which was developed nearly two decades ago is now deteriorated requiring an urgent overlaying. If such intervention is not done the road surface shall further deteriorate, slowing the movement of traffic unacceptable limits.

2.3.2. Widening the road section in to four lanes status

69. As commonly observed in trunk roads in Sri Lanka, a ribbon type development can be observed along the road section from Nittambuwa to Kadugannawa of A001 road as well. So that, acquisition of land for the additional lanes on both sides of the road to meet the four lanes status will result large amount of land acquisition, involuntary resettlement and livelihood loss. Therefore, this will result severe social unrest to public as well as will incur high land acquisition and resettlement cost which will not be economically viable. On the other hand, iRoad does not encourage land acquisition and involuntary resettlement therefore widening the Nittambuwa – Kadugannawa section of A001 road in to four lanes status under this project is not a feasible alternative (under this project).

2.3.2. With Project Alternative

70. With the iRoad program, about 60.29km section of A001 road will be rehabilitated and maintained to all-weather standard. Further passing lanes shall be introduced along sections where ROW is available to ensure an undisturbed traffic flow. Therefore, the travel time between Colombo and Kandy will be reduced while cost of transportation will also be reduced. This will lead increase in transportation efficiency along the A001 road which will be a positive impact to the socio-economic status of the project area. Therefore, with project alternative is justified.

2.4. Magnitude of Operations

2.4.1. Proposed improvement

71. Under RMC of iRoad, 60.29km length from Nittambuwa (39.71km) to Kadugannawa (100.0km) section of A001 Road will be rehabilitated and maintained. And it has been proposed to rehabilitate the particular section in to standard two lanes configurations. On the other hand, passing lanes shall also be constructed along the road sections where existing ROW is adequate. Drainage of the road shall also be improved within the candidate road section. The project will not involve acquisition of additional lands and all improvement activities will be restricted to the existing ROW. The proposed typical cross section consists of carriageway, hard shoulder, soft shoulder and side drains where necessary as given below.

- Carriageway: 3.5m x 2
- Hard shoulder: 1.5m x 2
- Soft shoulder (varies): 1.5m x 2
- Drain (where necessary) 0.9m x 2
- Total (required): 14.8m

72. As mentioned, passing lanes having a width of 3.5m each shall be constructed either in a one side or both sides based on the availability of the existing ROW. Any locations where the ROW has been encroached shall not be considered in designing these passing lanes. This measure is taken to avoid any physical and/ or economic loss to such encroacher/s.

73. Proposed typical cross section with passing bays is attached in Appendix 2.2. The typical cross section will be modified based on the location specific contexts keeping the major components unchanged.

74. At present, the cross section of the A001 road consists of a dual carriageway of 7.0m and soft shoulders of 1m each on average. And the existing ROW of the road generally varies between 15m to 18m at measured locations.

2.4.2. Project activities

75. The scope of work proposed under the RMC include the following: clearing and grubbing; road excavation; channel excavation; excavation and backfill of structures; embankment construction; sub bases, capping layers, and bases; shoulder construction, asphalt overlay; roadside and lead away drains; cleaning, de-silting, and repairing of culverts.

76. All improvements are limited to the available ROW and no land acquisition is necessary.

77. The proposed pavement is Asphalt Concrete (AC) with the following criteria:
- If the existing surface is asphalt; it will be overlaid by the asphalt concrete.
 - Base correction will be carried out if base failures are found along the road.
 - Build-up drains have been provided for town areas or other required areas. Otherwise the earth drain will be provided.
 - The earth work will be carried out in required areas.
 - Finally, road marking and providing necessary road furniture shall be carried out.
78. In addition, improvement to cross and side drainage will be considered in locations where structures have been badly damaged or rectification of the drainage is significantly required. Special consideration will be paid at flood prone road sections and opening sizes of cross drainage structures, surface treatment and road finished level will be determined with necessary hydrological studies which will be carried out during detailed designs.
79. The following specific design standards will be the key components of the RMC of iRoad project:
80. The applicable design standards and guidelines are:
- (a.) Road design manual and Bridge design manual—RDA's standards (b) AASHTO—Geometric Design of Highways and Streets 5th edition (2004); (c) TRL—Overseas Road Note 6, A Guide to Geometric Design (1988), and (d) Austroads—Rural Road Design (2003). Bridges: RDA's Sri Lanka Bridge Design Manual of 1997, based on the British Standards Code of Practice for Bridge Design (BS5400:1990). Road Pavement: (a) Transport Research Laboratory's Road Note 31, 4th Edition (TRL-RN31), basis of RDA's pavement design process; (b) AASHTO Pavement Design Guide, and (c) design life for new pavements: 10-year life with provision for overlays during or at the end of that period to extend the life to 15–20 years. Drainage: RDA's standards incorporating relevant standards from AASHTO and the British Standard Design Manual for Roads and Bridges.
 - **Alignment and Traffic Facilities:** In general, the proposed improvements follow the existing horizontal and vertical alignment. The only minor changes are applied to the horizontal alignment for very short sections to enhance road safety, to ease the radius of curves, or minimize blind spots (within the ROW). The road safety aspects relate mostly to localized sections of the road alignments. In densely populated areas, roads, bridges, and associated sidewalks are made accessible for all, including the disabled.
 - **Road Safety:** The road safety aspects are related mostly to localized sections of the alignments. Based on the road safety inspections, carried out on the road sections during the field evaluation, the detailed design, wherever possible, incorporates improvements to road width and alignment, including installing precautionary sign boards, direction boards and speed signs to slow down for oncoming curves or low speed areas.

- **Road Side Drains.** To minimize storm water flooding or ponding, roadside drains are reconstructed to direct surface flows away from road pavements and divert to streams or watercourses. Built up drains are provided for urban and sub-urban areas and for rural areas, earth drains are provided. For existing built up drains, which can be retained with minor repairs (retained or repaired), the waterways are restored by removing sediment materials and debris.
- **Culverts and Bridges.** Improvements comprised of repairing and or replacing existing culverts and bridge structures, depending on hydraulic and structural requirements. These interventions include structural renovation of substructure and superstructure elements together with installation or repair of guardrails and improvement of causeways and vented drifts. Depending on the terrain and outcome of hydrological studies, few new culverts may be introduced to improve drainage. Materials and construction methods are in accordance with Technical Specifications, Part 1 Standard Specification for Construction and Maintenance of Roads and Bridges 1989 (Sri Lanka), modified to suit project requirements.
- **Earth Retaining Structures.** When the road is in embankment, retaining walls are introduced to get required additional road widths. Gabions, random rubble masonry and reinforced concrete retaining walls are used and Materials and construction methods are in accordance with Technical Specifications, Part 1 Standard Specification for Construction and Maintenance of Roads and Bridges 1989 (Sri Lanka), modified to suit project requirements.
- **Road Pavement.** Road pavements are constructed in accordance with Technical Specifications, Part 1 Standard Specification for Construction and Maintenance of Roads and Bridges 1989 (Sri Lanka). Road pavement consists of granular soil sub base, aggregate base course and Asphalt concrete wearing course.

81. RMC will cover the periodic, routine, and emergency maintenance of the rehabilitated road section. Periodic maintenance works consist of specific types of major interventions designed to ensure the residual pavement and surfacing lives are provided to RDA by the contractor at the end of the contract period. Routine maintenance services are all interventions on the roads which are to be carried out by the contractor in order to achieve maintain the road performance standards defined by the service levels included in these specifications and all activities related to the management and auditing of the road contract performance measures. Emergency works are activities needed to reinstate the roads and reconstruct their structure or their ROW which has been damaged as a result of natural phenomena such as strong storms, floods and earthquakes.

2.4.3. Extraction of Construction Material

82. Material required for construction will be explored from the project area. Existing sites which are operating with relevant licenses and approvals will be used especially for extraction of soil, metal and sand.

83. Potential locations which are currently used for iRoad program in Sabaragamuwa and Central Provinces as well as for other road development projects operated are given priority in selecting sites for material extraction for the project.

84. Offshore sand could also be used for construction subjected to confirmation of quality. If new material extraction sites will be opened for this project, necessary licenses and approvals will be obtained from relevant agencies. As per the estimations prepared for iRoad Program, projected approximate quantities of material required for the project are provided below:

Table 2.2: Material Requirement for A001 Road

Description	Amount required
Aggregate (m ³)	96,500
Soil (m ³)	175,000
Sand (m ³)	500
Reinforcement (MT)	250
Bitumen (MT)	8,400

CHAPTER 3: POLICY AND LEGAL FRAMEWORK

3.1. Legal Framework

3.1.1. National Environmental Act and other applicable regulation

85. The national environment act (NEA) No. 47 is the key environmental policy framework which is administered through the central environment authority (CEA) of the ministry of environment and wild life resources (ME&WLR). NEA No. 47 was enacted in 1980 and NEA amendment Act No. 56 of 1988 stipulated the regulations for assessing and managing environmental impacts and obtaining the environmental clearance in a timely and systematic manner. It also provides guidelines for environment management, management of natural resources, fisheries, wildlife, forestry, soil conservation, environment quality, environment protection and approval of projects. The environmental clearance process is implemented 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.

86. The environmental clearance process should be initiated by submitting the completed basic information questionnaire (BIQ) to CEA with preliminary information about the project including exact locations of the project components, extent and environmental sensitivity related to project activities. Based on this CEA decides whether the project is a “Prescribed Project”¹ or not and who the PAA will be for administering the IEE or EIA process to obtain environmental clearance if the proposed project is a prescribed project. For Prescribed project CEA or the designated PAA will issue a TOR for the IEE or EIA required.

87. The scope of the investment program includes rehabilitation and upgrading of existing rural and national roads with no widening. According to the Gazette Extra-ordinary No. 772/22 of 24th June 1993 and subsequent amendments all rehabilitation works for existing highways and roads do not fall within the category of Prescribed Projects. Hence, it is likely that the project roads under the investment program will not be required to prepare an IEE or EIA for securing an environmental clearance. However, further amendments to the NEA on requirements for material extraction, emissions, noise and vibration levels that are relevant for the project will need to be followed. Necessary revisions will need to be made within the project to meet the new requirements if there are any.

88. If a project road falls within the boundary or inside a protected area, necessary clearance will need to be sought from the department of wildlife conservation (DWLC) even if there will be no widening of the road ROW. Depending on the sensitivity of the protected area, the DWLC may require conduction of an IEE or EIA study for the respective road. No

¹Under the NEA, a prescribed project means that the project requires a full Initial Environmental Examination or environmental impact assessment (EIA) study depending on the TOR issued by CEA for securing the environmental clearance

works are allowed in project roads falling inside National parks and Strict Nature Reserves. **However, the road section from Nittambuwa to Kadugannawa of A001 Road does not fall within or near to any protected area declared by DWLC.**

89. While the NEA is the key environmental legislation under GOSL there are a number of other environmental laws and regulations that are applicable to the investment program as given in Table 3.1 below.

Table 3.1: Applicable National Laws and Regulations for the Investment Program

Legislation	Relevance and main content	Authorizing Institution
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 regulates the discharge and deposit of any kind of waste or emission into the environment and stipulates requirements for an environmental protection license (EPL) depending on the project activity. Examples of activities requiring and EPL are: asphalt processing plant, concrete batching plants, treatment plants, sewerage networks, mechanized mining activities etc.	CEA
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
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
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
National Environmental (Vehicle Horns) Regulations, No. 1 of 2011	Regulates maximum allowable noise emanating from vehicular horns on a highway or road any motor vehicle use during project construction activities	CEA
National Environmental (Municipal Solid Waste) Regulations, No. 1 of 2009	Regulates 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
Fauna and Flora Protection Act No.2 of 1937 amended in 1993	The act specifies that any development activity taking place within one mile from the boundary of a National Reserve	Department of Wildlife Conservation

Legislation	Relevance and main content	Authorizing Institution
and 2009	declared under the Ordinance requires an EIA/IEE which provide for the protection and conservation of fauna and flora of Sri Lanka and their habitats; for the prevention of commercial and other misuse of such fauna and flora and their habitats for conservation of biodiversity of Sri Lanka; and to provide for matters connected there with.	
Forest Act No. 34 of 1951	This act is to consolidate and amend the law relating to the conservation, protection and management of forest and forest resources for the control of felling and transport of timber and Forest and for matters connected therewith or incidental thereto.	Department of Forest
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
Water Resources Board Act, No. 29 of 1964 and (Amendment) Act, No. 42 of 1999	The act controls and regulates developments (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
Soil Conservation Act, No. 25 of 1951 and Amended No. 24 of 1996	This Act makes provisions for the enhancement of productive capacity of 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; and to provide for matters connected therewith or incidental thereto	Department of Agriculture
Explosives Act No. 36 of 1976	To provide control of explosions and regulations of matters connected with explosive activities related with the project.	Ministry Of Defence
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 offices etc. and methods taking place within the command area relevant to government laws and regulations	Ministry of Local Government And Provincial Council

Legislation	Relevance and main content	Authorizing Institution
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
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
Agrarian Development Act No. 46 of 2000 (Section 32)	This act regulates using paddy land for a purpose other than agricultural cultivation without the written permission of the Commissioner General.	Agrarian Services Department
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 (chapter 454) and the land development ordinance no.19 of 1935 chapter 464 as amended by land development (amendment) acts, no. 16of 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
Sri Lanka Land Reclamation and Development Corporation Act 15 of 1968 as amended by Act No 52 of 1982	This act established Sri Lanka Land Reclamation and Development Corporation which grants permission for the public to fill marshy land subject to provision of storm water drainage.	Sri Lanka Land Reclamation and Development Corporation
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.	Road Development Authority

Legislation	Relevance and main content	Authorizing Institution
Urban Development Authority (UDA) Law No 41 of 1978 and Urban Development Projects (Special Provisions) Act No 2 of 1980	<p>This law provides for the establishment of an 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.</p> <p>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.</p>	Urban Development Authority (UDA) under the ministry of Urban Development and Defence
Town and country planning ordinance No. 13 of 1946 and The Town & Country Planning (Amendment) Act, No. 49 of 2000	This regulates the National Physical Plan with transport as the main component	National Physical Planning Department (NPPD) under the Ministry of Urban Development and Defence
Buddhist Temporalities Ordinance No. 19 of 1931	This act provides necessary assistance to administer and protect the property of Viharas, interventions to settle disputes regarding property of Viharas and makes recommendations to release money to be paid as compensation in respect of property of Viharas acquired by government for any development project	Department of Buddhist Affairs
Cemeteries and burial grounds ordinance No. 9 of 1899 and amendments	The act regulates any disturbance, removal of burial, monuments and use of such areas for development project	Local Government Authority
Antiquities Ordinance No. 9 of 1940 and amendments	The act regulate activities of projects located in close proximity of any archaeological reserves	Department of Archaeology

90. Under the NEA (No). 47 and some of the laws and regulations listed in Table 3.1 above, there are specific requirements for clearances, permits and licenses required for road projects as listed in Table 3.2 below.

Table 3.2: Applicable approvals required for the project

Project stage	Approvals	Project Related Activity	Relevant Agency
Pre-Construction Stage Note: Although clearances and approval should be obtained during preconstruction stage it is valid throughout the project cycle. However this should be renewed before expiry date	Environment clearance	Implementation of the project	Central Environment Authority
	industrial mining license (IML)	Operation of quarries, borrow areas and other material extraction sites	Geological Survey and Mines Bureau
	environmental protection license (EPL)	Operation of material extraction site including operation of asphalt plants, treatment plants etc.	CEA
	Local Government Authority Trade license and machinery permits	Deciding waste disposal sites, material storage and sites for worker camps and other project stations Trade license should be obtained for asphalt plants, batching plants, quarries etc.	Respective Provincial Council, Local authorities and respective Pradeshiya Sabha
	Explosive Permits	Blasting activities	Ministry of Defence
	Approval for removal of trees	Road clearance for construction	Forest department, CEA and local authorities
	Filling of paddy lands located within the ROW	Ground preparation for ROW and side drains	Commissioner of Agrarian Services
	Consent of Department of Archaeology	Construction activities near archeologically protected monuments	Department of Archaeology
Construction stage	Consent of national building research organization (NBRO)	Project activities within landslide prone areas	NBRO
	Consent from relevant government agencies	Construction of bridges, culverts and other drainage systems, land filling, dredging activities	Department of Irrigation, Department of Agrarian services, Local government authority, Land Reclamation and Development Cooperation
	Approval from relevant state /local agencies for the removal/ temporary disturbances for existing utilities	Surfacing, construction of bridges and side drains, embankment filling works	NWSDB for water lines, Ceylon electricity Board for Electric cable/poles, Sri Lanka Telecom for land line telephone cables, poles, Pradeshiya sabha, other local authorities for drainage, sewer systems etc.

Environmental Protection License (EPL)

91. The environmental protection license (EPL) is a regulatory/legal tool under the provisions of the National Environmental Act No: 47 of 1980 amended by Acts No 56 of 1988 and No 53 of 2000. Industries and activities which required an EPL are listed in Gazette Notification No 1533/16 dated 25.01.2008. Industries are classified under 3 lists i.e. List and "C" depending on their pollution potential.

92. Part "A" comprises of 80 significantly high polluting industrial activities and Part "B" comprises of 33 numbers of medium level polluting activities. EPL for industries in lists "A" and "B" have to be obtained from the relevant Provincial Offices or District Offices of the CEA.

93. Part "C" comprises of 25 low polluting industrial activities which have been delegated to Local Government Authorities, namely Municipal Councils, Urban Councils and Pradeshiya Sabhas. EPL for the industries in List "C" has to be obtained from the respective Local Authorities. The Local Authorities carry out issuing of EPLs and related functions such as follow up, monitoring and law enforcement.

94. Objectives of the EPL

- To prevent or minimize the release of discharges and emissions into the environment from prescribed (industrial) activities in compliance with national discharge and emission standards.
- To develop an approach to pollution control that considers discharges from prescribed (industrial) processes to all media (air, water, land) in the context of the effect on the environment.
- To contain the burden on industry, in particular by providing guidance on pollution control for polluting processes.
- To ensure that the system responds flexibly both to changing pollution abatement technology and to new knowledge such as cleaner production, waste minimization etc

3.1.2. International Agreements and Conventions

95. Sri Lanka is also a signatory to a number international agreements and conventions related to environmental conservation. Those that are relevant for this investment program are provided below:

- Conventions on Wetlands of International Importance Especially as Water Fowl habitats (Ramsar)
- Convention concerning the protection of the World Cultural and Natural Heritage
- convention on international trade in endangered species of wild fauna & flora (CITES)
- Convention on the conservation of migratory species of wild animals (CMS 1979)
- United Nations Framework Convention on Climate Change

- Convention on Biological Diversity
- Plant Protection Agreement for Asia and the Pacific region

However, the project road from Nittambuwa to Kadugannawa of A001 Road does not fall in to any of the sites declared under above mentioned international agreements and conventions.

3.2. Policy Framework

3.2.1. ADB Safeguards Policy Statement (SPS), June 2009

96. ADB's safeguard policy framework consists of three operational policies on the environment, Indigenous People, and involuntary resettlement. All three safeguard policies involve a structured process of impact assessment, planning, and mitigation to address the adverse effects of projects throughout the project cycle. The safeguard policies require that (i) impacts are identified and assessed early in the project cycle; (ii) plans to avoid, minimize, mitigate, or compensate for the potential adverse impacts are developed and implemented; and (iii) affected people are informed and consulted during project preparation and implementation. The policies apply to all ADB-financed projects, including private sector operations, and to all project components.

97. The objective of environment safeguards policy is to ensure the environmental soundness and sustainability of projects and to support the integration of environmental considerations into the project decision-making process.

98. Proposed projects are screened according to type, location, scale, and sensitivity and the magnitude of their potential environmental impacts, including direct, indirect, induced, and cumulative impacts.

99. Projects are classified into the following four categories:

- **Category A.** A proposed project is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental impact assessment (EIA), including an environmental management plan (EMP), is required.
- **Category B.** The proposed project's potential adverse environmental impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for category A projects. An initial environmental examination (IEE), including an EMP, is required.
- **Category C.** A proposed project is likely to have minimal or no adverse environmental impacts. An EIA or IEE is not required, although environmental implications need to be reviewed.
- **Category FI.** A proposed project involves the investment of ADB funds to or through a financial intermediary. The financial intermediary must apply and maintain an environmental and social management system, unless all of the

financial intermediary's business activities have minimal or no environmental impacts or risks.

100. **Policy Principles:** Use a screening process for each proposed project, as early as possible, to determine the appropriate extent and type of environmental assessment so that appropriate studies are undertaken commensurate with the significance of potential impacts and risks.

101. Conduct an environmental assessment for each proposed project to identify potential direct, indirect, cumulative, and induced impacts and risks to physical, biological, socioeconomic (including impacts on livelihood through environmental media, health and safety, vulnerable groups, and gender issues), and physical cultural resources in the context of the project's area of influence. Assess potential transboundary and global impacts, including climate change. Use strategic environmental assessment where appropriate.

102. Examine alternatives to the project's location, design, technology, and components and their potential environmental and social impacts and document the rationale for selecting the particular alternative proposed. Also consider the no project alternative.

103. Avoid, and where avoidance is not possible, minimize, mitigate, and/or offset adverse impacts and enhance positive impacts by means of environmental planning and management. Prepare an EMP that includes the proposed mitigation measures, environmental monitoring and reporting requirements, related institutional or organizational arrangements, capacity development and training measures, implementation schedule, cost estimates, and performance indicators. Key considerations for EMP preparation include mitigation of potential adverse impacts to the level of no significant harm to third parties, and the polluter pays principle.

104. Carry out meaningful consultation with affected people and facilitate their informed participation. Ensure women's participation in consultation. Involve stakeholders, including affected people and concerned nongovernment organizations, early in the project preparation process and ensure that their views and concerns are made known to and understood by decision makers and taken into account. Continue consultations with stakeholders throughout project implementation as necessary to address issues related to environmental assessment. Establish a grievance redress mechanism to receive and facilitate resolution of the affected people's concerns and grievances regarding the project's environmental performance.

105. Disclose a draft environmental assessment (including the EMP) in a timely manner, before project appraisal, in an accessible place and in a form and language(s) understandable to affected people and other stakeholders. Disclose the final environmental assessment, and its updates if any, to affected people and other stakeholders.

106. Implement the EMP and monitor its effectiveness. Document monitoring results, including the development and implementation of corrective actions, and disclose monitoring reports.

107. Do not implement project activities in areas of critical habitats, unless (i) there are no measurable adverse impacts on the critical habitat that could impair its ability to function, (ii) there is no reduction in the population of any recognized endangered or critically endangered species, and (iii) any lesser impacts are mitigated. If a project is located within a legally protected area, implement additional programs to promote and enhance the conservation aims of the protected area. In an area of natural habitats, there must be no significant conversion or degradation, unless (i) alternatives are not available, (ii) the overall benefits from the project substantially outweigh the environmental costs, and (iii) any conversion or degradation is appropriately mitigated. Use a precautionary approach to the use, development, and management of renewable natural resources.

108. Apply pollution prevention and control technologies and practices consistent with international good practices as reflected in internationally recognized standards such as the World Bank Group's Environmental, Health and Safety Guidelines. Adopt cleaner production processes and good energy efficiency practices. Avoid pollution, or, when avoidance is not possible, minimize or control the intensity or load of pollutant emissions and discharges, including direct and indirect greenhouse gases emissions, waste generation, and release of hazardous materials from their production, transportation, handling, and storage. Avoid the use of hazardous materials subject to international bans or phase outs. Purchase, use, and manage pesticides based on integrated pest management approaches and reduce reliance on synthetic chemical pesticides.

109. Provide workers with safe and healthy working conditions and prevent accidents, injuries, and disease. Establish preventive and emergency preparedness and response measures to avoid, and where avoidance is not possible, to minimize, adverse impacts and risks to the health and safety of local communities.

110. Conserve physical cultural resources and avoid destroying or damaging them by using field-based surveys that employ qualified and experienced experts during environmental assessment. Provide for the use of "chance find" procedures that include a pre-approved management and conservation approach for materials that may be discovered during project implementation.

CHAPTER 4: DESCRIPTION OF EXISTING ENVIRONMENT

4.1. Existing land use along the road

111. In general, the land use of the project area could be categorized in to home gardens, townships, agricultural lands, water bodies such as streams. Generally, the entire road section has a ribbon type development comprised of both residential and commercial buildings. Specific land uses observed within candidate road section is summarized as below.

Nittambuwa (39.71km) to Warakapola (57.0km)

112. The road starts near Nittambuwa junction (A001/Veyangoda - Ruwanwella (B445) road) at 39.71km. Starting point of the road has a ribbon type development which consists of commercial buildings. Land use immediately adjacent to the this section is dominated by commercial buildings and apart from this residential areas, paddy lands (e.g. 41km on either side, 42km on Right Hand Side (RHS), 47km on Left Hand Side (LHS), 51 km on LHS and marshy areas (e.g. 49km on LHS, 51km, 51+850km on LHS on RHS, 52km on LHS, 53km on RHS) present in this section. Pasyala (44km), Radawadunna (47km), Weweldeniya (50km), Danowita (54km), Warakapola (57km) are the small townships located within this section. This section traverses through Western province and enters Sabaragamuwa province passing the 49th Kilometer post.

113. Nittambuwa Buddhist College and Pasyala Maha Vidyalaya are located on 40.1km and 43.7km on RHS of the road. Nittambuwa police station is located at 40.9km on the same side. One mosque and a church are located on LHS at 45.7km and 50.37km respectively and three other mosques on RHS at 48.63km, 51.35km and 55.82km and are located adjacent to this stretch of the road.

114. Kajugama (which is a village popular for selling cashew nuts) area from 46.0km to 46.75km is an iconic sight along the A001 road where a small cluster of home enterprises immerses in processing and selling cashew nuts. Radawadunna area (47km) is famous as a cane village that has earned a name for the craft.



Figure 4.1: Starting point at Nittambuwa (39.71km)



Figure 4.2: Road side vendors selling Cashew at Kajugama

115. The road takes a sharp U shaped bend at around 49km. Weweldeniya - Mirigama (B476) road and Danowita - Mirigama (B090) road branches off from the A001 road near 51.0km and 53.5km respectively.

116. Warakapola base hospital is located near 56km of the road. The surrounding of the road section from 56.72km to 57.0m within the Warakapola town gets inundated during the heavy rains however the A001 road within this section does not get flooded. Warakapola - Kandalama (B456) road branches off to RHS of the road before 58km. Near 58.2km on LHS the road traverses near an area with slope failures.



Figure 4.3: Road side vendors selling cane products



Figure 4.4: Road entering Warakapola Town

Warakapola (57.0km) to Kegalle (78.0km)

117. Immediate vicinity of this section of the candidate road traverses through a commercial area with business structures, residential area with home gardens and agricultural area consists with paddy and rubber plantations. The terrain is rolling and undulating. Ambepussa (59.5km), Udukumbura (65.0km), Nelundeniya (67.0km), Yattogoda (64.0km), Galigamuwa (73.0km), Ranwala (77.0km) are the small townships belong to Pradeshiya Sabas (Local Authorities) and the Kegalle (78km) is a large township belongs to Kegalle urban council located within this section of the road.

118. Ambepussa is famous for the presence of Sri Lankan old rest house built in 1822 which, is a popular lunch spot located at LHS of the 59km. Passing this the road traverses over the bridge the across Kuda Oya at meet Ambepussa – Kurunegala -Trincomalee (A006) road by forming a junction at 59.5km. The road traverses near the famous Kalwariya Christian church RHS at 60km.

119. From 66km to 72km road runs near Galigamuwa Oya and crosses it at 63km and 69.5km. Meanwhile the Galigamuwa - Ruwanwella (B127) road at Galigamuwa (72.1km), Polgahawela - Kegalle (A019) road near 77km and Kegalle – Bulathkohupitiya - Karawanella (A021) road at 78km join with A001 road respectively. At 81km the newly constructed Kegalle town bypass road connects with the A001 road.

120. Ambepussa Maha Vidyalaya (school) (58.95km, on LHS), a primary School (59.97km), Dadley Senanayake Vidyalaya, Tholangamuwa (63.05km on LHS), Galigamuwa Primary School (71.56km on LHS), Mahanama school (74.70km on RHS), St. Joseph Balika Vidyalaya (77.10km on RHS), Tamil School and St. Mary School (77.15km on LHS) and several churches, mosques, shrines and temples are located within this section.



Figure 4.5: Ambepussa Junction at 59.5km



Figure 4.6: Entrance to Dadly Senanayake School, Tholangamuwa



Figure 4.7: St. Joseph Girls School at 77km



Figure 4.8: Road across Kegalle township

Kegalle (78.0km) to Kadugannawa (100.0km)

121. This road section traverses through the Sabaragamuwa province and enters the Central Province between 98.0 and 99.0km. Karandupona (82.0km), Mologoda (84km), Uthuwankanda (88.0km), Mawanella (90km) and Hingula (94km), Ganethenna (96.0km) are the built up areas within this section.

122. The stretch of road passes through Mologoda (84km) area which is a village famous for local pottery production. Many shops showcasing these pots for sale can be found on the side of the road from 82km to 86km.

123. An ancient rest house locally called “Ambalama” is located at Mangalagama (85km) on LHS of the road which has an archaeological value. This rest house has been declared as an archaeological monument by Department of Archaeology (Please refer section 4.6 for further details).

124. Just before entering Mawanella Town the road crosses Maha oya over a bridge (between 90.0km and 91.0km) which is a stone bridge which was built in the early 19th century. This bridge has been entirely constructed using stones. After this bridge the road passes through Mawanella town.

125. The road traverses near Mederigama Maha Vidyalaya (School) on RHS at 92.75km. Then the road comes to Ganethenna, an area that is common for leather product shops. Between 94.0 and 95.0km, road crosses Hingul oya, a tributary of Maha oya.

126. After passing Hingula, road starts to climb Kadugannawa hill and reaches its top at 100km. Along this section, the road traverses adjacent to another ancient rest house at 97.15km. This rest house is located on LHS of the road and popular as “Kadugannawa Ambalama”. This rest house is also declared as an archaeological monument by Department of Archaeology (Please refer section 4.6). Access road to Mawela Walagamba Cave Temple (An ancient cave temple) starts to RHS from A001 Road after the rest house. This cave temple is located at the foot of the mountain which is on the downslope of A001 road.

127. A001 Road meets Kadugannawa Tunnel at 98.68km which is located along the old trace of the A001 road and at present only light vehicles are allowed to use it (Figure 4.9).

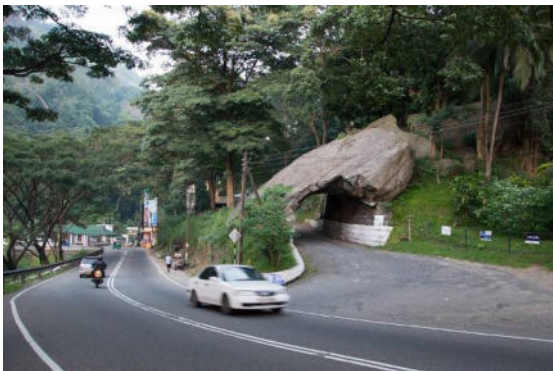


Figure 4.9: Kadugannawa Tunnel

128. Immediately before the 100km post, Kadugannawa Police Station is located adjacent to the road on RHS. As described in section 4.6 below, Captain Dowson’s Tower which is an Archaeologically Protected Site is located at 100km on RHS. Kandy rail track runs on the LHS at the 100km of the road. 100km post is found immediately before to the Kadugannawa town.

4.2. Physical Environment

4.2.1. Climate, land use, terrain and Soil

129. Based on major climatic zones of the country, the A001 road section falls entirely within the wet zone of Sri Lanka. The climatic environment of the project area is further categorized in to agro – ecological zones which are categorized based on climate, altitude, soil, natural vegetation and land use pattern of an area. The specific agro-ecological zones related to candidate road sections and their characteristics are presented in Table 4.1 below.

Table 4.1: Climatic characteristics of candidate roads

Agro-ecological Zone	75% expectancy value of rainfall (mm)	Description (Land use, Terrain, Soil groups)
WL3	>1700	Coconut, fruit crops, mixed home gardens, paddy Rolling and undulating
WL2b	>2200	Rubber, Coconut, mixed home garden, Paddy. Steeply, dissected rolling and undulating. RYP,RYP with strong mottled sub soil, RBL and LHG
WM3a	>1600	Mixed home garden, Export agriculture crop, tea, paddy, rubber. Steeply, hilly and rolling. RBL, IBL, LHG, Lithosol
WM2b	>1800	Mixed home garden, Paddy, Export agricultural crops and tea. Steep, hilly and rolling. RBL,IBL and RYP soils

LHG - Low Humic Gley, RYP - Red Yellow Podsolc, RBL - Reddish Brown Latosolic, RBE - Reddish Brown Earth, IBL- Immature Brown Loam.

130. Most important element of the climate of Sri Lanka is the rainfall which is influenced by monsoon winds from the Indian Ocean and the Bay of Bengal. The monsoon winds create two distinctive rainy seasons, namely South-West Monsoon and North-East Monsoon. In addition to these rainy seasons two inter monsoons rains are also experienced during March to April and October to November. The project area receives sufficient rainfall from the South-West Monsoon during the period of May to September and relatively low rainfall from North-East Monsoon in the months of December to February.

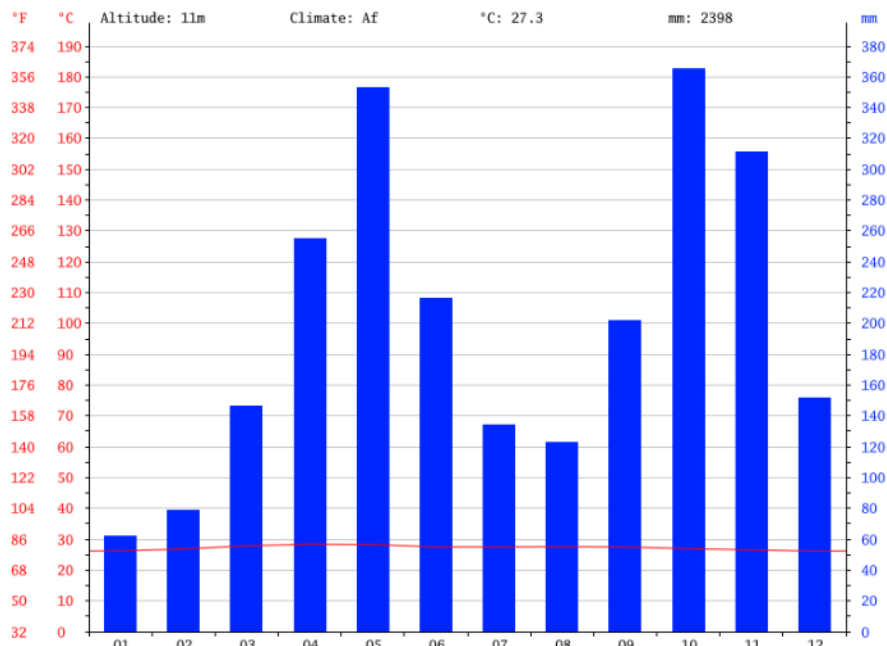


Figure 4.10: Rainfall and temperature variation of Gampaha District

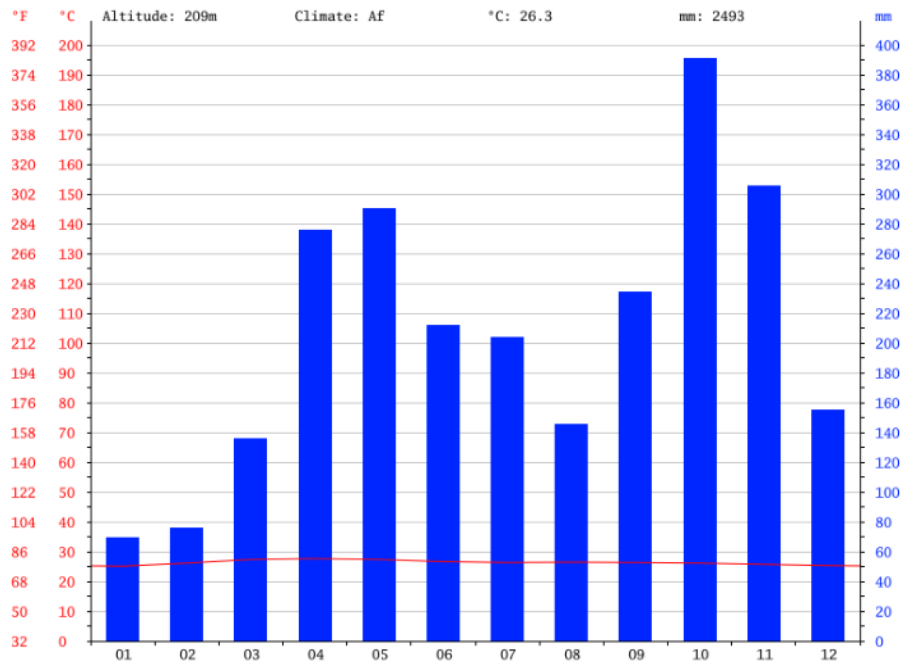


Figure 4.11: Rainfall and temperature variation of Kegalle District

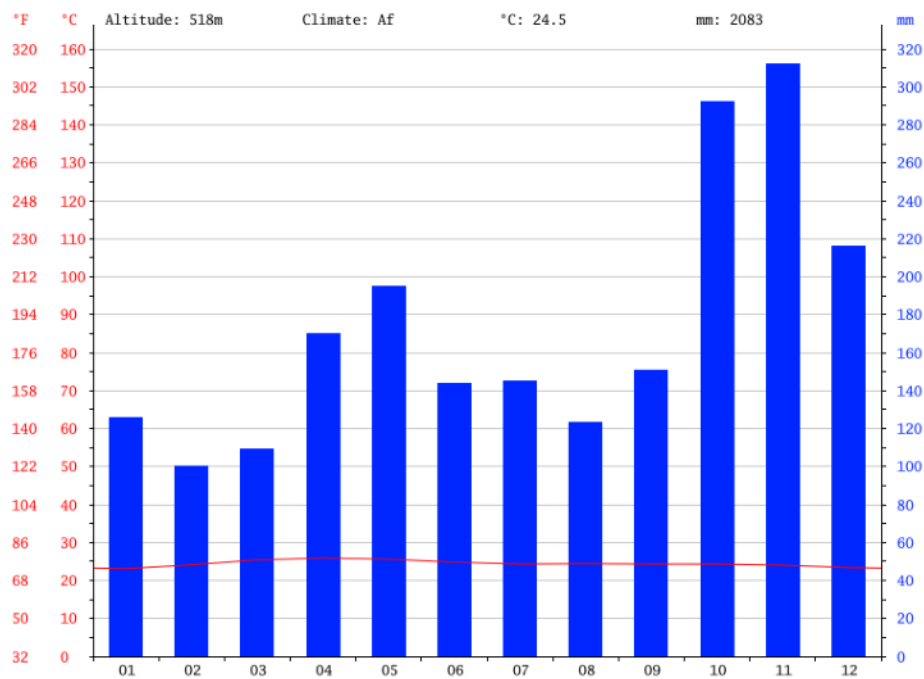


Figure 4.12: Rainfall and temperature variation of Kandy District
(Source: <https://en.climate-data.org/location/11319/>)

4.2.2. Hydrology

Surface water resources

131. Maha oya is one of the major surface water body located in the project area. The road crosses Maha oya between 90.0km and 91.0km. A tributary of Maha Oya called Kuda Oya crosses the road at Ambepussa Junction (59km). Maha Oya which originates in the hilly regions around Aranayaka, Bible rock and Kadugannwa has catchment area 1538 km² and a stream length of 130 km. Maha oya flows through four provinces as Central, Sabaragamuwa, Western and North Western. The watershed of Maha Oya is characterise with extensive paddy, rubber tea and coconut plantations. The most important use of water in the Maha Oya is for the supply of drinking water, presently there are 14 water supply intake is located in the basin serving an urban population of about 200,000 (<http://www.cea.lk>). Also, the communities use the river for bathing and washing. Other than Maha Oya, tributaries of Attanagalu Oya also crosses the road at several locations as mentioned in the table below.

Table 4.2: Surface water bodies located along the candidate road section

Road section	Hydrologically sensitive area
41.2	Crosses a tributary to Attanagalu Oya (stream)
41.2-43	Road runs On RHS to a tributary of Attanagalu Oya
43	Crosses a tributary to Attanagalu Oya
45.5	Crosses Diaella oya a tributary to Attanagalu Oya over bridge 46/2
57.2	Crosses Kuda Oya (stream)
59-60	Kuda oya over bridge 60/1
62-63	Tholangamuwa oya (stream) over bridges 63/3 and 63/4
65-66	Nelundeniya oya (stream) over the bridge 66/8
66-67	Nelundeniya oya over the bridge 67/5
67-68	Batapotha ela (stream) over the bridge 68/9
69-70	Yattogoda oya (stream) over the bridge 70/3
70-71	Ballapana oya (stream) over the bridge 71/2
71-72	Galigamuwa ela (stream) over bridges 72/6 and 72/7
75-76	Ranwala oya (stream) over the bridge 77/6
78-79	Kegalle ela (stream) over the bridge 79/1
81-82	Madeiyawa ela (stream) over the bridge 80/5
81-82	Road crosses Karandupana Ela (stream) over bridges 82/3 and 82/7
82-83	Molagoda ela (stream) over the bridge 83/2
83-84	Mudamawatha ela (stream) over the bridge 84/2
84-85	Waragoda ela (stream) over the bridge 85/1
85-86	Palpatha ela (stream) over the bridge 86/5
86-87	Wlakadayawa ela (stream) over the bridge 87/7
87-88	Wlakadayawa ela over the bridge 88/4
89-90	Anwarama Ela (stream) (bridge 90/3) and Wlakadayawa ela bridge (90/4)
90-91	Crosses Maha Oya over the bridge 91/1
91-92	Crossess Hingul oya (stream) over the bridge 92/4
93-95	Crosses Hingul oya and Hingul oya branch over bridges 94/7 and 95/4 respectively
95-96	Crosses Ganethenna ela (stream)

98-99	Crosses Galawidaputhena Ela (stream) over the bridge 99/8
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Ground Water Resources:

132. Dug wells are commonly observed within home gardens. Protected dug wells are used by residents of most of all DS divisions (Attanagalla, Meerigama, Warakapola, Galigamuwa, Kegalle and Rambukkana) crossed by the road section. Several water springs are observed along the road mainly in Kadugannawa area. In the hilly terrain groundwater is generally available in fractured rocks and obtained through deep wells at some locations.

Surface Water and ground water quality

133. Selected parameters of water were measured to check the quality of surface water using portable scientific water quality meter and kit. The measured parameters included Conductivity, Total Dissolved solids (TDS), Salinity, turbidity, pH, Dissolved Oxygen. However, ground water quality is not obtained during the study. ESDD measured water quality of surface water bodies found along the road trace and the results of surface water quality monitoring were as follow. The climate was sunny during the sampling period.

Table 4.3: Results of water quality measurements

Parameter	Unit	Standards ²	Name of the surface water body			
			SWQ 1	SWQ 2	SWQ 3	SWQ 4
Conductivity	ms	-	0.098	0.172	0.16	0.062
TDS	ppm	-	65	115	107	41
Salinity	ppt	-	0.09	0.13	0.24	0.09
Turbidity	ntu	-	6.05	7.479	2.9	2.69
Temperature	°C	-	24.4	22.6	25.3	25.2
pH at 25°C ± 2°C	-	5.5-9.0	8.5	8.6	7.42	8.27
DO	mg/l	3.0	7.9	7.9	5	7.8

134. Baseline values of pH at measured locations are within the standard limits as specified for class III waters in proposed inland water quality standards of CEA. However, the baseline Dissolved Oxygen (DO) values are slightly higher than the respective standard levels.

4.2.3. Air quality

135. Air quality in the town areas such as Nittambuwa, Warakapola, Kegalle, Mawanella and Kadugannawa is generally observed to be in a dilapidated condition mainly due to high levels in exhaust emission resulting from traffic congestions. Therefore, the major source of atmospheric pollution in the area is from road traffic especially heavy vehicles in the form of diesel and petrol engine vehicle fumes. However, no baseline measurements are available for project area. An extract from the National Environmental (Ambient Air Quality) Regulations, declared in 1994 is presented in Table 4.4.

²Proposed inland water quality standard for class III waters-category 7 of Central Environment Authority.

Table 4.4: National ambient air quality standards

Parameter	Averaging time (hrs)	NAAQS (mg m ⁻³)	NAAQS (ppm)
Carbon Monoxide	8	10	9
Nitrogen Dioxide	24	0.10	0.05
	8	0.15	0.08
Sulphur Dioxide	24	0.08	0.03
Lead	24	0.002	-
TSP	24	0.03	-
PM10	8	0.35	-

Source: Gazette of the Democratic Socialist Republic of Sri Lanka, 850/4 (20 December, 1994)

PM 10 – particulate matter < 10 µm

NAAQS – National Ambient Air Quality Standards (NAAQS)

4.2.4. Noise and vibration

136. ESDD measured ambient noise levels during the daytime in a sunny day during the environmental assessment and results are given below.

Table 4.5: Measure noise levels

Location code	N1	N2	N3	N4	N5
Noise level (leq) dB	75	78	74	81	78

137. According to Schedules I and II of National environmental (Noise Control) regulations No.1 1996 (924/12) imposed under the National Environmental Act No 47 of 1980, the project area falls to “Low noise area” and “Medium noise area”. Low noise area is located within Pradeeshiya Sabha area where the ambient noise level of the area can be considered as 55 dB (A) during day time (06.00 hrs-18.00 hrs) and 45 dB (A) night time (18.00 hrs - 06.00 hrs). Medium noise area is located within Municipal councils and Urban Council areas where the ambient noise level of the area can be considered as 63 dB (A) during day time (06.00 hrs-18.00 hrs) and 50 dB (A) night time (18.00 hrs - 06.00 hrs).

138. Measured noise levels are found to be high because of the frequent traffic movement along the A001 road.

139. Many receptors which are sensitive to high noise and vibration levels such as schools, religious places and archaeological sites etc... are located along the road. The table below shows key sensitive sites to higher noise levels along the road located within 10m on either side of the ROW edge.

Table 4.6: Sensitive receptors to noise and vibration located adjacent to the road

Chaninage-km	LHS	RHS
40.1		Nittambuwa Buddhist College
43.7		Pasyala Maha Vidyalaya
45.75	Mosque	
48.63		Mosque
50.37	Church	
51.35		Mosque

55.82		Mosque
57.0	Warakapola base hospital	
57.15	Church	
58.0	Kovil	
58.3	Kovil	
58.85	Church	
58.95	School (Ambepussa Maha Vidyalaya)	
59.75	Church	
59.4		Shrine-Catholic cemetery
59.98	Primary School	
62.8		Temple
63.05	School (Dadley Senanayake Vidyalaya, Tholangamuwa)	
64.3	Mosque	
67.00		Elderly house
69.18	Temple	
71.56	Galigamuwa Primary School	
72.00		Temple
73.65		Temple
74.7		Mahanama School
75.25		Elderly house
77.1		St. Joshep Balika Vidyalaya
77.15	Tamil School and st. Mary School	
77.16	Church	
77.55		Mosque
77.85		Kovil
80.0		Royal International school
81.58	Bo tree and a Shrine	
83.90		Jayapala Maha Vidyalaya
85.00	Ancient rest house (Mangalagama Ambalama)	
87.15	Temple	
88.42	School	
92.75		Mederigama Maha Vidyalaya
93.2		Dadimunda devalaya
94.00		Mosque
94.25	School (Udama Kadawara Vidyalaya)	
94.48		Mosque
97.15	Ancient rest house (Kadugannawa Ambalama)	
98.68	Kadugannawa old rock tunnel	
100+000		Captain Dosan's tower

4.3. Ecological Environment

4.3.1. Existing Habitats with Respect to Flora and Fauna and protected areas

140. Road section of A001 road from Nittambuwa to Kadugannawa does not fall into any protected area or declared forest area.

141. Road section runs mostly through well-developed areas including major and secondary towns. Thus, natural habitats are almost not to be found. The two dominant habitats identified in the road trace are home gardens including Kandyan Home Gardens (KHGs), paddy fields, plantations (rubber and coconut), roadsides and water bodies which are limited to few streams that cross the road.

142. Kadugannawa climb has immense scenic value due to spectacular views of the mountains and land hundreds of feet below. At this point many local and foreign travellers stop here for rest.

Home gardens

143. Home gardens in the project area are important as feeding, resting and breeding ground of faunal species. They support the survival of several species of ornamental plants, plants with medicinal value, fruit trees, vegetables, medicinal plants and Palms trees.

144. KHGs located in the project area between Kegalle and Kadugannawa area. This ecosystem is unique in the high level of functional plant diversity they contain. This system comprises of several perennial food crops such as fruits, vegetables, roots, tubers, medicinal plants, tuber, timber and spice crops. KHGs provide key ecosystem services and habitat for a range of floral and faunal species. These habitats provide connectivity and linkages to other agricultural and natural landscapes.

Paddy lands and upland crop cultivations

145. Both cultivated and abandoned paddy lands were observed in the project area (e.g., 41 -43km, 45.0km, 46.8km, 50.0km, 56.0km, 63.2km, 67.0km, 69.0km, 89 - 90km). Several species of weeds could be observed in the paddy lands. Some abandoned paddy fields serve as grazing grounds for cattle. Different stages with different farming practices of paddy creates distinct habitats for variety of animal species. Small canals, which run through the paddy fields, provide habitats for several species of freshwater fish. Therefore, the paddy fields provide provisioning services and regulating services. Also rice fields provide regulating services by increasing water storage of the catchment, trapping of sediments, percolation from rice field help to recharge ground water. Cultivated paddy fields provide cultural services because there are many traditional and religious practices associated with the cultivation and harvesting of this crop. Also, the rice fields are valued for their scenic beauty.

146. Few patches of rubber (60km and 66km) and coconut plantations (63km) are present in the project area. These crop cultivations provide provisioning services by providing food and raw materials for human. In addition, this area supports biodiversity by providing habitat

for survival of associated flora and fauna. These perennial crops provide regulating services by controlling soil erosion in rolling to undulating terrain.

Marshy lands

147. Existing marshes (e.g., 51.0km, 54.0km, 54.65km, 57.6km, 61.77km, 62km, 64km, 65.35km to 65.6km, 69.7km, 70.5km, 86.1km) support biodiversity by providing habitats and act as feeding, breeding and resting areas for terrestrial, avian and aquatic fauna. Marshy area provides regulating services by increasing water storage of the catchment, trapping of sediments and controlling flood.

Roadside trees

148. There are about 500 roadside trees on either side of the road. These trees serve many useful purposes especially in the urban areas where they improve air quality, enhance aesthetic element of the area, provide shade and conserve soil. Majority of the roadside tree species include Rosy trumpet (*Tabebuia rosea*), Sri Lankan Almond (*Terminalia catappa*), Mango (*Mangifera indica*) and Rain tree (*Samanea saman*).

Water bodies

149. Surface water bodies in the project area seem to be already polluted due to the various human activities. Streams which were found in the project area were mostly associated with several species of native, introduced aquatic and associated floral species. Some of the aquatic bird species commonly were also observed in association with the paddy fields were cormorants, herons, egrets, water hens, stilts, kingfishers and storks. Thus, this habitat provides supporting services for the biodiversity in the project area and also it adds scenic beauty to the project area thus providing cultural services too. Water bodies in the project area also provide regulating service by controlling flood.

Fauna

150. As the natural habitat is highly influenced and changed by human activities the faunal species found in home gardens, paddy lands and plantations are not unique or rare. Among the animals reported in this road section are monkey, species of rats and squirrels. Bats are also found in all parts of this section. Lizards, many species of frogs and snakes are common in the area. Many varieties of indigenous bird species are also found.

151. List of fauna and flora observed during the assessment in the study area is presented in Appendix 4.1.

4.4. Occurrence of Natural Disasters in the Project Area

152. Mainly two types of natural disasters observed in the project area i.e. slope failures and localised drainage congestions.

153. The road section near Warakapola town from 56.72km to 57.00km gets inundated during the heavy rains due to overflowing of Kuda Oya and causes the roads in the surrounding areas to be inundated.

154. Excessive rainfall, landform and geology, unsustainable land use practices, deforestation, collectively contribute to create landslide hazards particularly during the monsoon rains in the mountainous slopes of the central and south western regions of the country. Kegalle area (77 to 78km) and Pahala Kadugannawa (96 - 97km) are such areas prone to modest level of landslide risk as per the national building research organizations (NBRO) maps of landslide hazard zones. Based on the information provided by provincial RDA officers, slope failures are possible at 86km post to 87/1 culvert, 98.8 to 98.9km. Further, as per the field investigation conducted by ESDD minor slope failures could be observed at; 77 to 78km, 96 - 97km and 98-99km along the road trace.

4.5. Socio - Economic Environment

4.5.1. Population:

155. The candidate road section of A001 road is located within Gampaha, Kegalle and Kandy districts of Western, Sabaragamuwa and Central provinces and traverses through eight Divisional Secretariat (DS) Divisions, namely, Attanagalla, Mirigama, Warakapola, Galigamuwa, Kegalle, Rambukkana, Mawanella and Yatinuwara. Table below presents the administrative divisions which are falling into the road section.

Table 4.7: Administrative divisions of Nittambuwa - Kadugannawa road section of Colombo-Kandy (A001) Road

Districts	DSD	GNDs
Gampaha	Attanagalla	Nittambuwa south, Kongasdeniya, Nawagamuwa, Kalalpitiya, Wedagama, Napagoda, Nittambuwa North
	Mirigama	Pasyala East, Pasyala, Pasyala West, Muruthawela, Bataleeya South, Bataleeya, Radawadunna, Makkanigoda North, Hedidenikanda, Imbulgasowita, Radawadunna Central, Weweldeniya Ihalagama, Weweldeniya Ihalagama West, Kotadeniya, Weweldeniya Pahalagama, Madabavita Ihalagama, Danowita, Newgala
Kegalle	Warakapola	Panihela, Godawela, Dummaladeniya, Warkapola, Mahena Colony, Ambepussa, Mahena, Tholangamuwa, Nape, Morawaka, Nelumdeniya, Mampita
	Galigamuwa	Palapoluwa, Yattegodda, Ballapana Pahathabage, Mayfeild, Ballapana Udabage, Kobbewala, Galigamuwa, Bisowala,

	Kegalle	Ranwala , Uraulla, Ambanpitiya, Paranagampola,, Golahela, Kegalle town, Meepitiya, Puwakdeniya, Emunugalla, Karadupotha
	Rambukkana	Molagoda, Waragoda,Kumbaldeewela, Mangalagama
	Mawanella	Uthuwankanda, Habankaduwa, Mawanella, Rankothdiwala, Hinguloya, Hingula, Mawana, Beliammana, Owatta, Batawala, Molligoda, Mawela, Ganethanna, Warakapana,
Kandy	Yatinuwara	Ihala Mudaliwatta, Kadawathgama,

156. According to Department of Census and Statistics, in 2016, estimated midyear population of Gampaha, Kegalle and Kandy districts were 2,372,000, 869,000 persons and 1,434,000 persons respectively. In 2012, majority of population in these three districts are living in rural areas, i.e. 84.3% in Gampaha, 91.3% in Kegalle and 81.4% in Kandy.

157. In 2012, total population of above mentioned DSDs is 923,068 persons. Highest population is reported from Attanagalla DSD and it is 179,565 persons. The second highest population is in Meerigama DSD, which has a population of 164,580 persons.

158. A ribbon type development can be observed all along the road section while township areas such as Nittambuwa, Warakapola, Kegalle, Mawanella and Kadugannawa are densely populated. Table 4.8 given below shows the distribution of population of project located DSDs by gender segregation.

Table 4.8: Distribution of population of project located DSDs by gender

DS division	Male		Female		Total
	No.	%	No	%	
Attanagalla	86,489	48.17	93,076	51.8	179,565
Mirigama	79,185	48.11	85,395	51.9	164,580
Warakapola	54,179	47.92	58,877	52.1	113,056
Galigamuwa	35,581	47.77	38,909	52.2	74,490
Kegalle	43,127	47.47	47,727	52.5	90,854
Rambukkana	38,929	47.03	43,840	53.0	82,769
Mawanella	52,665	47.14	59,062	52.9	111,727
Yatinuwara	50,921	48.03	55,106	52.0	106,027
Total	441,076	47.78	481,992	52.2	923,068

Source: Department of Census and Statistics, 2012

159. With regard to ethnicity, majority of population in eight DSDs is Sinhalese i.e. Rabukkana 95.38%, Kegalle 95.79%, Galigamuwa 94.47% etc. The second highest population in eight DSDs is Moor i.e. Mawanella 30.28%, Attanagalla 12.27%, Yatinuwara 7.16% etc. Table 4.9 shows the distribution of population of project located DSDs according to ethnicity.

Table 4.9: Distribution of population by the ethnicity

DS division	Sinhala		Sri Lankan Tamil		Indian Tamil		Moor		Burgher		Other	
	No	%	No	%	No	%	No	%	No	%	No	%
Attanagalla	155593	86.65	1020	0.57	595	0.33	22041	12.27	244	0.14	72	0.04
Meerigama	155822	94.68	850	0.52	149	0.09	7560	4.59	107	0.07	92	0.06
Warakapola	103109	91.20	1568	1.39	2124	1.88	6208	5.49	30	0.03	17	0.02
Galigamuwa	70369	94.47	564	0.76	2378	3.19	1133	1.52	4	0.01	42	0.06
Kegalle	87029	95.79	824	0.91	1756	1.93	1198	1.32	29	0.03	18	0.02
Rambukkana	78949	95.38	802	0.97	186	0.22	2759	3.33	16	0.02	57	0.07
Mawanella	76413	68.39	917	0.82	492	0.44	33827	30.28	55	0.05	23	0.02
Yatinuwara	95285	89.87	2565	2.42	426	0.40	7593	7.16	77	0.07	81	0.08

Source: Department of Census and Statistics, 2012

4.5.2. Main economic activities

160. **Agriculture:** In 2015, out of total employed population, 4.6% in Gampaha District, 23.5% in Kegalle District and 22.7% in Kandy district are identified as engaging in agricultural sector. Paddy is the main agricultural crop in these three districts. Paddy is grown mainly twice a year in two rainy seasons: Maha (Major) season from November to February during northeast monsoon and Yala season from May to September during southwest monsoon. According to Department of Census and Statistics, Gampaha district has 20,968 acres of cultivable paddy lands and in 2015/2016 Maha season, it has produced 1,560,000 Bushels of paddy. In 2015/2016 Maha season, Kegalle district has 13,224 acres of cultivable lands and it has produced 1,009,000 bushels of paddy and Kandy district has 22,928 acres of paddy lands and in the same period it has produced 1,674,000 Bushels of paddy.

161. Coconut, tea and rubber are the main plantation crops grown in Kegalle and Kandy districts while coconut and rubber are cultivated in Gampaha district. In the Gampaha, Kegalle and Kandy districts, coffee, pepper, cashew, cloves and areca nut also are grown and fruits such as mango, orange, lime, jak, plantain, papaya avocado and vegetables can be found in home gardens.

162. Table 4.10 given below shows the percentage of employment distribution by major industry group.

Table 4.10: Percentage of employment distribution by major industry group - 2015

District	Agriculture %	Industry %	Services %
Gampaha	4.6	38.8	56.6
Kegalle	23.5	33.2	43.4
Kandy	22.7	23.4	53.9

Department of Census and Statistics, Labour Force Survey - Annual Report 2015

163. **Industries:** The industrial sector is well developed in these three districts. In Gampaha, Kegalle and Kandy Districts, 38.8%, 33.2% and 23.4% of population are engaged in this sector in 2015 respectively.

164. **Services:** In Gampaha, Kegalle and Kandy districts, employment contribution to services sector is 56.6%, 43.4% and 53.9% respectively (table 4.11). Majority of employed population in this sector belong to wholesale and retail trade activities and government and private sector employments.

165. In the project area, especially in Nittambuwa, Pasyala, Warakapola, Ambepussa, Kegalle, Mawanella and Kadugannawa areas a number of trade and business centers, private companies and government offices are located, and many people are working in private and government sector employments in the project area.

4.5.3. Poverty Situation

166. Table 4.11 shows poverty headcount index of project located two districts. In 2009/2010, Poverty Head Count Index of the Gampaha, Kegalle and Kandy districts was 3.9, 10.8% and 10.3% respectively and in 2016 it has decreased up to 2.0%, 7.1% and 5.5% respectively. Accordingly, during this period these three districts show good performance of reducing poverty. However, in the rural areas of Kegalle and Kandy districts, majority of people are working in agriculture and agricultural estate. Most of these people are working as casual laborers and they earn relatively lower level of monthly income. Accordingly, poverty in rural areas may not be presented as it is through the district level figures. This situation also applies to the project area. It can be assumed that poverty is relatively low in the commercialized areas.

Table 4.11: Poverty Headcount Index of affected districts

District	Poverty Headcount Index	
	Year -2009/ 2010	Year -2016
Gampaha	3.9	2.0
Kegalle	10.8	7.1
Kandy	10.3	5.5

Source: Household Income and Expenditure Survey – 2012/2013, Department of Census and Statistics,

4.5.4. Existing Infrastructure facilities

167. **Transportation:** Roads are the main transportation mode in Gampaha, Kegalle and Kandy districts. In Gampaha district there are 128.38km of A class roads, 622.45km of B class roads and 35.15km of E class roads. In Kandy district, there are 183.67km of A class roads and 563.11 km of B class roads. In Kegalle district, there are 143.88km of A class roads and 364.65km of B class roads. This road transportation mode is heavily used by many public and private sector employees, school children and other commuters for travelling and transportation of goods. In addition to roads, rail transportation also a prominent transportation mode in these three districts.

4.5.5. Energy source of households

168. Electricity is the major source of energy for lightning in the DS divisions belong to candidate road sections, e.g. Attanagalla 96.25%, Meerigama 92.83%, Warakapola 89.68%. Kerosene is the second major source, e.g. Warakapola 10.18%, Galigamuwa 9.34%. Meanwhile few households in these divisions use sola power and other sources for lighting. Table 4.12 given below summarizes energy source of households of affected DS divisions.

169. During the field reconnaissance, the electricity supply lines located in the project area were observed. When carrying out the public consultations people mentioned that majority of the households in the project area use electricity to lighten their households.

Table 4.12: Principle type of lightning the occupied housing units

DS division	Electricity (%)	Kerosene (%)	Solar power (%)	Other (%)
Attanagalla	96.25	3.70	0.01	0.04
Mirigama	92.83	7.10	0.03	0.05
Warakapola	89.68	10.18	0.12	0.01
Galigamuwa	90.55	9.34	0.09	0.02
Kegalle	92.70	7.17	0.05	0.08
Rabukkana	92.24	7.69	0.05	0.02
Mawanella	92.77	17.08	0.12	0.02
Yatinuwara	96.11	3.80	0.02	0.07

Department of Census and statistics, 2012.

4.5.6. Drinking water

170. As per the table 4.13, except Mawanella DS division, majority of households of other seven DS divisions use protected well water, e.g. Attanagalla 83.8%, Meerigama 87.44%, Warakapola 76.72%. In Mawanella Ds division use pipe born water. Except warakapola, Meerigama and Galigamuwa Ds divisions, Pipe born water is second major source for other five Ds division. E.g. Mawanella 47.23%, Yatinuwara 43.91%. In warakapola, Meerigama and Galigamuwa Ds divisions, majority of households use unprotected well. E.g. Warakapola 10.22%, Galigamuwa 11.86%. Meanwhile few households in these divisions use river/ tanks /streams/ spring and Other source (Tube well, Bottled water etc.) for drinking. In the project area, according to the field observations, majority of households use pipe born water.

Table 4.13: Source of Drinking water

DS division	Protected well	Unprotected well	Pipe born water	River/tank/streams/spring	Other (Tube well, Bottled water, etc.)
Attanagalla	83.8.	3.10	11.99	0.11	5.40
Mirigama	87.44	7.92	3.97	0.13	5.19
Warakapola	76.72	10.22	3.43	4.86	4.77
Galigamuwa	71.23	11.86	4.76	3.96	8.20
Kegalle	51.14	6.04	30.13	2.71	9.98
Rabukkana	68.03	8.35	18.09	1.09	4.44

Mawanella	40.65	2.78	47.23	2.96	6.39
Yatinuwara	45.16	2.70	43.91	1.88	6.35

Department of Census and statistics, 2012.

4.5.7. Sanitary Facilities

171. Majority of households of the affected DS divisions use private toilets, e.g. Attanagalla 99.88%, Meerigama 99.7%, Warakapola 99.64%. Meanwhile, 0.02% to 0.04% of households in these DS divisions are sharing toilets with other families. 0.10% to 0.43% households in these DS divisions are not using toilets.

172. During the field reconnaissance, when carrying out public consultations, people in the project area mentioned that most of the households in the area have their own toilets.

4.6. Archaeological and cultural sites located in the project area

173. During the assessment, four sites with archaeological importance were observed which are located adjacent to the road section from Nittambuwa to Kadugannawa of A001.

4.6.1. Mangalagama Ancient Rest House

174. As mentioned in the section 4.1 above, Mangalagama ancient rest house is located at 85km of the road at LHS. This building is found immediately adjacent to the hard shoulder on LHS of the road and there is a retaining wall at the edge of the road as shown in the figure 4.13 above. Therefore, there is no more space for road improvement to LHS at this location.

175. This kind of rest houses are locally known as “Ambalama” which were used for short stays during ancient days for travellers along the trunk roads. It is believed that the Mangalagama Ambalama was built during British colonial period in Sri Lanka however has been renovated 1970s. This is declared as an archaeological monument by Department of Archaeology.

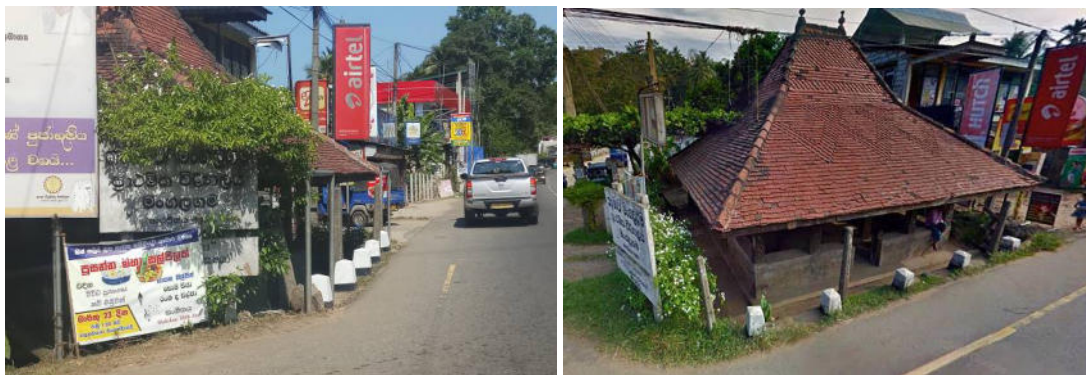


Figure 4.13: Mangalagama Ambalama at 85km

4.6.2. Kadugannawa Ancient Rest House

176. Another ancient rest house is located at 97.15km on LHS along the section of the A001 road that takes Kadugannawa climb. This rest house is known as “Kadugannawa Ambalama” which is located adjacent to the hard shoulder of LHS of the road (Figure 4.14).

177. Similar to Mangalagama Ambalama, this has also been used as a rest house for travellers of A001 Road which was built during the British colonial era. Kadugannawa Ambalama is also an archaeologically protected monument.



Figure 4.14: Kadugannawa Ambalama at 97.15km

4.6.3. Captain Dowson's Tower

178. The Captain Dowson's Tower is located near 100km on RHS which was erected to commemorate Captain William Francis Dawson. Colombo – Kandy (A001) Road was constructed under the direction of Captain Dowson however he died during the project.

179. Captain Dowson's Tower has been declared as an archaeologically protected site and site expands to the ROW edge at RHS of the A001 road (Figure 4.15).



Figure 4.15: Captain Dowson's Tower (To the reverse direction)

CHAPTER 5: ANTICIPATED ENVIRONMENTAL IMPACTS AND PROPOSED MITIGATION MEASURES

180. This chapter describes anticipated impacts on the existing environment and social setup during pre-construction, construction and operational stages. Feasible mitigation measures were designed based on environment best practices to minimize the adverse impacts or manage to acceptable limits while enhancing the beneficial impacts of the project. Impacts identified here are applicable for improving, rehabilitating and maintaining of the A001 Road under RMC package of iRoad. In addition impacts during the operational phase have been identified mostly based on activities to be undertaken by the contractors during the maintenance period.

5.1. Pre-construction phase

5.1.1. Shifting of temporary developments on the existing ROW

181. All proposed road rehabilitation activities including construction of passing lanes shall be within the existing ROW. However, still construction of passing lanes shall need to shift the temporary buildings/structures which encroached to the existing ROW and this will result negative impacts to public such as loss of income etc...

182. Therefore, to avoid this impact, designing of passing bays shall be done only at sections which are free from permanent or temporary encroachments to the existing ROW.

5.1.2. Natural hazards aggravated by the project and impacts to the road

Impacts due to Landslides

183. As some sections of the road are located within areas with steep, hilly and rolling terrain which are prone to landslides, it is possible to occur landslide if natural slopes are disturbed by the construction activities during extreme rainfall events.

184. As per the information of provincial RDA offices and based on field observations, the locations from 77 to 78km, 86km post to 87/1 culvert, 96 to 97km and 98.8 to 98.9km are in landslide prone areas.

185. Since road improvement and rehabilitation is restricted to the available ROW, natural slopes along the candidate roads will not be disturbed. Therefore, possibility of occurrence of landslides is minimum due to this project. However, special attention should be taken at above mentioned locations along the road trace and even temporary disturbances to existing slopes shall also be avoided at such locations.

186. Prior consent shall be obtained from national buildings and research organization (NBRO) for the road sections which are prone to landslides and recommendation of NBRO if any should be incorporated to the designs.

Flood Impacts

187. As mentioned above, sections of A001 road section near Warakapola town from 56.72km to 57.0km gets inundated during the heavy rains where the Kuda Oya overflows and causes the roads in the surrounding areas to be inundated. Due to the proposed project activities flood impacts may be aggravated. In order to mitigate this impact, hydrology along the road with special attention to these flood prone locations should be deeply studied during the detailed design stage and pre-construction phase and cross drainage structures, road finished level and the surface treatment should be decided accordingly in rehabilitating the road.

188. A close coordination with Department of Irrigation and Disaster Management Center (DMC) shall be maintained in this regard in order to obtain high flood levels, their return periods, respective retention periods and other recommendations in order to support the final design. Public consultation will also be used to verify the findings.

5.1.3. Alteration of surface water bodies

189. All water bodies crossing or located adjacent to the road shall not be disturbed other than at following locations.

190. In order to construct passing lanes at required locations and other road rehabilitation works, canals and drains located around 63.5km (LHS), 65.65km (LHS), 67.75km (LHS), 69.6 – 70km (RHS), 75.7km (RHS) and 75.8km (LHS) within the existing ROW need to be shifted. In order to minimize the impact to such canals and drains following measures have been incorporated to the design so that they will be remained within the existing ROW.

- Canal from 63.44 – 63.63 (LHS) will be diverted to the edge of the ROW
- It is proposed to introduce underground conduits for the canal from 65.63 – 65.67 (LHS)
- It is proposed to construct a retaining wall for canal protection from 67.733 – 67.780 (LHS)
- Underground drains are proposed to the drains from 69.642 – 70.010 (RHS), 75.620 – 75.703 (RHS) and 75.750 – 75.952 (LHS)

191. Further, consent from third party agencies such as Department Agrarian Services shall be obtained for the proposed canal improvement if such agency is getting involved.

5.1.4. Impacts to archaeologically protected monuments and sites

192. Road rehabilitation works or construction of passing lanes carried out near to the archaeologically protected monuments and sites at Mangalagama ancient rest house (85km, LHS), Kadugannawa ancient rest house (97.15km, LHS) and at Captain Dowson's Tower; 100km (RHS), could cause damages to these protected monuments.

Therefore, the design shall be modified at these locations so that the particular side of the road will be kept as it is in order to avoid any encroachments to such sites. Further the proposed improvement/ activities at these locations shall be presented to the Department of Archaeology for their concurrence prior to implementation.

5.1.5. Relocating of Utility Supply Lines

193. For the road upgrading and improving works electricity power lines, telephone lines and water supply mains located within the proposed cross section will need to be shifted.

194. The exact number of utilities to be shifted will be identified during detailed design stage and will be included in the site-specific environmental management action plan (SSEMAP). Proper co-ordination with relevant line authorities such as Ceylon Electricity Board (CEB), Sri Lanka Telecom and National Water Supply and Drainage Board (NWS&DB) and Community Based Organizations (CBO) which are responsible for community based water supply schemes in advance will help to reduce the nuisance from temporary blockades and service interruptions of these utility supply lines. Risks of accidental disruption can be reduced by ensuring that machinery such as excavators are operated by trained personnel, and that operations are adequately supervised. Water supply should be restored as soon as possible if such accidental disruption is occurred. Advance notice to the public about the times that the utility supplies will be disrupted helps the public to adjust to the situation before hand, thereby minimize the difficulties that they will face in the case of sudden disruption of these services.

5.1.6. Designing of labour camps/ accommodations

Overcrowded and unhygienic labor accommodations shall cause easy spread of diseases among laborers impacting the labor force for the project and even harm the near by settlements. Proper designing of labor accommodations shall minimize this risk. Following details should be considered in designing labor accommodations.

- Provision of adequate physical distancing between users of such accommodations,
- Provision of adequate ventilation,
- Provision of separate area to store boots, shoes which shall not be allowed inside the huts.
- A hand washing area at the entrance of each labor camp.

It is also important to inform the public health officer (PHI) and local health authorities of establishment of labor camps.

5.2. Construction phase

5.2.1. Increase of local air pollution, noise and vibration

195. Excavation for shoulders and other earthworks, pavement improvement operations, quarry operations, operation of asphalt plant, batching plant, operation of construction vehicles during construction period will release aerial contaminants (dust and fumes)

increasing local air pollution. Heavy machinery used for construction work will create noise and vibration which will cause nuisance to residents in settlements and also animals and also excessive vibration can damage buildings located nearby to the trace. Locations such as schools, and places of worship as given in table 4.6 above are particularly vulnerable to nuisance from noise.

196. Especially, archaeologically protected monuments and sites as mentioned in section 4.6 above are highly vulnerable to high vibration levels and damages to such sites can be possible if heavy construction activities which result high vibration levels will be practiced at such sites.

197. Table below gives the identified noise levels of various construction equipment and machinery at a distance of 7 m from the source.

Table 5.1: Typical construction equipment used in road construction, unobstructed at obstructed noise level 7m from the source

Equipment	Noise level at 7 m in dB(A)	Predicted noise 10m from source, unobstructed	Predicted noise 10m from source, obstructed by 1.5m movable barrier
Compressor	109	81	45.2
Truck, scraper or grader	94	66	30.2
Pneumatic drill	85	57	21.2
Excavator	112	84	48
Loader	112	84	48
Roller vibrator	108	80	44.2
Poke vibrator	113	85	49.2
Sound reduced jack hammers and lock drills	82	54	46.2

198. The impact of construction noise, vibration and emissions at sensitive areas shall be mitigated by;

- Limiting operations to times when they have least impact in settlement areas, especially near schools and other sensitive locations such as hospitals and places of worship.
- Ensuring that construction plant and equipment is maintained to high operable standards, and that exhaust baffles are fitted and maintained in a high serviceable condition.
- Vibration should be controlled with the agreement of the project implementation consultant (PIC) at locations where sensitive receptors are found.
- Regular sprinkling of water to dampen the construction surface will reduce the emission of dust.
- Implementation of all construction activities in compliance with acceptable levels of noise which are specified in National Environmental (Noise Control) Regulations 1996 stipulated by C amendments act 924/12 to mitigate the noise impact.
- A property condition survey will be conducted along the trace within a corridor as specified by PIC. The survey shall record all details related to cracks and construction failures existing in structures along this corridor.
- Buildings cracked due to construction activities should be compensated or repaired to the satisfactory level (which is agreed by the PIC) of the affected person. Here, precondition survey conducted for surrounding buildings located within an agreed area and a corridor with the PIC will be helpful in differentiating cracks caused by construction activities.
- All machinery, plants and vehicles used for the project shall be well maintained and regularly monitored in order to keep their emissions below the threshold levels (as specified in NEA) in order to minimize degradation of air quality
- At archaeologically protected sites and monuments, the recommendations given by Department of Archaeology shall be adhered to avoid any damages to such sites. Precautionary measures such as using small compactors without vibration, avoiding use of heavy machinery, maintaining the air quality below the standards at such sites should be practiced in order to avoid impacts.

5.2.2. Disruption to traffic flow

199. A001 Road generally caters a heavy traffic flow throughout the day therefore closure of lanes and diversion of traffic to facilitate road rehabilitation works will severely affect the traffic flow creating heavy traffic congestions. This will delay the day to day activities of the commuters such as schooling, attending to office works at time etc... Further, emergency vehicles such as ambulances which use the road very often will also be trapped in the traffic congestions.

200. Following measures shall be implemented to minimize the impacts on existing traffic;

- Preparation of traffic management plan in collaboration with the Police and implementation during the construction phase with the help of Police. Traffic management plan shall be updated as necessary. Assistance of Police shall be obtained to ensure that traffic will comply with the measures of the traffic management plan
- Providing advance information to the public about the planned construction works,
- Providing properly marked by-passes and one-way section including barriers, reflectors, and night illumination.
- Use of well-trained flagmen to control traffic flows at constricted sites, including safe crossing for pedestrians especially near town areas and schools.
- Public shall be made aware about alternative roads that can be used to bypass construction areas using media and sign boards
- Flagmen shall be instructed to pay especial attention to emergency vehicles in order to allow them to cross the construction sites without delay

5.2.3. Deterioration of surface water and ground water quality due to silt runoff, emissions and spoil from labour camps

201. In order to improve roads and the rehabilitation works clearing of roadside vegetation near the edge of the existing road, excavation and removal of unsuitable soil will be required. Such activities may develop temporary piles of soil and debris along the road edge.

202. All these activities could cause temporary erosion and thereafter siltation of nearby water bodies mentioned in table 4.2. If un-compacted earth surfaces or soil dumps are left exposed to rain or if they are placed near water bodies and paddy lands soil erosion will be possible. Sediments could drift away and get silted up in the side drains, adjoining streams and irrigation canals causing deterioration of water quality.

203. Run off contaminated with oil, grease, and leaked fuel from construction vehicles, equipment and material stores, wastewater and solid waste from worker camp sites will contain pollutant materials. Such materials have the potential to cause deterioration of surface water resources in the project area if they are released to adjacent water bodies.

204. Following measures shall be adopted to mitigate deterioration of surface water quality due to silt runoff, emissions and spoils from construction and labour camps;

- Reuse of soil removed for filling sites if any as much as possible and unsuitable materials can be used to refill borrow pits with the approval of the PIC.
- Where earthworks take place adjacent to water bodies, drainage of storm water should be managed in order to minimize the soil erosion to nearby water bodies. This should be planned prior to the commencement of earthwork activity.
- All temporary unsuitable soil dumps and debris should be removed from site to disposal sites which are approved by the relevant local authority as early as possible. Contractor should present a method statement stating how the environmental and social impacts that can be generated are managed at disposal sites in advance for approval.
- All disposal sites should be sited in locations which are not affected by floods or exposed to soil erosion.
- If temporary soil dumps are left at the site for a long time proper remedial measures to minimize soil erosion should be practiced (E.g.: Placing sandbags around the dump etc...)
- Temporary soil dumps should not be placed near water bodies or flood prone areas
- All fills, back fills and slopes should be compacted within the shortest possible time to reach the specified degree of compaction
- Turfing of all embankment slopes with suitable turf material, Establishment of suitable mulch to cover the slopes of embankments
- All materials (including toxic and hazardous material) required for construction shall be stored at secured and managed sites, sited away from water bodies,
- Construction vehicles and equipment will be maintained in good operable condition, ensuring no undue leakage of oil or fuel,
- Construction vehicles and equipment will be serviced only at properly managed and equipped workshops and waste oil will be collected and disposed at approved locations,
- Sanitation arrangements and an adequate water supply will be made at worksites and at any accommodation facilities provided for workers' accommodation, ensuring that no open dumping of solid wastes, no raw sewage is released into drains or water bodies.

5.2.4. Impacts to archaeological sites

205. Excessive vibration levels and noise generated due to operation of machineries, compaction activities and other construction activities will damage archaeological monuments and sites such as Managalagama ancient rest house (85km, LHS), Kadugannawa ancient rest house (97.15km, LHS) and Captain Dowson's Tower (100km, RHS). Further improper handling of machineries, dumping of debris and material can also damage such sites as they are located adjacent to the ROW. On the other hand, thieving of artifacts of the protected monuments and damaging will also possible by the workers if not properly monitored. Devotees to such sites will face inconveniences if access will be disturbed due to road improvement activities. Following measures shall be implemented through the Contractor to ensure the safety of archaeological monuments and sites.

- All construction activities at above mentioned sites shall be implemented under the supervision of Department of Archaeology
- Vibration shall be controlled using low vibration rollers, small compactors and using other measures as recommended by Department of Archaeology. Attention shall be made to the Kadugannawa tunnel as well in this regard as the tunnel can also be cracked due to excessive vibration.
- Dumping of debris, soil and any other material at such sites will be avoided.
- Machinery operators and other workers shall be made aware about the importance of the sites in order to minimize accidental damages
- The roadside (ROW) at these sites shall be properly barricaded
- Labor force shall be monitored continuously to ensure safety of artifacts at these locations
- Temporary safety access to the above mentioned sites shall be maintained for the convenience to the visitors
- Contractor shall immediately inform Department of Archaeology through PIU if he chance find any artifact during the construction period and activities at the particular location shall be stopped immediately until Department of Archaeology confirms to proceed with.

5.2.5. Flood Impacts

206. Contractor's activities shall not lead to flooding conditions as a result of blocked drainage paths and drains. The contractor shall take all measures necessary and as directed by the PIC to keep all drainage paths and drains clear of blockage at all times. If flooding or stagnation of water is caused by contractor's activities, contractors shall provide suitable means to (a) prevent loss of access to any land or property and (b) prevent damage to land and property. Contractor's activities shall not lead to aggravate floods when working in flood prone areas. Further, any recommendations laid down by the hydrological studies, should be adopted at flood prone areas. In addition, contractor will pay special attention to avoid flood prone areas in selecting disposal sites, locations for material stock piles, yards and other locations where chemicals and other construction material are stored.

5.2.6. Social and environmental impacts due to establishment of labour camps

207. Labour camps may need to be established near the road alignment and improper sanitation, lack of water supply, improper disposal of wastewater and solid waste will increase risk of contaminating nearby surface water sources. Stagnant water at the labour camp can create mosquito breeding and vector for communicable diseases to the workers and host communities. Social conflicts may arise due to use of illicit liquor and unpleasant behaviour which causes inconvenience to local community.

208. Labour camps will be located at least 100m away from the major water resources and site specific mitigation measures as agreed with the PIC will be strictly applied if camps are to be located nearby a water body or other environmentally/socially sensitive location. Proper sanitary facilities will be provided to the labour camps and any wastewater and other

waste matter generated from the camps will be disposed in environmentally friendly manner as agreed with the PIC.

209. Maximizing recruiting of local labour will minimize the need for migrant workers and avoid potential and health conflicts with the host community. Awareness programs should be conducted targeting workers as well as local community in order to minimize and avoid any such conflicts.

5.2.7. Biological impacts

Loss of trees and vegetation

210. Due to the construction activities, clearing of vegetation, felling and/or trimming of trees will be required. This may in turn result in loss of soil moisture and soil, improve air quality, reduction of aesthetic value and loss of shade.

211. following measures shall be adopted in order to mitigate this impact.

212. Unnecessary clearing of vegetation and removing of trees will be prevented by removing only the demarcated trees. All trees that will be marked and handed over to the State Timber Corporation for cutting and removal. Moving of construction vehicles and machineries will be restricted only to designated areas in order to save vegetation beyond the proposed project area due to trample. Weedicides will not be recommended as it causes many damages to the environment. Presence of nests, habitats for species such as epiphytes on the trees to be felled should be carefully assessed before felling and if such species or nest found, they should be relocated to a similar habitat. A compensatory tree replanting program should be implemented by the Contractor to compensate the loss of trees. Suitable native tree species should be selected for the replanting purpose at 1:3 ratio. Replanting of threatened/endemic species should be given priority.

213. Replanting program will be carried out within the ROW and at locations with public importance (such as schools and other government institutes) according to the necessity. Planting 'bole rooted' plants are not recommended, since it destroy another habitat to make this habitat good. After establishing in the field, continuous supervision and maintenance during operational stage will be needed in order to ensure proper survival of trees for at least 2 years.

Adverse impacts on terrestrial fauna

214. The selected roads of the project are mainly located within home gardens, paddy fields, township and urban areas. The free movement of animals were minimal and not observed. If any domestic animals present the project area, there will be a disturbance during the construction stage on the movement and natural behaviour of such animals. Therefore, care should be taken with strict labour supervision does not harm any animals in the project area.

Impact on aquatic fauna and flora

215. There will be soil erosion from stockpiles, excavation, oil and grease from construction vehicles. Accumulation of these materials in water bodies will cause increase in turbidity level lower the water quality. This will lead to reduction of light penetration and make it an undesirable place for aquatic fauna and flora. Further due to the reduced light penetration to the water body, the primary productivity of the biota in the water body will be reduced resulting in increased mortality of aquatic organisms. In addition, when these particles settle on the bottom it will affect the breeding ground of aquatic animals.

216. This impact could be mitigated by; location of all hot mix plants, crushing plants, workshops, depots and temporary worker camps and storing of toxic and hazardous materials at approved locations, and recycling and dumping of solid waste matter at locations approved by local authorities, maintenance of vehicles and equipment in good operable condition, ensuring no leakage of oil or fuel and the fitting of proper exhaust baffles. Any solid waste should not be dumped into water bodies.

Ecological disturbances by workers and their camp operations

217. Several adverse impacts such as dumping of refuse, sanitary waste and sewage into waterways, clearance of vegetation for worker camp sites, hunting of animal species and collection of firewood from forests may be particularly intense at camp sites. This may cause pollution of waterways. Open dumping of garbage at these sites could also increase threats of mosquitoes, flies and the spread of rats and crows. Such garbage dumps can attract wild fauna, posing some threats to both humans and wildlife.

Local labour will be recruited as much as possible in order to minimize this impact. Strict labour supervision, provision of labour camps with electricity or LP gas for cooking, to eliminate them using the firewood from surrounding vegetation. Fishing and poaching will not be allowed within the project area. Solid waste and sanitary waste arising from labour camps and other sites shall be properly collected and disposed. Accepted sanitation methods (e.g. mobile toilets) with proper sewage disposal facilities should be provided. Under no circumstances should such waste be released untreated into the water bodies, near forest areas.

5.2.8. Impacts due to extraction and transportation of construction materials

218. Sources of construction materials such as soil/metal will be obtained from quarries and borrow sites. Extraction and transportation of materials from such sites will cause noise, vibration, dust, induced slope failure, negative visual impacts, creation of mosquito breeding sites, and damage to private properties and minor roads. Heavy trucks transporting materials to construction sites will cause disturbances to local traffic, damage minor roads, and increase dust and noise nuisance.

219. Above impacts could be mitigated by avoiding over exploitation, reuse of ABC, use of paver in laying ABC against using the grader (the conventional method). Further, quarry and borrow sites approved by geological survey and mines bureau (GSMB) and the conditions (If

any) laid down in the approval should be adhered. Keeping provisions for repairing and restoration of all property damages including the roads used for the transportation of construction materials by the contractor in the contract document and use of covers over transported materials to guard against dust blow and water spraying to dampen the gravel surfaces will mitigate the impacts due to transportation of construction material

5.2.9. Alteration of surface water hydrology of waterways

220. The reconstruction of culverts may temporarily divert streams, disturbing the natural drainage pattern and create flooding condition in the area. Improperly stored construction materials can also block natural drainage pattern.

221. The contractor will take all measures necessary and as directed by the PIC to keep all drainage paths and drains clear at all times. Temporary storage of material will be made only in approved sites by the PIC where natural drainage is not disturbed. All wastes will be disposed at locations approved by the Local Authority. If flooding or stagnation of water is caused by contractor's activities, contractors shall provide suitable means to prevent loss of access to any land or property and prevent damage to land and property.

222. No material including excavated soil will be allowed to be disposed near water bodies or in paddy lands, even on temporary basis, to curtail any undue wash off of soil and debris to nearby water bodies and agricultural lands. The contractor will ensure that not to damage or block any manmade drainage canal even for temporary basis. If blocked, the contractor will remove such debris without any delay.

5.2.9. Requirement of lands for the road upgrading

223. The land acquisition has not been envisaged for this project expecting that available right of way will be adequate to carry out road improvements. In case the land is required for temporary requirements, the lands will be taken after negotiating with landowners with an involvement of a third party.

224. During construction, temporary occupation of privately owned land may be required for stock piling, use as yards etc... If such a necessity occurs the contractor with the concurrence of project staff will sign a temporary occupation contract with the owner.

5.2.10. Health and safety of labour force and public

225. Labourers from locations outside of the project area shall be brought for construction activities. These laborers shall be provided with accommodation. Any spread of communicable disease within such labour accommodation shall affect the labourers within such accommodation, infect staff who have contacts with these labourers and even public living close to such accommodation. The risk of spreading disease from community into the labour camp should also be considered. These risks shall be minimized through adopting the following measures.

- Comply with National Institute of Occupational Safety and Health and IFC EHS Guidelines on Occupational Health and Safety. And other guidelines on occupational health and safety issued time to time by other government institutes/ agencies of Sri Lanka.
- Prepare a comprehensive & site-specific Health and safety plan (H&SP) describing in detail

how the health and safety of all site personnel (workers, staff and visitors) will be maintained at all times (including measures that would be taken in case of spread of a communicable disease within the site or project area). It is to provide guidance on establishing a management strategy and applying practices that are intended to eliminate, or reduce, fatalities, injuries and illnesses for workers performing activities and tasks associated with the project.

- Obtain a health (medical certificate) and behavioral certificate (police report) from all staff and workers who are recruited to office and sites (this shall be applicable for sub-contractors also).
- Upon returning for work (after a shutdown) all staff and workers shall inform the health and safety officer of any ailments they had during the vacation period.
- Provide compulsory H&S orientation training (including awareness on both communicable/ non-communicable diseases, good health and hygienic practices) to all new workers to ensure that they are apprised of H&S Plan including rules of work, PPE, preventing injury to fellow workers, etc.,.

Construction activities pose potential safety hazards to both workers and public. Safety to workers and the public can be enhanced by;

- Proper briefing and training of workers on safety precautions, and their responsibilities for the safety of themselves and others
- Provision to workers of personnel protective equipment (PPE) to be used at every time involved in when construction activities and high visibility jackets at night
- Ensuring that plant and vehicle operators are properly licensed and trained
- Arranging for the provision of first aid facilities, readily available trained paramedical personnel, and emergency transport to the nearest hospital
- Arranging for regular safety checks of vehicles and material, and allocation of responsibility for this
- Ensuring that quarry operations, particularly blasting is carried out as per guidelines given in the relevant licences and approvals and supervised by trained personnel, that explosives are stored in a secure location and that all due precautions are taken to ensure that blasting does not induce rock falls
- Provision of hazard warning signals around construction sites, and directing vehicle and pedestrian traffic away from work sites
- Provision of traffic management plans during construction including barricading of openings and lighting at night where required.

5.3. Operational Phase

5.3.1. Impacts on water resources

226. Improvements to the road drainage will result in improved storm water flows, and reduce the tendency of blockages to occur in roadside drains. Risks to the public health caused by such stagnant water bodies by acting as disease vector breeding places will be reduced. By designing the drains to withstand appropriate storm events will reduce the risk

of any operational failure of the drainage system and regular maintenance will further reduce the chances of failure.

227. In addition, improper handling of chemicals used for maintenance works such as paints, pesticides, asphalt etc... will also degrade water bodies located nearby to the road. Proper handling of such chemicals under strict supervision will help to minimize the water pollution during the maintenance period.

5.3.2. Disposal of waste material generated during maintenance operations

228. De-silting of drains, culverts and bridges, removal of roadside vegetation and removal of damaged/degraded road surfaces during the maintenance period will generate unsuitable soil, vegetation and debris. If these materials are disposed to road sides, agricultural lands, areas susceptible to floods etc... there is a possibility of siltation of water bodies, agricultural lands and blocking of drainage paths due to washing away by storm water. Proper disposal of all unsuitable material resulted from periodic and routine maintenance activities in the approved locations will minimize this impact.

5.3.3. Extraction of material for repairing and maintenance works

229. For repairing of maintenance of carriageway and other structures, material such as gravel, aggregates and sand will be required. And mitigation measures specified in 5.2.8 above (Impacts due to extraction and transportation of construction materials) could be adopted to minimize impacts due to maintenance activities of the roads.

5.3.4. Pedestrian and commuter safety

230. Improvements to the road surface will be conducive to safe vehicle travel at higher speeds. Such speeds may increase the incidences of accidents. Incorporating the following measures could offset this negative impact;

- Provision of centreline road marking where possible, edge delineation etc...
- Provision of clearly marked signing at townships, sensitive areas such as schools, temples
- Enforcement of speed limits and other traffic rules, especially within the town limits
- Placing of sign boards for animal crossings etc.

231. Furthermore, safety of road users could be ensured during repairing of carriageway and hydraulic structures by placing standard sign boards, barricading of the repairing site etc...

Air quality and noise

232. With better road surface and passing lanes the vehicles shall be able to maintain better speed level reducing the travel time through the area. Improved road surface conditions shall reduce the number of accelerations and decelerations in travelling thereby reduce the emissions to the air. The project is therefore expected to have a positive effect on overall air quality. Clear signing will be put in sensitive areas such as schools, temples to warn drivers and avoid making unnecessary horn signals.

CHAPTER 6: CLIMATE CHANGE IMPACTS AND RISKS

233. Growth in vehicle traffic and energy use are indicators of people moving in to better living conditions or poverty reduction. However growth in vehicular traffic and energy use will also lead to increased greenhouse gas (GHG) emissions which directly affect global warming. According to “international energy outlook 2016” (IEO2016) prepared by U.S. Energy Information Administration, the energy use in the transportation sector includes energy consumed in moving people and goods by road, rail, air, water, and pipeline. Transportation sector has accounted for 25% of total world delivered energy consumption in 2012. And it is forecasted that transportation energy use to increase by 1.4% per year from 2012 to 2040 in the IEO2016 Reference case.

234. The evaluation study by ADB’s independent evaluation department (IED) in year 2010 (evaluation knowledge brief, July 2010 – EKB) on reducing Carbon emission for transport projects has indicated the need of a shift in ADB’s investments on transport sector in to low Carbon growth across Asia and the Pacific regions.

235. Improving the surface (pavement) of existing Nittambuwa (39.71km) to Kadugannawa (100km) section of Colombo – Kandy (A001) Road under road maintenance contract will bring about a change in vehicle operation speeds, traffic composition along the highway.

236. Such changes with respect to present conditions will have an impact on emission levels of the gases emitted by vehicles travelling along the candidate section of A001 road. Most common types of vehicles that would move on these two sections are bicycles, motor cycles, three wheelers, cars, vans, buses, light and heavy commercial vehicles. Thus emission of carbon dioxide (CO₂) from motorized vehicles which is a GHG needs to be analyzed to evaluate the overall contribution of this investment program in terms of the change in CO₂ emissions.

237. The EKB has developed a set of spreadsheet-based models to evaluate the CO₂ impacts of rural roads, urban roads, bikeway projects, expressways, light rail and metro rail transit (MRT) projects, bus rapid transit (BRT) projects, and railways. These transport emissions evaluation models for projects (TEEMPs) consider passenger and freight travel activity, the shares of trips by different modes and vehicle types (structure), fuel CO₂ efficiency (intensity), and fuel type, validated by more detailed emission factor models. The models directly estimate CO₂ emissions for a business-as-usual case (a no-action alternative) vs. one or more alternative modal investment interventions (including improvement to road pavement) and calculate scenario differences. The models consider induced traffic demand generated by changes in the generalized time and money cost of travel by different modes, building on best practice analysis techniques.

238. The TEEMP model for urban roads was used for the analysis with using default parameters for base fuel consumption, emission factor and upstream emission percentage. Occupancy-loading, average trip lengths of each type of vehicle, vehicle type growth and roughness factors (before and after improvements) were fed to the model based on the

details of traffic and economic analysis for the candidate section of A001 road. The candidate road was sub divided in to three sections for running the model and the summary of these input parameters are presented below.

Table 6.1: Input parameters for TEEMP model for two sections of A001 road

Parameter	Input values			
	Section I (39.71 – 56.96km)	Section II (56.96 – 78.35km)	Section III (78.35 – 90.55km)	Section IV (90.55 – 100km)
Occupancy/loading				
Two wheeler	1.6	1.6	1.6	1.6
Three wheeler	2.2	2.2	2.2	2.2
Passenger car	3.5	3.5	3.5	3.5
Light Commercial Vehicle	3.0	3.0	3.0	3.0
Bus	30.0	30.0	30.0	30.0
Heavy Commercial Vehicle	8.0	8.0	8.0	8.0
Cycle	1.0	1.0	1.0	1.0
Roughness				
Before improvement	5.0 m/km	5.0 m/km	5.0 m/km	5.0 m/km
After improvement	3.0 m/km	3.0 m/km	3.0 m/km	3.0 m/km
Lane configuration				
Before	Two lane @ 3.5 m pavement	Two lane @ 3.5 m pavement	Two lane @ 3.5 m pavement	Two lane @ 3.5 m pavement
After	Two lane @ 3.5 m pavement	Two lane @ 3.5 m pavement	Two lane @ 3.5 m pavement	Two lane @ 3.5 m pavement

Model predicted CO₂ emission levels

239. Model output includes CO₂ emissions at business as usual (BAU) or without project; with project (i.e. with improvements) and with induced traffic; and with project and without induced traffic.

Table 6.2: CO₂ emission at PAU, Project & induced traffic and Project without induced traffic

	Emission of CO ₂ in Ton/km/year (net change in emission)			
	Section I	Section II	Section III	Section IV
BAU	15172.5	14,469.4	14,113.0	14,176.7
Project with induced traffic	14925.4	14,233.8	13,883.1	13,945.8
Project without induced traffic	14925.4	14,233.8	13,883.1	13,945.8

240. As indicated in the model output and summarized in above table the proposed improvement to existing highway pavements will bring a reduction in CO₂ emission even with a growth of traffic. However, this analysis is based on the assumption that the roughness of improved highway pavement surface will be maintained during the project life. Therefore, it is

important that the road maintenance program is maintained throughout the project span (i.e. during operational stage for seven years and beyond).

241. The net change in CO₂ emissions of each section of the road and respective CO₂ saving is presented in following table.

Table 6.3: CO₂ saving due to rehabilitation of A001 road

Section of the road	Net change in CO₂ emission (Tons/km/year)	Total CO₂ saving (Tons/year)
Section I (17.25km)	247.1	4262.47
Section II (21.39km)	235.60	5039.48
Section III (12.2km)	229.90	2804.78
Section IV (9.45km)	230.90	2182.00
Total		14288.73

CHAPTER 7: INSTITUTIONAL ARRANGEMENT AND ENVIRONMENTAL MANAGEMENT PLAN AND GRIEVANCE REDRESS MECHANISM

7.1. Institutional arrangements

242. The Ministry of Roads and Highways is the executing agency (EA) for the program and the secretary to the ministry will be responsible for decisions on overall approvals and operational policies of the project. RDA will be the implementing agency (IA). A PIU will be setup headed by a project director (PD) who will be responsible for carrying out Road Maintenance Contracts. The PIU will be responsible for implementing the project on a province basis. The PD will be assisted by a staff of engineers, environment and social safeguards officers and other administrative staff. The PIU will be assisted by a separate PIC who will be responsible to review and approve designs prepared by contractor, supervise civil works of contractor and review and certify bills submitted by contractor. A team of experts including engineers, quantity surveyors, environment and social experts will be working in the PIC headed by a team leader (TL).

243. Safeguard team of PIU, PIC and the contractor is primarily responsible for safeguards compliance of all activities carried out for rehabilitation and maintenance of two candidate sections of the A001 road. Their specific roles and responsibilities of each party are given in chapter VI of the EARF.

7.2. Environmental Management Plan and Monitoring

244. Environmental Safeguards Manual of RDA and the ADB SPS, outlines the requirements for an EMP which is presented as a matrix developed based on best practices for environmental management. This IEE report includes EMP prepared for rehabilitation of A001 road which is given in Appendix 7.1. This EMP covers all impacts and mitigation measures identified within the project. However contractor will be responsible for preparation of SSEMAP based on the EMP given in this IEE. SSEMAP is supposed to include site specific impacts related site specific construction activities and relevant mitigation measures proposed to particular locations in order to minimize relevant impacts. SSEMAP will be supported by site plans in which proposed mitigation measures are presented. Separate SSEMAPs will be prepared for each contract packages if the A001 road will be contractually subdivided. All costs for implementing the mitigation measures must be included in the bill of quantities (BOQ) by the contractor as implementation of the SSEMAP will be the responsibility of the contractor and the PIU will oversee the effectiveness of the implementation with the assistance of the PIC. In addition, in compliance with the EARF, ESDD is also responsible for monitoring of implementation of the SSEMAP biannually. ESDD also assists PIU in meeting safeguards compliance and will conduct training sessions to the safeguards staff of the contractor on safeguards considerations of iRoad.

245. Contractors who implement RMC package will be responsible to keep the road in operational condition for a period of 5 years after rehabilitation. Therefore, the EMP has been modified accordingly paying more attention on the environmental impacts and

mitigation measures during the operational stage together with rehabilitation stage. The EMP prepared for A001 road section is attached in Appendix 7.1.

246. Monitoring of EMP implementation will be carried out during the preconstruction, construction, and operation and maintenance stages of the project. Based on the EMP, environmental monitoring checklist (EMC) will be prepared by the PIC for each of these stages. The EMC monitors the degree of compliance of the mitigation measures proposed in the EMP in all three stages. Project must have at least one EMC completed during pre-construction, four³ during construction and bi-annually during operation and maintenance period. A sample EMC based on the EMP is provided in Appendix 7.2. Records of these completed monitoring checklists must be systematically maintained within the PIC and/or PIU office. Based on these records and site visits, monitoring reports will be prepared during the construction and operation stage on an annual basis and submitted to ADB for disclosure on the ADB website.

247. In addition there will be an EMOP based on the project cycle to monitor EMP implementation by measuring environmental parameters. During the pre-construction phase baseline data on air, water quality 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.

248. Appendix 7.3 presents the EMOP prepared for A001 Road. Based on the EMOP, the contract will be required to prepare contract package specific EMOPs. Furthermore the contractor will also be responsible for updating/modifying the EMP, EMC and EMOP if there are any significant changes in the project site, activities, conditions, engineering design or if any unpredicted impact will arise with the approval of PIC.

³ The monitoring checklist during construction stage will be completed three times when the progress of physical works is 25%, 50% and 75% respectively.

7.3. Grievance Redress Mechanism

249. The grievance redress mechanism (GRM) is necessary to support general public to resolve their problems due to project activities through mutual understanding and consensus reaching process with relevant parties. The ADB safeguards policy 2009 also provides guidance to establish GRM to address the affected peoples' concerns, complaints, and grievances about the project's environmental performance.

250. The proposed GRM for this project can be of two levels. Level one at the grassroots level with a grievance redress committee (GRC) comprising of following members.

Grama Niladari of the area	Chairman
Representative of PIU	Secretary
Representative of Supervision Consultant	Member
Representative of Contractor	Member
A community member/religious leader	Member

The Level two will be at Divisional Secretariat level involving following members.

Divisional Secretary of the area	Chairman
Representative of PIU	Secretary
Grama Niladari	Member
Representative of Supervision Consultant	Member
Representative of Contractor	Member
Representative of a social organization (NGO/CBO) of the area	Member
A community member/religious leader	Member

251. Level one GRC meetings will be held at the GN office (Level one) and DS office (Level two) to which people who have lodged complaints will be invited and examined. The people will be informed about the GRC, seven (7) days prior to its meeting.

252. Secretary of GRC is requested to coordinate with all relevant parties to get necessary information. In addition to that the secretary should keep records of all complaints and reports. All complaints should be in written form.

253. If the issue is resolved at GN level GRC, the decision should be informed by the secretary to the Site Manager without any delay (in written form). If the issue cannot be resolved at this level, then it should be brought in to the notice of DS Level GRC without any delay.

254. Committee meetings will be conveyed by the Secretary, the PIU representative. The chairman of GRC is expected to take appropriate actions with the consultation of other committee members within three weeks' time and to be informed immediately to affected people.

255. The issues that could not be resolved by level one GRC will be forwarded to DS level GRC within seven days (working days) of the final decision of GN level GRC.

256. The flow chart of the GRM is presented in figure 6.1.

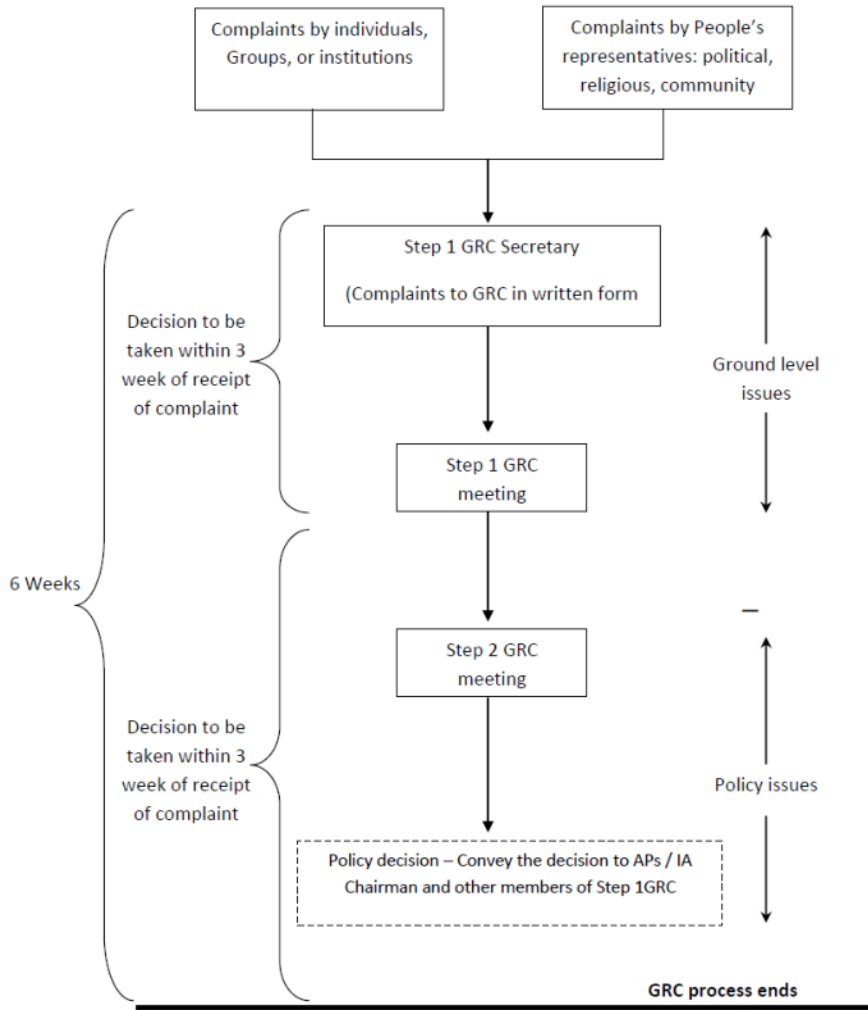


Figure 7.1: GRM process

257. For RMC roads, the contractor will be required to establish an information centre for receiving and addressing complaints or grievances and forwarding them to the PIU and PIC as necessary.

CHAPTER 8: PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

258. It is important to consult public and other stakeholders regarding project activities. This helps to understand viewpoints of stakeholders and to respond to their concerns and suggestions during the early stages of the project, thereby incorporating valuable suggestions to the designs and reducing objections to the project. One on one interviews and Focus Group Discussions were conducted along the proposed sections to be developed in A001.

8.1. One on one interviews



Figure 8.1: Interviewing a school teacher



Figure 8.2: Interviewing a traditional cane business man and a woman

259. The key stakeholders of the project were consulted during the field survey. This included Divisional secretaries, Grama Niladaries, Government officers and public. The Divisional Secretaries and other government officers expressed that this development is good and they highlighted the main concerns that need to be addressed during project implementation. Few such concerns were providing sign boards and bus bays, providing speed boards, providing side drainage etc...

260. One on one interviews were conducted with all the persons contacted through the household survey. All most all the people welcomed the development project. A sample (4 Males and 9 Females) of ideas expressed are provided in Appendix 8.1. Many people highlighted the same concerns expressed by government officers. The females have specially highlighted the road safety issues.


8.2. Focus Group Discussions (FGDs)



261. The FGDs were conducted to get the ideas of the community. Seven FGDs were conducted with government officers and public in road section to be developed. The table 4.1 below presents the information on FGDs conducted with number of people participated according to gender.




Table 8.1: The summary of attendance to FGDs


Item No.	Date	Location	Target Group	Total number of participants	Males	Females
1	2017/01/04	Mirigama Divisional Secretariat Office	Government officers	08	6	2
2	2017/02/09	Radawadunna GN Division,	Public	43	26	17
3	2017/02/09	House located in Bataleeya GN Division	Public	17	6	11
4	2017/01/06	House located in Kongasdeniya GN Division	Public	14	9	5
5	2017/02/01	Molagoda GN Division	Public	11	10	1
6	2017/02/09	Shop located in Galigamuwa-Ambanpitiya GN Division	Public	9	6	3
7	2017/02/09	Shop located in Ganethanna GN Division	Public	26	22	4

Table 8.2: Summary of Key points discussed in FGDs with photographs

Location	Key points	Photographs
Mirigama DS Division	<ul style="list-style-type: none"> No color lights. When buses are stopped near the junction there is a big traffic jam. As there is a bus halt at the Pasyala junction itself there is a double line. When buses stopped near the pedestrian crossing It's difficult for pedestrian the cross the road. The Pasyala junction should be widened. The Three Wheeler Park and Sunday fair should be remove from there. A bypass should be put up between Meerigama road to Kandy road .Then there will be less traffic at Pasyala junction When vehicle is put from court junction to Kandy road It's difficult to climb the road The vehicle knocked because There is a big hole. There are encroachers along the Danowita road. Although they are asked to leave the place, they do not. There's no bus halt at Pasyala junction towards Colombo. The Kandy road is actually not enough. The road from Warakapola to Ambepussa is narrow When buses are stopped at Ambepussa 	

Location	Key points	Photographs
	<p>junction towards to Kurunagala there is a big traffic jam.</p> <ul style="list-style-type: none"> At four way junction colour lights should be put up The most traffic jam is observed at Warakapola and Pasyala Junctions 	
Bataleeya 25A (GN Division)	<ul style="list-style-type: none"> Speed limit are necessary (near the G.N. office bend It's better to have a pedestrian Crossing near the Bataleeya school. There's a no bus stop near the Anura School Street lamps are not sufficient and signal lights are out of order and they have to be replaced. The main income of about 250 families is the cashew business and the main business about 80 businessmen are carrying on business beside the main road . Request to provide parking facilities for cashew shops Rehabilitation should be finished as early as possible without dragging the work 	
Mologoda GN Division	<ul style="list-style-type: none"> There is no drainage system on both sides either sides . The water that flows along the road goes into private properties (83 km post and 84 km post) Fix colour lights as drivers neglect pedestrian crossings. Accidents could be reduced if speed limit is reduced from 70 to 40 km Lane should be reserved for pedestrians Bus halts should be put up closer in populous areas. Street lamps have not been put up according to necessity. Drainage systems should be cleaned or it's useless because when it rains the drain is blocked water and side drains should be constructed. The drain near the Molagoda shed is always blocked, and the drain near craft council (near the bodiya) is always blocked. A culvert should be put up No signal light. 	

Location	Key points	Photographs
Radawadun na GN Division	<ul style="list-style-type: none"> Develop road as soon as possible as we depend on our business. The drainage system , should be covered accordingly We have no way to put up our shops as road is not constructed yet. Accidents will reduce if road is widened. When road is carpeted it's difficult to stop vehicles due to the humps and the vehicle topple, therefore please repair both side of the road No attention has been made to maintain drains since 2012 No speed limits, earlier there was Make arrangements to get tap line Street lamps not in order (A busstand is required at temple junction, it should be put up before 48 km post) When manholes are stagnant with water, mosquitoes breed as they are not closed. 	
Ganethanna GN Division	<ul style="list-style-type: none"> Therefore please mark pedestrian crossing There are no pedestrian crossing from Ganethanna lower to Kadugannawa . The road where the rock has been grilled lower Kadugannawa lower bend is very flat. Therefore accident happens very frequently. At present there are about 50 fruits stalls here. They can't be adjusted back and rebuilt. Can't other building be erected beside these buildings They own the land they have the deed 	
Kongasdeni ya GN Division	<ul style="list-style-type: none"> The pedestrian crossing near Jayanthi stores should be extending up to Napagoda temple to minimize accidents. There are no drains from 4/1 culvert. Hence the water that flows flow into private garden. Therefore construct a drainage system. Please continue the construction of drainage up to culvert near the police station . Water gets stagnated near the Sumanasingha and Wanigasingha houses. Colour light is required at Kongasdeniya .It's difficult to cross the road. The road should be widened. The middle line should be marked. Put up colour lights to cross the road. Drainage system is not maintained well 	

Location	Key points	Photographs
Galigamuwa – Ambanpitiya GN Division	<ul style="list-style-type: none"> • Construct road as soon as possible. • Since doing this business not easy while construction is taking place. We will lose our profit • Selling toys is difficult therefore it's difficult to gain profit through this business. 	

CHAPTER 9: CONCLUSION AND RECOMMENDATIONS

262. This Initial Environmental Examination report discuss various aspects of the proposed rehabilitation and maintenance of nearly 60.29km of road section from Nittambuwa (39.71km) to Kadugannawa (100.0km) of Colombo – Kandy (A001) highway under of iRoad program implemented by RDA under ADB financing. Under RMC package, contractors are liable to keep the roads in operational status for approximately 5 years after rehabilitation.

263. As discussed, candidate A001 road section will be rehabilitated and maintained under the project and all construction and maintenance activities will be restricted to the available ROW therefore no land acquisition shall be required. The road will be improved to standard two lanes status with hard shoulders, drains and other road furniture. Passing lanes shall also be constructed at locations where existing ROW is adequate and free from any encroachments. Design will be carried out accordingly along the flood prone areas of the road in order to cater hazardous conditions and as well as to minimize road induced flood impacts.

264. The candidate road section of A001 road does not cross or located adjacent to protected forest or wildlife areas.. However, the project traverses adjacent to few archeological areas as mentioned in the Chapter 4. These areas will not be directly affected as all project activities will be strictly implemented within the existing ROW. However, special considerations as mentioned in the Chapter 5 will need to be taken to reduce the indirect impacts such as vibration impacts at these locations.

265. The project induced social impacts are also negligible as the project does not allow acquisition of lands for the road rehabilitation. Indirect impacts to environmental and social set up of the project area will be minimized with effective mitigation measures as given in the chapter 5 of the report and EMP.

266. An EMP, EMC and EMOP have been prepared as part of this report. These are required to be updated and incorporated in to tender documents and converted into contract package specific documents before the commencement of construction activities.

267. The proposed improvement for A001 Road will increase the transportation efficiency and also will boost economic activities in the Western, Sabaragamuwa and Central provinces including potential growth in industries, tourism, and agriculture in lagging rural areas which will be a positive step to the socio economic development of the country.

APPENDIX 1.1:
Rapid environmental assessment checklist (REA)

RAPID ENVIRONMENTAL ASSESSMENT (REA) CHECKLIST

Instructions:

- (i) The project team completes this checklist to support the environmental classification of a project. It is to be attached to the environmental categorization form and submitted to the Environment and Safeguards Division (RSES), for endorsement by Director, RSES and for approval by the Chief Compliance Officer.
- (ii) This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB's (a) checklists on involuntary resettlement and Indigenous Peoples; (b) poverty reduction handbook; (c) staff guide to consultation and participation; and (d) gender checklists.
- (iii) Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Country/Project Title:

Integrated Road Investment Program (I road)- Road Management Contract (RMC) package

Sub project:

Asphalt Concrete overlaying and maintenance of Nittambuwa (39.71km) to Kadugannawa (100km) section of Colombo-Kandy (A001) road

Sector Division:

Roads & Highways

Project Location:

Administrative divisions which are crossed by Nittambuwa – Kadugannawa section of Colombo – Kandy (A001) Road is given in the following table.

Province	District	DSD
Western	Gampaha	Mirigama
		Attnagalla
Sabaragamuwa	Kegalle	Warakapola
		Galigamuwa
		Kegalle
		Rambukkana
		Mawanalla
Central	Kandy	Yatinuwara

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		✓	
▪ Protected Area	✓		The candidate road is located adjacent to following archeologically protected areas; Protected areas belong to Department of Archeology; 1. Mangalagama ancient rest house is located at 85km of the road at left hand side (LHS). This building is found immediately adjacent to the hard shoulder on LHS of the road. 2. Kadugannawa Ancient rest house is located at 97.15km on LHS (At the edge of the hard shoulder) 3. The Captain Dowson's Tower is located near 100km on right hand side (RHS)
▪ 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; disfiguration of landscape by road embankments, cuts, fills, and quarries?		✓	
▪ 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?	✓		Altered drains and canals shall be restored within the existing right of way (ROW). Site specific mitigation measures shall be applied to minimize siltation impacts to water bodies.

Screening Questions	Yes	No	Remarks
<ul style="list-style-type: none"> Deterioration of surface water quality due to silt runoff and sanitary wastes from worker-based camps and chemicals used in construction? 	✓		Establishment of silt traps, silt trenches to minimize siltation impacts, providing adequate facilities for sanitary management for labor camps and storing of chemicals in sealed containers will mitigate these impacts.
<ul style="list-style-type: none"> Increased local air pollution due to rock crushing, cutting and filling works, and chemicals from asphalt processing? 	✓		<p>Activities such as earth works, cutting and filling rock blasting etc... will not be practiced under the RMC package. Therefore, impacts due to above activities will not be experienced.</p> <p>However temporary impacts due to asphalt processing will be possible at asphalt plants and these impacts are restricted to such plant sites. Erection of noise and dust barriers, dampening the surfaces which can emit dust, using exact amount of chemicals for bitumen processing and most importantly siting the asphalt plants well away from protected areas and sensitive sites such as settlement areas, temples and schools will mitigate the impacts from asphalt plants.</p>
<ul style="list-style-type: none"> 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? 	✓		It is proposed to prepare a separate health and safety plan to be implemented during road maintenance period 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.
<ul style="list-style-type: none"> Noise and vibration due to blasting and other civil works? 	✓		Site specific measures to minimize noise and vibration resulted due to civil works with special attention to archaeological sites along the road will mitigate this impact.
<ul style="list-style-type: none"> Dislocation or involuntary resettlement of people? 		✓	
<ul style="list-style-type: none"> Disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups? 		✓	
<ul style="list-style-type: none"> Other social concerns relating to inconveniences in living conditions in the project areas that may trigger cases of upper respiratory problems and stress? 		✓	

Screening Questions	Yes	No	Remarks
<ul style="list-style-type: none"> Hazardous driving conditions where construction interferes with pre-existing roads? 	✓		<p>This impact is possible during transportation of asphalt concrete to the site through pre-existing roads.</p> <p>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.</p> <p>Contractor will be advised to use alternative roads to the best possible to avoid roads which are heavily used by the public.</p>
<ul style="list-style-type: none"> 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? 	✓		<p>During the construction phase. Using local labour 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.</p> <p>Further it will be ensured that labor camp, yards or any other site which emit solid waste or wastewater will not be located within or adjacent to the protected areas as given in section A.</p>
<ul style="list-style-type: none"> Creation of temporary breeding habitats for diseases such as those transmitted by mosquitoes and rodents? 		✓	
<ul style="list-style-type: none"> Accident risks associated with increased vehicular traffic, leading to accidental spills of toxic materials? 	✓		<p>Using sign boards, barricades and other safety arrangements along the road during overlaying, informing the public on possible hazards in advance and using PPE for the staff engaged in maintenance activities will minimize this impact.</p> <p>Storing of toxic material will be required only in asphalt plants and they should be stored in well secured containers with labels and necessary first aid facilities and firefighting equipment should be available at these sites.</p>

Screening Questions	Yes	No	Remarks
<ul style="list-style-type: none"> Increased noise and air pollution resulting from traffic volume? 	✓		<p>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.</p> <p>Smooth and steady flow of traffic along the road during the operational phase will ensure the emissions and the noise kept below the maximum permissible levels.</p>
<ul style="list-style-type: none"> Increased risk of water pollution from oil, grease and fuel spills, and other materials from vehicles using the road? 		✓	
<ul style="list-style-type: none"> Social conflicts if workers from other regions or countries are hired? 		✓	
<ul style="list-style-type: none"> Large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)? 		✓	
<ul style="list-style-type: none"> 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? 		✓	
<ul style="list-style-type: none"> 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. 		✓	

A Checklist for Preliminary Climate Risk Screening

Country/Project Title: Road Management Contract (RMC) Package of I Road Project of Sri Lanka
Colombo-Kandy (A001) Road ;section from Nittambuwa to Kadugannawa
Sector: Roads & Highways
Subsector: Roads & Highways
Division/Department: Environmental

Screening Questions		Score	Remarks ¹
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?	1	Kegalle area (77 to 78km) and Pahala Kadugannawa (96-97km) are prone to modest level of landslide risk as per the national building research organization (NBRO) maps of landslide hazard zones
	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	Project design may need to consider locations which are prone to floods and necessary mitigation measures need to be incorporated to the surface treatment.
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	
	Would weather, current and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s)?	0	

¹ 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.

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	
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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 Risk

Project Classification:

Proposed Environmental Classification: **B**

Remarks

A001 Road is an existing trunk road and will be overlaid and maintained to the given standards during the project period under road management contract (RMC) package of iRoad of road development authority (RDA). And the scope of the project includes improvement of the road surface with asphalt concrete and establishment of passing lanes where necessary and maintaining the road to the given standards. All activities related to surface treatment and maintenance will be restricted to the existing right of way (ROW) of the road. Therefore, it is obvious that the proposed project will not encroach to the protected sites or cause significant environmental issues as mentioned in the section A of the checklist.

In addition site specific mitigation measures shall be implemented under the project adjacent to protected areas in order to avoid adverse impacts to the identified protected areas in collaboration with the Department of Archeology.

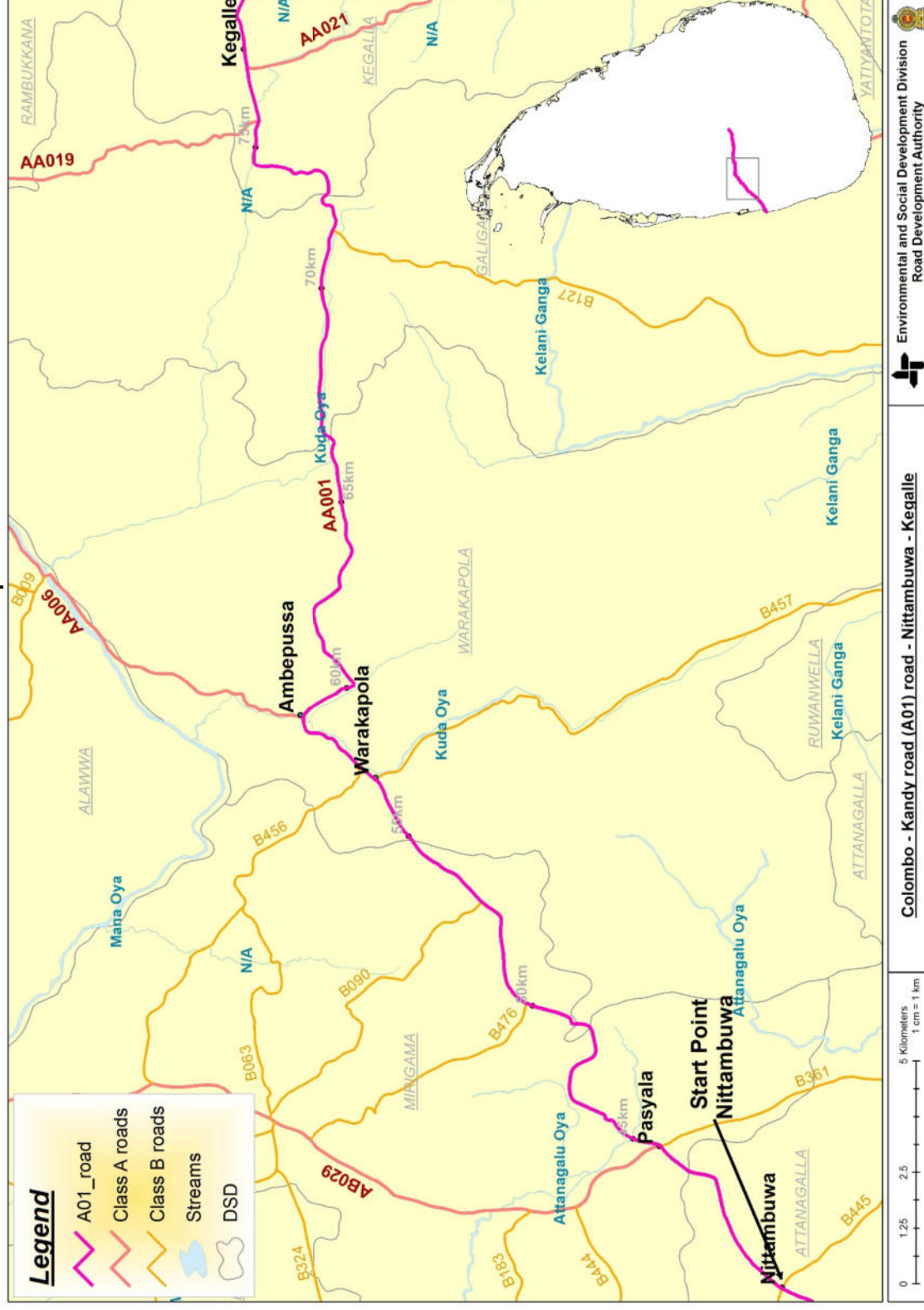
Therefore it is proposed that the project can be classified as Category B.

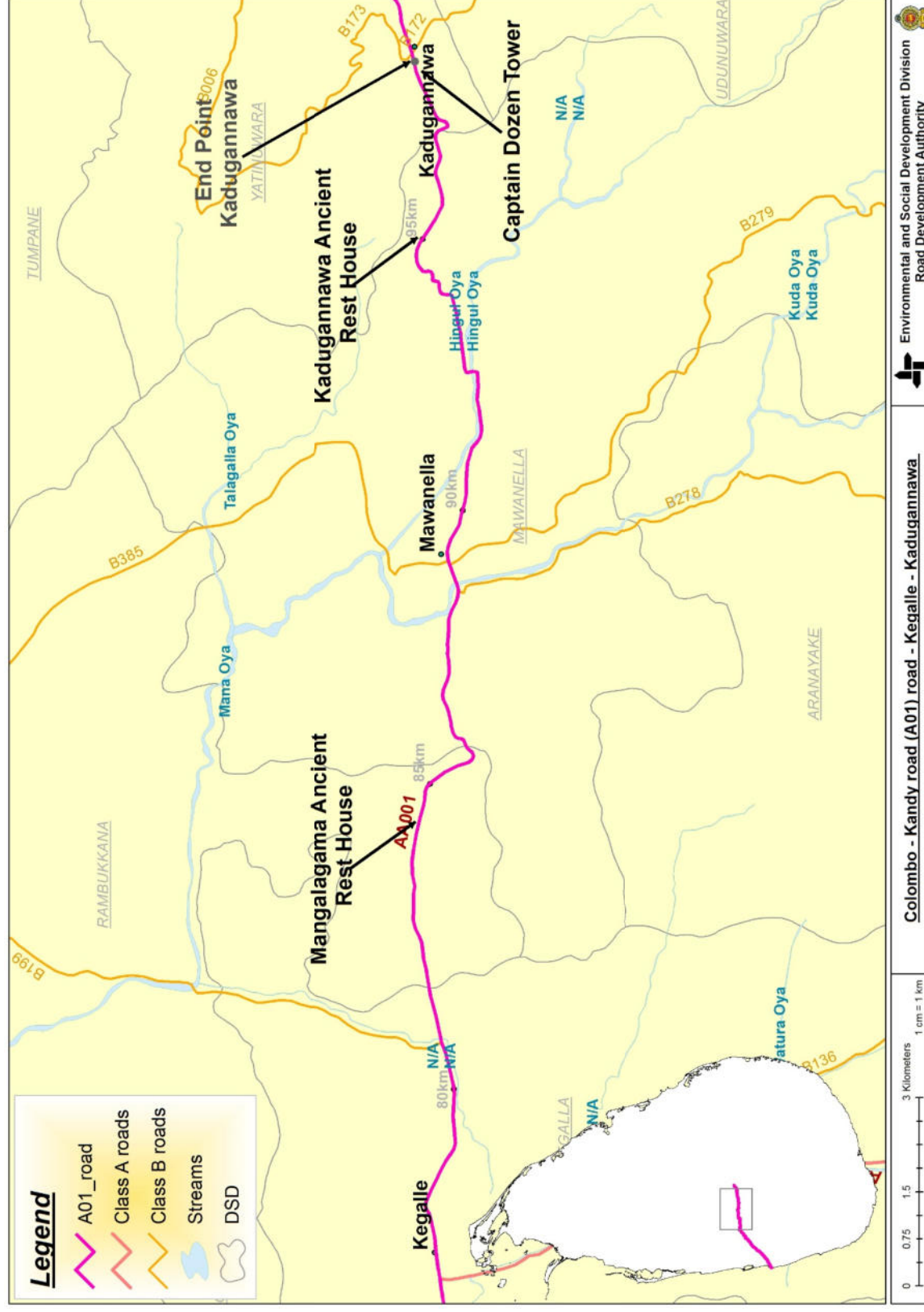
Prepared by:

Environmental and Social Development Division,
Road Development Authority

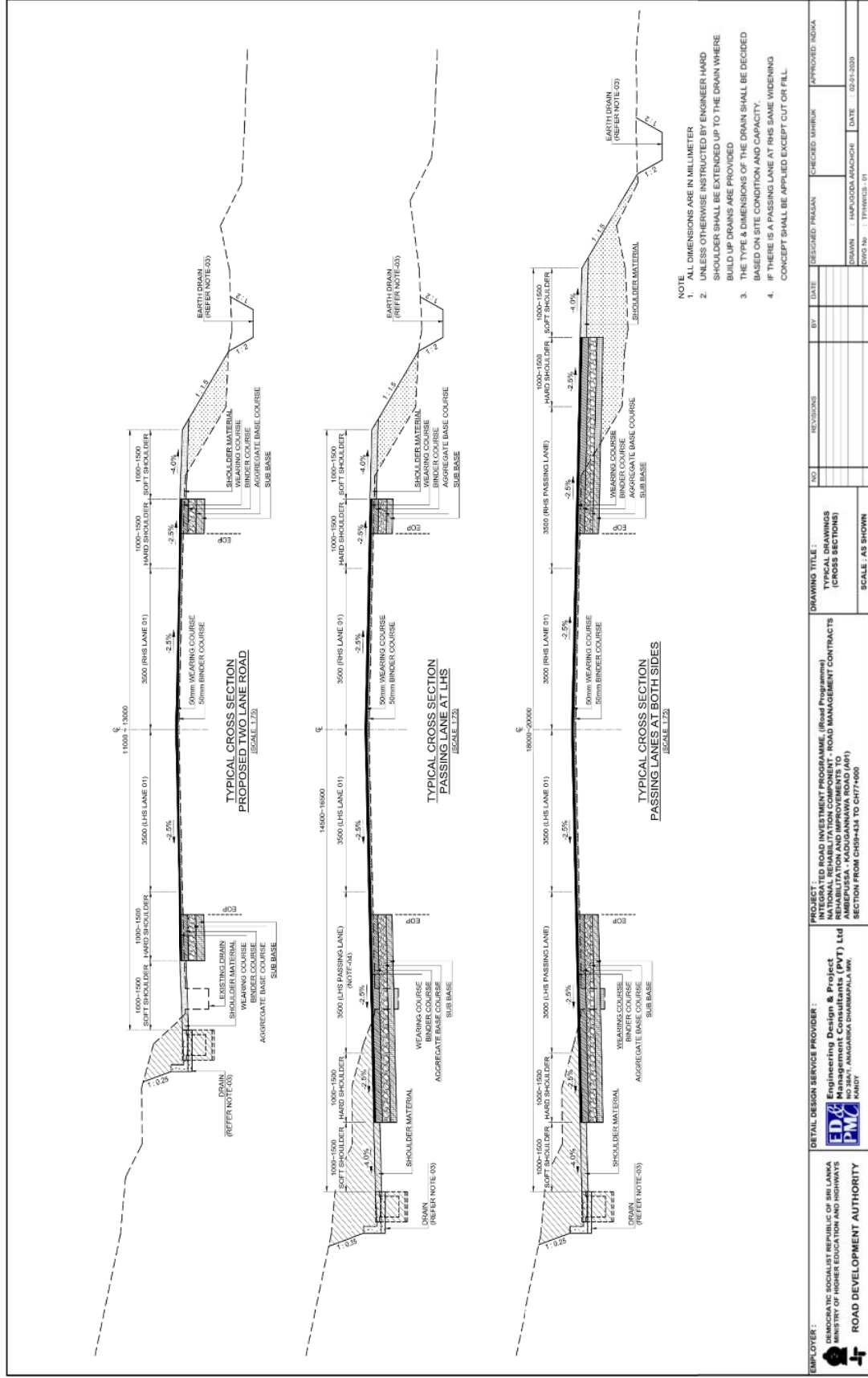
APPENDIX 2.1:
Location map of the road

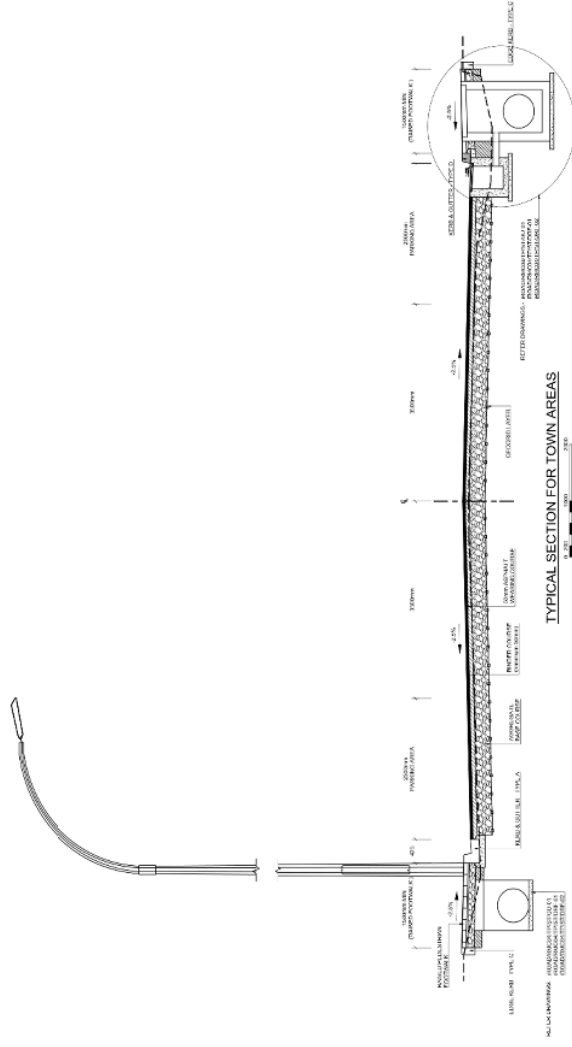
Location Map





APPENDIX 2.2:
Typical cross sections





APPENDIX 4.1:
List of flora & fauna Species in the project area

Terrestrial and Aquatic Floral Species Recorded – A001 Road**Abbreviations:****HA:** Habit**T:** Tree**S:** Shrub**H:** Herb**EP:** Epiphyte**TS:** Taxonomic status**E:** Endemic**N:** Native**I:** Introduced**RS:** Road sides**CS:** Conservation status**TR:** Threatened**C:** Climber or Creeper**ML:** Marshlands**CL:** Cultivated lands**HG:** Home Garden**IW:** Irrigation canals streams & with other water bodies**PF:** Paddy fields**+**: Present

Family	Scientific Name	Common Name	H A	TS	CS	Habitats					
						M L	H G	R S	P F	C L	I W
Amaranthaceae	<i>Achyranthes aspera</i>	Gas karal heba	H	N	-				+		
	<i>Aerva lanata</i>	Pol Pala	H	N	-		+	+	+	+	
	<i>Alternanthera sessile</i>	Mukunuwenna	H	N	-	+	+	+	+	+	
	<i>Amaranthus viridis</i>	Kura Thampala	H	N	-	+			+		
Anacardiaceae	<i>Anacardium occidentale</i>	Caju	T	I	-		+			+	
	<i>Mangifera indica</i>	Amba	T	I	-		+	+		+	
	<i>Spondias dulcis</i>	Amberella	T	I	-		+			+	
	<i>Lannea coromandelica</i>	Hik	T	N	-			+	+		
Apocynaceae	<i>Pagiantha dichotoma</i>	Divi kaduru	T	N	-				+		
	<i>Cerbera odollam</i>	Gon kaduru	T	N	-				+		
	<i>Alstonia macrophylla</i>	Havari Nuga	T	I	-				+		
	<i>Alstonia scholaris</i>	Ruk Athtana	T	N	-			+			
	<i>Allamanda cathartica</i>	Wel Ruk Attana	C	I	-				+		
	<i>Carissa spinarum</i>	Heen Karaba	C	N	-	+					
	<i>Tabernaemontana divaricata</i>	Watu sudda	S	I	-		+				
	<i>Walidda antidysenterica</i>	Wal Idda	S	E	-		+				
Aponogetonaceae	<i>Aponogeton crispus</i>	Kekatiya	H	N	-	+					+
Araceae	<i>Pistia stratiotes</i>	Diya paradel	H	N	-	+					+
	<i>Alocasia macrorrhiza</i>	Habarala	H	N	-	+					+
	<i>Colocasia esculenta</i>	Ala	H	N	-	+	+	+		+	+
	<i>Colocasia esculenta</i>	Gahala	H	N	-	+	+	+	+	+	+
	<i>Lagenandra sp.</i>	Ketala	H	E	TR	+					+
	<i>Lasia spinosa</i>	Kohila	H	N	-	+	+			+	+
Arecaceae	<i>Areca catechu</i>	Puwak	T	N	-		+			+	
	<i>Caryota urens</i>	Kitul	T	N	-		+			+	
	<i>Cocos nucifera</i>	Pol	T	N	-		+	+		+	
	<i>Phoenix pusilla</i>	Indi	T	N	-		+				

Family	Scientific Name	Common Name	H A	TS	CS	Habitats					
						M L	H G	R S	P F	C L	I W
Asclepiadaceae	<i>Calotropis gigantea</i>	Wara	S	N	-				+		
Asparagaceae	<i>Asparagus falcatus</i>	Hatawariya	C	N	-				+		
Apocynaceae	<i>Plumeria rubra</i>	Araliya	S	N	-		+				
Asteraceae	<i>Eupatorium odoratum</i>	Podisinnamara n	S	I	-			+	+		
	<i>Mikania cordata</i>	Watu Palu	C	N	-	+	+		+		
	<i>Sphaeranthus indicus</i>	Mudu mahana	H	N	-			+			
	<i>Vernonia cinerea</i>	Monara Kudumbiya	H	N	-	+	+	+	+	+	
Bombacaceae	<i>Ceiba pentandra</i>	Pulun	T	N	-		+	+		+	
Bignoniaceae	<i>Spathodea campanulata</i>		T	I	-			+			
	<i>Tabebuia rosea</i>		T	I	-			+			
Capparaceae	<i>Cleome viscosa</i>	Wal Aba	H	N	-	+					
Cactaceae	<i>Opuntia dillenii</i>	Pathok	H	I	-		+				
Caricaceae	<i>Carica papaya</i>	Gas labu	T	I	-		+			+	
Clusiaceae	<i>Calophyllum sp.</i>		T	N	-					+	
	<i>Garcinia quaesita</i>	Goraka	T	E	-		+			+	
Colchicaceae	<i>Gloriosa superba</i>	Niyagala	C	N	-					+	
Combretaceae	<i>Terminalia catappa</i>	Kottamba	T	I	-		+	+		+	
Commelinaceae	<i>Commelina sp.</i>	Gira Pala	H	N	-				+		
Convolvulaceae	<i>Ipomoea pes-tigridis</i>	Divi adiya	C	N	-				+		
	<i>Ipomoea aquatica</i>	Kankun	H	N	-	+	+		+		+
	<i>Merremia tridentata</i>	Heen Madu	C	N	-			+	+		
Connaraceae	<i>Connarus monocarpus</i>	Radaliya	C	N	-				+		
Cucurbitaceae	<i>Coccinia grandis</i>	Kowakka	C	N	-				+		
Cypereceae	<i>Cyperus rotundus</i>	Kalanduru	H	N	-		+	+	+		
	<i>Cyperus sp.</i>		H	N	-					+	
	<i>Eleocharis sp.</i>		H	N	-					+	
	<i>Frimbristylis sp.</i>		H	N	-		+				
Dilleniaceae	<i>Dillenia retusa</i>	Goda para	T	N	-				+		
	<i>Dillenia suffruticosa</i>	Diya Para	T	I	-	+					
Dioscoreaceae	<i>Dioscorea alata</i>	Raja Ala	C	I	-		+				
Droseraceae	<i>Drosera indica</i>	Kandulesa	H	N	-					+	
Ebenaceae	<i>Diospyros ferrea</i>	Kalu Habara	T	N	-					+	
Elaeocarpaceae	<i>Elaeocarpus serratus</i>	Weralu	T	N	-		+			+	
Eriocaulaceae	<i>Eriocaulon truncatum</i>	Kokmota	H	N	-		+				
	<i>Acalypha indica</i>	Kuppameniya	H	N	-		+	+	+		
	<i>Antidesma ghaesembilla</i>	Bu Embilla	T	N	-			+			
	<i>Aporusa lindleyana</i>	Kabella	T	N	-			+			
	<i>Breynia vitis-idaea</i>	Gas Kaila	S	N	-					+	
	<i>Croton hirtus</i>	Wal Tippili	H	I	-			+			
	<i>Croton laccifer</i>	Keppetiya	S	N	-				+		
	<i>Flueggea leucopyrus</i>	Katu pila	H	N	-				+		

Family	Scientific Name	Common Name	H A	TS	CS	Habitats					
						M L	H G	R S	P F	C L	I W
	<i>Glochidion zeylanicum</i>	Hunu Kirilla	T	N	-				+		
	<i>Hevea brasiliensis</i>	Rubber	T	I	-		+			+	
	<i>Macaranga peltate</i>	Kenda	T	N	-		+	+			
	<i>Manihot esculenta</i>	Manyokka	S	I	-		+			+	
	<i>Ricinus communis</i>	Beheth endaru	S	I	-		+	+	+		
	<i>Ricinus communis</i>	Endaru	S	I	-		+	+			
	<i>Sauropus androgynus</i>	Melladunkola	S	N	-			+			
Fabaceae	<i>Clitoria ternatea</i>	Katurodu	C	N	-		+	+			
	<i>Samanea saman</i>	Para Mara	T	I	-						
	<i>Delonix regia</i>	Mai mal	T	I	-		+	+		+	
	<i>Acacia caesia</i>	Higuru Wel	C	N	-			+			
	<i>Albizia lebbeck</i>	Mara	T	N	-		+	+		+	
	<i>Cassia fistula</i>	Ahela	T	N	-			+	+	+	
	<i>Cassia occidentalis</i>	Peni tora	T	N	-			+	+		
	<i>Cassia occidentalis</i>	Ath Tora	S	N	-			+	+		
	<i>Cassia tora</i>	Peti tora	H	N	-			+	+		
	<i>Crotalaria laburnifolia</i>	Andanahiriya	H	N	-			+			
	<i>Desmodium heterocarpon</i>	Et Undupiyali	H	N	-			+	+		
	<i>Desmodium triflorum</i>	Heen undupiyali	H	N	-	+	+	+	+		
	<i>Dichrostachys cinerea</i>	Andara	T	N	-			+		+	
	<i>Erythrina variegata</i>	Erabadu	T	N	-			+	+		
	<i>Gliricidia sepium</i>	Weta hiriya	T	I	-		+	+	+		
	<i>Leucaena leucocephala</i>	Ipil Ipil	T	I	-		+	+		+	
	<i>Mimosa pudica</i>	Nidi Kumba	H	I	-	+	+	+	+	+	
	<i>Sesbania grandiflora</i>	Katuru murunga	T	I	-		+			+	
	<i>Tamarindus indica</i>	Siyambala	T	I	-		+	+		+	
	<i>Tephrosia purpurea</i>	Pila	H	N	-			+			
	<i>Pterocarpus indicus</i>	Wal Ehela	T	I	-			+			
	<i>Acacia melanoxylon</i>	Acacia	T	I	-			+			
	<i>Peltophorum pterocarpum</i>	Kaha mara	T	I	-			+			
Flagellariaceae	<i>Flagellaria indica</i>	Goyi Wel	C	N	-					+	
Gleichniaceae	<i>Dicranopteris linearis</i>	Kekilla	H	I	-	+					+
Hippocrateaceae	<i>Salacia chinensis</i>	Heen Himbutu	C	N	-					+	
	<i>Salacia reticulata</i>	Kothala Himbutu	C	N	TR		+				
	<i>Salacia sp.</i>	Himbutu Wel	C	N	-					+	
Lamiaceae	<i>Leucas zeylanica</i>	Tumba	H	N	-					+	
	<i>Leea indica</i>	Gurulla	H	N	-					+	
	<i>Hyptis suaveolens</i>	Maduru Tala	H	I	-		+	+	+		
Lauraceae	<i>Cinnamomum dubium</i>	Wal Kurundu	T	E	-					+	

Family	Scientific Name	Common Name	H A	TS	CS	Habitats					
						M L	H G	R S	P F	C L	I W
	<i>Cinnamomum verum</i>	Kurundu	T	N	-					+	
	<i>Persea americana</i>	Ali pera	T	I	-		+			+	
	<i>Litsea longifolia</i>	Rat Keliya	T	E	-					+	
Leeaceae	<i>Leea indica</i>	Gurulla	T	N	-					+	
Lecythidaceae	<i>Careya arborea</i>	Kahata	T	N	-			+			
	<i>Barringtonia racemosa</i>	Diya muddilla	H	N	-	+					
Lentibulariaceae	<i>Utricularia reticulata</i>		H	N	-		+				
Loranthaceae	<i>Dendrophthoe falcata</i>	Pilila	Ep	N	-		+			+	
Lythraceae	<i>Lagerstroemia speciosa</i>	Murutha	T	N	-			+			
Malvaceae	<i>Hibiscus rosa-sinensis</i>	Wada	S	I	-		+				
	<i>Hibiscus farcatus</i>	Napiritta	C	N	-			+			
	<i>Hibiscus tiliaceus</i>	Beli patta	S	N	-	+	+		+		
	<i>Sida acuta</i>	Gas Bevila	H	N	-			+	+		
	<i>Urena lobata</i>	Epala	S	N	-			+	+		
Melastomataceae	<i>Clidemia hirta</i>	Kata Kalu Bowitiya	H	I	-					+	
	<i>Cyclea peltate</i>	Kehi Pittan	C	N	-				+		
	<i>Memecylon capitellatum</i>	Kora Kaha	T	E	-		+				
	<i>Osbeckia aspera</i>	Bowitiya	S	N	-				+		
Meliaceae	<i>Azadirachta indica</i>	Kohomba	T	N	-		+	+		+	
	<i>Melia azedarach</i>	Lunu midella	T	N	-		+	+		+	
	<i>Toona sp.</i>		T	I	-				+		
	<i>Swietenia macrophylla</i>	Mahogany	T	I	-		+	+		+	
Moraceae	<i>Artocarpus heterophyllus</i>	Kos	T	I	-		+	+		+	
	<i>Artocarpus incisus</i>	Rata del	T	I	-		+	+		+	
	<i>Ficus racemosa</i>	Attikka	T	N	-			+			
	<i>Ficus religiosa</i>	Bo	T	I	-			+			
	<i>Ficus sp.</i>	Nuga	T	N	-			+			
	<i>Ficus tinctoria</i>	Wal ehету	T	N	-			+	+		
	<i>Artocarpus nobilis</i>	Wal Del	T	E	-		+				
	<i>Streblus asper</i>	Nitulla	T	N	-				+		
Moringaceae	<i>Moringa oleifera</i>	Murunga	T	I	-		+				
	<i>Breynia retusa</i>	Wal murunga	T	N	-			+			
Myristicaceae	<i>Horsfieldia iryaghedhi</i>	Malaboda	T	E	-			+			
Myrtaceae	<i>Psidium guajava</i>	Pera	T	I	-		+				
	<i>Syzygium aromaticum</i>	Karabu	T	I	-		+				
	<i>Syzygium caryophyllatum</i>	Dan	T	N	-		+		+		
	<i>Syzygium malaccense</i>	Jambu	T	I	-		+			+	
	<i>Eucllyptus spp.</i>	Terpentine	T	I				+			

Family	Scientific Name	Common Name	H A	TS	CS	Habitats					
						M L	H G	R S	P F	C L	I W
	<i>Syzygium samarangense</i>	Pini jambo	T	I	-		+			+	
	<i>Syzygium operculatum</i>	Bata Damba	T	E	-				+		
Musaceae	<i>Musa x paradisiaca</i>	Kessel	T	N	-		+			+	
Nymphaeaceae	<i>Nymphaea pubescens</i>	Olu	H	N	-	+					+
Olacaceae	<i>Olax zeylanica</i>	Mella	T	N	-				+		
Pandanaceae	<i>Pandanus kaida</i>	Weta keyiya	S	N	-		+	+			
Periplocaceae	<i>Hemidesmus indicus</i>	Iramusu	C	N	-		+	+			
Piperaceae	<i>Piper betle</i>	Bulath	C	I	-		+			+	
	<i>Piper nigrum</i>	Gammiris	C	I	-		+			+	
	<i>Piper sylvestre</i>	Wal gammiris	C	N	-			+			
Poaceae	<i>Bambusa vulgaris</i>	Una	T	N	-		+	+			
	<i>Imperata cylindrica</i>	Iluk	H	N	-				+		
	<i>Oryza sativa</i>	Wi	H	N	-				+		
	<i>Panicum maximum</i>	Rata Tana	H	I	-				+		
Pontederiaceae	<i>Eichhornia crassipes</i>	Japan jabara	H	I	-	+					
Pteridaceae	<i>Acrostichum aureum</i>	Karen koku	H	N	-	+					+
Punicaceae	<i>Punica granatum</i>	Delum	S	I	-		+			+	
Rhamnaceae	<i>Ziziphus oenoplia</i>	Heen eraminiya	S	N	-				+		
	<i>Ziziphus rugosa</i>	Maha Eraminiya	C	N	-				+		
Rubiaceae	<i>Ixora coccinea</i>	Rat mal	S	N	-				+		
	<i>Coffea arabica</i>	Kopi	T	I	-		+				
	<i>Mussaenda frondosa</i>	Mussenda	S	N	-		+				
	<i>Gaertnera vaginans</i>	Pera Thambala	S	N	-					+	
	<i>Hedyotis fruticosa</i>	Weraniya	S	N	-					+	
	<i>Ixora coccinea</i>	Ratambala	S	N	-					+	
	<i>Ixora pavetta</i>	Maha Ratambala	T	N	-					+	
	<i>Morinda citrifolia</i>	Ahu	T	N	-					+	
Rutaceae	<i>Acrornychia pedunculata</i>	Ankenda	T	N	-					+	
	<i>Euodia lunu-ankenda</i>	Lunu Ankenda	T	N	-					+	
	<i>Aegle marmelos</i>	Beli	T	I	-		+			+	
	<i>Limonia acidissima</i>	Diwul	T	N	-		+			+	
	<i>Murraya koenigi</i>	Karapincha	S	N	-		+			+	
	<i>Toddalia asiatica</i>	Kudu Miris	C	N	-				+		
Salviniaceae	<i>Salvinia molesta</i>	Salvinia	H	I	-	+					+
Sapindaceae	<i>Filicium decipiens</i>	Pihimbiya	T	N	-		+	+		+	
	<i>Allophylus cobbe</i>	Kobbe	S	N	-				+		
	<i>Cardiospermum halicacabum</i>	Penela wel	C	N	-				+		

Family	Scientific Name	Common Name	H A	TS	CS	Habitats					
						M L	H G	R S	P F	C L	I W
	<i>Cardiospermum halicacabum</i>	Wel Penela	C	N	-		+		+		
	<i>Nephelium lappaceum</i>	Rambutan	T	I	-		+			+	
Smilacaceae	<i>Smilax sp.</i>	Kabaresa	C	N	-				+		
Schizaeaceae	<i>Lygodium sp.</i>	Paba Wel	C	N	-				+		
Scrophulariaceae	<i>Scoparia dulcis</i>	Wal Koththamalli	H	I	-			+			
Sterculiaceae	<i>Waltheria indica</i>		H	N	-				+		
Symplocaceae	<i>Symplocos cochinchinensis</i>	Bobu	T	N	-					+	
Thymelaeaceae	<i>Gyrinops walla</i>	Walla	T	N	-				+		
Typhaceae	<i>Typha angustifolia</i>	Hambupan	H	N	-	+					
Tiliaceae	<i>Muntingia calabura</i>	Jam	T	I	-		+				
	<i>Microcos paniculata</i>	Kohu Kirilla	S	N	-				+		
Umbellifera	<i>Centella asiatica</i>	Gotukola	H	N	-		+				
Verbenaceae	<i>Clerodendrum infortunatum</i>	Pinna	S	N	-		+				
	<i>Lantana camara</i>	Ganda pana	S	I	-			+			
	<i>Stachytarpheta jamaicensis</i>	Balu nakuta	H	I	-			+	+		
	<i>Tectona grandis</i>	Tekka	T	I	-		+	+		+	

Terrestrial and aquatic faunal species found in the proposed project area.

Abbreviations

TR: Threatened

ML: Marshlands

HG: Home gardens

PF: Paddy fields

RS: Road sides

+: Present

IW: Irrigation canals streams & with other water bodies

Class, Order and Species Name	Common Name	Status	Habitats					
			ML	HG	RS	PF	CL	IW
Class- Insecta	Insects							
Order: Odonata- Dragonflies								
Family: Libellulidae								
1 <i>Rhyothemis variegata</i>	Variable glider	Indigenous	+					
Order: Lepidoptera	Butterflies							
Family – Papilionidae								
1 <i>Pachliopta hector</i>	Crimson rose	Indigenous		+		+	+	

Class, Order and Species Name		Common Name	Status	Habitats					
				ML	HG	RS	PF	CL	IW
2	<i>Pachliopta aristolochiae</i>	Common rose	Indigenous	+	+		+		
3	<i>Papilio polymnestor</i>	Blue mormon	Indigenous	+				+	
4	<i>Graphium agamemnon</i>	Tailed jay	Indigenous	+					
Family – Pieridae									
5	<i>Catopsilia pyranthe</i>	Mottled emigrant	Indigenous			+			
6	<i>Erema hecabe</i>	Common grass yellow	Indigenous			+			
Family: Danaidae									
7	<i>Danaus chrysippus</i>	Plain tiger	Indigenous		+		+	+	
8	<i>Euploea core</i>	Common crow	Indigenous		+	+			
Family – Nymphalidae									
9	<i>Danaus chrysippus</i>	Plain tiger	Indigenous	+		+			
10	<i>Junonia atlites</i>	Grey pansy	Indigenous				+	+	
11	<i>Neptis hylas</i>	Common sailor	Indigenous		+		+		
12	<i>Ypthima ceylonica</i>	White four-ring	Indigenous		+	+	+		
Family – Satyridae									
13	<i>Elymnias hypermnestra</i>	Common palmfly	Indigenous		+				
Family – Lycaenidae									
14	<i>Jamides celeno</i>	Common Cerulean	Indigenous			+		+	
Class- Ostecthyes		Bony fishes							
Family- Cichlidae									
1	<i>Oreocromis mosambicus</i>	Tilapia	Exotic						+
Family- Anabantidae									
2	<i>Anabus testudineuas</i>	Climbing perch	Indigenous						+
Family – Cyprinidae									
3	<i>Rasboroides atukorali</i>	Horadandia	Indigenous						+
4	<i>Puntius vittatus</i>	Silver barb	Indigenous						+
Family – Aplocheilidae									
5	<i>Aplocheilus dayi</i>	Day's killifish	Endemic						+
Family – Belontiidae									
6	<i>Pseudosphromenus cupanus</i>	Spiketailed paradisefish	Indigenous						+
Class- Amphibia		Amphibians							
Family – Bufonidae									
1	<i>Bufo melanostictus</i>	Common toad	Indigenous		+				
Family – Ranidae									
2	<i>Euphlyctis hexadactylus</i>	Sixtoe green frog	Indigenous					+	
3	<i>Limnonectes limnocharis</i>	Common paddy field frog	Indigenous	+			+		
Family- Microhylidae									
4	<i>Uperodon systoma</i>	Baloon frog	Indigenous					+	

Class, Order and Species Name	Common Name	Status	Habitats					
			ML	HG	RS	PF	CL	IW
Class – Reptilia	Reptiles							
Family – Agamidae								
1 <i>Calotes calotes</i>	Green garden lizard	Indigenous		+	+	+	+	
2 <i>Calotes versicolor</i>	Common garden lizard	Indigenous	+		+	+		
Family- Gekkonidae								
3 <i>Hemidactylusbrookii</i>	Spotted house gecko	Indigenous	+					
4 <i>Hemidactylus frenatus</i>	Common house-gecko	Indigenous	+					
Family – Varanidae								
5 <i>Varanus bengalensis</i>	Land monitor	Indigenous		+	+	+		
6 <i>Varanus salvator</i>	Water monitor	Indigenous	+					+
Family- Elapidae								
7 <i>Naja naja</i>	Cobra	Indigenous				+	+	
Family- Viperidae								
8 <i>Daboia russelii</i>	Russell's viper	Indigenous					+	
Family- Boidae								
9 <i>Python molurus</i>	Indian Python	Indigenous/T R				+		
Class- Aves	Birds							
Family – Accipitridae								
1 <i>Haliastur indus</i>	Brahminy Kite	Indigenous			+			
2 <i>Spilornis cheela</i>	Crested serpent eagle	Indigenous			+			
Family – Alcedinidae			+					
3 <i>Halcyon smyrnensis</i>	White-throated Kingfisher	Indigenous				+		
4 <i>Alcedo atthis</i>	Common kingfisher	Indigenous	+			+		+
Family- Apodidae								
5 <i>Cypsiurus balasensis</i>	Asian Palm Swift	Indigenous		+				
Family – Ardeidae								
6 <i>Ardeola grayii</i>	Pond Heron	Indigenous	+			+		+
7 <i>Ardea purpurea</i>	Purple heron	Indigenous	+					+
8 <i>Bubulcus ibis</i>	Cattle Egret	Indigenous	+	+	+	+	+	+
9 <i>Butorides striatus</i>	Little green heron	Indigenous	+					+
10 <i>Casmerodius albus</i>	Great egret	Indigenous	+		+	+		+
11 <i>Mesophoyx intermedia</i>	Intermediate Egret	Indigenous	+		+	+		+
12 <i>Egretta garzetta</i>	Little Egret	Indigenous	+		+	+	+	+
Family- Burhinidae								

Class, Order and Species Name	Common Name	Status	Habitats					
			ML	HG	RS	PF	CL	IW
13 <i>Burhinus oedicephalus</i>	Eurasian thick knee	Indigenous			+			
Family – Capitonidae								
14 <i>Megalima rubicapilla</i>	Small barbet	Indigenous		+			+	
Family – Centropodidae								
15 <i>Centropus sinensis</i>	Greater Coucal	Indigenous	+			+		
Family – Charadriidae								
16 <i>Vanellus indicus</i>	Red-wattled Lapwing	Indigenous	+			+		
Family – Columbidae								
17 <i>Chalcophaps indica</i>	Emerald Dove	Indigenous					+	
18 <i>Columba livia</i>	Domestic Pigeon	Indigenous		+		+		
19 <i>Streptopelia chinensis</i>	Spotted Dove	Indigenous			+	+	+	
Family – Coraciidae								
20 <i>Coracias benghalensis</i>	Indian Roller	Indigenous			+	+		
Family – Corvidae								
21 <i>Corvus macrorhynchos</i>	Large-billed Crow	Indigenous		+	+		+	
22 <i>Dicrurus caerulescens</i>	White-bellied Drongo	Indigenous	+	+	+			
23 <i>Eudynamys scolopacea</i>	Asian Koel	Indigenous		+			+	
Family – Dicaeidae								
24 <i>Dicaeum erythrorhynchos</i>	Small flowerpecker	Indigenous	+					
Family – Hemiprocidae								
25 <i>Hemiprocne coronata</i>	Crested Treeswift	Indigenous				+		
26 <i>Pycnonotus luteolus</i>	White-browed Bulbul	Indigenous	+				+	
Family - Indigenousectariidae								
27 <i>Indigenousectaria lotenia</i>	Loten's Sunbird	Indigenous	+		+			
28 <i>Indigenousectaria zeylonica</i>	Purple-rumped Sunbird	Indigenous	+		+		+	
Family – Magalaimidae								
29 <i>Megalaima zeylanica</i>	Brown-headed Barbet	Indigenous		+	+		+	
Family – Meropidae								
30 <i>Merops philippinus</i>	Blue tail bee eater	Indigenous	+		+	+		
Family – Muscicapidae								
31 <i>Aegithina tiphia</i>	Common Iora	Indigenous			+			
32 <i>Copsychus saularis</i>	Oriental Magpie Robin	Indigenous		+	+	+		

Class, Order and Species Name			Common Name	Status	Habitats					
					ML	HG	RS	PF	CL	IW
Family – Picidae										
33	<i>Dinopium benghalense</i>	Red backed woodpecker	Indigenous		+					
Family - Phalacrocoracidae										
34	<i>Phalacrocorax niger</i>	Little Cormorant	Indigenous	+					+	
Family – Phasianidae										
35	<i>Gallus domesticus</i>	Domestic fowl	Exotic		+	+				
Family- Podicipedidae										
36	<i>Tachybaptus ruficllis</i>	Little grebe	Indigenous			+	+			
Family – Psittacidae										
37	<i>Psittacula krameri</i>	Rose-ringed Parakeet	Indigenous		+	+	+	+		
Family – Pycnonotidae										
38	<i>Pycnonotus cafer</i>	Red-vented Bulbul	Indigenous	+	+	+	+	+		
Family – Rallidae										
39	<i>Amaurornis phoenicurus</i>	White-breasted Waterhen	Indigenous	+		+			+	
40	<i>Porphyrio porphyrio</i>	Purple swamphen	Indigenous	+						
Family – Sturnidae										
41	<i>Acridotheres tristis</i>	Common Myna	Indigenous		+	+		+		
Family – Sylviidae										
42	<i>Orthotomus sutorius</i>	Tailor bird	Indigenous		+	+				
Class- Mammalia			Mammals							
Family – Pteropodidae										
1	<i>Pteropus giganteus</i>	Flying fox	Indigenous		+	+	+	+		
2	<i>Rousettus leschenaultii</i>	Dog faced fruit bat	Indigenous		+		+	+		
3	<i>Cynoptrrus sphinx</i>	Short nosed fruit bat	Indigenous	+	+		+	+		
Family – Cercopithecidae										
4	<i>Semnopithecus vetulus</i>	Purple-faced leaf monkey	Endemic		+			+		
Family – Canidae										
5	<i>Canis familiaris</i>	Domestic dog	Exotic		+	+	+			
Family – Felidae										
6	<i>Felis catus</i>	Domestic cat	Exotic		+	+	+			
Family – Herpestidae										
7	<i>Herpestes smithii</i>	Black-tipped mongoose	Indigenous	+						
Family – Bovidae										
8	<i>Bubalus bubalis</i>	Water buffalo	Indigenous	+	+		+		+	

Class, Order and Species Name	Common Name	Status	Habitats					
			ML	HG	RS	PF	CL	IW
9 <i>Bos indicus</i>	Domestic cattle	Indigenous	+	+	+	+	+	
Family – Sciuridae								
10 <i>Funambulus palmarum</i>	Palm squirrel	Indigenous	+	+	+	+	+	
11 <i>Ratufa macroura</i>	Giant Squirrel	Indigenous		+			+	
Family – Leporidae								
12 <i>Lepus nigricollis</i>	Black-naped hare	Indigenous				+	+	
Family – Tragulidae								
13 <i>Moschiola kathygre</i>	Sri Lanka pigmy mouse-deer	Endemic					+	
Family- Soricidae								
14 <i>Suncus murinus</i>	Musk shrew	Indigenous		+				
Family – Muridae								
15 <i>Rattus rattus</i>	House rat	Indigenous		+				
16 <i>Mus musculus</i>	House mouse	Indigenous		+				
17 <i>Bandicota indica</i>	Malabar bandicoot	Indigenous		+			+	
Family- Mustellidae								
18 <i>Lutra lutra</i>	Indian otter	Indigenous/T R	+					
Family- Viverridae								
19 <i>Viverricula indica</i>	Ring tailed civet cat	Indigenous	+		+			

APPENDIX 7.1:
Environmental management plan (EMP)

Environmental management plan (EMP) for rehabilitation and improvement of Nittambuwa – Kadugannawa section of Colombo – Kandy (A001) road

This environmental management plan (EMP) is the summarized matrix of all likely impacts that may occur during preconstruction, construction and operational activities of rehabilitation and improvement of Nittambuwa (39.71km) – Kadugannawa (100km) section of Colombo – Kandy (A001) road with the financial assistance of Asian Development Bank (ADB) through road management contract (RMC) of iRoad which is under road development authority (RDA). This EMP is prepared based on all anticipated impacts that are identified in the main report of the initial environmental examination (IEE) conducted for the said project during each phases of the project, their locations where they shall possibly be occurred and mitigation measures to minimise the particular impacts at particular locations and responsible agencies for implementation.

The EMP forms part of the Contract, the prescriptions detailed in the EMP are mandatory in nature and also contractually binding with the parties stated in the EMP. The EMP will also equally applicable to sub – contractors including nominated sub – contractors if any. With the assistance of the project implementation consultant (PIC)/Engineer the Employer shall monitor the compliance of EMP by the Contractor. The Contractor is advised to carefully consider the relevant EMP requirements stated under item “Pre-construction and design phase” and “Construction phase” when preparing the bid. The prescriptions and clauses detailed in the EMP are integral component of the contract unless separate items are included in the bill of quantities (BOQ). Thus separate payments will not be made in respect of compliance with the EMP by the Contractor. In case the Contractor or its sub-contractor/s fail/s to implement the EMP recommendations, after informing in writing, the PIC/Engineer shall take whatever actions it is deemed necessary to ensure that the EMP is properly implemented. If the Contractor still fails to comply with EMP requirements, the PIC/Engineer shall impose a penalty and take actions to arrange appropriate remedial measures to rectify the impact through a third party and cost shall be recovered from the Contractor.

The Contractor through an appointed dedicated Environmental Manager shall assist the PIC/Engineer to discharge his duties as required in the EMP implementation by (a) maintaining up to date records on actions taken by the Contractor with regard to implementation of EMP recommendations (b) timely submission of reports, information and data to the Employer through Engineer, (c) participating in the meetings convened by the Engineer and (d) any other assistance requested by the Engineer.

Environmental Management Plan

	Construction activity	Anticipated impacts	Mitigation Action	Approx. location	Monitoring/performance indicator	Mitigation Cost	Institutional responsibility	
							Implementation	Supervision
1.	Pre-construction/design phase							
1.1	Shifting of temporary development on the existing ROW	Though all proposed road rehabilitation activities including construction of passing lanes shall be within the existing ROW, it shall need to shift the temporary buildings/structures which encroached to the existing ROW and this will result negative impacts to public such as loss of income etc...	Designing the road including passing bays shall be done avoiding permanent or temporary encroachments to the existing ROW.	Throughout the road section	Passing lanes without intersecting structures in the design	Design Cost under the Bills of Quantities (BOQ)	Project implementation unit (PIU) of Road and Design Engineer of the Contractor	Environmental and social development division (ESDD) of RDA
1.2	Natural hazards aggravated by the project and impacts to the road	<p>Landslide impact; Slope failures due to disturbance to natural slopes</p> <p>Flood impacts; A001 road section near Warakapola town from 56.72km to</p>	<p>Restricting all road rehabilitation activities to the existing ROW. Paying special attention at landslide prone locations along the road trace and even temporary disturbances to existing slopes to be avoided at such locations.</p> <p>Obtaining prior consent national buildings and research organization (NBRO) and recommendation if any to be incorporated to the designs.</p> <p>Hydrology along the road with special attention to flood prone locations to be deeply studied and cross drainage</p>	<p>Throughout the road section with special attention to road sections from 77 to 78km, 86km post to 87/1 culvert, 96 to 97km and 98.8 to 98.9km.</p> <p>Throughout the road section with</p>	<p>No encroachments to the slopes in the design in given locations</p> <p>Consent of NBRO obtained for the design and their recommendations incorporated (if any)</p> <p>Mitigation measures incorporated to the design at given locations with the</p>	Design Cost under the Bills of Quantities (BOQ)	PIU and The Contractor	PIC, NBRO, DoI, DMC and ESDD

	Construction activity	Anticipated impacts	Mitigation Action	Approx. location	Monitoring/performance indicator	Mitigation Cost	Institutional responsibility	
							Implementation	Supervision
		57.0km gets inundated during the heavy rains where the Kuda Oya overflows and causes the roads in the surrounding areas to be inundated. Due to the proposed project activities flood impacts may be aggravated	structures, road finished level and the surface treatment should be decided accordingly. Close coordination with Department of Irrigation and disaster management center (DMC) in order to obtain high flood levels, their return periods, respective retention periods and other recommendations in order to support the final design. Public consultation will also be used to verify the findings	special attention near Warakapol a town from 56.72km to 57.0km	agreement of Department of irrigation and DMC			
1.3	Alteration of surface water bodies	Disturbance to canals, waterways and drains located within the ROW	All water bodies crossing or located adjacent to the road shall not be disturbed other than at following locations; <ul style="list-style-type: none"> Canal from 63.44 – 63.63 (LHS) will be diverted to the edge of the ROW It is proposed to introduce underground conduits for the canal from 65.63 – 65.67 (LHS) It is proposed to construct a retaining wall for canal protection from 67.733 – 67.780 (LHS) Underground drains are proposed to the drains from 69.642 – 70.010 (RHS), 75.620 – 75.703 (RHS) and 75.750 – 75.952 (LHS) Consent from third party agencies such as Department Agrarian Services to be obtained if such agency is getting involved.	Throughout the road section	Proposed site specific mitigation measures are incorporated to the design at given locations Consent from third party agencies obtained	Design Cost under the Bills of Quantities (BOQ)	PIU and the Contractor	PIC, DoL, LA, Department of Agrarian Services and ESDD

Appendix 7.1

	Construction activity	Anticipated impacts	Mitigation Action	Approx. location	Monitoring/performance indicator	Mitigation Cost	Institutional responsibility Implementation	Supervision
1.4	Impacts to archaeologically protected monuments and sites	Damages to archaeologically protected sites and monuments.	Design shall be modified at locations where archaeologically important sites and particular side of the road will be kept as it is in order to avoid any encroachments to such sites. Further the proposed improvement/ activities at particular locations shall be presented to the department of archaeology for their concurrence prior to implementation.	At Mangalaga ma ancient rest house (85km, LHS), Kaduganna wa ancient rest house (97.15km, LHS) and at Captain Dowson's Tower; 100km (RHS)	No impact to the archaeological monuments and sites in the design. Concurrence of department of archaeology obtained at given locations	Design Cost under the Bills of Quantities (BOQ)	PIU and the Contractor	PIC, Department of Archaeology and ESDD
1.5	Removal of public utilities	Inconvenience to the public due to uninformed interruption of utility services Unnecessary damages/accidental damages to utility lines when shifting and safety of the labourers and the public	Initial consultation and consent shall be taken from relevant service providers (CEB / NWSDB / SLT) well in advance. Advance notice to the affected public about the time and the duration of the utility disruption. Use of well trained and experienced machinery operators to reduce accidental damage to the public utilities. Restoration of the public utilities as soon as possible.	Throughout the road section	Particular service provider consulted. Advance notifications given to the users. Method statement for shifting of utilities presented to the PIC.	Cost estimated by the line agencies/ Cost of utility shifting under the BOQ	The Contractor	The Employer, line agencies (CMC, SLLRDC, CEB/ NWSDB/ SLT)
1.6	Site selection and preparation for labor accommodation	Spread of contagious diseases	Labor accommodations shall be designed and constructed considering adequate physical distancing between users of such accommodations, provision of adequate ventilation, with	Sites identified/ selected to establish labor	Designs include sufficient spacing, ventilation and other safety arrangements	Design Cost under the Bills of Quantities (BOQ)	The contractor	Employer, PIC

	Construction activity	Anticipated impacts	Mitigation Action	Approx. location	Monitoring/performance indicator	Mitigation Cost	Institutional responsibility	
							Implementation	Supervision
2.	Construction phase							
2.1	Increase of local air pollution, noise and vibration	Degradation of air quality, excessive noise and vibration due to excavation for shoulders and other earthworks, pavement improvement operations, quarry operations, operation of asphalt plant, batching plant, operation of construction vehicles etc... Nuisance to public, schools, hospitals, places of worship and archaeologically protected sites due to high noise, vibration and degradation of air quality	<ul style="list-style-type: none"> Limiting operations to times when they have least impact in settlement areas, especially near schools and other sensitive locations such as hospitals and places of worship. Ensuring that construction plant and equipment is maintained to high operable standards, and that exhaust baffles are fitted and maintained in a high serviceable condition. Vibration should be controlled with the agreement of the Project Implementation Consultant (PIC) at locations where sensitive receptors are found. Regular sprinkling of water to dampen the construction surface will reduce the emission of dust. Implementation of all construction activities in compliance with acceptable levels of noise which are specified in National Environmental 	Throughout the road section with special attention to residential areas, schools, hospitals, places of worship and archaeologically protected sites	Sensitive receptors consulted in advance. Public/stakeholder complaints received on high noise, vibration and degradation of air quality. Method statement presented to PIC on vibration controlling. No. of water bowsers deployed. Necessary licenses obtained for prescribed activities.	Within Contract Price	The Contractor	PIC, PIU, ESDD, CEA
			<p>separate area to store boots, shoes which shall not be allowed inside the huts. A hand washing area shall be provided at the entrance of each labour camp.</p> <p>Inform the public health officer (PHI) and local health authorities of establishment of labour camps.</p>	accommodations.				

	Construction activity	Anticipated impacts	Mitigation Action	Approx. location	Monitoring/performance indicator	Mitigation Cost	Institutional responsibility	
							Implementation	Supervision
			<p>(Noise Control) Regulations 1996 stipulated by C amendments act 924/12 to mitigate the noise impact.</p> <ul style="list-style-type: none"> • A property condition survey will be conducted along the trace within a corridor as specified by PIC. The survey shall record all details related to cracks and construction failures existing in structures along this corridor. • Buildings cracked due to construction activities should be compensated or repaired to the satisfactory level (which is agreed by the PIC) of the affected person. Here, precondition survey conducted for surrounding buildings located within an agreed area and a corridor with the PIC will be helpful in differentiating cracks caused by construction activities. • All machinery, plants and vehicles used for the project shall be well maintained and regularly monitored in order to keep their emissions below the threshold levels (as specified in NEA) in order to minimize degradation of air quality • At archaeologically protected sites and monuments, the recommendations given by Department of Archaeology shall be adhered to avoid any damages to 		<p>Property condition survey presented to PIC in advance.</p> <p>No. of complaints received and no. of complaints resolved on cracking of buildings.</p> <p>Availability of service records and certificate of emission test</p> <p>Recommendation obtained from Department of Archaeology.</p> <p>Measures taken to control vibration at particular locations</p>			

Appendix 7.1

	Construction activity	Anticipated impacts	Mitigation Action	Approx. location	Monitoring/performance indicator	Mitigation Cost	Institutional responsibility	
							Implementation	Supervision
2.2.	Disruption to traffic flow	Closure of lanes and diversion of traffic to facilitate road rehabilitation works will severely affect the traffic flow creating heavy congestions. This will delay the day to day activities of the commuters such as schooling, attending to office works at time etc... Further, emergency vehicles such as ambulances which use the road very often will also be trapped in the traffic congestions	<p>such sites. Precautionary measures such as using small compactors without vibration, avoiding use of heavy machinery, maintaining the air quality below the standards at such sites should be practiced in order to avoid impacts.</p> <ul style="list-style-type: none"> Preparation of traffic management plan in collaboration with the Police and implementation during the construction phase with the help of Police. Traffic management plan shall be updated as necessary. Assistance of Police shall be obtained to ensure that traffic will comply with the measures of the traffic management plan Providing advance information to the public about the planned construction works, Providing properly marked by-passes and one-way section including barriers, reflectors, and night illumination. Use of well-trained flagmen to control traffic flows at constricted sites, including safe crossing for pedestrians especially near town areas and schools. Public shall be made aware about alternative roads that can be used to bypass construction areas using media and sign boards 	Throughout the road section	Traffic management plan prepared and consent of Police obtained Advance information to the road users provided Presence of required sign boards at required locations Flagmen deployed at every required location. Presence of long queued of traffic jams on either sides of construction sites	Within Contract Price	The Contractor	PIC, PIU, ESDD, Police

	Construction activity	Anticipated impacts	Mitigation Action	Approx. location	Monitoring/performance indicator	Mitigation Cost	Institutional responsibility	
							Implementation	Supervision
2.3.	Deterioration of surface and ground water quality due to silt runoff, emissions and spoil from labour camps	Siltation of surface and ground water bodies by soil washed off from construction sites, contamination of surface and ground water resources by chemicals, lubricants, fuels etc... used for the project and degradation of surface and ground water quality by emissions from labor camps.	<ul style="list-style-type: none"> Flagmen shall be instructed to pay especial attention to emergency vehicles in order to allow them to cross the construction sites without delay Reuse of soil removed for filling sites if any as much as possible and unsuitable materials can be used to refill borrow pits with the approval of the PIC. Where earthworks take place adjacent to surface water bodies and wells, drainage of storm water to be managed. This should be planned prior to the commencement of earthwork activity. All temporary unsuitable soil dumps and debris should be removed to approved disposal sites by the relevant local authority. Contractor should present a method statement stating how the environmental and social impacts that can be generated are managed at disposal sites in advance for approval. All disposal sites should be sited in locations which are not affected by floods or exposed to soil erosion. If temporary soil dumps are left at the site for a long time, proper remedial measures to minimize soil erosion 	Throughout the road section	Number of borrow sites refilled with unsuitable material Presence of drainage management measures as necessary Presence of unsuitable soil heaps along the road. No. of disposal sites operated (approved) Method statements for each disposal site approved by PIC Presence of mitigation measures for temporary soil dumps Location of disposal sites	Within Contract Price	The Contractor	PIC, PIU, ESDD, CEA, LA

Construction activity	Anticipated impacts	Mitigation Action	Approx. location	Monitoring/performance indicator	Mitigation Cost	Institutional responsibility	
						Implementation	Supervision
		<p>should be practiced (E.g.: Placing sandbags around the dump etc...)</p> <ul style="list-style-type: none"> • Temporary soil dumps should not be placed near water bodies or flood prone areas • All fills, back fills and slopes should be compacted within the shortest possible time to reach the specified degree of compaction • Turfing of all embankment slopes with suitable turf material, Establishment of suitable mulch to cover the slopes of embankments • All materials (including toxic and hazardous material) required for construction shall be stored at secured and managed sites, sited away from water bodies, • Construction vehicles and equipment will be maintained in good operable condition, ensuring no undue leakage of oil or fuel, • Construction vehicles and equipment will be serviced only at properly managed and equipped workshops and waste oil will be collected and disposed at approved locations, • Sanitation arrangements and an adequate water supply will be made at worksites and at any accommodation facilities provided 		<p>near water bodies and flood prone areas</p> <p>Length of embankments turfed</p> <p>Storing of materials sealed containers, on impervious surfaces etc...</p> <p>Timely servicing of vehicles and equipment (service records)</p> <p>Vehicles and equipment are serviced at approved workshops (service records)</p> <p>Permanent water supply provided to labor camps</p> <p>Adequate number of waste bins provided</p> <p>Properly sealed septic tanks provided and mechanism for removal of sludge available</p>			

	Construction activity	Anticipated impacts	Mitigation Action	Approx. location	Monitoring/performance indicator	Mitigation Cost	Institutional responsibility	
							Implementation	Supervision
			<p>for workers' accommodation, ensuring that no open dumping of solid wastes, no raw sewage is released into drains or water bodies.</p> <ul style="list-style-type: none"> • Adequate wastewater treatment method shall be provided to concrete batching plants and asphalt plants • Site specific mitigation measures such as silt fences, barriers shall be applied at wells located nearby to the road to minimize sedimentation of ground water and it shall be ensured that the wells are not contaminated by chemicals, lubricants and fuels used for the project 		<p>Presence of wastewater treatment plants for concrete batching plants and asphalt plants</p> <p>Availability of location specific measures if wells are located at project sites</p>			
2.4.	Impacts to archaeological sites	Excessive vibration levels and noise generated due to operation of machineries, compaction activities and other construction activities will damage archaeological monuments and sites. Further improper handling of machineries, dumping of debris and material can also damage such sites as they are located adjacent to the ROW. On the other hand, thieving of	<ul style="list-style-type: none"> • All construction activities shall be implemented under the supervision of Department of archaeology (DoA) • Vibration shall be controlled using low vibration rollers, small compactors and using other measures as recommended by DoA. Attention shall be made to the Kadugannawa tunnel as well in this regard as the tunnel can also be cracked due to excessive vibration. • Dumping of debris, soil and any other material at archaeological will be avoided. • Machinery operators and other workers shall be made aware about 	Managalagama ancient rest house (85km, LHS), Kaduganna wa ancient rest house (97.15km, LHS), Captain Dowson's Tower (100km, RHS) and Kaduganna wa Tunnel.	<p>Presence of a supervisor of DoA as required</p> <p>Use of vibration controlling measures at required locations</p> <p>Debris and material not dumped at archaeological sites</p> <p>Operators are aware about the location of archaeological sites</p>	Within Contract Price	The Contractor	PIC, PIU, ESDD, DoA

Appendix 7.1

	Construction activity	Anticipated impacts	Mitigation Action	Approx. location	Monitoring/performance indicator	Mitigation Cost	Institutional responsibility	
							Implementation	Supervision
		artifacts of the protected monuments and damaging will also be possible by the workers if not properly monitored. Devotees to such sites will face inconveniences if access will be disturbed due to road improvement activities.	the importance of the sites in order to minimize accidental damages <ul style="list-style-type: none"> • The road edge at these sites shall be properly barricaded • Labor force shall be monitored continuously to ensure safety of artifacts • Temporary safe access to the sites shall be maintained for the convenience of the devotees • Contractor shall immediately inform DoA through PIU if he chance find any artifact during the construction period and activities at the particular location shall be stopped immediately until DoA confirms to proceed with. 		Road edge is properly barricaded Presence of separated entrance for devotees Contractor is aware about the mechanism to be complied in chance found artifacts			
2.5.	Flood Impacts	Increase of flood situation as a result of Contractors activity	Contractor's activities shall not lead to flooding conditions as a result of blocked drainage paths and drains. The contractor shall take all measures necessary and as directed by the PIC to keep all drainage paths and drains clear of blockage at all times. If flooding or stagnation of water is caused by contractor's activities, contractors shall provide suitable means to (a) prevent loss of access to any land or property and (b) prevent damage to land and property. Further, any recommendations laid down by the hydrological studies, should be adopted at flood prone areas. In addition, contractor will pay special	Throughout the road section, at material stock yards and disposal sites	All drains and canals are free of blocks Disposal sites, yards and material stock piles not located in flood prone areas	Within Contract Price	The Contractor	PIC, PIU, ESDD, LA, DoI

Appendix 7.1

	Construction activity	Anticipated impacts	Mitigation Action	Approx. location	Monitoring/performance indicator	Mitigation Cost	Institutional responsibility	
							Implementation	Supervision
			attention to avoid flood prone areas in selecting disposal sites, locations for material stock piles, yards and other locations where chemicals and other construction material are stored.					
2.6.	Landslide impacts	Disturbances to road side slopes, disposal of material in to slopes, improper selection of disposal sites shall induce slope failures	Minimise disturbances to road side slopes even for temporary requirements, storing material and establishing disposal sites only at approved locations will minimize the above impact. Consent of NBRO shall be obtained for disposal sites if selected in sloppy areas and necessary mitigation measures shall be implemented	Throughout the road section with special attention to road sections from 77 to 78km, 86km post to 87/1 culvert, 96 to 97km and 98.8 to 98.9km.	No slope failures resulted due to construction activities Consent obtained from NBRO for disposal sites located within susceptible areas	Within Contract Price	The Contractor	PIC, PIU, ESDD, NBRO
2.7.	Social and environmental impacts due to establishment of labour camps	Improper sanitation, lack of water supply, improper disposal of wastewater and solid waste will increase risk of contaminating nearby surface water sources. Stagnant water will create mosquito breeding and vector for communicable diseases to the workers and host communities. Social	Locating labour camps at least 100m away from major water resources. Application of site specific mitigation measures as agreed with the PIC if camps are to be located nearby a water body or other environmentally/socially sensitive location. Providing proper sanitary facilities to the labour camps and any wastewater and other waste matter generated from the camps will be disposed in environmentally friendly manner as agreed with the PIC. Maximizing recruiting of local labour and conducting awareness programs	At locations where labor camps to be established	Application of location specific measures to minimize impacts to water bodies, soil and society Sanitary facilities provided are adequate Presence of wastewater treatment method No. of local labor	Within Contract Price	The Contractor	PIC, PIU, ESDD, CEA, LA

	Construction activity	Anticipated impacts	Mitigation Action	Approx. location	Monitoring/performance indicator	Mitigation Cost	Institutional responsibility	
							Implementation	Supervision
		conflicts due to use of illicit liquor and unpleasant behaviour which causes inconvenience to local community	targeting workers as well as local community in order to above impacts.		recruited			
2.8.	Loss of trees and vegetation	Loss of soil moisture, reduction of air quality, reduction of aesthetic value and loss of shade and habitats due to clearing of vegetation and felling of trees.	Avoidance of unnecessary felling of trees and clearing of vegetation, limiting movement of vehicles and machineries to the ROW, trees to be felled to be clearly marked and presence of nests, habitats for species such as epiphytes to be identified and to be relocated to a similar habitat before felling of such trees. Conducting compensatory tree replanting program by the Contractor to compensate the loss of trees. Suitable native tree species should be selected for the replanting purpose at 1:3 ratio. Replanting of threatened/endemic species should be given priority. Contractor shall ensure survival of replanted trees at least for 2 years.	At locations where trees to be felled and replanted	Felling only trees as identified in the tree list approved by PIC Rehabilitation of habitats and species, nests on trees to be felled Conducting replanting program with required number of plants Survival of all replanted trees with an acceptable growth at the end of the contract period	Within Contract Price	The Contractor	PIC, PIU, ESDD
2.9.	Impacts due to extraction and transportation of construction materials	Noise, vibration, dust, induced slope failure, negative visual impacts, creation of mosquito breeding sites, and damage to private properties and	Avoiding over exploitation, reuse of ABC, use of paver in laying ABC against using the grader (the conventional method). Adhering the conditions laid down in the approval of GSMB and CEA for quarry and borrow sites. Keeping provisions for repairing	At all material extraction sites and road used for material	Extraction of material to the approved amount All conditions laid down in the approvals	Within Contract Price	The Contractor	PIC, PIU, ESDD, GSMB, CEA

Appendix 7.1

	Construction activity	Anticipated impacts	Mitigation Action	Approx. location	Monitoring/performance indicator	Mitigation Cost	Institutional responsibility	
							Implementation	Supervision
		minor roads. Heavy trucks transporting materials cause disturbances to local traffic, damage minor roads, and increase dust and noise nuisance.	and restoration of all property damages including the roads used for the transportation of construction materials by the contractor in the contract document and use of covers over transported materials to guard against dust blow and water spraying to dampen the gravel surfaces.	transportation	adhered Damages to roads and buildings restored Adequate number of water bowsters deployed/adequate passes done for dust controlling			
2.10.	Impacts to surface water hydrology	Alteration/blocking of drainage paths and upstream flooding.	Drainage passages, drainage paths across the road shall not be blocked for construction activities. Temporary drainage passages/ diversions shall be provided (if drainage structures to be blocked for reconstruction of the bridge) to facilitate smooth drainage of water across the road until meeting lead away drains and such facilities shall be maintained until the permanent solution will be in place. Contractor should ensure that project activities will not create any flooding condition during the construction phase due to his activities. Contractor shall avoid storage of construction materials and disposal of debris in and around drainage paths. Location specific mitigation measures as recommended by the PIC will be implemented in order to minimize soil erosion and disturbance to natural drainage pattern if material are to be stored near to such locations.	Throughout the road section	All drains, canals across the road are not blocked Temporary bypasses for water paths provided and water flow continues to downstream	Within Contract Price	The Contractor	PIC, PIU, ESDD, DoI, Agrarian Department, LA

	Construction activity	Anticipated impacts	Mitigation Action	Approx. location	Monitoring/performance indicator	Mitigation Cost	Institutional responsibility	
							Implementation	Supervision
2.11.	Requirement of lands for the road upgrading	Public unrest due to improper use of lands for construction activities	Lands required for stock piling, use as yards etc... shall be obtained by the contractor with the concurrence of project staff and will sign a temporary occupation contract with the owner in which a site restoration plan is specified.	At all locations where lands are temporarily required for the project	Contract signed for every land used for the project Site restoration plan is integrated to each contracts	Within Contract Price	The Contractor	PIC, PIU, ESDD
2.12.	Occupational health and safety	Safety of the laborers, residents and the public during the day work and night time work	Contractor shall organize awareness program regarding personal safety of workers, residents and general public at regular time basis. Establishment of road engineering aspects to reduce the likelihood of accidents (warning signs, barricading, speed limits markings, breakers and signals to particular locations) and night visibility of them shall be ensured. Placement of well-trained flag men will be necessary to control traffic in collaboration with the Police. Providing Personnel Protective Equipment (PPE) for laborers such as protective footwear, helmets, goggles, eye-shields and clothes to the workers depending on their duty (Mixing asphalt, blasting, handling equipment etc...) Arranging a first aid unit and transport facilities to take injured people to the nearest hospital. Contractor shall place firefighting equipment where necessary	Throughout the road section and at all other sites used for the project	Number of awareness programs conducted per week is adequate Necessary sign boards introduced for required locations and maintained properly All project staff wearing PPE as and when required Presence of adequate facilities for first aid and fire fighting	Within Contract Price	The Contractor	PIC, PIU, ESDD

	Construction activity	Anticipated impacts	Mitigation Action	Approx. location	Monitoring/performance indicator	Mitigation Cost	Institutional responsibility	
							Implementation	Supervision
			<p>Use experience and well trained workers for the handling of machinery, equipment and material processing plants</p> <p>Construction work shall be carried out at night only with adequate lighting, night visible road signs, PPE etc...</p> <p>Comply with National Institute of Occupational Safety and Health and IFC EHS Guidelines on Occupational Health and Safety. And other guidelines on occupational health and safety issued time to time by other government institutes/ agencies of Sri Lanka.</p> <p>Prepare a comprehensive & site-specific Health and Safety Plan (H&SP) describing in detail how the health and safety of all site personnel (workers, staff and visitors) will be maintained at all times (including measures that would be taken in case of spread of a communicable disease within the site or project area). It is to provide guidance on establishing a management strategy and applying practices that are intended to eliminate, or reduce, fatalities, injuries and illnesses for workers performing activities and tasks associated with the project.</p>		Adequate lighting facilities' are available for night works			

Appendix 7.1

Construction activity	Anticipated impacts	Mitigation Action	Approx. location	Monitoring/performance indicator	Mitigation Cost	Institutional responsibility	
						Implementation	Supervision
		<p>Obtain a health (medical certificate) and behavioral certificate (police report) from all staff and workers who are recruited to office and sites (this shall be applicable for sub-contractors also).</p> <p>Upon returning for work (after a shutdown) all staff and workers shall inform the health and safety officer of any ailments they had during the vacation period.</p> <p>Provide compulsory H&S orientation training (including awareness on both communicable/ non-communicable diseases, good health and hygienic practices) to all new workers to ensure that they are apprised of H&S Plan including rules of work, PPE, preventing injury to fellow workers, etc.,.</p> <p>Staff/ workers shall be made aware to report any symptoms of ailments immediately to their supervisor/s.</p> <p>The site management shall keep continuous contact with PHI, local health authorities during the construction period.</p>					

Appendix 7.1

	Construction activity	Anticipated impacts	Mitigation Action	Approx. location	Monitoring/performance indicator	Mitigation Cost	Institutional responsibility	
							Implementation	Supervision
			<p>Sharing of tools and equipment shall be not allowed. Tools and equipment used shall be cleaned and returned to stores on a daily basis.</p> <p>Smoking and chewing of betel shall be prohibited during work hours.</p>					
2.13.	Loss of access to houses, commercial activities and public utilities	Loss of access to houses, commercial activities, office premises and other lands located along the road due to excavations and other road improvement activities	<p>Convenient and safety access to all existing residential and commercial lands located along the road section shall be ensured.</p> <p>Access to houses, commercial structures and public utilities should be clearly marked within the road reservation and safe temporary access will be maintained until the permanent solution will be in place. If the access is significantly lost for houses and shops, compensation shall be paid for temporary evacuation of households and for loss of livelihood of commercial structures with the approval of the PIC and PIU.</p>	Throughout the road section	Access is not disturbed to all road side houses and shops	Within Contract Price	The Contractor	PIC, PIU, ESDD
2.14.	Handling environmental issues/grievances during construction		<p>The Contractor shall appoint a qualified Environmental Manager for implementation of the EMP and also for community liaison to handle public complaints and grievances. The Contractor shall develop the grievance redress mechanism (GRM). The person who is responsible for</p>	At every project site	Environmental Officer/s recruited as necessary	Within Contract Price	The Contractor	PIC, PIU, ESDD

	Construction activity	Anticipated impacts	Mitigation Action	Approx. location	Monitoring/performance indicator	Mitigation Cost	Institutional responsibility	
							Implementation	Supervision
3.								
3.1.	Impacts on water resources	Blocking of canals, drains across the road due to siltation, stagnation of debris. Degradation of water quality due to improper handling of chemicals used for maintenance works such as paints, pesticides, asphalt etc...	Regular maintenance of all canals and drains located within the ROW and proper handling of chemicals used during the maintenance period under strict supervision	Throughout the road section	Smooth drainage is ensured	Within Contract Price	The Contractor	PIC, PIU, ESDD
3.2.	Disposal of waste material generated during maintenance operations	Siltation of water bodies, agricultural lands from soil removed as result of maintenance activities.	Proper disposal of all unsuitable material resulted from periodic and routine maintenance activities in the approved disposal sites.	Throughout the road section	Unsuitable matter is disposed to approved sites	Within Contract Price	The Contractor	PIC, PIU, ESDD
3.3.	Extraction of material for repairing and maintenance works	Impacts due to extraction of material for road maintenance activities.	Mitigation measures as given in 2.9 above shall be implemented.	At all material extraction sites and road used for material transportation	Indicators as given in 2.9 shall be applied	Within Contract Price	The Contractor	PIC, PIU, ESDD, GSMB, CEA

Appendix 7.1

	Construction activity	Anticipated impacts	Mitigation Action	Approx. location	Monitoring/performance indicator	Mitigation Cost	Institutional responsibility	
							Implementation	Supervision
3.4.	Pedestrian and commuter safety	Higher vehicular speed on the rehabilitated road will increase the incidences of accidents.	Provision of centreline road marking where possible, edge delineation etc... Provision of clearly marked signing at townships, sensitive areas such as schools, temples. Enforcement of speed limits and other traffic rules, especially within the town limits. Placing of sign boards for animal crossings etc. Safety of road users could be ensured during repairing of carriageway and hydraulic structures by placing standard sign boards, barricading of the repairing site etc...	Throughout the road section	All necessary road markings done All necessary permanent sign boards are established	Within Contract Price	The Contractor	PIC, PIU, ESDD

APPENDIX 7.2:
Environmental management checklist (EMC)

Environmental management checklist (EMC) for rehabilitation and improvement of Nittambuwa – Kadugannwa section of Colombo – Kandy (A001) road

Package Name:

Report No. and date:

Completed by:

1. Pre-construction stage

	Construction activity	Anticipated impacts	Mitigation Action	Approx. location	Monitoring/performance indicator	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
1.1	Shifting of temporary developments on the existing ROW	Though all proposed road rehabilitation activities including construction of passing lanes shall be within the existing ROW, it shall need to shift the temporary buildings/structures which encroached to the existing ROW and this will result negative impacts to public such as loss of income etc...	Designing the road including passing bays shall be done avoiding permanent or temporary encroachments to the existing ROW.	Throughout the road section	Passing lanes without intercepting structures in the design		
1.2	Natural hazards aggravated by the project and impacts to the road	Landslide impact; Slope failures due to disturbance to natural slopes	Restricting all road rehabilitation activities to the existing ROW. Paying special attention at landslide prone locations along the road trace and even temporary disturbances to	Throughout the road section with special attention to road	No encroachments to the slopes in the design in given locations		

Constructio n activity	Anticipated impacts	Mitigation Action	Approx. location	Monitoring/perfo rmance indicator	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
	Flood impacts; A001 road section near Warakapola town from 56.72km to 57.0km gets inundated during the heavy rains where the Kuda Oya overflows and causes the roads in the surrounding areas to be inundated. Due to the proposed project activities flood impacts may be aggravated	existing slopes to be avoided at such locations. Obtaining prior consent national buildings and research organization (NBRO) and recommendation if any to be incorporated to the designs. Hydrology along the road with special attention to flood prone locations to be deeply studied and cross drainage structures, road finished level and the surface treatment should be decided accordingly. Close coordination with Department of Irrigation and disaster management center (DMC) in order to obtain high flood levels, their return periods, respective retention periods and other recommendations in order to support the final design. Public consultation will also be used to verify the findings All water bodies crossing or located adjacent to the road shall not be disturbed other than at following locations; <ul style="list-style-type: none"> Canal from 63.44 – 63.63 (LHS) will be diverted to the edge of the ROW 	sections from 77 to 78km, 86km post to 87/1 culvert, 96 to 97km and 98.8 to 98.9km. Throughout the road section with special attention near Warakapol a town from 56.72km to 57.0km	Consent of NBRO obtained for the design and their recommendations incorporated (if any) Mitigation measures incorporated to the design at given locations with the agreement of Department of irrigation and DMC		
1.3	Alteration of surface water bodies Disturbance to canals, waterways and drains located within the ROW		Throughout the road section	Proposed site specific mitigation measures are incorporated to the design at given locations		

Construc ⁿ activity	Anticipated impacts	Mitigation Action	Approx. location	Monitoring/performance indicator	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
		<ul style="list-style-type: none"> It is proposed to introduce underground conduits for the canal from 65.63 – 65.67 (LHS) It is proposed to construct a retaining wall for canal protection from 67.733 – 67.780 (LHS) Underground drains are proposed to the drains from 69.642 – 70.010 (RHS), 75.620 – 75.703 (RHS) and 75.750 – 75.952 (LHS) <p>Consent from third party agencies such as Department Agrarian Services to be obtained if such agency is getting involved.</p>		Consent from third party agencies obtained		
1.4 Impacts to archaeologically protected monuments and sites	Damages to archaeologically protected sites and monuments.	Design shall be modified at locations where archaeologically important sites and particular side of the road will be kept as it is in order to avoid any encroachments to such sites. Further the proposed improvement/ activities at particular locations shall be presented to the department of archaeology for their concurrence prior to implementation.	At Mangalaga ma ancient rest house (85km, LHS), Kaduganna wa ancient rest house (97.15km, LHS) and at Captain Dowson's Tower; 100km (RHS)	No impact to the archaeological monuments and sites in the design. Concurrence of department of archaeology obtained at given locations		

	Construction activity	Anticipated impacts	Mitigation Action	Approx. location	Monitoring/performance indicator	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
1.5	Removal of public utilities	Inconvenience to the public due to uninformed interruption of utility services Unnecessary damages/accidental damages to utility lines when shifting and safety of the labourers and the public	Initial consultation and consent shall be taken from relevant service providers (CEB / NWSDB / SLT) well in advance. Advance notice to the affected public about the time and the duration of the utility disruption. Use of well trained and experienced machinery operators to reduce accidental damage to the public utilities. Restoration of the public utilities as soon as possible.	Throughout the road section	Particular service provider consulted. Advance notifications given to the users. Method statement for shifting of utilities presented to the PIC.		

2. Construction stage

Package Name:

Report No. and date:

Completed by:

	Construction activity	Anticipated impacts	Mitigation Action	Approx. location	Monitoring/performance indicator	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
2.1	Increase of local air pollution, noise and vibration	Degradation of air quality, excessive noise and vibration due to excavation for shoulders and other earthworks, pavement improvement operations, quarry operations, operation of asphalt plant, batching plant, operation of construction vehicles etc... Nuisance to public, schools, hospitals, places of worship and archaeologically protected sites due to high noise, vibration and degradation of air quality	<ul style="list-style-type: none"> Limiting operations to times when they have least impact in settlement areas, especially near schools and other sensitive locations such as hospitals and places of worship. Ensuring that construction plant and equipment is maintained to high operable standards, and that exhaust baffles are fitted and maintained in a high serviceable condition. Vibration should be controlled with the agreement of the Project Implementation Consultant (PIC) at locations where sensitive receptors are found. Regular sprinkling of water to dampen the construction surface will reduce the emission of dust. Implementation of all construction activities in compliance with acceptable levels of noise which are 	Throughout the road section with special attention to residential areas, schools, hospitals, places of worship and archaeologically protected sites	Sensitive receptors consulted in advance. Public/stakeholder complaints received on high noise, vibration and degradation of air quality. Method statement presented to PIC on vibration controlling. No. of water bowsers deployed. Necessary licenses obtained for prescribed		

Construction activity	Anticipated impacts	Mitigation Action	Approx. location	Monitoring/performance indicator	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
		<p>specified in National Environmental (Noise Control) Regulations 1996 stipulated by C amendments act 924/12 to mitigate the noise impact.</p> <ul style="list-style-type: none"> • A property condition survey will be conducted along the trace within a corridor as specified by PIC. The survey shall record all details related to cracks and construction failures existing in structures along this corridor. • Buildings cracked due to construction activities should be compensated or repaired to the satisfactory level (which is agreed by the PIC) of the affected person. Here, precondition survey conducted for surrounding buildings located within an agreed area and a corridor with the PIC will be helpful in differentiating cracks caused by construction activities. • All machinery, plants and vehicles used for the project shall be well maintained and regularly monitored in order to keep their emissions below the threshold levels (as specified in NEA) in order to minimize degradation of air quality • At archaeologically protected sites and monuments, the 		<p>activities.</p> <p>Property condition survey presented to PIC in advance.</p> <p>No. of complaints received and no. of complaints resolved on cracking of buildings.</p> <p>Availability of service records and certificate of emission test</p> <p>Recommendation obtained from Department of Archaeology.</p> <p>Measures taken to control</p>		

Construction activity	Anticipated impacts	Mitigation Action	Approx. location	Monitoring/performance indicator	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
		recommendations given by Department of Archaeology shall be adhered to avoid any damages to such sites. Precautionary measures such as using small compactors without vibration, avoiding use of heavy machinery, maintaining the air quality below the standards at such sites should be practiced in order to avoid impacts.		vibration at particular locations		
2.2. Disruption to traffic flow	Closure of lanes and diversion of traffic to facilitate road rehabilitation works will severely affect the traffic flow creating heavy congestions. This will delay the day to day activities of the commuters such as schooling, attending to office works at time etc.... Further, emergency vehicles such as ambulances which use the road very often will also be trapped in the traffic congestions	<p>Preparation of traffic management plan in collaboration with the Police and implementation during the construction phase with the help of Police. Traffic management plan shall be updated as necessary. Assistance of Police shall be obtained to ensure that traffic will comply with the measures of the traffic management plan</p> <ul style="list-style-type: none"> • Providing advance information to the public about the planned construction works, • Providing properly marked by-passes and one-way section including barriers, reflectors, and night illumination. • Use of well-trained flagmen to control traffic flows at constricted sites, including safe crossing for 	Throughout the road section	<p>Traffic management plan prepared and consent of Police obtained</p> <p>Advance information to the road users provided</p> <p>Presence of required sign boards at required locations</p> <p>Flagmen deployed at every required location.</p> <p>Presence of long queued of traffic jams on either</p>		

Construction activity	Anticipated impacts	Mitigation Action	Approx. location	Monitoring/performance indicator	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
		<p>pedestrians especially near town areas and schools.</p> <ul style="list-style-type: none"> Public shall be made aware about alternative roads that can be used to bypass construction areas using media and sign boards Flagmen shall be instructed to pay especial attention to emergency vehicles in order to allow them to cross the construction sites without delay 		sides of construction sites		
2.3. Deterioration of surface and ground water quality due to silt runoff, emissions and spoil from labour camps	<p>Siltation of surface and ground water bodies by soil washed off from construction sites, contamination of surface and ground water resources by chemicals, lubricants, fuels etc... used for the project and degradation of surface and ground water quality by emissions from labor camps.</p>	<ul style="list-style-type: none"> Reuse of soil removed for filling sites if any as much as possible and unsuitable materials can be used to refill borrow pits with the approval of the PIC. Where earthworks take place adjacent to surface water bodies and wells, drainage of storm water to be managed. This should be planned prior to the commencement of earthwork activity. All temporary unsuitable soil dumps and debris should be removed to approved disposal sites by the relevant local authority. Contractor should present a method statement stating how the environmental and social impacts that can be generated are managed at disposal sites in advance for approval. 	Throughout the road section	<p>Number of borrow sites refilled with unsuitable material</p> <p>Presence of drainage management measures as necessary</p> <p>Presence of unsuitable soil heaps along the road.</p> <p>No. of disposal sites operated (approved)</p> <p>Method statements for each disposal site approved by</p>		

Construction activity	Anticipated impacts	Mitigation Action	Approx. location	Monitoring/performance indicator	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
		<ul style="list-style-type: none"> • All disposal sites should be sited in locations which are not affected by floods or exposed to soil erosion. • If temporary soil dumps are left at the site for a long time, proper remedial measures to minimize soil erosion should be practiced (E.g.: Placing sandbags around the dump etc...) • Temporary soil dumps should not be placed near water bodies or flood prone areas • All fills, back fills and slopes should be compacted within the shortest possible time to reach the specified degree of compaction • Turfing of all embankment slopes with suitable turf material, Establishment of suitable mulch to cover the slopes of embankments • All materials (including toxic and hazardous material) required for construction shall be stored at secured and managed sites, sited away from water bodies, • Construction vehicles and equipment will be maintained in good operable condition, ensuring no undue leakage of oil or fuel, • Construction vehicles and equipment will be serviced only at properly managed and equipped 		PIC Presence of mitigation measures for temporary soil dumps Location of disposal sites near water bodies and flood prone areas Length of embankments turfed Storing of materials sealed containers, on impervious surfaces etc... Timely servicing of vehicles and equipment (service records) Vehicles and equipment are serviced at approved workshops (service records) Permanent water supply provided to labor		

Constructio n activity	Anticipated impacts	Mitigation Action	Approx. location	Monitoring/perfo rmance indicator	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
		workshops and waste oil will be collected and disposed at approved locations, <ul style="list-style-type: none"> Sanitation arrangements and an adequate water supply will be made at worksites and at any accommodation facilities provided for workers' accommodation, ensuring that no open dumping of solid wastes, no raw sewage is released into drains or water bodies. Adequate wastewater treatment method shall be provided to concrete batching plants and asphalt plants Site specific mitigation measures such as silt fences, barriers shall be applied at wells located nearby to the road to minimize sedimentation of ground water and it shall be ensured that the wells are not contaminated by chemicals, lubricants and fuels used for the project 		camps Adequate number of waste bins provided Properly sealed septic tanks provided and mechanism for removal of sludge available Presence of wastewater treatment plants for concrete batching plants and asphalt plants Availability of location specific measures if wells are located at project sites		
2.4. Impacts to archaeological sites	Excessive vibration levels and noise generated due to operation of machineries, compaction activities and other construction activities will damage archaeological monuments and sites.	<ul style="list-style-type: none"> All construction activities shall be implemented under the supervision of Department of archaeology (DoA) Vibration shall be controlled using low vibration rollers, small compactors and using other measures as recommended by DoA. Attention shall be made to the Kadugannawa tunnel as well in this 	Managalag ama ancient rest house (85km, LHS), Kaduganna wa ancient rest house (97.15km,	Presence of a supervisor of DoA as required Use of vibration controlling measures at required locations Debris and		

Constructio n activity	Anticipated impacts	Mitigation Action	Approx. location	Monitoring/perfo rmance indicator	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
	Further improper handling of machineries, dumping of debris and material can also damage such sites as they are located adjacent to the ROW. On the other hand, thieving of artifacts of the protected monuments and damaging will also possible by the workers if not properly monitored. Devotees to such sites will face inconveniences if access will be disturbed due to road improvement activities.	<p>regard as the tunnel can also be cracked due to excessive vibration.</p> <ul style="list-style-type: none"> • Dumping of debris, soil and any other material at archaeological will be avoided. • Machinery operators and other workers shall be made aware about the importance of the sites in order to minimize accidental damages • The road edge at these sites shall be properly barricaded • Labor force shall be monitored continuously to ensure safety of artifacts • Temporary safe access to the sites shall be maintained for the convenience of the devotees • Contractor shall immediately inform DoA through PIU if he chance find any artifact during the construction period and activities at the particular location shall be stopped immediately until DoA confirms to proceed with. 	LHS), Captain Dowson's Tower (100km, RHS) and Kaduganna wa Tunnel.	<p>material not dumped at archaeological sites</p> <p>Operators are aware about the location of archaeological sites</p> <p>Road edge is properly barricaded</p> <p>Presence of separated entrance for devotees</p> <p>Contractor is aware about the mechanism to be complied in chance found artifacts</p>		
2.5. Flood Impacts	Increase of flood situation as a result of Contractors activity	Contractor's activities shall not lead to flooding conditions as a result of blocked drainage paths and drains. The contractor shall take all measures necessary and as directed by the PIC to keep all drainage paths and drains clear of blockage at all times. If	Throughout the road section, at material stock yards and	<p>All drains and canals are free of blocks</p> <p>Disposal sites, yards and material stock piles not located</p>		

Constructio n activity	Anticipated impacts	Mitigation Action	Approx. location	Monitoring/perfo rmance indicator	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
		flooding or stagnation of water is caused by contractor's activities, contractors shall provide suitable means to (a) prevent loss of access to any land or property and (b) prevent damage to land and property. Further, any recommendations laid down by the hydrological studies, should be adopted at flood prone areas. In addition, contractor will pay special attention to avoid flood prone areas in selecting disposal sites, locations for material stock piles, yards and other locations where chemicals and other construction material are stored.	disposal sites	in flood prone areas		
2.6. Landslide impacts	Disturbances to road side slopes, disposal of material in to slopes, improper selection of disposal sites shall induce slope failures	Minimise disturbances to road side slopes even for temporary requirements, storing material and establishing disposal sites only at approved locations will minimize the above impact. Consent of NBRO shall be obtained for disposal sites if selected in sloppy areas and necessary mitigation measures shall be implemented	Throughout the road section with special attention to road sections from 77 to 78km, 86km post to 87/1 culvert, 96 to 97km and 98.8 to 98.9km.	No slope failures resulted due to construction activities Consent obtained from NBRO for disposal sites located within susceptible areas		
2.7.	Social and environment al impacts due to	Locating labour camps at least 100m away from major water resources. Application of site specific mitigation measures as agreed with the PIC if	At locations where labor camps to	Application of location specific measures to		

	Construction activity	Anticipated impacts	Mitigation Action	Approx. location	Monitoring/performance indicator	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
	establishment of labour camps	waste will increase risk of contaminating nearby surface water sources. Stagnant water will create mosquito breeding and vector for communicable diseases to the workers and host communities. Social conflicts due to use of illicit liquor and unpleasant behaviour which causes inconvenience to local community	camps are to be located nearby a water body or other environmentally/socially sensitive location. Providing proper sanitary facilities to the labour camps and any wastewater and other waste matter generated from the camps will be disposed in environmentally friendly manner as agreed with the PIC. Maximizing recruiting of local labour and conducting awareness programs targeting workers as well as local community in order to above impacts.	be established	minimize impacts to water bodies, soil and society Sanitary facilities provided are adequate Presence of wastewater treatment method No. of local labor recruited		
2.8.	Loss of trees and vegetation	Loss of soil moisture, reduction of air quality, reduction of aesthetic value and loss of shade and habitats due to clearing of vegetation and felling of trees.	Avoidance of unnecessary felling of trees and clearing of vegetation, limiting movement of vehicles and machineries to the ROW, trees to be felled to be clearly marked and presence of nests, habitats for species such as epiphytes to be identified and to be relocated to a similar habitat before felling of such trees. Conducting compensatory tree replanting program by the Contractor to compensate the loss of trees. Suitable native tree species should be selected for the replanting purpose at 1:3 ratio. Replanting of threatened/endemic species should be given priority. Contractor shall	At locations where trees to be felled and replanted	Felling only trees as identified in the tree list approved by PIC Rehabilitation of habitats and species, nests on trees to be felled Conducting replanting program with required number of plants Survival of all		

Construction activity	Anticipated impacts	Mitigation Action	Approx. location	Monitoring/performance indicator	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
		ensure survival of replanted trees at least for 2 years.		replanted trees with an acceptable growth at the end of the contract period		
2.9. Impacts due to extraction and transportation of construction materials	Noise, vibration, dust, induced slope failure, negative visual impacts, creation of mosquito breeding sites, and damage to private properties and minor roads. Heavy trucks transporting materials cause disturbances to local traffic, damage minor roads, and increase dust and noise nuisance.	Avoiding over exploitation, reuse of ABC, use of paver in laying ABC against using the grader (the conventional method). Adhering the conditions laid down in the approval of GSMB and CEA for quarry and borrow sites. Keeping provisions for repairing and restoration of all property damages including the roads used for the transportation of construction materials by the contractor in the contract document and use of covers over transported materials to guard against dust blow and water spraying to dampen the gravel surfaces.	At all material extraction sites and road used for material transportation	Extraction of material to the approved amount All conditions laid down in the approvals adhered Damages to roads and buildings restored Adequate number of water bowsers deployed/adequate passes done for dust controlling		
2.10. Impacts to surface water hydrology	Alteration/blocking of drainage paths and upstream flooding.	Drainage passages, drainage paths across the road shall not be blocked for construction activities. Temporary drainage passages/ diversions shall be provided (if drainage structures to be blocked for reconstruction of the bridge) to facilitate smooth drainage of water across the road until meeting lead away drains and such facilities shall be maintained until the permanent solution will be in place. Contractor should ensure that project	Throughout the road section	All drains, canals across the road are not blocked Temporary bypasses for water paths provided and water flow continues to downstream		

Construction activity	Anticipated impacts	Mitigation Action	Approx. location	Monitoring/performance indicator	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
		activities will not create any flooding condition during the construction phase due to his activities. Contractor shall avoid storage of construction materials and disposal of debris in and around drainage paths. Location specific mitigation measures as recommended by the PIC will be implemented in order to minimize soil erosion and disturbance to natural drainage pattern if material are to be stored near to such locations.				
2.11. Requirement of lands for the road upgrading	Public unrest due to improper use of lands for construction activities	Lands required for stock piling, use as yards etc... shall be obtained by the contractor with the concurrence of project staff and will sign a temporary occupation contract with the owner in which a site restoration plan is specified.	At all locations where lands are temporarily required for the project	Contract signed for every land used for the project Site restoration plan is integrated to each contracts		
2.12. Health and safety	Safety of the laborers, residents and the public during the day work and night time work	Contractor shall organize awareness program regarding personal safety of workers, residents and general public at regular time basis. Establishment of road engineering aspects to reduce the likelihood of accidents (warning signs, barricading, speed limits markings, breakers and signals to particular locations) and night visibility of them shall be ensured. Placement of well-trained flag men will be necessary to	Throughout the road section and at all other sites used for the project	Number of awareness programs conducted per week is adequate Necessary sign boards introduced for required locations and maintained properly All project staff wearing PPE as		

Construction activity	Anticipated impacts	Mitigation Action	Approx. location	Monitoring/performance indicator	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
		control traffic in collaboration with the Police. Providing Personnel Protective Equipment (PPE) for laborers such as protective footwear, helmets, goggles, eye-shields and clothes to the workers depending on their duty (Mixing asphalt, blasting, handling equipment etc...) Arranging a first aid unit and transport facilities to take injured people to the nearest hospital. Contractor shall place firefighting equipment where necessary Use experience and well trained workers for the handling of machinery, equipment and material processing plants Construction work shall be carried out at night only with adequate lighting, night visible road signs, PPE etc....		and when required Presence of adequate facilities for first aid and fire fighting Adequate lighting facilities' are available for night works		
2.13. Loss of access to houses, commercial activities and public utilities	Loss of access to houses, commercial activities, office premises and other lands located along the road due to excavations and other road improvement activities	Convenient and safety access to all existing residential and commercial lands located along the road section shall be ensured. Access to houses, commercial structures and public utilities should be clearly marked within the road reservation and safe temporary access will be maintained until the permanent solution will be in place. If the access is significantly lost for houses and shops, compensation	Throughout the road section	Access is not disturbed to all road side houses and shops Compensation paid for loss of access as instructed		

	Construction activity	Anticipated impacts	Mitigation Action	Approx. location	Monitoring/performance indicator	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
			shall be paid for temporary evacuation of households and for loss of livelihood of commercial structures with the approval of the PIC and PIU.				
2.14.	Handling environmental issues/grievances during construction		<p>The Contractor shall appoint a qualified Environmental Manager for implementation of the EMP and also for community liaison to handle public complaints and grievances. The Contractor shall develop the grievance redress mechanism (GRM). The person who is responsible for receiving complaints shall be easily accessible by the public. Complaints that could not be resolved shall be referred to GRM.</p>	At every project site	<p>Environmental Officer/s recruited as necessary</p> <p>Availability of GRM (method of receiving complaints, submitting to the responsible party, resolving etc...)</p>		

3. Operational phase

Package Name:

Report No. and date:

Completed by:

	Construction activity	Anticipated impacts	Mitigation Action	Approx. location	Monitoring/performance indicator	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
3.1.	Impacts on water resources	Blocking of canals, drains across the road due to siltation, stagnation of debris. Degradation of water quality due to improper handling of chemicals used for maintenance works such as paints, pesticides, asphalt etc....	Regular maintenance of all canals and drains located within the ROW and proper handling of chemicals used during the maintenance period under strict supervision	Throughout the road section	Smooth drainage is ensured		
3.2.	Disposal of waste material generated during maintenance operations	Siltation of water bodies, agricultural lands from soil removed as result of maintenance activities.	Proper disposal of all unsuitable material resulted from periodic and routine maintenance activities in the approved disposal sites.	Throughout the road section	Unsuitable matter is disposed to approved sites		
3.3.	Extraction of material for repairing and maintenance works	Impacts due to extraction of material for road maintenance activities.	Mitigation measures as given in 2.9 above shall be implemented.	At all material extraction sites and road used for material	Indicators as given in 2.9 shall be applied		

Appendix 7.2

	Construction activity	Anticipated impacts	Mitigation Action	Approx. location	Monitoring/performance indicator	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
				transportation			
3.4.	Pedestrian and commuter safety	Higher vehicular speed on the rehabilitated road will increase the incidences of accidents.	Provision of centreline road marking where possible, edge delineation etc... Provision of clearly marked signing at townships, sensitive areas such as schools, temples. Enforcement of speed limits and other traffic rules, especially within the town limits. Placing of sign boards for animal crossings etc. Safety of road users could be ensured during repairing of carriageway and hydraulic structures by placing standard sign boards, barricading of the repairing site etc...	Throughout the road section	All necessary road markings done All necessary permanent sign boards are established		

APPENDIX 7.3:
Environmental monitoring plan (EMoP)

Environmental monitoring plan (EMoP) for the Rehabilitation and Improvement of Nittambuwa (39.71) to Kadugannawa (100km) of Colombo – Kandy (A001) road

Environmental component	Project Stage	Parameters to be Monitored	Location ⁱ	Frequency	Standards	Rate (Rs.)	Amount (Rs.)	Implementation and Supervision
Air Quality	Before construction stage	SPM, PM ₁₀ , NO ₂ , CO, SO ₂ , CO ₂	<ol style="list-style-type: none"> 1. Pasyala Maha Vidyalaya (School) at 43.7km 2. Warakapola Base Hospital (57km) 3. Dadley Senanayake Vidyalaya, Tholangamuwa (63km) 4. St. Joshep Balika Vidyalaya (School) at 77.1km 5. Ancient rest house (Mangalagama Ambalama) at 85km 6. Mederigama Maha Vidyalaya at 92.7km 7. Udama Kadawara Vidyalaya at 94.2km 8. End point (100km) 9. Selected quarry sites and crusher plants 10. Selected burrow sites 11. Selected asphalt plants 	Twice covering dry and wet weather conditions	NAAQS of Sri Lanka	Per sample 40,000	880,000	Contractor through approved monitoring agency under supervision of PIC, PIU and ESDD

Appendix 7.3

Environmental component	Project Stage	Parameters to be Monitored	Location ¹	Frequency	Standards	Rate (Rs.)	Amount (Rs.)	Implementation and Supervision
	Construction stage	SPM, PM ₁₀ , NO ₂ , CO, SO ₂ , CO ₂	1. Pasyala Maha Vidyalaya (School) at 43.7km 2. Warakapola Base Hospital (57km) 3. Dadley Senanayake Vidyalaya, Tholangamuwa (63km) 4. St. Joshep Balika Vidyalaya (School) at 77,1km 5. Ancient rest house (Mangalagama Ambalama) at 85km 6. Mederigama Maha Vidyalaya at 92.7km 7. Udamakadawara Vidyalaya at 94.2km 8. End point (100km) 9. Selected quarry sites and crusher plants 10. Selected burrow sites 11. Selected asphalt plants	Construction - Three times/Year for 2 Years (however, additional measurements may need to be taken in case there are complaints of deterioration of air quality)	As specified under NEA	Per sample 40,000	2,640,000	Contractor through approved monitoring agency under supervision of PIC, PIU and ESDD
	Maintenance stage	SPM, PM ₁₀ , NO ₂ , CO, SO ₂ , CO ₂	1. Pasyala Maha Vidyalaya (School) at 43.7km 2. Warakapola Base Hospital (57km) 3. Dadley Senanayake Vidyalaya, Tholangamuwa (63km) 4. St. Joshep Balika Vidyalaya (School) at 77,1km 5. Ancient rest house (Mangalagama Ambalama) at 85km 6. Mederigama Maha Vidyalaya at 92.7km 7. Udamakadawara Vidyalaya at 94.2km 8. End point (100km) 9. Selected quarry sites and crusher plants 10. Selected burrow sites 11. Selected asphalt plants	Once a year for 5 years	As specified under NEA	Per sample 40,000	2,200,000	Contractor through approved monitoring agency under supervision of PIC, PIU and ESDD

Appendix 7.3

Environmental component	Project Stage	Parameters to be Monitored	Location ¹	Frequency	Standards	Rate (Rs.)	Amount (Rs.)	Implementation and Supervision
Water Quality	Before construction stage	Temperature, pH, Electrical Conductivity, DO, BOD ₅ , TSS, Turbidity, Salinity, Total Coliform count	1. Tributary of Attanagalu Oya (41.2km) 2. Diyaela oya (46/2) 3. Kuda Oya (60/1) 4. Galigamuwa Stream (72/6) 5. Waragoda stream (85/1) 6. Maha Oya (91/1) 7. Higula stream (95/4) 8. Galawidaputhena Stream (99/8)	Twice covering dry and wet weather conditions	As specified under NEA	Per sample 10,000	160,000	Contractor through approved monitoring agency under supervision of PIC, PIU and ESDD
	Construction stage	Temperature, pH, Electrical Conductivity, DO, BOD ₅ , TSS, Turbidity, Salinity, Total Coliform count	1. Tributary of Attanagalu Oya (41.2km) 2. Diyaela oya (46/2) 3. Kuda Oya (60/1) 4. Galigamuwa Stream (72/6) 5. Waragoda stream (85/1) 6. Maha Oya (91/1) 7. Higula stream (95/4) 8. Galawidaputhena Stream (99/8)	Construction – three times/Year for 2 Years	As specified under NEA	Per sample 10,000	480,000	Contractor through approved monitoring agency under supervision of PIC, PIU and ESDD
	Maintenance stage	Temperature, pH, Electrical Conductivity, DO, BOD ₅ , TSS, Turbidity, Salinity, Total Coliform count	1. Tributary of Attanagalu Oya (41.2km) 2. Diyaela oya (46/2) 3. Kuda Oya (60/1) 4. Galigamuwa Stream (72/6) 5. Waragoda stream (85/1) 6. Maha Oya (91/1) 7. Higula stream (95/4) 8. Galawidaputhena Stream (99/8)	Once a year for 5 years	As specified under NEA	Per sample 10,000	400,000	Contractor through approved monitoring agency under supervision of PIC, PIU and ESDD

Appendix 7.3

Environmental component	Project Stage	Parameters to be Monitored	Location ¹	Frequency	Standards	Rate (Rs.)	Amount (Rs.)	Implementation and Supervision
Noise and Vibration Noise and vibration	Before construction stage	Leq10 and Leq 50 values	<ol style="list-style-type: none"> 1. Pasyala Maha Vidyalaya (School) at 43.7km 2. Warakapola Base Hospital (57km) 3. Dadley Senanayake Vidyalaya, Tholangamuwa (63km) 4. St. Joshep Balika Vidyalaya (School) at 77,1km 5. Ancient rest house (Mangalagama Ambalama) at 85km 6. Mederigama Maha Vidyalaya at 92.7km 7. Udamakadawara Vidyalaya at 94.2km 8. Kadugannawa ancient rest house (97.15) 9. End point (100km) 10. Selected quarry sites and crusher plants 11. Selected burrow sites 12. Selected asphalt plants 	Twice covering dry and wet weather conditions	As specified under NEA	Per sample 10,000	240,000	Contractor through approved monitoring agency under supervision of PIC, PIU and ESDD
	Construction	Leq10 and Leq 50 values	<ol style="list-style-type: none"> 1. Pasyala Maha Vidyalaya (School) at 43.7km 2. Warakapola Base Hospital (57km) 3. Dadley Senanayake Vidyalaya, Tholangamuwa (63km) 4. St. Joshep Balika Vidyalaya (School) at 77,1km 5. Ancient rest house (Mangalagama Ambalama) at 85km 6. Mederigama Maha Vidyalaya at 92.7km 7. Udamakadawara Vidyalaya at 94.2km 8. Kadugannawa ancient rest house (97.15) 9. End point (100km) 10. Selected quarry sites and crusher plants 11. Selected burrow sites 12. Selected asphalt plants 	Construction – three times/Year for 2 Years	As specified under NEA	Per sample 10,000	720,000	Contractor through approved monitoring agency under supervision of PIC, PIU and ESDD

Appendix 7.3

Environmental component	Project Stage	Parameters to be Monitored	Location ¹	Frequency	Standards	Rate (Rs.)	Amount (Rs.)	Implementation and Supervision
Flora	Maintenance stage	Leq10 and Leq 50 values	1. Pasyala Maha Vidyalaya (School) at 43.7km 2. Warakapola Base Hospital (57km) 3. Dadley Senanayake Vidyalaya, Tholangamuwa (63km) 4. St. Joshep Balika Vidyalaya (School) at 77.1km 5. Ancient rest house (Mangalagama Ambalama) at 85km 6. Mederigama Maha Vidyalaya at 92.7km 7. Udama Kadawara Vidyalaya at 94.2km 8. Kadugannawa ancient rest house (97.15) 9. End point (100km) 10. Selected quarry sites and crusher plants 11. Selected burrow sites 12. Selected asphalt plants	Once a year for 5 years	As specified under NEA	Per sample 10,000	600,000	Contractor through approved monitoring agency under supervision of PIC, PIU and ESDD
	Before construction stage	No. of trees to be removed, existence of endangered, threatened species	Land available within the proposed ROW	Once	-	100,000	100,000	Contractor through qualified consultant/s under supervision of PIC, PIU and ESDD
	Construction stage	No. of trees replanted, Impacts to endangered, threatened species	Land available within the proposed ROW	2 times/ year for 2years	As specified in NEA and F&FPO	100,000	400,000	Contractor through qualified consultant/s under supervision of PIC, PIU and ESDD

Appendix 7.3

Environmental component	Project Stage	Parameters to be Monitored	Location ¹	Frequency	Standards	Rate (Rs.)	Amount (Rs.)	Implementation and Supervision
	Maintenance stage	Survival of trees and number of trees planted to replace dead plants, Impacts to endangered, threatened species	Land available within the proposed ROW	Once a year for 5 years	As specified in NEA and F&FPO, percentage of survival of replanted trees	100,000	500,000	Contractor through qualified consultant/s under supervision of PIC, PIU and ESDD
Fauna (including aquatic fauna)	Before construction stage	Diversity of species and presence of animal corridors/path way, locations/number of animal crossing structures to be placed during construction stage	Land available within the proposed ROW	Once	As specified in NEA and F&FPO	100,000	100,000	Contractor through qualified consultant/s under supervision of PIC, PIU and ESDD

Appendix 7.3

Environmental component	Project Stage	Parameters to be Monitored	Location ¹	Frequency	Standards	Rate (Rs.)	Amount (Rs.)	Implementation and Supervision
	Construction stage	Adequacy of animal crossing structures, impacts to fauna species	Land available within the proposed ROW	2 times/ year for 2years	As specified in NEA and F&FPO	100,000	400,000	Contractor through qualified consultant/s under supervision of PIC, PIU and ESDD
	Maintenance stage	No. of animal death due to the road accidents, impacts to fauna species	Land available within the proposed ROW	Once a year for 5 years	As specified in NEA and F&FPO	100,000	500,000	Contractor through qualified consultant/s under supervision of PIC, PIU and ESDD
	Before construction stage	<ul style="list-style-type: none"> Submission of the list of disposal sites selected for the project and their locations to the PIC 		Once	-	-	-	Contractor under supervision of PIC, PIU and ESDD
Waste disposal								

Appendix 7.3

Environmental component	Project Stage	Parameters to be Monitored	Location ¹	Frequency	Standards	Rate (Rs.)	Amount (Rs.)	Implementation and Supervision
	Construction phase and maintenance phase	<ul style="list-style-type: none"> Submission of the list of disposal sites used for the project and their locations to the engineer Submission of approvals obtained for such sites to the engineer Submission of progress of disposal of all debris and spoil from the site to approved sites by the site engineer to the engineer Submission of number of disposal sites restored after completion to the engineer 		Once a month during construction and once in six months during maintenance period	-	-	-	Contractor under supervision of PIC, PIU and ESDD
Dust Generation	Construction phase	Submission of; <ul style="list-style-type: none"> Construction activities and their locations along the road Number of bowsters allocated for water sprinkling including for roads used to transport material Frequency and locations of water sprinkling Public complaints regarding dust issues to the PIC Presence of; <ul style="list-style-type: none"> Appropriate dust control measures (approved by PIC) at material storage yards Using covers on trucks transporting material 		Once a month	-	-	-	Contractor under supervision of PIC, PIU and ESDD
Occupational safety	Construction phase and maintenance phase	Submission of; <ul style="list-style-type: none"> Number of labor occupied in the project List of PPE supplied to laborers (in appropriate sizes) Record from Field Supervisors on use of PPE Frequency of conducting tool box meetings and attendance of laborers to the engineer Method of supplying sanitary facilities, drinking water and waste disposal system 		Once a month during construction and once in six months during maintenance period	Road safety manual of RDA	-	-	Contractor under supervision of PIC, PIU and ESDD

Appendix 7.3

Environmental component	Project Stage	Parameters to be Monitored	Location ¹	Frequency	Standards	Rate (Rs.)	Amount (Rs.)	Implementation and Supervision
Public safety	Construction phase and maintenance phase	Submission of; <ul style="list-style-type: none"> Construction activities and their locations along the road List of safety precautions such as placing sign boards, barricading, direction boards, use of flag men and blinkers applied for the project based on the construction activities and their locations to the engineer 		Once a month during construction and once in six months during maintenance period	Road safety manual of RDA	-	-	Contractor under supervision of PIC, PIU and ESDD
Soil erosion	Construction phase and maintenance phase	<ul style="list-style-type: none"> Incorporation of site specific mitigatory measures to control soil erosion in the SSEMAP which is approved by PIC Implantation of proposed mitigation measure at the given locations in compliance of SSEMAP 		Once a month during construction and once in six months during maintenance period	-	-	-	Contractor under supervision of PIC, PIU and ESDD
Slope stability	Construction phase and maintenance phase	<ul style="list-style-type: none"> Incorporation of site specific mitigatory measures to ensure slope stability in the SSEMAP which is approved by PIC Implantation of proposed mitigation measure at the given locations in compliance of SSEMAP 		Once a month during construction and once in six months during maintenance period	-	-	-	Contractor under supervision of PIC, PIU and ESDD
Total Cost for monitoring of before construction and construction stage							10,320,000 (US\$ 59,181.00)	

Notes:

BOD = Biological Oxygen Demand, CO=Carbon monoxide, CO₂= Carbon Dioxide, PIC = Construction Supervision Consultant, DO = Dissolved Oxygen, DOF = Forest Department, ESD Division = Environmental and Social Development Division, NAAQS= National Air Quality Standards, NO₂= Nitrogen Dioxide, PM₁₀= Reparable particulate matter<10micrometers diameter, RDA=Road Development Authority, SO₂=Sulphur dioxide, SPM= Suspended particulate matter, TSS = Total Suspended Solids, NEA – National Environmental Act, F&FPO – Flora and Fauna Protection Ordinance

Appendix 7.3

1. Contractor should secure the cost of monitoring for “before construction”, “construction” and “maintenance” stages of above monitoring plan.
2. Locations of monitoring shall be updated and number of locations will be altered based on field conditions, contract packages and weather conditions with the consent of the PIC
3. 1US\$ = Rs. 189.33 (April, 2020)

APPENDIX 8.1:
Public consultation and their views

A sample of one on one interviews carried out with stakeholder and public during the preparation social and environmental assessments for Nittabuwa Junction to Kadugannawa section of Colombo Kandy (A001) Road

Name of the Respondent	Sex	Designation/ Address	Date	Views
Mr. Lakmendra Dayamantha Kumara Thenuwara	Male	Divisional Secretary, Divisional Secretariat Division, Warakapola	2017-01-06	There are many accidents taking place near Dummaladeniya due to slippery condition of the road. The road gets flooded close to the post office of Warakapolla. The crossing point at Ambepussa junction need to be changed and taken towards Kegalle. Bus stand or the crossing point at Udukumbura junction also need to be changed. There, the bus stand is located at the double lane. There are no speed boards. RDA should take responsibility in maintaining the ROW. It is better if RDA can build a guard rail near Tholangamuwa Central. RDA need to remove harmful trees in the ROW as well. Further, when the road is developed and asphalted, the road gets raised. Due to this, the road is higher than the shops located along the road side and during rainy days, the water flows in to shops. After the development, Telecom and Water Board may dig the road to lay their wires and pipes. It is better to coordinate with these agencies to do the development together.
Ms. Nadeesha Amarasinghe	Female	Assistant Divisional Secretary, Divisional Secretariat Division, Meerigama	2017-01-06	It is better if a colour light system can be established for Pasyala junction. There is lot of traffic in the junction due to long distance buses and the three-wheel park in the junction also need to be changed. There's weekly fair at the junction that need to be removed too. Usawiyawatta road can be improved and used as a bypass when there's traffic at Pasyala junction. The ROW is encroached in many places. There are no flooded sections along the road.
Ms. Nalika Piyasena	Female	Divisional Secretary, Divisional Secretariat Division, Kegalle	2017-02-01	The Kegalle town has already been developed. Therefore, a redevelopment is not necessary. However, the traffic condition in the town should be minimised.
Mr. M.P.I. Senarathna	Female	Assistant Director (Planning), Divisional Secretariat Division, Galigamuwa	2017-02-01	Many accidents take place from DS office junction up to Ballapana junction. It's very difficult to cross the road from the crossing near the DS office. It is better to establish a crossing right across DS office.

Appendix 8.1

Name of the Respondent	Sex	Designation/ Address	Date	Views
Ms. Yamuna Kumari	Female	Shop owner, 170/1 Negambo Rd , Nittambuwa	2016-12-02	There are accidents taking place near shed at Nittambuwa. I do this business of selling lotteries for last 2 and half years. I earn Rs. 900 – 1000 per day.
Ms. A.D. Shamali	Female	Cashew shop owner, Kandy road.	2016-12-02	The road development is good. We are doing this Cashew business for last 10 years. We can have a good income on April and August months. Daily we sell cashew worth of Rs. 2000/=. However, the business will be reduced after constructing the Central Expressway as tourists use that route to Kandy or Kurunegala.
Mr. Chaminda Ranasingha	Male	Shop owner 141 , Fancy,House, Warakapola	2016-12-02	During rainy days, the storm water stagnates near the hospital and water drains after about 1 hour. There's traffic in the evening for around 1 and half hours. There's no space to park vehicles in the town, because of that the traffic aggravates.
Mr. H. Thilakarathna	Male	Shop owner, 335, Main Street , Warakapola	2016-12-02	During rainy days, the road gets under water for about 2 feet. This will disturb the transportation for about 2 hours. However, the duration the water goes under water depend on the intensity of rain. The drain system along the road is blocked and not enough to drain the storm water. There are many developments carried out in the town such as buildings. The ground was developed by Urban Development Authority by filling low lands. These are the reasons for flooding. From 7 a.m. to 11 a.m. in morning and 2 to 3 hours in evening are the peak time for traffic. I do business in the town since 1978. It is good to develop the bypass road.
Mr. P.W.G. Kulathunga	Male	Shop owner, No : 25 Warakapana, Uduwella (Pahala Kadugannawa)	2016-12-02	I do this business here for last nine years. The shop is open from Sunday to Friday and on Saturday its closed. On October and November the business is not portable as there's lack of fruits. There are landslides taking place in this area. On heavy rainy days rock fall and small land slides are visible.
Ms. Sadamali ,	Female	Shop owner, No: 76/A Bataleeya , Pasyala	2016-12-02	The road development is good. Accidents take place near Bataleeya bus halt as vehicles go very fast in this area. As there is no proper drain system, the water flows on the road. The drain along the road need to be constructed. We earn around Rs. 1000 – 2000 per day from selling cashew.
Ms. Sumana Rajapaksha	Female	Shop owner, Kandy road, Radawadunna	2016-12-02	There are accidents taking place in this area due to speeding of vehicles. There is not much income as we bring cane from other areas and sell here. Some days. There's no income at all.

Appendix 8.1

Name of the Respondent	Sex	Designation/ Address	Date	Views
Ms. Wasana	Female	Shop owner, Kandy Road Warakapola .	2016-12-02	On heavy rainy days, the road goes under water. The main reason for this is drains are blocked. Further, the traffic also take place due to flooding. When there are some functions in the community ground there's lot of traffic in the town.
Ms. Chandra Pathirana	Female	Shop owner, Warakapola	2016-12-02	On heavy rainy days, the road goes under water and there's traffic as it is difficult for vehicles to move.
Ms. Irangani	Female	Shop owner, Pahala, Kadugannawa, Higula	2016-12-02	Accidents take place in Pahala Kadugannawa as vehicles do not have enough space. We pay a rental of Rs. 150/= for the Pradeshiya sabaha for this business. We don't do the business everyday. The business is good on Kandy possession days and season for climbing Adam's peak.

ⁱ Locations and number of locations can be revised as required with the instructions of PIC, PIU and ESDD