Initial Environmental Examination

September 2014

SRI: Integrated Road Investment Program – Project 2

Central Province

Prepared by Environmental and Social Development Division, Road Development Authority, Ministry of Highways, Ports and Shipping for the Asian Development Bank

CURRENCY EQUIVALENTS

(as of 12 September 2014)

Currency unit	–	Sri Lanka rupee (SLRe/SLRs)
SLRe1.00	=	$ 0.00767
$1.00	=	SLR 130.300

ABBREVIATIONS

ABC	-	Aggregate Base Coarse
AC	-	Asphalt Concrete
ADB	-	Asian Development Bank
CBO	-	Community Based Organizations
CEA	-	Central Environmental Authority
DoF	-	Department of Forest
DSDs	-	Divisional Secretary Divisions
DOFC	-	Department of Forest Conservation
DWLC	-	Department of Wild Life Conservation
EC	-	Environmental Checklist
EIA	-	Environmental Impact Assessment
EMoP	-	Environmental Monitoring Plan
EMP	-	Environmental Management Plan
EPL	-	Environmental Protection License
ESDD	-	Environmental and Social Development Division
FBO	-	Farmer Based Organizations
GoSL	-	Government of Sri Lanka
GRC	-	Grievance Redress Committee
GRM	-	Grievance Redress Mechanism
GSMB	-	Geological Survey and Mines Bureau
IEE	-	Initial Environmental Examination
LAA	-	Land Acquisition Act
MOHPS	-	Ministry of Highways, Ports and Shipping
NAAQS	-	National Ambient Air Quality Standards
NBRO	-	National Building Research Organization
NEA	-	National Environmental Act
NWS&DB	-	National Water Supply and Drainage Board
OPRC	-	Output and Performance - based Road Contract
PIC	-	Project Implementation Consultant
PIU	-	Project Implementation Unit
PRDA	-	Provincial Road Development Authority
PS	-	Pradeshiya Sabha
RDA	-	Road Development Authority
ROW	-	Right of Way
TOR	-	Terms of Reference

NOTE

In this report, "$" refers to US dollars unless otherwise stated.

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Table of Contents

List of tables

List of Figures

List of Appendixes

EXECUTIVE SUMMARY

1. The Integrated Investment Program (iROAD) is proposed by the Road Development Authority (RDA) under Ministry of Highways, Ports and Shipping (MOHPS) to improve transport connectivity between rural communities and socioeconomic centers. iROAD intends to connect 1,000 Grama Niladari Divisions1 (GNDs) throughout the country as rural hubs and link them to trunk road network to all weather standards, and operating a sustainable trunk road network of at least fair condition. The iROAD will be financed by the Asian Development Bank (ADB) under a Multi tranche Financing Facility (MFF) to have four tranches implemented over ten years. Tranche 2 covers: Sabaragamuwa, Kaluthara District of Western Province, North Western, Central, and North Central Provinces.

2. Tranche II roads of iROAD are located in Ratnapura and Kegalle districts of Sabargamuwa Province, Kandy, Matale and NuwaraEliya districts of Central Province, Anuradhapura and Polonnaruwa districts of North Central Province, Puttalam and Kurunegala districts of North West Province and Kaluthara district of Western Province. In Central Province, iRoad program will develop a total of 144 rural roads with a total length of 594.46 km. Out of this, 194.35 km, 220.66 km and 179.45 km rural roads are located within Matale, Kandy, Nuwera Eliya districts, respectively. These roads have been selected for financing based on consultations with MOHPS, local authorities, and parliamentarians and a screening criteria on existing road conditions and development needs.

3. The proposed road upgrading will include: improvement and maintenance to all weather standards with single lanes facility, surfacing the existing pavement with asphalt concrete (AC) if the present surface is weak, repairing or reconstructing damaged culverts, introducing earth drains for all road sections and built up drains where necessary, and removing any irregularities on the existing vertical profile.

4. The Program was classified as environmental category B based on the ADB Rapid Environmental Assessment checklist for roads and highways. This Initial Environmental Examination (IEE) report was prepared consistent with the ADB Safeguard Policy Statement (SPS) 2009 and the Environmental Safeguards Compliance Manual of RDA. Key national environmental laws and regulations that guided the environmental assessment includes: National Environment Act (NEA) No. 47; Coast Conservation Act No 57 of 1981, National environmental protection and quality regulations; National Environmental (Protection and Quality) Regulation No. 1 of 1990; National Environmental (Ambient Air Quality) Regulations, 1994; National Environmental (Noise Control) Regulations No.1 of 1996; Fauna and Flora Protection Act (FFPO) No.2 of 1937; Forest Act No. 34 of 1951; Felling of Trees Control Act No. 9 of 1951; Soil Conservation Act, No. 25 of 1951; Explosives Act No. 36 of 1976; Buddhist Temporalities Ordinance No. 19 of 1931; and Antiquities Ordinance No. 9 of 1940, among others.

5. As provided in the EARF, no road under Tranche 2 is located inside strict national reserve. There will be no road widening inside legally protected or critical habitat. All project roads adjacent to protected or eco-sensitive areas are limited to existing RoW. Most environmental impacts attributed to the project and related activities are short-term, site-specific, and easily mitigated. Close coordination with the Department of Wildlife Conservation, Forest Department, and ADB were made in the screening of the roads to ensure the project will cause not significant adverse environmental impacts that will trigger an ADB environment “Category A” tranche or Prescribed Project classification consistent with domestic environmental laws and regulations

6. **Transect Walk.** In developing rural roads, the community participation and consultation has been identified as important. For this project, the participation of communities started at the very initial stage of the project through the transect walk. Transect walks are organized in close coordination with the Grama Niladari concerned at village level and Divisional Secretary at divisional level. In doing this, the project team and key informants conduct a walk along the road, to listen, to identify issues, and conditions and to ask questions to identify possible solutions. The field assessment was followed by preparation of Environmental Checklist (EC) for each candidate rural road and the IEE was prepared for the particular province while summarizing findings of each EC

7. **Public consultation and disclosure**. Consultations with stakeholders during the environmental examination involved local communities and government agencies like the Department of Wildlife Conservation (DWLC). During project implementation, signboards with project information detailing the nature of construction works, road length, construction period, name of contractor, contract sum and contact information for reporting complaints or grievances will be posted in three languages (Sinhala, Tamil and English) for the rural roads. Annual environmental monitoring reports will be prepared per province and submitted to ADB for disclosure on the ADB website.

A. Physical Environment

8. Based on major climatic zones of the country, Matale District fall in to upcountry - wet, mid country - intermediate and mid country - wet zones. Whereas roads in Kandy District are located within up country - wet, mid country - wet, and mid country - intermediate zones. On the other hand, road sections in Nuwera Eliya District fall in to upcountry - wet, mid country - wet, mid country - intermediate and up country - dry zones. The climatic environment of the project area is further categorized into agro-ecological zones[1](AEZ) which are categorized based on climate, soil, natural vegetation and land use pattern of an area. Majority of the roads in Matale are located in AEZ WU1, IL2 and IL3, in Kandy are WU1, WU2, WM1, WM2, IU2 and IU3 and in NuwaraEliya are WU1, WU2 and WM1.

9. Rainfall pattern of Central Province is influenced by southwest monsoon from May to September when peak rainy season occurs. However, Dambulla, Galewella and Naula areas (dry intermediate zone) of the Matale district receive rain from the North -East monsoon from November to February which is comparatively lower than the rains received from southwest monsoon. During the rest of the year, there is also considerable precipitation due to convective rains. The western slopes of the province are very wet, some places having almost 7000 mm of rain per year.The Temperatures range from 24°C at Kandy to about 16°C in NuwaraEliya, which is located 1,889 m above sea level.

10. **Hydrology.** Seven roads in Matale district namely road IDs,1,11,15,16,18,20,44 are crossing streams. One of the major rivers called “White River” is running close to two of the candidate roads namely road ID 19 and 21. Road ID 48 is running close to one water tank ‘Walaswewa’.The major catchments located in Kandy District are of Mahaweli Ganga, HilOya, KalotuwawaOya, WewathennaOya and KalugalOya. Thirteen roads in Kandy district namely road IDs 4A, 39, 8,12,16,17,19,20,25,26,31,32 and 33 are either crossing or running along

[1] The AEZ nomenclature is alphanumeric where the first upper case letter denotes the climatic condition (W-wet, I-intermediate, D-dry), the second upper case letter indicates elevation (L-low, M-medium, U-upper), the first number describes the moisture regime, and the last lower case letter indicates the rainfall distribution and other environmental factors where the decree of wetness degrades from letters *a* to *f* .

rivers/streams. Most of the major perennial rivers of Sri Lanka including the Mahaweli Ganga River and Kelani River originate from the central hills located in the NuwaraEliya District. Eight roads in NuwaraEliya district cross or run close to rivers/streams.

11. **Air Quality and Noise.**Since the selected road sections are mostly located within rural areas, major sources of air pollution are not present. The general air quality in the project area is excellent except along unpaved roads and major intersections where temporary deterioration occurs.According to Schedules I and II of National environmental (Noise Control) regulations No.1 1996 (924/12), the study area belongs to “Low noise area”

12. **Natural Disasters.** Based on the landslide hazardous zoning maps of National Building Research Organization (NBRO), some of the areas in Matale, Kandy and Nuwera Eliya districts have been identified as landslide prone areas and declared as unsuitable for settlement or development activities. During field reconnaissance carried out by ESDD, RDA to each road, major landslide prone areas were not observed.

B. Ecological Environment

13. No forest reserves, national parks, sanctuaries are located along or near any of the project roads in Central province

C. Demographic Characteristics

14. **Population and population density.** The Department of Census and Statistics estimated mid-year population of Matale District in 2012 at 4, 82,229 persons with 2,32,855 males and 2,49,374females. During the same period, estimated mid-year population of Kandy and NuwaraEliya districts were 13, 69,899 and 7, 06,588 respectively. In Matale district, population density is 247 persons per square kilometer while in Kandy it is 715 and NuwaraEliya414.

15. **Ethnicity**. Majority of population in Matale (80.7%) and Kandy (74.3%) districts are Sinhalese while in NuwaraEliya district it is Indian Tamils (53.2%). Muslims are the second majority population in Matale and Kandy districts, while Singhalese take the second position in NuwaraEliya district.

16. **Distribution**. Majority of the population lived in rural areas in Matale (83.4%) and Kandy (82%) districts while NuwaraEliya has the highest of 53.2% living in Estates. Among the 3 project districts Matale district has the highest proportion of urban population (14.1%) followed by Kandy district (12.1%) and NuwaraEliya district (5.9%).

17. **Economic Activities**. The 2012 labor force survey revealed agriculture is the prominent economic activity employing majority of workforce in NuwaraEliya (67.4%) and Matale (43%) districts, while majority of the workforce is employed in services sector (50.5%) in Kandy district.

18. **Agriculture**. In In Matale and Kandy districts, the agricultural workforce is employed in relatively smaller holdings of tea, rubber and pepper plantations and in paddy fields as well. In NuweraEliya district, tea is the main agricultural crop. According to the Department of Census and Statistics, the district has 32,568 hectares of cultivable tea lands and in 2010; it has produced 4,189,059 metric tons of tea. Paddy is grown as the main commercial crop, while citronella (*Cymbopogoncomosus*), cinnamon (*Cinnamomumzeylanicum*), pepper (*Piper nigrum*) and coffee (*Coffeaarabics*) are grown as export crops. In addition, fruit crops such as mango

(*Mangiferaindica*),papaya (*Carica papaya*), citrus (*Citrus aurantifolia*), banana (*Musa paradisiacal*) and vegetables like tomato (*Lycopersiconesculentum*),potato (*Solanumtuberosum*), Cabbage (*Brassica Oleracea*), leeks (*Allium ampeloprasum*),Carrot (*Dacuscarota*), lettuce (*Lactuca sativa*) and bean, beets are grown as highland crops in NuweraEliya District.

19. **Livestock**. NuweraEliya district is reputed for dairy cows and yogurt made of diary milk. According to census and statistics, in 2010, there were 20,460 livestock farms in Nuwera Eliya district, consisting of 18349 dairy cows' farms and 1,863 poultry farms.

20. **Industries**. As per the data from Department of Census and Statistics, 2012; among the 3 project districts, Kandy district has the highest proportion of workers engaged in industries (27%) followed by Matale (17.9%) and NuwaraEliya (10.8%).Dairy industry, which produces 70% of the total milk production of the country, is the major industrial activity in NuwaraEliya district. Furthermore, productions of animal feed, textile weaving, sewing, and fruit packing have been identified as potential industries in the district. Majority of the operating industries in the other two districts are related to agriculture processing and garment manufacturing. There is a well-established tourism industry in the Central Province. Both the hill capital Kandy and the city of NuwaraEliya are located within the Central Province as well as Sri Pada. Central Province attracts many tourists, with hill station towns such as Kandy, Gampola, Hatton, Haputale, Bandarawela, Diyatalawa and Nuwara Eliya. Temple of the tooth or Dalada Maligawa at Kandy, Central province is the holiest temple of Buddhist world of Theravada cannon

D. Socioeconomic status

21. **Literacy rate**. As of 2012 Census and Statistics, Kandy district shows the highest literacy rate (92.4%) compared to Matale (88.9%) &NuwaraEliya (84.5%) districts. Female literacy rate is lower than male literacy rate in all the three districts; lowest being 79.7% in Nuwara Eliyata.

22. **Household income.** As per the 'Household Income and Expenditure Survey - 2009/10' of the Department of Census and Statistics, the monthly mean and median per capita income of Kandy district is higher (Rs. 8285) than other two districts. There is no significant difference of average monthly income levels between Matale and NuweraEliya districts.

23. **Poverty.** The poverty headcount index of Central province and two of the three districts (Kandy and Matale) are higher than that of the country poverty headcount index while NuwaraEliya district is slightly lower than that of the country. This higher poverty situation is due to predominance of agriculture based economy and lower base of industrial sector. Over the years from 1990 to 2009/10 a significant decrease of poverty headcount index is seen in all the project districts and at overall province level.

E. Existing Infrastructure facilities

24. **Energy.** Electricity is the main source of energy used for household lighting in the project districts with 92.5%, 87.4% and 83.4% reliance of the households in Kandy, NuwaraEliya and Matale districts respectively. Kerosene is the second major source accounting for 15.4%, 12.2% and 7.1% of the households in Matale, NuwaraEliya and Kandy districts respectively.

25. **Drinking water**. Majority of households in Kandy district (49.3%) use pipe water supply, while both in Matale and Nuwara Eliya districts about 29% households use the same. Protected wells form the major source of drinking water for 41.3% households in Matale district. About 61% of households depend on other sources like rural water supply projects, tube wells, bottled water, tank, river, etc. for drinking water in Nuwara Eliya district.

26. **Sanitation**. About 89.1%, 86.3%, and 81% households in Kandy, Matale and NuweraEliya districts respectively use private toilets, while 8.9%, 12.5% and 14.2% households respectively in these districts share toilets with other families.Overall, 4.4% households do not use any toilet facility in NuwaraEliya district.

27. **Education**. There are 639 schools in Kandy district followed by 519 in Nuwara Eliya district and 308 in Matale district majority of which are co-education and only 15 exclusive boys and 30 excusive girls schools in the project districts.

F. Anticipated Environmental Impacts and Proposed Mitigation Measures

28. **Pre-construction stage**. Environmental impacts related to project siting in flood and erosion prone areas, and shifting of utilities were addressed. Hydrologic studies allowed the proper design of bridges and culverts to have adequate capacities based on 100- and 50-year flood return periods. Collected data and structural designs were validated by the Irrigation Department in collecting information and checking the adequacy of design, conducting construction operations during dry weather flow are possible mitigation measures. Road sections located in rolling and hilly terrain were identified and screened for susceptibility to erosion and counter measures were designed in consultation with the National Building Research Organization (NBRO). Finally, the need to safely shift electric power and telephone lines, and water supply mains along the ROW were defined for each road project. Detailed inventory, co-ordination with the concerned authorities, and the need for public notification forms part of the detailed EMPs.

29. **Construction phase**. Significant environmental impacts anticipated during construction phase are: (i) increase of local air pollution, noise and vibration from earthworks, pavement improvement operations, quarry operations, operation of hot mix plants, and operation of construction vehicles; (ii) deterioration of surface water quality due to silt runoff, emissions and spoil from labour camps; (iii) landslides; (iv) social and health impacts from labour camps; (v) disruption to access/traffic; (vi) loss of avenue trees; (vii) alteration of hydrology due to siltation of streams and (viii) occupational health and community safety. Principal mitigation measures imbedded in the EMP includes: (i) utilizing least noisy equipment and timing of equipment operation to reduce noise impacts; (ii) sprinkling of water on material storage and handling areas and unpaved road travel to control dust; (iii) installation of silt and oil traps, and avoiding storage of materials near water bodies to avoid contamination of receiving waters; (iv) bioengineering and slope stabilization to control erosion; (v) locate camps at least 100m away from water resources, provide septic tanks to treat wastewater, and link with local health programs on prevention and control of communicable diseases; (vi) maximize the hiring of local labor to avoid the establishment of big labor camps; (vii) traffic management to avoid congestion and maintain access of local residents; (viii) implement 1:3 compensatory plantation to off-set impacts from tree cutting; (ix) no camp, materials storage, hot mix plant will be allowed near the national park; (x) provision of personal protective equipment to all workers.

30. **Operation Phase**. Environmental impacts during operation and less significant involving the potential deterioration of water bodies from oil-contaminated runoff, disposal of debris and

waste collected along the roadside including drainage canals, road crashes, and deterioration of air quality. Mitigation measures include regular maintenance of road drain and proper disposal of collected debris, provision of road safety appurtenances in the road design, and avenue plantation to control noise.

31. **Greenhouse gas emissions and addressing risk of climate change.** Using the Transport Emissions Evaluation Model for Projects (TEEMP) total annual emission was estimated at 7239.1 tons which is less than the 100,000 tons per year threshold set by ADB. The projected variations in temperature and precipitation, the project roads indicated vulnerability to these climate risks: landslide triggered by increased precipitation, fire, flood, drought, cyclone wind, cyclone surge, and coastal erosion. Key engineering measures taken to address these risks in the design are: i) increase in embankment height, ii) construction of new side and lead away drains, iii) construction of new culverts or widening of existing ones and iv) construction of new bridges which amounts to Rs 162 million (about $ 1.2 million) of approximately 1.05 % of the total civil works costs.

32. **EMP implementation.** The Ministry of Highways, Ports and Shipping (MOHPS) is the Executing Agency (EA) and RDA is the Implementing Agency and within RDA there will be a Project Implementation Unit (PIU). The PIU will be responsible for implementing the project and managing detailed design and supervision of the construction works and ensuring that all environmental safeguard requirements in accordance with this EARF are met. The PIU will be headed by a full time Project Director (PD) and supported by a team of engineers from RDA. The PIU will have a safeguards team with sufficient social and environment safeguards officers to cover the quantum and geographic distribution of works in all provinces under the investment program. The Project Implementation Consultants (PIC) will support the PIU for supervision of the design and construction works by the civil works contractor. The PIC team will include a team of environment safeguards consultants for conduction of regular monitoring of safeguards implementation on site.

33. **Environmental Management and Monitoring Plans.** A standard EMP was prepared as part of the IEE report, however, contract package specific EMP's will be prepared by the contractor by consonance to the standard EMP, road specific information in the environmental checklists and the detailed design (level 1 design). All costs for implementing the mitigation measures will be included in the Bill of Quantities (BOQ) by the contractor as implementation of the EMP will be the responsibility of the contractor. Contractors who implement rural road components will have a construction period of approximately two years and routine maintenance for three years. 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 checklists (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. Every road must have at least one EMC completed during pre-construction, one to three during construction depending on the length of the road and one per year during operation and maintenance. Based on these records and site visits monitoring reports will be prepared during the construction and operation stage on an annual basis per province and submitted to ADB for disclosure on the ADB website. An Environmental Monitoring Plan (EMoP) provides the guidance to contractor and PIU on monitoring environmental quality and implementation of the EMP. Furthermore the contractor will also be responsible for updating EMP and EMOP if there are any significant changes in the project site conditions or engineering design.

34. **Grievance Redress Mechanism.** Starts at the grass roots level where complaints are received and addressed by the contractor, PIC or PIU representative on site. Grievances that are not immediately resolved are elevated to the GramaNiladhari (GN) levels and Divisional Secretariat (DS) level for final resolution.

G. Conclusion and Recommendations

35. The proposed iROAD subproject has been categorized as Category 'B' based on environmental screening and assessment of likely impacts while the initial environmental examination ascertains that it is unlikely to cause any significant environmental impacts. Few impacts were identified attributable to the proposed subproject, all of which are localized and temporary in nature and easy to mitigate.

36. The screening criteria ensure no road will cause significant adverse impacts. iROAD ensures no project road will trigger classification as an environment 'Category A' tranche in accordance with the ADB's SPS (2009); no project roads falling in part or whole inside a protected area will be selected under the investment program; (iii) project roads falling adjacent to protected areas or eco-sensitive areas will be included only if there is no widening of the road "Right of Way" (ROW) or acquiring of land from the protected area or eco-sensitive area.

37. Candidate roads are dispersed over the entire province and few road sections are located near or within geologically and hydrological sensitive entities therefore mitigation measures will be incorporated to designs in order to bare any road related impacts at such locations. No roads are located in or adjacent to environmental sensitive areas declared by the DOFC and DWLC.

38. The initial environmental examination has discussed various aspects of the proposed rehabilitation and upgrading of 157 road sections comprising 660km length. Contractors are liable to keep the roads in operational status for approximately 3 years after the 2 years of construction period.

39. The IEE recommends to update EMP and EMC with package specific information and locations while EMOP to be road specific before commencement of construction activities. In addition EMC and EMOP should be effectively implemented in order to monitor application of the EMP.

40. The road network improvement in Central province will boost economic activities in the province including potential growth in industries, tourism, gem industry and agriculture in lagging rural areas which will be a positive step to the socio economic development of the country.

I. INTRODUCTION

A. Background

1. In Sri Lanka, about 85% of the population is living in the rural and peri-urban sector and out of that 84.7% are identified as poor. Poverty is concentrated in areas where connectivity to towns and markets, access to electricity and average educational attainment are relatively low, and agricultural labor is an important source of employment. Location attributes are highly correlated with each other, which indicate the many-sided nature of challenges faced by poor areas. Remote areas with lack of all-weather access to the socioeconomic centers have rendered a large portion of the rural population with poor agricultural productivity, limited employment opportunities and slow economic growth.

2. In order to address this problem and improve transport connectivity between rural communities and socioeconomic centers, the Road Development Authority (RDA) under Ministry of Highways, Ports and Shipping (MOHPS) has proposed an Integrated Road Investment Program (iRoad). The Government would like to select about 1000 Grama Niladari Divisions[1] (GNDs) throughout the country as rural hubs according to the population, development potential and distance to trunk road network. As a first step for developing the rural hubs the government will enhance the connectivity by (i) improving rural access roads linking the rural hubs to trunk road network to all weather standards, and (ii) operating a sustainable trunk road network of at least fair condition.

3. This program will be financed by the Asian Development Bank (ADB) under a Multi tranche Financing Facility (MFF). The investment program is planned to have four tranches that will be implemented over a period of ten years.The first focus was on the Tranche 1, the Southern Province. Tranche 2 focuses on other five provinces as mentioned below for which feasibility studies are currently carried out.

- Sabaragamuwa Province
- Central Province
- North Central Province
- North Western Province
- Western Province (Kaluthara District)

4. This document presents the Initial Environmental Examination (IEE) prepared by Environmental and Social Development Division (ESDD) of RDA for Central Province of Tranche 2 which covers 594.46kmof rural roads to be upgraded and maintained to all weather standards.This report complies with the Environmental Assessment and Review Framework (EARF) iROAD MFF, the ADB Safeguard Policy Statement (2009), and the Environmental Compliance Manual of RDA.

5. As provided in the EARF, no road under Tranche 2 is located inside strict national reserve. There will be no road widening inside legally protected or critical habitat. All project roads adjacent to protected or eco-sensitive areas are limited to existing RoW. Most environmental impacts attributed to the project and related activities are short-term, site-specific, and easily mitigated. Close coordination with the Department of Wildlife Conservation, Forest Department, and ADB were made in the screening of the roads to ensure the project will cause

[1] A GramaNiladhari Division (GND) is the smallest administrative unit in Sri Lanka.

no significant adverse environmental impacts that will trigger an ADB environment “Category A” tranche or Prescribed Project classification consistent with domestic environmental laws and regulations.

6. Accordingly, iRoad program will develop 194.35 km, 220.66km and 179.45 km rural roads located within Matale, KandyNuweraEliyadistricts respectively of Central Province. These rural roads are currently governed by Provincial Road Development Authority (PRDA) and PradeshiyaSabhas (PS, the local Authority) of Central Province. The total length disaggregated to three districts; Matale, Kandy and Nuwera Eliya of the province are presented in table 1.1. The road list is attached in appendix 1.1.

Table I.1: District-wise length of roads in Central Province

District	Number of Roads	Length of Roads (km)
Matale	51	194.35
Kandy	50	220.66
NuweraEliya	43	179.45
Total	**144**	**594.46**

Source: iRoad Program, RDA

7. As mentioned in table 2.1, there will be three contract packages per district. The contractor will be responsible for construction of the road over 2 years and performance based maintenance for another 3 years.

B. Objectives of the proposed project

8. The broadd objective of this project is to improve the connectivity of road network in rural areas of Sri Lanka, so that rural population can be conveniently involved in the nationwide economic and social development.

9. Specific objectives of this project are;

- To improve the road condition between rural communities and socioeconomic centers of the Central Province,
- To upgrade and maintain 660km of rural access roads in Central connecting rural communities to all-weather standard,
- To improve connectivity between production centers and market places and improve linkage with the other districts and provinces,
- To facilitate the increase of mobility by improving road network which link up with other provinces,
- To open up rural areas for development,
- To facilitate to generate efficiency gains by lowering the unit cost of individual producers through transport efficiency which will lead to increase their margins and profits thus making them generating another round of investments,
- To reduce rural poverty through improved access to (a) markets and economic centers (b) social infrastructure and (c) new employment opportunities

10. In order to achieve these objectives, the road network in Matale, Kandy and Nuwara Eliya districts will be upgraded with the following guidelines:

- Upgrade and maintain the existing roads to all weather standards

- Surfacing the existing pavement with Asphalt Concrete (AC) if the present surface is weak
- Repair or reconstruct damaged culverts
- Introduce earth drains for all road sections and built up drains where necessary
- Remove any irregularities that are on the existing vertical profile,
- There by improve the vehicle operating speeds while ensuring safety of road users.

C. Objectives of the Initial Environmental Examination

11. As mentioned, this IEE covers upgrading and maintaining 594.46km of rural roads to all weather standards.

12. The purpose of this Initial Environmental Examination (IEE) is to gather and provide:

(i) Information about the following existing environmental settings of the project influential area;
- Physical Environment (including climate, air quality, topography, soil, surface and ground water hydrology, natural hazards etc…),
- Biological Environment (protected forest and wildlife areas, fauna and flora and presence of endemic, endangered species),
- Social Environment (socio economic profile of the communities living in the project influence area, infrastructure facilities and land use etc…)

(ii) Identify beneficial and potential adverse impacts on the existing environment during preconstruction, construction and operational phases of the project

(iii) Propose effective mitigation measures to avoid/ minimize the project induced adverse impacts while enhancing the beneficial impacts, and;

(iv) Formulate an effective Environmental Management Plan (EMP) which is common for all roads and will be specified to each contract package during bidding process, so as to sensitize and guide respective divisions of RDA in environmental and social safeguards compliance and sensitize and guide respective contractors in environmental and social safeguards compliance during construction stage.

D. Approach, Methodology and Personnel Involved

13. This IEE was carried out in compliance with the RDA manuals on environmental and social safeguards compliance in road development projects which is in line with national environmental and social safeguards acts/ policies and ADB safeguards policy statement, 2009. The field assessments were carried out during the months of May to July, 2014 by Environmental and Social Development Division (ESDD) of RDA.

14. The field assessment was followed by preparation of Environmental Checklist (EC) for each candidate rural road and the IEE was prepared for the particular province while summarizing findings of each EC.

15. As mentioned, EC was prepared for each road to be upgraded under the iRoad Program. The EC summarizes the following details;
- Road details
- Location information

- Climatic conditions of the project area
- Generic description of the surrounding environment
- Specific description of the road environment considering location of environmentally protected areas, occurrence of road related natural hazards, locations of road side trees, road side utilities and public properties etc…
- Public Consultation
- List of photographs taken along the road

16. Sample ECs are provided appended to this IEE report for reference. All ECs prepared for the Central Province are available at the ESDD-RDA, and PIU upon request.

17. In order to collect the number of road side trees and road side utilities for preparation of ECs, the existing ROW was considered during field assessments as construction activities will be limited to the existing ROW. However for road sections where the existing ROW could not be demarcated, a 2m corridor from the edge of the existing carriageway to the both sides of the road was considered to count number of road side trees and utilities. A wider corridor of 100m to the either sides of the road was studied to explore any environmentally sensitive entity such as forest reserves and sanctuaries. Further, public properties such as schools, temples, and public wells located within 50m on the either sides of the road from the centreline of the road were taken in to account during field assessments.

18. ESDD of RDA prepared the IEE during the period from June to August, 2014. In preparation of the assessment, findings of each EC within the province was analyzed and summarized. In addition to field data, 1:50,000 topographic map sheets of Survey Department of Sri Lanka were used to identify the land use pattern up to 200m or impact influential area on both sides of the existing center line of the existing road. Further satellite imagery available on-line from Google maps were used as a secondary information base. In addition information available in Management Information System (MIS) of ESDD was also utilized for the assessment.

19. The field assessment and preparation of EC were carried out by the environmental and social safeguards staff of ESDD while a trained multidisciplinary team including Hydrologist, Biologist/Ecologist, Acting Environment and Social Safeguards officer, Acting Social Impact Awareness officer and Acting Chemist of ESDD, RDA was engaged in preparation of the IEE. 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, Senior Project Director – iRoad, and Project Director – iRoad of RDA is highly appreciated.

II. DESCRIPTION OF THE PROJECT

A. Location of the project

20. As mentioned, all road sections selected for this project connect rural areas with the trunk road network in Matale, Kandy and NuwaraEliyaDistricts in Central Province. Accordingly a road length of 194.35 km in Matale, 220.66km in Kandy and 179.45km in NuwaraEliya District will be upgraded and maintained to all weather standards under this project. The administrative divisions including the district and Divisional Secretariat (DS) Divisions falling within particular sections of road are presented in appendix1.1. The respective GNDs crossed by each road are submitted in appendix 2.3.

21. Location maps attached in Appendix 2.1 presents the general location of rural roads in Matale, Kandy and Nuwara Eliya Districts respectively.

B. Need of the Project

22. Sri Lanka is currently driven to be a strategically important economic center by means of naval, aviation, commercial, energy and knowledge hub serving as a link between east and west using its geographical location effectively. Accordingly, an accelerated development program is undertaken by the Government of Sri Lanka (GOSL) by means of socio-economic and social infrastructure development. Central Province is one of the key provinces which is targeted to implement major development projects in order to facilitate economic and social infrastructure development of the country. Kandy major city development project under world bank assistance, Pallekella cricket stadium development project, establishment of major economic centre in the Dambulla of the Matale district and NuweraEliya tourism based development project are few of such major development projects offered to the Central Province. However, to increase the effectiveness of the development, it should be assured that the benefits should penetrate to the rural regions of the province as well as development potentials available in rural areas should be exposed. On the other hand 50.1%, 45.1% and 53.2% of the labor force in Matale, Kandy and Nuwara Eliya districts respectively are engaged in agriculture based employments and majority of them are restricted to rural areas (Department of Census and Statistics, 2012). In order to obtain a reasonable price for their products it is necessary to transport them to better markets which are mostly found in urban centers. In this regard, connectivity of these areas with the trunk road network is significant however it is found that the rural road network is still in dilapidated condition and not accessible in all weather conditions. Thus this situation fails to facilitate an efficient connectivity. Therefore, after identifying the existing situation, the government intends to select rural communities according to the population, development potentials, and the distance to trunk roads to extend the development benefits to rural areas. To address the connectivity issues for these communities.

23. The proposed iRoad Program of RDA will improve the transport connectivity between rural communities and socio-economic centers. And under the second tranche of the project, 594.46 km of the Central Province will be upgraded and maintained to all-weather standard which will serve rural communities. Improved connectivity will ultimately benefit the targeted communities by increased flow of economic opportunities and accessibility to developed markets and therefore it is expected to increase income generation possibilities of rural communities. This will ultimately enhance the socio-economic development of such communities which will be a positive drive to development of the country.

C. Analysis of Alternatives

1. No Project Alternative

24. The GOSL has already initiated mega development projects in the Central region including the Kandy strategic city development project under the world bank assistance, Pallekella cricket stadium development project, establishment of major economic centre in the Dambulla (Matale district) and NuwaraEliya tourism based development project and the industrial park in Pallekele. In order to sustain this socio-economic development of the Central region, it is necessary that socio-economic benefits of these development projects should penetrate to rural communities as well. And efficient road network connecting developed centers and under developed areas is essential to facilitate the penetration of socio-economic opportunities. The Poverty Head Count Index of Matale, Kandy and NuwaraEliya Districts as of 2013 are 7.8%, 6.2% and 6.6%, respectively.

25. In terms of environmental quality, not improving the rural roads will contribute to the further deterioration of the road surface, increase flooding due to lack of cross- and side-drains, and increase erosion due to lack of slope protection. Poor road surface will result to increase in fuel consumption and combustion gas emissions, and increase in noise and dust levels which will result to poorer air quality particularly immediately along the project road. The lack of cross and side drains will increase the risk of damage to life and property on flood prone areas. On areas that are already prone to erosion, the inadequate infrastructure to stabilize the soil will result to loss in agricultural soil and increase sedimentation of receiving bodies of water. Limiting the road improving to the available RoW also minimized the need for vegetation clearing and tree cutting.

2. With Project Alternative

26. With the i Road program, 594.46km length of rural roads in Central Province will be upgraded and maintained to all-weather standard improving accessibility of rural communities to socio-economic centers will be increased and enhance income generation avenues. Improvements in road roughness, drainage, and strengthening against erosion will have their corresponding environmental benefits. However, the projected increase in traffic may increase the total emissions, traffic noise, and road crash.

D. Magnitude of Operations

1. Project Activities

27. The iRoad Program will upgrade and maintain selected road sections in Central Province to all-weather standards. The selected rural roads are currently governed by *PradeshiyaSabhas* (The local Authorities) of Matale, Kandy and NuwaraEliya Districts and Provincial Road Development Authority (PRDA) of Central Provincial Council. Under the project, rural roads of 194.35 km in Matale, 220.66km in Kandy and 179.45km in Nuwara Eliya District have been selected to be upgraded.

28. Selected roads are narrow with varying widths and bad surface condition. Details of these roads i.e. length, widths, and surface type are provided on Appendix 2.3.

29. As mentioned, it is proposed to upgrade and maintain selected roads in Matale, Kandy and Nuwara Eliya Districts to all weather standards under iRoad Program. For selected roads,

different typical cross sections have been developed to suit existing road condition; gravel, concrete, macadam and block pavements and special attention has been provided to avoid land acquisition in all road sections. The proposed cross sections will be modified based on the available Right of Way (ROW) and for narrow road sections minimum 3m carriageway will be kept. The improved pavement will be of Asphalt Concrete (AC) which is comparatively a long lasting treatment. The proposed improvement works for selected roads are as follows;

- The widening of roads will be carried out only if there is sufficient ROW.
- If the existing surface is asphalt; it will be overlaid with the AC.
- Base correction will be carried out if base failures are found along the road.
- If the existing surface is macadam based it will be overlaid by Aggregate Base Coarse (ABC) and asphalt as per the pavement design given by the Engineer.
- If the existing road surface is concrete paved and in good condition; it should be rectified and if it is damaged; it should be completely demolished and laid with ABC and asphalt.
- If the existing road surface is gravel; it will be reconstructed with ABC and asphalt.
- If the existing surface is block paved; it will be rectified to correct minor damages. Otherwise it will be completely demolished and will be laid with AC.
- The buildup drain has been provided for town areas or other requested areas. Otherwise the earth drain will be provided.
- The earth work will be carried out in required areas.
- Finally road marking will be carried out.

(Source: PIU, i Road Program, RDA)

30. Selected roads are narrow with varying widths and bad surface condition. Details of these roads i.e. length, widths, and surface type are provided on Appendix 2.3.

31. Proposed typical designs details including cross sections are attached in Appendix 2.2.

32. Improvements on cross- and side-drainage of the particular roads will be considered in locations where structures have been badly damaged or rectification of the drainage is significantly required. Several road sections as identified in Chapter 4 of this report are located in flood prone areas. The proposed road design in these sections was modified to withstand frequent inundations as shown in Appendix 2.2).

33. The proposed improvement will be limited along the existing ROW, no building or temporary structure will be fully or partially affected by the Program.

2. Requirement of Construction Material

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

35. Based on engineering estimates prepared for each road for Central Province, approximate quantities of material required for each package are given in Table II.1.

Table II.1: Material Requirement for each package of Central Province

District	Package	Aggregate (m^3)	Sand (m^3)	Sub base (m^3)	Asphalt (t)
Matale	Package 1	100	10	10	10
	Package 2	100	10	10	10
	Package 3	100	10	10	10
Kandy	Package 1	100	10	10	10
	Package 2	100	10	10	10
	Package 3	100	10	10	10
NuwaraEliya	Package 1	100	10	10	10
	Package 2	100	10	10	10
	Package 3	100	10	10	10

Source: iRoad Program, RDA

III. POLICY AND LEGAL FRAMEWORK

A. Legal Framework

1. National Environmental Act and other applicable regulation

36. 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 Renewable Energy (ME&RE). 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, wild life, 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.

37. 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"[2]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.

38. 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.

39. If a project road falls adjacent to the boundary or inside a protected area, necessary clearance will need to be sought from the Department of Wildlife Conservation (DWC) even if there will be no widening of the road ROW. Depending on the sensitivity of the protected area, the DWC may require conduction of an IEE or EIA study for the respective road. No works are allowed in project roads falling inside Strict Nature Reserves.

40. 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 III.1 below.

[2] Under 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.

Table III.1: Applicable National Laws and Regulations for the Investment Program

Legislation	Relevance and main content	Authorizing Institution
Coast Conservation Act No 57 of 1981	This act regulates any un authorized construction within the coastal zone, by making it mandatory to obtain permits for any Development activity falling within the coastal zone.	Coast Conservation and Coastal Resources Management Department
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 (FFPO) No.2 of 1937 amended in 1993 and 2009	The act specifies that any development activity taking place within one mile from the boundary of a National Reserve declared under the Ordinance requires an	Department of Wildlife Conservation

Legislation	Relevance and main content	Authorizing Institution
	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 Defense
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	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. Urban Development Projects (Special Provisions) Act No 2 of 1980 is an act to provide for the declaration of lands urgently required for carrying out urban development projects and to provide for matters connected there with relevant project activities.	Urban Development Authority (UDA) under the ministry of Urban Development and 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 Dept. (NPPD) under the Ministry of Urban Development and Defense
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

41. Under the NEA (No) 47 and some of the laws and regulations listed in Table III.1 above; there are specific requirements for clearances, permits and licenses required for road projects as listed in Table III.2 below.

Table III.2: Applicable Approvals required for the Investment Program

Project stage	Approvals	Project Related Activity	Relevant Agency
Pre-Construction	Environment clearance	Implementation of the project	Central Environment Authority

Project stage	Approvals	Project Related Activity	Relevant Agency
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	Clearance from Coast Conservation and coastal resources management department	Development activities in coastal areas	Coast Conservation and coastal resources management department
	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
	Disturbance to Paddy Lands	Ground preparation for ROW and side drains	Commissioner of Agrarian Services
Construction stage	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, Pradeshiyasabha, other local authorities for drainage, sewer systems etc.

2. Environmental Protection License (EPL)

42. 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 "A","B" and "C" depending on their pollution potential.

43. 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 Officesof the CEA.

44. 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.

45. 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. International Agreements and Conventions

46. 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

B. Policy Framework

1. ADB Safeguards Policy Statement, June 2009

47. 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.

48. 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.

49. 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.

50. 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.

51. **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.

52. 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 trans-boundary and global impacts, including climate change. Use strategic environmental assessment where appropriate.

53. 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.

54. 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 environmental management plan (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.

55. 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.

56. 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.

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

58. 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.

59. 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.

60. 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.

61. 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.

IV. DESCRIPTION OF EXISTING ENVIRONMENT

62. Selected roads to be upgraded under iRoad Program are scattered in Matale, Kandy and NuwaraEliya Districts of Central Province. This chapter describes the general environment in the districts and along the corridor of impact particularly along which environmental or social sensitive entities are observed. In addition, ECs prepared for each road summarizes the environmental profile with specific chainage-wise information and supported with photographs. Sample ECs are provided in Appendix 2.4.

A. Physical Environment

1. Climate, land use, terrain and soil

63. Based on major climatic zones of the country, Matale District fall in to upcountry - wet, mid country - intermediate and mid country - wet zones. Whereas roads in Kandy District are located within up country - wet, mid country - wet, and mid country - intermediate zones. On the other hand, road sections in NuweraEliya District fall in to upcountry - wet, mid country - wet, mid country - intermediate and up country - dry zones.

64. The climatic environment of the project area is further categorized into agro – ecological zones which are categorized based on climate, 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 IV.1 below.

Table IV.1: Climatic characteristics of candidate roads

District	Agro-ecological Zone	Roads (ID) falls in to agro-ecological zone	75% expectancy value of rainfall (mm)	Description (Land use, Terrain, Soil groups)
Matale	WU1	10,11, 12, 13,14, 15,16,17,18	>2500	Tea, Rubber, Mixed Home Garden, Paddy , Export Agricultural Crops (Pepper), Steep slope,, Undulating and Hilly with sharp bends RYP,RYP Soils With mountain Regosols & LGH Soils
	.	6,7,8,9	>2000	Rubber , Tea , Coconut ,Mixed Home Garden , Paddy , , Export Agricultural crops (pepper), vegetables, Steep sloppy, undulating ,hilly with bends RYP , LHG & IBL
	IU2	1,2,3,4,5	>1500	Coconut, Mixed Home Garden , Paddy, mango, vegetables Undulating, sloppy and bends, RYP & LHG Soils
	IL2	30,31,32,33,	>1300	Tea, Natural Forest

District	Agro-ecological Zone	Roads (ID) falls in to agro-ecological zone	75% expectancy value of rainfall (mm)	Description (Land use, Terrain, Soil groups)
		34,35,36,37,38, 39,40,41,42,43, 44,45,46,47,48, 49,50		patches, Steeply Dissected, Hilly And Rolling RYP Soils With Semi Prominent A1 Horizon
	IL3	22,23,24,25,26, 27,28,29,53,54	>800	Coconut, Mixed Home Garden , Paddy ,mango, Undulating, flat terrain RYP & LHG Soils
Kandy	WU1	9,10,11,16,17,18, 19,20,23,24, 25,26,	>2500	Tea, , Mixed Home Garden, Paddy , Export Agricultural Crops (cardamom) Hilly and mountainous areas, Rolling , Undulating RYP,RYP Soils with LGH Soils
	WU2	1,2,3,4,4A,5,6,7,8	>2000	Tea , Coconut ,Mixed Home Garden , vegetables, Rolling , mountainous, Undulating And hilly RYP , LHG & Mountainous Regosols
	WMI	12,13,14,15,41,48 ,49,49A	>1800	Tea, l Forest patches Mountainous, Steeply Dissected, Hilly And Rolling RYP Soils , RBE,LHG
	WM2	21,22,27,28,29, 30,50,51,52,	>1500	Tea, Natural Forest, Mixed Home Gardens Steeply Dissected, Hilly & Rolling RYP Soils With Low HumicGley soils
	IU2	31,32,33,34,35,37 ,38,39,40,42,	>1200	Coconut, Mixed Home Gardens, Export Agricultural Crops, Paddy, Export Agri crops (Cardamom) Rolling, Undulating & hilly RYP Soils l, RYP, LHG, RBL &Regosol Soils
	IU3	36,43,44,45,46, 47	>1100	Coconut, Paddy, Mixed Home Gardens, Export Agricultural Crops Rolling, Undulating & hilly RYP, RBL, RBE, LHG & Regosol Soils

District	Agro-ecological Zone	Roads (ID) falls in to agro-ecological zone	75% expectancy value of rainfall (mm)	Description (Land use, Terrain, Soil groups)
NuweraEliya	WU1	1,2,3,4,5,6,7,8,9,10,11,12,13,14, 15,16,17,18	>3000	Tea , Mixed Home Garden , Export Agricultural Crops (vegetables) Rolling , Undulating And hilly RYP , LHG & Bog And Half – Bog Soils
	WU2	19,20,21,22,23,24 ,25,26,27,28,29,30,31,32,	>2700	Tea, Natural Forest, Mixed Home Gardens Steeply Dissected, Hilly & Rolling RYP Soils With Prominent A1 Horizon &RBL Soils
	WMI	33,34,35,36,37,38 ,39,40	>2500	Export Agricultural Crops, Mixed Home Gardens, Tea, Vegetables Steep, Hilly And Rolling RBL & RYP Soils
	IU1	41,42,43,44,45	>2000	Coconut, Paddy, Mixed Home Gardens, Export Agricultural Crops Rolling, Undulating & Flat RYP, RBL, RBE, LHG &Regosol Soils

LHG - Low HumicGley, RYP - Red Yellow Pod zolic, RBL - Reddish Brown Latosolic, RBE - Reddish Brown Earth, MR-Mountain Regosols, IBL-immature brown Loam

65. Rainfall pattern of Central Province is influenced by southwest monsoonfrom May to September when peak rainy season occurs. However, Dambulla, Galewella and Naula areas (dry intermediate zone) of the Matale district receive rain from the North -East monsoon from November to February which is comparatively lower than the rains received from southwest monsoon. During the rest of the year, there is also considerable precipitation due to convective rains. The western slopes of the province are very wet, some places having almost 7000 mm of rain per year. (Source: http://www.meteo.gov.lk/). The Temperatures range from 24°C at Kandy to about 16°C in NuwaraEliya, which is located 1,889 m above sea level.

2. Hydrology

a. Matale District

66. Seven roads in Matale district namely road IDs,1,11,15,16,18,20,44 are crossing streams. One of the major rivers called “White River” is running close to two of the candidate roads namely road ID 19 and 21. Road ID 48 is running close to one water tank ‘Walaswewa’. Road wise details are presented in Table IV.2.

Table IV.2: Road sections that Cross or Located Near Rivers and Streams, Matale District

No.	Road ID	Streams adjacent/crossed by the road
1	10	Crosses water fall (stream)
2	19,21	Run close to the white river (within 50m)
3	48	Runs adjacent to Walaswewa Tank
4	1,11,15,16,18,20,44	Cross streams

b. Kandy District

67. The major catchments located in Kandy District are of Mahaweli Ganga, HilOya, KalotuwawaOya, WewathennaOya and KalugalOya. Table IV.3 below presents the candidate roads inKandy District that crossed or located along rivers and streams.

Table IV.3: Road Sections that Cross or Located Near Rivers and Streams, Kandy District

No.	Road ID	Streams adjacent/crossed by the road
1	4A	Crossing HilOya
2	39	Crossing KalotuwawaOya
3	8,12,16,17,19,20,25	Crossing streams
4	26	Crossing WewathennaOya
5	31	Crossing Hanwella stream
6	32	Running in the vicinity of Randenigala irrigation canal
7	33	Running parallel to KalugalOya

c. Nuwara Eliya District

68. Most of the major perennial rivers of Sri Lanka including the Mahaweli Ganga River and Kelaniriver originate from the central hills located in the NuwaraEliya District. Table IV.4 below presents the candidate roads in Kandy District that crossed or located along rivers and streams.

Table IV.4: Road Sections that Cross or Located Near Rivers and Streams, NuwaraEliya District

No.	Road ID	Hydrological sensitive area
1	8	Crosses KurunduOya
2	06	Running 50m away from Poona Oya Ella
3	17	Crossing the Mapanana Ella
4	25	Running close to Hellboda Ella fall
5	24	Running 100 m limit of Devon waterfall
6	15	Going above Nalioya
7	26	Crossing KudaOya
8	35	Crossing Hunugaloya

3. Air Quality and Noise

69. Since the selected road sections are mostly located within rural areas, major sources of air pollution are not present. The general air quality in the project area is excellent except along unpaved roads and major intersections where temporary deterioration occurs. An extract from the National Environmental (Ambient Air Quality) Regulations, declared in 1994 is presented in Table IV.5.

Table IV.5: 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)
Note:
PM 10 – particulate matter < 10 µm
NAAQS – National Ambient Air Quality Standards (NAAQS)

70. Vehicle Emission Test (VET) became mandatory in 15th July 2008 in order to enforce the environmental standards on vehicle emission provided in the Motor Traffic Act (Emission Control) Regulation of 1994, 817/6, Part I, Section I. This move is a part of the efforts to improve the air quality in the island. And this regulation is applicable for all construction vehicles as well.

71. The area mostly includes rural areas with a good vegetation cover and therefore the noise levels are relatively low. According to Schedules I and II of National environmental (Noise Control) regulations No.1 1996 (924/12), the study area belongs to “Low noise area”. Therefore 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). Rich vegetation in the project area acts as an efficient noise absorbent.

4. Occurrence of Natural Disasters in the Project Area

a. Landslides

72. Based on the landslide hazardous zoning maps of National Building Research Organization (NBRO),some of the areas in Matale, Kandy and Nuwera Eliya districts have been identified as landslide prone areas and declared as unsuitable for settlement or development activities as shown in landslide hazard maps attached in Appendix 4.1. Further, these prone areas consist of landslides which are most likely to occur where there is danger and potential threat to life and property exist. In addition, these districts are comprised of expected landslide areas and locations with modest level of landslide hazard.

73. According to the NBRO classification, lands with slope over 60% are not recommended for any development activity or establishment of settlements. In Matale district, 40 people who lived in the upper mountainous areas (slope above 60%) died and their houses were damaged due to a land slide that occurred in 2012 (Source: www.desinventar.lk). However, the selected candidate roads are located in areas of low landslide prone category as per the classification of NBRO which is not frequently prone to landslides. As per NBRO, most of landslides occurred in the province are as a result of human activity as well as due to natural causes. And it is revealed that 4/5th of landslides occur due to human activity. During field reconnaissance carried out by ESDD, RDA to each road, major landslide prone areas were not observed.

b. Floods

74. Although some of the candidate roads as mentioned in table 4.2, in table 4.3 and in table 4.4 were either crossing small local streams or were in close proximity of rivers, none of them was passing through flood prone area as per the field reconnaissance carried out by ESDD, RDA to each road.

75. The central province as already mentioned earlier is predominately hilly and some of the project roads crossing the local streams are prone to flash flood during heavy rains. In the valley sections due to lack of drains, some roads also come under water due to water logging. Table 4.6 presents a list of the roads that are prone to flooding and water logging.

Table IV.6: Project Roads prone to Flooding/Water Logging

No.	Road ID	Name of Road
Matale District		
1	14	Kaikawela Temple to PahalaOwelaPunchikade Main Road
2	11	Kambiadiya to Kandenuwara via Bogambara
3	10	Bodhikotuwa junction to Hoagolla bridge road
4	49	Walaswewa Main Road
5	1	DombawelaGamameda Road
6	16	KosgollaAdawela Road via KuballoluwaMagallewa
7	15	Hulangamuwa Junction to Watagoda Road
8	18	Dambuluoya Junction to Kalundewa Road
9	20	KapuwattaAkkaraSeeyaYapagama Road
10	24	SisirawattaBulanwalaAthuparayayaDambulla Town Road
Kandy District		
1	4A	Iskolamuduna Junction - Hiloya Road (Watagala Road) via Podadalgoda
2	39	Hatharaliyadda,Rambukkana main Road to Dedunupitiya post office to Weniwella Road via Kalotuwawa
NuwaraEliya		
Nil		

B. Ecological Environment

1. Existing Habitats with Respect to Flora and Fauna and Protected areas

76. Both manmade habitats i.e., home gardens, paddy fields, plantations of tea, rubber, coconut and cinnamon, and natural or semi natural habitats i.e., marshland, streams, scrubland and forest could be observed adjacent to the project area. Many natural habitats within the project area have been subjected to the impact of human activities of varying extents; nevertheless they retain some degree of naturalness. No forest reserves, national parks, sanctuaries are located along or near any of the project roads in Central province.

C. Socio - Economic Environment

1. Condition of road infrastructures

77. Roads are the main transportation mode in Matale, Kandy and NuwaraEliya districts. There are nine “A” class” roads and 41 “B” class roads located within or crossing the province. There is plenty of C, D, and E class roads (local authority roads)in the three districts. Kandy – Colombo Express way has been designed to reduce the travel time and traffic congestion between Colombo and Kandy. According to RDA, it will begin construction activities in

December 2014 and start as part of the Northern -Express Way project going to Jaffna in the Northern Province.

78. Initial constructions of the Strategic Development project (World Bank funded) centering the Kandy city would commence by the end of August 2014 as per the Ministry of Defence and Urban Development. The Strategic Development Plan together with a Transport Improvement Plan to overcome traffic issues in Kandy city were identified as priority needs under this project. In addition to roads, rail transport is also a prominent transportation mode with Colombo-Kandy, Kandy –Baddula and Kandy-Matale being the prominent links.

79. The government policy plan under Mahinda Chinthanaya aims to develop the road system by constructing new expressways and rehabilitating existing roads to improve the socio – economic condition of the backward areas of the country. Accordingly, Road Development Authority (RDA) of Ministry of Port, Highways and Shipping planned to upgrade 51 rural roads (194.35km) in Matale district, 50rural roads (220.66km) in Kandy district and 43 rural roads (179.45 km) in Nuwara Eliya district under iRoad Program. Objective of this program is to expose rural areas which have development potentials to new development opportunities while providing access to rural communities in order to improve their socio – economic standards.

80. According to the Department of Census and Statistics, majority of population are living in rural areas, i.e. 83.4% in Matale , and 82% in Kandy as mentioned in the table 4.7. During the field reconnaissance it was observed that proposed road improvement roads are poor or very poor due to inadequate road maintenance and are too narrow. People in the area have to spend more time to reach working places, hospitals, schools, and markets, which are mostly situated far from their villages. Agriculture is the prominent economic activity in these two districts and poor road network make it difficult for farmers to transport agricultural products to market. Moreover, vehicle owners have to bear higher vehicle operating cost due to dilapidated road condition.

2. Population and population density

81. As per the Census 2012, among the 3 districts in Central Province, population of Kandy district was highest at 1,369,899 persons. This population includes 649,790 males and 720,109 females. In all the 3 districts, female population is more than 50% of the total population, Kandy district having the highest proportion of 52.6%. Majority of the population lived in rural areas in Matale (83.4%) and Kandy (82%) districts while NuwaraEliya has the highest of 53.2% living in Estates. Among the 3 project districts Matale district has the highest proportion of urban population (14.1%) followed by Kandy district (12.1%) and NuwaraEliya district (5.9%). In Kandy district population density is the highest at 715 persons per square kilometre followed by Nuwara Eliya(414 persons/km^2)and Matale (247 persons/km^2). Table 4.7 shows the distribution of population and population density.

Table IV.7: Distribution of Population and Population Density

District		Matale	Kandy	NuwaraEliya
Population	Male	2,32,855	6,49,790	3,38,646
	%	48.3	47.4	47.9
	Female	2,49,374	7,20,109	3,67,942
	%	51.7	52.6	52.1
Total population		4,82,229	13,69,899	7,06,588
Urban	Pop	67994	165758	41689
	%	14.1	12.1	5.9

District		Matale	Kandy	NuwaraEliya
Rural	Pop	402179	1123317	288994
	%	83.4	82	40.9
Estate	Pop	12056	80824	375905
	%	2.5	5.9	53.2
Population density per km^2		247	715	414

Source: Department of Census and Statistics, 2012

3. Population by ethnicity

82. With regard to ethnicity, majority of population in Matale (80.7%) and Kandy (74.3%) districts are Sinhalese while in Nuwara Eliya district it is Indian Tamils (53.2%). Muslims are the second majority population in Matale and Kandy districts, while Singhalese take the second position in Nuwara Eliya district. Table 4.8 shows the population data of the 3 districts by ethnicity.

Table IV.8: Distribution of population by the ethnicity

District		Matale	Kandy	NuwaraEliya
Sinhalese	No.	3,89,092	10,18,323	2,79,784
	%	80.7	74.3	39.6
SL Tamil	No.	24,756	71,640	31,867
	%	5.1	5.2	4.5
Indian Tamil	No.	23,400	83,234	3,75,795
	%	4.9	6.1	53.2
Muslim	No.	44,113	1,91,159	17,422
	%	9.1	14	2.5
Burger	No.	376	2,201	770
	%	0.1	0.2	0.1
Other	No.	492	3,342	950
	%	0.1	0.2	0.1
Total		**4,82,229**	**13,69,899**	**7,06,588**

Source: Department of Census and Statistics, 2012

4. Main economic activities

a. Agriculture

83. As per the Department of Census and Statistics (2012), agriculture is the prominent economic activity employing majority of workforce in Nuwara Eliya (67.4%) and Matale (43%) districts, while majority of the workforce is employed in services sector (50.5%) in Kandy district. This reflects the economic base of the project districts; Nuwara Eliya being the district predominated by tea gardens and other agricultural activities while Kandy is dominated by tourism related activities.

Table IV.9: Employment by major industry group –2012

District	Agriculture (%)	Industry (%)	Services (%)	Total (%)
Matale	43	17.9	39.1	100.0
Kandy	22.5	27	50.5	100.0
Nuwara Eliya	67.4	10.8	21.8	100.0

Source: Department of Census and Statistics, Labour Force Survey - Annual Report, 2012

84. In Matale and Kandy districts, the agricultural workforce is employed in relatively smaller holdings of tea, rubber and pepper plantations and in paddy fields as well. In NuweraEliya district, tea is the main agricultural crop. According to the Department of Census and Statistics, the district has 32,568 hectares of cultivable tea lands and in 2010; it has produced 4,189,059 metric tons of tea. Paddy is grown as the main commercial crop, while citronella (*Cymbopogoncomosus*), cinnamon (*Cinnamomumzeylanicum*), pepper (*Piper nigrum*) and coffee (*Coffeaarabics*) are grown as export crops. In addition, fruit crops such as mango (*Mangiferaindica*),papaya (*Carica papaya*), citrus (*Citrus aurantifolia*), banana (*Musa x paradisiacal*) and vegetables like tomato (*Lycopersiconesculentum*),potato (*Solanumtuberosum*), Cabbage (*Brassica Oleracea*), leeks (*Allium ampeloprasum*),Carrot (*Dacuscarota*), lettuce (*Lactucasativa*) and bean, beets are grown as highland crops in NuweraEliya District.

b. Livestock

85. Livestock farming such as raring of cattle and buffaloes, and poultry farming are also popular agricultural activities in the three project districts. Nuwera Eliya district is reputed for dairy cows and yogurt made of diary milk. According to Dept. of Census and Statistics, in 2010, there were 20460 livestock farms in Nuwera Eliya district, consisting of 18349 dairy cows' farms and 1863 poultry farms.

c. Industries

86. As per the data from Department of Census and Statistics, 2012; among the 3 project districts, Kandy district has the highest proportion of workers engaged in industries (27%) followed by Matale (17.9%) and NuwaraEliya (10.8%). The Census data reveals that in 2011 there are 328, 1234 and 273 industrial establishments in Matale, Kandy and NuweraEliya districts respectively. Dairy industry, which produces 70% of the total milk production of the country, is the major industrial activity in NuwaraEliya district. Furthermore, productions of animal feed, textile weaving, sewing, and fruit packing have been identified as potential industries in the district. Majority of the operating industries in the other two districts are related to agriculture processing and garment manufacturing. Table 4.10 provides the details of industrial establishments and employees in the 3 districts.

Table IV.10: No. of industrial establishments (with 5 or more persons engaged)

District	No. of industrial establishments	No. of employees
Matale	328	7480
Kandy	1234	37046
NuwaraEliya	273	17707

Source: Department of Census and Statistics, 2012

87. There is a well-established tourism industry in the Central Province. Both the hill capital Kandy and the city of Nuwara Eliya are located within the Central Province as well as Sri Pada. The province produces much of the famous Ceylon tea. Central Province attracts many tourists, with hill station towns such as Kandy, Gampola, Hatton, Haputale, Bandarawela, Diyatalawa and NuwaraEliya. Temple of the tooth or Dalada Maligawaat Kandy, Central province is the holiest temple of Buddhist world of Theravada cannon.

88. During the field reconnaissance it was observed that majority of proposed roads are traversing through large scale tea and rubber plantation lands and the proposed roads will facilitate easy access of workers to these areas.

d. Education

89. Table 4.11 shows the distribution of the population by education attainment in these three districts. As per the department of Census and Statistics – 2012, Kandy district shows the highest literacy rate (92.4%) compared to Matale (88.9%) &NuwaraEliya(84.5%) districts. Female literacy rate is lower than male literacy rate in all the three districts;lowest being 79.7% inNuwaraEliyata.

Table IV.11: Literacy rate by district - 2012

District	Literacy Rate		Total
	Male	Female	
Matale	90.5	87.6	88.9
Kandy	94.3	90.9	92.4
NuwaraEliya	90.0	79.7	84.5

Source: Department of Census and Statistics, 2012

90. During the field reconnaissance, it was observed that several schools are located along the project roads e.g. Waradiwela Maha Viddiyalaya& GiddawaWaradiwela Primary Viddiyalaya at MetihakwalaMahaVidyalayaalong Werapitiya Road, Dunhinna Junction – Makuldeniya Road(Makuldeniya Junction) via Waradiwela (3), Raja MahaViharaya along Raja MahaViharay etc..

e. Household income

91. As per the 'Household Income and Expenditure Survey - 2009/10' of the Department of Census and Statistics, the monthly mean and median per capita income of Kandy district is higher (Rs. 8285) than other two districts. There is no significant difference of average monthly income levels between Matale and NuweraEliya districts (Refer table 4.12).

Table IV.12: Mean and median monthly per capita income by district -2009/10

District	Average monthly income	
	Mean (Rs)	Median (Rs)
Matale	7930	4908
Kandy	8285	5400
NuwaraEliya	7667	5127

Source: Department of Census and Statistics, Household Income and Expenditure Survey - 2009/10

f. Poverty Situation

92. Table 4.13 shows the comparison of poverty headcount index of Sri Lanka with the Central province and the project districts during the period 1990/91 to 2009/10. The poverty headcount index of Central province and two of the three districts (Kandy and Matale) are higher than that of the country poverty headcount index while Nuwara Eliya district is slightly lower than that of the country. This higher poverty situation is due to predominance of agriculture based economy and lower base of industrial sector. Over the years from 1990 to 2009/10 a significant decrease of poverty headcount index is seen in all the project districts and at overall province level.

Table IV.13: Poverty Headcount Index of Affected provinces and districts

Province/Districts	Poverty Headcount Index (%)				
	1990/91	1995/96	2002	2006/07	2009/10
Sri Lanka	26.1	28.8	22,7	15.2	8.9
Central Province	30.7	36.2	25.1	22.3	9.7
Matale	28.7	41.9	29.6	18.9	11.5
Kandy	35.9	36.7	24.9	17.0	10.3
NuwaraEliya	20.1	32.1	22.6	33.8	7.6

Source: Household Income and Expenditure Survey - 2009/10, Department of Census and Statistics, 2011

g. Existing Infrastructure facilities

93. **Energy source of households.** In all the three project districts electricity is the main source of energy accounting for 92.5%, 87.4% and 83.4% of the households in Kandy, NuwaraEliya and Matale districts respectively. Kerosene is the second major source accounting for 15.4%, 12.2% and 7.1% of the households in Matale, NuwaraEliya and Kandy districts respectively.

Table IV.14: Principle type of lighting the occupied housing units - 2012

District	Electricity from national grid	Rural Hydro power project	Kerosene	Solar power	Bio Gas
Matale	83.4	0.3	15.4	0.9	0.0
Kandy	92.5	0.3	7.1	0.1	0.0
NuwaraEliya	87.4	0.0	12.2	0.1	0.0

Source: Department of Census and statistics, 2012.

94. **Drinking water.** As shown in table 4.15, majority of households in Kandy district (49.3%) use pipe water supply, and while both in Matale and NuwaraEliya districts about 29% households use the same. Protected wells form the major source of drinking water for 41.3% households in Matale district. About 61% of households depend on other sources like rural water supply projects, tube wells, bottled water, tank, river, etc. for drinking water in NuwaraEliya district.

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Table IV.15: Source of Drinking water

District	Protected well	Unprotected well	Pipe born water	Other
Matale	41.3	3.3	28.9	26.3
Kandy	25.5	2.6	49.3	22.5
NuwaraEliya	7.5	2.6	28.8	61.0

Source: Department of Census and statistics, 2012.

95. **Sanitary Facilities**. Table 4.16 shows that 89.1%, 86.3%, and 81% households in Kandy, Matale and NuweraEliya districts respectively use private toilets, while 8.9%, 12.5% and 14.2% households respectively in these districts share toilets with other families. Meanwhile, Common public toilets used by the families are highest (1.4%) in Kandy district followed by NuwaraEliya district (0.5%) and 0.3% households in Matale. Overall, 4.4% households do not use any toilet facility in NuwaraEliya district.

Table IV.16: Type of toilets - 2012

District	Private	Sharing with others	Common/Public toilets	Not using
Matale	86.3	12.5	0.3	0.8
Kandy	89.1	8.9	1.4	0.5
NuwaraEliya	81	14.2	0.5	4.4

Source: Department of Census and statistics, 2012.

96. **Education Infrastructure**. Table 4.17 presents that there are 639 schools in Kandy district followed by 519 in Nuwara Eliya district and 308 in Matale district. Considering the types of schools, more than 98.7% of these schools are mixed schools (common for boys and girls)in NuwaraEliya district and Matale district while they form 94.5% of the total schools in Kandy district.

Table IV.17: Functioning Schools by gender of students -2010

District	Boys schools	Girls' schools	Mixed Schools	Total
Matale	1	3	304	308
Kandy	13	22	604	639
NuwaraEliya	1	5	513	519

Source: Department of census and statistics, 2012.

97. **Transport facilities**. Road transport is the dominant mode of transportation in the project area. The proposed roads, are connected to the existing "A and B class" road network in the Central province.

V. ANTICIPATED ENVIRONMENTAL IMPACTS AND PROPOSED MITIGATION MEASURES

98. This chapter describes anticipated impacts on the environment during preconstruction, construction and operational stages of the project which have been identified during the Environmental Assessment. 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.

A. Pre construction phase

1. Project induced natural hazards

a. Impacts due to Landslides

99. As the terrain in the Central Province is predominantly hilly there is the risk of landslide if natural slopes are disturbed and land use is altered by the construction activities during extreme rainfall events.

100. However as the road improvement is restricted to the available ROW, natural slopes along the project roads will not be disturbed and land use exterior to the ROW will not change. The risk of landslide occurrence is minimum due to these design features. Prior consent will be obtained from National Building Research Organization (NBRO) for roads along which landslide prone areas and special attention will be made in road design incorporating recommendation of NBRO.

b. Road construction in flood prone areas

101. As described in Chapter 4, some of the roads in Matale and Kandy Districts are located within flood prone areas and improvements in the hydraulic structures will address this issue. Culverts and bridges design will have adequate capacities considering the local hydrology, historical high flood levels, and required flood return periods. Coordination with the Irrigation Department in collecting information and checking the adequacy of design and conducting construction operations during dry weather flow will be observed. RDA requires a 50 year flood return period in culvert designs and a 100 year flood return period for designing bridges.

c. Shifting of Utility Supply Lines

102. For the road upgrading works, electricity power lines, telephone lines, and water supply mains located closer to the ROW will be shifted. Such utility facilities available within the existing ROW are identified in ECs and the exact number of utilities to be shifted will be updated during the preparation of specific EMPs. Proper co-ordination with the relevant service providing authorities in advance and supervision during shifting will help to reduce any impacts to relevant utility supply lines. Advance notice to the public about the times that the utility supplies will be disrupted will help 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.

B. Construction phase

1. Landslides during construction stage

103. Since the proposed upgrading is restricted to the available ROW, minimal disturbance to the road side natural slopes is expected and possibility of project induced landslides is minimal. Proper coordination will be maintained with NBRO for roads which already have landslides or slope failures. The contractor's activities will not lead to landslides and if any such incident occurs will immediately inform RDA and provide suitable means to prevent damage adjacent land and property.

2. Hydrological impacts

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

105. The contractor will take all measures necessary or as directed by the Engineer to keep all drainage paths and drains clear at all times particularly in Matale and Kandy Districts. Temporary storage of material will be made only in approved sites by the engineer where natural drainage is not disturbed. All waste 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.

106. 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.

3. Increase of local air pollution, noise and vibration

107. Earthworks, pavement improvement operations, quarry operations, operation of hot mix plants, operation of construction vehicles and operation of plants during construction period will emit dust and fumes, which will contribute to local air pollution.

108. Heavy machinery used for construction work such as vibrators and compactors and operation of heavy vehicles at higher speeds will create noise and vibration which will cause nuisance to residents in settlements. Sensitive receptors like schools, hospitals, and places of worship are particularly vulnerable to nuisance from noise. Structures located near the roads are at risk to structural damage like cracks due to construction vibration.

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

- 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.
- 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.
- Vibration should be controlled with the agreement of the Engineer at locations where sensitive receptors are found. Precondition survey should be carried out if requested by the engineer at identified locations.

- Regular sprinkling of water to dampen the construction surface will reduce the emission of dust.

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

110. In order to upgrade roads, clearing of roadside vegetation within the ROW, excavation and removal of unsuitable soil, cutting trenches for roadside drains and removal of degraded surface of roads will be required. Such activities may develop temporary piles of soil and debris along the road edge. These activities could cause temporary erosion and siltation of nearby water bodies, drainage canals, and irrigation systems.

111. Run-off contaminated with oil, grease and emissions from construction vehicles, equipment and material stores, wastewater and solid waste from worker camp sites will cause the deterioration of surface water sources if they are released to adjacent water bodies.

112. Following measures should be adopted to mitigate deterioration of surface water quality due to silt runoff, discharges, and spoils from construction and labour camps;

- Reuse of waste soil for refilling of borrow pits if any
- Where earthworks take place adjacent to water bodies, silt traps shall be installed prior to the commencement of earthwork activity
- All temporary unsuitable soil dumps and debris should be removed from site to approved disposal sites
- If temporary soil dumps are left at the site for a long time proper remedial measure to minimize soil erosion should be practiced
- Temporary soil dumps should not be placed near water bodies
- All fills, back fills and slopes should be compacted immediately to reach the specified degree of compaction,
- Suitable local drainage measures should be established to properly drain the water in the construction area to the nearby waterways
- Establishment of suitable mulch to cover the slopes of embankments
- All materials particularly fuels, lubricants, and bitumen(including toxic and hazardous material) required for construction shall be stored at secure 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 will be made at worksites and any accommodation facilities provided for workers' accommodation, ensuring that no raw sewage is released into drains or water bodies.

5. Social and Environmental Impacts due to Establishment of Labour Camps

113. Labour camps may need to be established near the road alignment and improper sanitation, wastewater and solid waste disposal risk contaminating nearby surface water sources. Stagnant water from the labor 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 behavior which causes inconvenience to local community.

114. Labour camps will be located at least 100m away from the major water resources. Proper sanitary facilities will be provided to the labour camps and proper way of disposing any wastewater and other waste matter generated from the camps as agreed with the Public Health Inspector (PHI) will be strictly observed.

115. Maximize recruiting of local labor to 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.

6. Disruption to Traffic/Transportation

116. Improvement works on the road pavement and reconstruction of culverts will impede existing traffic flows. The movement of trucks and other construction vehicles may cause accident risks and may damage other roads that they use to bring construction material to the construction sites.

117. Following measures should be considered to minimize the impacts on existing traffic;

- Providing advance information to the public about the planned construction works,
- Use of flagmen control traffic flows at constricted sites, including safe crossing for pedestrians especially near town areas and schools.

7. Biological impacts

a. Impact on Protected Areas and Sensitive Ecosystems

118. There are no anticipated impacts on the protected areas and sensitive ecosystems. No project road is located in or within 100m of any forest, wildlife reserve, and sanctuaries.

b. Impacts on terrestrial flora

119. During the construction stage loss of vegetation within the ROW is inevitable. Trees commonly found along the road are fruit bearing or ornamental that includes: Subukku (*Michelia nilagirica*), Del (*Artocarpus nobilis*), Kithul (*Cariyota urens*), Kotamba (*Terminalia catappa*), Coconut (*Cocos nucifera*), Mango (*Mangifera indica*), Jam (*Muntigia calabura*), and Siyabala (*Tamarindus indica*). This could aggravate the erosive processes especially during the rainy season.

120. All construction works will be carried out in a manner that the destruction or disruption of vegetation is minimal. A compensatory tree planting program will be developed at a rate of at least three (3) good specimens of tree species planted for each tree removed. If there no space available along the road for tree planting, these trees will be planted on home gardens, schools, government institutions, private institutes and government institutes in the project area.

121. Suitable species of trees will be distributed free of charge among the interested parties by the contractor with the consultation of Department of Forest/Central Environmental Authority/Agrarian Service Department/community based organization.

c. Impacts on terrestrial fauna

122. No impacts of fauna is anticipated as no road is encroaching or located near forest, wildlife reserve, and sanctuaries.

d. Impact on aquatic fauna and flora

123. There will be soil erosion from stock piles, excavation, oil and grease from construction vehicles which will deteriorate the water quality of the receiving water body including increase in turbidity leading to temporary impairment to sustain aquatic fauna and flora.

124. This impact could be mitigated through proper siting 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. No solid waste will be dumped into water bodies.

e. Establishment of invasive species

125. During the construction stage, soil brought into the project area from outside may contain seeds of alien invasive species. Also, the construction machinery and vehicles can accidentally introduce seeds of such plants if used without proper cleaning. Temporary facilities such as labour camps, dumping sites, soil storage sites are potential locations where invasive plant species can get established in quick succession. This will negatively affect both the natural and manmade habitats.

126. It is observed that several alien invasive species have dominated the vegetation in certain sections. Therefore, there is a possibility that such invasive species may invade new areas if the waste plant material generated during site clearing and dredging activities (if any) is disposed to areas away from the project.

8. Impacts Due to Extraction and Transportation of Construction Materials

127. Sources of construction materials such as soil/metal could be obtained from the quarry 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.

128. This could be mitigated by using quarry and borrow sites approved by Geological Survey and Mines Bureau (GSMB). Spoils will not be dumped along road side and near water bodies. Spoils, top soil and denuded materials will be reused for restoring borrow sites and transported materials should be covered using polythene or any other suitable material to avoid dust blow. Keeping provisions for repairing and restoration of 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 surface will mitigate the impacts due to transportation of construction material.

9. Requirement of lands for the road upgrading

129. 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, the lands will be taken after negotiating with land owners with involvement of a third party. During construction, temporary occupation of privately owned land may be required for stock pilling and use as yards. If such a necessity occurs the contractor with the concurrence of project staff will sign a temporary occupation contract with the owner.

10. Safety of Workers and Public

130. Construction activities pose potential hazards to both workers and public. Safety to workers and the public will 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 Equipments (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 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.

11. Management of Construction Debris/Waste

131. Debris can be generated by dismantling of existing pavement. Collected dust and unused iron bars or damaged support structures constitute significant wastes. Mitigation for solid waste from construction camp has been given in construction camp section.

132. The existing bitumen surface can be utilized for paving of cross roads, access roads, and paving works in construction sites and camps, temporary traffic diversions, haulage routes, etc.

133. All excavated materials from roadway, shoulders, verges, drains, cross drainage and the like may be used for backfilling embankments, filling pits, and landscaping to the extent feasible. Unusable debris material should be suitably disposed off at pre-designated disposal locations, with approval of the concerned authority. The bituminous wastes shall be disposed in an environmentally accepted manner as follow:

- Unusable and surplus materials, as determined by the Project Engineer, will be removed and disposed off-site.
- Unproductive/wastelands shall be selected for dumping sites.
- Away from residential areas and located at downwind side of these locations.
- Dumping sites do not contaminate any water sources, rivers etc, and
- Dumping sites have adequate capacity equal to the amount of debris generated.
- Public perception and consent from the village about the location of debris disposal site has to be obtained before finalizing the location.
- Form works will be re-used to the extent possible, more than 20 times as dictated by good practice. All stripped formworks will be examined for any damage and rectified in the workshop for re-use. Rectification includes plugging holes, and straightening bent steel props.

C. Operational Phase

1. Impacts on water resources

134. Improvements to the road drainage will result in improved storm water flows and reduce the frequency of blockages from occurring. Risks to the public health caused by stagnant water bodies 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.

135. In addition, improper handling of chemicals used for maintenance works such as paints, pesticides, and asphalt will degrade nearby water bodies. Proper handling of such chemicals under strict supervision will minimize risk of water pollution during the maintenance period.

2. Occurrence of landslides

136. Regardless of road related activities, landslides could occur along the candidate roads which could block the access and damage the road surface. In such case, the contractor is responsible for clearing the road and restoring the access immediately after informing PIU and relevant Executive Engineer of RDA one comply with the recommendations of NBRO.

3. Disposal of unsuitable material

137. De-silting of drains, culverts and bridges, removal of road side vegetation and removal of damaged/degraded road surfaces during the maintenance period will generate unsuitable soil, vegetation and debris. Collected materials will be properly disposed to avoid blocking of drainage.

4. Extraction of material for repairing and maintenance works

138. 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 will be adopted to minimize impacts due to maintenance activities of the roads.

5. Pedestrian and commuter safety

139. 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 will 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

140. 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.

6. Air quality and noise

141. Higher speed limits will reduce the travel time through the area and better surface conditions will 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. Necessary traffic signs and signals will be installed in sensitive areas such as schools, temples to warn drivers and avoid making unnecessary horn.

7. Positive Impacts of the Project

a. Socio - economic benefits

142. Following socio-economic benefits are expected to transfer to the affected population of roads selected under the iRoad Program.

- Improvements in road connectivity reduce regional disparity, open up new markets, generate employment opportunities and thereby reduce poverty in lagging areas.
- An efficient and convenient transportation system will accelerate the economic growth by facilitating easy and faster mobility of people, goods and services and reducing disparities in regional development.
- The road network improvement in Central Province will boost economic activities including potential growth in industries, tourism, gem industry and agriculture in lagging areas.
- Good road network will reduce transport cost and travel time leading to increase the profit margin of the small scale farmers. The market expansion increases the marketability of the product.
- The wages of agricultural laborers will be increased when profit margins and sales are increased due to the road development.
- Similarly, better road network will provide access to schools and other services. In the long term this will improve education level and other associated life values (health status, awareness and social skills) of the people and they will become more competitive in the labor markets in finding their destinies.

8. Climate Change Impacts and Risks

a. Climate Change Mitigation

143. The Transport Emissions Evaluation Model for Projects (TEEMPT) developed by Clear Air Asia[3] with support from ITDP, ADB, Cambridge Systematics and the United Nations Environment Programme (UNEP) – Global Environment Facility (GEF) Scientific and Technical Advisory Panel. TEEMP is an excel-based, free-of-charge spreadsheet models to evaluate emissions impacts of transport projects.

144. TEEMPT was utilized to assessed the CO2 gross emissions with- and without the project improvements which is mainly surface roughness and directly impacts speed and fuel consumptions. It also allows the assessment of future congestion, if they will occur in the future given the projected increase in traffic and road capacity with-and without the project improvements like lane configuration and road roughness.

9. Key road upgrading features

145. iROAD Programme will upgrade 144 rural roads with a total aggregated length of 594.46 kms distributed across Mathale, Kandy, and Nuwa Eliya districts. No land acquisition will be allowed and all improvements will be limited to the existing 1-lane configuration with 3-3.50m carriageway with an asphalt concrete surface. Road roughness will decrease from the general condition of 8.0 m/km to 2.5 m/km. Other improvements include the repair or reconstruct damaged culverts, introduction of earth drains for all road sections and built up drains where necessary, removal of any irregularities that are on the existing vertical profile, and road safety appurtenances.

146. Traffic forecast were taken from the economic analysis for each road section disaggregated into vehicle types and share to the annual average daily traffic.

147. Road capacity of 7,200 PCU/lane/day for rural roads was adopted for the project. Emission factors were mostly taken from the CBCP/MOEF (2007) Draft Report on Emission Factor Development for Indian Vehicles, the Automotive Research Association of India, and C. Reynolds et.al (2011) Climate and Health Relevant Emissions from in-Use Indian for three-wheelers rickshaw as follow:

Table: IV:18 CO2 Emission Factors

Vehicle Type	Gas	Diesel	LPG/CNG
2-Wheel	1.37 kg/l		
3-Wheel	2.12 kg/l		3 kg/l
Cars/bus/bus	2.24 kg/l	2.58 kg/l	

10. Estimated Carbon Emissions

148. For each kilometer of rural road upgrading, CO2 emission from construction is estimated at 11 tons[4]. Total annual emission without the project is estimated at 2,450 tons and with project including induced traffic is estimated at 7239.1 tons.

[3]A network of 250 organizations in 31 countries established by the Asian Development Bank, World Bank, and USAID to promote better air quality and livable cities by translating knowledge to policies and actions that reduce air pollution and greenhouse gas emissions from transport, energy and other sectors.
[4]R. Shantini (2006). "Impact of Sri Lankan Rural Roads on Greenhouse Gas Emissions & Mitigation and Climate Change – A Case Study." http://www.rshanthini.com/tmp/CP551SD/RuralRoadandGHG.pdf

149. Climate risks were identified following both top down and bottom up approaches. Under the top down approach changes of key climate parameters, mainly temperature and precipitation were projected for 2050 using an ensemble of Global Climate Models (GCMs). Given the projected variations of temperature and precipitation the project roads were screened for the following climate risks.

- **Increased precipitation.** Seasonal runoff may lead to erosion and siltation of water courses, ponds and reservoirs. Risk of flooding and precipitation induced landslide events as there are existing hazards associated with heavy precipitation in the some of the project roads.
- **Flood.** Climate change is projected to influence the frequency and intensity of flood events. Existing engineering designs may not take into consideration the impact of climate change on the risks from flooding. A more localised and in-depth assessment must be carried out.
- **Onshore Category 1 Storms**. The project is located in a region which has experienced Category 1 storms in the recent past. A high exposure means that between 1968 and 2009 there have been at least one Category 1 storm in the region based on post-processed data from UNEP/ GRID-Europe. On the Saffir-Simpson Hurricane Scale a category 1 storm is characterised by sustained winds in excess of 119 km/hr (33 m/s). Even this least intense storm can still produce plenty of damage and be life threatening. The region may also be susceptible to lower intensity but more frequent tropical storms as well as less frequent higher-intensity storms. Existing engineering designs may not take into consideration the impact of climate change on the risks from tropical or extra tropical storms. If coastal surges and high winds are identified as a potential problem for the project, it is recommended that a more localised and in-depth assessment is carried out.
- **Sea Level Rise.** Some recent research suggests that global sea levels could be 0.75 to 1.9m higher by the end of the century. Local changes in ocean density/dynamics and land movements can also add to, or lessen, the effects of sea level rise at a given location. Sea level rise has the potential to accelerate the rate of coastal erosion. Changes in erosion regimes also impact the rate of sedimentation in other areas, particularly in estuarine and other tidal settings.
- **Temperature Increase.** There is a potential for an increase in incidences where current design standards will not be sufficient. The design, operational and maintenance standards should be reviewed - take into consideration current impacts of high temperatures as well as potential future changes. Heatwaves put stress on roads and other transport links.
- **Natural Hazards.** a) Landslide Triggered by Precipitation. All roads and road sections 10km off the coastal areas are potentially susceptible to low to medium levels of landslide risk; b) Coastal Erosion. Coastal erosion has been identified as a major hazard in many coastal areas of Sri Lanka, ; c)Tsunami. Tsunamis are infrequent in Sri Lanka but have caused severe damages, and recent understanding of the tectonics of the Indian Ocean region points to an increasing risk of earthquakes.

150. Key engineering measures taken to address these risks in the design are: i) increase in embankment height, ii) construction of new side and lead away drains, iii) construction of new culverts or widening of existing ones and iv) construction of new bridges. As shown in the succeeding Table.

Table. V.1: Cost of Climate Adaption Measures (LKR.million)- Central Province

District	Increase Embankment Height	New Side and Lead away drains	New/Widneng Culverts	New Bridges	Total
Mathale	12.71	63.16	177.99	20	**273.86**
Kandy	6.78	175.74	315.92	53.12	**551.56**
Nuwara-Eliya	3.46	126.19	330.55	71.43	**531.63**
Total	**22.95**	**365.09**	**824.46**	**144.55**	**1357.05**

VI. INSTITUTIONAL REQUIREMENTS AND ENVIRONMENTAL MANAGEMENT PLAN AND GRIEVANCE REDRESS MECHANISM

A. Environmental Management Plan and Environmental Monitoring Plan

151. Environmental Safeguards Manual of RDA and the Environmental Policy Statement of ADB, outline the requirement for an Environmental Management Plan (EMP) which is presented as a matrix developed based on best practices for environmental management. The mitigation measures suggested in the EMP should be incorporated in the contract document. The Environmental and Social Development Division (ESDD) of the RDA could assist the Project Implementation Unit (PIU) in incorporating the EMP in to contract documents and audit the effectiveness of implementing the EMP by the contractor during the construction period. It is also recommended that an environmental specialist to work in the PIU or Project Implementation Consultant (PIC) to address all issues related environmental aspects during the construction period. This specialist should work closely with the Environmental and Social Safeguards Officer of the ESDD who will assist in issues related to the environment.

152. Implementation of the EMP will be a responsibility of the contractor and the PIU will oversee the effectiveness of the implementation on behalf of the RDA with the assistance of the ESDD.

153. Environmental Management Checklist (EMC) is prepared based on the EMP for pre-construction, construction and post construction stages. EMC monitors the degree of compliance of the mitigation measures proposed in the EMP in all three stages. It is required to complete EMC for pre-construction stage once, 1 – 3 times during the construction stage depending on the length of the road, and one post construction checklist in order to take care of site rehabilitation, clearing of camp site etc. PIU is responsible for the completion of EMC for all three stages with the help of PIC.

154. On the other hand Environmental Monitoring Plan (EMoP) is developed based on the project cycle and monitors the EMP implementation by measuring environmental parameters. During the pre-construction phase it is important to measure air, water quality and noise levels. 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.

155. Contractors who implement rural road component of the iRoad Program are provided with approximately two (2) year construction period and responsible for maintaining the particular road for three (3) years. A typical EMP prepared for the rural road component is attached in appendix 6.1 and a sample of relevant EMC is presented in appendix 6.2. Appendix 6.3 presents the EMOP prepared for a typical rural road with one monitoring location for each parameter.

156. As presented in table 2.1, there will be three contract packages in each district. Therefore, contractor is responsible for updating EMP, EMC and EMOP for particular packages with specific details and locations in order to prepare package specific documents.

B. Grievance Redress Mechanism

157. 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.

158. 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.

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

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

Divisional Secretary of the area	Chairman
Representative of PIU	Secretary
GramaNiladari	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

160. 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. The people will be informed about the GRC, seven (7) days prior to its meeting.

161. 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.

162. 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.

163. 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.

164. 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.

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

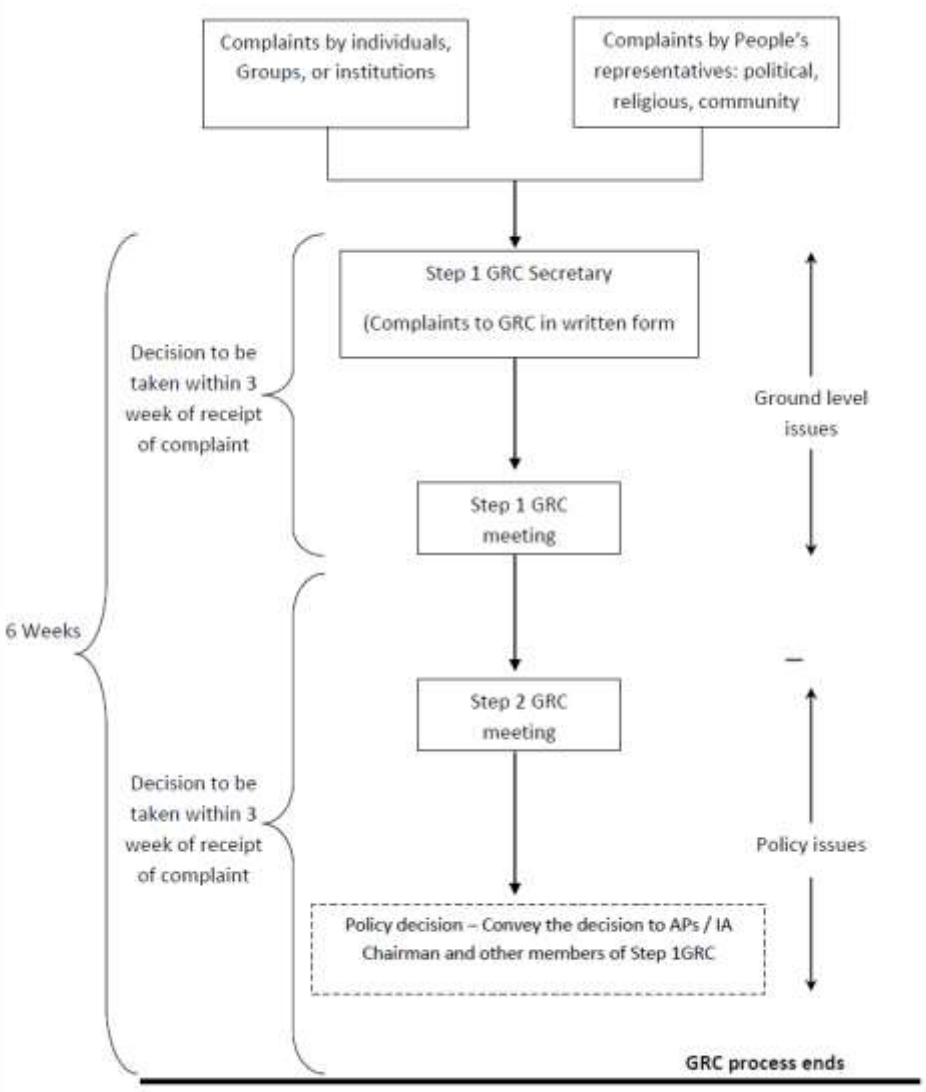


Figure 6.1: GRM process

VII. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

A. Public consultation process

166. Along with the field assessment for preparation of the ECs, ESDD carried out public consultation in each road. Objective of this activity was to understand the viewpoints of the public especially regarding environmental issues along the road and to respond to their concerns and suggestions during the early stages of the project there by reducing any objections towards the project, incorporate any valuable suggestions by the public in to the design so as to reduce any adverse impacts to the environment. Here, special consideration was paid to explore locations which are susceptible to floods and landslides along roads. The public consultations for roads in the Central Province and their views are given in the report.

167. People in the project area (both males and females) have positive ideas about the road development and their ideas indicate the importance of the road network development in the Central Province. The main benefits perceived by the public are listed below.

- Easy transportation for people and agro products
- Easy access to main towns
- Ability use roads in all weather conditions
- Road safety during natural hazardous conditions
- Less travel time for school children
- Improvement in living standard of people
- Security for women, children and elders
- Increased road safety
- Potential development to tourism industry and other industries
- Town development and increase in land value
- Increased connectivity among villages

168. In addition, ESDD consulted government organizations such as Department of Forest Conservation (DOFC), Department of Wildlife Conservation (DWLC) and National Building Research Organization (NBRO) in order to obtain their views on roads located within or adjacent to declared forests, wildlife areas and landslide prone areas respectively and to confirm the locations of such protected areas with respect to particular roads. And both DOFC and DWLC confirmed that there will not be major impacts to the protected areas since road improvement will be strictly within the existing ROW.

B. Focus Group Discussions

169. In addition to one on one interviews, several focus group discussion (FGDs) in the three districts were carried out from 9th August to 19th August 2014. Key comments and suggestions made are listed below.

Table VII.1: Summary of key points discussed in FGDs

Location of FGD	• Comments made by participants	File photo
Matale District		
Rattota DS area	• The damaged bridges need to be reconstructed to provide access to local community. • The culverts are damaged and are not functioning and they need to be shifted towards the ROW to get a good road width • Road side drains and all other existing drainage structures need to be properly investigated and reconstructed where necessary. • It is important to improve/ widen road sections with sharp bends and locations with poor visibility. This will improve road safety. • Road edges need to be well constructed to avoid accidents • The Kaikawala Road comes under flood near Alakanda area and the road needs to be raised. • New culverts and drains need to be constructed to drain out water • Road maintenance is highly emphasized after reconstruction • Due to bad drainage, nobody can travel on the road and drains are needed. • Marginal profit is gained due to damages on the Agri. products	
Ambangangakorale DS area	• Reconstruction of highly damaged road surface is needed as it has barred vehicle transportation and travelling to the hospital by patients and pregnant mothers • Pradeshiya Shabahs (PS) did not do any road improvement for last 15 years in the area. • Quality road surfaces and safety features needed to be considered to avoid accidents in culvert and bridge designs. • Agri products are damaged while being transported to markets. It leads to huge income loss • Blockage of drainage causes flooding over some road sections. • Farmers spend more money to transport their product to markets due to bad road conditions. • Few landslide areas are located within the DS division. Need to consider stability of cut slopes. • Construction works need to be properly monitored.	 

Matale Ds area	• Side drains and culverts needs to be maintained after reconstruction • Blockage of drainage causes flooding over some road sections. • Proper supervision is needed to ensure the quality of the road. • Existing drains are filed with soil and debris.Hence, road surface is highly eroded.	
Galewella DS area	• It is required to make bends straight to avoid accidents • Culvert capacity needs to be increased as compared to the drainage volume • Road reconstruction without drains are no means and land donation is also promised if road widening is done • Due to high water flow during rains, road comes under flood, therefore, culverts are needed to be constructed at such locations • Road safety is not adequate , hence, it is needed to be widened at some locations	
Dambulla DS area	• Agri products are damaged while being transported to markets. It leads to huge income loss • Easy access to transport Vegetable to Dambulla market. • Proper supervision is needed to ensure the quality of the road. • Drains are filed with soil and debris. Hence, road surface is highly eroded. • During the rainy season, hired vehicles do not like to travel this road. • Storm water drainage system need to be improved during the rainy season • Alternative routes for traffic jam is needed • Good health effects will be felt to local people through execution of this project.	
Kandy district		
Panwila DS area	• Road side drains and other existing drainage structures need to be properly investigated and reconstructed where necessary • Since Plantation Cooperation unit of Galpilla Estate is located along this road, many people use these roads. • Road widenings needed as well as retaining walls also are needed at some locations • Quality road surfaces and safety features needed to be considered to avoid accidents.	

Gaga Ihala Korale	• Lot of school children use these roads • Erosion control measures need to be implemented at locations like temples and schools as floods can devastate the roads • Storm water drainage system has collapsed and needs improvements during the rainy season • Lower prices received for agri products due to damages incurred on them. • Farmers spend more money to transport their products to markets due to bad road conditions.	
Pasbage Korale	• Bridges are fully damaged and not functioning during the rainy season • Many people face accidents due to large potholes on the road. • School children got sling mud to their clothes due to muddy condition on some road sections • Need proper supervision to get quality road surfaces during road construction • Lot of patients face problems like old ones and pregnant mother during the rainy season • Pradeshiya Shabahs (PS) has no money to repairs roads once roads are damaged, hence repairs are needed. • It is important to widen road sections with sharp bends and locations with poor visibility. This will improve road safety. • Road edges are left without proper fillings.	
Udunuwara	• Bends need to be straight to avoid accidents • Culvert capacity needs to be increased as compared to the drainage volume • Drains need to be placed as per engineering investigation and supervision. • Road widening is also needed to avoid accidents when no space for passing two vehicles at some locations is available • Due to high water flow during the rainy season, some road sections come under flood • Road safety is not available in downward slopping areas • Road maintenance is highly emphasized after reconstruction	

Udapalatha	• If roads are good, tea products can be transported and save some money and the time • Retaining walls and widening culverts are needed for roads. • Both Sinhala and Islam families about 400 use these roads every day. • Quality road surfaces are needed for convenient travelling. • Cut slopes should be shaped to avoid land slide and unnecessary erosion. • Construction works need to be properly monitored	
Nuwera Eliya District		
Walapane	• Large population use this road, hence condition has barred use of the road. • Road development will definitely lead to socio-economic improvement in the area • The only alternative road for the Mulhalkele to Ragala road need improvement as early as possible • Base hospital and school road sides will be developed very fast up on road reconstruction • Only the bus running on the road has stopped due to dilapidated condition of the road width • Road side drains and all other existing drainage structures need to be properly investigated and reconstructed where necessary. • It is important to improve/ widen road sections with sharp bends and locations with poor visibility. This will improve road safety. • Road edges need to be well constructed to avoid accidents	
Hanguranketha	• It is important to improve sections with sharp bends and locations with poor visibility to improve road safety. • Road edges need to be well constructed to avoid accidents • Some road sections need to be raised to avoid floods. • This is a short -cut road to pass avoid many important towns :Nuwara Eliya,Hattan and Thalawakale towns • Landslide prone areas can be reduced if some structure are built along roads • Government should be welcomed if rural roads are built under this project • Save more money for three wheelers if rural road network is built. • Rural support could be extended to the RDA if this project will start in the near future.	

	• Rural infrastructure development has not happened for last 10 years due to lack of financial capacity of local authorities.	
Rikillagaskada	• Rural land value will go up following rural road reconstruction. • Rural people will have a healthy comfortable life if the rural roads are reconstructed as soon as possible. • Post-harvest losses can be reduced dramatically if roads are well carpeted. • Drainage system is out of order for long period. Hence rural people experience floods from time to time. • Road side drains and all other existing drainage structures need to be properly investigated and reconstructed where necessary	
Kothmale	• Resettled people have been housed in the area following kothmale dam construction. Reconstruction of the rural is very important. • Agri products can be transported to nearest towns such as Hapugasthalawa junction and Nawalapitiya town • Post officeand sub office of Small Tea Holding Authority are located along this road. Reconstruction has a big value. • The private sector bus service will resume following road reconstruction. • This road is short cut to Beramana to Pundaluoya. It will reduce time for travelling to schools and Temples • Some land slide prone areas need attention while road reconstruction	

C. Disclosure of information

170. Disclosure of information at an early stage of the project has many benefits such as to negate any objections by the public towards the project, avoid misinformation getting in to the public through agitating groups and some NGOs. While disclosure of information can be done through the Divisional Secretariat and the GramaNiladari (village administrative officer) of the area, Farmer Based Organizations (FBOs), Community Based Organizations (CBO) and village societies are also possible sources of disseminating project related information. Village leaders such as the head priest of the temple can be resource persons for such an activity. The use of mass media to advertise the availability of the report could help information disclosure to other interested groups outside the project area.

171. According to the requirements of the ADB environment policy statement, the draft IEE will be disclosed in ADB website before the Management Review Meeting (MRM) or equivalent meeting or approval of the respective tranche.

D. Transect Walk

172. In developing rural roads, the community participation and consultation has been identified as important. For this project, the participation of communities started at the very initial stage of the project through the transect walk. Transect walks are organized in close coordination with the Grama Niladari concerned at village level and Divisional Secretary at divisional level. In doing this, the project team and key informants conduct a walk along the road, to listen to identify issues, and conditions and to ask questions to identify possible solutions. Following figure details the stages of participatory project preparation.

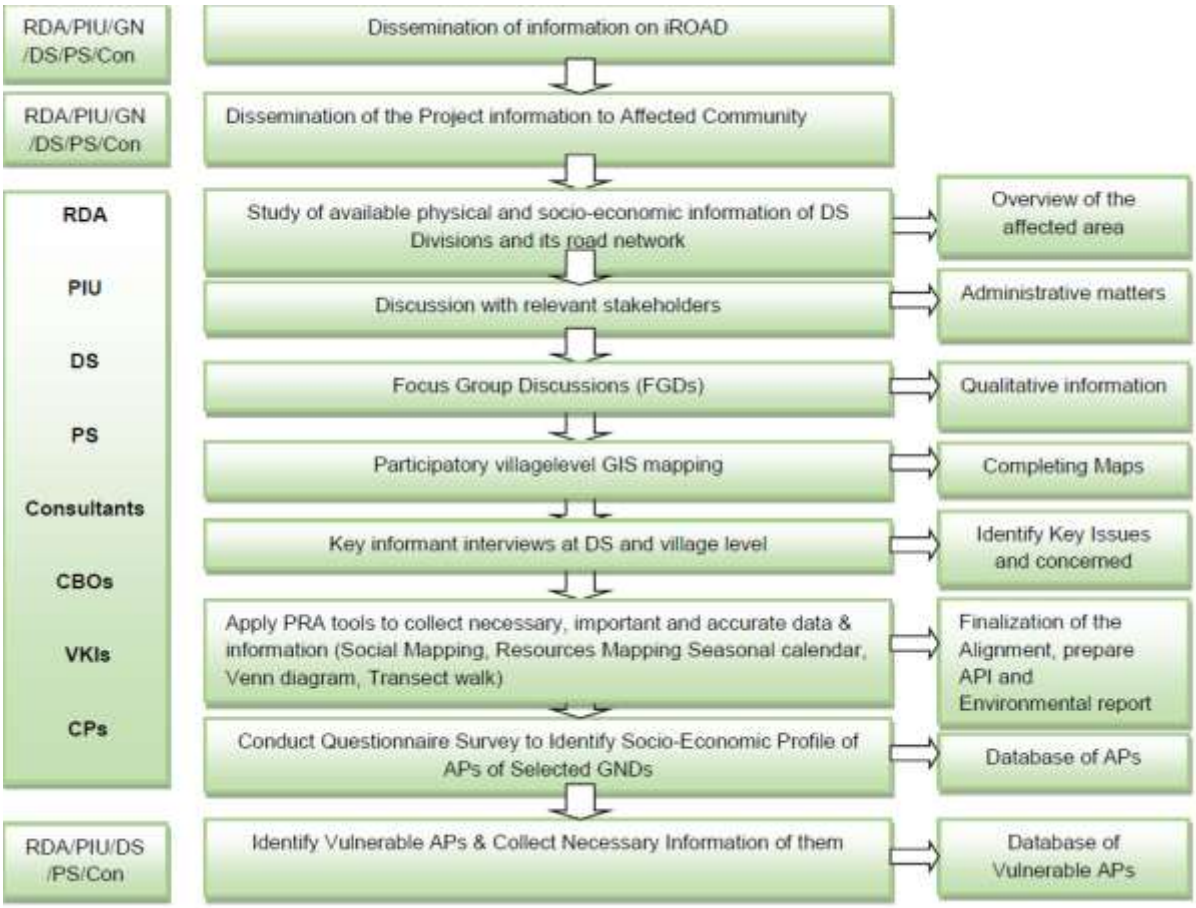


Figure VII.1: Stages of participatory project preparation

Source: Page 44, Appendix 3, Resettlement Framework, Integrated Road Investment Program

VIII. CONCLUSION AND RECOMMENDATIONS

173. The information on existing social environment suggests that agriculture is the main occupation for most of rural population in the Central province and poverty and unemployment still prevails in the region. The public consultation confirmed that the roads cannot be used during rainy seasons due to inundations in some roads and lack of connectivity within the region. Further it was noted that occurrence of road related landslides also hinders the accessibility in some regions. Thus, the public welcome this development project and expect an improvement to their socio economic situation with the project.

174. This Initial Environmental Examination has discussed various aspects of the proposed rehabilitation and upgrading of 144 road sections comprising 594.46 km length. Contractors are liable to keep the roads in operational status for approximately 3 years after the 2 years of construction period.

175. As discussed, candidate roads are dispersed over the entire province and few road sections are located near or within geologically and hydrological sensitive entities therefore mitigation measures will be incorporated to designs in order to bare any road related impacts at such locations. No roads are located in or adjacent to environmental sensitive areas declared by the DOFC and DWLC.

176. Further the IEE recommends to update EMP and EMC with package specific information and locations while EMOP to be road specific before commencement of construction activities. In addition EMC and EMOP should be effectively implemented in order to monitor application of the EMP.

177. The road network improvement in Central province will boost economic activities in the province including potential growth in industries, tourism, gem industry and agriculture in lagging rural areas which will be a positive step to the socio economic development of the country.

LIST OF ROADS TO BE UPGRADED UNDER I ROAD PROGRAM
Mathale District Central Province
Rural Road List

Serial No	D.S.Division	Road ID	Road Name	Road Category	Length (KM)	Sub Total (Km)
1	**Yatawaththa**	**2**	Ratalawewa Junction to Nikagolla Road via Kottagolla	PS	1.60	
2		**3**	Mathalapitiya Rathninda Thuththiripitiya Atipola Dullawa via Walawela Aluthgama Road	PS	12.00	
3		**4**	Yatawatta Mathalapitiya Road to Kurunegala Matale Road via Idangama Alutwatta Walpola & Maligathenna	PS	5.00	
4		**5**	Yatawatta Mahawela Road to Pathingaskotuwa Kurunagala on Yatawatta Road via Nikagolla North	PS	2.00	
5		**56**	Beeridewala to Walawela and Muduna via dullawa junction	PRDA	5.33	**25.93**
6	**Mathale**	**35**	Madawela Junction to Nalanda Industrials Zone	PS	2.50	
7		**36**	Ellepola Kalupalama to Hilton Janapadaya Road	PS	1.00	
8		**38**	Kanangamuwa Parawatta Road	PS	2.80	**6.30**
9	**Naula**	**27**	Bobella Bibila Road	PS	1.50	
10		**40**	Kanamulayaya Rubber watta Via Police Station Road	PS	2.50	
11		**41**	Meegolla Deewara Gammanaya Road	PS	1.20	**9.90**
12	**Naula**	**42**	Gedige Junction to Hapugasyaya Tamil Village Via Ududeniya Road	PS	3.00	
13		**39**	Bibila Murutholuwa Road	PS	1.70	
14	**Wilgamuwa**	**29**	Weeragolla Munamalpitiya Via Moragaha Ulpatha Road	PS	2.80	
15		**33**	Malgammana Gangeyaya Road	PS	2.50	
16		**28**	Lewiyangala Junction to Weheragala Via Himbiliyakada Road	PS	4.20	
17		**30**	Nagolla Amuneyaya Via Godaulpoyha Weheragala Road	PS	4.60	
18		**31**	Alikanda cemetry via Kaduruvediya Ela Road	PS	3.30	
19		**32**	Medakanda Maraka Road	PRDA	6.20	
20		**34**	Hadungamuwa Kumbukoya Road	PS	4.10	**27.70**
21	**Ambagamuwa Korale**	**16**	Kosgolla Adawela Road via Kuballoluwa Magallewa	PRDA	8.50	
22		**17**	Koongahamula Eriyagolla Rosawaththa via Hapugaspitiya Hunuketa Ela Matihakka Road	PS	1.00	
23		**43**	Kosgolla Muduna to Loluwela Junction via Imbulgolla	PS	6.00	**15.50**
24	**Laggala - Pallegama**	**44**	Mahalakotuwa to Meda Ela via Raththinda Junction	PS	2.00	**2.00**
25	**Raththota**	**6**	Uda Hapuwida Junction to Leliambe Junction Road	PS	3.30	
26	**Raththota**	**7**	Polwaththakanda to Kaudagammana Road	PS	4.20	
27		**8**	Madakumbura to Udathenna Road (Riveston Road)	PS	1.40	
28		**9**	Udahapuwida Keselwaththa Road	PS	1.00	
29		**10**	Bodhikotuwa junction to Hoagolla bridge road	PRDA	6.00	

Serial No	D.S.Division	Road ID	Road Name	Road Category	Length (KM)	Sub Total (Km)
30		**11**	Kambiadiya to Kandenuwara via Bogambara	PS	9.10	
31		**12**	Dombagoda Pahala Hapuwida	PS	2.90	
32		**13**	Udaweragama Thennewatta Gansarapola Road	PS	5.60	**33.50**
33	**Ukuwela**	**15**	Hulangamuwa Junction to Watagoda Road	PS	2.70	
34		**14**	Kaikawela Temple to Pahala Owela Punchikade Main Road	PS	4.00	
35		**45**	Ovilikanda to Babaragahakanda Road via Wademada Pathingolla	PS	4.80	
36		**46**	Rathwatta to Elkaduwa Road via Wawugammadda	PS	2.00	
37		**47**	Kaduwela to Pujagoda Gama Meda Road	PRDA	2.90	**16.40**
38	**Dambulla**	**18**	Dambuluoya Junction to Kalundewa Road	PRDA	7.80	
39		**20**	Kapuwatta Akkara Seeya Yapagama Road	MC	3.80	
40		**22**	Kandalama Rotawewa Road	PS	4.80	
41		**24**	Sisirawatta Bulanwala Athuparayaya Dambulla Town Road	MC	5.80	
42	**Dambulla**	**25**	Pelwehara Randeniya Bulagala Road	PRDA	4.10	
43		**19**	Kapuwatta Yapagama Road	MC	3.40	
44		**23**	Thiththawelgolla Rathmalgaha Ela Road	MC	6.70	
45		**21**	Yapagama Dambulla Pola Ate Ela Batuyaya Via Diddeniya Kade Road	MC	6.10	**42.50**
46	**Galewela**	**49**	Walaswewa Main Road	PS	1.60	
47		**53**	Dabuyaya Dambagolla Road	PRDA	4.10	
48		**50**	Galapaula Damunumulla Road	PS	3.30	
49		**55**	Damunumulla Yatigalpoththa Road	PS	2.10	**11.10**
50	**Pallepola**	**52**	Akuramboda Temple to Koswatta Road	PRDA	1.00	
51		**54**	Ambokka Dewalaya Road	PS	2.50	**3.50**
Total					**194.33**	**194.33**

Kandy District – Central Province
Rural Road List

Serial No	D.S Division	Road ID	Road Name	Road Category	Length (Km)	Sub Total (Km)
1	**Medadumbara**	**1**	Bambaragahadeniya Junction - Madamahanuwara via Meeriyagolla	PS	7.00	
2		**2**	Medamahanuwara town - Kandekumbura Road (Retiyagama bus stand) via Metideniya	PRDA	7.80	
3		**3**	Werapitiya Road ,Dunhinna Junction - Makuldeniya Road (Makuldeniya Junction) via Waradiwela	PRDA	5.13	
4		**4**	Bambaragala Juncton - Nithulemada Bus Stand, Nithulmada Main Road via Senarathwela	PS	6.30	
5		**4-A**	Iskolamuduna Junction - Hiloya Road (Watagala Road) via Podadalgoda	PRDA	4.40	**30.63**

Serial No	D.S Division	Road ID	Road Name	Road Category	Length (Km)	Sub Total (Km)
6	**Panvila**	**21**	Angammana Nikathenna Road	PRDA	1.30	**1.30**
7	**Pathadumbara**	**41**	Wattegama , Pinnalanda Junction - Thunkandura Junction via Puwakgahadeniya	PRDA	4.90	
8		**42**	Pitiyegedara Junction - Polgolla 6th mile Post via Meegamawatta	PS	5.75	**10.65**
9	**Pathahewaheta**	**9**	Haththana,Uduwela watta - Galaha town via Galahawatta , Kithulgolla	PS	9.70	
10		**10**	Delthota town - Gabadagama Road	PRDA	7.40	
11		**11**	maussawa - Kolambissa Junction	PRDA	3.69	**20.79**
12	**Minipe**	**36**	Parana Polonnaruwa	PRDA	7.20	**7.20**
13	**Ududumbara**	**53**	Nugethenna to Kewulgama Pamunuwella Ganegala Road	PS	5.80	
14		**32**	Madugalla Kalawala Road	PRDA/PS	3.45	**9.25**
15	**Kundasale**	**43**	Digana Ambakotte Road	PRDA	4.40	
16		**44**	Sirimalwatta Nattarampotta Road	PRDA	2.70	
17		**45**	Manikkahinna (Pitiye Dewalaya) Galaluwa Road	PRDA	1.30	
18		**46**	Gagasiriwatta Polgolla Road	PRDA	2.60	
19		**47**	Digana Aluthwatta Road (Aluthwatta No.10 Junction) - Parana Gagapitiya Road	PRDA	2.57	**13.57**
20	**Yatinuwara**	**12**	Kobbekaduwa Gamameda Road	PRDA/PS	2.00	
21		**13**	Dodamwala Dewalaya - Wathurakumbura Road via Greppitiya temple	PRDA/PS	2.70	
22		**14**	Siyambalagoda - Omandel Sikurapotha Road	PRDA/PS	3.00	
23		**15**	Pottapitiya 4th mile post Udaranmeewala	PS	2.51	**10.21**
24	**Gangaihala Korale**	**16**	Galpaya , Thelihunna Colony via Kurunduwatta New Town Pellapitiya Colony	PRDA/PS	8.20	
25		**17**	Yatapana Boswod Road	PS	4.40	**12.60**
26	**Pasbage**	**19**	Aluthgama Centre Village Road	PS	2.70	
27	**Korele**	**20**	Dekinda,Weralugolla Road	PS	2.65	
28		**18**	Nawalapitiya - Udakanda Bus Stand via Veralugashinna, Weligodawatta	PS	7.55	**12.90**
29	**Udapalatha**	**23**	Pussellawa Melfret Boment Kalugala Wanahapuwa via Dunukeula Road	PS	7.10	
30		**24**	Panvilathenna Junction - Legumdeniya Main Road via Robert Nocks Gala Pussathenna	PS	3.70	
31		**25**	Boralu Mankada Junction - Millagahamulla Junction via Grohil Road Angammana Drate Kahawatta	PS	8.00	
32		**26**	Udaiguruwatta Road to Wewathenna Road	PRDA/PS	3.40	**22.20**
33	**Udunuwara**	**27**	Manikkawa Junction to Gonadhikawatta Road	PRDA/PS	6.80	
34		**28**	Viharagama - Watadeniya Road via Appallagoda	PS	1.87	

Serial No	D.S Division	Road ID	Road Name	Road Category	Length (Km)	Sub Total (Km)
35		**29**	Pamunuwa Daliwala Mugatiyapola Road	PRDA/PS	2.30	
36		**30**	Pamunuwa Junction - Elugoda Road	PRDA/PS	1.90	**12.87**
37	**Gangawata korele**	**5**	Ogastawatta Wagirarama Road - Udaperadeniya Road	PS	2.95	
38		**6**	Mahakanda Junction Mobre Samadi Mawatta via Sarasavigama Road	PS	3.45	
39		**7**	Gurudeniya - Dambawela Bus Stand	PRDA	0.75	
40		**8**	Dambawela Road , Kandy Thalathuoya via Govi Janapadaya	PS	0.98	**8.13**
41	**Hatharaliyadda**	**37**	Hatharaliyadda,Mahanuwara main Road ,cross Junction to Galagedara Minigamuwa main Road via polwatta Ihalagama	PS	3.75	
42		**38**	Poththapitiya Weligodapola main Road to Patapola post office via Alagalla primary school	PS	2.58	
43		**39**	Hatharaliyadda,Rambukkana main Road to Dedunupitiya post office to Weniwella Road via Kalotuwawa	PRDA	12.00	
44	**Hatharaliyadda**	**40**	Harataliyadda Mawathagama main Road to Anludeniya school to Paragoda Gonathenna Road	PS	4.41	**22.74**
45	**Pujapitiya**	**48**	Karaduwawala Gatathale Road	PS	2.85	
46		**49**	Bokkawala Pahala Higulwala via Miliyedda Road	PS	7.79	
47		**49A**	Vilana Pallegama - Watagoda Burton Watta	PRDA	2.01	**12.65**
48	**Pujapitiya & Harispattuwa**	**50**	Poojapitiya , Dodamthanna , Bothota , Antharagama , Pattiyawatta via Rajapihilla Road	PS	6.92	**6.92**
49	**Akurana**	**51**	Kasawatta Poojapitiya Road	PS	2.54	**2.54**
50		**52**	Malwanahinna Nirella via Main Road	PS	3.51	**3.51**
Total					**220.66**	**220.66**

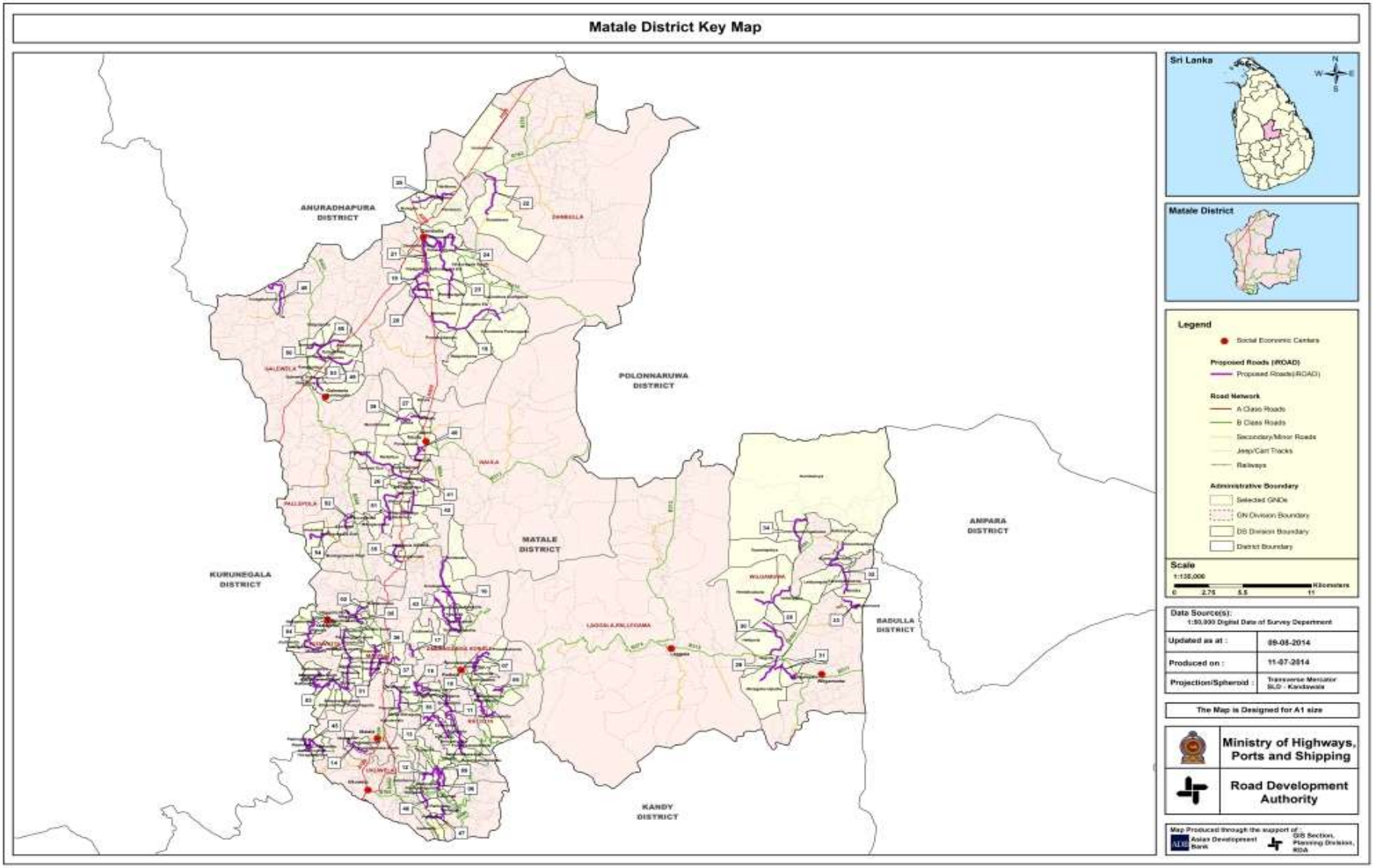
Nuwara Eliya District- Central Province
Rural Roads List

Serial No	D.S.Division	Road ID	Road Name	Road Category	Length (Km)	Sub Total (Km)
1	**Nuwara Eliya**	**16**	Uwakele Estate road	Estate Road	4.75	
2		**18**	Pilot Project road	PS	1	
3		**19**	Piduruthalagala Farm road	PS	1.5	
4		**20**	Kantha Govipola & Ranaviru Gammana road	PS	1.32	
5		**21**	Meepilimana Gamameda road	PS	3	
6		**23**	Thalawakele Galkanda road	PS	4	
7		**24**	Rahanwatta Maussaella road	PS	4	
8		**26**	Kandapola Konkordia road	PS	1.92	

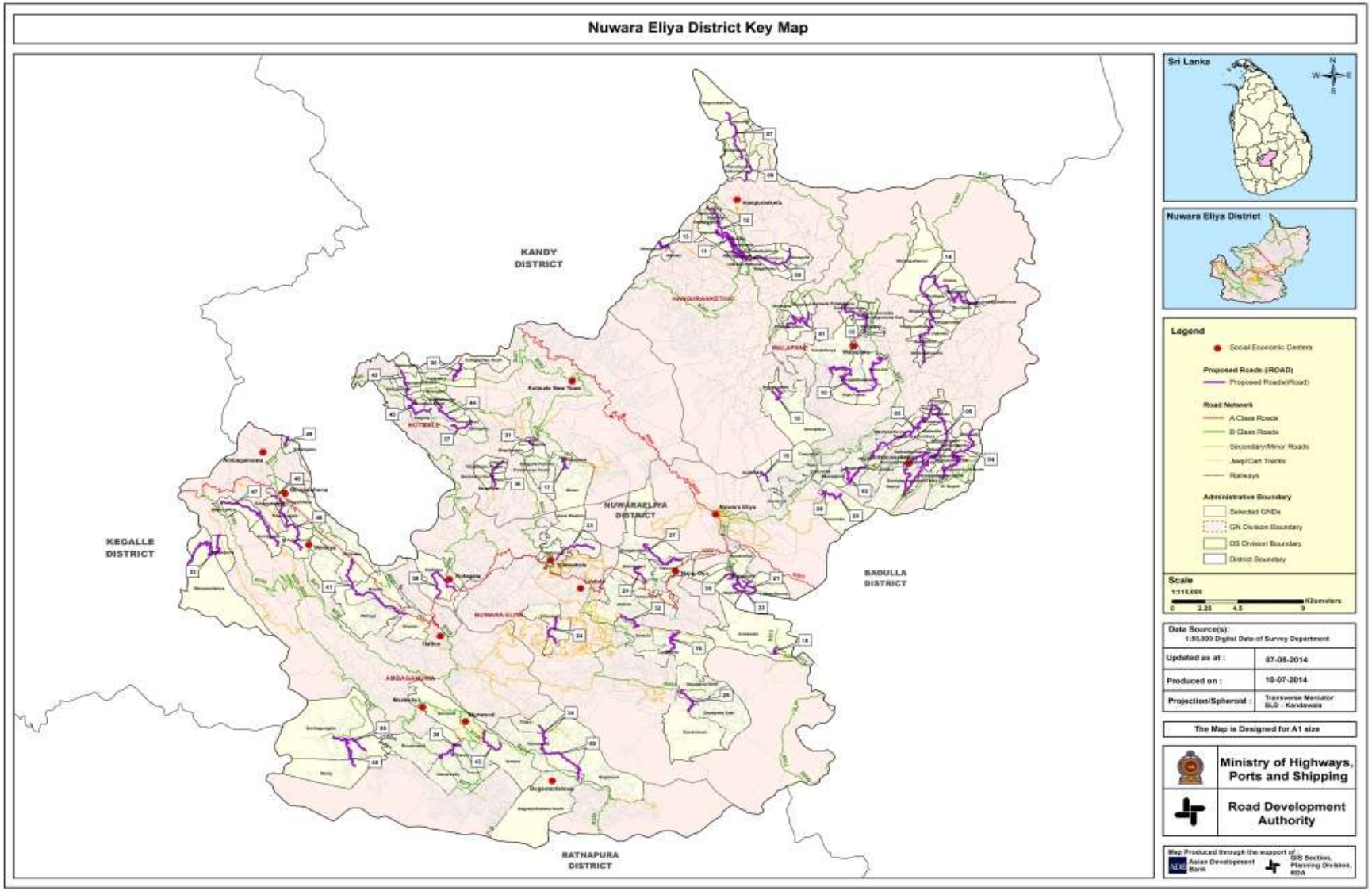
Serial No	D.S.Division	Road ID	Road Name	Road Category	Length (Km)	Sub Total (Km)
9		**28**	Kandapola Heatherset Estate road	Estate Road	1	
10		**29**	Nanuoya Udaradella road	PS	6.54	
11		**32**	Henfold Couleena Estate road	Estate Road	2.6	**31.63**
12	**Ambagamuwa**	**33**	Htiyegama Udapolgahawaththa Minuwandeniya road	PRDA	8	
13		**34**	Tillary Tinsing road	PS	4	
14		**38**	Stockhome lower Gruden road	PS	3.2	
15		**40**	Waladola Mare road	PS	4	
16		**41**	Welioya Shanon road	PRDA	9.5	
17		**42**	Wencher State road	PS	3.75	
18		**46**	Ginigathhena Dehigasthenna Ellauda road	PRDA	6.5	
19		**47**	Pallewaththa Dagampitiya road	PRDA	7	
20		**48**	Ginigathhena School road	PS	1	
21		**49**	Abagamuwa Shilalekana road	PS	1.25	**48.20**
22	**Walapane**	**1**	Ambagaspitiya- Ladupita - Liyanwela	PRDA	5	
23		**2**	Ragala Water Board - Ekagapura Road	PRDA	4.22	
24		**3**	Ragala Starpet - Panditha Kumbura - Kotambe Road	PRDA	10	
25		**4**	Udupussellawa - Kurupanawela - Meepanawa Road	PRDA	7	
26		**5**	Delmar - Galkadapathana - Rupaha Road	PS	5	
27		**6**	Walapone Hospital Road	PRDA	2.2	
28		**10**	Mahauva - Highforest Road	PS	14.4	
29		**15**	Keenagala Estate Road	PS	2	**49.82**
30	**Hanguranketha**	**7**	Adikarigama - Ambewela - Merimount Road	PRDA	4.6	
31		**8**	Rikillagaskada - Dimbulkumbura Road	PRDA	5.3	
32	**Hanguranketha**	**9**	Karaliyadda Village Road Via Gonagantenna Hospital	PS	2	
33		**11**	Rikillagaskada - Hapuwela Road	PRDA/PS	5	
34		**12**	Ambaliyadda - Ihala Kotape - Rikillagaskada Road	PS	7.6	
35		**13**	Pallebowala - Medagama - Deltota	PS	2	**26.50**
36	**Kothmale**	**17**	Lower Pundaluoya to upper Shingama road	PS	2.2	
37		**30**	Kothmale Dam View point to Kotagepitiya road	PRDA	3	
38		**31**	Connecting road to Halpola	PS	1.5	
39		**36**	Beramana Udagama Madakubura road	PRDA	4	
40		**37**	Katugolla Hunugaloya Nawathispana road	PS	2.6	
41		**43**	Hapugasthalawa Halgolla road	PRDA	5	
42		**44**	Nawathispane Harangala road	PRDA	3	
43		**45**	Hapugasthalawa Dabagala road	PRDA	2	**23.30**
Total					**179.45**	**179.45**

GENERAL LOCATION MAPS

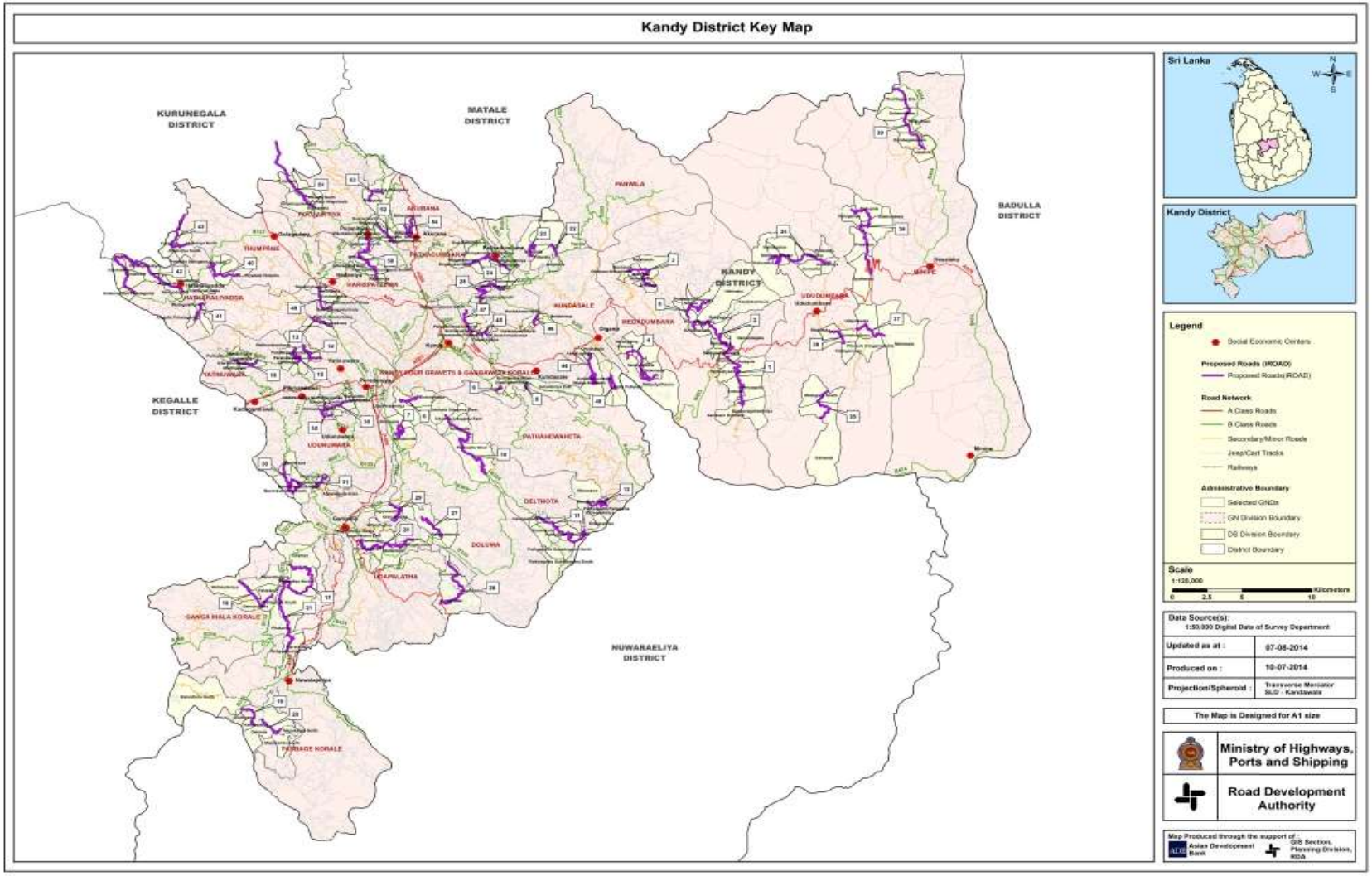
Mathale District – Central Province



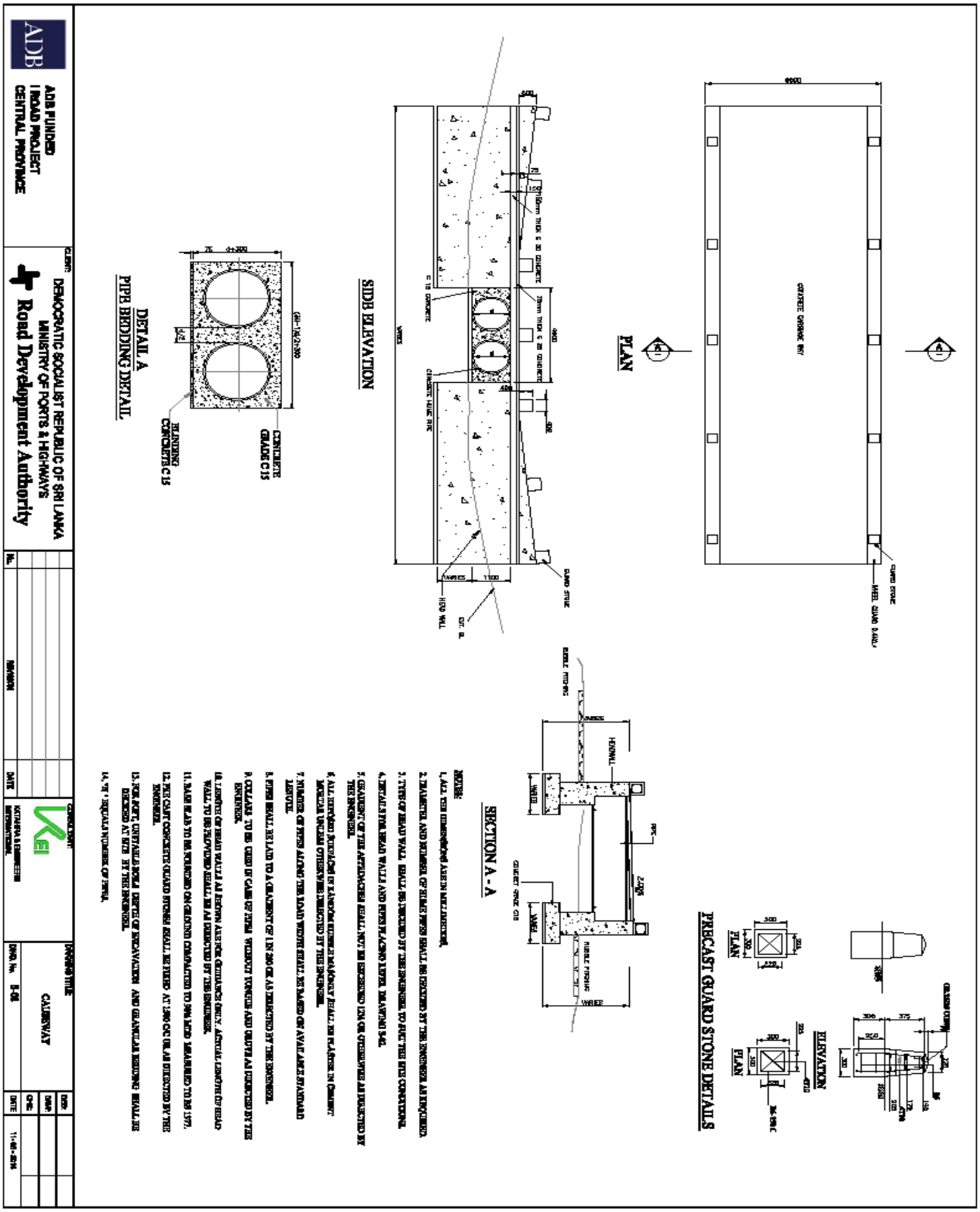
Nuwara-Eliya District – Central Province

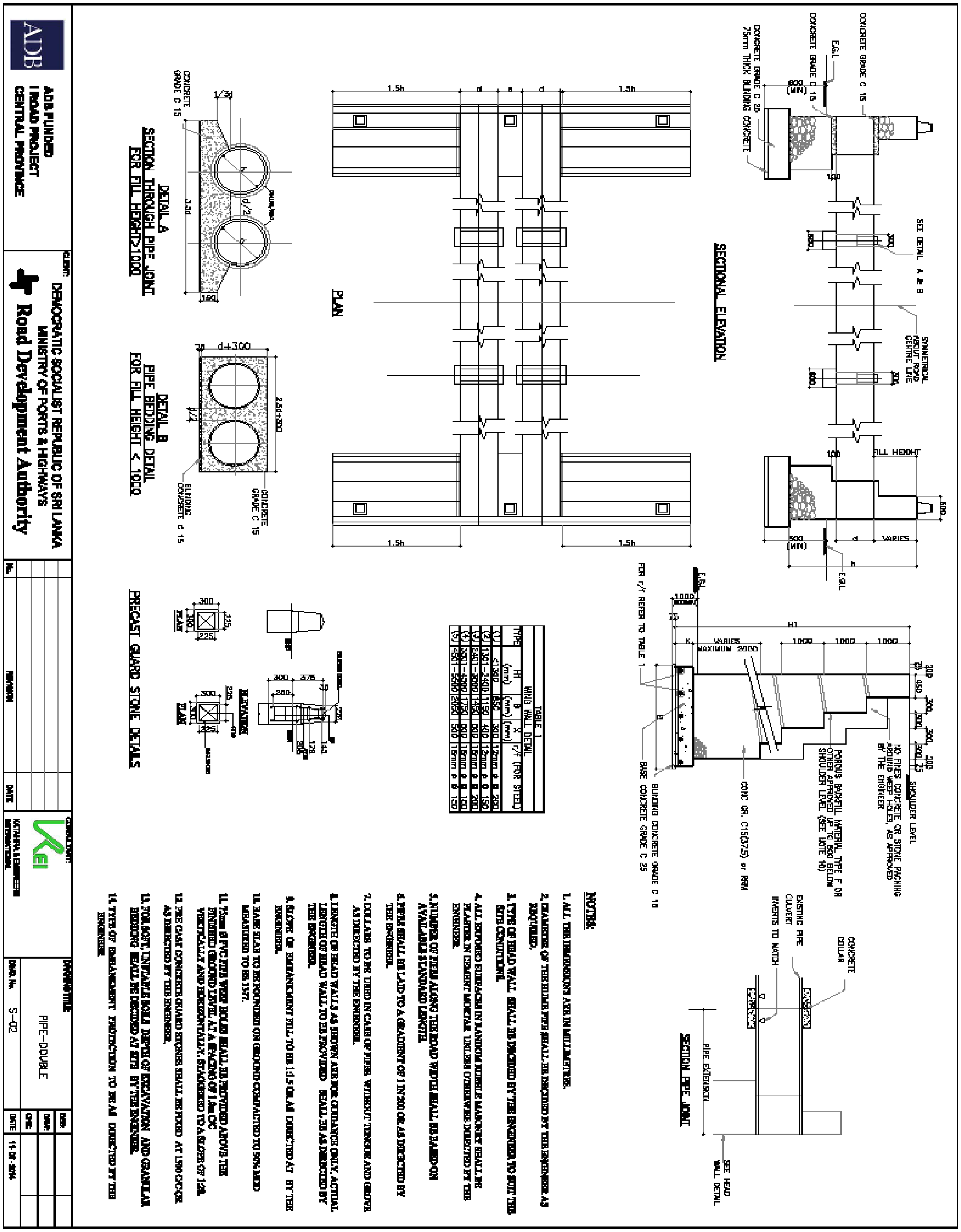


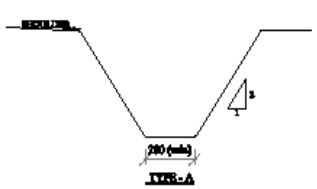
Kandy District – Central Province



PROPOSED CROSS SECTIONS

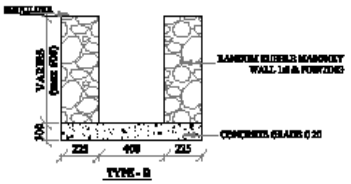



ADB FUNDED
I ROAD PROJECT
CENTRAL PROVINCE
DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA
MINISTRY OF PORTS & HIGHWAYS
Road Development Authority
PIPE-DOUBLE
S-02
SECTIONAL ELEVATION
PLAN
DETAIL A
SECTION THROUGH PIPE JOINT
FOR FILL HEIGHT>1000
DETAIL B
PIPE BEDDING DETAIL
FOR FILL HEIGHT < 1000
PRECAST GUARD STONE DETAILS
SECTION PIPE JOINT
NOTES:

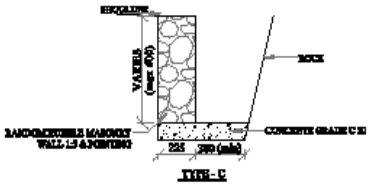


TYPE - A

EARTH DRAIN
SCALE : 1:25

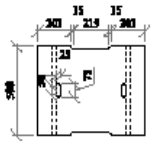


TYPE - B

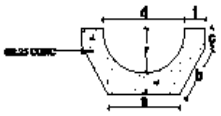


TYPE - C

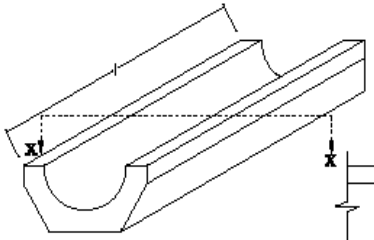
MASONRY RUBBLE LINED DRAIN
SCALE : 1:25



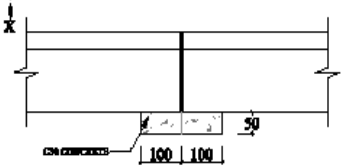
PLAN OF 450mm X 295mm X 150mm COVER SLAB



SECTION X-X



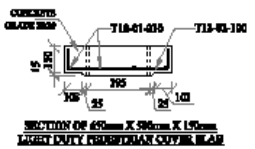
PLAN VIEW



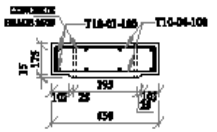
FIXING DETAILS

TYPE	DIAMETER	THIKNESS (t)	LENGTH (l)	a	b	c	d/2 (r)	R/F
9"	225	50	600	216	140	40	112	R6
12"	300	50	600	250	160	75	150	R6

PRECAST OPEN CHANNEL DRAIN (TYPE D)
SCALE : 1:10

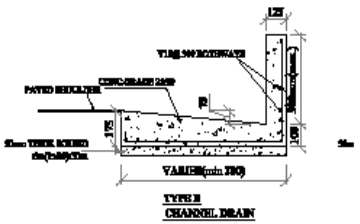


SECTION OF 450mm X 295mm X 150mm LIGHT DUTY PEDESTRIAN COVER SLAB

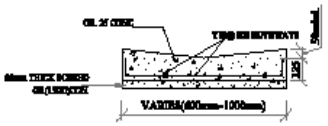


SECTION OF 450mm X 300mm X 175mm HEAVY DUTY COVER SLAB

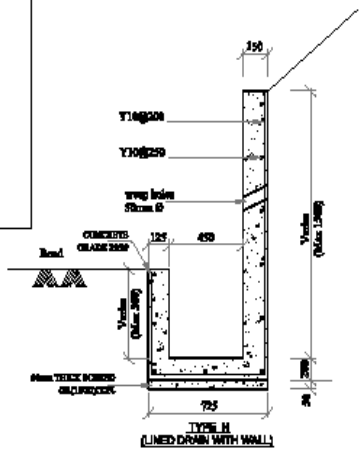
DETAIL OF COVER SLAB
(SCALE 1:25)



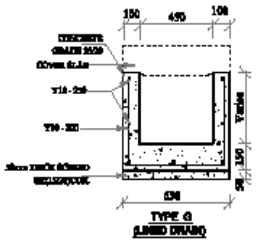
TYPE B
CHANNEL DRAIN



TYPE F
EDGE DRAIN



TYPE H
(LINED DRAIN WITH WALL)

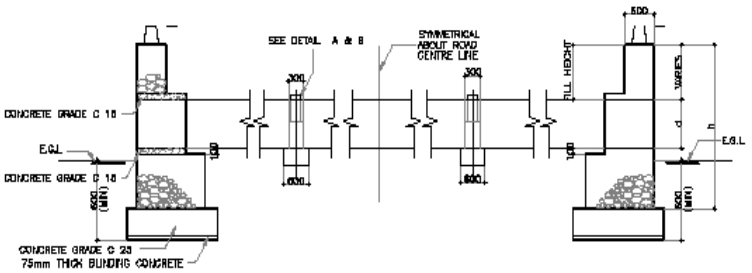


TYPE G
(LINED DRAIN)

REINFORCEMENT CONCRETE DRAINS
SCALE : 1:25

ADB FUNDED I ROAD PROJECT CENTRAL PROVINCE	CLIENT: DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA MINISTRY OF PORTS & HIGHWAYS Road Development Authority	No.	REVISION	DATE	CONSULTANT: KATAHIRA & ENGINEERS INTERNATIONAL

DRAWING TITLE: TYPICAL DRAIN SECTIONS	DES:		
	DRAW:		
	CHK:		
DWG No. D8-03	DATE	23-06-2014	



SECTIONAL ELEVATION

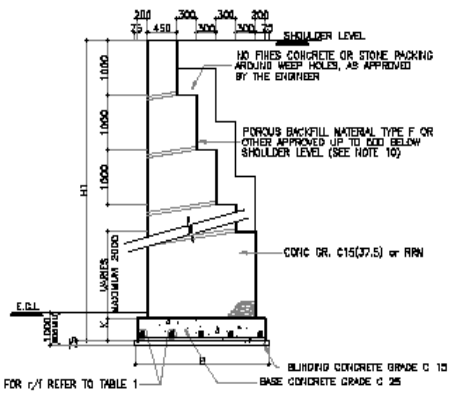
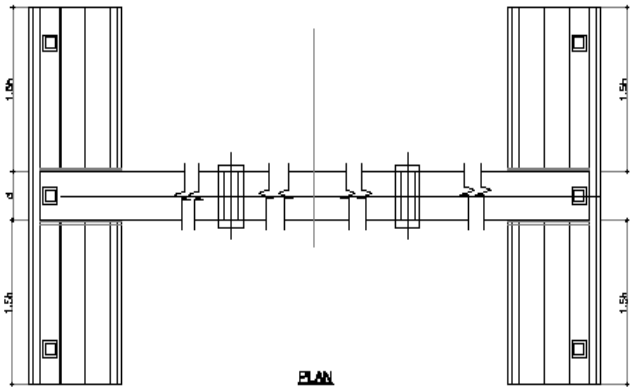
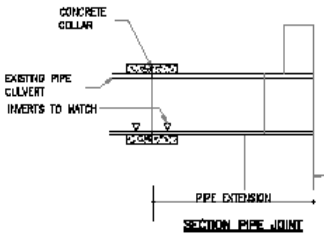


TABLE 1
WING WALL DETAIL

TYPE	H1 (mm)	B (mm)	X (mm)	r/t (FOR STEEL)
(1)	<1301	850	300	12mm ϕ @ 200
(2)	1301-2400	1150	400	12mm ϕ @ 150
(3)	2401-3500	1450	500	16mm ϕ @ 200
(4)	3501-4500	1750	500	16mm ϕ @ 150
(5)	4501-5500	2050	500	16mm ϕ @ 150



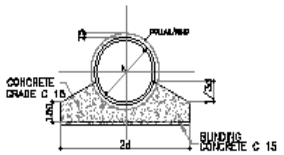
PLAN



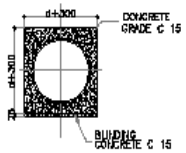
SECTION PIPE JOINT

NOTES:

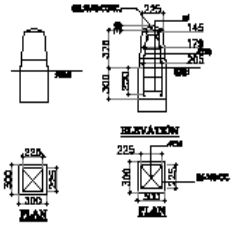
1. ALL THE DIMENSIONS ARE IN MILLIMETRES.
2. DIAMETER OF THE HUME PIPE SHALL BE DECIDED BY THE ENGINEER AS REQUIRED.
3. TYPE OF HEAD WALL SHALL BE DECIDED BY THE ENGINEER TO SUIT THE SITE CONDITIONS.
4. ALL EXPOSED SURFACES IN RANDOM RUBBLE MASONRY SHALL BE PLASTER IN CEMENT MORTAR UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
5. NUMBER OF PIPES ALONG THE ROAD WIDTH SHALL BE BASED ON AVAILABLE STANDARD LENGTH.
6. PIPES SHALL BE LAID TO A GRADIENT OF 1 IN 200 OR AS DIRECTED BY THE ENGINEER.
7. COLLARS TO BE USED IN CASE OF PIPES WITHOUT TONGUE AND GROVE AS DIRECTED BY THE ENGINEER.
8. LENGTH OF HEAD WALLS AS SHOWN ARE FOR GUIDANCE ONLY. ACTUAL LENGTH OF HEAD WALL TO BE PROVIDED SHALL BE AS DIRECTED BY THE ENGINEER.
9. SLOPE OF EMBANKMENT FILL TO BE 1:1.5 OR AS DIRECTED AT BY THE ENGINEER.
10. BASE SLAB TO BE FOUNDED ON GROUND COMPACTED TO 90% MDD MEASURED TO BS 1377.
11. 75mm ϕ PVC PIPE WEEP HOLES SHALL BE PROVIDED ABOVE THE FINISHED GROUND LEVEL AT A SPACING OF 1.0m C/C VERTICALLY AND HORIZONTALLY, STAGGERED TO A SLOPE OF 1:20.
12. PRE CAST CONCRETE GUARD STONES SHALL BE FIXED AT 1500 C/C OR AS DIRECTED BY THE ENGINEER.
13. FOR SOFT, UNSTABLE SOILS DEPTH OF EXCAVATION AND GRANULAR BEDDING SHALL BE DECIDED AT SITE BY THE ENGINEER.
14. TYPE OF EMBANKMENT PROTECTION TO BE AS DIRECTED BY THE ENGINEER.



DETAIL A
SECTION THROUGH PIPE JOINT
FOR FILL HEIGHT>600



DETAIL B
PIPE BEDDING DETAIL
FOR FILL HEIGHT < 600

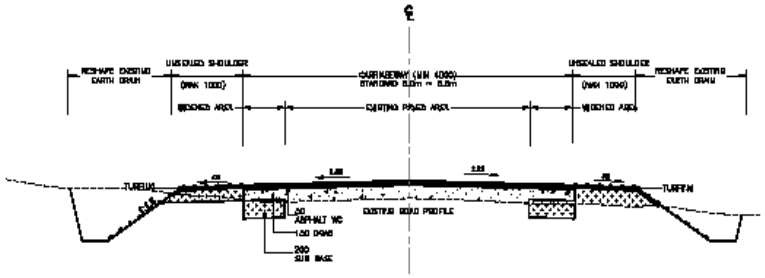


PRECAST GUARD STONE DETAILS

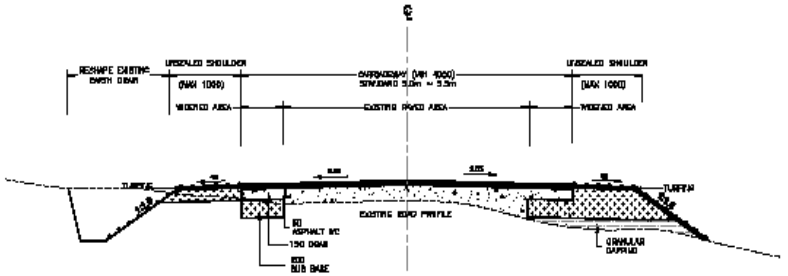
ADB FUNDED I ROAD PROJECT CENTRAL PROVINCE	CLIENT: DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA MINISTRY OF PORTS & HIGHWAYS Road Development Authority	No.	REVISION	DATE	CONSULTANT: KATAHIRA & ENGINEERS INTERNATIONAL

DRAWING TITLE: PIPE – SINGLE
DRAWING No. S–01
DES:
DRAF:
CHE:
DATE: 11-06-2014

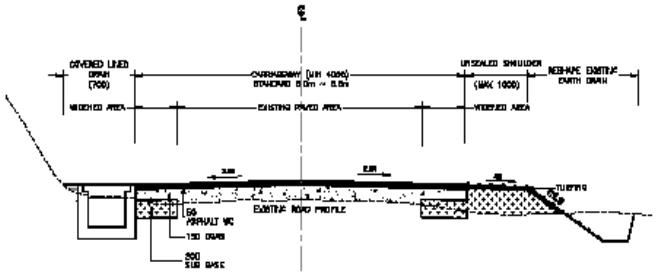
PROPOSED TYPICAL SECTIONS (TS) FOR PRDA ROAD



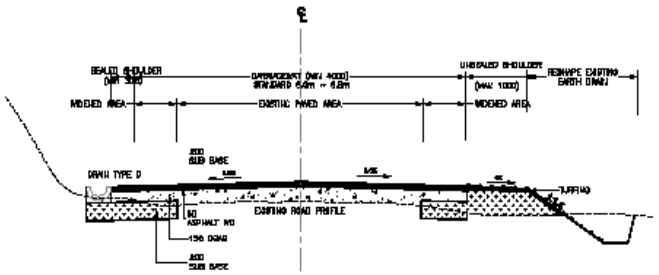
TS–A (TYPICAL SECTION FOR ROAD RECONSTRUCTION – BOTH SIDES EARTH DRAINS)



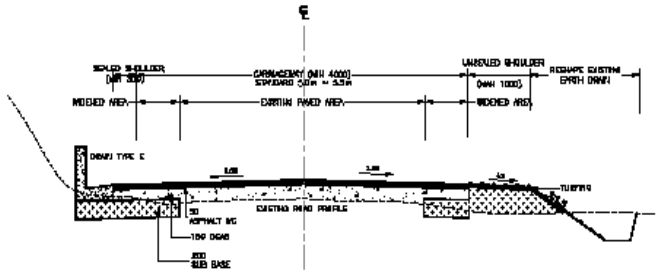
TS–B (TYPICAL SECTION FOR ROAD RECONSTRUCTION – ONE SIDE EARTH DRAINS)



TS–C (TYPICAL SECTION FOR ROAD RECONSTRUCTION – ONE SIDE COVERED LINE DRAIN)



TS–D (TYPICAL SECTION FOR ROAD RECONSTRUCTION – ONE SIDE OPEN CHANNEL DRAIN



TS–E (TYPICAL SECTION FOR ROAD RECONSTRUCTION – ONE SIDE CHANNEL DRAIN)

LEGEND:

	ASPHALT WEARING COURSE	WC
	DENSE GRANULAR AGGREGATE BASE	DGAB
	GRANULAR SUB BASE (CBR>30%)	GS
	GRANULAR CAPPING (CBR>10%)	GC
	SHOULDER FILL	

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE MENTIONED.
2. THIS DRAWING PROVIDES A GUIDANCE ONLY. EXACT DETAILS TO SUIT SITE CONDITIONS SHALL BE DECIDED BY THE ENGINEER AT CONSTRUCTION STAGE.
3. SELECT DRAINS AS PER SITE CONDITION FOR DRAIN DETAILS REFER DRAWING NO. DS–01
4. FOR TOE WALL DETAILS REFER DRAWING NO. S–04 & S–05.
5. IF THE SPECIFIED MINIMUM DIMENSIONS SHOWN IN THE DRAWING CAN NOT BE MAINTAINED DUE TO ROW RESTRICTIONS THE DIMENSIONS CAN BE REDUCED SUBJECT TO THE APPROVAL OF THE ENGINEER.
6. INTERFACING DETAILS WITH ADJACENT BUILDINGS/LANDS SHOULD BE DECIDED ACCORDING TO THE SITE CONDITIONS.
7. MINIMUM THICKNESS OF DGAB SHOULD BE 100mm TOP OF THE EXISTING PAVEMENT.
8. MINIMUM THICKNESS OF THE GRANULAR CAPPING LAYER SHOULD BE 100mm, IF THE THICKNESSES < 100mm USE GRANULAR SUB BASE.
9. ISOLATED BASE FAILURE SECTION SHOULD BE RECTIFIED PRIOR TO EXISTING PAVEMENT STRENGTHENING.

ADB FUNDED
I ROAD PROJECT
CENTRAL PROVINCE

CLIENT: DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA
MINISTRY OF PORTS & HIGHWAYS
Road Development Authority

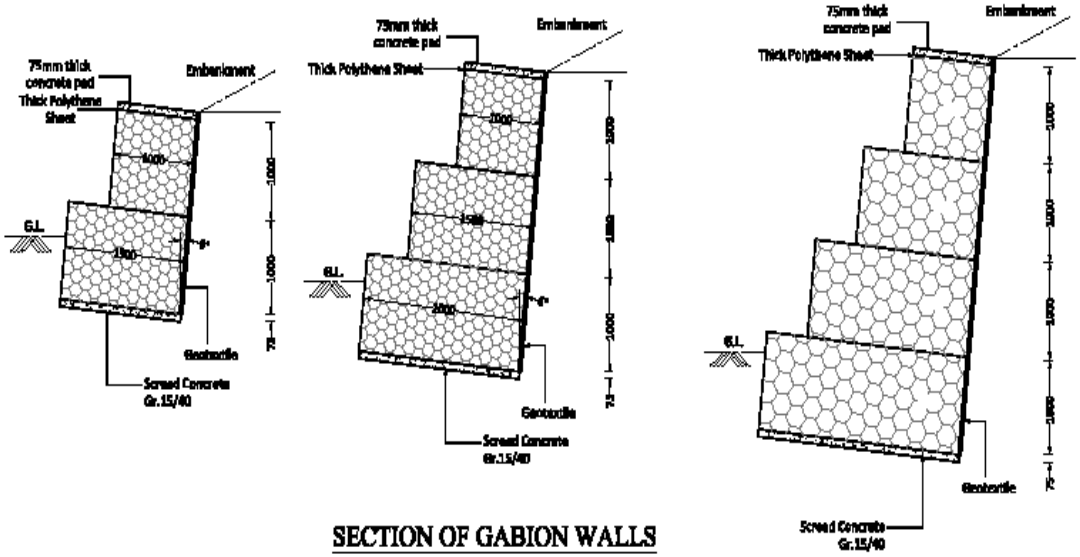
No.	REVISION	DATE

CONSULTANT: KATAHIRA & ENGINEERS INTERNATIONAL

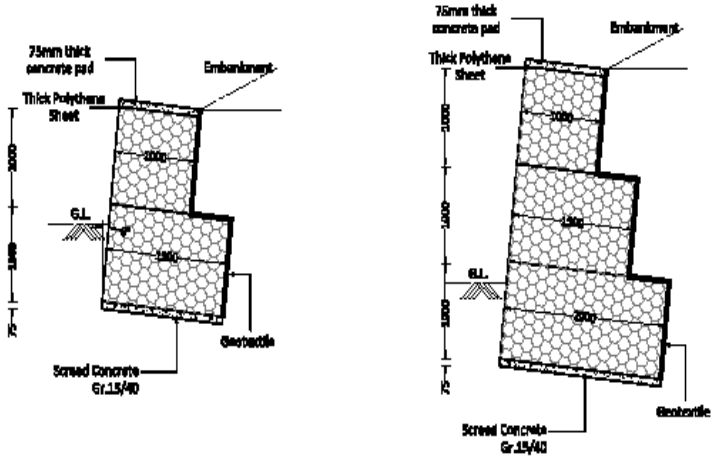
DRAWING TITLE: TYPICAL CROSS SECTION FOR PRDA ROAD

DWG. No. TS–PRDA–01

DES: DRN: CHK: DATE 07–07–2014



SECTION OF GABION WALLS

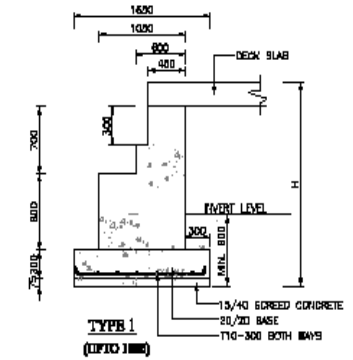


SECTION OF GABION WALLS

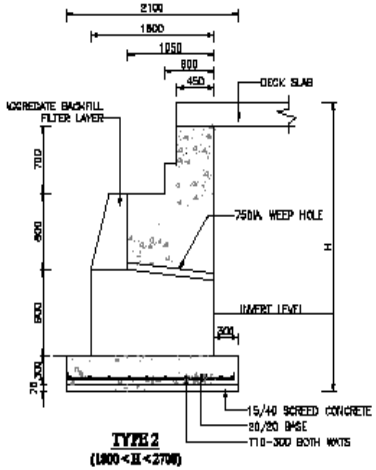
NOTES:

1. ALL THE DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE STATED
2. THIS DRAWINGS PROVIDES A GUIDANCE ONLY. EXACT DETAILS TO SUIT SITE CONDITIONS, SHALL BE DECIDED BY THE ENGINEER AT CONSTRUCTION STAGE.
3. ALL SCREED IN GRADE C15 CONCRETE AND IT IS 50MM THICK UNLESS OTHERWISE SHOWN.
4. FOUNDATION DEPTHS IN EACH WALL TYPE SHOULD BE AS SHOWN OR AS DIRECTED AT SITE TO SUIT SITE CONDITIONS.
5. USE DOUBLE TWISTED HEXAGONAL MESH AS INSTRUCTED IN STANDARD SPECIFICATION FOR THE BOXES.
6. BROKEN ROCK SHALL BE VARYING IN SIZE (SIZE MINIMUM 100MM AND MAXIMUM 300MM)
7. USE GEO-TEXTILE AS DIRECTED BY THE ENGINEER ACCORDING TO THE SITE CONDITION.

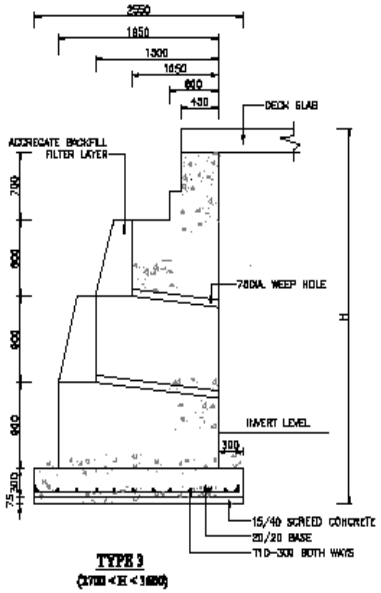
ADB FUNDED I ROAD PROJECT CENTRAL PROVINCE	CLIENT: DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA MINISTRY OF PORTS & HIGHWAYS Road Development Authority	No.	REVISION	DATE	CONSULTANT: KATAHIRA & ENGINEERS INTERNATIONAL	DRAWING TITLE: RETAINING WALL GABION WALL	DES: DRN: CHK: DATE: 11-05-2014
						DWG No. S -07	



TYPE 1
(H≤1800)

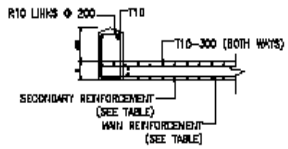


TYPE 2
(1800 < H < 2700)

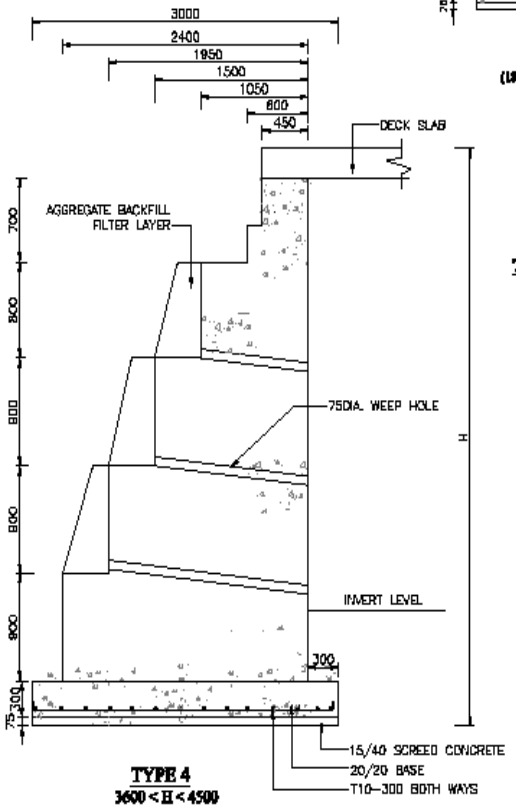


TYPE 3
(2700 < H < 3600)

REINFORCEMENT SCHEDULE FOR CULVERT DECK SLABS			
CULVERT SPAN(m) S	THICKNESS OF SLAB(mm) D	MAIN REINFORCEMENT	SECONDARY REINFORCEMENT
0.6	175	T10-150	T10-300
1.0	200	T10-150	T12-175
1.5	225	T20-150	T12-150
2.0	250	T20-175	T16-200
2.5	200	T20-150	T16-200
3.0	275	T20-150	T16-200

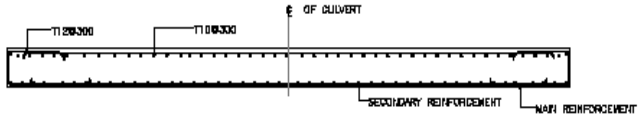


REINFORCEMENT DETAILS AT PARAPET

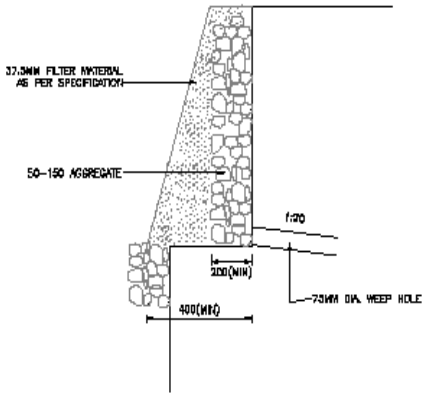


TYPE 4
3600 < H < 4500

TYPICAL SECTIONS FOR ABUTMENTS OF SLAB CULVERTS



TYPICAL REINFORCEMENT DETAILS FOR CULVERT DECK SLAB



DETAIL OF POROUS BACK FILL

NOTE :

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. CONCRETE GRADE TO BE IN CULVERT DECK SLAB GRADE 30(N) IN BASE & CASTING BEAM GRADE 20(N) AND IN PARAPET GRADE 25(N)
3. ABUTMENT WALLS SHALL BE RANDOM RUBBLE MASONRY FOR TYPE 1 AND 2, GRADE 15(N) CONCRETE FOR TYPE 3 AND 4 OR AS DIRECTED BY THE ENGINEER.
4. POROUS BACK FILL TO BE PROVIDED ALONG THE ENTIRE LENGTH OF THE WALL.
5. PROVIDE WEEP HOLES OF 75 DIA. PVC PIPE OR SIMILAR APPROVED.
6. IF WEAKER MATERIALS IS FOUND AT BASE LEVEL, EITHER MATERIALS TO BE REMOVED AND REFILLED WITH SUITABLE MATERIAL OR INCREASE THE BASE SLAB WIDTH TO SUIT.
7. FOUNDATION DEPTH BELOW THE INVERT LEVEL SHALL BE DECIDED TO SUIT CONDITIONS AND SHALL NOT BE LESS THAN 600 MM.
8. FOR CULVERT ABUTMENTS FOUNDED ON HARD ROCK, BASE SLAB SHALL BE OF GRADE 15(N) MASS CONCRETE.
9. COVER TO REINFORCEMENT OF CULVERT DECK SLAB SHALL BE 40MM

ADB FUNDED
I ROAD PROJECT
CENTRAL PROVINCE

CLIENT: DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA
MINISTRY OF PORTS & HIGHWAYS
Road Development Authority

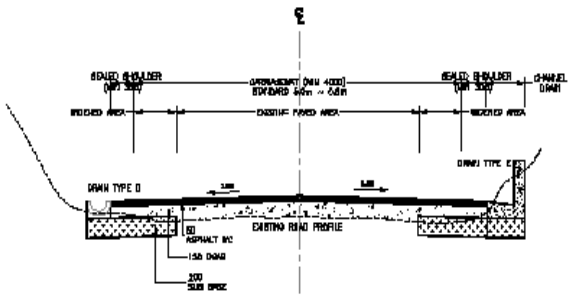
No.	REVISION	DATE

CONSULTANT: KATAHIRA & ENGINEERS INTERNATIONAL

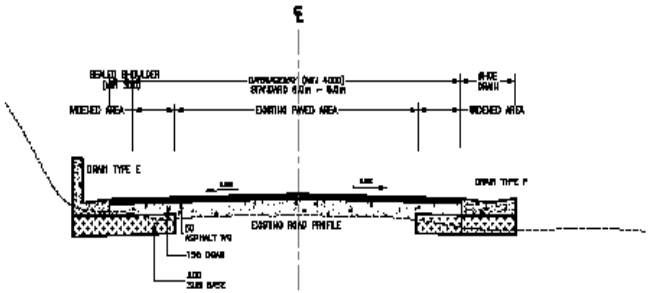
DRAWING TITLE: SLAB CULVERT
DWG No. S-03

DES:
DRAWN:
CHKD:
DATE: 11-09-2016

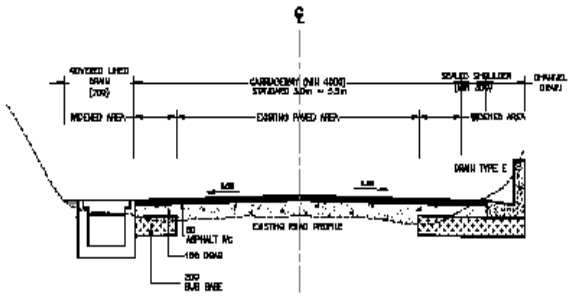
PROPOSED TYPICAL SECTIONS (TS) FOR PRDA ROAD



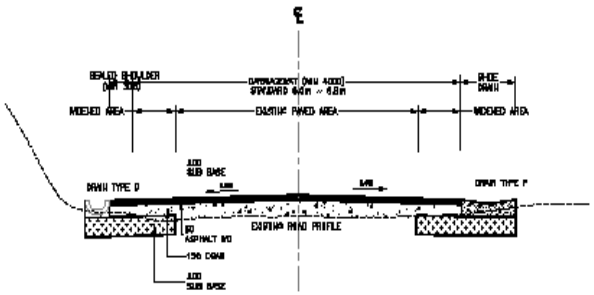
TS-K (TYPICAL SECTION FOR ROAD RECONSTRUCTION)
(ONE SIDE TYPE "D" DRAIN AND OTHER SIDE TYPE "E")



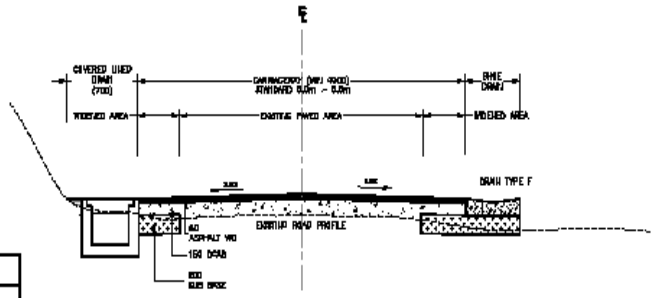
TS-L (TYPICAL SECTION FOR ROAD RECONSTRUCTION)
(ONE SIDE TYPE "E" DRAIN AND OTHER SIDE TYPE "F")



TS-M (TYPICAL SECTION FOR ROAD RECONSTRUCTION)
(ONE SIDE LINED DRAIN AND OTHER SIDE TYPE "E")



TS-N (TYPICAL SECTION FOR ROAD RECONSTRUCTION)
(ONE SIDE TYPE "D" DRAIN AND OTHER SIDE TYPE "F")



TS-O (TYPICAL SECTION FOR ROAD RECONSTRUCTION)
(ONE SIDE LINED DRAIN AND OTHER SIDE TYPE "F")

LEGEND:

	ASPHALT WEARING COURSE	WC
	DENSE GRANULAR AGGREGATE BASE	DGAB
	GRANULAR SUB BASE (CBR>30%)	GS
	GRANULAR CAPPING (CBR>10%)	GC
	SHOULDER FILL	

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE MENTIONED.
2. THIS DRAWING PROVIDES A GUIDANCE ONLY. EXACT DETAILS TO SUIT SITE CONDITIONS SHALL BE DECIDED BY THE ENGINEER AT CONSTRUCTION STAGE.
3. SELECT DRAINS AS PER SITE CONDITION FOR DRAIN DETAILS REFER DRAWING NO. DS-01
4. FOR TOE WALL DETAILS REFER DRAWING NO. S-04 & S-05.
5. IF THE SPECIFIED MINIMUM DIMENSIONS SHOWN IN THE DRAWING CAN NOT BE MAINTAINED DUE TO ROW RESTRICTIONS THE DIMENSIONS CAN BE REDUCED SUBJECT TO THE APPROVAL OF THE ENGINEER.
6. INTERFACING DETAILS WITH ADJACENT BUILDINGS/LANDS SHOULD BE DECIDED ACCORDING TO THE SITE CONDITIONS.
7. MINIMUM THICKNESS OF DGAB SHOULD BE 100mm TOP OF THE EXISTING PAVEMENT.
8. MINIMUM THICKNESS OF THE GRANULAR CAPPING LAYER SHOULD BE 100mm, IF THE THICKNESSES < 100mm USE GRANULAR SUB BASE.
9. ISOLATED BASE FAILURE SECTION SHOULD BE RECTIFIED PRIOR TO EXISTING PAVEMENT STRENGTHENING.

ADB FUNDED
I ROAD PROJECT
CENTRAL PROVINCE

CLIENT: DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA
MINISTRY OF PORTS & HIGHWAYS
Road Development Authority

No.	REVISION	DATE

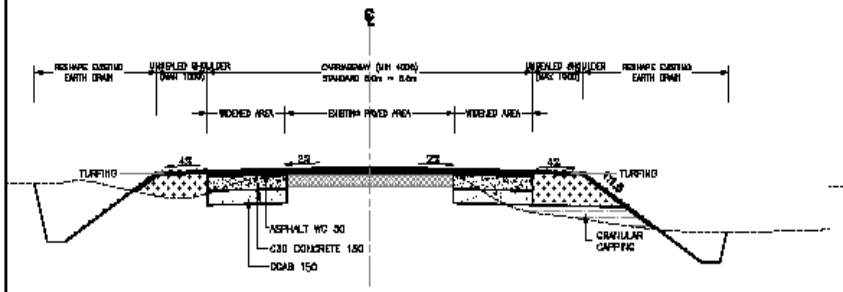
CONSULTANT: KOTAHENA & ENGINEERS INTERNATIONAL

DRAWING TITLE: TYPICAL CROSS SECTION FOR PRDA ROAD

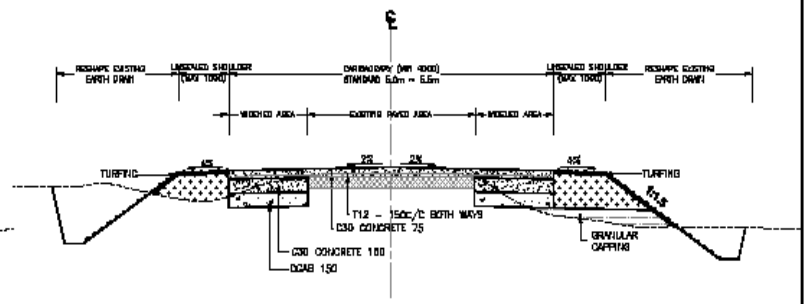
DWG. No. TS-PRDA-03

DES: DRAF: CHK: DATE: 07-07-2014

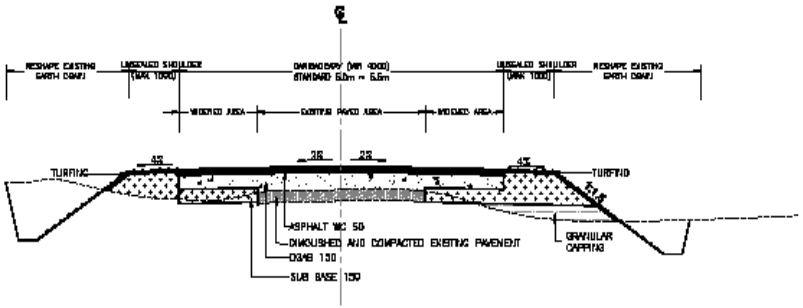
PROPOSED TYPICAL SECTIONS (TS) FOR PRDA ROAD



TS–P (TYPICAL SECTION FOR OVERLAYING ON CONCRETE SURFACE)



TS–Q (TYPICAL SECTION FOR OVERLAYING ON CONCRETE SURFACE – PARTLY DAMAGED)



TS–R (TYPICAL SECTION FOR OVERLAYING ON CONCRETE SURFACE – DAMAGED)

LEGEND:

	ASPHALT WEARING COURSE	WC
	DENSE GRANULAR AGGREGATE BASE	DGAB
	GRANULAR SUB BASE (TYPE I–CBR>30%)	GS
	GRANULAR CAPPING (TYPE II–CBR>10%)	GC
	SHOULDER FILL	
	BLINDING LAYER (GRADED AGGREGATE)	
	ROCK FILL (MAXIMUM SIZE 250mm)	
	QUARRY FINE	
	C30 CONCRETE	

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE MENTIONED.
2. THIS DRAWING PROVIDES A GUIDANCE ONLY. EXACT DETAILS TO SUIT SITE CONDITIONS SHALL BE DECIDED BY THE ENGINEER AT CONSTRUCTION STAGE.
3. SELECT DRAINS AS PER SITE CONDITION FOR DRAIN DETAILS REFER DRAWING NO. DS–01
4. FOR TOE WALL DETAILS REFER DRAWING NO. S–04 & S–05.
5. IF THE SPECIFIED MINIMUM DIMENSIONS SHOWN IN THE DRAWING CAN NOT BE MAINTAINED DUE TO ROW RESTRICTIONS THE DIMENSIONS CAN BE REDUCED SUBJECT TO THE APPROVAL OF THE ENGINEER.
6. INTERFACING DETAILS WITH ADJACENT BUILDINGS/LANDS SHOULD BE DECIDED ACCORDING TO THE SITE CONDITIONS.
7. MINIMUM THICKNESS OF DGAB SHOULD BE 100mm TOP OF THE EXISTING PAVEMENT.
8. MINIMUM THICKNESS OF THE GRANULAR CAPPING LAYER SHOULD BE 100mm, IF THE THICKNESSES < 100mm USE GRANULAR SUB BASE.
9. ISOLATED BASE FAILURE SECTION SHOULD BE RECTIFIED PRIOR TO EXISTING PAVEMENT STRENGTHENING.

ADB FUNDED
I ROAD PROJECT
CENTRAL PROVINCE

CLIENT: DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA
MINISTRY OF PORTS & HIGHWAYS
Road Development Authority

No.	REMARKS	DATE

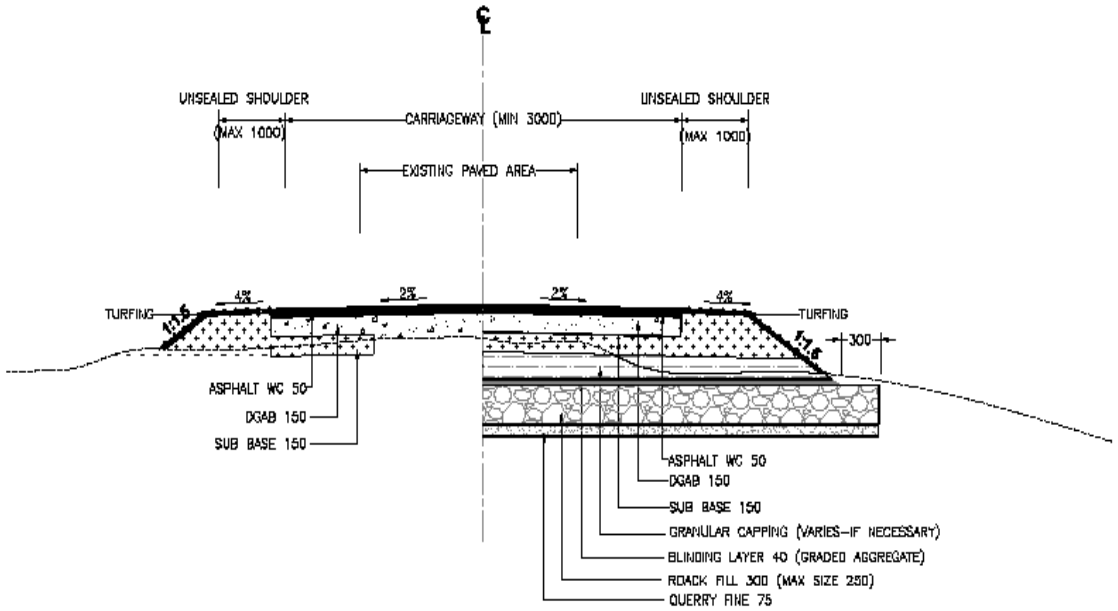
CONSULTANT: KATAHIRA & ENGINEERS INTERNATIONAL

DRAWING TITLE: TYPICAL CROSS SECTION FOR PRDA ROAD

DWG. No. TS–PRDA–04

DSGN: | DRWN: | CHKD: | DATE: 07–07–2014

PROPOSED TYPICAL SECTIONS (TS) FOR WEEK SOIL AREA



TS-M (TYPICAL SECTION FOR MARSHY & WEAK SOIL AREA)

LEGEND:

	ASPHALT WEARING COURSE	WC
	DENSE GRANULAR AGGREGATE BASE	DGAB
	GRANULAR SUB BASE (TYPE I-CBR>30%)	GS
	GRANULAR CAPPING (TYPE II-CBR>10%)	GC
	SHOULDER FILL	
	BLINDING LAYER (GRADED AGGREGATE)	
	ROCK FILL (MAXIMUM SIZE 250mm)	
	QUARRY FINE	
	C30 CONCRETE	
	INTERLOCKING BLOCK	

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE MENTIONED.
2. THIS DRAWING PROVIDES A GUIDANCE ONLY. EXACT DETAILS TO SUIT SITE CONDITIONS SHALL BE DECIDED BY THE ENGINEER AT CONSTRUCTION STAGE.
3. SELECT DRAINS AS PER SITE CONDITION FOR DRAIN DETAILS REFER DRAWING NO. DS-01
4. FOR TOE WALL DETAILS REFER DRAWING NO. S-04 & S-05.
5. IF THE SPECIFIED MINIMUM DIMENSIONS SHOWN IN THE DRAWING CAN NOT BE MAINTAINED DUE TO ROW RESTRICTIONS THE DIMENSIONS CAN BE REDUCED SUBJECT TO THE APPROVAL OF THE ENGINEER.
6. INTERFACING DETAILS WITH ADJACENT BUILDINGS/LANDS SHOULD BE DECIDED ACCORDING TO THE SITE CONDITIONS.
7. MINIMUM THICKNESS OF DGAB SHOULD BE 100mm TOP OF THE EXISTING PAVEMENT.
8. MINIMUM THICKNESS OF THE GRANULAR CAPPING LAYER SHOULD BE 100mm, IF THE THICKNESSES < 100mm USE GRANULAR SUB BASE.
9. ISOLATED BASE FAILURE SECTION SHOULD BE RECTIFIED PRIOR TO EXISTING PAVEMENT STRENGTHENING.

ADB FUNDED
I ROAD PROJECT
CENTRAL PROVINCE

CLIENT: DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA
MINISTRY OF PORTS & HIGHWAYS
Road Development Authority

No. | REVISION | DATE

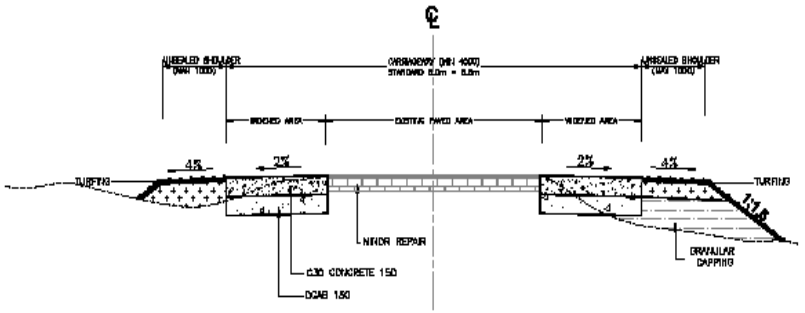
CONSULTANT: KATAHIRA & ENGINEERS INTERNATIONAL

DRAWING TITLE: TYPICAL CROSS SECTION FOR PS ROAD

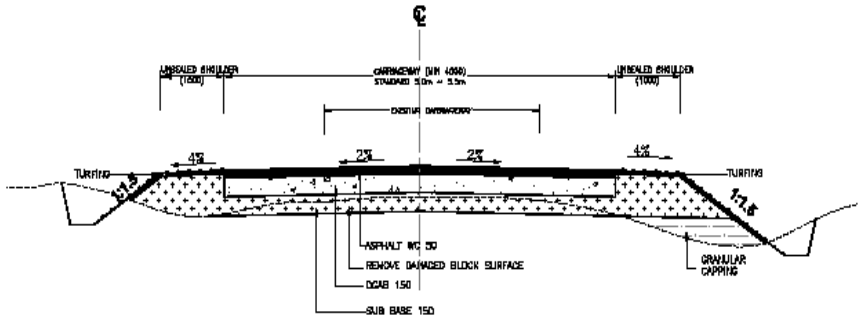
DWG. No. TS-PS-09

DES: | DRN: | CHK: | DATE: 23-08-2014

PROPOSED TYPICAL SECTIONS (TS) FOR PRDA ROAD



TS-U (TYPICAL SECTION FOR BLOCK PAVED SURFACE – GOOD CONDITION)



TS-V (TYPICAL SECTION FOR BLOCK PAVED SURFACE – DAMAGED)

LEGEND:

	ASPHALT WEARING COURSE	WC
	DENSE GRANULAR AGGREGATE BASE	DGAB
	GRANULAR SUB BASE (TYPE I–CBR>30%)	GS
	GRANULAR CAPPING (TYPE II–CBR>10%)	GC
	SHOULDER FILL	
	BLINDING LAYER (GRADED AGGREGATE)	
	ROCK FILL (MAXIMUM SIZE 250mm)	
	QUARRY FINE	
	C30 CONCRETE	
	INTERLOCKING BLOCK	

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE MENTIONED.
2. THIS DRAWING PROVIDES A GUIDANCE ONLY. EXACT DETAILS TO SUIT SITE CONDITIONS SHALL BE DECIDED BY THE ENGINEER AT CONSTRUCTION STAGE.
3. SELECT DRAINS AS PER SITE CONDITION FOR DRAIN DETAILS REFER DRAWING NO. DS-01
4. FOR TOE WALL DETAILS REFER DRAWING NO. S-04 & S-05.
5. IF THE SPECIFIED MINIMUM DIMENSIONS SHOWN IN THE DRAWING CAN NOT BE MAINTAINED DUE TO ROW RESTRICTIONS THE DIMENSIONS CAN BE REDUCED SUBJECT TO THE APPROVAL OF THE ENGINEER.
6. INTERFACING DETAILS WITH ADJACENT BUILDINGS/LANDS SHOULD BE DECIDED ACCORDING TO THE SITE CONDITIONS.
7. MINIMUM THICKNESS OF DGAB SHOULD BE 100mm TOP OF THE EXISTING PAVEMENT.
8. MINIMUM THICKNESS OF THE GRANULAR CAPPING LAYER SHOULD BE 100mm, IF THE THICKNESSES < 100mm USE GRANULAR SUB BASE.

ADB FUNDED
I ROAD PROJECT
CENTRAL PROVINCE

CLIENT: DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA
MINISTRY OF PORTS & HIGHWAYS
Road Development Authority

No.	REMARK	DATE

CONSULTANT: KATAHIRA & ENGINEERS INTERNATIONAL

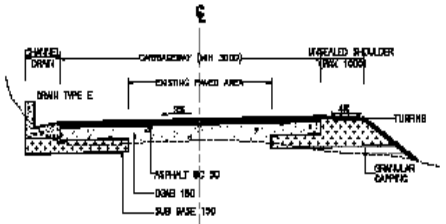
DRAWING TITLE: TYPICAL CROSS SECTION FOR PRDA ROAD

DWG. No. TS-PRDA-06

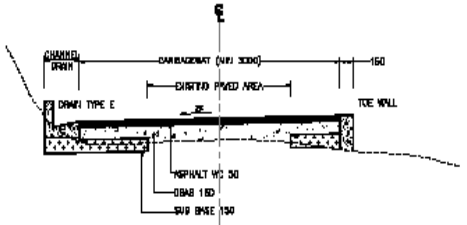
DES: | DRN: | CHK:

DATE: 07-07-2014

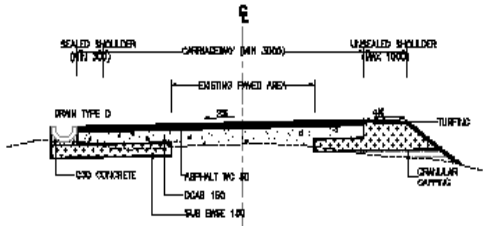
PROPOSED TYPICAL SECTIONS (TS) FOR NARROW ROAD
(OVERLAYING OF MACADAM SURFACE)



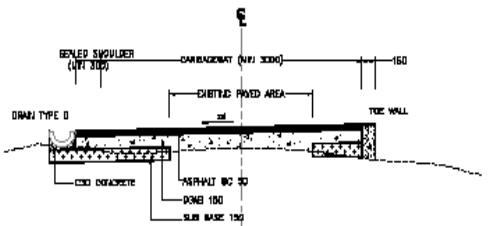
TS-I (TYPICAL SECTION FOR RESTRICTED ROW – ONE SIDE DRAIN TYPE "E")



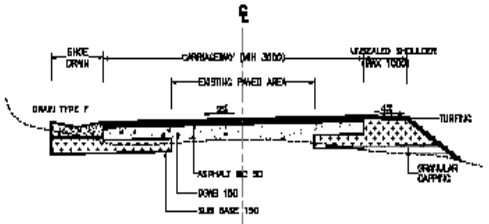
TS-K (TYPICAL SECTION FOR BOTH SIDE RESTRICTED ROW – ONE SIDE DRAIN TYPE "E")



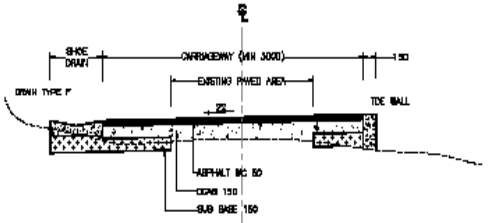
TS-J (TYPICAL SECTION FOR RESTRICTED ROW – ONE SIDE DRAIN TYPE "D")



TS-L (TYPICAL SECTION FOR BOTH SIDE RESTRICTED ROW – ONE SIDE DRAIN "D")



TS-O (TYPICAL SECTION FOR RESTRICTED ROW – ONE SIDE DRAIN "F")



TS-P (TYPICAL SECTION FOR BOTH SIDE RESTRICTED ROW – ONE SIDE DRAIN TYPE "E")

LEGEND:

ASPHALT WEARING COURSE	WC
DENSE GRANULAR AGGREGATE BASE	DGAB
GRANULAR SUB BASE (TYPE I-CBR>30%)	GS
GRANULAR CAPPING (TYPE II-CBR>10%)	GC
SHOULDER FILL	
BLINDING LAYER (GRADED AGGREGATE)	
ROCK FILL (MAXIMUM SIZE 250mm)	
QUARRY FINE	
C30 CONCRETE	
INTERLOCKING BLOCK	

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE MENTIONED.
2. THIS DRAWING PROVIDES A GUIDANCE ONLY. EXACT DETAILS TO SUIT SITE CONDITIONS SHALL BE DECIDED BY THE ENGINEER AT CONSTRUCTION STAGE.
3. SELECT DRAINS AS PER SITE CONDITION FOR DRAIN DETAILS REFER DRAWING NO. DS-01
4. FOR TOE WALL DETAILS REFER DRAWING NO. S-04 & S-05.
5. IF THE SPECIFIED MINIMUM DIMENSIONS SHOWN IN THE DRAWING CAN NOT BE MAINTAINED DUE TO ROW RESTRICTIONS THE DIMENSIONS CAN BE REDUCED SUBJECT TO THE APPROVAL OF THE ENGINEER.
6. INTERFACING DETAILS WITH ADJACENT BUILDINGS/LANDS SHOULD BE DECIDED ACCORDING TO THE SITE CONDITIONS.
7. MINIMUM THICKNESS OF DGAB SHOULD BE 100mm TOP OF THE EXISTING PAVEMENT.
8. MINIMUM THICKNESS OF THE GRANULAR CAPPING LAYER SHOULD BE 100mm. IF THE THICKNESSES < 100mm USE GRANULAR SUB BASE.
9. ISOLATED BASE FAILURE SECTION SHOULD BE RECTIFIED PRIOR TO EXISTING PAVEMENT STRENGTHENING.
10. TYPICAL NARROW ROAD SECTIONS ARE PREPARED ONLY FOR OVERLAYING OF MACADAM ROAD SURFACE.OTHER PAVEMENT STRUCTURES SHALL BE SUBSTITUTE BY THE ENGINEER AS PER SITE CONDITION.

ADB FUNDED
I ROAD PROJECT
CENTRAL PROVINCE

CLIENT: DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA
MINISTRY OF PORTS & HIGHWAYS
Road Development Authority

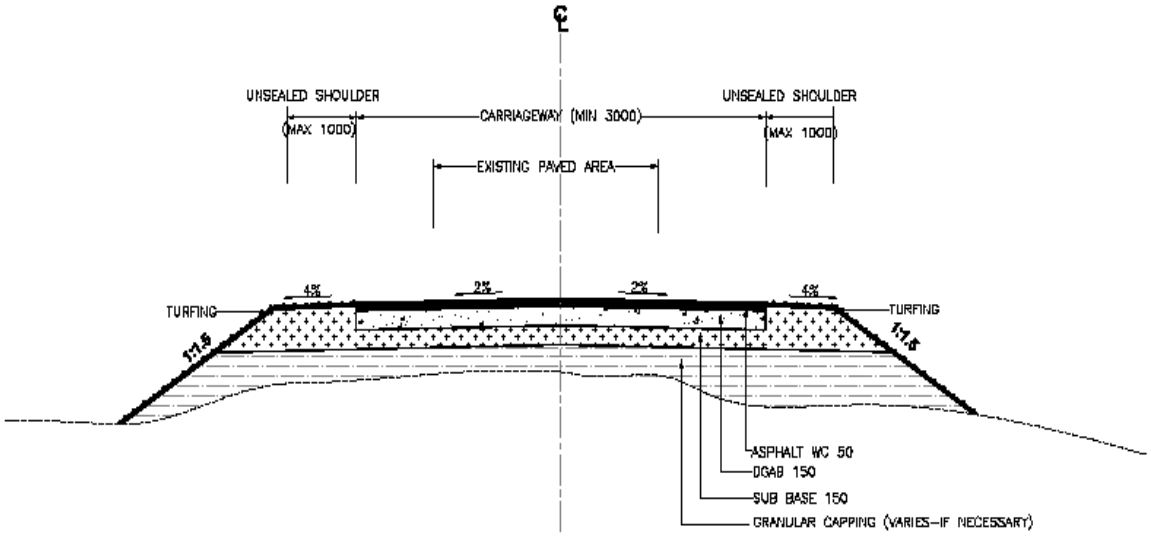
No.	REVISION	DATE

CONSULTANT: KATAHENA & ENGINEERS INTERNATIONAL

DRAWING TITLE: TYPICAL CROSS SECTION FOR PS ROAD

DES:
DRAW:
CHK:
DWG No. TS-PS-05
DATE 23-08-2014

PROPOSED TYPICAL SECTIONS (TS) FOR EMBANKMENT AREA



TS-N (TYPICAL SECTION FOR EMBANKMENT AREA)

LEGEND:

	ASPHALT WEARING COURSE	WC
	DENSE GRANULAR AGGREGATE BASE	DGAB
	GRANULAR SUB BASE (TYPE I-CBR>30%)	GS
	GRANULAR CAPPING (TYPE II-CBR>10%)	GC
	SHOULDER FILL	
	BLINDING LAYER (GRADED AGGREGATE)	
	ROCK FILL (MAXIMUM SIZE 250mm)	
	QUARRY FINE	
	CJO CONCRETE	
	INTERLOCKING BLOCK	

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE MENTIONED.
2. THIS DRAWING PROVIDES A GUIDANCE ONLY. EXACT DETAILS TO SUIT SITE CONDITIONS SHALL BE DECIDED BY THE ENGINEER AT CONSTRUCTION STAGE.
3. SELECT DRAINS AS PER SITE CONDITION FOR DRAIN DETAILS REFER DRAWING NO. DS-01
4. FOR TOE WALL DETAILS REFER DRAWING NO. S-04 & S-05.
5. IF THE SPECIFIED MINIMUM DIMENSIONS SHOWN IN THE DRAWING CAN NOT BE MAINTAINED DUE TO ROW RESTRICTIONS THE DIMENSIONS CAN BE REDUCED SUBJECT TO THE APPROVAL OF THE ENGINEER.
6. INTERFACING DETAILS WITH ADJACENT BUILDINGS/LANDS SHOULD BE DECIDED ACCORDING TO THE SITE CONDITIONS.
7. MINIMUM THICKNESS OF DGAB SHOULD BE 100mm TOP OF THE EXISTING PAVEMENT.
8. MINIMUM THICKNESS OF THE GRANULAR CAPPING LAYER SHOULD BE 100mm, IF THE THICKNESSES < 100mm USE GRANULAR SUB BASE.
9. ISOLATED BASE FAILURE SECTION SHOULD BE RECTIFIED PRIOR TO EXISTING PAVEMENT STRENGTHENING.

ADB FUNDED
I ROAD PROJECT
CENTRAL PROVINCE

CLIENT: DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA
MINISTRY OF PORTS & HIGHWAYS
Road Development Authority

No.	REVISION	DATE

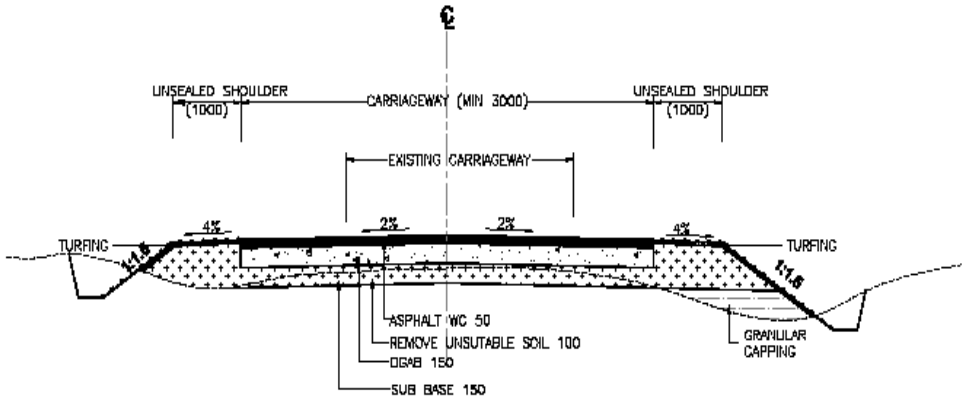
CONSULTANT: KATAHIRA & ENGINEERS INTERNATIONAL

DRAWING TITLE: TYPICAL CROSS SECTION FOR PS ROAD

DWG. No. TS-PS-07

DES:
DRN:
CHK:
DATE: 23-08-2014

PROPOSED TYPICAL SECTIONS (TS) FOR GRAVEL ROAD



TS–A (TYPICAL SECTION FOR GRAVEL SURFACE

LEGEND:

	ASPHALT WEARING COURSE	WC
	DENSE GRANULAR AGGREGATE BASE	DGAB
	GRANULAR SUB BASE (TYPE I–CBR>30%)	GS
	GRANULAR CAPPING (TYPE II–CBR>10%)	GC
	SHOULDER FILL	
	BLINDING LAYER (GRADED AGGREGATE)	
	ROCK FILL (MAXIMUM SIZE 250mm)	
	QUARRY FINE	
	C30 CONCRETE	
	INTERLOCKING BLOCK	

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE MENTIONED.
2. THIS DRAWING PROVIDES A GUIDANCE ONLY. EXACT DETAILS TO SUIT SITE CONDITIONS SHALL BE DECIDED BY THE ENGINEER AT CONSTRUCTION STAGE.
3. SELECT DRAINS AS PER SITE CONDITION FOR DRAIN DETAILS REFER DRAWING NO. DS–01
4. FOR TOE WALL DETAILS REFER DRAWING NO. S–04 & S–05.
5. IF THE SPECIFIED MINIMUM DIMENSIONS SHOWN IN THE DRAWING CAN NOT BE MAINTAINED DUE TO ROW RESTRICTIONS THE DIMENSIONS CAN BE REDUCED SUBJECT TO THE APPROVAL OF THE ENGINEER.
6. INTERFACING DETAILS WITH ADJACENT BUILDINGS/LANDS SHOULD BE DECIDED ACCORDING TO THE SITE CONDITIONS.
7. MINIMUM THICKNESS OF THE GRANULAR CAPPING LAYER SHOULD BE 100mm, IF THE THICKNESSES < 100mm USE GRANULAR SUB BASE.

ADB FUNDED
I ROAD PROJECT
CENTRAL PROVINCE

CLIENT:
DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA
MINISTRY OF PORTS & HIGHWAYS
Road Development Authority

No.	REMARK	DATE

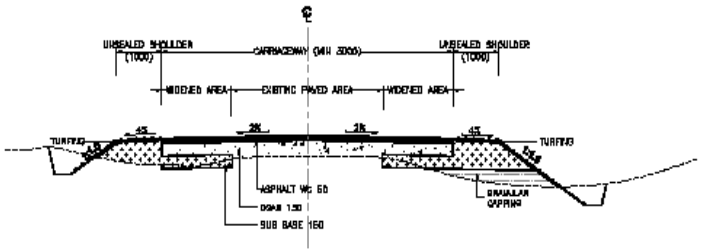
CONSULTANT:
KATAHIRA & ENGINEERS INTERNATIONAL

DRAWING TITLE: TYPICAL CROSS SECTION FOR PS ROAD

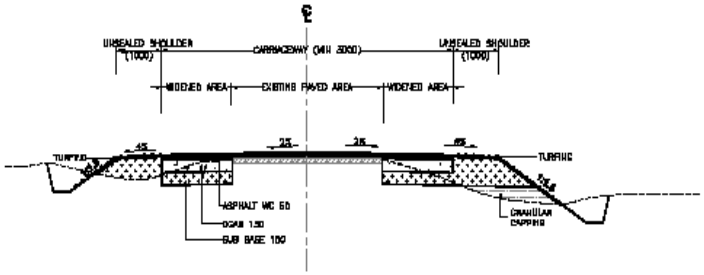
DWG. No. TS–PS–01

DESIGN:
DRAWN:
CHECKED:
DATE: 23–08–2014

PROPOSED TYPICAL SECTIONS (TS) FOR MACADAM ROAD



TS-B (TYPICAL SECTION FOR RECONSTRUCTION OF MACADAM SURFACE)



TS-C (TYPICAL SECTION FOR OVERLAYING ON MACADAM SURFACE)

LEGEND:

ASPHALT WEARING COURSE	WC
DENSE GRANULAR AGGREGATE BASE	DGAB
GRANULAR SUB BASE (TYPE I-CBR>30%)	GS
GRANULAR CAPPING (TYPE II-CBR>10%)	GC
SHOULDER FILL	
BLINDING LAYER (GRADED AGGREGATE)	
ROCK FILL (MAXIMUM SIZE 250mm)	
QUARRY FINE	
C30 CONCRETE	
INTERLOCKING BLOCK	

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE MENTIONED.
2. THIS DRAWING PROVIDES A GUIDANCE ONLY. EXACT DETAILS TO SUIT SITE CONDITIONS SHALL BE DECIDED BY THE ENGINEER AT CONSTRUCTION STAGE.
3. SELECT DRAINS AS PER SITE CONDITION FOR DRAIN DETAILS REFER DRAWING NO. D5-01
4. FOR TOE WALL DETAILS REFER DRAWING NO. S-04 & S-05.
5. IF THE SPECIFIED MINIMUM DIMENSIONS SHOWN IN THE DRAWING CAN NOT BE MAINTAINED DUE TO ROW RESTRICTIONS THE DIMENSIONS CAN BE REDUCED SUBJECT TO THE APPROVAL OF THE ENGINEER.
6. INTERFACING DETAILS WITH ADJACENT BUILDINGS/LANDS SHOULD BE DECIDED ACCORDING TO THE SITE CONDITIONS.
7. MINIMUM THICKNESS OF DGAB SHOULD BE 100mm TOP OF THE EXISTING PAVEMENT.
8. MINIMUM THICKNESS OF THE GRANULAR CAPPING LAYER SHOULD BE 100mm, IF THE THICKNESSES < 100mm USE GRANULAR SUB BASE.
9. ISOLATED BASE FAILURE SECTION SHOULD BE RECTIFIED PRIOR TO EXISTING PAVEMENT STRENGTHENING.

ADB FUNDED
I ROAD PROJECT
CENTRAL PROVINCE

CLIENT: DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA
MINISTRY OF PORTS & HIGHWAYS
Road Development Authority

CONSULTANT: KATAHIRA & ENGINEERS INTERNATIONAL

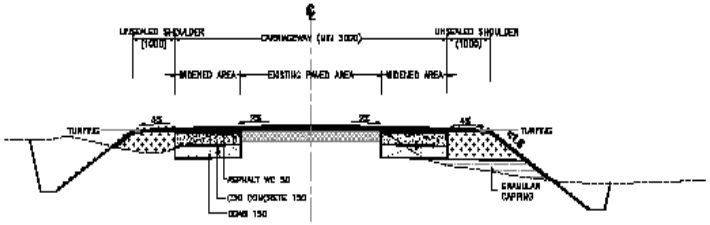
DRAWING TITLE: TYPICAL CROSS SECTION FOR PS ROAD

DRAWING No. TS-PS-01

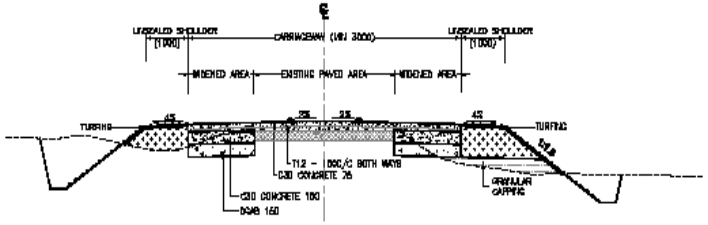
DES:
DRN:
CHK:
DATE: 23-08-2014

No. REMARKS DATE

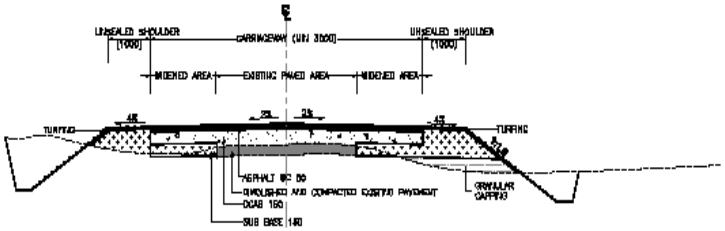
PROPOSED TYPICAL SECTIONS (TS) FOR CONCRETE ROAD



TS–D (TYPICAL SECTION FOR OVERLAYING ON CONCRETE SURFACE)



TS–E (TYPICAL SECTION FOR OVERLAYING ON CONCRETE SURFACE – PARTLY DAMAGED)



TS–F (TYPICAL SECTION FOR OVERLAYING ON CONCRETE SURFACE – DAMAGED)

LEGEND:

	ASPHALT WEARING COURSE	WC
	DENSE GRANULAR AGGREGATE BASE	DGAB
	GRANULAR SUB BASE (TYPE I–CBR>30%)	GS
	GRANULAR CAPPING (TYPE II–CBR>10%)	GC
	SHOULDER FILL	
	BLINDING LAYER (GRADED AGGREGATE)	
	ROCK FILL (MAXIMUM SIZE 250mm)	
	QUARRY FINE	
	C30 CONCRETE	
	INTERLOCKING BLOCK	

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE MENTIONED.
2. THIS DRAWING PROVIDES A GUIDANCE ONLY. EXACT DETAILS TO SUIT SITE CONDITIONS SHALL BE DECIDED BY THE ENGINEER AT CONSTRUCTION STAGE.
3. SELECT DRAINS AS PER SITE CONDITION FOR DRAIN DETAILS REFER DRAWING NO. DS–01
4. FOR TOE WALL DETAILS REFER DRAWING NO. S–04 & S–05.
5. IF THE SPECIFIED MINIMUM DIMENSIONS SHOWN IN THE DRAWING CAN NOT BE MAINTAINED DUE TO ROW RESTRICTIONS THE DIMENSIONS CAN BE REDUCED SUBJECT TO THE APPROVAL OF THE ENGINEER.
6. INTERFACING DETAILS WITH ADJACENT BUILDINGS/LANDS SHOULD BE DECIDED ACCORDING TO THE SITE CONDITIONS.
7. MINIMUM THICKNESS OF DGAB SHOULD BE 100mm TOP OF THE EXISTING PAVEMENT.
8. MINIMUM THICKNESS OF THE GRANULAR CAPPING LAYER SHOULD BE 100mm, IF THE THICKNESSES < 100mm USE GRANULAR SUB BASE.
9. ISOLATED BASE FAILURE SECTION SHOULD BE RECTIFIED PRIOR TO EXISTING PAVEMENT STRENGTHENING.

ADB FUNDED
I ROAD PROJECT
CENTRAL PROVINCE

CLIENT: DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA
MINISTRY OF PORTS & HIGHWAYS
Road Development Authority

No.	REMARK	DATE

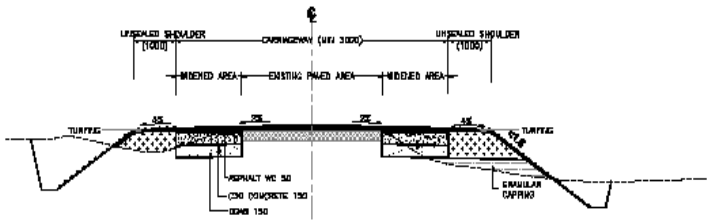
CONSULTANT: KOSTHEERA & ENGINEERS INTERNATIONAL

DRAWING TITLE: TYPICAL CROSS SECTION FOR PS ROAD

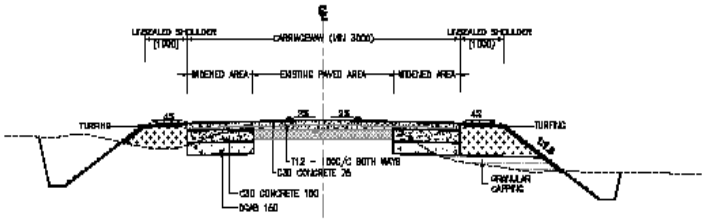
DRAWING No. TS–PS–03

DES:	
DRN:	
CHK:	
DATE	23–08–2014

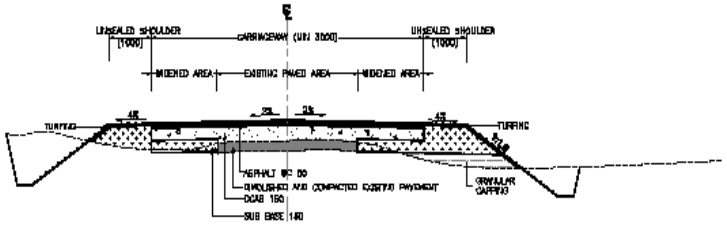
PROPOSED TYPICAL SECTIONS (TS) FOR CONCRETE ROAD



TS–D (TYPICAL SECTION FOR OVERLAYING ON CONCRETE SURFACE)



TS–E (TYPICAL SECTION FOR OVERLAYING ON CONCRETE SURFACE – PARTLY DAMAGED)



TS–F (TYPICAL SECTION FOR OVERLAYING ON CONCRETE SURFACE – DAMAGED)

LEGEND:

ASPHALT WEARING COURSE	WC
DENSE GRANULAR AGGREGATE BASE	DGAB
GRANULAR SUB BASE (TYPE I–CBR>30%)	GS
GRANULAR CAPPING (TYPE II–CBR>10%)	GC
SHOULDER FILL	
BLINDING LAYER (GRADED AGGREGATE)	
ROCK FILL (MAXIMUM SIZE 250mm)	
QUARRY FINE	
C30 CONCRETE	
INTERLOCKING BLOCK	

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9. ISOLATED BASE FAILURE SECTION SHOULD BE RECTIFIED PRIOR TO EXISTING PAVEMENT STRENGTHENING.

ADB FUNDED
I ROAD PROJECT
CENTRAL PROVINCE

CLIENT: DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA
MINISTRY OF PORTS & HIGHWAYS
Road Development Authority

No.	REMARK	DATE

CONSULTANT: KOTAHENA & ENGINEERS INTERNATIONAL

DRAWING TITLE: TYPICAL CROSS SECTION FOR PS ROAD

DES.
DRAWN
CHK.
DWG No. TS–PS–03
DATE 23–08–2014

DETAILS OF ROAD LENGTHS, WIDTHS AND SURFACE TYPE

MATHALE DISTRICT- CENTRAL PROVINCE

Serial No	D.S Division	Road ID	Road Name	Road Category	Length (Km)	Present width (m)	No of culverts and Bridges	Surface type	Road condition
1	Yatawaththa	2	Ratalawewa Junction to Nikagolla Road via Kottagolla	PS	1.6	3	3	Gravel/Macadam	Medium
2		3	Mathalapitiya Rathninda Thuththiripitiya Atipola Dullawa via Walawela Aluthgama Road	PS	12	4	14	Concrete/Macadam	Medium/ Bad
3		4	Yatawatta Mathalapitiya Road to Kurunegala Matale Road via Idangama Alutwatta Walpola & Maligathenna	PS	5	4	7	Gravel/Macadam/	Medium
4		5	Yatawatta Mahawela Road to Pathingaskotuwa Kurunagala on Yatawatta Road via Nikagolla North	PS	2	2.5	5	Gravel/Macadam/Concrete	Medium/Bad
5		56	Beeridewala to Walawela and Muduna via dullawa junction	PRDA	5.33	3.5	8	Gravel/Concrete	Bad
6	Mathale	35	Madawela Junction to Nalanda Industrials Zone	PS	2.5	3.5	4	Gravel/Concrete	Medium
7		36	Ellepola Kalupalama to Hilton Janapadaya Road	PS	1	4	2	Gravel/Macadam/ Concrete	Medium
8		38	Kanangamuwa Parawatta Road	PS	2.8	3.5	4	Gravel/Macadam/ Concrete	Bad
9	Naula	27	Bobella Bibila Road	PS	1.5	4	2	Macadam/Concrete	Bad
10		40	Kanamulayaya Rubber watta Via Police Station Road	PS	2.5	3	3	Macadam/Concrete	Medium/Bad
11		41	Meegolla Deewara Gammanaya Road	PS	1.2	3.5	3	Macadam/Concrete	Bad
12		42	Gedige Junction to Hapugasyaya Tamil Village Via Ududeniya Road	PS	3	3.5	4	Gravel/Macadam/ Concrete	Medium/Bad
13		39	Bibila Murutholuwa Road	PS	1.7	4	4	Gravel/Macadam/Concrete	Medium/Bad
14	Wilgamuwa	29	Weeragolla Munamalpitiya Via Moragaha Ulpatha Road	PS	2.8	3.5	4	Gravel	Bad
15		33	Malgammana Gangeyaya Road	PS	2.5	3.5	4	Gravel	Bad
16		28	Lewiyangala Junction to Weheragala Via Himbiliyakada Road	PS	4.2	4	7	Gravel/	Bad
17		30	Nagolla Amuneyaya Via Godaulpoyha Weheragala Road	PS	4.6	3	5	Macadam/Concrete	Medium/Bad
18		31	Alikanda cemetry via Kaduruvediya Ela Road	PS	3.3	3	5	Gravel/Concrete	Medium/Bad

Serial No	D.S Division	Road ID	Road Name	Road Category	Length (Km)	Present width (m)	No of culverts and Bridges	Surface type	Road condition
19		32	Medakanda Maraka Road	PRDA	6.2	4	10	Gravel/Macadam/ Concrete	Medium
20		34	Hadungamuwa Kumbukoya Road	PS	4.1	4.5	8	Gravel/Macadam/ Concrete	Medium
21	Ambagamuwa Korale	16	Kosgolla Adawela Road via Kuballoluwa Magallewa	PRDA	8.5	4	9	Gravel/Concrete	Medium
22		17	Koongahamula Eriyagolla Rosawaththa via Hapugaspitiya Hunuketa Ela Matihakka Road	PS	1	3	3	Gravel/Macadam/ Concrete	Medium/Bad
23		43	Kosgolla Muduna to Loluwela Junction via Imbulgolla	PS	6	3.5	9	Gravel/Concrete	Medium
24	Laggala - Pallegama	44	Mahalakotuwa to Meda Ela via Raththinda Junction	PS	2	3.5	4	Gravel/Macadam/ Concrete	Medium
25	Raththota	6	Uda Hapuwida Junction to Leliambe Junction Road	PS	3.3	4	4	Gravel/Macadam/	Medium
26		7	Polwaththakanda to Kaudagammana Road	PS	4.2	4	6	Macadam/Concrete	Medium
27		8	Madakumbura to Udathenna Road (Riveston Road)	PS	1.4	3.5	4	Gravel/Macadam/	Bad
28		9	Udahapuwida Keselwaththa Road	PS	1	3.5	2	Gravel/Macadam/ Concrete	Medium
29		10	Bodhikotuwa junction to Hoagolla bridge road	PRDA	6	3.5	7	Gravel/Concrete	Medium/Bad
30		11	Kambiadiya to Kandenuwara via Bogambara	PS	9.1	4	14	Gravel/Macadam/ Concrete	Bad
31		12	Dombagoda Pahala Hapuwida	PS	2.9	3.5	4	Macadam/Concrete	Medium/Bad
32		13	Udaweragama Thennewatta Gansarapola Road	PS	5.6	3	5	Macadam/Concrete	Medium/Bad
33	Ukuwela	15	Hulangamuwa Junction to Watagoda Road	PS	2.7	4	3	Macadam	Medium
34		14	Kaikawela Temple to Pahala Owela Punchikade Main Road	PS	4	3.5	6	Macadam	Medium
35		45	Ovilikanda to Babaragahakanda Road via Wademada Pathingolla	PS	4.8	2.5	7	Macadam	Medium
36		46	Rathwatta to Elkaduwa Road via Wawugammadda	PS	2	3	4	Macadam	bad
37		47	Kaduwela to Pujagoda Gama Meda Road	PRDA	2.9	3.5	4	Gravel/Macadam/ Concrete	Medium
38	Dambulla	18	Dambuluoya Junction to Kalundewa Road	PRDA	7.8	4	8	Gravel/Macadam	Medium
39		20	Kapuwatta Akkara Seeya Yapagama Road	MC	3.8	2.5	7	Gravel/Macadam	Medium
40		22	Kandalama Rotawewa Road	PS	4.8	3.5	6	Gravel/Macadam/Concrete	Medium/Bad

Serial No	D.S Division	Road ID	Road Name	Road Category	Length (Km)	Present width (m)	No of culverts and Bridges	Surface type	Road condition
41		24	Sisirawatta Bulanwala Athuparayaya Dambulla Town Road	MC	5.8	4	7	Gravel/Concrete	Medium
42		25	Pelwehara Randeniya Bulagala Road	PRDA	4.1	3	9	Gravel	Medium
43		19	Kapuwatta Yapagama Road	MC	3.4	3	6	Gravel	Medium
44		23	Thiththawelgolla Rathmalgaha Ela Road	MC	6.7	2.5	8	Gravel	Medium
45		21	Yapagama Dambulla Pola Ate Ela Batuyaya Via Diddeniya Kade Road	MC	6.1	4	8	Gravel/Macadam/ Concrete	Medium/Bad
46	Galewela	49	Walaswewa Main Road	PS	1.6	3.5	9	Concrete	Medium
47		53	Dabuyaya Dambagolla Road	PRDA	4.1	4.5	5	Gravel/Concrete	Medium
48		50	Galapaula Damunumulla Road	PS	3.3	4	6	Gravel/Macadam/ Concrete	Bad
49		55	Damunumulla Yatigalpoththa Road	PS	2.1	4.5	4	Gravel/Concrete	Medium/Bad
50	Pallepola	52	Akuramboda Temple to Koswatta Road	PRDA	1	3.5	3	Macadam/Concrete	Bad
51		54	Ambokka Dewalaya Road	PS	2.5	3.5	3	Gravel/Macadam	Medium/Bad
Total					194.33				

KANDY DISTRICT - CENTRAL PROVINCE

Serial No	D.S Division	Road ID	Road Name	Road Category	Length (Km)	Present width (m)	No of culverts and Bridges	Surface type	Road condition
1	**Medadumbara**	**1**	Bambaragahadeniya Junction - Madamahanuwara via Meeriyagolla	PS	7	4	9	Macadam	Medium
2		**2**	Medamahanuwara town - Kandekumbura Road (Retiyagama bus stand) via Metideniya	PRDA	7.8	4.5	7	Concrete/ Macadam	Medium/Bad
3		**3**	Werapitiya Road ,Dunhinna Junction - Makuldeniya Road (Makuldeniya Junction) via Waradiwela	PRDA	5.13	3	6	Gravel/Concrete	Medium
4		**4**	Bambaragala Juncton - Nithulemada Bus Stand, Nithulmada Main Road via Senarathwela	PS	6.3	3.5	8	Gravel	Medium/Bad
5		**4-A**	Iskolamuduna Junction - Hiloya Road (Watagala Road) via Podadalgoda	PRDA	4.4	4	6	Gravel/ Macadam/ Concrete	Medium/Bad
6	**Panvila**	**21**	Angammana Nikathenna Road	PRDA	1.3	3.5	3	Gravel/ Macadam	Medium/Bad
7	**Pathadumbara**	**41**	Wattegama , Pinnalanda Junction - Thunkandura Junction via Puwakgahadeniya	PRDA	4.9	2.5	4	Gravel/ Macadam/ Concrete	Medium/Bad

Serial No	D.S Division	Road ID	Road Name	Road Category	Length (Km)	Present width (m)	No of culverts and Bridges	Surface type	Road condition
8		**42**	Pitiyegedara Junction - Polgolla 6th mile Post via Meegamawatta	PS	5.75	4	6	Macadam/ Concrete	Medium/Bad
9	**Pathahewaheta**	**9**	Haththana,Uduwela watta - Galaha town via Galahawatta , Kithulgolla	PS	9.7	3	14	Gravel/Macadam	Medium/Bad
10		**10**	Delthota town - Gabadagama Road	PRDA	7.4	4	7	Gravel/Macadam/ Concrete	Medium
11		**11**	maussawa - Kolambissa Junction	PRDA	3.69	3.5		Gravel/Macadam	Medium/Bad
12	**Minipe**	**36**	Parana Polonnaruwa	PRDA	7.2	3.5	6	Gravel/Macadam/ Concrete	Medium/Bad
13	**Ududumbara**	**53**	Nugethenna to Kewulgama Pamunuwella Ganegala Road	PS	5.8	4	7	Gravel/Macadam/ Concrete	Medium/Bad
14		**32**	Madugalla Kalawala Road	PRDA/PS	3.45	4	5	Gravel/Macadam	Medium/Bad
15	**Kundasale**	**43**	Digana Ambakotte Road	PRDA	4.4	3	5	Macadam/Concrete	Medium/Bad
16		**44**	Sirimalwatta Nattarampotta Road	PRDA	2.7	3.5		Gravel/	Medium/Bad
17		**45**	Manikkahinna (Pitiye Dewalaya) Galaluwa Road	PRDA	1.3	3.5	3	Macadam/Concrete	Medium/Bad
18		**46**	Gagasiriwatta Polgolla Road	PRDA	2.6	2.5		Gravel/Macadam	Medium/Bad
19		**47**	Digana Aluthwatta Road (Aluthwatta No.10 Junction) - Parana Gagapitiya Road	PRDA	2.57	3.5	4	Gravel/Concrete	Medium/Bad
20	**Yatinuwara**	**12**	Kobbekaduwa Gamameda Road	PRDA/PS	2	4		Gravel/Macadam	Medium
21		**13**	Dodamwala Dewalaya - Wathurakumbura Road via Greppitiya temple	PRDA/PS	2.7	4	3	Gravel/Macadam/ Concrete	Medium/Bad
22		**14**	Siyambalagoda - Omandel Sikurapotha Road	PRDA/PS	3	3.5		Gravel/Macadam	Medium/Bad
23		**15**	Pottapitiya 4th mile post Udaranmeewala	PS	2.51	4	5	Gravel/Macadam/ Concrete	Medium/Bad
24	**Gangaihala Korale**	**16**	Galpaya , Thelihunna Colony via Kurunduwatta New Town Pellapitiya Colony	PRDA/PS	8.2	4.5		Gravel/Macadam	Medium/Bad
25		**17**	Yatapana Boswod Road	PS	4.4	4	3	Gravel/Macadam	Medium/Bad
26	**Pasbage Korele**	**19**	Aluthgama Centre Village Road	PS	2.7	3	5	Gravel/Macadam	Medium/Bad
27		**20**	Dekinda,Weralugolla Road	PS	2.65	3.5	2	Gravel/Macadam/ Concrete	Medium

Serial No	D.S Division	Road ID	Road Name	Road Category	Length (Km)	Present width (m)	No of culverts and Bridges	Surface type	Road condition
28		**18**	Nawalapitiya - Udakanda Bus Stand via Veralugashinna, Weligodawatta	PS	7.55	3.5	9	Gravel/Macadam/Concrete	Medium/Bad
29	**Udapalatha**	**23**	Pussellawa Melfret Boment Kalugala Wanahapuwa via Dunukeula Road	PS	7.1	2.5	8	Gravel/Macadam	Medium/Bad
30		**24**	Panvilathenna Junction - Legumdeniya Main Road via Robert Nocks Gala Pussathenna	PS	3.7	4	5	Gravel/Macadam/ Concrete	Medium/Bad
31		**25**	Boralu Mankada Junction - Millagahamulla Junction via Grohil Road Angammana Drate Kahawatta	PS	8	3.5	4	Gravel/Macadam/ Concrete	Medium/Bad
32		**26**	Udaiguruwatta Road to Wewathenna Road	PRDA/PS	3.4	4	6	Gravel/Macadam/ Concrete	Medium/Bad
33	**Udunuwara**	**27**	Manikkawa Junction to Gonadhikawatta Road	PRDA/PS	6.8	4.5		Gravel/Macadam/ Concrete	Medium/Bad
34		**28**	Viharagama - Watadeniya Road via Appallagoda	PS	1.87	4.5		Gravel/ Macadam/ Concrete	Medium/Bad
35		**29**	Pamunuwa Daliwala Mugatiyapola Road	PRDA/PS	2.3	4	4	Gravel/Macadam/ Concrete	Medium
36		**30**	Pamunuwa Junction - Elugoda Road	PRDA/PS	1.9	3.5	2	Gravel/Macadam/ Concrete	Medium/Bad
37	**Gangawata korele**	**5**	Ogastawatta Wagirarama Road - Udaperadeniya Road	PS	2.95	3	3	Gravel/Macadam/ Concrete	Medium/Bad
38		**6**	Mahakanda Junction Mobre Samadi Mawatta via Sarasavigama Road	PS	3.45	4	5	Gravel/Macadam/ Concrete	Medium/Bad
39		**7**	Gurudeniya - Dambawela Bus Stand	PRDA	0.75	3.5	5	Gravel/Macadam/ Concrete	Medium
40		**8**	Dambawela Road , Kandy Thalathuoya via Govi Janapadaya	PS	0.98	4	3	Gravel/Macadam/	Medium/Bad
41	**Hatharaliyadda**	**37**	Hatharaliyadda,Mahanuwara main Road ,cross Junction to Galagedara Minigamuwa main Road via polwatta Ihalagama	PS	3.75	3.5	5	Gravel/Macadam/ Concrete	Medium/Bad
42		**38**	Poththapitiya Weligodapola main Road to Patapola post office via Alagalla primary school	PS	2.58	4	2	Gravel/Macadam/ Concrete	Medium/Bad
43		**39**	Hatharaliyadda,Rambukkana main Road to Dedunupitiya post office to Weniwella Road via Kalotuwawa	PRDA	12	3.5	6	Gravel/Macadam/ Concrete	Medium/Bad
44		**40**	Harataliyadda Mawathagama main Road to Anludeniya school to Paragoda Gonathenna Road	PS	4.41	4.5	6	Macadam/Concrete	Medium/Bad

Serial No	D.S Division	Road ID	Road Name	Road Category	Length (Km)	Present width (m)	No of culverts and Bridges	Surface type	Road condition
45	**Pujapitiya**	**48**	Karaduwawala Gatathale Road	PS	2.85	3.5	4	Gravel/Concrete	Medium/Bad
46		**49**	Bokkawala Pahala Higulwala via Miliyedda Road	PS	7.79	4		Gravel/Macadam/ Concrete	Medium/Bad
47		**49A**	Vilana Pallegama - Watagoda Burton Watta	PRDA	2.01	4	2	Gravel/Macadam/ Concrete	Medium/Bad
48	**Pujapitiya & Harispattuwa**	**50**	Poojapitiya , Dodamthanna , Bothota , Antharagama , Pattiyawatta via Rajapihilla Road	PS	6.92	3.5		Gravel/Macadam/ Concrete	Medium/Bad
49	**Akurana**	**51**	Kasawatta Poojapitiya Road	PS	2.54	4	4	Gravel/Macadam/ Concrete	Medium/Bad
50		**52**	Malwanahinna Nirella via Main Road	PS	3.51	3.5		Gravel/Macadam/ Concrete	Medium/Bad
Total					**220.66**				

NUWARA ELIYA DISTRICT - CENTRAL PROVINCE

Serial No	D.S.Division	Road ID	Road Name	Road Category	Length (km)	Present width	No of Culverts and Bridges	Surface type	Road condition
1	**Nuwara Eliya**	**16**	Uwakele Estate road	Estate Road	4.75	4.0	6.0	Macadam	Medium
2		**18**	Pilot Project road	PS	1	3.4	1.0	Concrete/ Macadam	Medium/Bad
3		**19**	Piduruthalagala Farm road	PS	1.5	3.0	2.0	Gravel/Concrete	Medium
4		**20**	Kantha Govipola & Ranaviru Gammana road	PS	1.32	3.5	2.0	Gravel	Medium
5		**21**	Meepilimana Gamameda road	PS	3	4.0		Gravel/Macadam/ Concrete	Medium/Bad
6		**23**	Thalawakele Galkanda road	PS	4	3.5	4.0	Gravel/Macadam	Medium/Bad
7		**24**	Rahanwatta Maussaella road	PS	4	2.5	5.0	Gravel	Medium/Bad
8		**26**	Kandapola Konkordia road	PS	1.92	3.5	1.0	Gravel/Macadam/ Concrete	Medium/Bad
9		**28**	Kandapola Heatherset Estate road	Estate Road	1	3.5		Macadam/ Concrete	Medium/Bad
10		**29**	Nanuoya Udaradella road	PS	6.54	4.0	2.0	Concrete	Medium/Bad

Serial No	D.S.Division	Road ID	Road Name	Road Category	Length (km)	Present width	No of Culverts and Bridges	Surface type	Road condition
11		**32**	Henfold Couleena Estate road	Estate Road	2.6	3.5	3.0	Gravel/Macadam/ Concrete	Medium/Bad
12	**Ambagamuwa**	**33**	Htiyegama Udapolgahawaththa Minuwandeniya road	PRDA	8	2.5	4.0	Gravel/Macadam/ Concrete	Medium/Bad
13		**34**	Tillary Tinsing road	PS	4	4.0	6.0	Gravel/Macadam	Medium/Bad
14		**38**	Stockhome lower Gruden road	PS	3.2	3.5	3.0	Gravel/Macadam/ Concrete	Medium/Bad
15		**40**	Waladola Mare road	PS	4	3.0		Gravel/Macadam	Bad
16		**41**	Welioya Shanon road	PRDA	9.5	4.0		Gravel/Macadam/ Concrete	Medium/Bad
17		**42**	Wencher State road	PS	3.75	4.0	4.0	Gravel/Concrete	Medium
18		**46**	Ginigathhena Dehigasthenna Ellauda road	PRDA	6.5	3.0		Gravel/Macadam/ Concrete	Medium/Bad
19		**47**	Pallewaththa Dagampitiya road	PRDA	7	4.0	7.0	Gravel/Macadam/ Concrete	Medium
20		**48**	Ginigathhena School road	PS	1	3.5		Gravel/Macadam/Concrete	Medium/Bad
21		**49**	Abagamuwa Shilalekana road	PS	1.25	3.0	3.0	Gravel/Macadam/	Medium
22	**Walapane**	**1**	Ambagaspitiya- Ladupita - Liyanwela	PRDA	5	4.0	5.0	Gravel/Macadam/ Concrete	Medium/Bad
23		**2**	Ragala Water Board - Ekagapura Road	PRDA	4.22	4.5	6.0	Gravel/Macadam/ Concrete	Medium/Bad
24		**3**	Ragala Starpet - Panditha Kumbura - Kotambe Road	PRDA	10	3.0	8.0	Gravel	Medium/Bad
25		**4**	Udupussellawa - Kurupanawela - Meepanawa Road	PRDA	7	3.0	9.0	Gravel/Macadam/ Concrete	Medium/Bad

Serial No	D.S.Division	Road ID	Road Name	Road Category	Length (km)	Present width	No of Culverts and Bridges	Surface type	Road condition
26		**5**	Delmar - Galkadapathana - Rupaha Road	PS	5	3.5	4.0	Macadam	Medium/Bad
27		**6**	Walapone Hospital Road	PRDA	2.2	3.0	4.0	Gravel/Macadam/ Concrete	Bad
28		**10**	Mahauva - Highforest Road	PS	14.4	4.0	15.0	Gravel/Macadam	Medium/Bad
29		**15**	Keenagala Estate Road	PS	2	3.0	3.0	Gravel/Macadam/ Concrete	Medium/Bad
30	**Hanguranketha**	**7**	Adikarigama - Ambewela - Merimount Road	PRDA	4.6	3.0	5.0	Gravel/Macadam/Concrete	Medium/Bad
31		**8**	Rikillagaskada - Dimbulkumbura Road	PRDA	5.3	4.0	5.0	Gravel/Macadam	Medium/Bad
32		**9**	Karaliyadda Village Road Via Gonagantenna Hospital	PS	2	4.0	4.0	Gravel/Macadam/ Concrete	Medium/Bad
33		**11**	Rikillagaskada - Hapuwela Road	PRDA/PS	5	3.5	3.0	Gravel/Concrete	Medium/Bad
34		**12**	Ambaliyadda - Ihala Kotape - Rikillagaskada Road	PS	7.6	4.0	8.0	Gravel/Concrete	Medium/Bad
35		**13**	Pallebowala - Medagama - Deltota	PS	2	4.0	3.0	Gravel/Macadam/ Concrete	Medium
36	**Kothmale**	**17**	Lower Pundaluoya to upper Shingama road	PS	2.2	2.5	3.0	Gravel/Macadam/ Concrete	Medium
37		**30**	Kothmale Dam View point to Kotagepitiya road	PRDA	3	4.0	3.0	Gravel/Macadam/ Concrete	Medium/Bad
38		**31**	Connecting road to Halpola	PS	1.5	4.0	2.0	Gravel/Macadam/ Concrete	Medium/Bad
39		**36**	Beramana Udagama Madakubura road	PRDA	4	3.5	3.0	Gravel/Macadam/ Concrete	Medium/Bad
40		**37**	Katugolla Hunugaloya Nawathispana road	PS	2.6	4.0	3.0	Gravel/Macadam/ Concrete	Medium
41		**43**	Hapugasthalawa Halgolla road	PRDA	5	3.0	5.0	Macadam/	Medium/Bad

Serial No	D.S.Division	Road ID	Road Name	Road Category	Length (km)	Present width	No of Culverts and Bridges	Surface type	Road condition
								Concrete	
42		**44**	Nawathispane Harangala road	PRDA	3	5.0	3.0	Macadam/ Concrete	Medium
43		**45**	Hapugasthalawa Dabagala road	PRDA	2	4.0	3.0	Gravel/Macadam	Medium
Total					**179.45**				

SAMPLE COMPLETED ENVIRONMENTAL CHECKLISTS

ENVIRONMENTAL CHECKLIST
Integrated Road Investment Program (iROAD)

Road Name :Kanlugala 8th mile post to udukumbura Rd,
Road ID :33
District Name :Kandy
DSD & GNDs :

DSD	GNDS
Ududumbara	**Kalugaloya**

Total Length of the road:9.14
The first 4km section of this road already improved mainly macadam surface. Earth works ongoing some sections from 4+000 to 5+400.The carriage way of road section varies 2.6 – 3.1m up to 5+400.Earth works end 5+400.Rest of 4km lays within the forest reserve and that portion does not have motarable condition.Bulgy rocks observed both sides & surface in some section of the road.

Climate Conditions

Temperature– ^{0}C	High: 29^{0}c	Low:25^0
Humidity	High: 84%	Low:63%
Rainfall Rainy Season	2000mm – 2500mm May – September	

(Source : http://www.myweather2.com/)

A. Location of the Road and Generic description of Environment

No	Type of Ecosystem	Yes	No	Explanation
1	Type of Terrain (Plain/Undulating/Hilly/Mountainous etc.) (Explain the topography of the area and how many km of the road are located in the hilly area)	√		Altitude:1510ft – 2350ft The terrain of the road trace could be described as undulating to hilly
2	Forest Area/mangrove/other natural habitats (Explain whether the road passes through forest areas or located along the forest areas and distance from shoulder to the forest area.)	√		However the road passes through a thick home garden named kandian forest garden area on both sides from 250km – 400km
3	Inhabited Area	√		From the Start to middle area few houses are observed
4	Agricultural land	√		Mainly Cardamom & mix cultivation Pasture lands 5+300 to 5+350 Paddy lands Home garden
5	Barren Land	√		

B. Specific description of the road Environment

No	Parameter/Component	Yes	No	Explanation
1	Are there any areas withlandslide or erosion problemsalong the road? (If yes, indicate the location whetherRight or Left side and the chainage)	√		Areas of cut slopes and the steep slopes at LHS & RHS However related active landslides were not observed 4+800 road severely eroded
2	Are there any Tanks/streams/rivers etc. along/crossing theroad or any lakes/swampsbeside the road? (If yes, list them indicating the locationRight/ Left or crossing and thechainage)	√		The following streams crossing the road 4+300 stream There are 19 culverts for storm water.
3	Is the area along the projectroad prone to flooding or anyproblems of water stagnationand other drainage issues? (If yes, mention chainage, flood leveland frequency)		√	But no proper storm water side drains both sides. Existing drains area filled with silt storm water flowing over the road.
4	Are there any trees with a dbhof 30 cm or more within the existing ROW (withing two fences on either sides) or within 2m corridor from the edge of the carriage way on either side (If the existing Row is not clear)? (If yes attach list of tree indicating thelocation (Right or left side) and the chainage)	√		347 trees are located within 2m corridor on both sidesfrom edge of carriage way from start to 5+400 (within first 5km) However only about 06 trees may be cut due to the road improvement (within first 5km) (Please refer Annex – 1)
5	Along the road and within 100 mof the road shoulder,are there any Faunal habitatareas, Faunal breeding ground,bird migrationarea, or othersimilar areas? (If yes, specify details of habitat with chainage)	√		There may be faunal habitat areas and faunal breeding ground present within the RandenigalaVictoriyaRantabe forest reserve.
6	Along the road and within100m of the road shoulderis there any evidence of Floraand Fauna species that areclassified as endemic,endangered /Threatened Species?		√	There may be endemic, endangerad/threatened species within the RandenigalaVictoriyaRantabe forest reserve.
7	Are there any utility structures[1]within 2 m on either side fromthe centre line of the roadalignment or within the existing Row of the road? (If yes, attach list with chainage)	√		85 numbers of electric poles on RHS and 70 number of electric poles on LHS were observed within first 5km However only 08 to be affected to the improvement of the road. 2+200 RHS transformer no

				affected due to road improvement. Annex 2
8	Are there any religious, cultural or communitystructures/buildings2 within 20m on either side from the Centre line of the roadalignment? (If yes attach list with chainage)	√		Temple at ch – 2+200 RHS Annex 3

C. Public Consultation

No	Consultation Activities	Yes	No	Remarks
1.	Consultation with localcommunity was conductedbefore finalizing the alignment. (Attach list of people met and dates)	√		Public consultation during field reconnaissance carried out for preparation of the Environmental check list. (Details of public consultation are attached)
2.	Any suggestion receivedin finalizing the alignment and road related environmental issue	√		Public specified the need to connect section 35 road & need to improved road side drains.
3.	If suggestions received, were they Incorporated into the design?	√		

D. Please attach the following:

I. List of utility structures located within the study area (within exiting ROW or within 2mcorridor of either sides of the road from the edge of the carriageway if the ROW is not clear)indicating location and side of the road (Right Hand Side (RHS) or Left Hand Side (LHS)) asrequired under B.7.(Refer annex 2)

II. List of community structures indicating location and the side of the road (RHS or LHS) asrequired under B.8.(Refer Annex 3)

III. Photographs of the project area showing at least 02 m on either side from centre line ofroad alignment are attached in annex 4.

IV. List of trees with 30cm DBH or more located within study area (within existing ROW or within 2m from edge of the carriageway to the either sides of the road if ROW is not clear)as required in B.4.
Please refer to the annex 1 for the list of trees

Annex 1 : Affected trees (within Existing ROW)

Chanage	Tree (Common name)	Scientific name	Left	Right
Ch -1+300	Nedun	*Pericopsismuniana*	√	
Ch – 1+500	Kithul	*Caryotaurens*	√	
Ch – 1+900	Unknown			√
Ch – 3+500	Jack	*Artacarpasheterophylas*		√
Ch – 3+650	Unknown			√
Ch – 4+100	Unknown			√
Ch – 5+000	Unknown			√

Annex 2 : Affected Utility Structures (Within existing ROW)

Chainage (Km)	Utility structure	Left	Right
0+500 – 0+700	Electricity		1
1+300 – 2+000	Electricity		3
2+000 – 3+500	Electricity		2
3+500 – 5+300	Electricity		2

Annex 3 : List of community structures

Chainage (km)	Location	Left	Right
2+200	Temple		√

Annex – 04 : Photographs of the Project Area.

Photo 1	Photo 2	Photo 3
		
Road section near Starting point/small bridge at ch – 4+300	Road section/culvert area	End of existing road 5+300
Photo 4	Photo 5	Photo 6
		
Affected tree at ch - 3+500	Sevier eroded road section	Ongoing earth work road section

ENVIRONMENTAL CHECKLIST
Integrated Road Investment Program (iROAD)

Road Name : Pitadunna Junction to Imbulhitiya Mahwela Primery School
Road ID : 34
District Name : Kandy
DSD & GNDs :

DSD	GNDS
Ududumbara	**Mahawela**

Total Length of the road: 3.8km

Climate Conditions

Temperature– ^{0}C	High: 29 ^{0}C	Low: 18 ^{0}C
Humidity	High: 84%	Low: 63%
Rainfall Rainy Season	2000 mm – 2500 mm May – September	

(Source: http://www.myweather2.com/)

D. Location of the Road and Generic description of Environment

No	Type of Ecosystem	Yes	No	Explanation
1	Type of Terrain (Plain/Undulating/Hilly/Mountainous etc.) (Explain the topography of the area and how many km of the road are located in the hilly area)	√		Altitude: 2537ft – 2815ft The terrain of the road trace could be described as undulating to hilly.
2	Forest Area/mangrove/other natural habitats (Explain whether the road passes through forest areas or located along the forest areas and distance from shoulder to the forest area.		√	The road passes near the boundary of the Randenigala - Victoria sanctuary on left hand side from 3+000km to 3+300km .
3	Inhabited Area	√		From start to end scattered settlements are observed
4	Agricultural land	√		Mainly Cloves & nutmeg cultivation and pastureland located on either side of the road.
5	Barren Land	√		Barren Lands are located on either side of the road.

E. Specific description of the road Environment

No	Parameter/Component	Yes	No	Explanation
1	Are there any areas withlandslide or erosion problemsalong the road? (If yes, indicate the location whetherRight or Left side and the chainage)	√		However landslide problems area identified 1+400Km on LHS, and 2+3500Km on both side.

No	Parameter/Component	Yes	No	Explanation
2	Are there any Tanks/streams/rivers etc. along/crossing theroad or any lakes/swampsbeside the road? (If yes, list them indicating the locationRight/ Left or crossing and thechainage)	√		A stream (Kalunthenna pahala ela) crossing the road at 1+400km. also 7 storm water culverts are crossing the road.
3	Is the area along the projectroad prone to flooding or anyproblems of water stagnationand other drainage issues? (If yes, mention chainage, flood leveland frequency)		√	However the existing roadside and cross drainage is found to be poor and storm water is flowing over the road.
4	Are there any trees with a dbhof 30 cm or more within the existing ROW (withing two fences on either sides) or within 2m corridor from the edge of the carriage way on either side (If the existing Row is not clear)? (If yes attach list of tree indicating thelocation (Right or left side) and the chainage)	√		256 trees are located within 2m corridor on on both side from the edge of the existing carriageway. However only about 6 trees may be felled due to the improvement of the road. *(Please refer section Annex 1 for information)*
5	Along the road and within 100 m of the road shoulder,are there any Faunal habitatareas, Faunal breeding ground,bird migrationarea, or othersimilar areas? (If yes, specify details of habitat with chainage)		√	There are may be Faunal habitat areas, Faunal breeding ground, bird migration area within the forest sanctuary.
6	Along the road and within100m of the road shoulderis there any evidence of Floraand Fauna species that areclassified as endemic,endangered /Threatened Species?		√	There are may be Flora and Fauna species that are classified as endemic, endangered /Threatened Species.
7	Are there any utility structures[1]within 2 m on either side from the centre line of the roadalignment or within the existing Row of the road? (If yes, attach list with chainage)	√		53 number of electrical poles on RHS and 65 at LHS were observed along the road. *(Please refer section Annex 2 for information)*
8	Are there any religious, cultural or communitystructures/buildings2 within 20m on either side from the centre line of the roadalignment? (If yes attach list with chainage)	√		*(Please refer section Annex 4 for information)*

F. Public Consultation

No	Consultation Activities	Yes	No	Remarks
1.	Consultation with localcommunity was conducted before finalizing the alignment. (Attach list of people met and dates)	√		Public was consulted during field reconnaissance carried out for preparation of the environmental checklist. Detail of public consultations is attached.
2.	Any suggestion receivedin finalizing the alignment and road related environmental issue	√		public specified the need of improved road side and cross drainage system
3.	If suggestions received, were they Incorporated into the design?	√		

D. Please attach the following:

I. List of utility structures located within the study area (within exiting ROW or within 2m corridor of either sides of the road from the edge of the carriageway if the ROW is not clear) indicating location and side of the road (Right Hand Side (RHS) or Left Hand Side (LHS)) asrequired under B.7.(**Refex Annex 2)**

II. List of community structures indicating location and the side of the road (RHS or LHS) asrequired under B.8. (**Refer Annex 3)**

III. Photographs of the project area showing at least 02 m on either side from centre line ofroad alignment are attached in **(annex 4)**.

IV. List of trees with 30cm DBH or more located within study area (within existing ROW orwithin 2m from edge of the carriageway to the either sides of the road if ROW is not clear)as required in B.4.
Please refer to the annex 1 for the list of trees

Annex 1

Chainage (km)	Common Name	Scientific Name	LHS	RHS
Ch – 1+000	Dell Kithul	*Artacapus nobils Cariyota ureans*	√ √	
Ch – 2+300	Unknown			√
Ch – 3+100	Unknown			√

Annex 2

Chainage (Km)	Utility structure	LHS	RHS
0+800 – 2+000	Electric post Common well	 1	2
2+000 – 3+000	Electric post Water line Post office	4 1	1 1
3+000 – 3+800	Electric post School Ambalama	1 1 1	

Annex – 03

Chainage (km)	Location	Right	Left
Ch - 2+800	Economic development center	√	
Ch – 0+000	School(Wimaladarma Secondary school)	√	
End point	School (Mahawala Primary school)		√

Annex 04: Photographs of the project area

Photo 01	Photo 02	Photo 03
		
Water line along the road	Road damage	Rocky area
Photo 04	Photo 05	Photo 06
		
Eroded section ch – 3+500	Road section ch- 1+300	Bridge Ch – 2+700

ENVIRONMENTAL CHECKLIST
Integrated Road Investment Program (iROAD)

Road Name :Ragala water treatment plant via Ekagapura Rd,
Road ID :2
District Name :Nuwara Eliya
DSD & GNDs :

DSD	GNDS
Walapane	**Katandura**

Total Length of the road:4.4km

The first 1+900km section of this road is macadam and from 1+900km to 2+300km portion of this road is interlocked. Rest of the road is gravel. From 7+000km to 9+500km of the road is gravel and 9+500km to 10+000km of the road is concrete. The road passes through a syrups plantation area in LHS from 0+300km to 0+500km and a turpentine plantation is located at 2+500km – 2+800km LHS. Rest of the area is covered with a tea plantation.A church is at 0+150km LHS. Ragala factory office is located at 0+600km LHS and the factory is at the same site but in RHS. A Hidu kovil is at 1+000km RHS. Water pumping station is located at 2+000km RHS. Water treatment plant is located at 4+100km RHS.

Climate Conditions

Temperature– ^{0}C	High: 20^{0}c	Low:11^0
Humidity	High: 85%	Low:61%
Rainfall Rainy Season	More than 1900mm May – September	

(Source: http://www.myweather2.com/)

G. Location of the Road and Generic description of Environment

No	Type of Ecosystem	Yes	No	Explanation
1	Type of Terrain (Plain/Undulating/Hilly/Mountainous etc.) (Explain the topography of the area and how many km of the road are located in the hilly area)	√		Altitude:4952ft – 5914ft The terrain of the road trace could be described as undulating to hilly
2	Forest Area/mangrove/other natural habitats (Explain whether the road passes through forest areas or located along the forest areas and distance from shoulder to the forest area.)	√		The road passes through a syrups plantation area in LHS from 0+300km to 0+500km and a turpentine plantation is located at 2+500km – 2+800km LHS. Rest of the area is covered with a tea plantation.
3	Inhabited Area	√		Houses are located at 0+050km to 0+100km and from 0+700km to 1+000km.
4	Agricultural land	√		Tea cultivation
5	Barren Land	√		

H. Specific description of the road Environment

No	Parameter/Component	Yes	No	Explanation
1	Are there any areas withlandslide or erosion problemsalong the road? (If yes, indicate the location whetherRight or Left side and the chainage)	√		Areas of cut slopes and the steep slopes at LHS and RHS. However, related active landslides were not observed.
2	Are there any Tanks/streams/rivers etc. along/crossing theroad or any lakes/swampsbeside the road? (If yes, list them indicating the locationRight/ Left or crossing and thechainage)	√		Two streams crossing the roadat 0+400km and 0+800km. There are 7 culverts for storm water.
3	Is the area along the projectroad prone to flooding or anyproblems of water stagnationand other drainage issues? (If yes, mention chainage, flood leveland frequency)		√	But no proper storm water side drains both sides. Existing drains area filled with silt storm water flowing over the road.
4	Are there any trees with a dbhof 30 cm or more within the existing ROW (withing two fences on either sides) or within 2m corridor from the edge of the carriage way on either side (If the existing Row is not clear)? (If yes attach list of tree indicating thelocation (Right or left side) and the chainage)	√		50 trees are located within 2m corridor on both sidesfrom edge of carriage way from 0+000km to4+000km. However only about 02 trees may be cut due to the road improvement (Please refer Annex – 1)
5	Along the road and within 100 mof the road shoulder,are there any Faunal habitatareas, Faunal breeding ground,bird migrationarea, or othersimilar areas? (If yes, specify details of habitat with chainage)	√		There may be faunal habitat areas and faunal breeding ground present within the stream flowing area.
6	Along the road and within100m of the road shoulderis there any evidence of Floraand Fauna species that areclassified as endemic,endangered /Threatened Species?		√	There may be endemic, endangered/threatened species in the streams.
7	Are there any utility structures[1]within 2 m on either side fromthe center line of the roadalignment or within the existing Row of the road? (If yes, attach list with chainage)	√		50 numbers of electric poles on RHS and 20 number of electric poles on LHS were observed.However only 02 to be affected to the improvement of the road. A transformer is located at 0+100km LHS.

				Annex 2
8	Are there any religious, cultural or communitystructures/buildings2 within 20m on either side from the Centre line of the roadalignment? (If yes attach list with chainage)	√		A church is at 0+150km LHS. Ragala factory office is located at 0+600km LHS and the factory is at the same site but in RHS. A Hidu kovil is at 1+000km RHS. Water pumping station is located at 2+000km RHS. Water treatment plant is located at 4+100km RHS. Annex 3

I. Public Consultation

No	Consultation Activities	Yes	No	Remarks
1.	Consultation with localcommunity was conductedbefore finalizing the alignment. (Attach list of people met and dates)	√		Public consultation during field reconnaissance carried out for preparation of the Environmental check list. (Details of public consultation are attached)
2.	Any suggestion receivedin finalizing the alignment and road related environmental issue	√		Road side drains and all other existing drainage structures need to be properly investigated and reconstructed where necessary. Pradeshiya Shabahs (PS) did not do any road improvement for last 15 years in the area.
3.	If suggestions received, were they incorporated into the design?	√		The environmental check list will be forwarded to design team for father consideration.

D. Please attach the following:

I. List of utility structures located within the study area (within exiting ROW or within 2mcorridor of either sides of the road from the edge of the carriageway if the ROW is not clear)indicating location and side of the road (Right Hand Side (RHS) or Left Hand Side (LHS)) asrequired under B.7.(Refer annex 2)

II. List of community structures indicating location and the side of the road (RHS or LHS) asrequired under B.8.(Refer Annex 3)

III. Photographs of the project area showing at least 02 m on either side from centre line ofroad alignment are attached in annex 4.

IV. List of trees with 30cm DBH or more located within study area (within existing ROW orwithin 2m from edge of the carriageway to the either sides of the road if ROW is not clear)as required in B.4.
Please refer to the annex 1 for the list of trees

Annex 1 : Affected trees (within Existing ROW)

Chanage	Tree (Common name)	Scientific name	Left	Right
Ch - 0+010	Sabukku	*Michelia nilagirica*	√	√

Annex 2 : Affected Utility Structures (Within existing ROW)

Chainage (Km)	Utility structure	Left	Right
0+000 –0+100	Electricity	1	
0+600 – 0+800	Electricity	1	

Annex 3 : List ofList of community structures

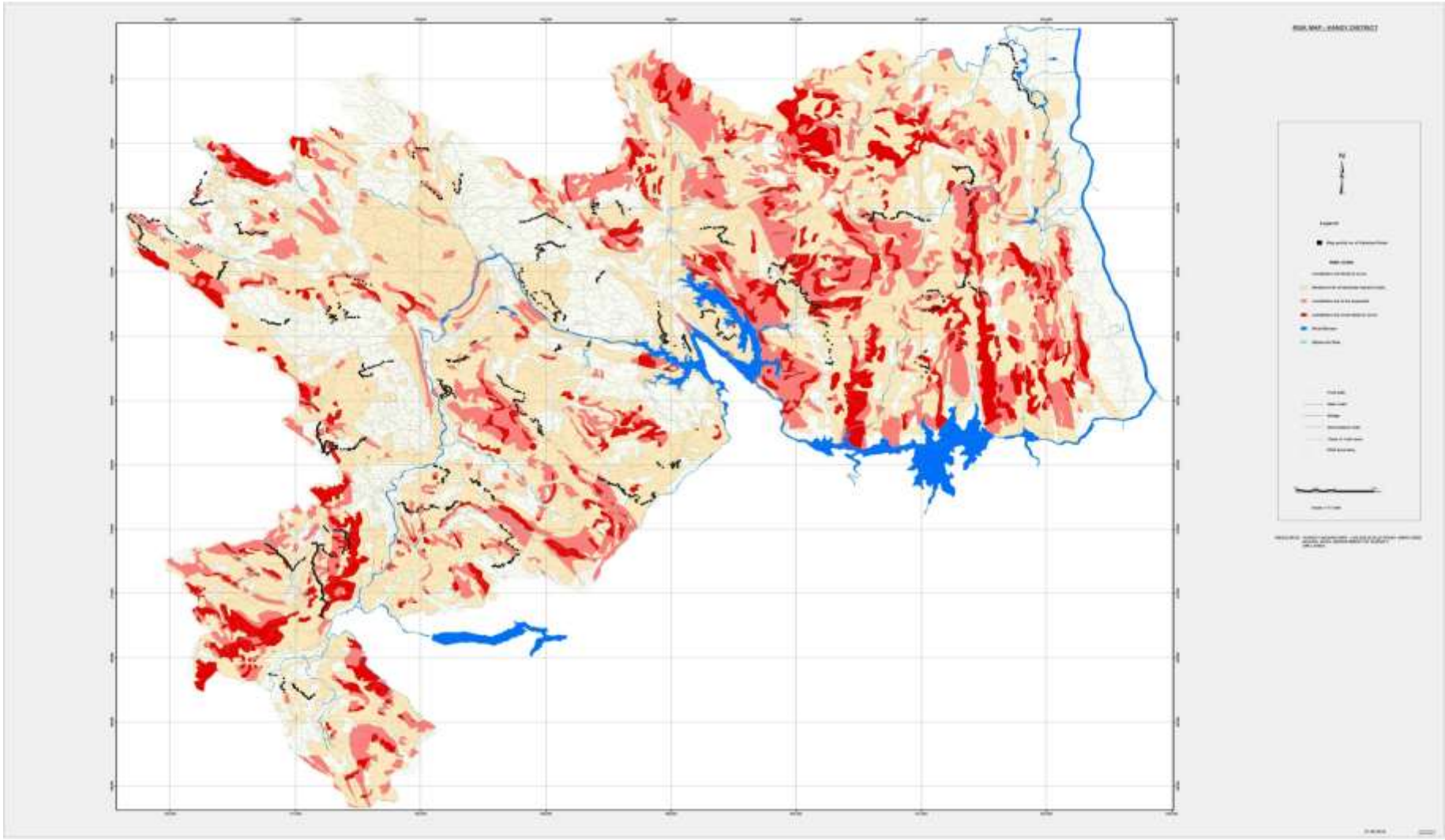
Chainage (km)	Location	Left	Right
0+150km	Church	√	
0+600km	Ragala factory office	√	
0+600km	Ragala factory		√
1+000km	Hidu kovil		√
2+000km	Water pumping station		√
4+100km	Water treatment plant		√

Annex – 04 : Photographs of the Project Area.

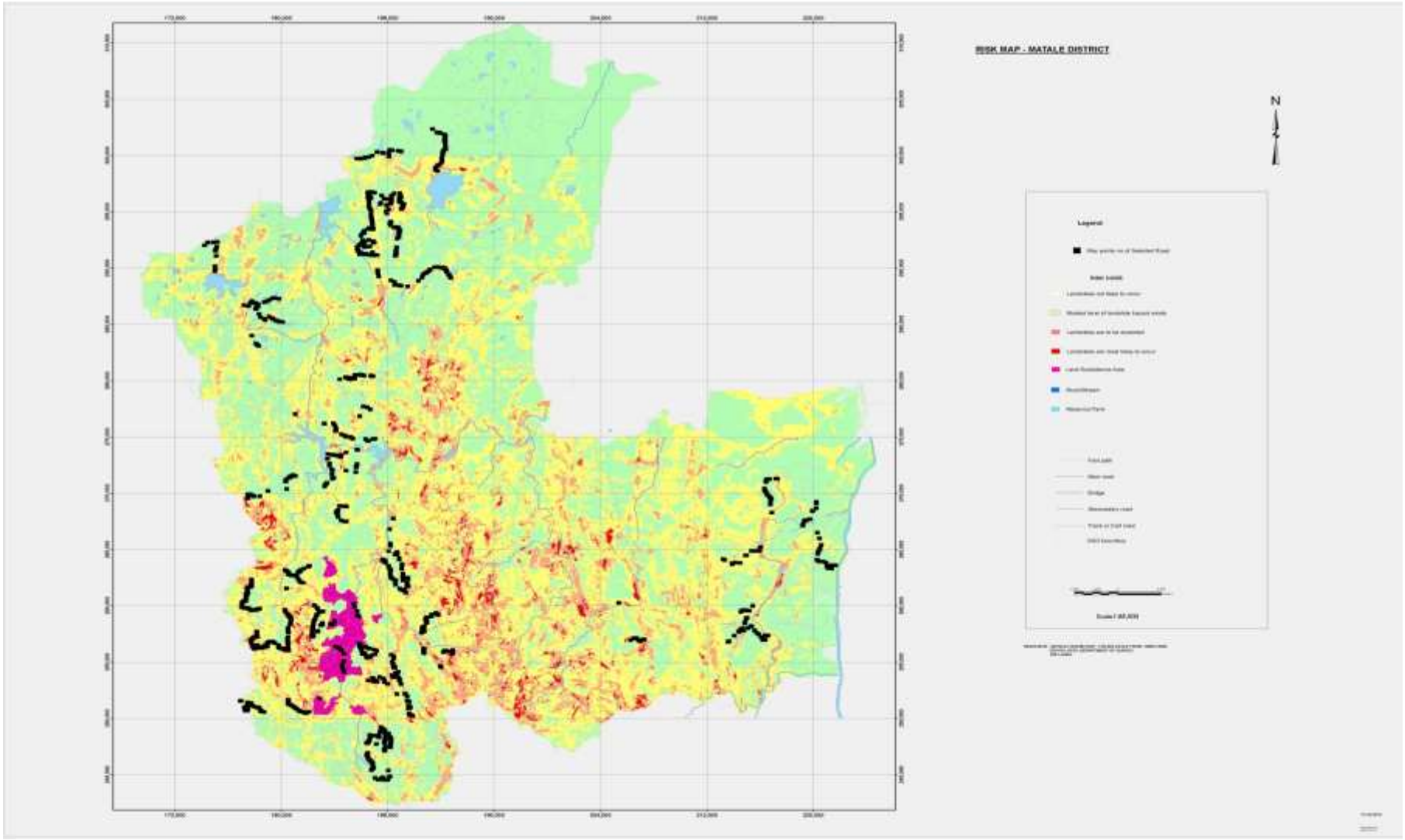
Photo 1	Photo 2	Photo 3
		
Starting point	Road section/transformer	A bridge at 0+400km
Photo 4	Photo 5	Photo 6
		
Road section with tea plantation	Syrups plantation	End point at water treatment plant

LANDSLIDE HAZARD MAP

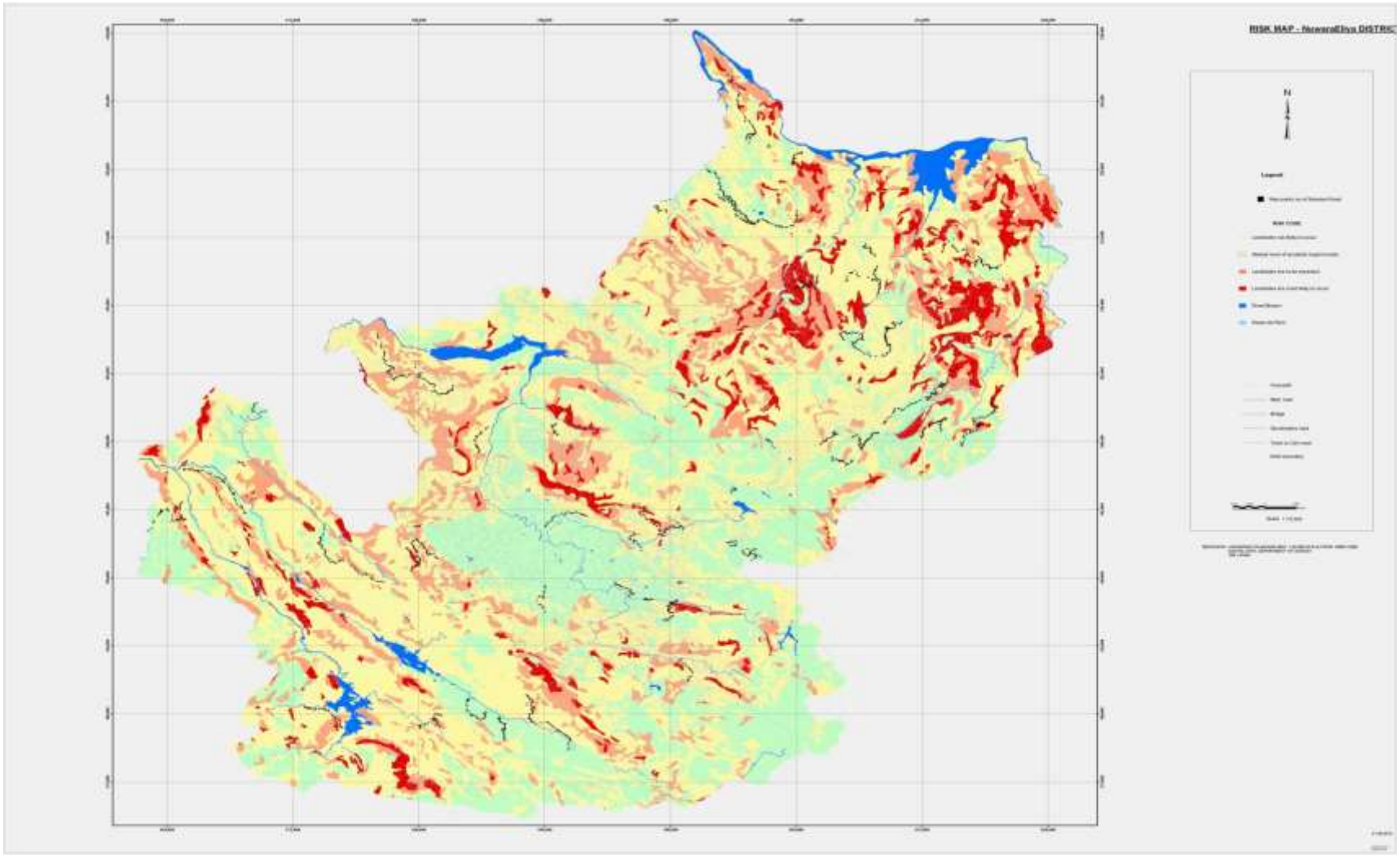
Mathale District – Central Province



Kandy District – Central Province



Nuwara-Eliya District – Central Province



STANDARD ENVIRONMENTAL MANAGEMENT PLAN

Upgrading of Rural Roads to all Weather Standards – Central Province

District:
Package Name:
Road Name:
Road ID:
Total length:

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Costs	Responsible for Implementing	Responsible for Monitoring
I	**Design and Preconstruction Stage**					
1.	Climate Change Consideration and Vulnerability screening	○ Compliance to climate change vulnerability check point given under IEE and adoption of necessary mitigative measures as may be required ○ Efforts shall be made to plant additional trees for increasing the carbon sink. The trees may be planted with help of DoF (Department of Forest) and space for additional planting (if the remaining space within ROW is not adequate) will be explored with the help of DoF, Divisional Secretary (DS) and Community Based Organizations (CBO).	Throughout the project and other possible areas of tree planting	Design costs.	PIU, Design consultants	Project Implementation Unit (PIU)
2.	Clearing of vegetation and removing trees	○ All efforts shall be taken to avoid tree cutting wherever possible. ○ Requisite permission from DS shall be obtained for cutting of roadside trees ○ Cut trees shall be handed over to the Timber Corporation. ○ Provision of Compensatory Afforestation shall be made on 1:3.ratio basis. ○ Only native species with the advice of DoF will be selected for replanting and locations for tree replanting will be as closer as possible to the tree removed. ○ And if road side space for replanting is not available, other possible locations such as schools, public areas will be explored with	Throughout the project area	Costs for tree removal. Costs for compensatory tree replanting.	Contractor	PIU, Project Implementation Consultant (PIC), DS

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Costs	Responsible for Implementing	Responsible for Monitoring
		the help of DoF, DS and CBOs of the area. ○ Provision shall be made for additional compensatory tree plantation. Any leftover of trees shall be removed and disposed in approved manner.				
3.	Shifting of utilities	○ The proposed Right of Way (ROW) shall be clearly demarcated on the ground. ○ All efforts will be made to minimize shifting of utilities ○ Utility shifting shall be planned in consultations and concurrence of the relevant service provider. ○ Required permissions and necessary actions will be taken from relevant service provider on a timely basis for removing and shifting utility structures before road construction activities begin. ○ The public/users of the particular service should be aware well in advance about the timing of the shifting/removal of the relevant utility lines when the service will be disrupted	Utility facilities located along either the side of the road which may be shifted due to the road improvement	Costs to cover shifting and reconstruction of utilities and common property resources must be included under project costs.	Contractor	PIU, PIC, CEB, Sri Lanka Telecom, NWS&DB, Community based water supply schemes if any
4.	Impacts to common properties	○ Common properties outside the ROW will not be affected due to road improvement ○ All efforts will be made to minimize shifting of common properties located within the ROW if any. ○ Structures with religious importance will not be touched ○ Any common property built within the existing ROW and to be removed due to road improvement will be reconstructed as to the satisfactory level to the relevant owner	Throughout the road with special attention to any common property to be shifted	Costs of removing and repairing common properties	Contractor	PIU, PIC

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Costs	Responsible for Implementing	Responsible for Monitoring
5.	Hydrology and Drainage	○ Provision of adequate cross drainage structure shall be made to ensure smooth passage of water and maintaining natural drainage pattern of the area. Here, special attention should be paid for flood prone areas. ○ The discharge capacity of the cross drainage structure shall be designed accordingly. ○ Provision of adequate drainage structures shall be made in water stagnant/logging areas. ○ The construction work near water body shall be planned preferably in dry season so that water quality of the water channel is not affected due to siltation and rain water runoff. ○ Provision of additional cross drainage structure shall be made in the areas where nearby land is sloping towards road alignment on both the sides.	Near all drainage crossings, rivers, streams and flood prone areas.	Included in project costs.	PIU, Design consultants	PIU, SRRDA
6.	Landslide impacts	○ Possibility of occurrence of project induced landslides is marginal as the road improvement activities will not touch slopes outside ROW. ○ However prior consent should be obtained from National Building Research Organization (NBRO) for roads along which landslide prone locations are already observed. ○ And special attention should be paid in designing at particular locations of such roads and also recommendation of NBRO if any should be incorporated to the designs	Throughout the project area with special attention to locations which are landslide prone	Included in project costs.	PIU, Design consultants	PIU, SRRDA
II.	**Construction Stage**					
1.	Landslide impact	○ As the improvement will be within the ROW, there will be minimal disturbance to the road side natural slopes and therefore possibility of occurring project induced landslides is minimal.	Throughout the project area with special attention to roads which already have	To be included under contractors costs	Contractor	PIU, PIC

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Costs	Responsible for Implementing	Responsible for Monitoring
		○ However proper coordination should be maintained with NBRO for roads which already have landslides or slope failures along its trace when construction activities are carried out and any recommendation from NBRO should be adhered. ○ Further contractor's activities shall not lead to create landslides and if any such incident occurs, he should immediately inform RDA and contractors shall provide suitable means to prevent loss of any access and prevent damage to land and property	landslides and locations previously stuck by landslides			
2.	Flood impacts	○ The contractor shall take all measures necessary or as directed by the Engineer to keep all drainage paths and drains clear of blockage at all times. ○ Temporary storage of material should only be within approved sites by the engineer where natural drainage is not disturbed. ○ All wastes should be disposed only at locations approved by the Local Authority of the area. ○ 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. ○ No material including excavated soil should 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 in to such nearby water bodies and agricultural lands. ○ The contractor should be advised not to damage or block any manmade drainage canal even for temporary basis. If blocked the contractor should remove such debris without any delay preventing any long interruptions of water flow which could damage or hinder cultivation activities	Throughout the project area with special attention to roads which are prone to floods	To be included under contractors costs	Contractor	PIU, PIC

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Costs	Responsible for Implementing	Responsible for Monitoring
		resulting in loss of crop and produce especially in the upstream side of the drainage path				
3.	Sourcing and transportation of construction material	_**Borrow Earth:** ○ The borrow earth shall be obtained from borrow pits which are operated with GSMB and CEA approvals. ○ And if new borrow pits are opened for the project, necessary approvals and licenses should be obtained from GSMB and CEA. And all conditions laid down in such licenses should be strictly adhered. ○ All completed borrow pits should be rehabilitated to satisfy conditions given in the industrial mining license of GSMB ○ Borrowing earth from agricultural land shall be minimized to the extent possible. Further, no earth shall be borrowed from already low-lying areas. _**Aggregate :** ○ The stone aggregate shall be sourced from existing licensed quarries ○ Copies of consent/ approval / rehabilitation plan for use of existing source will be submitted to PIU through PIC. ○ Topsoil to be stockpiled and protected for use at the rehabilitation stage. _**Transportation of Construction Material** ○ Existing tracks / roads are to be used for hauling of materials to the extent possible. ○ The vehicles deployed for material transportation shall be spillage proof to avoid or minimize the spillage of the material during transportation.	Throughout the project area with special attention to borrow pits and quarries to be used in each package	To be included under contractors costs	Contractor	PIU, PIC

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Costs	Responsible for Implementing	Responsible for Monitoring
5.	Loss of Productive Soil, erosion and land use change	○ The top soil from the productive land (borrow areas, road widening areas etc.) shall be preserved and reused for plantation purposes. ○ It shall also be used as top cover of embankment slope for growing vegetation to protect soil erosion. ○ Shrubs shall be planted in loose soil area.	Throughout the project area and camps sites, storage areas and temporary offices	To be included under contractors costs	Contractor	PIU, PIC
		○ It shall be ensured that the land taken on lease for access road, construction camp and temporary office of the storage facilities is restored back to its original land use before handing it over to land owner.				
6.	Slope protection and stabilization	○ Slope protection measures must be carried out using appropriate engineering and bio-engineering measures in combination with drainage improvement measures were appropriate ○ Only native plant species will be selected for the bio-engineering works ○ Follow up watering and maintenance of the plants must be carried out to ensure the survival of the plants and success of the slope stabilization	In project areas falling inside landslide prone	To be included under contractors costs	Contractor	PIU, PIC
7.	Compaction and Contamination of Soil	○ To prevent soil compaction in the adjoining productive lands beyond the ROW, the movement of construction vehicles, machinery and equipment shall be restricted to the designated haulage route. ○ The productive land shall be reclaimed after construction activity. ○ Fuel and lubricants shall be stored at the predefined storage location. ○ The storage area shall be paved with gentle slope to a corner and connected with a chamber to collect any spills of the oils. ○ All efforts shall be made to minimise the waste generation. Unavoidable waste shall be stored at the designated place prior to disposal.	Throughout the project area with special attention to paddy and other agricultural lands	To be included under contractors costs	Contractor	PIU, PIC

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Costs	Responsible for Implementing	Responsible for Monitoring
		○ To avoid soil contamination at the wash-down and re-fuelling areas, “oil interceptors” shall be provided. Oil and grease spill and oil soaked materials are to be collected and stored in labelled containers (Labelled: WASTE OIL; and hazardous sign be displayed) and sold off to relevant parties. o Any land degraded due to construction activities should be restored to the satisfactory level of the owner				
8.	Establishment of Construction Camp, temporary office and storage area	○ Construction camp sites and storage areas shall be located away from any local human settlements, water bodies and forested areas (minimum 0.2 km away) and preferably located on land which is not productive (barren/waste lands presently). If these are not possible private land maybe taken on lease as standard practice. ○ The construction camps, office and storage areas shall have provision of adequate water supply, sanitation and all requisite infrastructure facilities. ○ The construction camps, office and storage areas shall have provision of septic tank/soak pit of adequate capacity so that it can function properly for the entire duration of its use. ○ All construction camps shall have provision of rationing facilities particularly for kerosene/LPG so that dependence on firewood for cooking is avoided to the extent possible. The construction camps, office and storage areas shall have provision of health care facilities for adults, pregnant women and children. ○ Personal Protective Equipment (PPEs) such as helmet, boots, ear plugs for workers, first aid and firefighting equipment shall be available at construction sites before start of construction. An emergency plan shall be	Throughout the project area with special attention to labour camps, storage areas and office premises	To be included in contractor’s cost	Contractor	PIU, PIC, LA

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Costs	Responsible for Implementing	Responsible for Monitoring
		prepared to fight with any emergency like fire. ○ Provision shall be made for domestic solid waste disposal in acceptable manner. The solid waste shall be handed over to the waste collecting system of the Local Authority (LA) of the area and wastewater should be disposed with the approval of the PIC. ○ Provision of paved area for unloading and storage of fuel oil, lubricant oil, away from storm water drainage.				
9.	Construction Debris and waste	○ Excavated materials from roadway, shoulders, verges, drains, cross drainage will be used for backfilling embankments, filling pits, and landscaping. ○ Unusable debris material and removed pavements of roads should be suitably disposed off at pre-designated disposal locations, with approval of the concerned authority such as LA/DS. ○ The bituminous wastes if any shall be disposed in secure manner and environmentally accepted manner eg. Disposed in a pit that is covered properly and adequate revegetation is carried out or others. ○ In establishing disposal sites, unproductive/wastelands shall be selected with the help the PIC and villagers. The dumping site should be of adequate capacity. It should be located without causing nuisance to residential areas. Dumping sites. Further flood prone areas should be avoided in selecting disposal sites	Throughout the project area and all disposal sites	To be included under contractors costs	Contractor	PIU, PIC
10.	Air and Noise Quality and vibration	○ Vehicles delivering loose and fine materials like sand and aggregates shall be covered. ○ Dust suppression measures such as water sprinkling, shall be applied in all dust prone locations such as unpaved haulage roads, earthworks, stockpiles and asphalt mixing	Throughout the project road with special attention to schools, hospitals and religious places located along	To be included under contractors costs	Contractor	PIU, PIC

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Costs	Responsible for Implementing	Responsible for Monitoring
		areas. ○ Batching plants and asphalt (hot mix) should be operated with necessary licenses (Environmental Protection License (EPL) and trade license) and plants shall be located at least 0.2 km away and in downwind direction of the human settlements and should not disturb normal life of residents. ○ Material storage areas shall also be located downwind of the habitation area. ○ Hot mix plant shall be fitted with stack of adequate height (30m) or as may be prescribed in the EPL to ensure enough dispersion of exit gases. ○ Diesel Generators (DG) shall also be sound proof or fitted with stack of adequate height. ○ Construction vehicles and machineries shall be periodically maintained. o All heavy equipment and machinery shall be fitted in full compliance with the national regulation, Noise Control Regulations - Extra Ordinary Gazette No. 924/12 May 1996 amended by Extra Ordinary Gazette 937/7 April 1997. ○ No construction along community areas will be permitted during night time ○ Contractor shall take appropriate action to ensure that construction works do not result in damage to adjacent properties due to vibration. If any damages occur, contractor will be responsible for rectifying the damage.	candidate roads			
11.	Tree plantation	○ Compensatory forestation shall be made on 1:3.ratio basis. ○ Only native species should be selected with the consent of DoF for replanting ○ Additional trees shall be planted wherever feasible. ○ Follow up maintenance of planted saplings will be carried out for a minimum of 3 years	Throughout the all project roads.	To be included under contractors costs	Contractor	PIU, PIC
12.	Ground Water and Surface	○ The contractor shall arrange for water	Throughout the	To be included	Contractor	PIU, PIC

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Costs	Responsible for Implementing	Responsible for Monitoring
	Water Quality and Availability	required during construction in such a way that the water availability and supply to nearby communities remains unaffected. ○ Water intensive activities shall not be undertaken during dry period to the extent feasible. ○ Provision shall be made to link side drains with the nearby ponds for facilitating water harvesting if feasible. ○ Preventive measures such as proper storage of unsuitable soil, construction chemicals, servicing construction vehicles in approved sites, slope stabilisation, etc shall be taken for prevention of siltation and pollution of water bodies.	project area with special attention to streams, public wells and marshes	under contractors costs		
13.	Occupational Health and Safety	○ The requisite PPE (helmet, mask, boot, hand gloves, earplugs) shall be provided to the construction workers and it should be ensured that labourers use PPE during working hours. ○ Workers' exposure to noise will be restricted to less than 8 hours a day. Workers duty shall be regulated accordingly. ○ First aid facility should be readily available at every construction site throughout the construction period ○ Septic tank or mobile toilets fitted with anaerobic treatment facility shall be provided at construction camp/temporary office/ storage areas. ○ Domestic solid waste at construction camp shall be properly collected and handed over to the solid waste collecting system of LA. ○ Records on health and safety related accidents measures taken to address must be maintained ○ Adequate signboards shall be placed much ahead of diversion site to caution the road users. The road signs should comply with the Road Safety Manual of RDA. ○ It is proposed to discuss with the	Near forest reserves, national parks, sanctuaries if any	Costs to be borne by Contractor	Contractor	PIU, PIC

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Costs	Responsible for Implementing	Responsible for Monitoring
		Department of Railways for providing adequate safety measures at unmanned railway crossing where applicable. Adequate clearly visible sign shall be provided on both sides of the railway crossing. o Road furniture including footpaths, railings, storm water drains, crash barrier, traffic signs, speed zone signs, pavement markers and any other such items will be provided to enhance the road safety where necessary at the completion of the project o Monitor and record road crashes during construction and maintenance stages and take appropriate remedial actions				
14.	Impacts on Biodiversity	o No solid waste or spoil dumping sites, hot mix plants and worker camps should be located within or close to the protected areas. o Prior approval should be taken from the relevant department for entrance or temporary alteration of properties belongs to such areas. o Strict worker force supervision should be carried out by the contractor when conducting construction work within the area and the construction works should be completed within a minimum specified time period. o Restrictions on the daily working hours between daylight and sunset must be enforced in sites near protected areas or wildlife zones o Conditions which may be required by the DWLC for roads located adjacent or close to protected areas must be met o For roads falling near protected areas appropriate measures such as posting of information sign boards on the presence of wildlife, speed controls such as speed bumps etc. must be installed as appropriate o Other measures to facilitate wildlife	Throughout the project roads	To be included in contractor's cost	Contractor	PIU, PIC

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Costs	Responsible for Implementing	Responsible for Monitoring
		movement across the road such as exclusion fences may be installed with advise of DWLC ○ Ensure that construction timing of cross drains and bridges will not affect the migration or breeding of aquatic species. The contractor will seek guidance from pertinent agencies to identify rivers and creeks harbouring sensitive aquatic life. ○ Ensure that the timing of tree removal does not coincide with breeding season of birds or other fauna if the trees are being used by birds and other fauna				

SL. NO	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Costs	Responsible for Implementing	Responsible for Monitoring
III	**Post Construction and Operational Stage**					
1.	Occurrence of landslides	○ In such case, contractor is responsible for clearing the road and restore the access as soon as possible (during the maintenance period) after informing RDA (PIU and relevant Executive Engineer of RDA). ○ Here, contractor should also comply with recommendations of NBRO if any.	Throughout the project area	To be included in contractor's maintenance cost	Contractor (during maintenance period) and RDA	PIU/RDA
2.	Hydrology and Drainage	○ Regular removal/cleaning of deposited silt shall be done from drainage channels and outlet points before the monsoon season. ○ Renovation of the drainage system by repairing removing encroachments/ congestions shall be regularly conducted	At project road locations with drainage structures	To be included in contractor's maintenance cost	Contractor (during maintenance period) and RDA	PIU/RDA
3.	Air and Noise Quality	○ Placing sign boards for speed limitation and honking restrictions to be enforced near sensitive locations.o Removal of dust & mud collected on road surface to avoid dust emanation ○ Strategically locating compensatory plantation along sensitive noise receptors to provide additional attenuation ○ Installation of noise and dust barriers if levels are found to exceed required standards.	Throughout the project roads	construction cost and maintenance cost	Contractor (during maintenance period) and RDA	PIU/RDA
4.	Site restoration	○ All construction camp/temporary office/material storage areas are to be restored to its original conditions or as agreed with the land owner. ○ The borrow areas rehabilitation will be as per the conditions laid down in GSMB approval.	All locations of construction camps/temporary office/ material storage, and borrow areas	To be borne by the contractor	Contractor (during maintenance period) and RDA	PIU/RDA

5.	Tree replanting	○ Contractor to undertake survivability assessment and report to PIU the status of compensatory tree plantation. ○ Additional plants should be planted for dead plants if any	All tree replanted areas	To be borne by the contractor	Contractor (during maintenance period) and RDA	PIU/RDA
6.	○ Occupational Health and Safety	○ The requisite PPE (helmet, mask, boot, hand gloves, earplugs) shall be provided to the construction workers and it should be ensured that labourers use PPE during working hours. ○ First aid facility should be readily available at the construction site ○ Septic tank or mobile toilets fitted with anaerobic treatment facility shall be provided at construction camp/temporary office/storage areas. ○ Domestic solid waste at construction camp shall be properly collected and handed over to the solid waste collecting system of LA. ○ Records on health and safety related accidents measures taken to address must be maintained	Throughout the project roads and camp sites if any	To be borne by the contractor	Contractor (during maintenance period) and RDA	PIU/RDA

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SAMPLE ENVIRONMENTAL MONITORING CHECKLIST

Appendix 8.1 Environmental Monitoring Checklist during Design and Pre-Construction Stage
Upgrading of Rural Roads to all Weather Standards

District:
Road Name:
Road ID:
Total length:
Report No. and date:
Completed by:

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
I	**Design and Preconstruction Stage**				
1.	Climate Change Consideration and Vulnerability screening	○ Compliance to climate change vulnerability check point given under IEE and adoption of necessary mitigative measures as may be required ○ Efforts shall be made to plant additional trees for increasing the carbon sink. The trees may be planted with help of DoF (Department of Forest) and space for additional planting (if the remaining space within ROW is not adequate) will be explored with the help of DoF, Divisional Secretary (DS) and Community Based Organizations (CBO).	Throughout the project area and other possible areas of tree planting		
2.	Clearing of vegetation and removing trees	○ All efforts shall be taken to avoid tree cutting wherever possible. ○ Requisite permission from DS shall be obtained for cutting of roadside trees ○ Cut trees shall be handed over to the Timber Corporation. ○ Provision of Compensatory Afforestation shall be made on 1:3.ratio basis. ○ Only native species with the advice of DoF will be selected for replanting and locations for tree replanting will be as closer as possible to the tree removed. ○ And if road side space for replanting is not available, other possible locations such as schools, public areas will be explored with the help of DoF, DS and CBOs of the area. ○ Provision shall be made for additional compensatory tree plantation. Any leftover of trees shall be removed and disposed in approved manner.	Throughout the project area		

3.	Shifting of utilities	○ The proposed Right of Way (ROW) shall be clearly demarcated on the ground. ○ All efforts will be made to minimize ○ shifting of utilities ○ Utility shifting shall be planned in consultations and concurrence of the relevant service provider. ○ Required permissions and necessary actions will be taken from relevant service provider on a timely basis for removing and shifting utility structures before road construction activities begin. ○ The public/users of the particular service should be aware well in advance about the timing of the shifting/removal of the relevant utility lines when the service will be disrupted	Utility poles located along either the side of the road which may be shifted due to the road improvement		
4.	Impacts to common properties	○ Common properties outside the ROW will not be affected due to road improvement ○ All efforts will be made to minimize shifting of common properties located within the ROW if any. ○ Structures with religious importance will not be touched ○ Any common property built within the existing ROW and to be removed due to road improvement will be reconstructed as to the satisfactory level to the relevant owner	Throughout the road with special attention to any common property to be shifted		
5.	Hydrology and Drainage	○ Provision of adequate cross drainage structure shall be made to ensure smooth passage of water and maintaining natural drainage pattern of the area. Here, special attention should be paid for flood prone areas. ○ The discharge capacity of the cross drainage structure shall be designed accordingly. ○ Provision of adequate drainage structures shall be made in water stagnant/logging areas. ○ The construction work near water body shall be planned preferably in dry season so that water quality of the water channel is not affected due to siltation and rain water runoff. ○ Provision of additional cross drainage structure shall be made in the areas where nearby land is sloping towards road alignment on both the sides.	Near all drainage crossings, rivers, streams and flood prone areas		
6.	Landslide impacts	○ Possibility of occurrence of project induced landslides is marginal as the road improvement activities will not touch slopes outside ROW. ○ However prior consent should be obtained from National Building Research Organization (NBRO) for roads along which landslide prone locations are already observed. ○ And special attention should be paid in designing at particular locations of such roads and also recommendation of NBRO if any should be incorporated to the designs	Throughout the project area with special attention to locations which are landslide prone		

Appendix 8.2 Environmental Monitoring Checklist during Construction Stage
Upgrading of Rural Roads to all Weather Standards

District:
Road Name:
Road ID:
Total length:
Report No. and date:
Completed by:

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
1.	Landslide impact	○ As the improvement will be within the ROW, there will be minimal disturbance to the road side natural slopes and therefore possibility of occurring project induced landslides is minimal. ○ However proper coordination should be maintained with NBRO for roads which already have landslides or slope failures along its trace when construction activities are carried out and any recommendation from NBRO should be adhered. ○ Further contractor's activities shall not lead to create landslides and if any such incident occurs, he should immediately inform RDA and contractors shall provide suitable means to prevent loss of any access and prevent damage to land and property	Throughout the project area with special attention to roads which already have landslides and locations previously stuc by landslides		
2.	Flood impacts	○ The contractor shall take all measures necessary or as directed by the Engineer to keep all drainage paths and drains clear of blockage at all times. Here special attention should be paid to flood prone areas. ○ Temporary storage of material should only be within approved sites by the engineer where natural drainage is not disturbed. ○ All wastes should be disposed only at locations approved by the Local Authority of the area. ○ 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. ○ No material including excavated soil should 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 in to such nearby water bodies and agricultural lands. ○ The contractor should be advised not to damage or block any	Throughout the project area with special attention to roads which are prone to floods.		

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
		manmade drainage canal even for temporary basis. If blocked the contractor should remove such debris without any delay preventing any long interruptions of water flow which could damage or hinder cultivation activities resulting in loss of crop and produce especially in the upstream side of the drainage path			
3.	Sourcing and transportation of construction material	○ **Borrow Earth:** ○ The borrow earth shall be obtained from borrow pits which are operated with GSMB and CEA approvals. ○ And if new borrow pits are opened for the project, necessary approvals and licenses should be obtained from GSMB and CEA. And all conditions laid down in such licenses should be strictly adhered. ○ All completed borrow pits should be rehabilitated to satisfy conditions given in the industrial mining license of GSMB ○ Borrowing earth from agricultural land shall be minimized to the extent possible. Further, no earth shall be borrowed from already low-lying areas. ○ **Aggregate :** ○ The stone aggregate shall be sourced from existing licensed quarries ○ Copies of consent/ approval / rehabilitation plan for use of existing source will be submitted to PIU through PIC. ○ Topsoil to be stockpiled and protected for use at the rehabilitation stage. ○ **Transportation of Construction Material** ○ Existing tracks / roads are to be used for hauling of materials to the extent possible. ○ The vehicles deployed for material transportation shall be spillage proof to avoid or minimize the spillage of the material during transportation.	Throughout the project area with special attention to borrow pits and quarries		
5.	Loss of Productive Soil, erosion and land use change	○ The top soil from the productive land (borrow areas, road widening areas etc.) shall be preserved and reused for plantation purposes. ○ It shall also be used as top cover of embankment slope for growing vegetation to protect soil erosion. ○ Shrubs shall be planted in loose soil area. ○ It shall be ensured that the land taken on lease for access road, construction camp and temporary office of the storage facilities is restored back to its original land use before handing it over to land owner.	Throughout the project area and camps sites, storage areas and temporary offices		

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
6.	Slope protection and stabilization	○ Slope protection measures must be carried out using appropriate engineering and bio-engineering measures in combination with drainage improvement measures were appropriate ○ Only native plant species will be selected for the bio-engineering works ○ Follow up watering and maintenance of the plants must be carried out to ensure the survival of the plants and success of the slope stabilization	In project areas falling inside landslide prone		
7.	Compaction and Contamination of Soil	○ To prevent soil compaction in the adjoining productive lands beyond the ROW, the movement of construction vehicles, machinery and equipment shall be restricted to the designated haulage route. ○ The productive land shall be reclaimed after construction activity. ○ Fuel and lubricants shall be stored at the predefined storage location. ○ The storage area shall be paved with gentle slope to a corner and connected with a chamber to collect any spills of the oils. ○ All efforts shall be made to minimise the waste generation. Unavoidable waste shall be stored at the designated place prior to disposal. ○ To avoid soil contamination at the wash-down and re-fuelling areas, “oil interceptors” shall be provided. Oil and grease spill and oil soaked materials are to be collected and stored in labelled containers (Labelled: WASTE OIL; and hazardous sign be displayed) and sold off to relevant parties. o Any land degraded due to construction activities should be restored to the satisfactory level of the owner	Throughout the project area with special attention to paddy and other agricultural lands		
8.	Establishment of Construction Camp, temporary office and storage area	○ Construction camp sites and storage areas shall be located away from any local human settlements, water bodies and forested areas (minimum 0.2 km away) and preferably located on land which is not productive (barren/waste lands presently). If these are not possible private land maybe taken on lease as standard practice. ○ The construction camps, office and storage areas shall have provision of adequate water supply, sanitation and all requisite infrastructure facilities. ○ The construction camps, office and storage areas shall have provision of septic tank/soak pit of adequate capacity so that it can function properly for the entire duration of its use.	Throughout the project area with special attention to labour camps, storage areas and office premises		

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
		○ All construction camps shall have provision of rationing facilities particularly for kerosene/LPG so that dependence on firewood for cooking is avoided to the extent possible. ○ The construction camps, office and storage areas shall have provision of health care facilities for adults, pregnant women and children. ○ Personal Protective Equipment (PPEs) such as helmet, boots, earplugs for workers, first aid and firefighting equipment shall be available at construction sites before start of construction. An emergency plan shall be prepared to fight with any emergency like fire. ○ Provision shall be made for domestic solid waste disposal in acceptable manner. The solid waste shall be handed over to the waste collecting system of the Local Authority (LA) of the area and wastewater should be disposed with the approval of the PIC. ○ Provision of paved area for unloading and storage of fuel oil, lubricant oil, away from storm water drainage.			
9.	Establishment of Construction Camp, temporary office and storage area	○ Excavated materials from roadway, shoulders, verges, drains, cross drainage will be used for backfilling embankments, filling pits, and landscaping. ○ Unusable debris material and removed pavements of roads should be suitably disposed off at pre-designated disposal locations, with approval of the concerned authority such as LA/DS. ○ The bituminous wastes if any shall be disposed in secure manner and environmentally accepted manner eg. Disposed in a pit that is covered properly and adequate revegetation is carried out or others. ○ In establishing disposal sites, unproductive/wastelands shall be selected with the help the PIC and villagers. The dumping site should be of adequate capacity. It should be located without causing nuisance to residential areas. Dumping sites. Further flood prone areas should be avoided in selecting disposal sites	Throughout the project area and all disposal sites		
10.	Air and Noise Quality and vibration	○ Vehicles delivering loose and fine materials like sand and aggregates shall be covered. ○ Dust suppression measures such as water sprinkling, shall be applied in all dust prone locations such as unpaved haulage roads, earthworks, stockpiles and asphalt mixing areas. ○ Batching plants and asphalt (hot mix) should be operated with necessary licenses Environmental Protection License (EPL)	Throughout the project road with special attention to schools, hospitals and religious places		

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
		and trade license) and plants shall be located at least 0.2 km away and in downwind direction of the human settlements and should not disturb normal life of residents. o Material storage areas shall also be located downwind of the habitation area. o Hot mix plant shall be fitted with stack of adequate height (30m) or as may be prescribed in the EPL to ensure enough dispersion of exit gases. o Diesel Generators (DG) shall also be sound proof or fitted with stack of adequate height. o Construction vehicles and machineries shall be periodically maintained. o All heavy equipment and machinery shall be fitted in full compliance with the national regulation, Noise Control Regulations - Extra Ordinary Gazette No. 924/12 May 1996 amended by Extra Ordinary Gazette 937/7 April 1997. o No construction along community areas will be permitted during night time o Contractor shall take appropriate action to ensure that construction works do not result in damage to adjacent properties due to vibration. If any damages occur, contractor will be responsible for rectifying the damage.			
11.	Tree plantation	o Compensatory afforestation shall be made on 1:3.ratio basis. o Only native species should be selected with the consent of DoF for replanting o Additional trees shall be planted wherever feasible. o Follow up maintenance of planted saplings will be carried out for a minimum of 3 years	Throughout the road.		
12.	Ground Water and Surface Water Quality and Availability	o The contractor shall arrange for water required during construction in such a way that the water availability and supply to nearby communities remains unaffected. o Water intensive activities shall not be undertaken during dry period to the extent feasible. o Provision shall be made to link side drains with the nearby ponds for facilitating water harvesting if feasible. o Preventive measures such as proper storage of unsuitable soil, construction chemicals, servicing construction vehicles in approved sites, slope stabilisation, etc shall be taken for prevention of siltation and pollution of water bodies.	Throughout road with special attention to streams, tanks and marshes		

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
13.	Occupational Health and Safety	○ The requisite PPE (helmet, mask, boot, hand gloves, earplugs) shall be provided to the construction workers and it should be ensured that labourers use PPE during working hours. ○ Workers' exposure to noise will be restricted to less than 8 hours a day. Workers duty shall be regulated accordingly. ○ First aid facility should be readily available at every construction site throughout the construction period ○ Septic tank or mobile toilets fitted with anaerobic treatment facility shall be provided at construction camp/temporary office/storage areas. ○ Domestic solid waste at construction camp shall be properly collected and handed over to the solid waste collecting system of LA. ○ Records on health and safety related accidents measures taken to address must be maintained	Throughout the road		
		○ Adequate signboards shall be placed much ahead of diversion site to caution the road users. The road signs should comply with the Road Safety Manual of RDA. ○ It is proposed to discuss with the Department of Railways for providing adequate safety measures at unmanned railway crossing where applicable. Adequate clearly visible sign shall be provided on both sides of the railway crossing. ○ Road furniture including footpaths, railings, storm water drains, crash barrier, traffic signs, speed zone signs, pavement markers and any other such items will be provided to enhance the road safety where necessary at the completion of the project ○ Monitor and record road crashes during construction and maintenance stages and take appropriate remedial actions			

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
14.	Impacts on Biodiversity	○ No solid waste or spoil dumping sites, hot mix plants and worker camps should be located within or close to the protected areas. ○ Prior approval should be taken from the relevant department for entrance or temporary alteration of properties belongs to such areas. ○ Strict worker force supervision should be carried out by the contractor when conducting construction work within the area and the construction works should be completed within a minimum specified time period. ○ Restrictions on the daily working hours between daylight and sunset must be enforced in sites near protected areas or wildlife zones ○ Conditions which may be required by the DWLC for roads located adjacent or close to protected areas must be met ○ For roads falling near protected areas appropriate measures such as posting of information sign boards on the presence of wildlife, speed controls such as speed bumps etc. must be installed as appropriate ○ Other measures to facilitate wildlife movement across the road such as exclusion fences may be installed with ○ advise of DWLC ○ Ensure that construction timing of cross drains and bridges will not affect the migration or breeding of aquatic species. The contractor will seek guidance from pertinent agencies to identify rivers and creeks harbouring sensitive aquatic life. ○ Ensure that the timing of tree removal does not coincide with breeding season of birds or other fauna if the trees are being used by birds and other fauna	Near forest reserves, national parks, sanctuaries if any	To be included in contractor's cost	PIU, PIC

NOTE: Each report must enclose photographs to demonstrate the mitigation measures implemented

Appendix 8.3 Environmental Monitoring Checklist during Post-Construction or Operation Stage
Upgrading of Rural Roads to all Weather Standards

District:
Road Name:
Road ID:
Total length
Report No. and date:
Completed by

SL. NO.	Environmental Attributes		Mitigation Measures	Location	Compliance status (Complied, partly complied, not complied)
III	**Post Construction and Operational Stage**				
1.	Occurrence of landslides	○ In such case, contractor is responsible for clearing the road and restore the access as soon as possible (during the maintenance period) after informing RDA (PIU and relevant Executive Engineer of RDA). ○ Here, contractor should also comply with recommendations of NBRO if any.	Throughout the project area		
2.	Hydrology and Drainage	○ Regular removal/cleaning of deposited silt shall be done from drainage channels and outlet points before the monsoon season. ○ Renovation of the drainage system by repairing removing encroachments/ congestions shall be regularly conducted	At project road locations with drainage structures		
3.	Air and Noise Quality	○ Placing sign boards for speed limitation and honking restrictions to be enforced near sensitive locations.o Removal of dust & mud collected on road surface to avoid dust emanation ○ Strategically locating compensatory plantation along sensitive noise receptors to provide additional attenuation ○ Installation of noise and dust barriers if levels are found to exceed required standards.	Throughout the road		
4.	Site restoration	○ All construction camp/temporary office/material storage areas are to be restored to its original conditions or as agreed with the land owner. ○ The borrow areas rehabilitation will be as per the conditions laid down in GSMB approval.	All locations of construction camps/temporary office/ material storage, and borrow areas		
5.	Tree replanting	○ Contractor to undertake survivability assessment and report to PIU the status of compensatory tree plantation. ○ Additional plants should be planted for dead plants if any	Tree replanted areas		
6.	Occupational Health and Safety	○ The requisite PPE (helmet, mask, boot, hand gloves, earplugs) shall be provided to the construction workers and it should be ensured that labourers use PPE during working hours. ○ First aid facility should be readily available at the construction site ○ Septic tank or mobile toilets fitted with anaerobic treatment facility shall be provided at construction camp/temporary office/storage areas. ○ Domestic solid waste at construction camp shall be properly collected and handed over to the solid waste collecting system of LA. ○ Records on health and safety related accidents measures taken to address must be maintained	Throughout the project road and camp sites if any		

STANDARD ENVIRONMENTAL MONITORING PLAN (EMOP)

STANDARD ENVIRONMENTAL MONITORING PLAN (EMOP) FOR THE PERFORMANCE INDICATORS
Rural Road Component – Central Province

This Environmental Monitoring Plan (EMOP) is prepared for a typical rural road located in Central Province. Therefore this EMOP should be updated before commencement of the project with specific locations of monitoring for each candidate road. And the environmental specialist of the Project Implementation Consultant (PIC) of the project is responsible for selection of specific locations of each road with the help of the relevant contractor and updating the EMOP. The updated EMOP for each road should be approved by the Project Implementation Unit (PIU) well in advance to the construction phase and also it should be noted that baseline monitoring should be carried out by the contractor before the construction stage.

Environmental Component	Project Stage	Parameters	Frequency	Locations	Standards	Rate	Approximate Cost (SLRs)	Implementation	Supervision
Air Quality	Design and Construction stage	TSPM, PM10, NO_x , CO, SO_x , Pb	Design: Once Construction: 3 times per year for 2 years	Minimum 2 locations (Locations to be identified with the help of PIC)	NAAQS of Sri Lanka	Rs 40,000 per location	560,000.00	Contractor through approved monitoring agency	RDA/ESD
	Operation stage	TSPM, PM10, NO_x, CO, HC, Pb, SO_x	Once per year for 3 years	-do-	NAAQS of Sri Lanka	Rs 40,000 per location	240,000.00	Contractor/RDA through approved monitoring agency	RDA/ESD
Water Quality	Design and Construction stage	EC, pH, DO, TSS, BOD, Oil and grease, Lead, E. Coli	Design: Once Construction: 3 times per year for 2 years	Minimum 2 locations (Locations to be identified with the help of PIC)	CEA advisory guidelines	Rs 10,000 per location	140,000.00	Contractor through approved monitoring agency	RDA/ESD
	Operation stage	EC, pH, DO, TSS, BOD, Oil and grease, Lead, E. Coli	Once per year for 3 years	-do-	CEA advisory guidelines	Rs 10,000 per location	60,000.00	Contractor/RDA through approved monitoring agency	RDA/ESD
Noise Levels	Design and Construction stage	dB levels	Design: Once Construction: 3 times per year for 2 years	Minimum 2 locations (Locations to be identified with the help of PIC)	National Environmental (Noise Control) Regulations 1996(no. 924/12)	Rs 10,000 per day	140,000.00	Contractor through approved monitoring agency	RDA/ESD

Environmental Component	Project Stage	Parameters	Frequency	Locations	Standards	Rate	Approximate Cost (SLRs)	Implementation	Supervision
	Operation stage	dB levels	Once per year for 3 years	-do-	National Environmental (Noise Control) Regulations 1996(no. 924/12)	Rs 10,000 per day	60,000.00	Contractor/RDA through approved monitoring agency	RDA/ESD
Flora	Design stage		1 visit	Locations to be identified with the help of PIC	Diversity of existing species	Rs 20,000 per visit	20,000.00	RDA, through recognized community based organization	RDA/ESD
	Construction stage	Replanting of trees	1 visit	Locations to be identified with the help of PIC	Diversity of species replanted	Rs 20,000 per visit	20,000.00	Contractor/RDA	
	Operation stage	Survival of trees	1 visit	-do-	Percentage of survival	Rs 20,000 per visit	20,000.00	Contractor/RDA	RDA/ESD
Fauna	Design stage	Diversity of species	1 visit	Locations to be identified with the help of PIC		Rs 20,000 per visit	20,000.00	Contractor/RDA	RDA/ESD
	Construction stage	Diversity of species	1 visit	-do-		Rs 20,000 per visit	20,000.00	Contractor/RDA	RDA/ESD
	Operation stage	Diversity of species	1 visit	-do-		Rs 20,000 per visit	20,000.00	Contractor/RDA	RDA/ESD
	Total						1,320,000.00 (10,153.80 US$)		

Abbreviations:
TSPM = Total Suspended Particulate Matter, PM10 = Respirable Particulate Matter < 10□m diameter, NO_x = Oxides of Nitrogen, CO = Carbon Monoxide, SO_x = Oxides of Sulphur, Pb = Lead, HC = Hydro Carbons, EC = Electrical Conductivity, DO = Dissolved Oxygen, TSS = Total Suspended Solids, BOD = Biological Oxygen Demand, ESD = Environmental and Social Division, RDA = Road Development Authority.
1$ = SLRs. 130.00 (April, 2014