Initial Environmental Examination

September 2014

SRI: Integrated Road Investment Program – Project 2

North 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
ECOP	-	Environmental Code of Practice
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
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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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.

2. Tranche II of iROAD are located in Ratnapura and Kegalle districts of Sabargamuwa Province, Kandy, Matale and Nuwara Eliya 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 the North Central Province, iRoad program will develop a total of 115 provincial and rural roads with a total length of 495.4 km. Out of this, 325.4km and 170km are located in Anuradhapura and Polannaruwa 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 iRoad Program will be located inside or adjacent to protected areas including archeological sites of national or international significance. 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

1. Physical Environment

8. **Climate**. Based on major climatic zones of the country, Polonnaruwa and Anuradhapura Districts fall in to low 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 Anuradhapura are located in DL1b, DL1e, DL1d, and DL1f and in Polunnaruwa are DL1c, DL2b, and IL2.

9. **Rainfall**. NCP receive comparatively low annual rainfall. Rainfall distribution is influenced by North east monsoon from December to February when peak rainy season occurs. The average temperature in the province varies 27^0C to 30^0C while high monthly temperature is observed during March to April and around September.

10. **Hydrology.** Anuradhapura period can be considered as most important era in the irrigation civilization in ancient Sri Lanka since most of large irrigation networks were done during this period. This includes the Kala Wewa reservoir, Tissa Wewa and Nuwara Wewa, Nachchaduwa reservoir, Parakrama Samudraya (reservoir), Thopa Wewa, Dumbutulu Wewa, Erabadu Wewa, and Minnerlya, Giritale, and Kantale reservoirs. These reservoir s supply irrigation waters to vast agricultural lands. In 1960's, the government implemented the Mahawelli Program the largest multipurpose irrigation and settlement program undertaken in Sri Lanka. A complex irrigation system which is integrated with the ancient irrigation system was established in Anuradhapura and Polonnaruwa Districts.

11. Almost all roads are located within the Mahaweli systems and several irrigation canals are crossed by the project roads. Some of the roads are located on the bunds of reservoirs and irrigation canals. The major irrigation canals crossed by candidate roads and roads which are located over the bunds of reservoirs and canals. In Aranadaphura district, 30 roads are either crossing or located along irrigation structure while in Pollunnaruwa district there are 49 roads.

[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* .

12. **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"

2. Natural Disasters.

13. Polonnaruwa District is severely affected by yearly floods caused by the overflowing of Mahaweli River and its tributaries affecting Manampitiya, Somawathiya and Kaduruwela areas. Anuradhapura District is less flood-prone but the low lying areas of Galnewa, Ipalogama, Talawa, Tambuttegama, Kalaoya and Yanoya are regularly inundated. There are 23 projects roads in Polonnaruwa district and 7 roads in Anaradhapura District are located in flood prone areas.

B. Ecological Environment

14. No strict nature reserves, national parks or sanctuaries are located along or near any of the project roads in the North Central Province.

C. Demographic Characteristics

15. **Population and population density.** .The Department of Census and Statistics estimated mid-year population of Anuradhapura District in 2012 at 856,399 and population density of 129 person/km2. In Polonnaruwa District, for the same year the population is 403,782 and density is 113 person/km^2.

16. **Ethnicity**. Majority of population in the Province are Sinhalese accounting for about 91% of the total population followed by Sri Lankan Tamil and Indian Tamil at roughly 1.5% and less than 0.3%, respectively.

17. **Household Income.** The mean monthly income in Anuradhapura and Polannaruwa are Rs 37,586 and Rs 31,526, respectively which are lower than the national of Rs 46,207 in 2013.

18. **Poverty.** The poverty headcount indexes in Anuradhapura and Polonnaruwa are 7.6 and 6.7, respectively while the national average is 6.7 as of 2013.

D. Infrastructure

19. Majority of the residents, at least 83% relies on electricity for lighting and about 15% uses kerosene. Piped water supply is enjoyed in 41.2% and 38.8% of the households in Anuradhapura and Polonnaruwa, respectively. However, majority estimated at 50.1% and 46.9% relies of protected well in Anuradhapura and Polonnaruwa, respectively. About 85% of the total provincial population have access to private toilets and about 12% share this facility with others.

20. The province has a rich history starting from the first and second kingdoms. Anuradhapura, the first capital of Sri Lanka is uniquely acknowledged as the focal city of Theravada Buddhism. Potsherds having Brahmi script unearthed in excavations had revealed that the historic period of Anuradhapura could be traced back

F. Anticipated Environmental Impacts and Proposed Mitigation Measures

21. **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.

22. **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.

23. **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 derbris, provision of road safety appurtenances in the road design, and avenue plantation to control noise.

24. **Greenhouse gas emissions and addressing risk of climate change.** Using the Transport Emissions Evaluation Model for Projects (TEEMP) total annual emission was estimated at 5,596 tons.

25. **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.

26. **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 ij 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.

27. **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 Grama Niladhari (GN) levels and Divisional Secretariat (DS) level for final resolution.

G. Conclusion and Recommendations

28. 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.

29. 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.

30. Candidate roads are dispersed over the entire province and few road sections are located near or within geologically and hydrologically 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 or archaeological sites of national or international significance.

31. 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.

32. 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.

33. 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 Divisions2 (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.

- North Central Province
- Sabaragamuwa Province
- 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 North Central Province (NCP) of Tranche 2 which covers 546.42km of 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. 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

[2]A Grama Niladhari Division (GND) is the smallest administrative unit in Sri Lanka

environmental impacts that will trigger an ADB environment “Category A” tranche or Prescribed Project classification consistent with domestic environmental laws and regulations.

6. Accordingly, i Road program will develop 358.79km and 187.66km rural roads located within Anuradhapura and Polonnaruwa districts respectively of NCP. These rural roads are currently governed by Provincial Road Development Authority (PRDA) and Pradeshiya Sabhas (PS, the local Authority) of NCP. The total length disaggregated to two districts; Anuradhapura and Polonnaruwa of the province is presented in table I.1. And particular road list is attached in appendix I.1.

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

District	Number of Roads	Length of Roads (km)
Anuradhapura	60	329.36
Polonnaruwa	55	169.56
Total	**115**	**498.92**

Source: iRoad Program, RDA

7. As per the Project Implementation Unit (PIU), 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 broad 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 nation wide economic and social development.

9. Specific objectives of this project are;

- To improve the road condition between rural communities and socioeconomic centers of the NCP,
- To upgrade and maintain 498.92km of rural access roads in North Central Province 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
- To enhance tourism within the province by improving access to archeologically important places

10. In order to achieve these objectives, the road network in Anuradhapura and Polonnaruwa 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 to 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 498.92km of rural roads to all weather standards in NCP.

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, land use and location of archeologically protected monuments 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. 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

15. Sample ECs are provided appended (appendix I.2) to this IEE report for reference. All ECs prepared for the North Central Province are available at the ESDD-RDA, and PIU upon request.

16. 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 along this corridor. However, for road sections where the existing ROW could not be demarcated, an additional 2m corridor from both edges of the existing carriageway was considered, and potentially affected road side trees and utilities were inventoried. 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 of the road centerline were identified and in the EC.

17. 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 were analyzed and summarized. Field data were translated on 1:50,000 topographic map sheets of Survey Department of Sri Lanka including land use pattern up to 200m of the existing road centerline. Satellite imagery available on-line from Google maps were used as a secondary information base. Finally, information available in Management Information System (MIS) of ESDD was also utilized for the assessment.

18. 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 – i Road, and Project Director – i Road of RDA is highly appreciated.

II. DESCRIPTION OF THE PROJECT

A. Location of the project

19. As mentioned, all road sections selected for this project connect rural areas with the trunk road network in Anuradhapura and Polonnaruwa Districts in NCP. Accordingly a road length of 329.36km in Anuradhapura District and 169.56km in Polonnaruwa 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 appendix I.1. The respective GNDs crossed by each road are presented in the specific ECs available in ESDD, RDA.

20. Road location maps are attached in Appendix II.1 which presents the general location of rural roads in Anuradhapura and Polonnaruwa Districts respectively. Specific location map for each road is attached in each ECs.

B. Need of the Project

21. Roads are the main transportation mode in Anuradhapura and Polonnaruwa districts of NCP. There are 8 A class roads, one AB class road, 34 B class roads and number of C, D, and E class roads (local authority roads) are crossing or located in these two districts. This road transportation mode is heavily used by a large number of public and private sector employees, school children, and other commuters for travelling and transportation of goods. In addition to roads, rail transportation also a prominent transportation mode in these two districts.

22. As per the department of Census and Statistics, majority of population in these two districts are living in rural areas, i.e. 94.6% in Anuradhapura and 100.0% in Polonnaruwa (Refer Table II.1 for details). Rural areas are mostly connected to the urban and semi urban centers through rural roads which are governed by local authorities. The significant portion of the rural road network which is currently under local authorities of the NCP was established under Mahaweli Development Program during 1970s and 80s and these roads were of gravel surface. After termination of the program, the condition of these roads deteriorated over time from lack of proper maintenance. Due to the gravel surface, dust condition during dry periods and muddy during rainy periods create unfavorable situations for transportation. During consultations, the public pointed out that pot holes filled with water during rainy season makes it difficult to even walk along these roads. Therefore the rural road system at present hardly support the access from rural setup to nearby service centers where hospitals, schools, markets, banks, etc… are available.

23. On the other hand, agriculture is the prominent economic activity in these two districts. Due to poor road network farmers face difficulties in transporting agricultural production to markets. Transportation costs have unnecessarily increased due to dilapidated road conditions. Therefore this situation highly affects the socio-economic status of the rural areas of NCP. Because of this situation it is necessary to improve the rural road network in these two districts and it will contribute to efficient transportation of people and commodities to and from nearby urban centers. And improvement of the rural road network will play an important role in integrating the region, facilitating economic growth, and ultimately reducing poverty.

Table II.1: Population distribution by sector in NCP

District	Total population	Population by sector (%)			Population density (Persons per km^2)
		Urban	Rural	Estate	
Anuradhapura	856,399	5.4	94.6	0.0	129
Polonnaruwa	403,782	0.0	100.0	0.0	131

Source: Department of Census and Statistics, 2012

C. Analysis of Alternatives

1. No Project Alternative

24. The GOSL will be initiating key infrastructure project in the province and in order to sustain and maximize the socio-economic benefits from these investments it I necessary to build an efficient road network connecting developed centers and under developed areas. Without the iROAD, these flagship projects will not realize the expected benefits and the province will continue to stagnate. About 94.6% of the total population of Anuradhapura district, and 100% in Polonnaruwa District live in rural communities, respectively having poor access to infrastructure facilities and socio-economic opportunities. The Poverty Head Count Index of Anuradhapura and Polonnaruwa Districts as of 2013 are 7.6% and 6.7%, respectively.

25. In terms of environmental quality, not improving the rural roads will contribute to 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, 546.42km length of rural roads in NCP will be upgraded and maintained to all-weather standard improving accessibility of rural communities and 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 mainly to upgrade and maintain the selected road sections within NCP to all-weather standards. The selected rural roads are currently governed by Pradeshiya Sabhas (local Authorities) of Anuradhapura and Polonnaruwa Districts and Provincial Road Development Authority (PRDA) of North Central Provincial Council. Under the project, rural roads of 329.36km in Anuradhapura District and 169.56km in Polonnaruwa 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, width and surface type are provided in each ECs.As mentioned, it is proposed to upgrade and maintain selected roads in Anuradhapura and Polonnaruwa 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. Therefore roads which do not have minimum 3m ROW were not selected for the improvement. 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)

29. Proposed typical designs details including cross sections are attached in Appendix II.2.

30. Improvement on cross- and side-drainage of the particular road 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 IV of this report are located in flood prone area. The proposed road design in these section were modified to withstand frequent inundations (please refer to Appendix II.2).

31. 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

32. 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.

33. Based on engineering estimations prepared for each road for NCP, approximate quantities of material required for each package are given in appendix II.3.

III. POLICY AND LEGAL FRAMEWORK

A. Legal Framework

1. National Environmental Act and other applicable regulation

34. 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.

35. 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”3 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.

36. 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.

37. 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.

38. 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.

[3] 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
1.	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
2.	National environmental protection and quality regulations under Extraordinary gazette notification No. 1534/18 and No. 1533/16 of 2008 under NEA section 32 & 23A, 23B	This 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
3.	National Environmental (Protection and Quality) Regulation No. 1 of 1990 published in Gazette Extraordinary No. 595/16 of February, 1990	Provides standards for discharging effluents into inland surface water during proposed project activities.	CEA
4.	National Environmental (Ambient Air Quality) Regulations, 1994, published in Gazette Extraordinary, No. 850/4 of December, 1994 and amendment gazette No. 1562/22 of 2008	Provides standards for emissions to the air during proposed project activities.	CEA
5.	National Environmental (Noise Control) Regulations No.1 of 1996 and its amendments	Regulates maximum allowable noise levels for construction activities during proposed project activities	CEA
6.	National Environmental (Vehicle Horns) Regulations, No. 1 of 2011	Regulates maximum allowable noise emanating from vehicular horns on a highway or road any motor vehicle use during project construction activities	CEA
7.	National Environmental (Municipal Solid Waste) Regulations, No. 1 of 2009	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
8.	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 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	Department of Wildlife Conservation

	Legislation	Relevance and main content	Authorizing institution
		conservation of biodiversity of Sri Lanka; and to provide for matters connected there with.	
9.	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
10.	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
11.	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
12.	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
13.	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
14.	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
15.	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
16.	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
17.	Agrarian Development Act No. 46 of 2000	This act regulates using paddy land for a purpose other than agricultural cultivation	Agrarian Services Department

	Legislation	Relevance and main content	Authorizing institution
	(Section 32)	without the written permission of the Commissioner General.	
18.	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
19.	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
20.	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
21.	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
22.	Town and country planning ordinance No. 13 of 1946 and The Town & Country Planning (Amendment) Act, No. 49 of 2000	This regulates the National Physical Plan with transport as the main component	National Physical Planning Department (NPPD) under the Ministry of Urban Development and Defense

	Legislation	Relevance and main content	Authorizing institution
23.	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
24.	Cemeteries and burial grounds ordinance No. 9 of 1899 and mendments	The act regulates any disturbance, removal of burial, monuments and use of such areas for development project	Local Government Authority
25.	Antiquities Ordinance No. 9 of 1940 and amendments	The act regulate activities of projects located in close proximity of any archeological reserves	Department of Archaeology
26	Mahaweli Authority Act No. 23 of 1979	The act regulates the implementation of Mahaweli Authority of Sri Lanka which has the governorship over Mahaweli Lands and projects	Mahaweli Authority

39. 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 Stage Note: Although clearances and approval should be obtained during preconstruction stage it is valid throughout the project cycle. However this should be renewed before expiry date	Environment clearance	Implementation of the project	Central Environment Authority
	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 Governme 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

Project stage	Approvals	Project Related Activity	Relevant agency
	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, Pradeshiya sabha, other local authorities for drainage, sewer systems etc

2. Environmental Protection License (EPL)

40. 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.

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

42. 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.

43. 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

44. 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

45. 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.

46. 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.

47. 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.

48. 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.

49. 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.

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

51. 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.

52. 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.

53. 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.

54. 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.

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

56. 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.

57. 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.

58. 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.

59. 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

60. Selected roads to be upgraded under iRoad Program are scattered in Anuradhapura and Polonnaruwa Districts of NCP. 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 I.2.

A. Physical Environment

1. Climate, land use, terrain and Soil

61. Based on major climatic zones of the country, Polonnaruwa and Anuradhapura Districts fall in to low country – dry zone.

62. The climatic environment of the project area is further categorized in to 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)
Anuradhapura	DL1b	1,2,3,5,6,7,8,9,10,12,13,14,15,16,17,18,19,23,24,25,26,27,28,29,30,31,32,36,37,38,39,40,41,43,45,46,47,48,49,53,56,60,61,63,65,66,67,68,69,	>900	Rain fed upland crops, paddy, scrub, mixed home gardens, forest plantations, undulating, RBE and LHG soils
	DL1e	35,33,34,59,57,50,55	>900	Rain fed upland crops, paddy, scrub, undulating, RBE and LHG soils
	DL1d	52,51	>900	Rain fed upland crops, paddy, scrub, undulating & flat, RBE, regosol and LHG soils
	DL1f	12,36	>800	Rain fed upland crops, paddy, scrub, natural forest, undulating, RBE, LHG and grumosal soils
Polonnaruwa	DL1c	1,2,3,5,6,7,8,9,10,11,12,13,14,18,19,20,21,22,24,25,27,28,29,33,34,35,36,37,40,41,42,43,45,46,47,48,49,51,52,55,61,62,66,67,68,71	>900	Rain fed upland crops, paddy, scrub, natural forest, forest plantations, sugar cane, undulating, RBE and LHG soils
	DL2b	57,58,59,62,64,6	>1100	Paddy, Rain fed upland crops,

District	Agro-ecological Zone	Roads (ID) falls in to agro-ecological zone	75% expectancy value of rainfall (mm)	Description (Land use, Terrain, Soil groups)
		5		undulating & flat, NCB, RBE, old alluvial, LHG, regosol and solodized-solonetz soils
	IL2	4	>1600	Mixed home gardens, paddy, rain fed upland crops, scrub, sugar cane, citrus, rolling, hilly and undulating, RBE, LHG and RBC soils

LHG - Low Humic Gley, RYP - Red Yellow Podsolic, RBL - Reddish Brown Latosolic, RBE - Reddish Brown Earth

63. NCP receive comparatively low annual rainfall and rainfall pattern is influenced by North east monsoon from December to February when peak rainy season occurs. As shown in figure IV.1 below, a bimodal rainfall pattern could be observed within NCP. Other than this, the area receives a considerable amount of rainfall during months of October to November with the effect of Second Inter Monsoon. The period from May to September is generally dry. The average temperature in the province varies 270C to 300C while high monthly temperature is observed during March to April and around September (Source: Environmental Atlas of Sri Lanka).

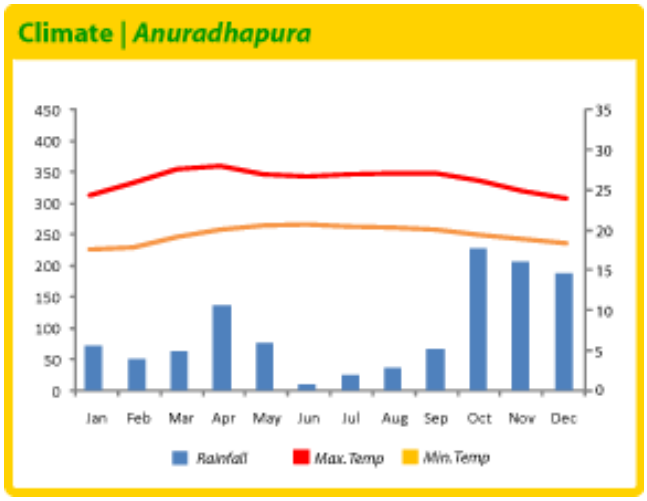


Figure IV.1: Rainfall and temperature variation of Anuradhapura District
(Source: http://www.meteo.gov.lk/)

2. Hydrology

64. Ancient Irrigation System of NCP: Anuradhapura period can be considered as most important era in the irrigation civilization in ancient Sri Lanka since most of large irrigation networks were done during this period. The massive Kala Wewa reservoir constructed across Kala Oya (a stream) and the 87km long Jaya Ganga or Yoda Ela (the left bank canal of Kala Wewa) which supplies water from Kala Wewa to Tissa Wewa (reservoir) and Nuwara Wewa and Nachchaduwa reservoir built across Malwathu Oya (a stream) are the few of major irrigation works in done during Anuradhapura era.

65. Parakrama Samudraya (reservoir) is a major irrigation construction in Polonnaruwa District consists of three tanks i.e. Thopa Wewa, Dumbutulu Wewa, and Erabadu Wewa. These three tanks were interconnected to form the Parakrama Samudraya and this is fed by the Angemedilla Anicut with its inlet canal of 38km long in addition to its own catchment. Elehara irrigation complex includes a diversion structure constructed at Elahera across Amban Ganga (a tributary of Mahaweli Ganga), which starts from the foothills of Matale District. This huge canal conveyed water from this point to Minnerlya, Giritale, and Kantale reservoirs. Minneriya Tank is also a key component of the irrigation system of Polonnaruwa District, which was built in 301AD, is equipped with two spillways.

66. The irrigation system of NCP was part of sustainable development in past since water stored in these tanks are usable during the dry period of the year from May to September for both irrigation and domestic purposes.

67. In 1960's, the government planned the Mahawelli Program, as a solution to growing population, increasing unemployment and the crisis of landlessness. Mahaweli Development program is the largest multipurpose irrigation and settlement program undertaken in Sri Lanka. This program caters to the water scarce dry zone by delivering some of water from river Mahaweli, the longest river of Sri Lanka to the Kala Oya basin. The original Mahawelli master plan was expected to develop 365,000 ha of land under irrigation, of which 100,000 was to consist of already developed lands, which were expected to be improved with the provision of irrigation facilities. A series of reservoirs were planned on the Mahawelli River and its tributaries of Amban, Maduru, Yan and Malwathu, and the development of irrigation projects in 13 systems was also implemented under the project. Accordingly, a complex irrigation system which is integrated with the ancient irrigation system was established in Anuradhapura and Polonnaruwa Districts under Mahaweli Development Project. And this irrigation system is distributed within the entire province feeding the agricultural lands.

68. These reservoirs including the tanks and irrigation canals are the major manmade surface water bodies found within the NCP. In addition, Malwathu Oya and Kala Oya flow to the North Western direction and Yan Oya and Ma Oya flow to the northeast direction are the main natural streams located or crossing the Anuradhapura District. While a significant portion of Polonnaruwa District is falling within Mahaweli River basin.

69. Almost all roads are located within the Mahaweli systems and several irrigation canals are crossed by the project roads. Some of the roads are located on the bunds of reservoirs and irrigation canals. The major irrigation canals crossed by candidate roads and roads which are located over the bunds of reservoirs and canals and other hydrologically sensitive locations within the project area are presented in table IV.2 below.

Table IV.2: Surface Water resources Located Along Project Roads

No.	Road ID	Hydrologically sensitive area
Anuradhapura District		
1	1	Road traverses along the Right Bank Main canal of the Kala Wewa reservoir (RHS)
2	2	Road crosses Right Bank Main canal of the Kala Wewa reservoir at 1.8km and runs RHS to the canal to the end point
3	3	Road crosses Right Bank Main canal of the Kala Wewa reservoir at 2.8km and traverses along the bund of "D" canal of the main canal
4	7	An irrigation canal runs along RHS of the road throughout
5	10	First 1km section runs parallel to a "D" canal of Right Bank Main canal of the Kala Wewa reservoir on LHS

No.	Road ID	Hydrologically sensitive area
7	12	An irrigation canal runs on LHS within first 50m while another canal is crossed at 1km. Road runs adjacent to the bund of a reservoir (RHS) from 1.5km to 2km.
8	13	Road follows the bund of the Right Bank Main Canal of Mahakanadarawa reservoir from 0.0 to 2.9km.
9	14	Road traverses closer to bund of irrigation tanks from 2-3km, around 4km and around 6.5km.
11	17	Road crosses natural streams at 2.2km and 2.4km
12	18	Road follows the bund of a minor tank from 2.7 to 3.7km
13	23	Located near to the Kala Wewa reservoir
14	24	Runs adjacent to an irrigation minor tank around 7.4km
15	26	Crosses Yoda Ela (Main canal of Kala Wewa) around 0.62km
16	27	Runs adjacent to irrigation tank from 0.6 to 2km on LHS.
17	35	Crosses an irrigation canal and located adjacent to tank at 1.9km
18	36	Crosses Left Bank Main canal of Mehavilachchiya Reservoir at 2km
19	41	Runs over the bund of Sucharithagama Tank from 1 – 1.5km
23	48	End sections are located closer to Rajanganaya Tank
25	61	Crosses left bank main canal of Nachchaduwa reservoir
27	63	First 1.3km section is along the bund of left bank main canal of Nachchaduwa reservoir
29	67	Crosses Malwathu oya round 3.4km
30	68	Located within Kala Oya flood prone area
31	69	Crosses natural streams around 1.8km
Polonnaruwa District		
1	**1**	Irrigation canal going parallel to the road in left hand side from start to end
2	2	Canal observed within 0.100km-2.700km running parallel to the LHS of the road
3	3	Canal observed within 0.000km-0.200km and a distributary canal of Elahera Yoda Ela observed within 1.000km-1.100km
4	6	Canal observed within 1.400km-1.500km
5	7	Srikanduyaya oya crossed the road within 1+200km. An irrigation canal flows parallel to the road within 0+400 – 1+000km & 1+800 – 2+100km.
6	9	**Section I** Irrigation canals going parallel to the road from 0+000km to 0+500km on RHS and From 0+800km to End of the road on RHS **Section II** Irrigation canal going parallel to the road from 0+100km to 0+200km on RHS
7	10	Road runs parallel with Irrigation canals at following chainages **Section I** From 0+800km to 1+100km (RHS) **Section II** From 1+000km to 1+500km (LHS) and From 1+500km to 2+300km (RHS)
8	11	Road crosses two canals at 2+800 and 4+700.
9	13	Road runs over the Parakramasamudraya Reservoir bund. Road crosses a main canal at 1+400km
11	14	Canal going parallel to the road from start to end
14	18	Road runs over the bund of a “D” canal of Left Bank Main Canal of Parakrama samudraya reservoir
15	20	The road crosses canals at 0+000 (Main canal of Patakrama Samudraya) and crosses a “D” canal of main canal. The “D” canal runs along the road on LHS of the road to the end point.
16	21	The road crosses canals at 0+600, 1+000 and 2+100 and two canals flow parallel to road from 0+700 to 1+000 and from 1+400 to 1+700km
17	22	Road runs parallel to canal on RHS from start to end.
18	24	Road crosses streams at 0+000, 2+400, 2+900, 3+400, 3+700, and 4+000

No.	Road ID	Hydrologically sensitive area
19	25	Road crosses streams at 0+000, 0+200, 0+300, 1+300, 1+900, 2+100 and 3+600. The Irrigation canal flow parallel to the road on RHS.
20	26	Road runs parallel to streams on LHS from 0+100 to 0+400
21	27	Road crosses streams at 0+200 (RHS) and an Irrigation canal is flow on LHS from 0+000 to 1+400.
22	29	Road crosses streams at 1+700 (MinnariyaOya) and 2+500 to 3+000km.
23	30	Road crosses canal at 0+200, 0+000 to 0+300 canal flow parallel to the road on LHS in section I, 0+000 to 0+700canal flow parallel to the road on RHS in section II.
24	31	Road crosses streams at 0+050, 0+800, and canal flow parallel to the road on RHS from 0+000 to 1+500.
25	32	Road crosses streams at 0+300
26	33	Irrigation channels observed within 0.100km- 3.100km
27	34	**Section I** Canal crossing the road at 1+000km Irrigation canalgoing parallel to the road within 0+000km - 0+100km on LHS and 1+600km -2+000km on LHS.
28	35	Canal flow within 1.7km-1.8km of the road.
29	36	Irrigation channels observed within 0.100km- 3.100km
30	37	Streams were flow within 2.3km-2.4km and 3.0km-3.1km
31	41	stream observed within 0.900km- 1.000km and irrigation cannel is observed at 0.200m-0.300m on LHS
32	42	Road crosses stream within 1.7km-1.8km.
33	43	stream flow near to the road within 0.8km-0.9km
34	44	Stream observed within 0.100km- 0.200km on LHS (water board) and canal within 0.400km-0.500km
35	45	Irrigation canal crossing the road within 0+100 - 0+700km and 0+800 - 0+900km, Yoda Ela crossing the road within 1+100 - 1+200km
36	46	Road 50m beyond to Minneriya Oya within 1.9km-2.1km Road crosses canal within 2.3km-2.4km
37	47	At 0+100m there is a irrigation canal crossing the road and that place and at 1+600 - 1+700m 4th Service bridge crossing the road.
38	51	Irrigation canal going parallel to the road within 0+000 - 0+200km
39	52	Yoda Ela going parallel to the Road from Starting to End in section I
40	55	Irrigation canals crosses the road within 0+100m, 3+100 3+600km and Miner water stream cross the road within 1+000 - 1+300m
41	57	Canal going through the culvert left to right within 1.0km-1.1km and 1.8km-1.9km 'ZD' canal cross the road from LHS to RHS within 5.2km-5.3km. 'D' Canal crossthe road from LHS to RHS within 7.3km-7.4km and 6km-11.7km
41	58	Canalscross the road right to left within 1.1km-1.2km and 2.0km-2.1km
44	62	Observed lake within 0+900 - 1+800 on LHS of the road. And Bogaswewa lake within 5+300 - 5+800 on LHS
45	66	Observed Nawagaha stream at 8+600 - 8+700km on RHS of the road. The Road crosses Nawagaha stream within 6+000 - 6+100km and Minor stream within 7+900 - 8+000km
46	67	canal going parallel to the road on LHS within 0+000 - 0+300km Road crosses the 'D3' canal from LHS to RHS at the end of the road
47	68	Road crosses the 'Mahaweli' Irrigation canal from LHS to RHS at the start point. Road crosses the Drainage canal from LHS to RHS within 0+400 – 0+500km Observed the Lake called Soruwila Lake on RHS on the road within 0+500 – 1+000km
50	71	Road crosses the canal LHS to RHS at 0+100km and irrigation canal cross the road within 0+700 – 0+800km Irrigation canal going parallel to the road on LHS from 2+400 – 3+100km

3. Air Quality and Noise

70. Since the selected road sections are mostly located within rural areas, sources of air quality pollutants are hardly found. Air quality in the entire study area appears to be good. However, there is a chance of deteriorating temporarily the air quality due to vehicular emissions and unpaved road travel. An extract from the National Environmental (Ambient Air Quality) Regulations, declared in 1994 is presented in Table IV.3.

Table IV.3: National Ambient Air Quality Standards

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

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

PM 10 – particulate matter < 10 µm

NAAQS – National Ambient Air Quality Standards (NAAQS)

71. Vehicle Emission Test (VET) became mandatory in 15th July 2008 in order to enforce the environmental standards on vehicle emission provided in 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 covering automobiles including construction-related vehicles.

72. The project area is mostly rural with a good vegetation cover and no substantial industrial or commercial activities 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”. 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).

4. Occurrence of Natural Disasters in the Project Area

73. Floods: Polonnaruwa is the districts which are severely affected by yearly floods causing damage to life and properties. Floods are caused by the overflowing of Mahaweli River and its tributaries affecting Manampitiya, Somawathiya and Kaduruwela areas of the district. The most serious flood occurred in 2011 affecting 20,739 people and making Galella and Manampitiya area in Polonnaruwa – Batticola road impassable. Parakrama Samudraya, Kawudulla, Minneriya and Girithale are such irrigation tanks generally spills during heavy rainy period.

74. Anuradhapura District was also affected in 2011 floods. Based on records, over 200,000 people have been affected due to floods in Anuradhapura in year 2011. Low lying areas of Galnewa, Ipalogama, Talawa, Tambuttegama, Kalaoya and Yanoya are inundated while Horowpathana town is reported to be heavily flooded in year 2011 flood (Source: http://www.onlanka.com/news/floods-hit-over-1-2-million.html).

75. Following table IV.4 presents candidate roads located within flood prone areas.

Table IV.4: Flood Prone Areas along Project roads

District	Roads (Road ID) located within flood prone areas
Polonnaruwa	1, 10, 11, 13, 14, 20, 21, 22, 24, 26, 29, 30, 45, 47, 48, 55, 62, 65, 64, 68,
Anuradhapura	41, 67, 68, 69

B. Ecological Environment

1. Existing Habitats with respect to flora and fauna and protected areas

76. Both manmade habitats i.e., home gardens and agricultural lands, inland tanks and channels and natural or semi natural habitats i.e., streams, rivers, scrubland and forest areas 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.

77. Based on 1:50,000 topographic maps of the Department of Survey no strict nature reserves, nature reserves, national parks and sanctuaries are located along or near any of the project roads in the North Central Province. The following forest area is found adjacent to the project area.

Table IV.5 Forest areas located within North Central Province

Road ID	Road Name	Length of the road-km	Name of the sensitive area	Proximity
Anuradhapura district				
2	Eppawala police junction jaya ganga	3.00	Yoda ela forest reserve	Yoda ela forest reserve is located on RHS of the road from 2km to 3km.

78. Yoda ela forest reserve: Based on the topographic maps of the Department of Survey, Eppawala police junction Jaya Ganga road in the Anuradhapura district is located adjacent to the Yoda ela forest reserve on RHS of the road from 2km to 3km. The Yoda ela forest of 2509ha was gazetted as a forest reserve in 10th February 1950 under gazette no 10072.

79. Department of Forest granted a general approval for improvement of all roads under this project which are falling within or adjacent to sensitive forest areas through letter No. EMD/EIA/RD/rural roads/2014 dated 27 Aug 2014 (attached in appendix IV.1).

C. Socio - Economic Environment

1. Condition of road infrastructures

80. Roads are the main transportation mode in Polonnaruwa and Anuradhapura districts. There are 7 “A” class” roads and 15 “B” class roads located within or crossing the province. There is plenty of C, D, and E class roads (local authority roads) in the two districts. In addition to roads, rail transport is also a prominent transportation mode with Mihintale and Galoya are popular railway stations in North Central Province.

81. 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 55 rural roads

(169.56km) in Polonnarua district and 60 rural roads (329.36km) in Anuradhapura 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.

82. According to the Department of Census and Statistics, majority of population are living in rural areas, i.e. 100% in Polonnaruwa, and 94.6% in Anuradhapura (Refer table IV.6 for details). 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

83. Table IV.6 shows the distribution of population by sectors and population density. Majority of population in all two districts are living in rural areas. Population density also almost same in these two districts.

Table IV.6: Distribution of population by sector

District	Total population	Population by sector (%)			Population density (Persons per km^2)
		Urban	Rural	Estate	
Anuradhapura	856,399	5.4	94.6	0.0	129
Polonnaruwa	403,782	0.0	100.0	0.0	131

Source: Department of Census and Statistics, 2012

84. Population by ethnicity: With regards to ethnicity, majority of population in these two districts is Sinhalese i.e. 90.9%, and 90.6%, in Anuradhapura and Polonnaruwa districts respectively. Ethnic category of Moor get second place. Table IV.7 shows the population data of affected districts by ethnicity.

Table IV.7: Distribution of population by the ethnicity

District	Sinhala		Sri Lankan Tamil		Indian Tamil		Moor		Burgher		Other	
	No	%	No	%	No	%	No	%	No	%	No	%
Anuradhapura	778,131	90.9	5,065	0.6	957	0.1	70,248	8.2	187	0.02	1,644	0.2
Polonnaruwa	365,476	90.6	7,356	1.8	1,190	0.3	29,060	7.2	86	0.02	167	0.1

Source: Department of Census and Statistics, 2012

3. Main economic activities

85. Agriculture: Agriculture is the prominent economic activity and carried out very successfully in these two districts. As per the Department of Census and Statistics (2013), 58.4% population in Anuradhapura district and 40.4% in Polonnaruwa district are engaged in agricultural sector. Paddy is the main agricultural crops. There are 100,598 hectors of cultivable paddy lands in Anuradhapura districts. There are 66,372 hectors of cultivable paddy lands in Polonnaruwa district.

86. During the field reconnaissance it was observed Chena cultivation (shifting and burning cultivation) practiced in the project areas and the proposed roads will facilitate easy access of workers to these areas.

Table IV.8: Percentage of employment distribution by major industry group - 2013

District	Agriculture	Industry	Services
Anuradhapura	58.4	14.5	27.0
Polonnaruwa	40.4	25.1	34.5

Department of Census and Statistics, Labour Force Survey - Annual Report 2013

87. Livestock: Livestock farming such as raring of cattle and buffaloes, and poultry farming are also popular agricultural activities in these two districts. Availability of large extent of natural grazing lands, scrubs and forests, harvested paddy fields and tank catchments areas favor the livestock farming. According to Dept. of Census and Statistics, in 2012, there were 11,885 livestock farmers in Anuradhapura district and 9,936 livestock farms in Polonnaruwa district.

88. Inland Fisheries: Inland fishing industry is another economic activity which is carried on very successfully in Anuradhapura and Polonnaru districts. Availability of a large number of manmade irrigation reservoirs within these two districts has made inland fishery an important livelihood activity. In 2009 Anuradhapura and Polonnaruwa district has produced 10770mt and 7280mt of inland fish production respectively.

89. Industries: The industrial sector is not well developed in these two districts. Majority of operating industries are related to agriculture processing. In Anuradhapura district 14.5% and In Polonnaruwa district 25.1% population are employed in industrial sector. Apatite, limestone and granite are in high concentrations in Anuradapura district. Eppawala Apatite Mining and Phosphate Fertilizer manufacturing industry is managed by a government corporation. Clay deposits suitable for manufacturing of bricks, tiles and pottery are available in large quantities in Anuradhapura district.

90. Tourism: Auradhapura and Polonnaruwa are famous for scenic areas such as manmade inland water reservoirs (tanks), ancient cities, natural forests, archeological sites. Anuradhapura and Polonnaruwa districts have important archaeological and historical sites and these two ancient cities have been declared as a UNESCO world heritage site. Anuradhapura and Mihintale sacred areas are world famous for Buddhist pagodas, statues, monasteries, temples and ruins of royal palaces etc. None of the project roads are passing through the protected heritage zones or the buffer zones of protected area

91. Education: Table IV.9 shows the distribution of the population by education attainment in these two districts. Majority of population in these two districts have completed primary or secondary education. Below 10% of population has passed General Certificate of Education – Advanced Level (G.C.E. - A/L) examination or completed degree education.

Table IV.9: Distribution of population by educational attainments

District	Educational attainment					
	No schooling	Primary	Secondary	G.C.E. (O/L)	G.C.E.(A/L)	Degree and above)
Anuradhapura	3.4	25.1	46.8	15.0	8.3	1.5
Polonnaruwa	4.1	27.3	47.0	12.5	7.9	1.3

Department of Census and Statistics, 2012.

92. Household income: As per 'Household Income and Expenditure Survey – 2009/10 of the Department of Census and Statistics, the monthly mean and median household income of Anuradhapura district is relatively higher than Polonnaruwa district.

Table IV.10: Mean and Median Monthly Household Income by District -2009/10

District	Average monthly income	
	Mean (Rs)	Median (Rs)
Anuradhapura	37,586	25,682
Polonnaruwa	31,526	22,634

Department of Census and Statistics, Household Income and Expenditure Survey – 2009/10

93. Poverty Situation: Table IV.11 shows poverty headcount index of affected two districts. Compared to year 2010, year 2013 poverty headcount index of both districts has increased. Anuradhapura district poverty headcount index is 7.6 and for Polonnaruwa it is 6.7.

Table IV.11: Poverty Headcount Index of Affected Province and Districts

District	Poverty Headcount Index	
	Yea - 2010	Year - 2013
Anuradhapura	5.7	7.6
Polonnaruwa	5.8	6.7

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

4. Existing Infrastructure facilities

94. Energy source of households: In the project districts, electricity is the main source of energy used for household lighting accounting for 85.1% and 82.7% households in Anuradhapura district and in Polonnaruwa district respectively, Kerosene is the second major source accounting for 14.4% and 16.9% of households in Anuradhapura and Polonnaruwa district respectively.

Table IV.12: Principle Type of Household Lighting Source - 2012

District	Electricity from national grid	Kerosene	Solar power
Anuradhapura	85.1	14.4	0.5
Polonnaruwa	82.7	16.9	0.4

Department of Census and statistics, 2012.

95. Drinking water: As per the table IV.13, majority of households of these two districts use protected well water, i.e. 50.1% and 46.9% of the total households in Anuradhapura and Polonnaruwa district respectively. Pipe born water is the second major source. 2.9% and 7.5% of total households in these two respective districts use water from unprotected wells.

Table IV.13: Source of Drinking water

District	Protected well	Unprotected well	Pipe born water	River/tank/ streams/spring	Other (Tube well, Bottled water, etc.)
Anuradhapura	50.1	2.9	41.2	1.0	1.7
Polonnaruwa	46.9	7.5	38.8	1.9	0.9

Department of Census and statistics, 2012.

96. Sanitary Facilities: As shown in Table IV.14 majority of households in these two districts use private toilets, i.e. 89.8%, in Anuradhapura district and 84.2% in Polonnaruwa district. 2.3% and 3.4% of total households in these two respective districts are not using toilets.

Table IV.14: Type of Toilets - 2012

District	Private	Sharing with others	Not using toilet
Anuradhapura	84.8	12.9	2.3
Polonnaruwa	84.2	12.3	3.4

Department of Census and statistics, 2012.

D. Archeologically protected areas

97. Anuradhapura and Polonnaruwa were the first and second Kingdoms respectively of Sri Lankan history and therefore the ruins of ancient cities have important archaeological and historical sites and have been declared as a UNESCO world heritage sites. Anuradhapura, the first capital of Sri Lanka is uniquely acknowledged as the focal city of Theravada Buddhism. Its history trails back to thousands of years. Excavations conducted in the inner city have revealed evidence of human settlements of the prehistoric era. Potsherds having Brahmi script unearthed in excavations had revealed that the historic period of Anuradhapura could be traced back to the 8-7c. B.C.

98. The old Anuradhapura which was situated on the west bank of a tributary of Malwathuoya was bounded by the Bulankulama reservoir on its west, Basawakkulama (Abhaya) reservoir on its south west, Tisa wewa reservoir on its south and the Nuwara (Jaya) reservoir on its East. From the spread of the ruins found in the ancient city of Anuradhapura it could be surmised that the city was divided in to two sections viz.

- Inner City
- Outer City

99. The inner city comprised the buildings belonging to the royalty while the outer city consisted of ecclesiastical buildings. The observation of the spatial arrangement of the monasteries reveals that Mahavihara, Jetavana, Abhayagiri, the three great monasteries and the peripheral monasteries together with the royal gardens are located as one complex in the outer city.

100. The ancient city of Polonnaruwa was the city developed after the destruction of Anuradhapura capital and it dates back to 9th and 8th century BC. After the destruction of Anuradhapura in 993 by Rajaraja, Polonnaruwa, a temporary royal residence during the 8th century, became the capital.

101. None of the Project roads are located within or near to any archeologically protected monuments in North Central Province.

V. ANTICIPATED ENVIRONMENTAL IMPACTS AND PROPOSED MITIGATION MEASURES

102. 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

103. Road construction in flood prone areas: As described in chapter IV, several roads in NCP are located within flood prone areas and improvement in the hydraulic structure will address this issue. Culverts and bridges 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 practiced. RDA requires a 50 year flood return period in culvert designs and a 100 year flood return period for designing bridges.

2. Shifting of Utility Supply Lines

104. 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. Hydrological impacts

105. 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.

106. The contractor will take all measures necessary or as directed by the Engineer to keep all drainage paths and drains clear at all times. 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.

107. 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.

2. Increase of local air pollution, noise and vibration

108. 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.

109. 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.

110. 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.

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

111. 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. These 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, canals and irrigation systems.

112. 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.

113. 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 (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.

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

114. 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 labour camp can create mosquito breeding and vector for communicable diseases to the workers and host communities. Social conflicts may arise due to use of illicit liquor and due to other unpleasant behavior which causes inconvenience to local community.

115. 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 there should be a 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.

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

5. Disruption to Traffic/Transportation

117. 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.

118. 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.

6. Biological impacts

119. Impact on Protected Areas and Sensitive Ecosystems: There are no anticipated impacts on the protected areas and sensitive ecosystems. No strict nature reserves, nature reserves, national parks and sanctuaries are located along or near any of the project roads in the North Central Province.

120. **Impacts on terrestrial flora:** During the construction stage loss of vegetation within the ROW is inevitable. Most of the trees that will be affected are fruit bearing and ornamentals like Maa (*Samanea saman*), Kohamba (*Azardirachta indica*), Kumbuk (*Terminalia arjuna*), Siyambala (*Tamarindus indica*), and Nuga (*Ficus bengalensis*). This could aggravate the erosive processes especially during the rainy season.

121. 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.

122. 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.

123. **Impacts on terrestrial fauna:** No road is encroaching forest lands. Hence there will be no direct impact on such areas. Still there is a possibility of occurring indirect impacts near forest areas during construction stage.

124. The free movement and natural behavior of animals near forest areas could be disturbed during the construction stage due to workers, construction noise and frequent movement of construction vehicles.

125. Further poaching and hunting will be carried out by workers if the worker camps are located close to the forest areas. Strict worker force supervision should be carried out by the contractor when conducting construction work close to these locations. Regular and adequate fuel supplies of Liquid Petroleum Gas (LPG) or kerosene should be supplied to worker camps in order to avoid workers scavenging for fuel wood especially close to forest areas.

126. No solid waste or spoil dumping sites, hot mix plants and worker camps should be located within or close to the forest areas. Collection of flora and fauna or their parts from natural forest and carrying out of any other illegal activity should not be allowed. 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.

127. Consent could be obtained from Department of Forest Conservation (DOFC) before start construction works within the areas under their jurisdiction. If any guidelines issued, it should be adhered.

128. **Impact on aquatic fauna and flora:** 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.

129. 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.

7. Establishment of invasive species

130. 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.

131. 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

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

133. 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

134. 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 an 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

135. 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. Possible impacts to undiscovered archaeological artefacts

136. As mentioned above, no project roads are within or adjacent to archeologically protected areas of both Anuradhapura and Polonnaruwa Districts. However as the entire two districts have an archaeological value, there is a possibility of exposing undiscovered artefacts especially during road side excavations and extracting sub base material. Therefore special care should be paid when construction activities are carried out and following measures are recommended in order to minimize any impact;

- Any object of value of antiquity and structures and other remains or things of geological or archaeological interest etc. discovered on the site and/or during construction work shall be the property of the Government of Sri Lanka, and shall be dealt with as per provisions of Antiquities Ordinance of 1940 (Revised in 1956 & 1998).
- The contractor shall take reasonable precaution to prevent his workmen or any other persons from removing and damaging any such article or thing and shall, immediately upon discovery thereof and before removal acquaint the PIC of such discovery and carry out the PIC's instructions.

12. Management of Construction Debris/Waste

137. 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.

138. 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.

139. 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

140. 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.

141. 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 the water pollution during the maintenance period.

2. Disposal of unsuitable material

142. 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.

3. Extraction of material for repairing and maintenance works

143. For repairing of maintenance of carriageway and other structures, material such as gravel, aggregates and sand will be required. And mitigation measures specified in 5.2.7 will be adopted to minimize impacts due to maintenance activities of the roads.

4. Pedestrian and commuter safety

144. 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

145. 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.

5. Air quality and noise

146. 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 signes and signals will be installed in sensitive areas such as schools, temples to warn drivers and avoid making unnecessary horn.

6. Ecological Impacts

147. With the improved road surfaces number of vehicles and the speed will be increased. Further, certain number of animals will attract to tarred road surfaces. There will be animal movement especially near the forest areas. This will result in the increase number of collision and run over of animals and disturbance to their natural movement within and close to the areas. This impact could be reduced up to some extent by placing warning sign boards by mentioning the warnings at least 1km ahead of approaching such areas (if any). DOFC could be consulted when identifying such areas.

D. Positive Impacts of the Project

1. Socio - economic benefits

148. 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 NCP 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.

E. Estimated Carbon Emission from i Road

1. Introduction

149. The Transport Emissions Evaluation Model for Projects (TEEMPT) developed by Clear Air Asia[4] with support from ITDP, ADB, Cambridge Systematics and the United Nations Environment Program (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.

150. 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.

2. Key road upgrading features

151. I-road Program will upgrade 115 rural roads with a total aggregated length of 498.92km distributed across Anuradhapura and Polonnaruwa districts, North Central Province. No land acquisition will be allowed and all improvements will be limited to the existing 1-lane configuration with 3.0m 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.

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

153. 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.

[4] 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.

Reynolds et.al (2011) Climate and Health Relevant Emissions from in-Use Indian for three-wheelers rickshaw as follow:

Table V.1. 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	

3. Estimated Carbon Emissions

154. For each kilometer of rural road upgrading, CO2 emission from construction is estimated at 11 tons[5]. Total annual emission without the project is estimated at 5,596 tons.

4. Climate Risks and Adaptation needs

155. 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 types of 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.
- **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.

156. 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.

Cost of Climate Adaption Measures (LKR.million)- North Central Province

District	Increase Embankment Height	New Side and Lead away drains	New/Widneng Culverts	New Bridges	Total
Anuradhapuraya	92.82	110.3	226.57	0	**429.69**
Polonnaruwa	63.19	13.45	50.89	10.56	**138.09**
Total	**156.01**	**123.75**	**277.46**	**10.56**	**567.78**

[5] R. Shanthini (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

157. Tranche-2 has earmarked LKR5,350M to address climate change risk by increasing road embankment height on flood and tsunami prone areas, provision of side drains and new culverts, and construction of small bridges representing about 8.36% of the total civil work cost[6]

[6] US$492.14M @ 1US$:130LKR

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

A. Environmental Management Plan

158. 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.

159. A standard EMP was prepared as part of the IEE report (appendix VI.1), however, contract package specific EMP's will be prepared by the contractor in 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. However, under the output and performance - based road contract, the contractor is responsible to keep the road in operational condition for a period of 7 years after reconstruction. The EMP has been modified accordingly paying more attention on the environmental impacts and mitigation measures during the operational stage together with reconstruction stage. 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 (Please refer to appendix VI.2 for standard EMC). 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. Furthermore the contractor will also be responsible for updating EMP if there are any significant changes in the project site conditions or engineering design.

B. Grievance Redress Mechanism

160. Grievances from the affected people on social and environmental issues during project implementation will be addressed mainly through the existing local administrative system. Depending on the nature and significance of the grievances or complaints, grievances will be addressed at two levels. The first will be at the grass roots level where complaints will be directly received and addressed by the contractor, PIC or PIU representative on site. Grievances which are simple but still cannot be addressed at the grass roots level will be addressed at the Grama Niladhari (GN) level. More complex grievances which cannot be

addressed at the GN level will be addressed at the Divisional Secretariat (DS) level. There will be a Grievance Redress Committee (GRC) at the GN and DS levels.

161. At the GN level the GRC members will be:

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

162. At the DS Level GRC members will be:

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

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

164. Recommended steps with timeline on the operation of the GRM is provided in Figure VI.1. Adjustments may be made to the GRM during processing of succeeding tranches if necessary and accordingly described in the respective IEE. In addition a complaints contact person will be designated within the PIU to help address all concerns and grievances of the local communities and affected parties. Contact details of this person will be provided in the project information display board that will be placed at the project site.

165. The flow chart of the GRM is presented in Figure VI.1.

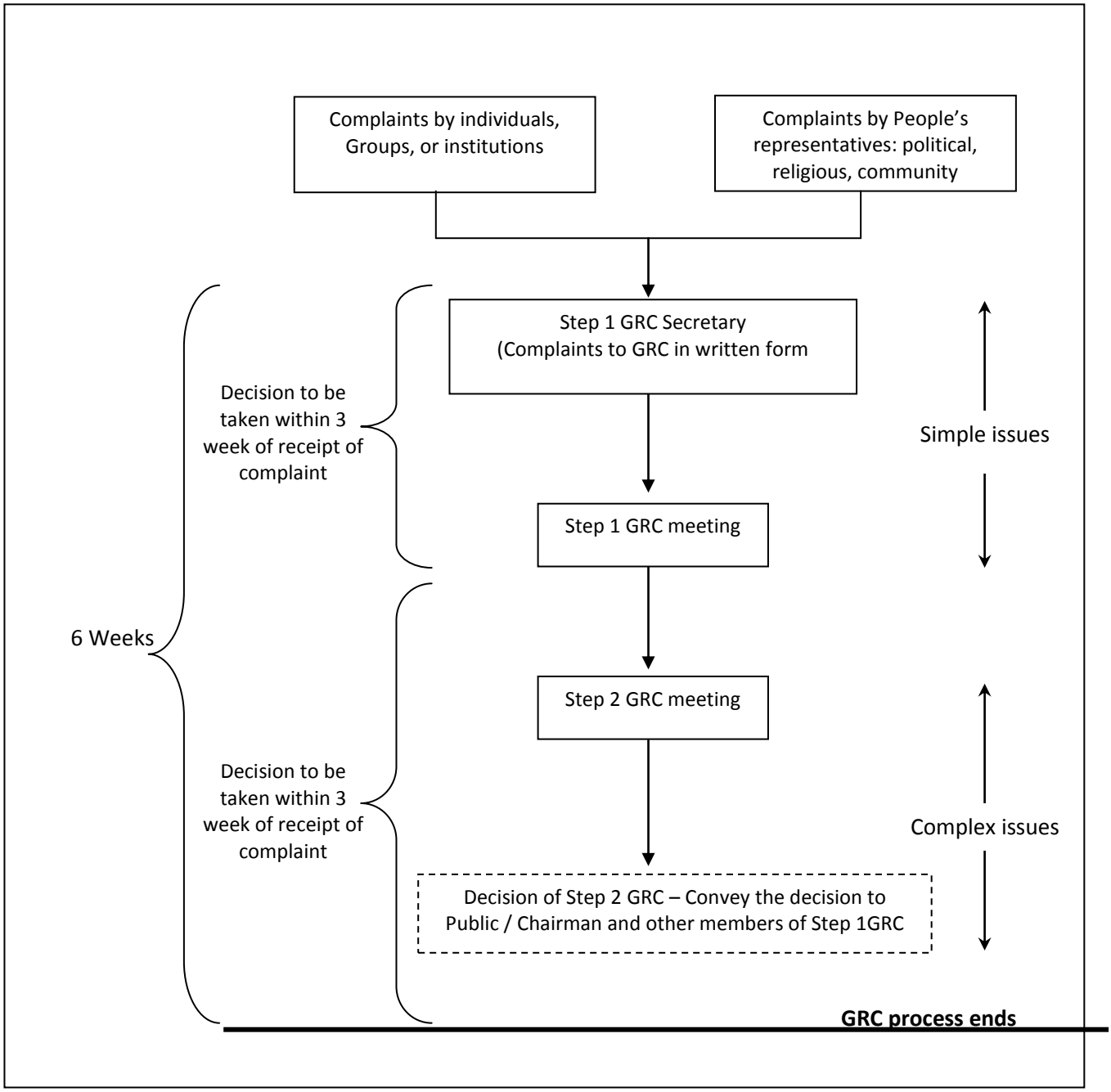


Figure VI.1: GRM process

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 consulted in each road and their views are given in the particular ECs which are attached in Volume II of this report.

167. People in the project area (a total of 50 males and 22 females) have positive ideas about the road development and their ideas indicate the importance of the road network development in the NCP. 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.

Table VII.1: A summary of Consultations Held for iRoads in North Central Province

Location/DSD	Male	Female	Key Issues
Anuradhapura District			
Thalawa	5	0	Inadequate drains, flooding, poor road surface which is dusty in summer and muddy in rainy season,
Mihinthale	4	4	Inadequate drains, flooding
Nochchiyaga	0	1	Inadequate drains
Rambewa	3	1	Inadequate drains, flooding
Medawachchiya	2	0	Streams are crossing road, inadequate drains, flooding
Kekirawa	2	0	Poor road surface, flooding
Palugaswewa	4	0	Flooding, lack of drains

Palagala	4	1	Poor road surface quality, limited road width
Galenbidunuwewa	2	0	Narrow roads, inadequate drains
Kahatagasdigiliya	2	0	Poor road surface and inadequate drains
Horowpathana	2	0	Poor road surface and inadequate drains
Willachchiya	2	1	Inadequate drainage
Nuwaragampalatgha Central	0	2	Poor road surface, flooding
Nuwaragampalatgha East	4	0	Poor road surface, inadequate side drains
Rajanganaya	0	1	Poor road surface, inadequate side drains
Thambuthhegama	1	0	Narrow road, inadequate side drain
Padaviya	6	2	Poor road condition, narrow width, inadequate side drains
Kebithigollewa	1	2	Poor road surface, flooded by Makunu Oya, narrow width
Nachchaduwa	1	1	Narrow width, inadequate side drains
Galnewa	0	1	Poor road surface, inadequate side drains
Ipalogama	2	0	Poor road surface, narrow width, inadequate side drains
Polonnaruwa			
Elahera	10	3	Poor road surface, dust condition affects school children in Lhekuluwela
Thamakaduwa	9	4	Inundated by flood during rainy season, poor road surface, damage culverts, narrow width
Lankapura	8	4	Poor road surface, dust, lack of drainage, roads are near schools, in Pulathisigama road is flooded up to 4-5 feet deep
Madirigaya	10	2	Poor road surface, dust, lack of drainage
Hingurakgoda	6	5	Flood prone
Wellikanda	7	1	Poor drainage blocked during rainy season, overflow from ZD canal
Dimbulagala	7	4	Flood prone, roads near Iddapichha and Bogaswewa lakes and ZD canals are prone to flooding, poor road surface

B. Disclosure of information

169. 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 Grama Niladari (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.

170. 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.

C. Transect Walk

171. 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.

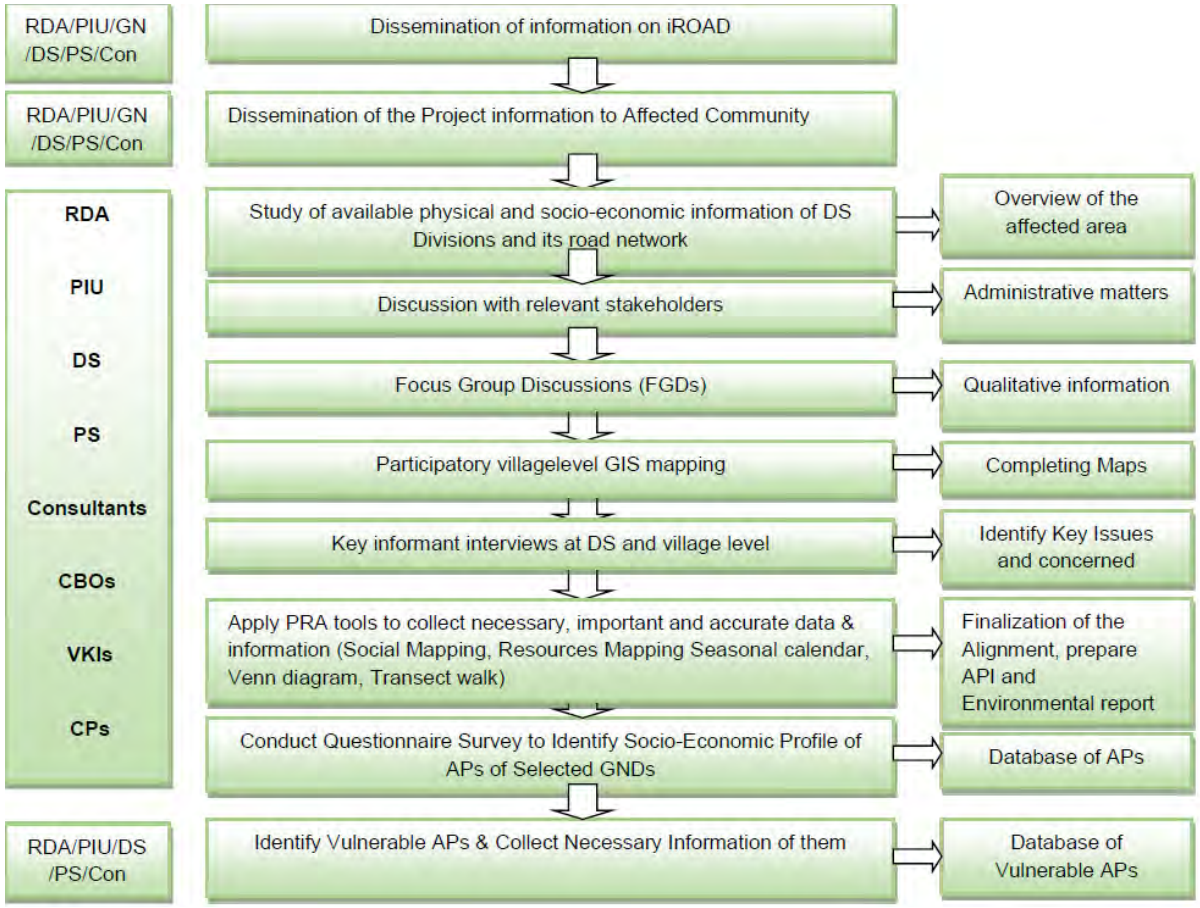


Figure VII.1: Stages of participatory project preparation

Source: Page 41, Appendix 3, Resettlement Framework, Integrated Road Investment Program

172. The transect walk for NCP was carried out by the Social safeguards consultant. The outcome of the transect walk carried out for Polonnaruwa and Anuradhapura districts were included in the Transect walk survey report prepared on August 2014. The reports are available for reference at PIU. The transect walk conducted for road code 71 of Polonnaruwa district and road code 05 of Anuradhapura district are attached in appendix VII.1 as samples.

Figure VII.2: Transect walk Polonnaruwa

Figure VII.3: Transect walk Anuradhapura

VIII. CONCLUSION AND RECOMMENDATIONS

173. The information on existing social environment suggests that agriculture is a main occupation for most of rural population in the North 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 and lack of connectivity within the region. Further it was noted that occurrence of floods also hinders the accessibility. 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 115 road sections comprising 498.98km 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 hydrologically 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 DOFC has granted the clearance over the improvement of roads which are within or near to forest sensitive areas.

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

177. The road network improvement in North Central province will boost economic activities in the province including potential growth in industries, tourism 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 IROAD PROGRAM

Anuradhapura District - North Central Province

Serial No	D.S Division	Road ID	Road Name	Road Category	Length (KM)	Sub Total (Km)
1	**Thalawa**	**1**	Thalawa - Jayagaga 149 Hagurankethagama	PRDA	10.30	**15.89**
2		**2**	Eppawala Police Junction Jaya Ganga Rotawewa	PRDA	3.00	
3		**3**	15 kanuwa - Kiriamunukole - Mawathawewa	PS	2.59	
4	**Rajanganaya**	**47**	Thambuththegama Rajanganaya Road	PRDA	17.80	**17.80**
5	**Thambuththegama**	**48**	Ayuruwedic Hospital Nawagattegama Road	PRDA	4.10	**10.30**
6		**49**	Eriyagama Paindakulama Road	PRDA	6.20	
7	**Galnewa**	**66**	Thammennawa Junction Kumbukwewa Siyanbalawewa Hunupalagama Rd	PRDA	11.00	**11.00**
8	**Nochchiyagama**	**10**	Mahawelithenna Ralapana Janapadaya Road	PS	5.20	**8.20**
9		**12**	Pahalamaragahawewa Katupathwewa	PS	3.00	
10	**Wilachchiya**	**36**	yaya 4 junction Bogas Handiya Kiralapetiyawa Halambewewa Road	PRDA	11.00	**24.00**
11		**37**	Maningamuwa Junction Ihala Oyamaduwa Nawodagama Road	PRDA	13.00	
12	**Nuwaragam Palatha Central**	**38**	4 Ela Junction Mankadawala Jaffna Road	PS	4.40	**11.10**
13		**39**	4 Ela Junction Parasangaswewa Hospital Road	PS	4.40	
14		**40**	Saliya Mawatha Thannayakulama Road	PS	2.30	
15	**Nuwaragam Palatha East**	**41**	Sucharithagama Yahalegama Temple Road	PS	4.50	**12.91**
16		**43**	CEB Depot Pahala Keerikkulama - Keerikkulama Nachchaduwa Road	PS	3.33	
17		**45**	Abeypura housing Scheme to Thammennapura	PS	3.08	
18		**46**	Nagasena Mawatha	PRDA	2.00	
19	**Nachchaduwa**	**61**	9 Ela Janahitha Junction 7 Ela Thuruwila	PRDA	4.85	**10.60**
20		**63**	Rathmale Nachchaduwa	PRDA	2.80	
21		**65**	Nelubewa Bidunkada Samanala Para	PS	2.95	
22	**Rambewa**	**13**	Mahakanadarawa Thabowa Pansala Junction to Welioya Junction	PRDA	4.00	**17.20**
23		**14**	Ihalagama Junction Muslim Diulwewa	PRDA	7.30	
24		**15**	Pihibiyagollewa 9th Post	PRDA	5.90	

Serial No	D.S Division	Road ID	Road Name	Road Category	Length (KM)	Sub Total (Km)
			Ambagahawewa Road			
25	**Kekirawa**	**19**	Elagamuwa Junction Canal Road Horapola New Mosque Road	PS	2.85	**6.75**
26		**23**	Dabawatana Road	PS	3.90	
27	**Palugaswewa**	**24**	Palugaswewa Mahakekirawa Road	PRDA	9.30	**17.70**
28		**25**	Laksirigama Puwakpitiya Kudarambewa Road	PS	6.70	
29		**71**	Palugaswewa -Udakadawala	PS	1.70	
30	**Palagala**	**26**	Balaluwewa Karawilagala Road	PS	4.20	**18.57**
31		**27**	Kudawatagala Dambuluhalmillewa Road	PRDA	9.52	
32		**28**	Ulpothagama Junction Morotthegama Road	PS	4.85	
33	**Galenbidunuwewa**	**29**	Yakalla Palugollagama Upuldeniya Road	PS	12.20	**20.10**
34		**30**	Galkulama Sivalakulama Yakalla Road	PRDA	7.90	
35	**Kahatagasdigiliya**	**31**	Kahatagasdigiliya Kainattama Road	PRDA	12.80	**19.80**
36		**32**	Rathmalgahawewa Rd Kurukkuragama Junction to Hettikattiya Road	PS	7.00	
37	**Horowpathana**	**33**	Elapathwewa Ritigahawewa Road	PS	3.80	**10.50**
38		**34**	Kapugollewa Maradanmaduwa Wagollewa Road	PRDA	4.20	
39		**35**	Nanumillewa Junction to Vilewewa Road	PS	2.50	
40	**Thirappane**	**60**	A-9 Road Labunoruwa Muriyakadawala Road	PRDA	18.64	**18.64**
41	**Ipalogama**	**67**	Kalawewa Aukana Road	RDA	4.55	**12.00**
42		**68**	6 Ela Walpaluwa to Kagama 2 Ela Road	PS	3.55	
43		**69**	Mahailuppallama Farm Akkara 100 to Senapura Katiyawa Road	PS	3.90	
44	**Mihinthale**	**5**	Matale Junction Samagipura Road	PS	2.50	**26.70**
45		**6**	Kurundankaulama School Via Kalaththewa Matale Junction Road	PS	2.80	
46		**7**	Mahakanadarawa left bank Elakanda Road	PRDA	5.50	
47		**8**	Kannattiya Ashokapura Road	PS	2.50	
48		**9**	Welankulama Junction Alappamkulama Road	PRDA	7.70	
49		**70**	Katukeliyawa Ihala Halmillewa Sivalakulama Road	PRDA	5.70	
50	**Madawachchiya**	**16**	A9 Karapikkada Kurukkandegama Kebithigollewa	PRDA	6.00	**14.70**
51		**17**	Puhudiula Junction to Galkadawala Road	PRDA	3.80	

Serial No	D.S Division	Road ID	Road Name	Road Category	Length (KM)	Sub Total (Km)
52		**18**	Kirigalwewa Unagaswewa Moragoda School Road	PRDA	4.90	
53	**Padaviya**	**50**	40 Kolaniya Bus Halt Nawagammanaya Road	PS	2.40	**12.60**
54		**51**	Thelmola Junction Milankulama AB Gammanaya Puhulagewewa Balaya Junction Road	PS	2.10	
55		**52**	Mailagashandiya Daluggala Jayanthi Road	PS	3.30	
56		**53**	Ruwanpura School Road	PS	1.00	
57		**55**	Kobbekaduwa Road	PS	2.00	
58		**56**	4th Post Thonigala Bridge Road	PS	1.80	
59	**Kebethigollewa**	**57**	Kanugahawewa Herathhalmillewa Road	PS	8.80	**12.30**
60		**59**	Halmillawatiya Yakawewa Road	PS	3.50	
Total					**329.36**	**329.36**

Polonnaruwa District – North Central District

Serial No	D.S. Division	Road ID	Road Name	Road Category	Length / km	Sub Total (Km)
1	**Elahera**	**1**	Ihekuluwewa Village Road	PS	3.5	**25.11**
2		**2**	Gange yaya Village Road	PS	3.5	
3		**3**	Athanakadawela - Pokunugala	PS	3.16	
4		**4**	Velank Kattuwa Road	PS	1.95	
5		**5**	Sarubima - Segala	PS	2	
6		**6**	Bakamuna - Damanayaya Housing sceam Road	PS	2.15	
7		**7**	Srikanduyaya Main Road - Track 18	PS	2.1	
8		**8**	Orubendisiyambalawa Road	PS	1.76	
9		**9**	Bisokotuwa - Koonthuruwawa	PS	1.74	
10		**10**	Yaya 32 Temple - 33 Bisokotuwa Junction	PS	3.25	
11	**Hingurakgoda**	**45**	Minnerya Cetral Colledge Road	PS	3.2	**19.86**
12		**46**	Hathamuna Bridge - Nugaga Daman Road	PS	3.5	
13		**47**	Dora theka Junction - Paluwewa	PS	1.75	
14		**48**	Grithala Middle Road	PS	1.4	
15		**49**	Hinguragoda Airport - Viddiyaloga School Road	PRDA	1.7	
16		**51**	Batukotuwa Middle Road	PS	1.1	
17		**52**	Minneriya - Samagipura	PS	2.3	
18		**55**	Hinguraka 4th Post-48 Village Chandanapokuna Aliwankuwa	PS	4.91	
19	**Lankapura**	**24**	Hinguragoda 7th Mile Post - Gallamuna - Hinguradamana	PRDA	4.1	**21.91**
20		**25**	Weerapura 317 - Karathakada Junction	PRDA	4	
21		**27**	BOP 317 - Dalpalama	PRDA	1.3	
22		**28**	BOP 316 - Karuwelagas Junction - Chandanapokuna	PRDA	3.01	

Serial No	D.S. Division	Road ID	Road Name	Road Category	Length / km	Sub Total (Km)
23		**29**	Patunugama Junctio - Damwelmangada - Buthayaya	PS	3	
24		**31**	Kumbukkanaruwa - 127 Bawdarthagama	PS	1.5	
25		**72**	Deberella Sudupalama - Gallamuna	PS	5	
26	**Madirigiriya**	**33**	Track 12 Bridge - Nagarapura - Weligampura	PS	7	**32.11**
27		**34**	Uthaganawa Irrigation Junction - Dinisuru Junction	PS	3	
28		**35**	Kusumpokuna - Pimpara Junction	PRDA	3	
29		**36**	Pimpara Pansalgoda Main Road - Sansungama 21 Division	PRDA	1.3	
30		**37**	Meegaswewa - Wadigawewa	PRDA	3	
31		**40**	Medrigriya Town Internal Road	PS	2.06	
32		**41**	Jayathugama Junction - Meegollawa School	PS	3	
33		**42**	Medrigriya Water tank - Mr. Vijeyadasa"s House	PS	2	
34		**43**	Jayathugama Junction - Meegollawa Keethiyawijaya Stores	PS	2	
35		**44**	Kalagedi Palama - Visobadaragama School	PS	2.5	
36		**73**	Diulankadawela Aliwankuwa Junction	PS	3.25	
37	**Thamankaduwa**	**11**	Athumalpitiya Junction - Laxauyana Siyambalagas Junction	PRDA	4.7	**24.2**
38		**12**	Palugasdaman Senanayaka Road	PS	1.2	
39		**13**	Kalagala - Angammedilla Village Road	PRDA	5.1	
40		**14**	Kadawela Wewa Road Stage - 01	PS	1.75	
41		**18**	Parakum Uyana D1 Uthuru Ela	PRDA	4.5	
42		**20**	Onagama main Road - Galkoriya Cemetry	PS	3	
43		**21**	Parakirama Samuthraya - Ambanganga Temple	PS	2.4	
44		**22**	Parakirama Samuthraya Bodhiya - Right Chanel Temple	PS	1.55	
45	**Welikanda**	**57**	Welikanda - Singapura Road	PRDA	12	**19**
46		**58**	Athugala - Katuwavilla	PRDA	5	
47		**59**	Gnithamana - Nilumwewa	PRDA	2	
48	**Dimbulagala**	**61**	Mahadamanawewa - Village Road	PRDA	3	**27.37**
49		**62**	Dimbulagala Junction - Bogaswewa	PRDA	6.1	
50		**64**	Mannempityiya Hospital Road	PRDA	1.2	
51		**65**	2nd Mile post - Seelapura	PS	1.45	
52		**66**	Sripura Nuwaragala Village Road	PRDA	9.2	
53		**67**	Aluthoya Junction - Vilage End	PS	1.92	
54		**68**	Dimbulagala Junction - Soruwila	PS	1.6	
55		**71**	Bandanagala bandanagala village	PS	2.9	
Total					**169.56**	**169.56**

SAMPLE ENVIRONMENTAL CHECKLISTS

ENVIRONMENTAL CHECKLIST- ANURADHAPURA

INTEGRATED ROAD INVESTMENT PROGRAMME (iROAD), ROAD DEVLOPMENT AUTHORITY

Road Name: Eppawala Police Junction Jaya Ganga Rotawewa road

Road ID: 02

District Name: Anuradhapura

DSD & G NDs:

DSD	GNDs
Thalawa	373 -Thulana 377 -Mawatha wewa

Total Length of the road: 3.000km

This road section starts near Police junction at Kekirawa - Thalawa (B213) road. Road surface is mainly macadam while some sections are gravel. At the starting point, the width of carriageway and Right of Way (ROW) are 6.5m and 8.0m and at the end point it is 5.4m and 7.00m respectively. The road crosses canals at 1+200, 2+000, 2+800. The road traverses through areas with home gardens and forest. The proposed construction ends at 3+00km near the Lanka Phosphate Limited office.

Climatic Conditions

Temperature	High: 36 ^{0}C Low: 25 ^{0}C
Humidity	High: 83% Low: 46%
Rainfall Rainy Season	>900 mm/year From October to December

(Source: National Atlas of Sri Lanka, 2nd edition, Department of Survey Sri Lanka, 2011)

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: Maximum elevation -128m at 2+460km Minimum elevation -1115m at 0+00km In general plain terrain could be observed along the road trace.

No:	Type of Ecosystem	Yes	No	Explanation
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)?	√		Yoda ela forest reserve is located on RHS of the road from 2km to 3km.
3.	Inhabited Area	√		This road traverses through residential lands in following areas; From 0+000 to 2+100 (Both side) From 2+100 to 2+500 (LHS)
4.	Agricultural Land		√	
5.	Barren Land		√	

B. Specific description of the Road Environment

No.	Parameter/ Component	Yes	No	Explanation
1.	Are there any areas with landslide or erosion problems along the road? (If yes, indicate the location whether Right or Left side and the chainage)		√	
2.	Are there any Tanks/streams /rivers etc. along/crossing the road or any lakes/swamps beside the road? (If yes, list them indicating the location Right/ Left or crossing and the chainage)	√		The road crosses canals at;- 1+200km - 2+000km. Road crosses Right Bank Main canal of the Kala Wewa reservoir and road runs RHS to the canal to the end point
3.	Is the area along the project road prone to flooding or any problems of water stagnation and other drainage issues? (If yes, mention chainage, flood level and frequency)		√	However storm water flowing over the road due to damaged culverts
4.	Are there any trees with a dbh of 30 cm or more within the existing ROW (within two fences on either sides) or within 2 m corridor from the edge of the carriageway on either side (if the existing ROW is not clear)? (If yes attach list of trees indicating the location (Right or Left side)and the chainage)	√		09 trees were observed within the existing ROW during the field reconnaissance. However based on engineering estimations prepared for this particular road, only 21 trees will be felled due to construction activities. Tree replanting with suitable native species as specified in Environmental

No.	Parameter/ Component	Yes	No	Explanation
				Management Plan (EMP) is recommended to compensate the impact due to trees removal.
5.	Along the road and within 100 m of the road shoulder, are there any Faunal habitat areas, Faunal breeding ground, bird migration area, or other similar areas? (If yes, specify details of habitat with chainage)	√		There may be faunal habitat areas and faunal breeding ground present within the Yoda Ela forest reserve
6.	Along the road and within 100m of the road shoulder is there any evidence of Flora and Fauna species that are classified as endangered / threatened species?	√		During the field reconnaissance, such species were not observed. However such species may be present within the forest reserve.
7.	Are there any utility structures[7] within 2 m on either side from the edge of the carriageway or within the existing ROW of the road? (If yes, attach list with chainage)	√		23 electric poles on LHS and 35 on RHS are present the road. 49 telephone poles are located only on LHS of the road. No pipe lines are located along the road. *Please refer to section D1*
8.	Are there any religious, cultural or community structures/buildings[8] within 50 m on either side from the centre line of the road alignment? (If yes attach list with chainage)	√		There is a mosque and a temple in the study area. *Please refer to section D11.* However none of these structures will be affected due to the road improvement. However, it is recommended to implement mitigation measures as specified in the EMP to minimise impacts due to degradation of air quality and noise.

C. Public Consultation

No.	Consultation Activities	Yes	No	Remarks
1.	Consultation with local community was conducted before finalizing the alignment.	√		Public was consulted during field reconnaissance carried out for preparation of the Environmental Checklist. Please refer to the annex 1 for the list of public consulted and their

[7] Water tap, hand pump, electric pole, telephone pole, pipe lines and other similar structures
[8] Religious/cultural/historical monuments, school, health centre, public toilet and other similar structures

No.	Consultation Activities	Yes	No	Remarks
				views
2.	Any suggestion received in finalizing the alignment and road related environmental issues	√		Public expressed the need of improving the drainage along the road
3.	If suggestions received, were they incorporated into the design?	√		The environment checklist will be forwarded to design team for further consideration.

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)) as required under B.7.

Chainage (Km)	Utility structure	LHS	RHS
0+000 – 0+100	Electric poles	1	2
0+100 – 0+200	Electric poles	-	1
0+200 – 0+300	Electric poles	-	3
0+300 – 0+400	Electric poles	-	2
0+400 – 0+500	Electric poles	-	1
0+500 – 0+600	Electric poles	2	1
0+600 – 0+700	Electric poles	2	-
0+700 – 0+800	Electric poles	1	1
0+800 – 0+900	Electric poles	2	2
0+900 – 1+000	Electric poles	1	1
1+000 – 1+100	Electric poles	-	2
1+100 – 1+200	Electric poles	-	3
1+200 -1+300	Electric poles	-	1
1+300 – 1+400	Electric poles	3	2
1+400 -1+500	Electric poles	2	2
1+500 – 1+600	Electric poles	6	2
1+600 – 1+700	Electric poles	-	1
1+700 – 1+800	Electric poles	-	1
1+800 -1+900	Electric poles	1	1
1+900 – 2+000	Electric poles	-	1
2+100 – 2+200	Electric poles	2	-
2+400 -2+500	Electric poles	-	1
2+500 – 2+600	Electric poles	-	2
2+600 -2+700	Electric poles	-	1
2+700 – 2+800	Electric poles	-	1
Total		23	35

Chainage (Km)	Utility structure	LHS	RHS
0+100 – 0+200	Telephone poles	3	-
0+200 – 0+300	Telephone poles	1	-
0+300 – 0+400	Telephone poles	3	-

0+400 – 0+500	Telephone poles	1	-
0+500 – 0+600	Telephone poles	2	-
0+600 – 0+700	Telephone poles	3	-
0+700 – 0+800	Telephone poles	2	-
0+800 – 0+900	Telephone poles	2	-
0+900 – 1+000	Telephone poles	2	-
1+000 – 1+100	Telephone poles	2	-
1+100 – 1+200	Telephone poles	3	-
1+200 -1+300	Telephone poles	1	-
1+300 – 1+400	Telephone poles	2	-
1+500 – 1+600	Telephone poles	4	-
1+600 – 1+700	Telephone poles	3	-
1+700 – 1+800	Telephone poles	3	-
1+800 -1+900	Telephone poles	1	-
1+900 – 2+000	Telephone poles	1	-
2+200 – 2+300	Telephone poles	2	-
2+300 – 2+400	Telephone poles	2	-
2+400 -2+500	Telephone poles	1	-
2+500 – 2+600	Telephone poles	1	-
2+600 -2+700	Telephone poles	1	-
2+700 – 2+800	Telephone poles	1	-
2+800 – 2+900	Telephone poles	1	-
2+900 -3+000	Telephone poles	1	-
Total		49	0

II. List of community structures indicating location (left or right side of the road) and chainage (as required under B.8)

Chainage/ GPS	**Location**	**Right**	**Left**
0+000-0+100	Mosque	√	
1+700- 1+800	Jayaganagaramaya Temple	√	

III. Project location map is attached in annex 2

IV. Photographs of the project area showing at least 2 m on either side from centre line of road alignment are attached in annex 3

V. List of trees with 30cm DBH or more located within the existing ROW or within 2m on either side of the road from the edge of the carriageway as required in B.4.

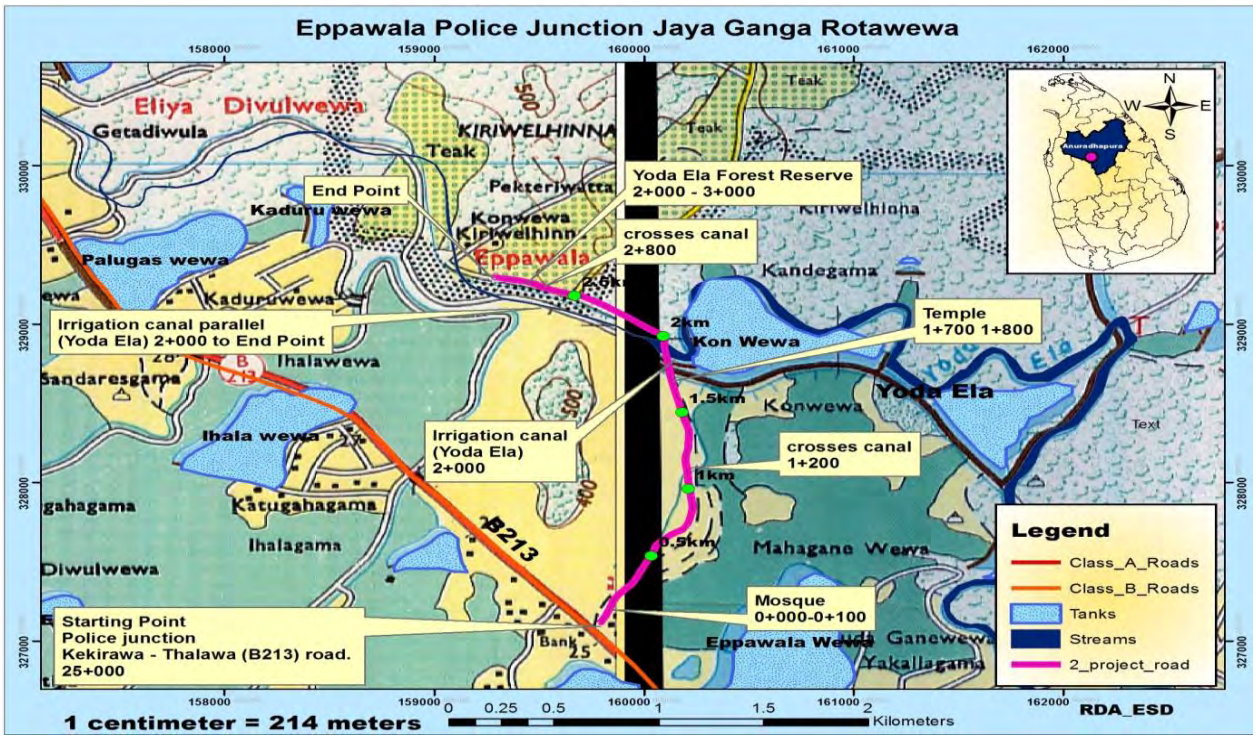
Chainage (m)	**LHS**			**RHS**		
	Common Name	**Botanical name**	**No. of trees**	**Common Name**	**Botanical name**	**No. of trees**
0+400 – 0+500	Unidentified		1		-	
0+500 – 0+600	Unknown Mara	*Samanea saman*	2 1		-	
0+600 – 0+700	Unknown		1	Teak	*Tectona grandis*	1

Chainage (m)	LHS			RHS		
	Common Name	Botanical name	No. of trees	Common Name	Botanical name	No. of trees
0+700 – 0+800	Teak	*Tectona grandis*	1			
2+200 – 2+300		-		Unkonwn		1
2+400 – 2+500		-		Kohomba	*Azadirachta indica*	1
Total			06			03

Annex 1: Public Consultation of Eppawala Police Junction Jaya ganga rota wewa Road

Name of Respondent	Age	Sex	Address	Views
Mr. W.B. Wijerathna	56	Male	101, Phosphate road Kon wewa Eppawala	During rain storm water flow over the road and due to insufficient culvert size. Also road surface runoff drains inside the houses. When constructing the road please make arrangement to repair the drainage system as well.
Mr. L.M. Jayasinghe	56	Male	Jayaganga road, Yakallegala	Road get muddy during the rainy season. Difficult to travel along the road. Please improve the drainage system of the road with this project.

Annex 2: Location Map of the Road



Annex 3: Photographs of Eppawala police junction Jaya ganga rota wewa Road

Plate 1 : Starting point of the road

Plate 2 : Canal crossing the road (2+000)

Plate 3 : Yoda ela forest reserve on RHS of the road from 2km to 3km

Plate 5 : End point of the road

ENVIRONMENTAL CHECKLIST

INTEGRATED ROAD INVESTMENT PROGRAMME (iROAD), ROAD DEVELOPMENT AUTHORITY

Road Name: Sucharithagama Yahalegama Temple road

Road ID: 41

District Name: Anuradhapura

DSD & GNDs:

DSD	GNDs
Nuwaragam Palatha East	236 Sucharithagama/yahalegama

Total Length of the road: 4.500km

The proposed section of the road to be implemented starts at the Sucharithagama junction and ends at 5+000km. Road surface varies with macadam and gravel. Macadam surface could be observed from 0+0km to 1+000km and from 1+600km to 2+800km. Gravel surface could be observed from 1+000km to 1+600km and from 2+800km to 5+000km. Road is narrow with varying carriageway and passes through a residential area with home gardens and paddy. The average width of the carriageway and Right of Way (ROW) are 3.4m and 7.4m respectively. Road passes canals within (0+00-0+300)km (LHS), (0+400-0+500)km (LHS) and a tank within (1+000km-1+600)km (LHS) sections of the road. Road crosses a Yoda Ela stream at 2+500km and a canal at 1+200km. Road traverses through a sub post office at 0+100km (RHS), a cemetery at 0+800km (RHS), two schools at 0+100km (LHS) and 1+800km (RHS), a temple at 2+700km (RHS) and a shrine at 3+600km (RHS). The road ends at Yahalegama.

Climatic Conditions

Temperature	High: 36 ^{0}C Low: 26 ^{0}C
Humidity	High: 83% Low: 46%
Rainfall Rainy Season	<900 mm/year From October to December

(Source: National Atlas of Sri Lanka, Second Edition,2011)

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)	√		In general ,road traverses through a Undulating and flat terrain. Altitude: Maximum elevation - 120m at 4+37km Minimum elevation - 96m at 1+18km

No:	Type of Ecosystem	Yes	No	Explanation
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)?		√	
3.	Inhabited Area	√		Scattered settlements were observed within following sections of the road (0+700 - 0+800)km (RHS) (0+800 – 3+600)km (Either side)
4.	Agricultural Land	√		Paddy cultivations were located on either side of the road
5.	Barren Land		√	

Specific description of the Road Environment

No.	Parameter/ Component	Yes	No	Explanation
1.	Are there any areas with landslide or erosion problems along the road? (If yes, indicate the location whether Right or Left side and the chainage)		√	
2.	Are there any Tanks/streams /rivers etc. along/crossing the road or any lakes/swamps beside the road? (If yes, list them indicating the location Right/ Left or crossing and the chainage)	√		Road passes canals and tanks at following locations Canals: (0+000-0+300)km (LHS) (0+400-0+500)km (LHS) Tanks: (1+000km-1+600)km (LHS) Road crosses Yoda Ela stream at 2+500km and a canal at 1+200km
3.	Is the area along the project road prone to flooding or any problems of water stagnation and other drainage issues? (If yes, mention chainage, flood level and frequency)		√	During the field reconnaissance, such areas were not mentioned by the public. However, public mentioned about the poor drainage system.
4.	Are there any trees with a dbh of 30 cm or more within the existing ROW (within two fences on either sides) or within 2 m corridor from the edge of the carriageway on either side (if the existing ROW is not clear)? (If yes attach list of trees	√		27 trees are located within 2m corridor on either side from the edge of the existing carriageway. However only about 15 trees may be felled due to the improvement of the road as per the engineering estimates. Tree replanting with suitable native

No.	Parameter/ Component	Yes	No	Explanation
	indicating the location (Right or Left side)and the chainage)			species as specified in Environmental Management Plan (EMP) is recommended to compensate the impact due to trees removal.
5.	Along the road and within 100 m of the road shoulder, are there any Faunal habitat areas, Faunal breeding ground, bird migration area, or other similar areas? (If yes, specify details of habitat with chainage)		√	During the field reconnaissance, such areas were not observed along the study corridor and further, no secondary information is available and local community is not aware of this matter
6.	Along the road and within 100m of the road shoulder is there any evidence of Flora and Fauna species that are classified as endangered / threatened species?		√	During the field reconnaissance, such areas were not observed along the study corridor and further, no secondary information is available and local community is not aware of this matter
7.	Are there any utility structures[9] within 2 m on either side from the edge of the road carriageway or within the existing ROW of the road? (If yes, attach list with chainage)	√		1 electric pole on LHS and 7 on RHS were observed along the road. A Transformer was observed at 1+800km. *Please refer to section D1* Telecommunication lines and Water supply pipe lines were not located along the road.
8.	Are there any religious, cultural or community structures/buildings[10] within 50 m on either side from the centre line of the road alignment? (If yes attach list with chainage)	√		A sub post office at 0+100km (RHS), a cemetery at 0+800km (RHS), two schools at 0+100km (LHS) and 1+800km (RHS), a temple Purana Aggararamaya temple at 2+700km (RHS) and a shrine at 3+600km (RHS). *Please refer to section D11.* However none of these structures will be affected due to the road improvement. However, it is recommended to implement mitigation measures as specified in the EMP to minimise impacts due to degradation of air quality and noise at these sensitive receptors.

[9] Water tap, hand pump, electric pole, telephone pole, pipe lines and other similar structures
[10] Religious/cultural/historical monuments, school, health centre, public toilet and other similar structures

Public Consultation

No.	Consultation Activities	Yes	No	Remarks
1.	Consultation with local community 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. *Please refer to the annex 1 for the list of public consulted and their views*
2.	Any suggestion received in finalizing the alignment and road related environmental issues	√		Public specified the need of improved road side and cross drainage system
3.	If suggestions received, were they incorporated into the design?	√		The environment checklist will be forwarded to design team for further consideration.

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)) as required under B.7.

Chainage (m)	Utility structure	LHS	RHS
0+200-0+300	Electric pole	-	3
0+600 – 0+700	Electric pole	-	1
0+700-0+800	Electric pole	1	-
2+800 -2+900	Electric pole	-	1
3+100-3+200	Electric pole	-	1
3+300-3+400	Electric pole	-	1
Total		1	7
Grand Total		8	

II. List of community structures indicating location and the side (left or right) of the road as required under B.8

Chainage (km)	Location	Right	Left
0+100	Sub post office	√	
0+100	School		√
0+600	Kovil	√	
0+800	Cemetery	√	
1+800	Yahalegama school	√	
2+700	Temple(Purana Aggararamaya Yahalegama)	√	
3+600	Shrine	√	

III. Project location map is attached in annex 2

IV. Photographs of the project area showing at least 2 m on either side from centre line of road alignment are attached in annex 3.

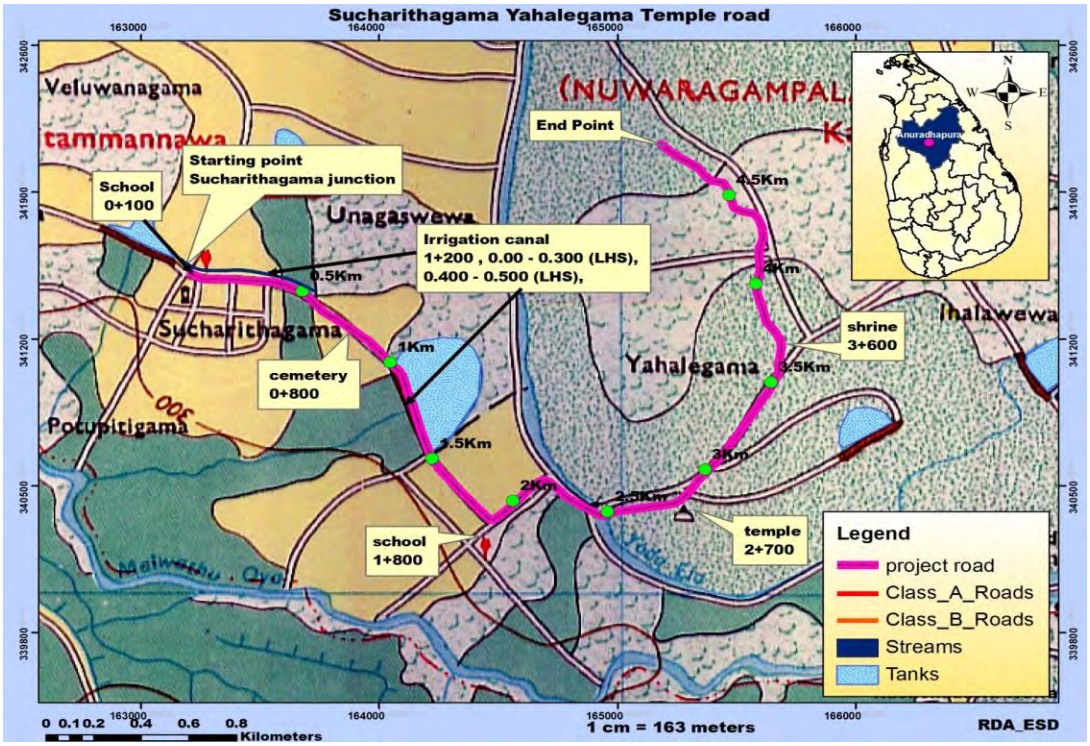
V. List of trees with 30cm DBH or more located within the existing ROW or within 2m on either side of the road from the edge of the carriageway as required in B.4.

Chainage (m)	LHS			RHS		
	Common Name	Botanical name	No. of trees	Common Name	Botanical name	No. of trees
0+3km-0+4km	Kumbuk	*Terminalia arjuna*	*1*		-	
0+4km-0+5km	Kumbuk	*Terminalia arjuna*	*7*		-	
0+5km-0+6km	Kumbuk	*Terminalia arjuna*	*6*		-	
0+6km-0+7km	Kumbuk	*Terminalia arjuna*	*5*		-	
0+7km-0+8km	Kumbuk	*Terminalia arjuna*	*1*		-	
0+9km-1+0km	Siyambala	*Tamarindus indica*	*1*		-	
	Dan	*Syzygium sp.*	*1*			
3+2km-3+3km	Kohomba	*Azadirachta indica*	*2*		-	
3+8km-3+9km	Kohomba	*Azadirachta indica*	*1*		-	
3+9km-4+0km	Teak	*Tectona grandis*	*1*		-	
4+0km-4+1km	Nuga	*Ficus benghalensis*	*1*		-	
Total			27	**Total**		0

Annex 1: Public consultation - Sucharithagama Yahalegame temple road

Name of Respondent	Age	Sex	Address	Views
D.P. Meriyagalla	40	Male	Yahalegama, Anuradhapura	There's no proper culverts and drainage system along this road. The road development should include the drainage improvement. We welcome this development.
Dayawathi	67	Female	Yahalegama	If the road is developed, it is good for this area and public. The businesses along the road will be developed and the villagers will be better off.

Annex 2: Location map of the project



Annex 3: Photographs of Sucharithagama Yahalegama Temple road

Plate 1: Starting point of the road (0.000km)

Plate 2: Purana Aggararamaya temple (2.700km) (RHS)

Plate 3 : Yahalegama school (1.800km)(RHS)

Plate 4: Consulting public during reconnaissance

Plate 5: End point of the road (4.500km)

ENVIRONMENTAL CHECKLIST
INTEGRATED ROAD INVESTMENT PROGRAMME (iROAD), ROAD DEVELOPMENT AUTHORITY

Road Name: 6 Ela Walpaluwa To Kagama 2 Ela road
Road ID: 68
District Name: Anuradahapura
DSD & G NDs:

DSD	GNDs
Ipologama	02 Ela

Total Length of the road: 3.550km

This road section starts near the chainage of 9km of Kagama- Gonapathirawa road. Road surface is macadam from 0+0km to 1+4km and gravel from 1+600km to 3+55km. At 0+520 the width of the carriageway and the ROW are 3.20m and 4.5 respectively. The road traverses through a plain terrain. Stream run near RHS of the road at several locations (e.g., from 0+600 to 1+900). A school and a community hall are located within the study area. There are home gardens, paddy, tobacco and banana plantation lands observed on either side of the road. The proposed construction ends at 3+55km at Walpaluwa area.

Climatic Conditions

Temperature	High: 36 ^{0}C Low: 25 ^{0}C
Humidity	High: 83% Low: 46%
Rainfall Rainy Season	>900 mm/year From October to December

Source: National Atlas of Sri Lanka, 2nd edition, Department of Survey Sri Lanka, 2011)

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: Maximum elevation -128m at 0+750km Minimum elevation -104m at 3+500km In general plain terrain could be observed along the road trace.
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)?		√	
3.	Inhabited Area	√		
4.	Agricultural Land	√		Paddy , banana , tobacco cultivations are present
5.	Barren Land		√	

Specific description of the Road Environment

No.	Parameter/ Component	Yes	No	Explanation
1.	Are there any areas with landslide or erosion problems along the road? (If yes, indicate the location whether Right or Left side and the chainage)		√	
2.	Are there any Tanks/streams /rivers etc. along/crossing the road or any lakes/swamps beside the road? (If yes, list them indicating the location Right/ Left or crossing and the chainage)	√		Stream runs RHS of the road from 0+600 to 1+900 From 2+00-2+300 From 2+500-2+800 Between 1+900-2+000 road crosses an irrigation canal
3.	Is the area along the project road prone to flooding or any problems of water stagnation and other drainage issues? (If yes, mention chainage, flood level and frequency)	√		The project area is located within the Kalaoya flood prone area
4.	Are there any trees with a dbh of 30 cm or more within the existing ROW (within two fences on either sides) or within 2 m corridor from the edge of the carriageway on either side (if the existing ROW is not clear)? (If yes attach list of trees indicating the location (Right or Left side)and the chainage)	√		No trees were observed within the existing ROW during the field reconnaissance.
5.	Along the road and within 100 m of the road shoulder, are there any Faunal habitat areas, Faunal breeding ground, bird migration area, or other similar areas? (If yes, specify details of habitat with chainage)		√	During the field reconnaissance, such areas were not observed along the study corridor.
6.	Along the road and within 100m of the road shoulder is there any evidence of Flora and Fauna species that are classified as endangered / threatened species?		√	During the field reconnaissance, such species were not observed along the study corridor.
7.	Are there any utility structures[11] within 2 m corridor from the edge of the carriageway on either side of the road alignment or within the existing ROW of the road? (If yes, attach list with chainage)		√	No electric poles, telecommunication lines and pipe lines are located within 2 m corridor from the edge of the carriageway. *Please refer to section D1*
8.	Are there any religious, cultural or community structures/buildings[12] within 50 m on either side from the centre line of the road alignment?	√		A school and a community hall are located within the study area. *Please refer to section D11.*

[11] Water tap, hand pump, electric pole, telephone pole, pipe lines and other similar structures
[12] Religious/cultural/historical monuments, school, health centre, public toilet and other similar structures

No.	Parameter/ Component	Yes	No	Explanation
	(If yes attach list with chainage)			However none of these structures will be affected due to the road improvement. However, it is recommended to implement mitigation measures as specified in the EMP to minimise impacts due to degradation of air quality and noise at these sensitive receptors.

Public Consultation

No.	Consultation Activities	Yes	No	Remarks
1.	Consultation with local community 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. Please refer to the annex 1 for the list of public consulted and their views
2.	Any suggestion received in finalizing the alignment and road related environmental issues	√		Public expressed the need of improving the drainage along the road and to consider flooding.
3.	If suggestions received, were they incorporated into the design?	√		The environment checklist will be forwarded to design team for further consideration.

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)) as required under B.7.

II. List of community structures indicating location (left or right side of the road) and chainage (as required under B.8)

Chainage/ GPS	Location	Right	Left
0+900	School (Dhathusana Vidyalaya)	√	
2+300	Community Hall	√	

III. Project location map is attached in annex 2

IV. Photographs of the project area showing at least 2 m on either side from centre line of road alignment are attached in annex 3.

V. List of trees with 30cm DBH or more located within the existing ROW or within 2m on either side of the road from the edge of the carriageway as required in B.4.
-No trees were observed within the existing ROW during the field reconnaissance

ENVIRONMENTAL CHECKLIST
INTEGRATED ROAD INVESTMENT PROGRAMME (i ROAD), ROAD DEVELOPMENT AUTHORITY

Road Name: Mahailluppallama Farm Akkara 100 to Senapura katiyawa Road
Road ID: 69
District Name: Anuradhapura
DSD & GNDs:

DSD	GNDs
Ipalogama	499 Mahailluppallama

Total Length of the road: 3.900km

The proposed road section to be implemented starts by forming a T junction with 17+200km (known as 18 kanuwa) of B213 - Kekirawa - Talawa road (0+000km) and ends by forming a junction (known as Kohobagas junction) with Senapura Katiyawa Road at 3+900km. Entire road section runs through a flat terrain with undulations. Proposed project area located in both government and private owned lands. From starting to 2+000km section of the road runs through the Government Seed Production Farm - Mahailluppallama and rest of the road runs through a residential area consisting of home gardens and paddy. Road surface is degraded and covered with macadam and gravel. Road surface is macadam from 0+000km to 1+300km and gravel from 1+300km to 3+900km. Carriageway and Right of Way (ROW) at the starting section of the road is 3.1m and 4.5m respectively and at the end it is 3.0m and 3.8m respectively. Road crosses a stream at 2+000km. Road runs parallel to a canal from 2+300km to 2+900km (LHS of the road) and crossing it at 2+900km and runs again parallel from 3+000km to 3+800km (RHS of the road).

Climatic Conditions

Temperature	High: 36 ^{0}C Low: 26 ^{0}C
Humidity	High: 83% Low: 46%
Rainfall Rainy Season	<900 mm/year From October to December

(Source: National Atlas of Sri Lanka, Second Edition,2011)

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)	√		In general, road traverses through an undulating and flat terrain. Altitude: Maximum elevation -135m at 0+180km Minimum elevation -109m at 2+13km
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)?		√	

No:	Type of Ecosystem	Yes	No	Explanation
3.	Inhabited Area	√		Scattered settlements were observed along the road from 2+000km to end
4.	Agricultural Land	√		Government Seed Production Farm - Mahailluppallama located from starting to 2+000km Paddy lands observed within the residential area from 2+000km to end
5.	Barren Land		√	

Specific description of the Road Environment

No.	Parameter/ Component	Yes	No	Explanation
1.	Are there any areas with landslide or erosion problems along the road? (If yes, indicate the location whether Right or Left side and the chainage)		√	
2.	Are there any Tanks/streams /rivers etc. along/crossing the road or any lakes/swamps beside the road? (If yes, list them indicating the location Right/ Left or crossing and the chainage)	√		Road crosses a stream at 2+000km and runs parallel to a canal from 2+300km to 2+900km (LHS) and crossing it at 2+900km runs again parallel from 3+000km to 3+800km (RHS)
3.	Is the area along the project road prone to flooding or any problems of water stagnation and other drainage issues? (If yes, mention chainage, flood level and frequency)		√	During the field reconnaissance, such areas were not mentioned by the local community.
4.	Are there any trees with a dbh of 30 cm or more within the existing ROW (within two fences on either sides) or within 2 m corridor from the edge of the carriageway on either side (if the existing ROW is not clear)? (If yes attach list of trees indicating the location (Right or Left side)and the chainage)	√		2 trees were observed within the existing ROW and will be felled for the construction activities as per the engineering estimates. Tree replanting with suitable native species as specified in Environmental Management Plan (EMP) is recommended to compensate the impact due to trees removal.
5.	Along the road and within 100 m of the road shoulder, are there any Faunal habitat areas, Faunal breeding ground, bird migration area, or other similar areas? (If yes, specify details of habitat with chainage)		√	During the field reconnaissance, such areas were not observed along the study corridor and further, no secondary information is available and local community is not aware of this matter

No.	Parameter/ Component	Yes	No	Explanation
6.	Along the road and within 100m of the road shoulder is there any evidence of Flora and Fauna species that are classified as endangered / threatened species?		√	During the field reconnaissance, such areas were not observed along the study corridor and further, no secondary information is available and local community is not aware of this matter
7.	Are there any utility structures[13] within 2 m on either side from the edge of the road carriageway or within the existing ROW of the road? (If yes, attach list with chainage)	√		2 electric poles on LHS and 3 electric poles on RHS, 2 telephone poles on either side and water supply pipe line were observed along the road *Please refer to section D1*
8.	Are there any religious, cultural or community structures/buildings[14] within 50 m on either side from the centre line of the road alignment? (If yes attach list with chainage)	√		A sacred Bo tree (*Ficus religiosa*) and a shrine at 0+100km on RHS. *Please refer to section D11.* However none of these structures will be affected due to the road improvement. However, it is recommended to implement mitigation measures as specified in the EMP to minimise impacts due to degradation of air quality and noise at these sensitive receptors.

Public Consultation

No.	Consultation Activities	Yes	No	Remarks
1.	Consultation with local community 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. *Please refer to the annex 1 for the list of public consulted and their views*
2.	Any suggestion received in finalizing the alignment and road related environmental issues		√	
3.	If suggestions received, were they incorporated into the design?		√	

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)) as required under B.7.

[13] Water tap, hand pump, electric pole, telephone pole, pipe lines and other similar structures
[14] Religious/cultural/historical monuments, school, health centre, public toilet and other similar structures

Chainage (km)	Utility structure	LHS	RHS
0+000-0+100	Electric pole Telephone pole	- -	1 1
1.100 – 1.200	Electric poles	-	2
2+100 – 2+200	Telephone pole	1	-
2+800-2+900	Electric poles	2	-
Total		2	3
Grand Total		**Electric Poles 5** **Telephone Poles 2**	

II. List of community structures indicating location (left or right side of the road) and chainage (as required under B.8)

Chainage/ GPS	Location	Right	Left
0+100	Sacred Bo tree	√	

III. Project location map is attached in annex 2

IV. Photographs of the project area showing at least 2 m on either side from centre line of road alignment are attached in annex 3.

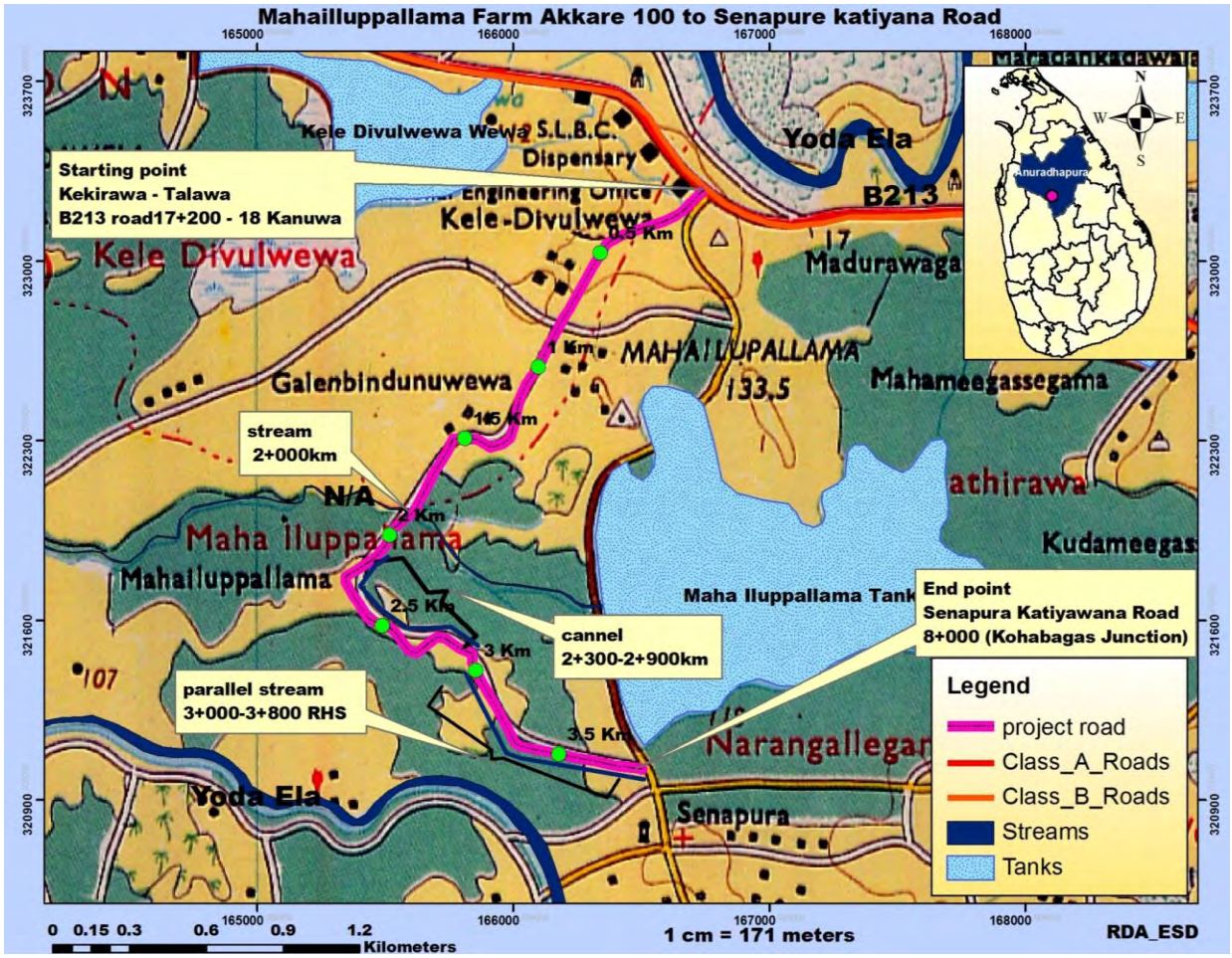
V. List of trees with 30cm DBH or more located within the existing ROW or within 2m on either side of the road from the edge of the carriageway as required in B.4.

Chainage (m)	LHS			RHS		
	Common Name	Botanical name	No. of trees	Common Name	Botanical name	No. of trees
1+700-1+800	Coconut	*Cocos nucifera*	1	-		
2+200-2+300	Jak	*Artocarpus heterophyllus*	1	-		

Annex 1: Public Consultation – Mahailuppallama Farm Akkara 100 to Senapura Katiyawa Road

Name of Respondent	Age	Sex	Address	Views
Isuru sameera	35	Male	LB2 Senapura	Flooding is not a problem to this road. This road development is very good.
Inoka Weerakoon	30	Female	LB13 Senapura	This road development is good. This road serves for many villages and many people use this road to reach town areas.

Annex 2: Location Map of the Road



Annex 3: Road of the Mahailluppallama Farm Akkara 100 to Senapura katiyawa Road

Plate 1. Starting point of the Road

Plate 2: Road surface near to the starting point

Plate 3. Road surface with damaged macadam

Plate 4. Crossing point of the Stream at 2.000km

Plate 5. Road passing through paddy lands

Plate 6. Road with Gravel surface

Plate 7: Carrying out public consultation

Plate 8. End point at Kohobagas junction

ENVIRONMENTAL CHECKLIST
INTEGRATED ROAD INVESTMENT PROGRAMME (iROAD), ROAD DEVELOPMENT AUTHORITY

Road Name: Ihekuluwewa Village Road
Road ID: 01
District Name: Polonnaruwa
DSD & G NDs:

DSD	GNDs
Elahera	26 (Diyabeduma)

Total Length of the road: 3.500km

Two sections of Ihekuluwewa Village road will be improved by this project. First section (0+000km – 0+900km) starts connecting with Elahera - Girithale road (B112) near 17+500km and end at the sub Post Office of Ihekuluwewa. Second section is starting at 2.000km of the proposed road and ending at Ihekuluwewa village. Road surface consists with gravel, macadam and concrete. For both sections condition of the road surface is very poor. The carriageway of these two sections varies between 2.6m to 4.2m while the ROW ranges within 5m – 10m. An irrigation canal is traversing adjacent and parallel to the road on LHS of the road. Home gardens are observed on right hand side of this road.

Climatic Conditions

Temperature-^{0}C	High: 36 °C Low: 20 °C
Humidity	High: 83% Low: 46%
Rainfall Rainy Season	>900 mm/year From October to December

(Source: National Atlas of Sri Lanka, 2nd edition, Department of Survey, Sri Lanka)

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)	√		In general, road traverse through a flat to undulating terrain. Altitude: First section Maximum elevation -128m at 0+575km Minimum elevation -116m at 0+965km Second section Maximum elevation -124m at 1+680km Minimum elevation -119m at 2+.450km

No:	Type of Ecosystem	Yes	No	Explanation
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)?		√	
3.	Inhabited Area	√		From the start to end scattered settlements are observed at right hand side of the road.
4.	Agricultural Land		√	
5.	Barren Land		√	

B. Specific description of the Road Environment

No.	Parameter/ Component	Yes	No	Explanation
1.	Are there any areas with landslide or erosion problems along the road? (If yes, indicate the location whether Right or Left side and the chainage)		√	
2.	Are there any Tanks/streams /rivers etc. along/crossing the road or any lakes/swamps beside the road? (If yes, list them indicating the location Right/ Left or crossing and the chainage)	√		An irrigation canal is traversing adjacent and parallel to the road on LHS of the road.
3.	Is the area along the project road prone to flooding or any problems of water stagnation and other drainage issues? (If yes, mention chainage, flood level and frequency)	√		During the field reconnaissance following areas were identified as flood prone areas; From 2+600km to 2+700km From 3+200km to 3+300km From 4+200km to 4+300km
4.	Are there any trees with a dbh of 30 cm or more within the existing ROW (within two fences on either sides) or within 2 m corridor from the edge of the carriageway on either side (if the existing ROW is not clear)? (If yes attach list of trees indicating the location (Right or Left side)and the chainage)	√		One tree is located within 2m corridor on either side from the edge of the existing carriageway. However about five trees have been identified to remove due to the improvement of the road by engineering estimates. Tree replanting with suitable native species as specified in Environmental Management Plan (EMP) is recommended to compensate the impact due to trees removal.

No.	Parameter/ Component	Yes	No	Explanation
5.	Along the road and within 100 m of the road shoulder, are there any Faunal habitat areas, Faunal breeding ground, bird migration area, or other similar areas? (If yes, specify details of habitat with chainage)		√	During the field reconnaissance, such areas were not observed along the study corridor and further, no secondary information is available and local community is not aware of this matter
6.	Along the road and within 100m of the road shoulder is there any evidence of Flora and Fauna species that are classified as endangered / threatened species?		√	During the field reconnaissance, such areas were not observed along the study corridor and further, no secondary information is available and local community is not aware of this matter
7.	Are there any utility structures[15] within 2 m on either side from the edge of the carriageway or within the existing ROW of the road? (If yes, attach list with chainage)	√		04 electric poles on LHS and 09 on RHS are present on either sides of the road. 02 Telephone poles on LHS and 03 on RHS are present on either sides of the road. No pipe lines are located along the road. *Please refer to section D1.*
8.	Are there any religious, cultural or community structures/buildings[16] within 50 m on either side from the centre line of the road alignment? (If yes attach list with chainage)	√		Ihekuluwewa Primary school is located at 3+800km on LHS of the road. Ihekulugama Temple is located at 4+400km on RHS. *Please refer section D ii for information.* It is recommended to place necessary sign boards and other safety measures at school. Mitigation measures as specified in the EMP should be implemented to minimise impacts due to degradation of air quality, noise at these sensitive receptors.

C. Public Consultation

No.	Consultation Activities	Yes	No	Remarks
1.	Consultation with local community was conducted before finalizing the alignment. (Attach list of people met and	√		Public was consulted during field reconnaissance carried out for preparation of the Environmental Checklist. Please refer to the annex

[15] Water tap, hand pump, electric pole, telephone pole, pipe lines and other similar structures
[16] Religious/cultural/historical monuments, school, health centre, public toilet and other similar structures

No.	Consultation Activities	Yes	No	Remarks
	dates)			1 for the list of public consulted and their views
2.	Any suggestion received in finalizing the alignment and road related environmental issues	√		Public specified the need to consider flooding areas when developing the road.
3.	If suggestions received, were they incorporated into the design?	√		The environment checklist will be forwarded to design team for further consideration.

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)) as required under B.7.

Chainage (Km)	Utility structure	LHS	RHS
0+000 – 0+100	Electric poles	1	-
0+100 – 0+200	Electric poles	-	1
0+300 – 0+400	Electric poles	1	2
0+500 – 0+600	Electric poles	-	1
0+600 – 0+700	Electric poles	-	1
0+800 – 0+900	Electric poles	1	2
0+900 – 1+000	Electric poles	1	1
2+000 – 2+100	Electric poles	-	1
Total		4	9

Chainage (Km)	Utility structure	LHS	RHS
0+000 – 0+100	Telephone poles	-	1
0+400 – 0+500	Telephone poles	-	1
0+800 – 0+900	Telephone poles	1	-
0+900 – 1+000	Telephone poles	1	-
1+100 – 1+200	Telephone poles	-	1
Total		2	3

II. List of community structures indicating location (left or right side of the road) and chainage (as required under B.8)

III.

Chainage/ GPS	Location	Right	Left
3+800km - 3+900km	Ihekuluwewa Primary School		√
4+400km - 4+500km	Ihekuluwewa Temple	√	

IV. Project location map is attached in annex 2.

V. Photographs of the project area showing at least 2 m on either side from centre line of road alignment are attached in annex 3.

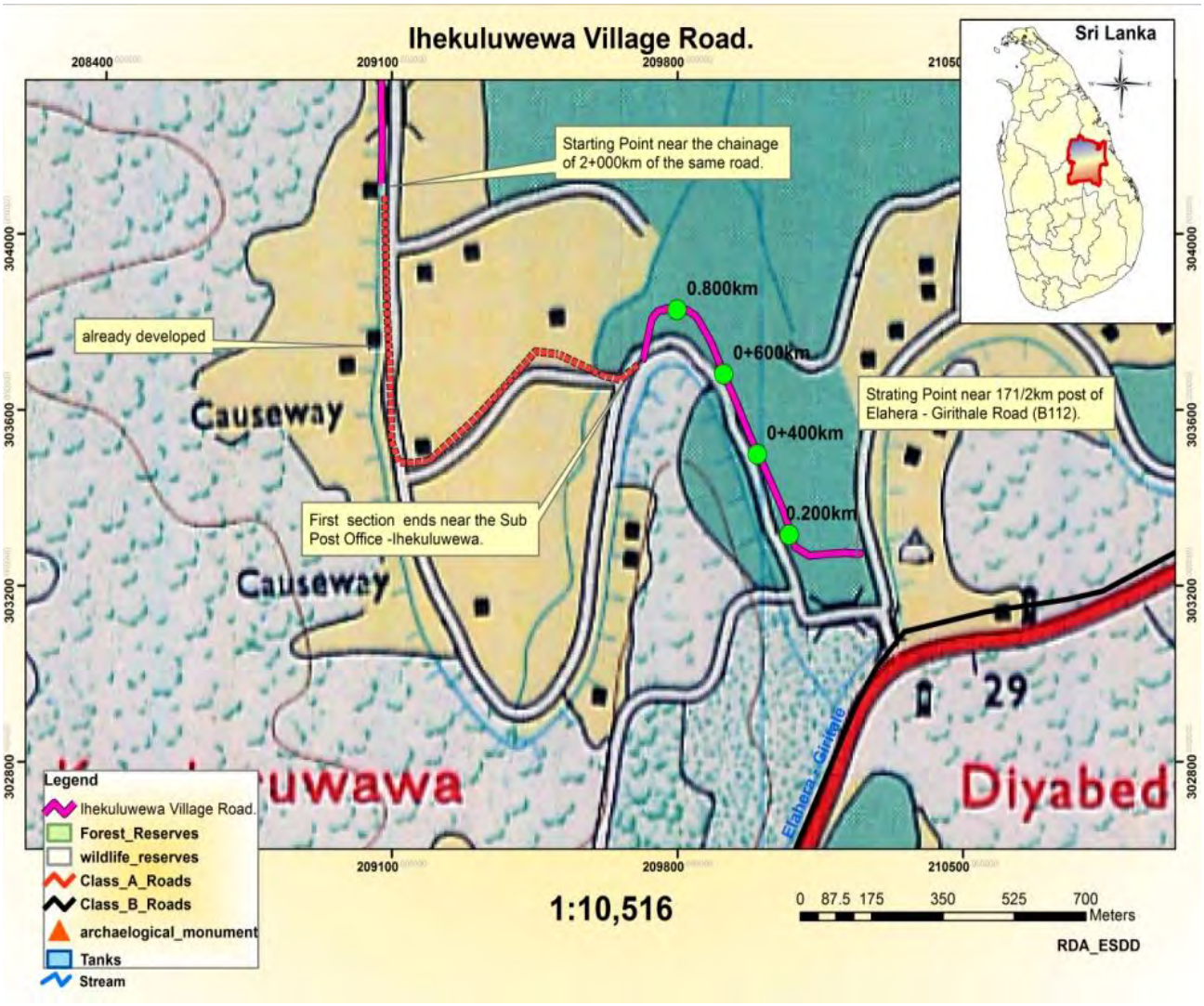
VI. List of trees with 30cm DBH or more located within the existing ROW or within 2m on either side of the road from the edge of the carriageway as required in B.4.

Chainage (Km)	LHS			RHS		
	Common Name	Botanical name	No. of trees	Common Name	Botanical name	No. of trees
0+500 – 0+600	Kohomba	*Azadirachta Indica*	1			

Annex 1: Public Consultation of Ihakulwewa Village Road

Name of Respondent	Age	Sex	Address	Views
Thamara Jayanthi	52	Female	Ihekuluwewa	Road is dilapidated. Ihekuluwewa primary school is located close to this road. School going children use this road to go to that school. Government and private sector workers and other general public in the area use this road to go to their working places and other day today activities. This road development is very good. After improving this road, it should be maintained properly, otherwise road become same condition (dilapidated condition) in short period.
Nishantha	47	Male	Ihekuluwewa	This road development is very good. When developing this road, road width should be at least 4m. We think road reservation is enough for this road development. However if it is not sufficient, we are willing to donate our lands. Adequate side drains and culvert need to be provided where necessary. It is better to do this road improvement activity with minimum impact to the environment.
Dhammika	57	Male	Ihekuluwewa	The road is getting flooded in some location. Around 2km to 4km. This need to be considered when developing the road

Annex 2: Location map



Annex 3: Photographs of Ihekulwewa Village Road

Plate 1: Starting point of the road

Plate 2: A Canal is flowing parallel to the road at LHS

Plate 3: Carrying out public consultation

Plate 4: Starting point of the second section

Plate 5: A stream crossing the road

Plate 6: School close to the road

Plate 7: End point of the road.

ENVIRONMENTAL CHECKLIST

INTEGRATED ROAD INVESTMENT PROGRAMME (iROAD), ROAD DEVLOPMENT AUTHORITY

Road Name: Yaya 32 Temple - 33 Bisokotuwa Junction
Road ID: 10
District Name: Polonnaruwa
DSD & G NDs:

DSD	GNDs
Elahera	No 25 Koduruwawa

Total Length of the road: 3.250km

Two sections of Yaya 32 Temple - 33 Bisokotuwa Junction road will be improved by this project. First section (0+000km – 1+000km) starts at Temple Junction from Elahera – Girithale (B112) road and ends near the transformer at Diya beduma Koduruwewa. Second section of the road starts near the Youth Farm of Elahera – Girithale (B112) road at Diya Beduma Mahayaya. Road surface consists with gravel, macadam and concrete with poor condition. The carriageway of these two sections varies between 3.0m to 3.5m while the ROW ranges within 7.0m – 9.0m. There are home gardens and paddy lands on either side of the road.

Climatic Conditions

Temperature-^{0}C	High: 36 °C Low: 20 °C
Humidity	High: 83% Low: 46%
Rainfall Rainy Season	>900 mm/year From October to December

(Source: National Atlas of Sri Lanka, 2nd edition, Department of Survey, Sri Lanka)

E. 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)	√		In general, road traverse through a flat to undulating terrain. Altitude: Maximum elevation -135m at 0+900km Minimum elevation -115m at 1+160km
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)?		√	

No:	Type of Ecosystem	Yes	No	Explanation
3.	Inhabited Area	√		This road traverses through residential lands in following locations; **Section I** From 0+000km to 0+500km (Both side) From 0+600km to 0+800km (Both side) **Section II** From 0+000km to 1+000km (Both side) From 2+000km to 2+300km (LHS)
4.	Agricultural Land	√		Paddy lands
5.	Barren Land		√	

F. Specific description of the Road Environment

No.	Parameter/ Component	Yes	No	Explanation
1.	Are there any areas with landslide or erosion problems along the road? (If yes, indicate the location whether Right or Left side and the chainage).		√	
2.	Are there any Tanks/streams /rivers etc. along/crossing the road or any lakes/swamps beside the road? (If yes, list them indicating the location Right/ Left or crossing and the chainage)	√		Irrigation canals are flowing parallel to the road at following locations; **Section I** From 0+800km to 1+100km (RHS) **Section II** From 1+000km to 1+500km (LHS) From 1+500km to 2+300km (RHS)
3.	Is the area along the project road prone to flooding or any problems of water stagnation and other drainage issues? (If yes, mention chainage, flood level and frequency)	√		During the field reconnaissance section II of this road was identified as flood prone area.
4.	Are there any trees with a dbh of 30 cm or more within the existing ROW (within two fences on either sides) or within 2 m corridor from the edge of the carriageway on either side (if the existing ROW is not clear)? (If yes attach list of trees indicating the location (Right or Left side)and the chainage)	√		One tree is located within 2m corridor on either side from the edge of the existing carriageway. However about 30 trees have been identified to remove due to the improvement of the road by engineering estimate. Tree replanting with suitable native species as specified in Environmental Management Plan (EMP) is recommended to compensate the

No.	Parameter/ Component	Yes	No	Explanation
				impact due to trees removal.
5.	Along the road and within 100 m of the road shoulder,are there any Faunal habitat areas, Faunal breeding ground, bird migration area, or other similar areas? (If yes, specify details of habitat with chainage)		√	During the field reconnaissance, such areas were not observed along the study corridor and further, no secondary information is available and local community is not aware of this matter.
6.	Along the road and within 100m of the road shoulder is there any evidence of Flora and Fauna species that are classified as endangered / threatened species?		√	During the field reconnaissance, such areas were not observed along the study corridor and further, no secondary information is available and local community is not aware of this matter.
7.	Are there any utility structures[17] within 2 m on either side from the edge of the carriageway or within the existing ROW of the road? (If yes, attach list with chainage)	√		One telephone pole located on Left Hand Side (LHS) was observed. *Please refer section D i for information.* No electricity poles and water supply pipe lines are located within the ROW of the road.
8.	Are there any religious, cultural or community structures/buildings[18] within 50 m on either side from the centre line of the road alignment? (If yes attach list with chainage)	√		There is a play ground located at 0.600km on RHS in section II of the road.

G. Public Consultation

No.	Consultation Activities	Yes	No	Remarks
1.	Consultation with local community 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. Please refer to the annex 1 for the list of public consulted and their views
2.	Any suggestion received in finalizing the alignment and road related environmental issues	√		Public expressed the need of improving the drainage along the road
3.	If suggestions received, were they incorporated into the design?	√		The environment checklist will be forwarded to design team for further consideration.

H. 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

[17] Water tap, hand pump, electric pole, telephone pole, pipe lines and other similar structures
[18] Religious/cultural/historical monuments, school, health centre, public toilet and other similar structures

clear) indicating location and side of the road (Right Hand Side (RHS) or Left Hand Side (LHS)) as required under B.7.

Chainage (Km)	Utility structure (Telephone pole)	LHS	RHS
1.000km – 1.100km	Telephone pole	1	

II. List of community structures indicating location (left or right side of the road) and chainage (as required under B.8)

Chainage/ GPS	Name of common property	Right	Left
0.600km	Play ground	√	

III. Project location map is attached in annex 2

IV. Photographs of the project area showing at least 2 m on either side from centre line of road alignment are attached in annex 3.

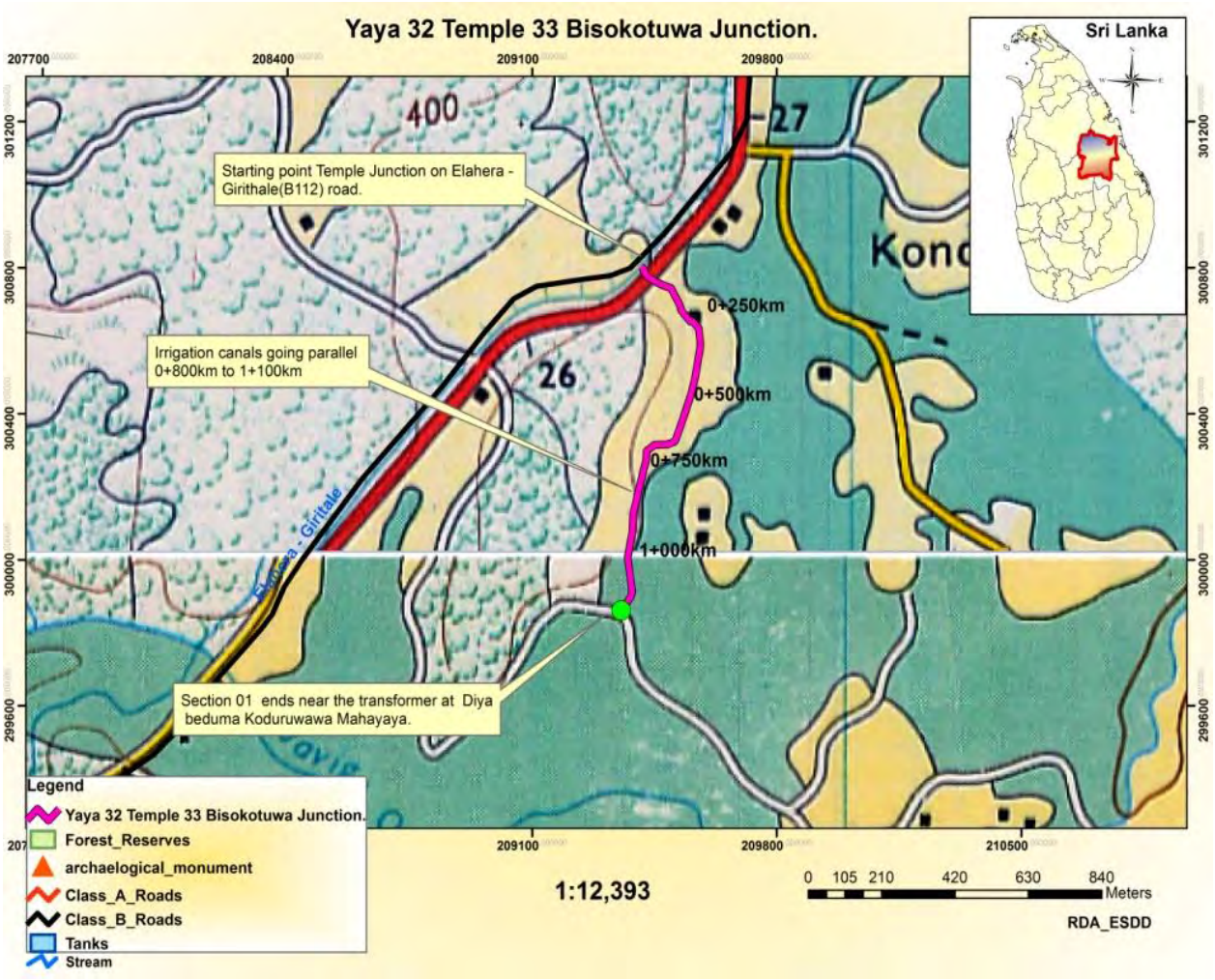
V. List of trees with 30cm DBH or more located within the existing ROW or within 2m on either side of the road from the edge of the carriageway as required in B.4.

Chainage (Km)	LHS			RHS		
	Common Name	Botanical name	No. of trees	Common Name	Botanical name	No. of trees
0+400km-0+500km	Tamarind	*Tamarindus indica*	1			

Annex 1: Public Consultation of Yaya 32 Temple 33 Bisokotuwa Junction

Name of Respondent	Age	Sex	Address	Views
Leelawathi	60	Male	Athanakadawala	Many people and vehicle users use this road. As the road surface is gravel, people in the area getting impacted by dust. Road users face difficulties due to damaged gravel surface. At starting point of section II of the road, road is getting inundated during the rainy seasons.
E G Somathilaka	32	Male	Athanakadawala	Condition of this road is very poor, therefore this road development is very good. When developing this road, it is necessary to build adequate culverts, and side drains. When developing this road, RDA needs to monitor the quality of the road.

Annex 2: Location Map of the Road



Annex 3: Photographs of Yaya 32 Temple 33 Bisokotuwa Junction

Plate 1: Starting point of the road (Section 1)

Plate 2: Concrete road surface

Plate 3: Plate 3: Paddy lands located adjacent to the road

Plate 4: End point of the first section

Plate 5: Play ground located adjacent to the road

Plate 6: Irrigation canal flowing parallel to the road

Plate 7: End point of the road

ENVIRONMENTAL CHECKLIST

INTEGRATED ROAD INVESTMENT PROGRAMME (iROAD), ROAD DEVLOPMENT AUTHORITY

Road Name: Athumalpitiya Junction - Laxauyana Siyambalagas Junction Road
Road ID: 11
District Name: Polonnaruwa
DSD & G NDs:

DSD	GNDs
Thamankaduwa	Athulmalpitiya

Total Length of the road: 4.700km

This road is starting at Athumalpitiya junction connecting with Polonnaruwa – Hingurakgoda road (B552). Road surface is macadam. The carriageway of this road varies between 3.0m to 4.0m while the ROW ranges within 6.0m – 10.0m. There are two temples located at 0+200km on LHS and at 4+300km on RHS of the road. A school, Luxauyana primary vidyalaya, is located at 1+100km and Luxauyana Industrial Zone is located at 1+700km on RHS of the road. Railway line is crossing at 1+000km. The road is crossing irrigation canals at 2+800km and 4+700km. There are home gardens on either side of the road. This road is ending at Siyambalagas junction connecting with Chandana pokuna road.

Climatic Conditions

Temperature-^{0}C	High: 36 °C Low: 20 °C
Humidity	High: 83% Low: 46%
Rainfall Rainy Season	>900 mm/year From October to December

(Source: National Atlas of Sri Lanka, 2nd edition, Department of Survey, Sri Lanka)

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: In general, road traverse through a flat to undulating terrain. Maximum elevation -66m at 4+680km Minimum elevation -53m at 2+220km
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)?		√	
3.	Inhabited Area	√		This road traverses through residential lands.
4.	Agricultural Land	√		Paddy lands
5.	Barren Land		√	

B. Specific description of the Road Environment

No.	Parameter/ Component	Yes	No	Explanation
1.	Are there any areas with landslide or erosion problems along the road? (If yes, indicate the location whether Right or Left side and the chainage)		√	
2.	Are there any Tanks/Channel /rivers etc. along/crossing the road or any lakes/swamps beside the road? (If yes, list them indicating the location Right/ Left or crossing and the chainage)	√		This road is crossing irrigation canals at 2+800km and 4+700km.
3.	Is the area along the project road prone to flooding or any problems of water stagnation and other drainage issues? (If yes, mention chainage, flood level and frequency)	√		During the field reconnaissance road section from 2+900km to 3+200km was identified as flood prone areas.
4.	Are there any trees with a dbh of 30 cm or more within the existing ROW (within two fences on either sides) or within 2 m corridor from the edge of the carriageway on either side (if the existing ROW is not clear)? (If yes attach list of trees indicating the location (Right or Left side)and the chainage)	√		07 trees are located within 2m corridor on either side from the edge of the existing carriageway. However about 08 trees have been identified to remove due to the improvement of the road by engineering estimate. Tree replanting with suitable native species as specified in Environmental Management Plan (EMP) is recommended to compensate the impact due to trees removal.
5.	Along the road and within 100 m of the road shoulder, are there any Faunal habitat areas, Faunal breeding ground, bird migration area, or other similar areas? (If yes, specify details of habitat with chainage)		√	During the field reconnaissance, such areas were not observed along the study corridor and further, no secondary information is available and local community is not aware of this matter.
6.	Along the road and within 100m of the road shoulder is there any evidence of Flora and Fauna species that are classified as endangered / threatened species?		√	During the field reconnaissance, such areas were not observed along the study corridor and further, no secondary information is available and local community is not aware of this matter.

No.	Parameter/ Component	Yes	No	Explanation
7.	Are there any utility structures[19] within 2 m on either side from the edge of the carriageway or within the existing ROW of the road? (If yes, attach list with chainage)	√		51 number of electrical poles and 15 number of telephone poles on either side of the road were observed. *Please refer section D i for information.* No water supply pipe lines are located along the road.
8.	Are there any religious, cultural or community structures/buildings[20] within 50 m on either side from the centre line of the road alignment? (If yes attach list with chainage)	√		There are two temples located at 0+200km on LHS and at 4+300km on RHS of the road. A school, Luxauyana primary vidyalaya, is located at 1+100km on RHS of the road. However none of these buildings will be affected due to the road improvement. *Please refer section D ii for information.* It is recommended to place necessary sign boards and other safety measures at school. Mitigation measures as specified in the EMP should be implemented to minimise impacts due to degradation of air quality, noise at these sensitive receptors.

C. Public Consultation

No.	Consultation Activities	Yes	No	Remarks
1.	Consultation with local community 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. *Please refer to the annex 1 for the list of public consulted and their views*
2.	Any suggestion received in finalizing the alignment and road related environmental issues	√		Public specified the need of considering the flood situation when developing the road.
3.	If suggestions received, were they incorporated into the design?	√		The environment checklist will be forwarded to design team for further consideration.

[19] Water tap, hand pump, electric pole, telephone pole, pipe lines and other similar structures
[20] Religious/cultural/historical monuments, school, health centre, public toilet and other similar structures

D. Please attach the following:

VII. 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)) as required under B.7.

Chainage (m)	Utility structure	LHS	RHS
0+000 - 0+100	Electric post	-	1
0+200 - 0+300	Electric post	-	2
	Telephone Post	1	-
0+300 - 0+400	Telephone Post	2	-
0+400 - 0+500	Electric post	-	2
	Telephone Post	2	-
0+500 - 0+600	Electric post	-	2
	Telephone Post	2	-
0+600 - 0+700	Electric post	-	1
	Telephone Post	2	-
0+700 - 0+800	Electric post	3	1
0+800 - 0+900	Electric post	2	-
0+900 - 1+000	Electric post	2	1
1+000 - 1+100	Electric post	1	2
	Telephone Post	1	-
1+300 - 1+400	Telephone Post	1	-
1+600 - 1+700	Electric post	-	1
	Telephone Post	1	-
1+700 - 1+800	Electric post	-	1
1+800 - 1+900	Electric post	-	1
2+000 - 2+100	Electric post	-	2
2+100 - 2+200	Electric post	-	1
	Telephone Post	1	-
2+800 - 2+900	Electric post	2	-
3+000 - 3+100	Electric post	2	-
3+100 - 3+200	Electric post	2	-
3+200 - 3+300	Electric post	2	-
3+400 - 3+500	Electric post	2	-
3+500 - 3+600	Electric post	1	-
3+600 - 3+700	Electric post	1	-
3+700 - 3+800	Electric post	2	-
3+800 - 3+900	Electric post	3	-
3+900 - 4+000	Electric post	1	-
4+000 - 4+100	Electric post	1	-
4+200 - 4+300	Telephone Post	1	-
4+300 - 4+400	Telephone Post	1	-
4+400 - 4+500	Electric post	1	-
4+500 - 4+600	Electric post	3	-
4+600 - 4+700	Electric post	2	-
Total		48	18
Grand Total		66	

I. List of community structures indicating location (left or right side of the road) and chainage (as required under B.8)

Chainage/ GPS	Name of Community structure	Right	Left
0+200	A temple		√
1+100	Laxauyana Primary School	√	
4+300	Sri Anandaramaya temple	√	

II. Project location map is attached in annex 2

III. Photographs of the project area showing at least 2 m on either side from centre line of road alignment are attached in annex 3.

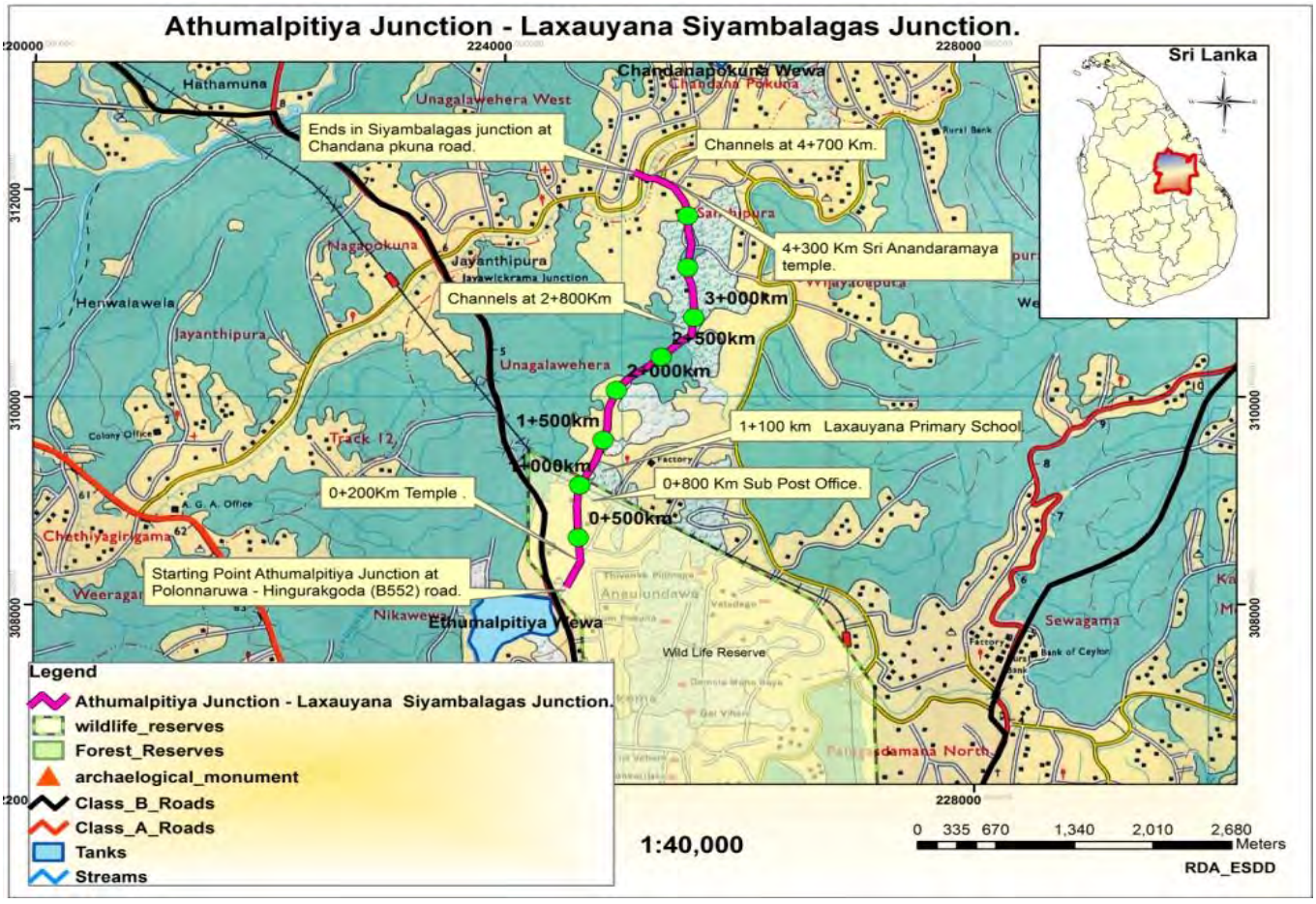
IV. List of trees with 30cm DBH or more located within the existing ROW or within 2m on either side of the road from the edge of the carriageway as required in B.4.

Chainage (m)	LHS			RHS		
	Common Name	Botanical name	No. of trees	Common Name	Botanical name	No. of trees
0+900 - 1+000				Kohomba	*Azadirachta indica*	2
1+700 – 1+800	Kohomba	*Azadirachta indica*	2			-
1+800 – 1+900	Unknown		1			-
2+200 - 2+300	Mango	*Mangifera indica*	1			-
3+600 - 3+700	Unknown		1			-
Total			5			2

Annex 1: Public Consultation - Athumalpitiya Junction to Laxauyana Siyambalagas Junction.

Name of Respondent	Age	Sex	Address	Views
H.R Dayananda	50	Male	No. 150/2, Athumal Pedesa, Polonnaruwa	This road development is very good. A school and two temples are located adjacent to the road. School going children use government and private sector workers and other general public use this road. When developing this road, side drains, road crossing specially near the school need to be provided. Road width should be about 4m.
Mahil Titas Perera	35	Male	No. 1242, Chandana Pokuna, Unagala Wehera, Polonnaruwa	This road development is very good. When developing this road, it is necessary to built adequate culverts, and side drains. When developing this road, contractor will not concern the road quality they try to maximize their profit. Therefore, RDA needs to monitor the quality of the road
Yasapala	50	Male	Unagala Wehera	The road get flooded at around 3km. The water flows away within 2-3 hours. This matter need to be considered when developing the road.

Annex 2: Location map of the Road



Annex 3: Photographs from Athumalpitiya Junction - Laxauyana Siyambalagas Junction Road

Plate 1: Starting point of the road

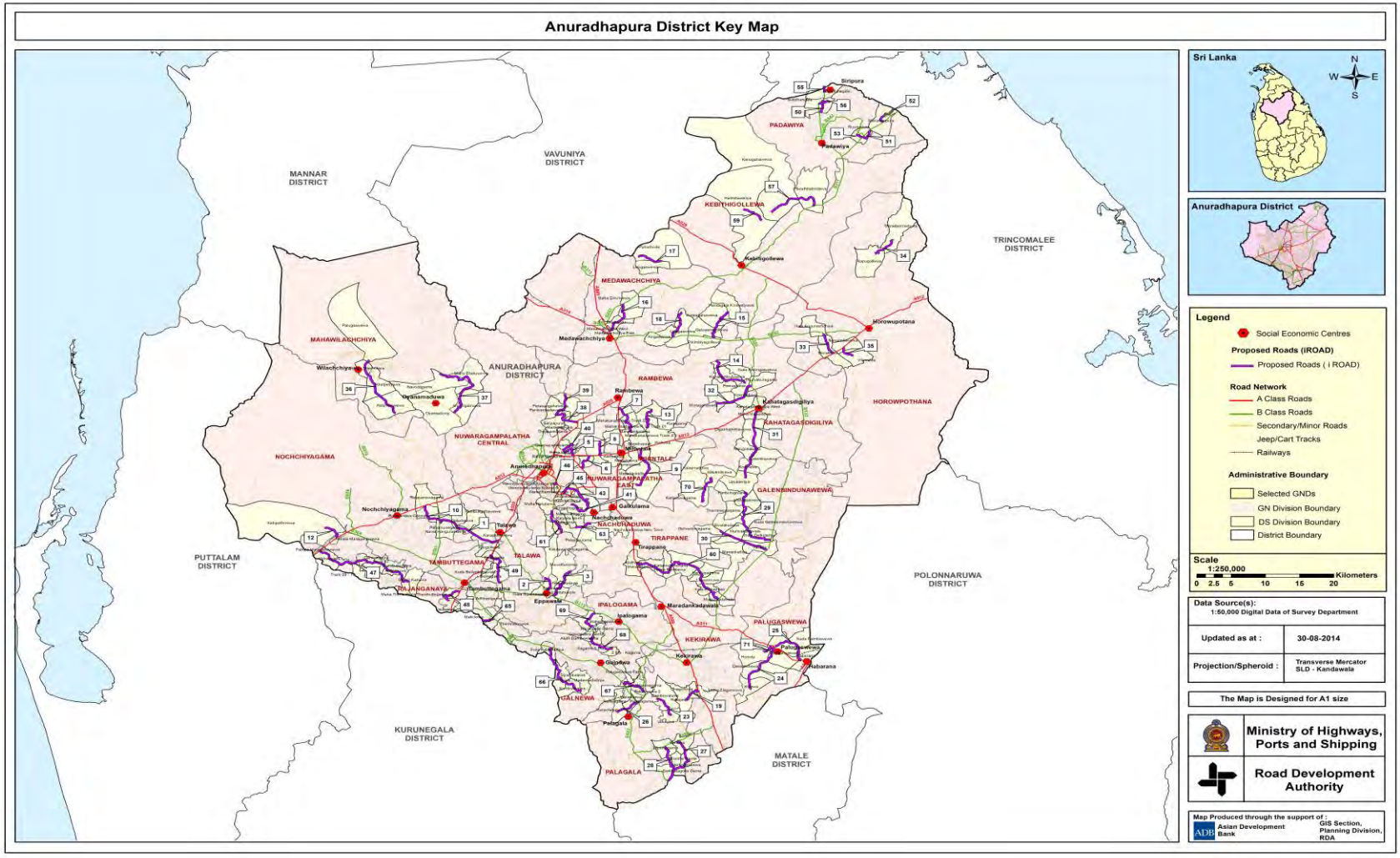
Plate 2: Settlement adjacent to the road

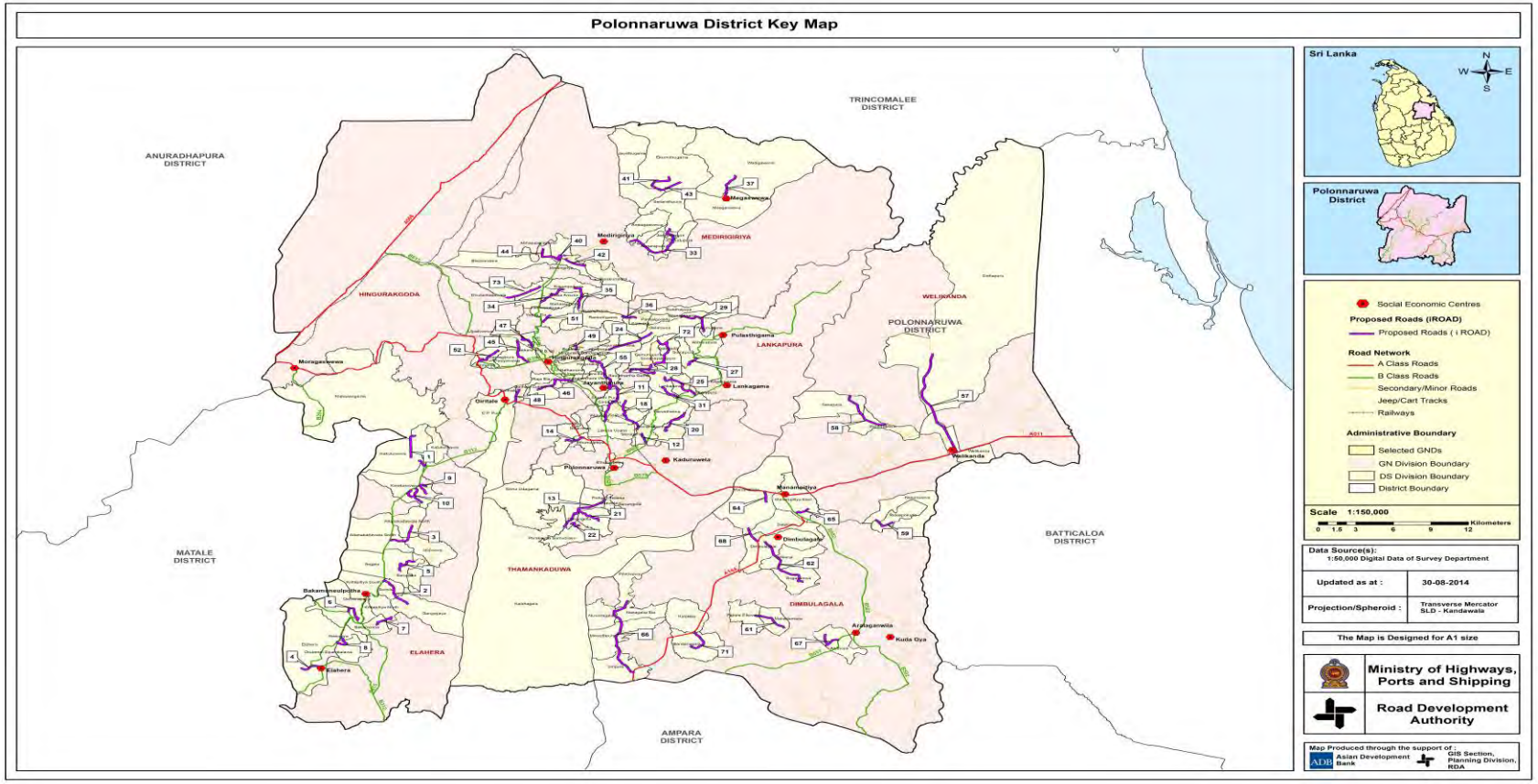
Plate 3: Temple close to the road

Plate 4: Railway track across the road

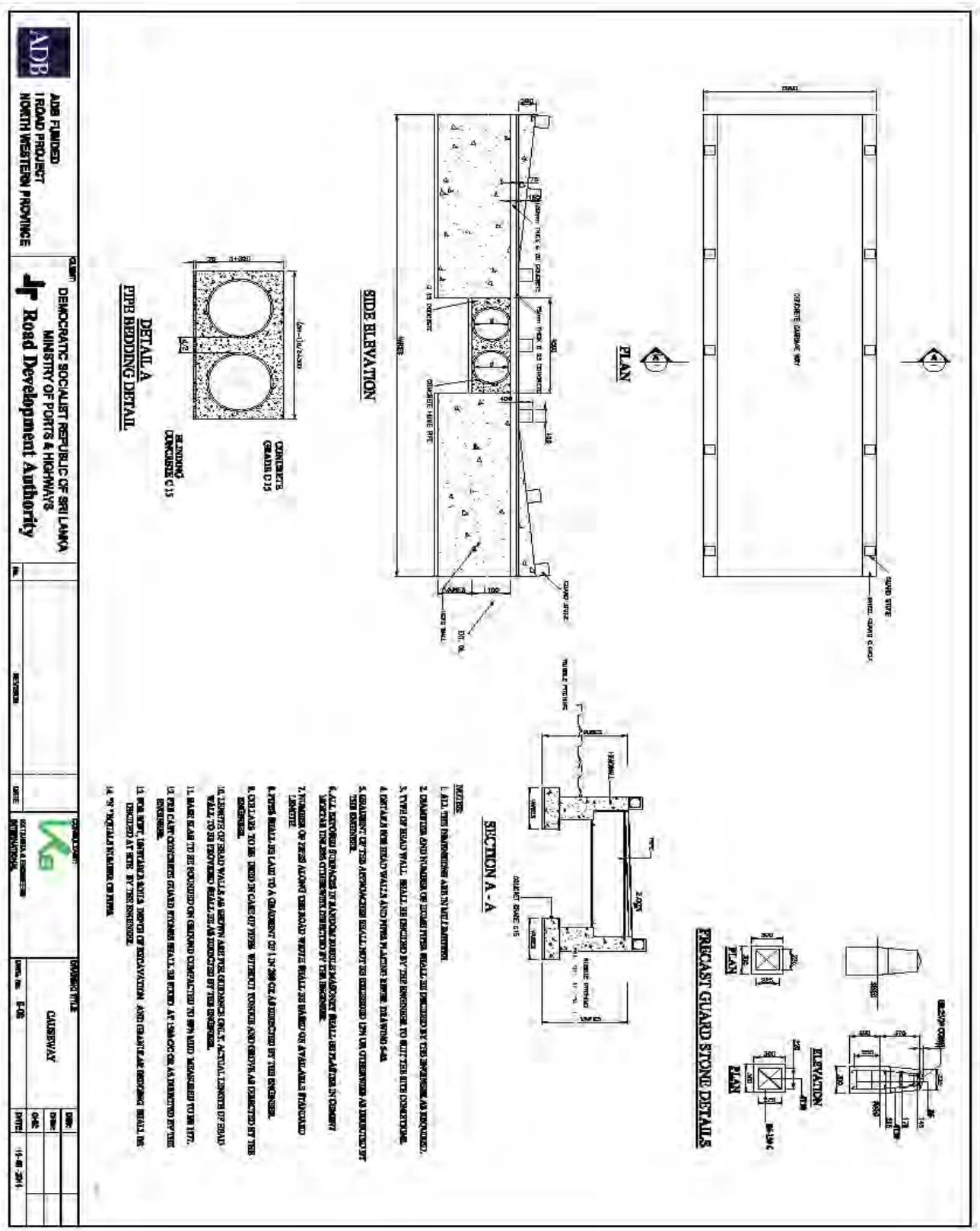
Plate 5: End point of the road

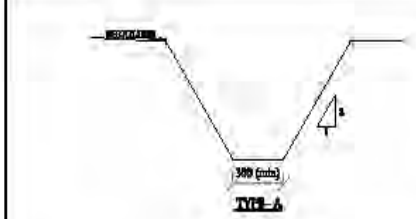
GENERAL LOCATION MAPS




Polonnaruwa District Key Map
TRINCOMALEE DISTRICT
ANURADHAPURA DISTRICT
MATALE DISTRICT
BATTICALOA DISTRICT
AMPARA DISTRICT
POLONNARUWA DISTRICT
MEDIRIGIRIYA
HINGURAKGODA
WELIKANDA
LANKAPURA
THAMANKADUWA
DIMBULAGALA
ELAHERA
Sri Lanka
Polonnaruwa District
Social Economic Centres
Proposed Roads (iROAD)
Proposed Roads (i ROAD)
Road Network
A Class Roads
B Class Roads
Secondary/Minor Roads
Jeep/Cart Tracks
Railways
Administrative Boundary
Selected GNDs
GN Division Boundary
DS Division Boundary
District Boundary
Scale 1:150,000
Kilometers
Data Source(s):
1:50,000 Digital Data of Survey Department
Updated as at :
30-08-2014
Projection/Spheroid :
Transverse Mercator
SLD - Kandawala
The Map is Designed for A1 size
Ministry of Highways, Ports and Shipping
Road Development Authority
Map Produced through the support of :
Asian Development Bank
GIS Section, Planning Division, RDA

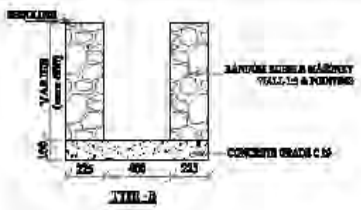
PROPOSED CROSS SECTIONS



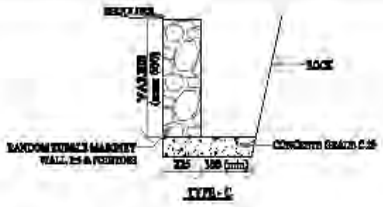


TYPE-A

EARTH DRAIN
SCALE : 1:25



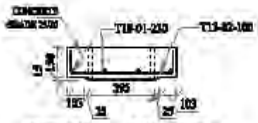
TYPE-B



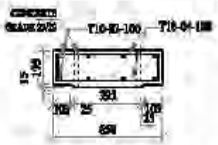
TYPE-C

MASONRY RUBBLE LINED DRAIN
SCALE : 1:25

PLAN OF 650mm X 500mm X 150mm COVER SLAB

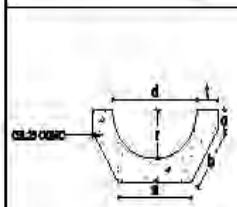


SECTION OF 650mm X 500mm X 150mm LIGHT DUTY FOOTPATH COVER SLAB

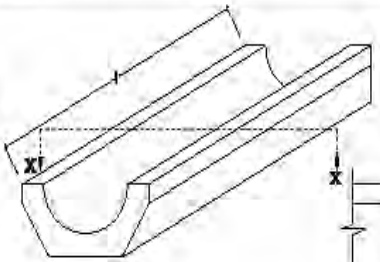


SECTION OF 650mm X 500mm X 175mm HEAVY DUTY COVER SLAB

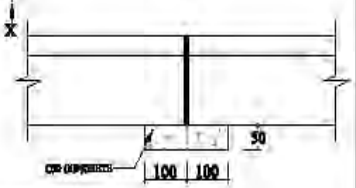
DETAIL OF COVER SLAB
SCALE 1:25



SECTION X-X



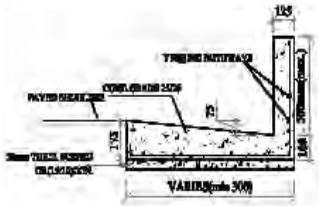
PLAN VIEW



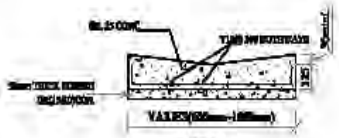
FIXING DETAILS

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

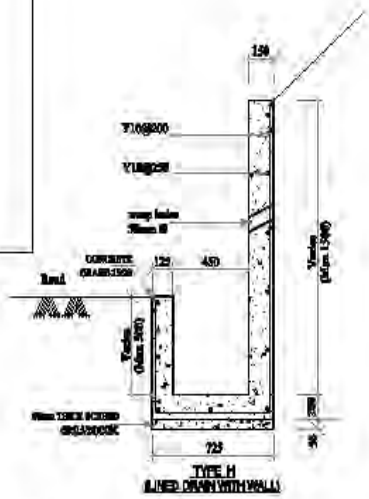
PRECAST OPEN CHANNEL DRAIN (TYPE D)
SCALE : 1:10



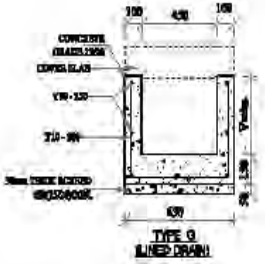
TYPE-E
CHANNEL DRAIN



TYPE-F
SIDE DRAIN



TYPE H
(LINED DRAIN WITH WALL)



TYPE G
(LINED DRAIN)

REINFORCEMENT CONCRETE DRAINS
SCALE : 1:25

ADB FUNDED
I ROAD PROJECT
NORTH WESTERN PROVINCE

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

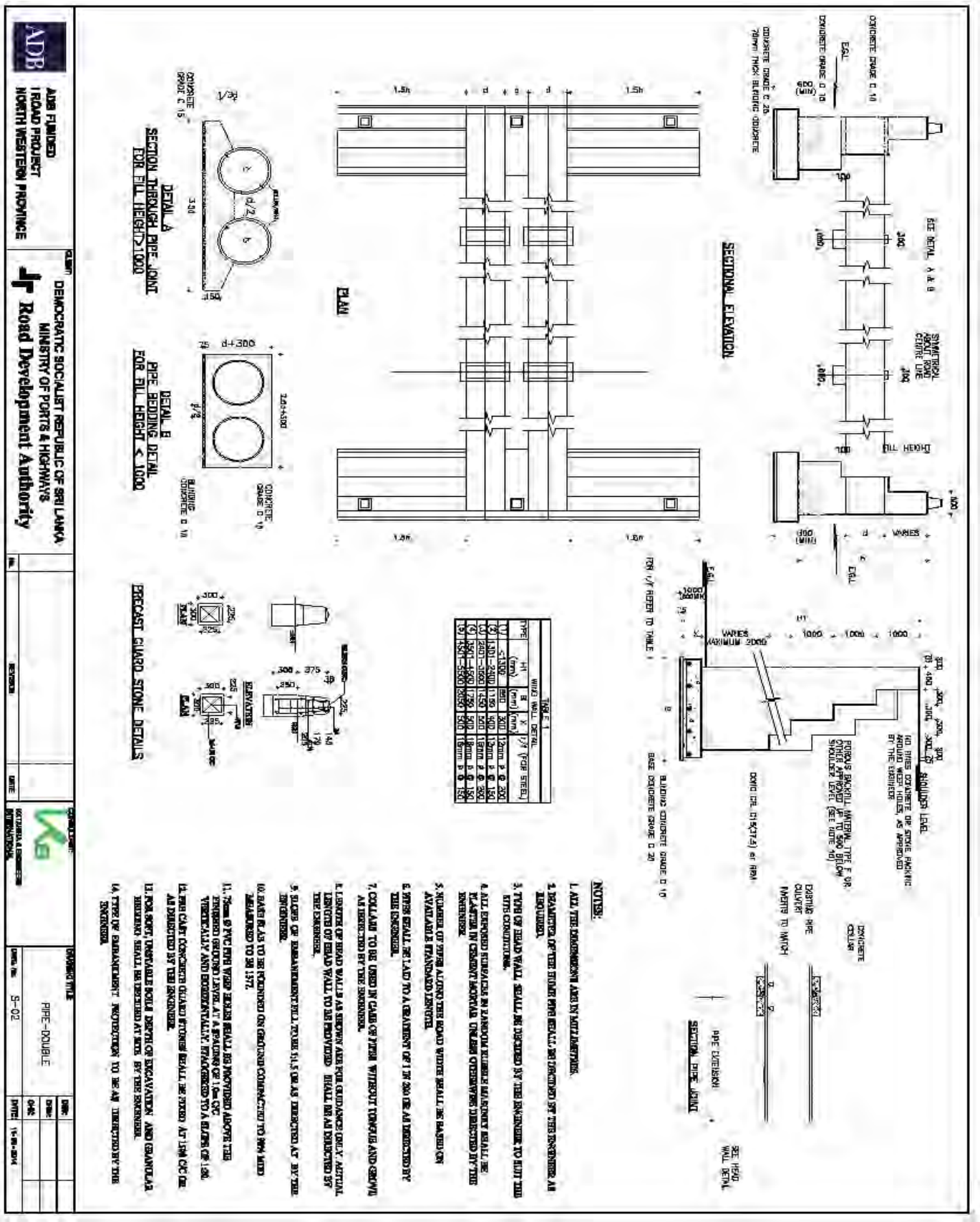
No.	REVISION	DATE

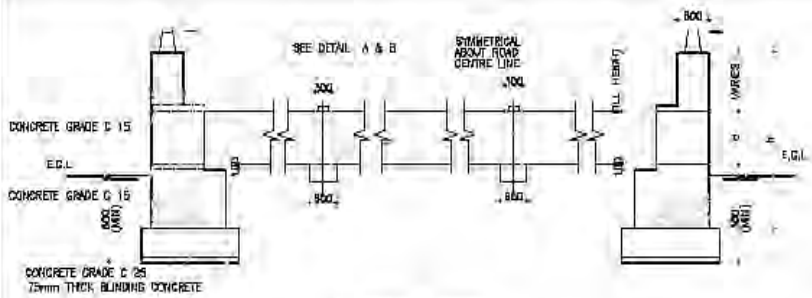
CONSULTANT
KOTUGODA & ENGINEERS INTERNATIONAL

DRAWING TITLE
TYPICAL DRAIN SECTIONS

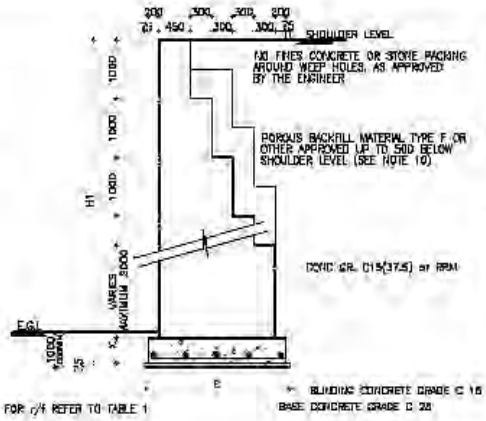
DWG. No. [illegible]

DSN:
DRN:
CHD:
DATE: [illegible]


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
NOTES:
ADB FUNDED
ROAD PROJECT
NORTH WESTERN PROVINCE
DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA
MINISTRY OF PORTS & HIGHWAYS
Road Development Authority
PIPE-DOUBLE
S-02
16-09-2014



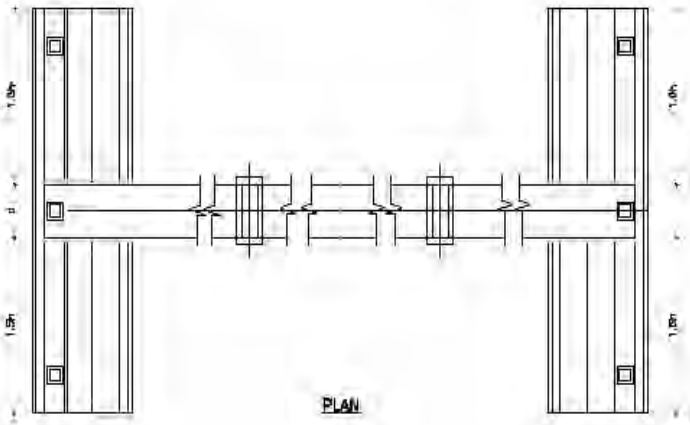
SECTIONAL ELEVATION



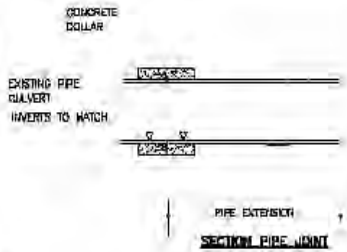
FOR r/f REFER TO TABLE 1

TABLE 1
WING WALL DETAIL

TYPE	H1 (mm)	B (mm)	X (mm)	r/f (FOR STEEL)
(1)	<1300	850	300	12mm ⌀ @ 200
(2)	1301 – 2400	1150	400	12mm ⌀ @ 150
(3)	2401 – 3500	1450	500	16mm ⌀ @ 200
(4)	3501 – 4500	1750	500	16mm ⌀ @ 150
(5)	4501 – 6000	2050	600	16mm ⌀ @ 150

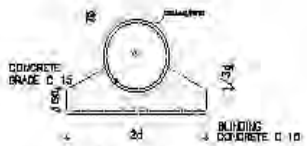


PLAN

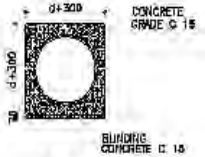


SECTION PIPE JOINT

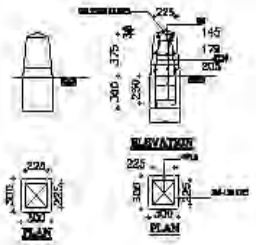
SEE HEAD WALL DETAIL



DETAIL A
SECTION THROUGH PIPE JOINT
FOR FILL HEIGHT≥600



DETAIL B
PIPE BEDDING DETAIL
FOR FILL HEIGHT < 600



PRECAST GUARD STONE DETAILS

NOTES:

1. ALL THE DIMENSIONS ARE IN MILLIMETERS.
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 Ø 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 1200 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.

ADB FUNDED
I ROAD PROJECT
NORTH WESTERN PROVINCE

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

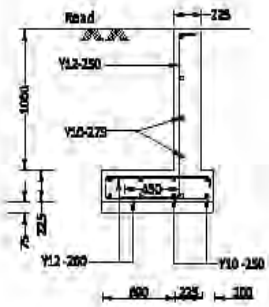
NO.	REVISION	DATE

KOTAKENA & ENGINEERS INTERNATIONAL

DRAWING TITLE: PIPE – SINGLE

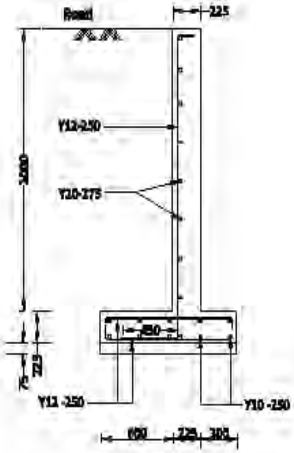
DRAWING No.: S–01

DATE: 11-08-2011



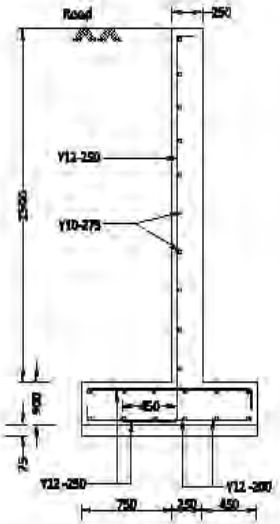
SECTION OF WALL

1m Wall



SECTION OF WALL

2m Wall



SECTION OF WALL

2.5m Wall

NOTES:

1. ALL THE DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE STATED

2. THIS DRAWING PROVIDES A GUIDANCE ONLY. EXACT DETAILS TO SUIT SITE CONDITIONS, SHALL BE DECIDED BY THE ENGINEER AT CONSTRUCTION STAGE.

3. ALL FOUNDATION PADS SHOULD BE IN GRADE C 30 AND SCREED IN GRADE C15 CONCRETE SCREED IS 50mm THICK UNLESS OTHERWISE SHOWN.

4. MINIMUM DEPTH IN EACH WALL TYPE SHOULD BE AS SHOWN CLAY CHECKED AT SITE TO SUIT SITE CONDITIONS.

5. CONCRETE GRADE SHALL BE GR. 25/20

6. REINFORCEMENT SHALL BE HOT ROLLED HIGH YIELD STEEL TO SLS 458 WITH MIN fy =460 N/MM2.

7. CLEAR COVER TO REINFORCEMENT SHALL BE 50 MIN.

8. REFER DRAWING S-03 FOR THE DETAIL OF FORCE BACKFILL.

9. 75 DIA PVC WEEP HOLES SHALL BE PROVIDED AT 2000 SPACING (STAGGERED) AND SHALL TO A SLOPE OF 1:50.

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I ROAD PROJECT
NORTH WESTERN PROVINCE

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

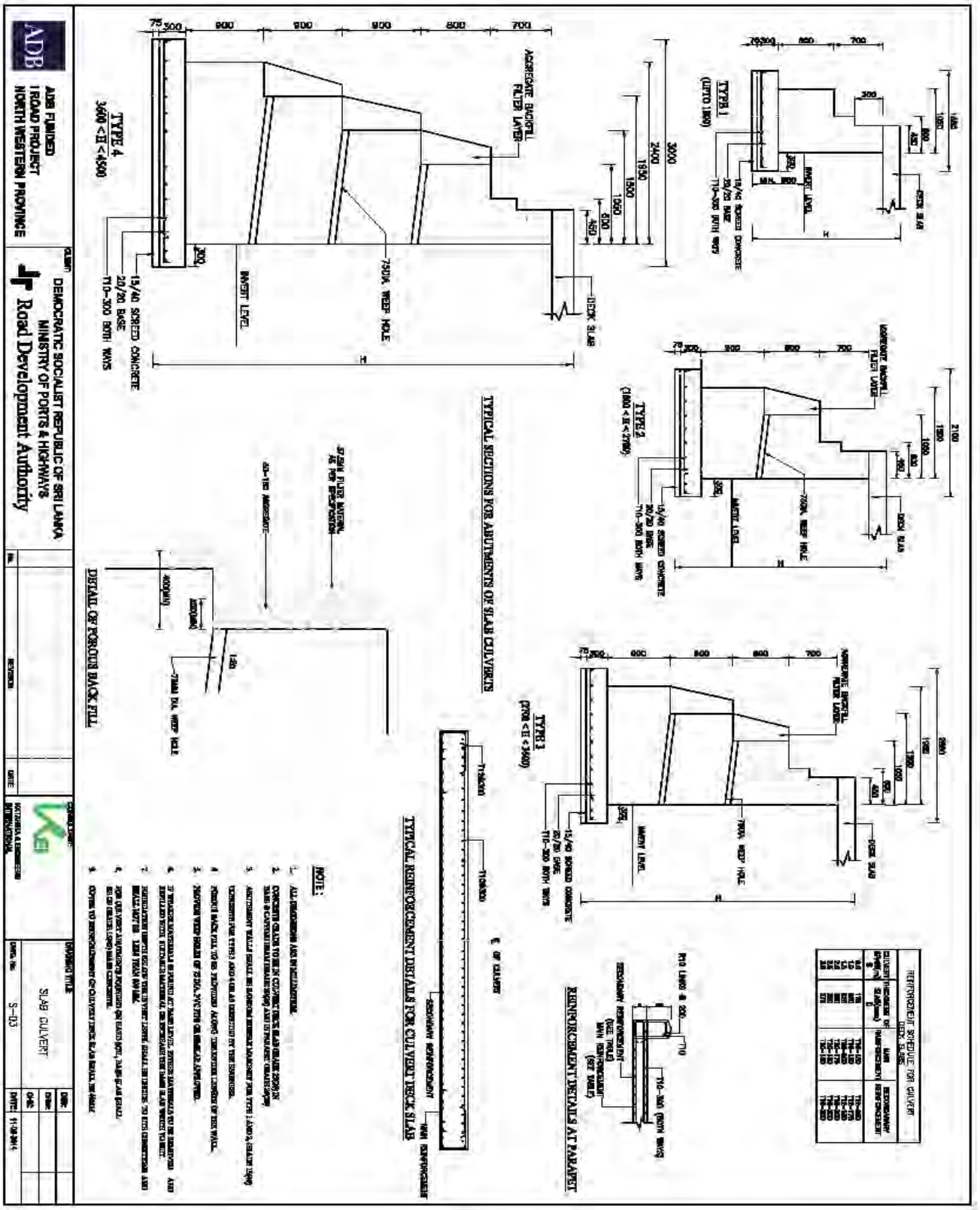
NO.	REVISION	DATE

CONSULTANT: KOTUWELLA & ENGINEERS INTERNATIONAL

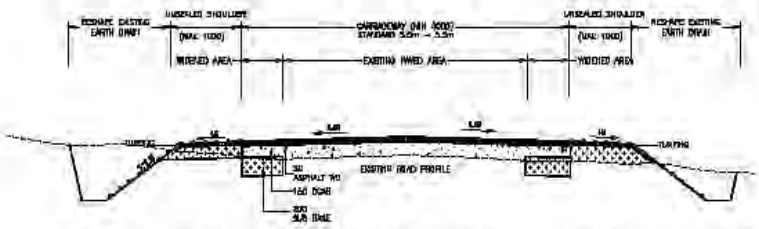
DRAWING TITLE: RETAINING WALL REINFORCED CONCRETE

DWG No. S - 05 - A

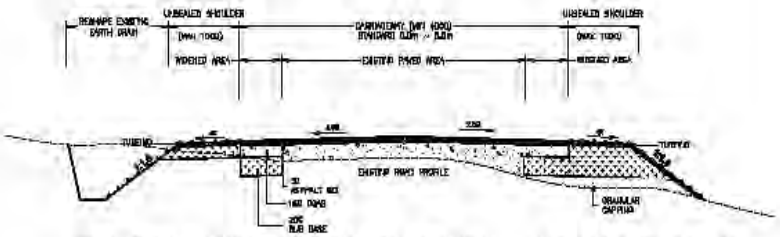
DSN: DWN: CHK: DATE: 11-06-2014


ADB FUNDED
ROAD PROJECT
NORTH WESTERN PROVINCE
DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA
MINISTRY OF PORTS & HIGHWAYS
Road Development Authority
SLAB CULVERT
S-03
TYPE 1
(UPTO 1800)
TYPE 2
(1800 < H < 2700)
TYPE 3
(2700 < H < 3600)
TYPE 4
3600 < H < 4500
TYPICAL SECTIONS FOR ABUTMENTS OF SLAB CULVERTS
TYPICAL REINFORCEMENT DISTAILS FOR CULVERT DECK SLAB
REINFORCEMENT DETAILS AT PARAPET
DETAIL OF BORROW BACK FILL
NOTE :
REINFORCEMENT SCHEDULE FOR CULVERT DECK SLAB
AGGREGATE BACKFILL FILTER LAYER
INVERT LEVEL
DECK SLAB
7500A WEEP HOLE
15/40 SCREED CONCRETE
20/20 BASE
T10-300 BOTH WAYS
T10
T10-300 (BOTH WAYS)
SECONDARY REINFORCEMENT
MAIN REINFORCEMENT
SECONDARY REINFORCEMENT
MAIN REINFORCEMENT

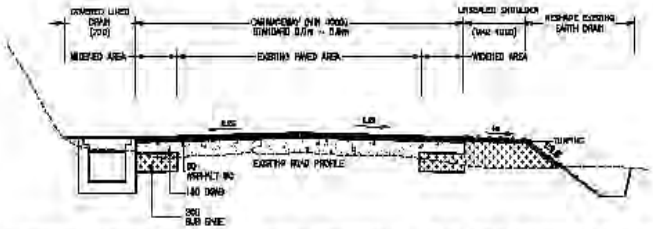
PROPOSED TYPICAL SECTIONS (TS) FOR PRDA ROAD



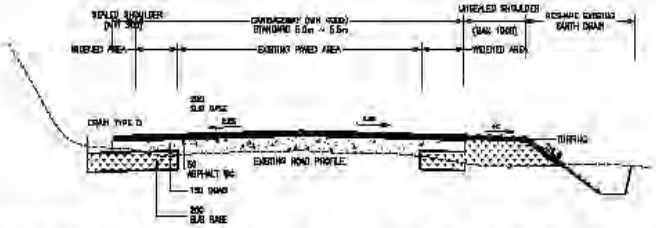
TS-A (TYPICAL SECTION FOR ROAD RECONSTRUCTION – BOTH SIDES EARTH DRAINS)



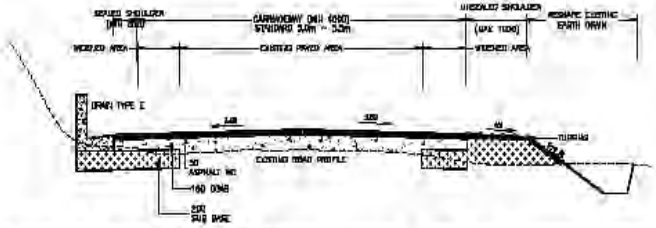
TS-B (TYPICAL SECTION FOR ROAD RECONSTRUCTION – ONE SIDE EARTH DRAINS)



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
NORTH WESTERN PROVINCE

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

No.	REVISION	DATE

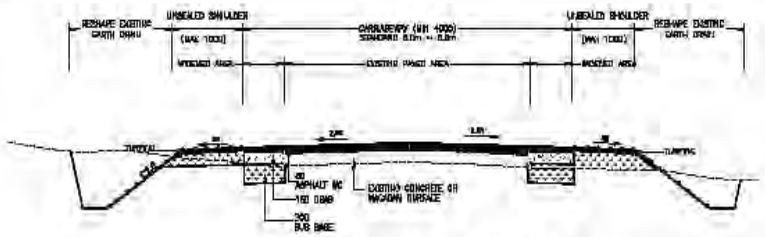
CONSULTANT: KATAHENA & ENGINEERS INTERNATIONAL

DRAWING TITLE: TYPICAL CROSS SECTION FOR PRDA ROAD

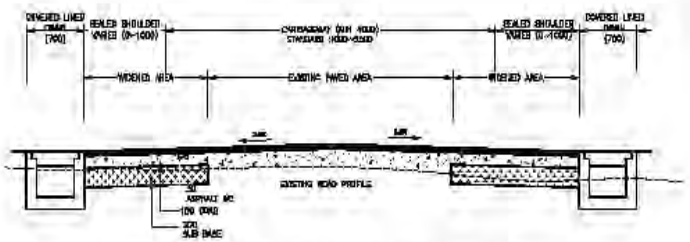
DRAWING No.: TS-PRDA-01

DSN: | DRN: | CHK: | DATE: 07-07-2014

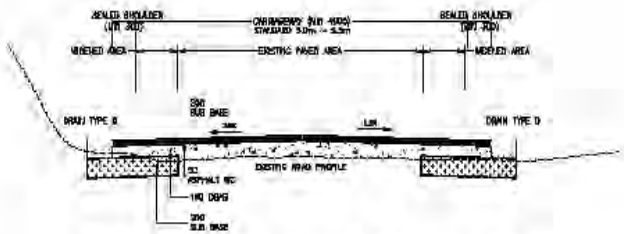
PROPOSED TYPICAL SECTIONS (TS) FOR PRDA ROAD



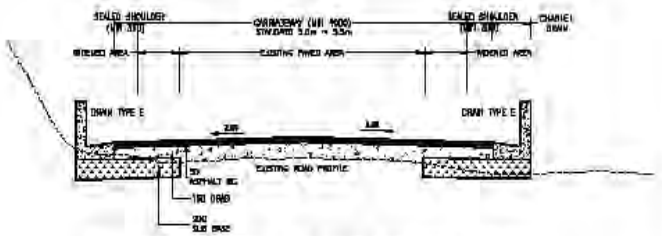
TS-F (TYPICAL SECTION FOR OVERLAYING)



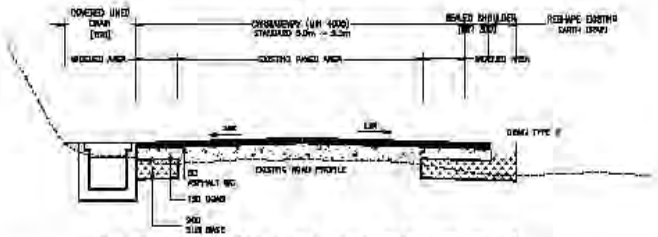
TS-G (TYPICAL SECTION FOR ROAD RECONSTRUCTION)
(BOTH SIDE LINED DRAIN)



TS-H (TYPICAL SECTION FOR ROAD RECONSTRUCTION)
(BOTH SIDE TYPE "D" DRAIN)



TS-I (TYPICAL SECTION FOR ROAD RECONSTRUCTION)
(BOTH SIDE TYPE "E" DRAIN)



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

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.

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I ROAD PROJECT
NORTH WESTERN PROVINCE

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

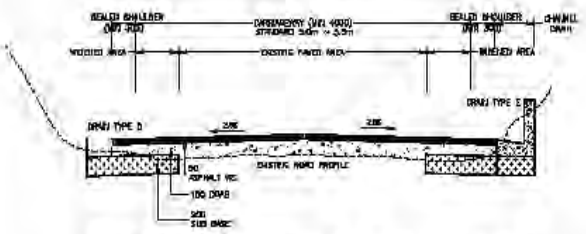
CONSULTANT: KATAHENA & ENGINEERS INTERNATIONAL

DRAWING TITLE: TYPICAL CROSS SECTION FOR PRDA ROAD

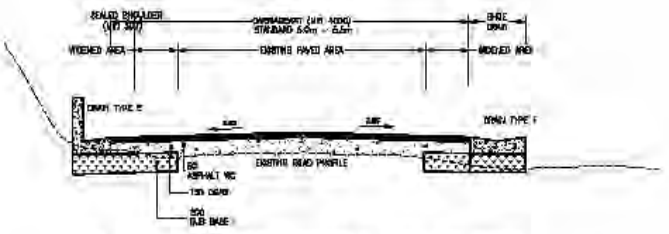
DRAWING No.: TS-PRDA-02

DATE: 07-07-2014

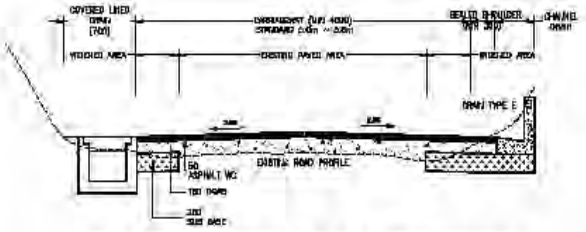
PROPOSED TYPICAL SECTIONS (TS) FOR PRDA ROAD



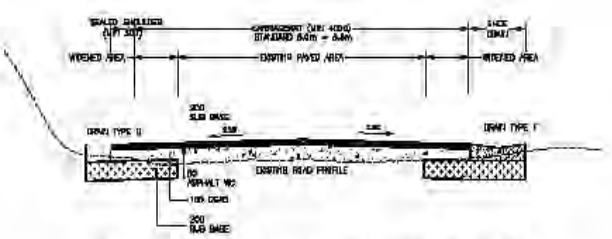
TS-K (TYPICAL SECTION FOR ROAD RECONSTRUCTION)
(ONE SIDE TYPE "D" DRAIN AND OTHER SIDE TYPE "E")



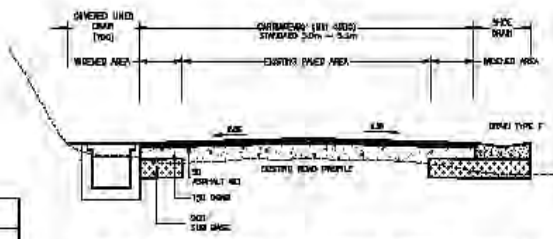
TS-L (TYPICAL SECTION FOR ROAD RECONSTRUCTION)
(ONE SIDE TYPE "E" DRAIN AND OTHER SIDE TYPE "F")



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")

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.

LEGEND:

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

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

NO.	REVISION	DATE

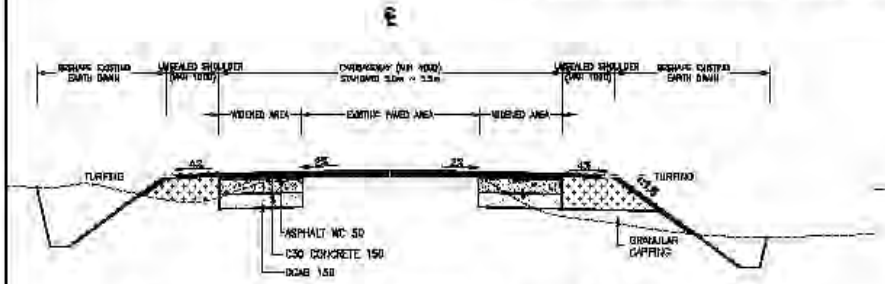
CONSULTANT: KATAHIRA & ENGINEERS INTERNATIONAL

DRAWING TITLE: TYPICAL CROSS SECTION FOR PRDA ROAD

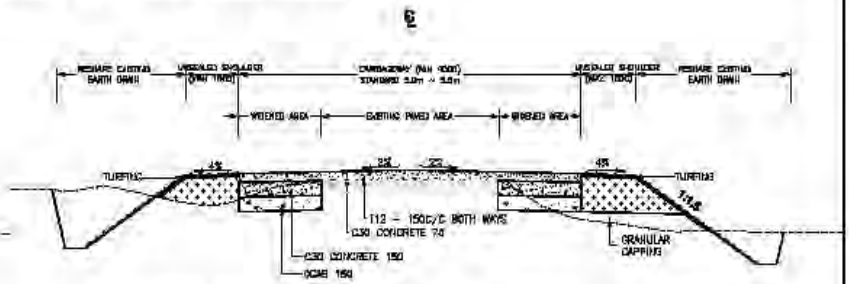
DRAWING NO.: TS-PRDA-03

DSN: DRN: CHK: DATE: 07-07-2014

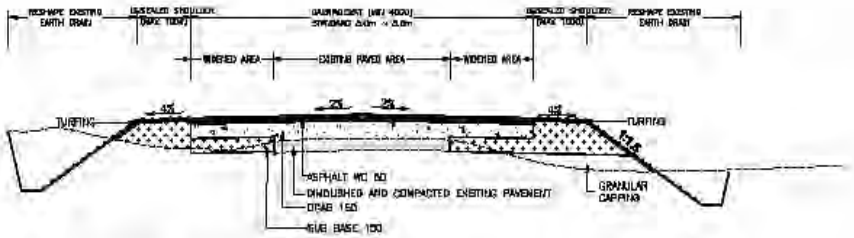
PROPOSED TYPICAL SECTIONS (TS) FOR PRDA ROAD



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.

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Road Development Authority

No.	REVISION	DATE

CONSULTANT: KATAHIRA & ENGINEERS INTERNATIONAL

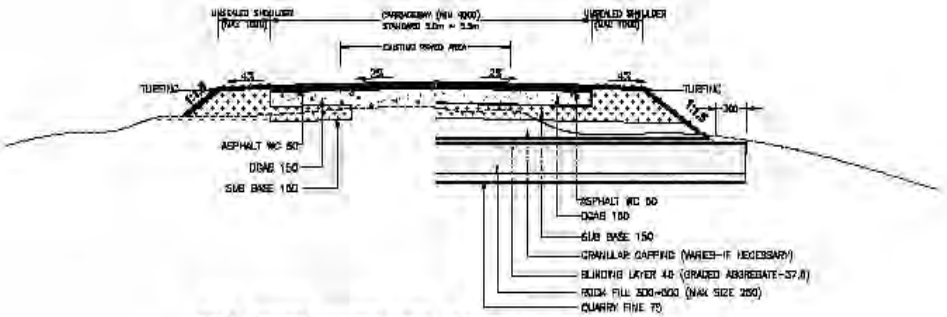
DRAWING TITLE: TYPICAL CROSS SECTION FOR PRDA ROAD

DRAWING No.: TS–PRDA–04

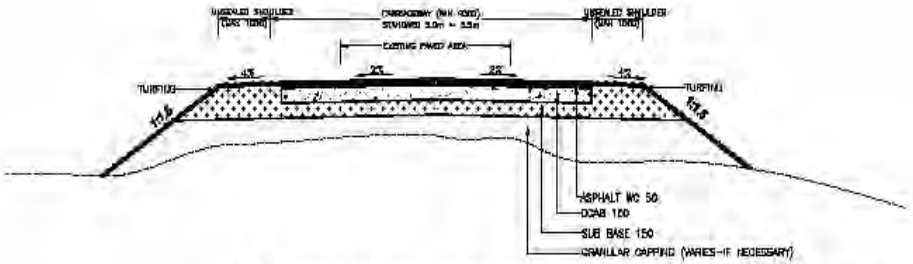
DSN: | DRN: | CHK:

DATE: 07–07–2014

PROPOSED TYPICAL SECTIONS (TS) FOR PRDA ROAD



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



TS-T (TYPICAL SECTION FOR EMBANKMENT AREA)

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. THICKNESS OF THE ROCK FILL SHALL BE DECIDED BY THE ENGINEER AS PER SITE CONDITION.

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	

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

NO.	REVISION	DATE

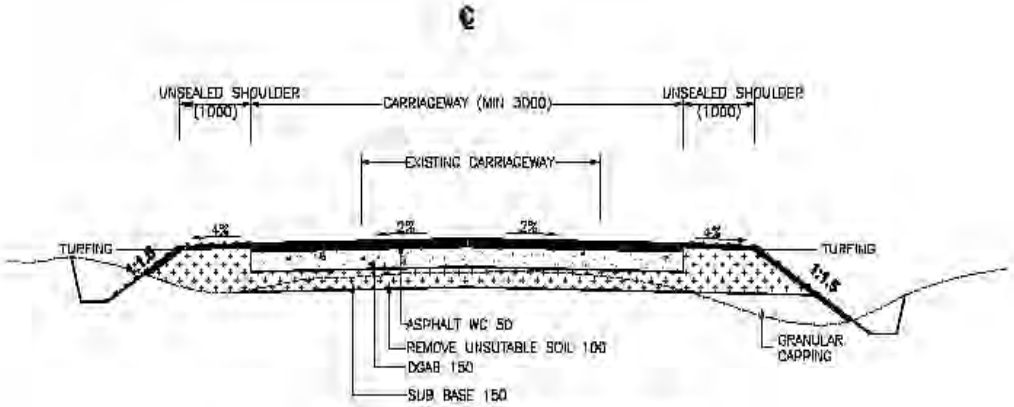
CONSULTANT: KATAHIRA & ENGINEERS INTERNATIONAL

DRAWING TITLE: TYPICAL CROSS SECTION FOR PRDA ROAD

DRAWING No.: TS-PRDA-05

DSN: DRN: CHK: DATE: 07-07-2014

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.

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NO.	REVISION	DATE

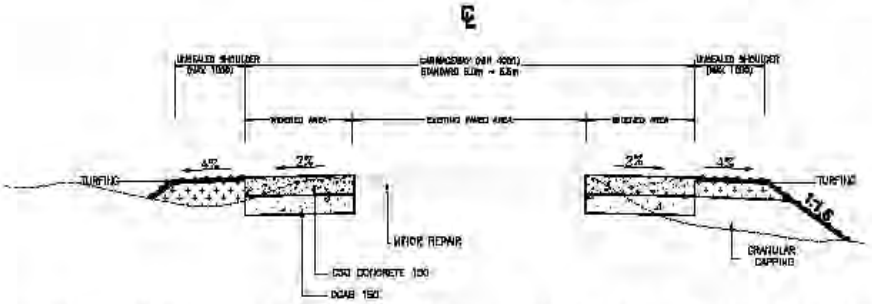
CONSULTANT: KATAHENA & ENGINEERS INTERNATIONAL

DRAWING TITLE: TYPICAL CROSS SECTION FOR PS ROAD

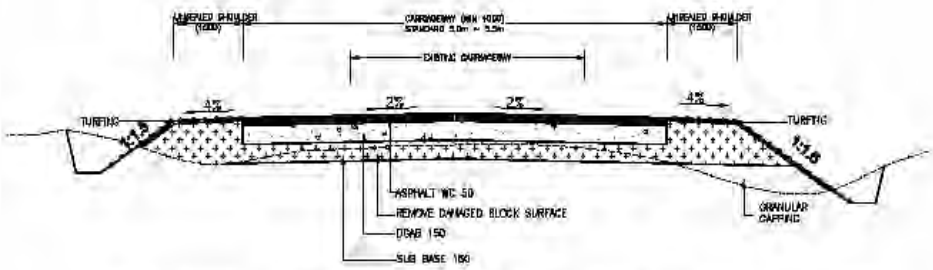
DRAWING No.: TS-PS-01

DES:
DRN:
CHK:
DATE: 23-06-2014

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.

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MINISTRY OF PORTS & HIGHWAYS
Road Development Authority

NO.	REVISION	DATE

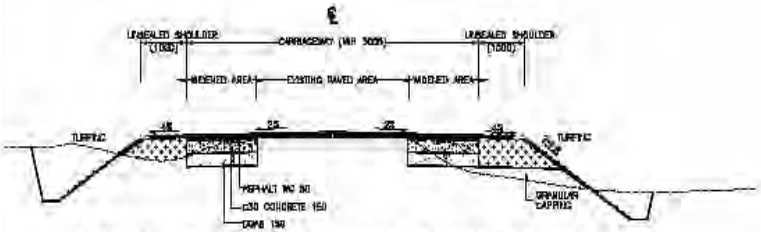
CONSULTANT: KATAHIRA & ENGINEERS INTERNATIONAL

DRAWING TITLE: TYPICAL CROSS SECTION FOR PRDA ROAD

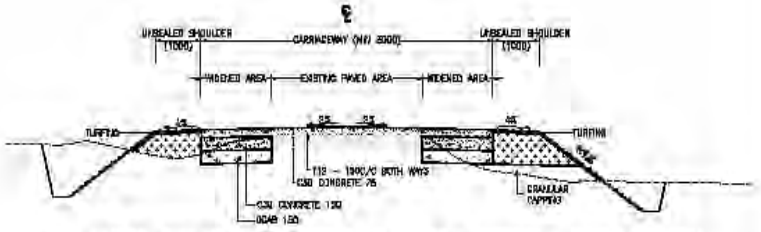
DRAWING NO.: TS–PRDA–D0

DES:
DRN:
CHK:
DATE: 07–07–2014

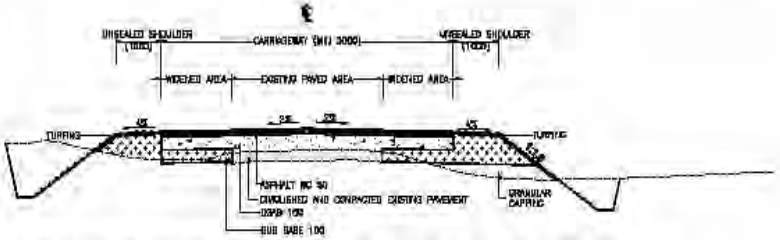
PROPOSED TYPICAL SECTIONS (TS) FOR CONCRETE ROAD



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	

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 150mm 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
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NORTH WESTERN PROVINCE

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

No.	REVISION	DATE

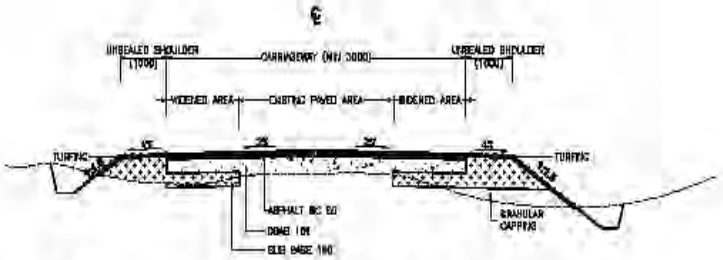
CONSULTANT: KATAHIRA & ENGINEERS INTERNATIONAL

DRAWING TITLE: TYPICAL CROSS SECTION FOR PS ROAD

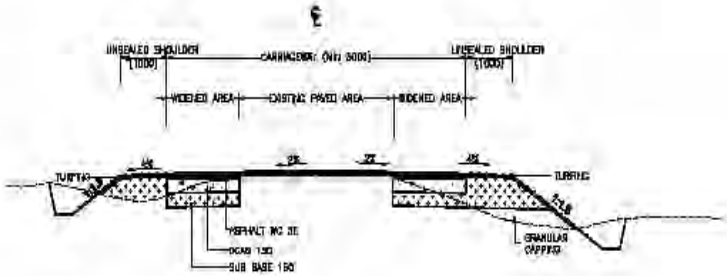
DRAWING No.: TS–PS–03

DSN: DRN: CHK: DATE: 23–06–2014

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.

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NORTH WESTERN PROVINCE

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

No.	REVISION	DATE

CONSULTANT: KATAHIRA & ENGINEERS INTERNATIONAL

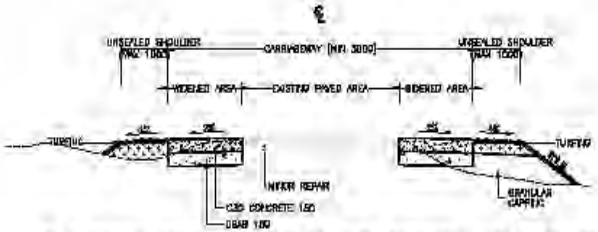
DRAWING TITLE: TYPICAL CROSS SECTION FOR PS ROAD

DRAWING No. TS-PS-02

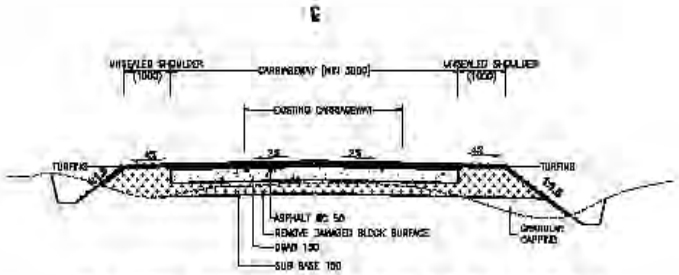
DSN: DRN: CHK:

DATE: 23-06-2014

PROPOSED TYPICAL SECTIONS (TS) FOR BLOCK PAVED ROAD



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



TS-H (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 THE GRANULAR CAPPING LAYER SHOULD BE 100mm. IF THE THICKNESSES < 100mm USE GRANULAR SUB BASE.
8. ISOLATED BASE FAILURE SECTION SHOULD BE RECTIFIED PRIOR TO EXISTING PAVEMENT STRENGTHENING.

ADB FUNDED
I ROAD PROJECT
NORTH WESTERN PROVINCE

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

No.	REVISION	DATE

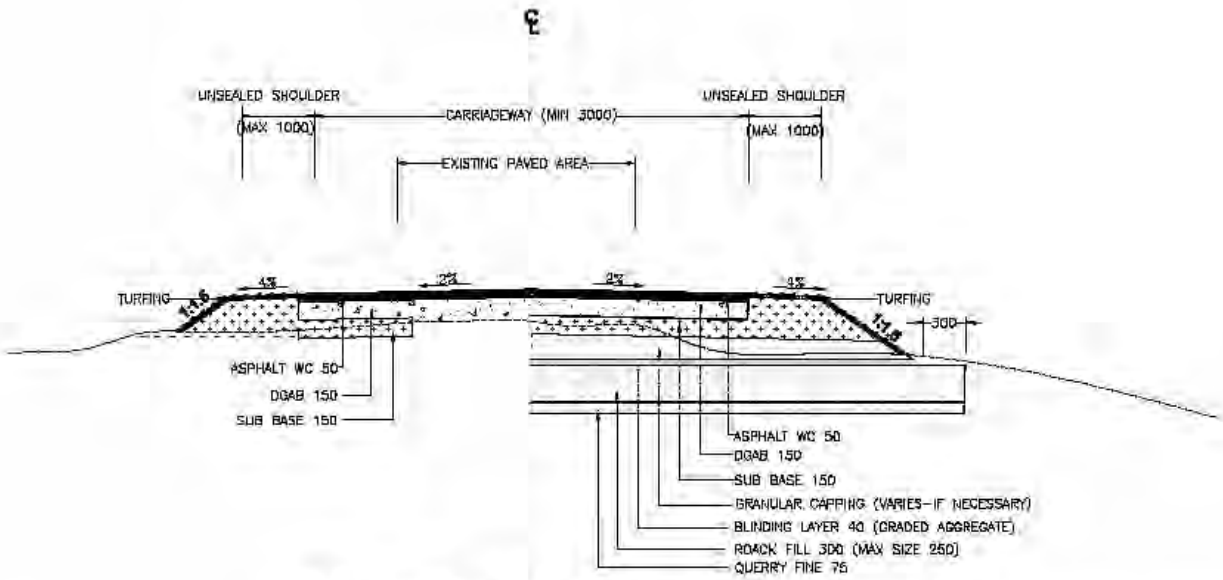
CONSULTANT: KATAHIRA & ENGINEERS INTERNATIONAL

DRAWING TITLE: TYPICAL CROSS SECTION FOR PS ROAD

DRAWING No: TS-PS-04

DES:
DRN:
CHK:
DATE: 23-06-2014

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
NORTH WESTERN PROVINCE

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

No.	REVISION	DATE

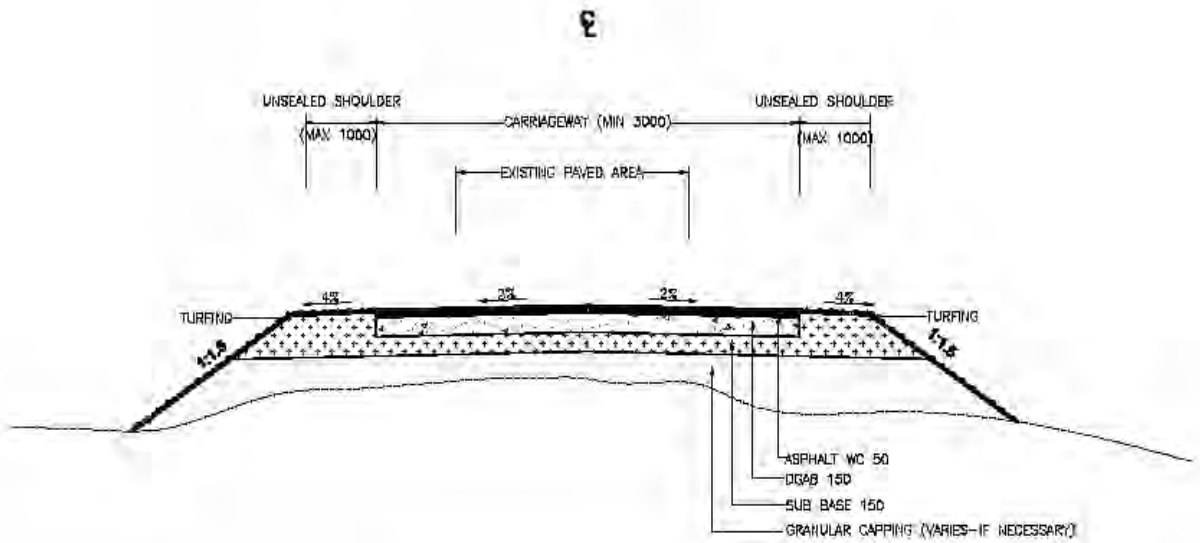
CONSULTANT: KATAHIRA & ENGINEERS INTERNATIONAL

DRAWING TITLE: TYPICAL CROSS SECTION FOR PS ROAD

DRAWING No: TS-PS-06

DES:
DRN:
CHK:
DATE: 23-06-2014

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	
	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
NORTH WESTERN PROVINCE

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

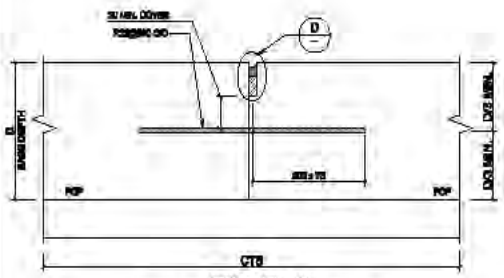
No.	REVISION	DATE

CONSULTANT: KATAHENA & ENGINEERS INTERNATIONAL

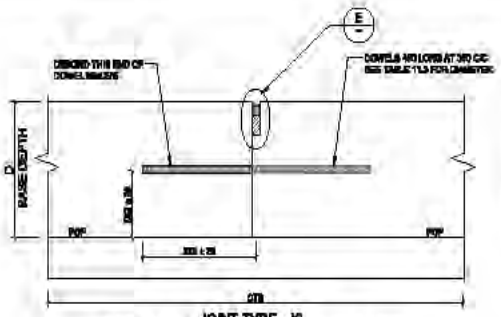
DRAWING TITLE: TYPICAL CROSS SECTION FOR PS ROAD

DRAWING No.: TS-PS-07

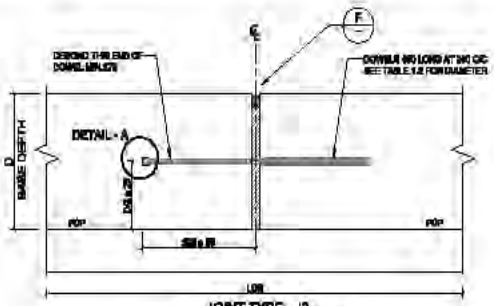
DSN: DRN: CHK: DATE: 23-06-2014



JOINT TYPE - J1
DETAIL OF LONGITUDINAL / TIED JOINT



JOINT TYPE - J2
DETAIL OF TRANSVERSE CONTRACTION JOINT



JOINT TYPE - J3
DETAIL OF EXPANSION JOINT

TABLE 1.1: UNTIED JOINTS - SILICONE SEALANT DIMENSIONS

SLAB LENGTH L OR WIDTH * (m)	DESIGN JOINT OPENING (mm)	SEALANT WIDTH Ws (mm)	SEALANT DEPTH Ds (mm)	RECESS Rs (mm)		JOINT DEPTH Dj (mm)
				CONTRACTIONS	ISOLATIONS & EXPANSIONS	
≤ 4.0	2	7 (+3, -0)	7 (+3, -0)	5 ± 5	8 ± 2	35 ± 5
4.5 ≤ 6.0	3	9 (+3, -0)	9 (+3, -0)	6 ± 5	8 ± 2	38 ± 6
6.5 ≤ 8.0	4	10 (+3, -0)	10 (+3, -0)	9 ± 5	8 ± 2	40 ± 5
8.5 ≤ 9.5	4	11 (+3, -0)	11 (+3, -0)	6 ± 5	8 ± 2	45 ± 5
9.5 ≤ 11.5	5	12 (+4, -0)	12 (+4, -0)	7 ± 5	10 ± 4	48 ± 5
11.5 ≤ 13.0	6	14 (+4, -0)	14 (+4, -0)	5 ± 5	10 ± 4	45 ± 5
13.0 ≤ 15.0	6	17 (+5, -0)	17 (+4, -0)	10 ± 3	12 ± 4	50 ± 5
Bridge Approch Slabs		25 ± 4	14 (+4, -0)	10 ± 4	12 ± 4	50 ± 5

NOTE: * SLAB LENGTH (IN THE CASE OF TRANSVERSE JOINTS) OR WIDTH (IN THE CASE OF LONGITUDINAL JOINTS) ARE CALCULATED AS THE AVERAGE OF SLABS ABUTTING THE JOINT UNDER DESIGN.

DETAIL - A

TABLE 1.2: DOWEL DIAMETER

BASE SLAB THICKNESS (mm)	DOWEL DIAMETER (mm)
150 < D ≤ 175	30
175 < D ≤ 200	35
200 < D ≤ 250	32
D > 250	40

GENERAL NOTE:-

CHARACTERISTIC STRENGTH

- FLEXURAL STRENGTH OF CONCRETE - 4.00 N/mm² (AT 28 DAYS)
- YIELD STRENGTH FOR MILD STEEL REINFORCED DOWELS - 250 N/mm²
- YIELD STRENGTH FOR TORE STEEL REINFORCED DOWELS -460 N/mm²

PAVING

- PAVING WITHIN TRAVEL LANES MUST PRECEDE PAVING WITHIN ADJACENT SHOULDER LANES.

TIEBARS

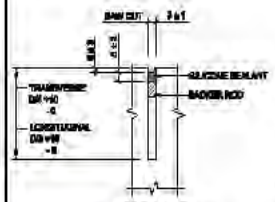
- TIEBARS MUST BE PROVIDED IN TIED LONGITUDINAL JOINTS AT THE SPECIFIED SPACING.

JOINT DETAILS

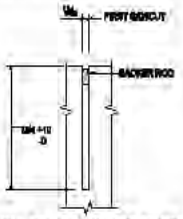
- SEALANT RESERVOIR DIMENSIONS SHOWN IN DETAIL 'D' ARE APPLICABLE WHEN JOINTS ARE SPACED AT CENTERS NOT EXCEEDING 4.6m REFER TO TABLE 1.1 FOR OTHER JOINT CENTERS.
- ALL FORMED JOINTS IN THE BASE (INCLUDING TIED JOINTS)MUST BE DEBONDED IN ACCORDANCE WITH THE SPECIFICATION.
- UNLESS OTHERWISE SHOWN, TRANSVERSE CONNECTION JOINTS MUST TYPICALLY BE CONSTRUCTED AT A SKEW OF 1 IN 10 TO THE CENTER LINE.THE SKEW MAY BE REDUCED AS NECESSARY TO ACHIEVE THE SPECIFIED SLAB DIMENSIONS BUT THE SKEW MUST NOT BE INCREASED TO YIELD CORNER ANGLES MORE ACUTE THAN 84°.
- JOINTS (KERBS (etc.) MUST BE LOCATED TO COINCIDE WITH JOINTS IN THE ADJOINING BASE.

DOWELS

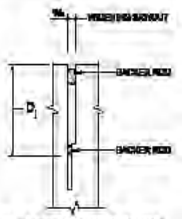
- DOWELS MUST BE LOCATED NOT CLOSER THAN 150mm TO A LONGITUDINAL JOINTS.THE OFFSET TO THE FIRST DOWEL MUST BE NOT GREATER THAN 250mm.



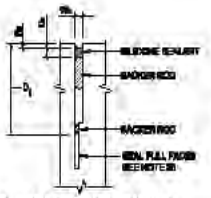
DETAIL - E



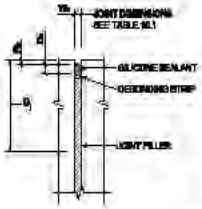
D1 - PRELIMINARY SEALING



D2- TEMPORARY SEALING



D3 - PERMANENT SEALING



DETAIL - F

ADB FUNDED I ROAD PROJECT NORTH WESTERN PROVINCE	CLIENT: DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA MINISTRY OF PORTS & HIGHWAYS Road Development Authority	CONSULTANT: KATAHIRA & ENGINEERS INTERNATIONAL	DRAWING TITLE: DETAILS OF JOINT CONSTRUCTION
	NO. REVISION DATE		DWG. NO. RTS-03
			DSGN: DRWN: CHKD: DATE: 07-07-2014

APPROXIMATE QUANTITIES OF MATERIALS REQUIRED FOR EACH PACKAGE

ANURADHAPURA - PACKAGE 1

ITEM	DESCRIPTION	UNIT	QUANTITY
1	Aggregate base, dense graded (37.5 mm)	Cu.m	50
2	Aggregate (20mm)	Cu.m	50
3	Asphalt concrete, cold mix	tonne	10
4	Bitumen emulsions, (CRS 1, CRS 2, CSS 1)	ltr	100
5	Bitumen prime coat, cutback MC 30	ltr	100
6	Bitumen, straight run, 60/70 penetration	ltr	100
7	Bitumen, straight run, 80/100 penetration	ltr	100
8	Block, cement, 400 x 200 x 100 mm	nr	500
9	Brick, hand-cut	nr	500
10	Cement, ordinary Portland	tonne	2.5
11	Concrete pipe, reinforced 600 mm diameter	lm	4.88
12	Concrete pipe, reinforced 900 mm diameter	lm	4.88
13	Concrete pipe, reinforced 1200 mm diameter	lm	4.88
14	Concrete, Grade 15	Cu.m	3
15	Concrete, Grade 20	Cu.m	3
16	Concrete, Grade 25	Cu.m	3
17	Concrete, Grade 30	Cu.m	3
18	Formwork, timber (smooth)	Sq.m	50
19	Pipe, PVC, 160 mm diameter (Type 600)	lm	50
20	Reinforcement, high-yield steel, Grade 460/425	kg	100
21	Reinforcement, mild steel, Grade 250	kg	100
22	Rubble, 100 - 150 mm	Cu.m	50
23	Rubble, 150 - 225 mm	Cu.m	50
24	River Sand	Cu.m	10
25	Timber, Class 2, Sri Lanka Timber Corporation	Cu.m	5
26	Precast concrete paving slabs 450x450x50 mm	Nos	200
27	Paint, emulsion	ltr	100
28	Paint, enamel	ltr	100
29	Auto diesel	ltr	100
30	Petrol	ltr	100
31	kerosene Oil	ltr	100

ANURADHAPURA - PACKAGE 2

ITEM	DESCRIPTION	UNIT	QUANTITY
2	Aggregate (20mm)	Cu.m	50
3	Asphalt concrete, cold mix	tonne	10
4	Bitumen emulsions, (CRS 1, CRS 2, CSS 1)	ltr	100
5	Bitumen prime coat, cutback MC 30	ltr	100
6	Bitumen, straight run, 60/70 penetration	ltr	100
7	Bitumen, straight run, 80/100 penetration	ltr	100
8	Block, cement, 400 x 200 x 100 mm	nr	500
9	Brick, hand-cut	nr	500
10	Cement, ordinary Portland	tonne	2.5
11	Concrete pipe, reinforced 600 mm diameter	lm	4.88
12	Concrete pipe, reinforced 900 mm diameter	lm	4.88
13	Concrete pipe, reinforced 1200 mm diameter	lm	4.88
14	Concrete, Grade 15	Cu.m	3

ITEM	DESCRIPTION	UNIT	QUANTITY
15	Concrete, Grade 20	Cu.m	3
16	Concrete, Grade 25	Cu.m	3
17	Concrete, Grade 30	Cu.m	3
18	Formwork, timber (smooth)	Sq.m	50
19	Pipe, PVC, 160 mm diameter (Type 600)	lm	50
20	Reinforcement, high-yield steel, Grade 460/425	kg	100
21	Reinforcement, mild steel, Grade 250	kg	100
22	Rubble, 100 - 150 mm	Cu.m	50
23	Rubble, 150 - 225 mm	Cu.m	50
24	River Sand	Cu.m	10
25	Timber, Class 2, Sri Lanka Timber Corporation	Cu.m	5
26	Precast concrete paving slabs 450x450x50 mm	Nos	200
27	Paint, emulsion	ltr	100
28	Paint, enamel	ltr	100
29	Auto diesel	ltr	100
30	Petrol	ltr	100
31	kerosene Oil	ltr	100

ANURADHAPURA - PACKAGE 3

ITEM	DESCRIPTION	UNIT	QUANTITY
1	Aggregate base, dense graded (37.5 mm)	Cu.m	50
2	Aggregate (20mm)	Cu.m	50
3	Asphalt concrete, cold mix	tonne	10
4	Bitumen emulsions, (CRS 1, CRS 2, CSS 1)	ltr	100
5	Bitumen prime coat, cutback MC 30	ltr	100
6	Bitumen, straight run, 60/70 penetration	ltr	100
7	Bitumen, straight run, 80/100 penetration	ltr	100
8	Block, cement, 400 x 200 x 100 mm	nr	500
9	Brick, hand-cut	nr	500
10	Cement, ordinary Portland	tonne	2.5
11	Concrete pipe, reinforced 600 mm diameter	lm	4.88
12	Concrete pipe, reinforced 900 mm diameter	lm	4.88
13	Concrete pipe, reinforced 1200 mm diameter	lm	4.88
14	Concrete, Grade 15	Cu.m	3
15	Concrete, Grade 20	Cu.m	3
16	Concrete, Grade 25	Cu.m	3
17	Concrete, Grade 30	Cu.m	3
18	Formwork, timber (smooth)	Sq.m	50
19	Pipe, PVC, 160 mm diameter (Type 600)	lm	50
20	Reinforcement, high-yield steel, Grade 460/425	kg	100
21	Reinforcement, mild steel, Grade 250	kg	100
22	Rubble, 100 - 150 mm	Cu.m	50
23	Rubble, 150 - 225 mm	Cu.m	50
24	River Sand	Cu.m	10
25	Timber, Class 2, Sri Lanka Timber Corporation	Cu.m	5
26	Precast concrete paving slabs 450x450x50 mm	Nos	200
27	Paint, emulsion	ltr	100
28	Paint, enamel	ltr	100
29	Auto diesel	ltr	100
30	Petrol	ltr	100
31	kerosene Oil	ltr	100

POLONNARUWA - PACKAGE 1

ITEM	DESCRIPTION	UNIT	QUANTITY
1	Aggregate base, dense graded (37.5 mm)	Cu.m	50
2	Aggregate (20mm)	Cu.m	50
3	Asphalt concrete, cold mix	tonne	10
4	Bitumen emulsions, (CRS 1, CRS 2, CSS 1)	ltr	100
5	Bitumen prime coat, cutback MC 30	ltr	100
6	Bitumen, straight run, 60/70 penetration	ltr	100
7	Bitumen, straight run, 80/100 penetration	ltr	100
8	Block, cement, 400 x 200 x 100 mm	nr	500
9	Brick, hand-cut	nr	500
10	Cement, ordinary Portland	tonne	2.5
11	Concrete pipe, reinforced 600 mm diameter	lm	4.88
12	Concrete pipe, reinforced 900 mm diameter	lm	4.88
13	Concrete pipe, reinforced 1200 mm diameter	lm	4.88
14	Concrete, Grade 15	Cu.m	3
15	Concrete, Grade 20	Cu.m	3
16	Concrete, Grade 25	Cu.m	3
17	Concrete, Grade 30	Cu.m	3
18	Formwork, timber (smooth)	Sq.m	50
19	Pipe, PVC, 160 mm diameter (Type 600)	lm	50
20	Reinforcement, high-yield steel, Grade 460/425	kg	100
21	Reinforcement, mild steel, Grade 250	kg	100
22	Rubble, 100 - 150 mm	Cu.m	50
23	Rubble, 150 - 225 mm	Cu.m	50
24	River Sand	Cu.m	10
25	Timber, Class 2, Sri Lanka Timber Corporation	Cu.m	5
26	Precast concrete paving slabs 450x450x50 mm	Nos	200
27	Paint, emulsion	ltr	100
28	Paint, enamel	ltr	100
29	Auto diesel	ltr	100
30	Petrol	ltr	100
31	kerosene Oil	ltr	100

POLONNARUWA - PACKAGE 2

ITEM	DESCRIPTION	UNIT	QUANTITY
1	Aggregate base, dense graded (37.5 mm)	Cu.m	50
2	Aggregate (20mm)	Cu.m	50
3	Asphalt concrete, cold mix	tonne	10
4	Bitumen emulsions, (CRS 1, CRS 2, CSS 1)	ltr	100
5	Bitumen prime coat, cutback MC 30	ltr	100
6	Bitumen, straight run, 60/70 penetration	ltr	100
7	Bitumen, straight run, 80/100 penetration	ltr	100
8	Block, cement, 400 x 200 x 100 mm	nr	500
9	Brick, hand-cut	nr	500
10	Cement, ordinary Portland	tonne	2.5
11	Concrete pipe, reinforced 600 mm diameter	lm	4.88
12	Concrete pipe, reinforced 900 mm diameter	lm	4.88
13	Concrete pipe, reinforced 1200 mm diameter	lm	4.88
14	Concrete, Grade 15	Cu.m	3
15	Concrete, Grade 20	Cu.m	3

ITEM	DESCRIPTION	UNIT	QUANTITY
16	Concrete, Grade 25	Cu.m	3
17	Concrete, Grade 30	Cu.m	3
18	Formwork, timber (smooth)	Sq.m	50
19	Pipe, PVC, 160 mm diameter (Type 600)	lm	50
20	Reinforcement, high-yield steel, Grade 460/425	kg	100
21	Reinforcement, mild steel, Grade 250	kg	100
22	Rubble, 100 - 150 mm	Cu.m	50
23	Rubble, 150 - 225 mm	Cu.m	50
24	River Sand	Cu.m	10
25	Timber, Class 2, Sri Lanka Timber Corporation	Cu.m	5
26	Precast concrete paving slabs 450x450x50 mm	Nos	200
27	Paint, emulsion	ltr	100
28	Paint, enamel	ltr	100
29	Auto diesel	ltr	100
30	Petrol	ltr	100
31	kerosene Oil	ltr	100

POLONNARUWA - PACKAGE 3

ITEM	DESCRIPTION	UNIT	QUANTITY
2	Aggregate (20mm)	Cu.m	50
3	Asphalt concrete, cold mix	tonne	10
4	Bitumen emulsions, (CRS 1, CRS 2, CSS 1)	ltr	100
5	Bitumen prime coat, cutback MC 30	ltr	100
6	Bitumen, straight run, 60/70 penetration	ltr	100
7	Bitumen, straight run, 80/100 penetration	ltr	100
8	Block, cement, 400 x 200 x 100 mm	nr	500
9	Brick, hand-cut	nr	500
10	Cement, ordinary Portland	tonne	2.5
11	Concrete pipe, reinforced 600 mm diameter	lm	4.88
12	Concrete pipe, reinforced 900 mm diameter	lm	4.88
13	Concrete pipe, reinforced 1200 mm diameter	lm	4.88
14	Concrete, Grade 15	Cu.m	3
15	Concrete, Grade 20	Cu.m	3
16	Concrete, Grade 25	Cu.m	3
17	Concrete, Grade 30	Cu.m	3
18	Formwork, timber (smooth)	Sq.m	50
19	Pipe, PVC, 160 mm diameter (Type 600)	lm	50
20	Reinforcement, high-yield steel, Grade 460/425	kg	100
21	Reinforcement, mild steel, Grade 250	kg	100
22	Rubble, 100 - 150 mm	Cu.m	50
23	Rubble, 150 - 225 mm	Cu.m	50
24	River Sand	Cu.m	10
25	Timber, Class 2, Sri Lanka Timber Corporation	Cu.m	5
26	Precast concrete paving slabs 450x450x50 mm	Nos	200
27	Paint, emulsion	ltr	100
28	Paint, enamel	ltr	100
29	Auto diesel	ltr	100
30	Petrol	ltr	100
31	kerosene Oil	ltr	100

APPROVAL LETTER OF DEPARTMENT OF FOREST

වන සංරක්ෂණ දෙපාර්තමේන්තුව
වන பரிபாலனத் திணைக்களம்
FOREST DEPARTMENT

ප්‍රධාන කාර්යාලය, සම්පත්පාය, තැ. පෙ. 3, බත්තරමුල්ල, ශ්‍රී ලංකාව.
தலைமை அலுவலகம், "சம்பத்பாய", த. பெ. இல. 3, பத்தரமுல்லை, இலங்கை.
Head Office, Sampathpaya, P. O. Box 3, Battaramulla, Sri Lanka

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ෆැක්ස් / பெக்ஸ் / Fax: (94-1) 2866633
E-mail: Forest@slt.lk.

මගේ අංකය / எனது இல. / My Ref.: EMD/EIA/RD/rural roads/2014
ඔබේ අංකය / உமது இல. / Your Ref.:
දිනය / திகதி / Date: 2014.08. 27

අධ්‍යක්ෂ, (පරිසරය සහ සමාජ සංවර්ධන)
මාර්ග සංවර්ධන අධිකාරිය.

ග්‍රාමීය පාරවල් වැඩිදියුණු කිරීමේ වැඩසටහන - මාර්ග සංවර්ධන අධිකාරිය

ඉහත කරුණට අදාළව ඔබේ අංක RDA/DG/07/113, හා 2014.07.25, යන ලිපිය හා අංක RDA/ESD/iroad හා 2014.08.04, හා 2014.08.26 දිනැති ලිපි හා බැඳේ.

02. මෙම වැඩ සටහන යටතේ වැඩි දියුණු කිරීමට යෝජිත මාර්ග වලට ඇතුළත් වන සංරක්ෂණ දෙපාර්තමේන්තුවේ පාලනය යටතේ පවත්නා වනාන්තර තුලින් වැටී ඇති මාර්ග සම්බන්ධව වෙන වෙනම පරීක්ෂා කර නිර්දේශ ඉදිරිපත් කිරීමට කලක් ගතවන බව දන්වමි.

03. මෙහි හදිසි අවශ්‍යතාවය සළකා වනාන්තර තුලින් වැටී ඇති මාර්ගවල අමතර කිසිදු අළුත් හෙලි කිරීමකින් හෝ ගස් ඉවත් කිරීමකින් තොරව, දිසා වන නිලධාරී ගේ අධීක්ෂණය යටතේ මෙම කාර්යයන් සිදු කිරීම සඳහා අවසර ලබා දීමේ හැකියාව ඇති බව කාරුණිකව දන්වමි.

මහින්ද සෙනෙවිරත්න
වන සංරක්ෂක
(පරිසර සංරක්ෂණ හා කළමනාකරණ)
වන සංරක්ෂක ජනරාල් වෙනුවට

වන සංරක්ෂක ජනරාල් / வன பாதுகாவலர் நாயகம் / Conservator-General of Forests: 2866616
වන සංරක්ෂක / வன பாதுகாவலர் / Conservator of Forests
මෙහෙයුම් / நடாத்துதல் / Operations: 2866624
පර්යේෂණ / ஆய்வு / Research: 2866628
පාලන / பரிபாலனம் / Administration: 2866625

Translation of the letter

27.08.2014

Director
Environment and Social Development Division
RDA

Program for upgrading of Rural roads - Road Development Authority

This refers to the letter no. RDA/DG/07/113 dated 25th of July 2014 and subsequent letters no RDA/ESD/IROAD dated 4th of August 2014 and 26th of August 2014 on above.

It seems that it will take a long time to inspect and give specific conditions on roads that are within the forest areas.

Therefore, considering the urgency of this program, Forest Department is able to grant approval to carry out the road construction work without using additional lands and removal of any trees within sensitive forest areas and it is recommend to carry out the development work under the supervision of the relevant District forest Officer of the Department of Forest.

Mahinda Senevirathne
Forest Conservator
(Environment Management)
For Conservator General of Forests

STANDARD ENVIRONMENTAL MANAGEMENT PLAN
Upgrading of Rural Roads to all Weather Standards – North Central Province

1. This standard Environmental Management Plan (EMP) is the summarized matrix of all possible impacts that may occur during upgrading and maintenance of roads in Anuradhapura and Polonnaruwa Districts to all weather standards under i Road Program of Road Development Authority (RDA). And this EMP should be updated and specified for each contract package before commencement of the project with specific locations for mitigation measures. And the environmental specialist of the Project Implementation Consultant (PIC) of the project is responsible for specifying and updating the EMP for each package. The updated EMP for each contract package should be approved by the Project Implementation Unit (PIU) well in advance to the construction phase.

2. The EMP should form part of the Bid Documents and shall be considered alongside with the specifications. Thereby the prescriptions detailed in the EMP are mandatory in nature and also contractually binding. The EMP will also equally applicable to sub-contractors including nominated sub-contractors if any. The Contractor shall be responsible for the compliance with the requirements of the EMP. With the assistance of the PIC, the “Engineer” on behalf of the Employer the Road Development Authority (RDA) will monitor the compliance of EMP by the Contractor.

3. The bidders are advised to carefully consider the EMP requirements when preparing the bid and pricing the items of work. As a thumb of rule it is suggested that the contractor allows 10~15% of construction cost as cost to execute environmental compliance requirements. The prescriptions and clauses detailed in the EMP are integral component of the specifications for relevant item of work unless separate items are included in the Bill of Quantities. Thus separate payments will not be made in respect of compliance with the EMP. In case the Contractor or his sub-contractor/s fails to implement the EMP recommendations after informing in writing, the Engineer will take whatever actions it is deemed necessary to ensure that the EMP is properly implemented. If the contractor or his sub-contractor/s still fails to comply with EMP requirement, the “Engineer” may levy a penalty based on the level of non-compliance, cost incurred to rectify the damages caused by such negligence and/ or recover the cost from contractor’s payments.

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

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Costs	Responsible for Implementing	Responsible for Monitoring/ Supervision
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 mitigation 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), Mahaweli Authority of Sri Lanka (MAS) and Community Based Organizations (CBO).	Throughout the project and other possible areas of tree planting	Design costs.	Project Implementation Unit (PIU), Design consultants	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 ○ Felled 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, MASL 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	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/ Supervision
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 obtained 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/archaeological 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/users	Throughout the road with special attention near to any common properties located adjacent to the road	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/ Supervision
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 irrigation canals crossed by and roads located within 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. ○ Prior consent should be obtained from relevant authority (Department of Irrigation (DI)/MASL/Agrarian Services Department (ASD)/ DS) for construction activities of roads over bunds of irrigations canals and tanks.	Near all drainage crossings, irrigation canals, irrigation tanks, streams and flood prone areas.	Included in project costs.	PIU, Design consultants	PIU, SRRDA
II.	**Construction Stage**					
1.	Alteration of surface water hydrology and flood impacts	○ The contractor shall take all measures necessary or as directed by the PIC to keep all drainage paths, drains and irrigation canals clear of blockage at all times. Here special attention should be paid to flood prone areas in Anuradhapura and Polonnaruwa Districts. ○ 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	Throughout the project area with special attention to roads which are across irrigation canals, near to tanks and areas 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/ Supervision
		allowed to be disposed near water bodies or within tank reservations and 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. o The contractor should be advised not to damage or block any manmade drainage or irrigation 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 downstream side of the drainage path or the canal o Contractor shall not close or block existing canals and streams permanently. If diversion or closure or blocking of canals and streams is required for the execution of work (e.g. for construction of bridges and culverts), contractor must first obtain the approval from PIC in writing. Contractor shall carry out an investigation and report to the PIC, if an investigation is requested by the PIC. Contractor shall also obtain the approval from the relevant agency such as Department of Irrigation (DI)/ MASL/Agrarian Services Department (ASD)/DS prior to such action is taken. o Contractors shall restore the drainage path back to its original status once the need for such diversion or closure or blockage is no longer required.				

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Costs	Responsible for Implementing	Responsible for Monitoring/ Supervision
2.	Sourcing and transportation of construction material	**Borrow Earth:** o The borrow earth shall be obtained from borrow pits which are operated with GSMB and CEA approvals. o 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. o All completed borrow pits should be rehabilitated to satisfy conditions given in the industrial mining license of GSMB o Borrowing earth from agricultural land shall be minimized to the extent possible. Further, no earth shall be borrowed from already low-lying areas. **Aggregate :** o The stone aggregate shall be sourced from existing licensed quarries o Copies of consent/ approval / rehabilitation plan for use of existing source will be submitted to PIU through PIC. o Topsoil to be stockpiled and protected for use at the rehabilitation stage. **Transportation of Construction Material** o Existing tracks / roads are to be used for hauling of materials to the extent possible. o The vehicles deployed for material transportation shall be spillage proof to avoid or minimize the spillage of the material during transportation. o Any road damaged due to transportation of material should repaired by the contractor to its original status	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/ Supervision
3.	Loss of productive soil, erosion and land use change	o The top soil from the productive land (borrow areas, carriageway widening areas etc.) shall be preserved and reused for plantation purposes. o It shall also be used as top cover of embankment slope for growing vegetation to protect soil erosion. o Shrubs shall be planted in loose soil area. o It shall be ensured that the land taken on lease for alternative roads, 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	To be included under contractors costs	Contractor	PIU, PIC
4.	Compaction and Contamination of Soil	o 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. o The productive land shall be reclaimed after construction activity. o Fuel and lubricants shall be stored at the predefined storage location. o The storage area shall be paved with gentle slope to a corner and connected with a chamber to collect any spills of the oils. o All efforts shall be made to minimise the waste generation. Unavoidable waste shall be stored at the designated place prior to disposal. o 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	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/ Supervision
5.	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 (streams, irrigation canals and tanks) 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.	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
		○ 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 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.				

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Costs	Responsible for Implementing	Responsible for Monitoring/ Supervision
6.	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, only with the 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. ○ 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
7.	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) and trade license) and plants shall be located at least 0.2 km away and in downwind direction of the human settlements and sensitive receptors such as schools and temples 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.	Throughout the project road with special attention to schools, hospitals and religious places located along candidate roads	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/ Supervision
		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 o 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. o Contractor should arrange air quality, noise and vibration level measurements at locations advised by the PIC in order to monitor severe impacts or to justify public complaints if any.				
8.	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 all project roads.	To be included under contractors costs	Contractor	PIU, PIC
9.	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.	Throughout the project area with special attention to irrigation canals, irrigation tanks and streams	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/ Supervision
		○ Preventive measures such as proper storage of unsuitable soil, construction chemicals, servicing construction vehicles in approved sites, slope stabilisation of embankments etc… shall be taken for prevention of siltation and pollution of water bodies. ○ Contractor should arrange water quality measurements at locations advised by the PIC in order to monitor severe impacts or to justify public complaints if any.				
10.	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	Throughout the project roads	Costs to be borne by Contractor	Contractor	PIU, PIC
		○ 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				

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Costs	Responsible for Implementing	Responsible for Monitoring/ Supervision
11.	Traffic Management and Road Safety	○ Identify the areas where temporary traffic diversion may be required. ○ Prepare appropriate traffic movement plan approved by PIU and RDA for ensuring continued safe flow of traffic, pedestrians and all road users during construction. ○ Wherever, cross drainage structure work require longer construction time and road is to be blocked for longer duration, the PIC shall define appropriate measures for traffic diversion before the start of the construction. ○ 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. ○ 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	Throughout the subproject area	To be included in contractor's cost	Contractor	PIU, PIC
12.	Impacts on Biodiversity	○ No solid waste or spoil dumping sites, material extraction site, 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/near the sensitive areas in order to avoid collection of flora and fauna or their parts. ○ 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	Near forest areas, national wilderness and heritage areas, Wildlife areas such as national parks, sanctuaries if any	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/ Supervision
		○ Conditions which may be required by the DOF and DWLC for roads located within/adjacent or close to protected areas must be met ○ For roads falling near/within 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 if advised by DWLC ○ Ensure that construction of cross drainage structures 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 if such evidence is found. ○ 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				
13.	Impacts to archaeological sites	○ During construction activities the contractor should take all necessary and adequate care to minimize impacts to archeologically protected locations if for roads traversing near to such sites. ○ Workers should not be allowed to trespass in to such areas. ○ Conservation and protection measures shall be taken up as per design and as per the instructions issued by the Department of Archaeology (DoA) if any when working close to such sites. Contractor shall seek advice from the PIC if such instructions are not available. ○ Access to such properties from the road shall be maintained clear and clean ○ Any object of value of antiquity and structures and other remains or things of geological or	Throughout the project area with special attention to roads traverses near to archeologically protected monuments	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/ Supervision
		archaeological interest etc. discovered on the site and/or during construction work shall be the property of the Government of Sri Lanka, and shall be dealt with as per provisions of Antiquities Ordinance of 1940 (Revised in 1956 & 1998). o The contractor shall take reasonable precaution to prevent his workmen or any other persons from removing and damaging any such article or thing and shall, immediately upon discovery thereof and before removal acquaint the PIC of such discovery and carry out the PIC's instructions.				
III	**Post Construction and Operational Stage**					
1.	Hydrology and Drainage	o Regular removal/cleaning of deposited silt shall be done from culvert, bridges and side drains and lead away drains before the monsoon season. o 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
2.	Air and Noise Quality	o 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 o Strategically locating compensatory plantation along sensitive noise receptors to provide additional attenuation o 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
3.	Site restoration	o All construction camp/temporary office/material storage areas are to be restored to its original conditions or as agreed with the land owner. o 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

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Costs	Responsible for Implementing	Responsible for Monitoring/ Supervision
4.	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 with the assistance of DOF/DWLC
5.	Placing warning signs for animals	○ Placing warning signs by mentioning the warnings at least 1km ahead of approaching such areas	Near animal migration paths if any e.g., elephant migration paths	To be borne by the contractor	Contractor (during maintenance period) and RDA	PIU/RDA with the assistance of DWLC
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

SAMPLE ENVIRONMENTAL MONITORING CHECKLIST FOR RURAL ROADS

I. Environmental Monitoring Checklist during Design and Pre-Construction Stage Upgrading of Rural Roads to all Weather Standards – North Central Province

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 mitigation 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), Mahaweli Authority of Sri Lanka (MAS) and Community Based Organizations (CBO).	Throughout the project and other possible areas of tree planting		

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
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 ○ Felled 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, MASL 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 obtained 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		

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Compliance status (Complied, partly complied, not complied)	Corrective action proposed 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/archaeological 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/users	Throughout the road with special attention near to any common properties located adjacent to the road		
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 irrigation canals crossed by and roads located within 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. ○ Prior consent should be obtained from relevant authority (Department of Irrigation (DI)/MASL/Agrarian Services Department (ASD)/ DS) for construction activities of roads over bunds of irrigations canals and tanks.	Near all drainage crossings, irrigation canals, irrigation tanks, streams and flood prone areas.		

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

II. Environmental Monitoring Checklist during Construction Stage
Upgrading of Rural Roads to all Weather Standards – North Central Province

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.	Alteration of surface water hydrology and flood impacts	○ The contractor shall take all measures necessary or as directed by the PIC to keep all drainage paths, drains and irrigation canals clear of blockage at all times. Here special attention should be paid to flood prone areas in Anuradhapura and Polonnaruwa Districts. ○ 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 within tank reservations and 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	Throughout the project area with special attention to roads which are across irrigation canals, near to tanks and areas 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
		damage or block any manmade drainage or irrigation 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 downstream side of the drainage path or the canal o Contractor shall not close or block existing canals and streams permanently. If diversion or closure or blocking of canals and streams is required for the execution of work (e.g. for construction of bridges and culverts), contractor must first obtain the approval from PIC in writing. Contractor shall carry out an investigation and report to the PIC, if an investigation is requested by the PIC. Contractor shall also obtain the approval from the relevant agency such as Department of Irrigation (DI)/ MASL/Agrarian Services Department (ASD)/DS prior to such action is taken. o Contractors shall restore the drainage path back to its original status once the need for such diversion or closure or blockage is no longer required.			
2.	Sourcing and transportation of construction material	**Borrow Earth:** o The borrow earth shall be obtained from borrow pits which are operated with GSMB and CEA approvals. o 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	Throughout the project area with special attention to borrow pits and quarries to be used in each package		

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
		should be strictly adhered. o All completed borrow pits should be rehabilitated to satisfy conditions given in the industrial mining license of GSMB o Borrowing earth from agricultural land shall be minimized to the extent possible. Further, no earth shall be borrowed from already low-lying areas. **Aggregate :** o The stone aggregate shall be sourced from existing licensed quarries o Copies of consent/ approval / rehabilitation plan for use of existing source will be submitted to PIU through PIC. o Topsoil to be stockpiled and protected for use at the rehabilitation stage. **Transportation of Construction Material** o Existing tracks / roads are to be used for hauling of materials to the extent possible. o The vehicles deployed for material transportation shall be spillage proof to avoid or minimize the spillage of the material during transportation. o Any road damaged due to transportation of material should repaired by the contractor to its original status			
3.	Loss of productive soil, erosion and land use change	o The top soil from the productive land (borrow areas, carriageway widening areas etc.) shall be preserved and reused for plantation purposes. o It shall also be used as top cover of embankment slope for growing vegetation to protect soil erosion. o Shrubs shall be planted in loose soil area. o It shall be ensured that the land taken on	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
		lease for alternative roads, 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.			
4.	Compaction and Contamination of Soil	o 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. o The productive land shall be reclaimed after construction activity. o Fuel and lubricants shall be stored at the predefined storage location. o The storage area shall be paved with gentle slope to a corner and connected with a chamber to collect any spills of the oils. o All efforts shall be made to minimise the waste generation. Unavoidable waste shall be stored at the designated place prior to disposal. o 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		
5.	Establishment of Construction Camp, temporary office and storage area	o Construction camp sites and storage areas shall be located away from any local human settlements, water bodies (streams, irrigation canals and tanks) and forested areas (minimum 0.2 km away) and preferably located on land which is not productive	Throughout the project area with special attention to labour camps, storage areas		

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
		(barren/waste lands presently). If these are not possible private land maybe taken on lease as standard practice. o The construction camps, office and storage areas shall have provision of adequate water supply, sanitation and all requisite infrastructure facilities. o 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. o 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. o The construction camps, office and storage areas shall have provision of health care facilities for adults, pregnant women and children. o 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 prepared to fight with any emergency like fire. o 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. o Provision of paved area for unloading and storage of fuel oil, lubricant oil, away from storm water drainage.	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
6.	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, only with the 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. ○ Further flood prone areas should be avoided in selecting disposal sites	Throughout the project area and all disposal sites		
7.	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) and trade license) and plants shall be located at least 0.2 km away and in downwind direction of the human settlements and sensitive	Throughout the project road with special attention to schools, hospitals and religious places located along candidate roads		

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
		receptors such as schools and temples 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. o Contractor should arrange air quality, noise and vibration level measurements at locations advised by the PIC in order to monitor severe impacts or to justify public complaints if any.			

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
8.	Tree plantation	○ Compensatory afforestation 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.		
9.	Ground Water and Surface Water Quality and Availability	○ The contractor shall arrange for water 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 of embankments etc… shall be taken for prevention of siltation and pollution of water bodies. ○ Contractor should arrange water quality measurements at locations advised by the PIC in order to monitor severe impacts or to justify public complaints if any.	Throughout the project area with special attention to irrigation canals, irrigation tanks and streams		

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
10.	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 project roads		
11.	Traffic Management and Road Safety	○ Identify the areas where temporary traffic diversion may be required. ○ Prepare appropriate traffic movement plan approved by PIU and RDA for ensuring continued safe flow of traffic, pedestrians and all road users during construction. ○ Wherever, cross drainage structure work require longer construction time and road is to be blocked for longer duration, the PIC shall define appropriate measures for traffic diversion before the start of the construction. ○ 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.	Throughout the subproject area		

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
		○ 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			
12.	Impacts on Biodiversity	○ No solid waste or spoil dumping sites, material extraction site, 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/near the sensitive areas in order to avoid collection of flora and fauna or their parts. ○ 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 DOF and DWLC for roads located within/adjacent or close to protected areas must be met ○ For roads falling near/within 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	Near forest areas, national wilderness and heritage areas, Wildlife areas such as national parks, sanctuaries if any		

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
		fences may be installed if advised by DWLC o Ensure that construction of cross drainage structures 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 if such evidence is found. o 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			
13.	Impacts to archaeological sites	o During construction activities the contractor should take all necessary and adequate care to minimize impacts to archeologically protected locations if for roads traversing near to such sites. o Workers should not be allowed to trespass in to such areas. o Conservation and protection measures shall be taken up as per design and as per the instructions issued by the Department of Archaeology (DoA) if any when working close to such sites. Contractor shall seek advice from the PIC if such instructions are not available. o Access to such properties from the road shall be maintained clear and clean o Any object of value of antiquity and structures and other remains or things of geological or archaeological interest etc. discovered on the site and/or during construction work shall be the property of the Government of Sri Lanka, and shall be dealt with as per provisions of Antiquities Ordinance of 1940 (Revised in	Throughout the project area with special attention to roads traverses near to archeologically protected monuments		

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/ numbers	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
		1956 & 1998). o The contractor shall take reasonable precaution to prevent his workmen or any other persons from removing and damaging any such article or thing and shall, immediately upon discovery thereof and before removal acquaint the PIC of such discovery and carry out the PIC's instructions.			
14.	Grievance Redress	o Maintaining records of all environment related grievances raised, if any, and the actions taken to address them through the village level grievance redress committee (GRC) and PIU as applicable	All project roads.		

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

III. Environmental Monitoring Checklist during Post-Construction or Operation Stage
Upgrading of Rural Roads to all Weather Standards – North Central Province

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)	Corrective action proposed if any
III	**Post Construction and Operational Stage**				
1.	Hydrology and Drainage	○ Regular removal/cleaning of deposited silt shall be done from culvert, bridges and side drains and lead away drains 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		
2.	Air and Noise Quality	○ Placing sign boards for speed limitation and honking restrictions to be enforced near sensitive locations. ○ 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		

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
3.	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		
4.	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		
5.	Placing warning signs for animals	○ Placing warning signs by mentioning the warnings at least 1km ahead of approaching such areas	Near animal migration paths if any e.g., elephant migration paths		
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		

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
7.	Grievance Redress	○ Maintaining records of all environment related grievances raised, if any, and the actions taken to address them through the village level grievance redress committee (GRC) and PIU as applicable	All project roads.		

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	Minimum 2 locations (Locations to be identified	National Environmental (Noise Control)	Rs 10,000 per day	140,000.00	Contractor through approved monitoring	RDA/ESD

Environmental Component	Project Stage	Parameters	Frequency	Locations	Standards	Rate	Approximate Cost (SLRs)	Implementation	Supervision
			years	with the help of PIC)	Regulations 1996(no. 924/12)			agency	
	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$)		

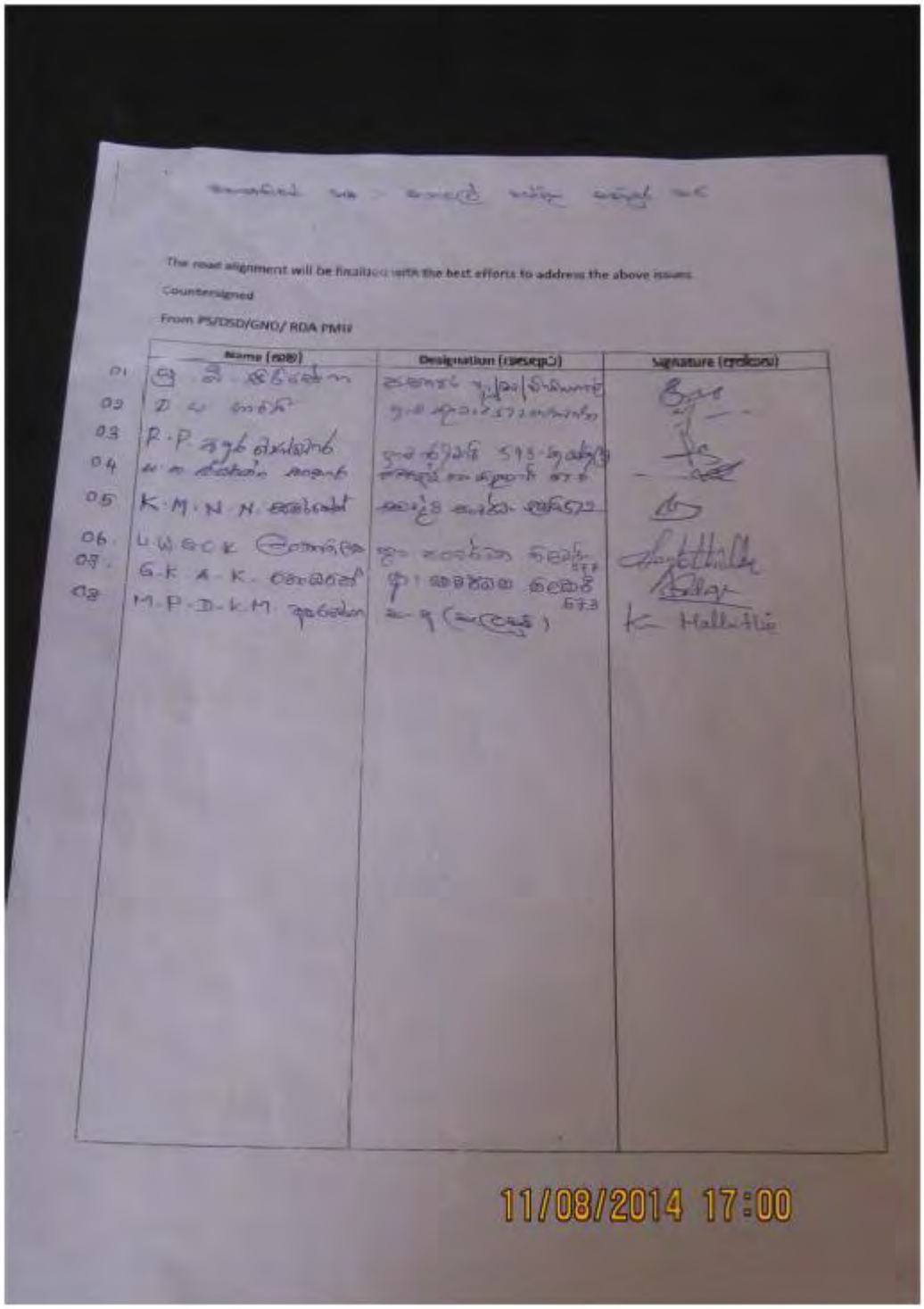
Abbreviations:
TSPM = Total Suspended Particulate Matter, PM10 = Respirable Particulate Matter < 10□m diameter, NO_x = Oxides of Nitrogen, CO = Carbon Monoxide, SO_x = Oxides of Sulphur, Pb = Lead, HC = Hydro Carbons, EC = Electrical Conductivity, DO = Dissolved Oxygen, TSS = Total Suspended Solids,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

SAMPLE TRANSECT WALK REPORTS

FORMAT FOR RECORDING TRANSECT WALK & CONSULTATIONS WITH THE AFFECTED PERSONS

1) Name of Road:	Matale Junction Samagipura Road
2) Villages:	Nallapambukulama, Samagipura
3) GND	Henawattha, Kunchikulama
4) District:	Anuradhapuraya
5) Date; Time:	8 Auguest,2014, at 14.30 hours
6) Total Number of Participants in theTransectwalk:	Fifty Eight
7) Numbers of Participants falling in the following categories:	
Indigenous Persons:	None
Disabled:	None
Households losing structure:	None(No family is losing structures)
Women:	Thirty four
8) Name & Designation of the Key Participants: From RDA/PIU From PS/DSD/GND	Please refer the attendance sheet
9) Issues and suggestions raised by the Participants	
i) Road alignment and design in general	It was suggested to raise the road, because the road get under by water of rainy season
ii) Road width and land availability:	Even though the existing way was about 2.8 – 3.2 m wide there is sufficient ROW for road widening if required (3.00 - 4. 00m)
iii) Land owned/used by vulnerable groups of people:	No land adjacent to the ROW is inhabited by a group of vulnerable people
iv) Sensitive locations (forests, cultural properties,etc.):	A section of the existing road passes through a cultural property of Ahatu tree. It may be removed. But all they like remove it, in case of developing road.
v) Water-related issues (drainage lines, rivers and water crossings, irrigation water courses, other water bodies, etc.):	There is a need of more Box culverts, culverts along the road. There is a water line in left side of the road.
vi) Suggestion on location of Contractor's camp site:	-
vii) Suggestions on alternate routes during construction:	Not required as the ROW is sufficient for any temporary diversion
viii) Road safety-related issues (major junctions, curves, bends, hospitals, schools etc.):	Special sing boards will be required near the major junctions.
ix) Other suggestions (such as regarding cattle crossing, borrow pits, etc.):	None
10) Major Out comes of the Transect Walk (Summary):	
i) Changes / inputs to be incorporated in the design (alignment, road safety, drains, irrigation water crossing etc.)	Drains are required by them near their home land entrance
ii) Extent of land take and willingness / unwillingness of land owner / users for donation:	Not required as there is sufficient ROW
iii) Environmental issues to be resolved (Ponds, water logging etc.):	No such special issues to be resolved.
iv) Other issues:	None
11) Brief Summary of consultation held during transect walk:	
Major Issues discussed during the Consultation:	The need of expediting the road construction work was emphasized by the public Public was confident that the new road will be better road as it will be constructed by RDA

Recommendations of the Social Safe guard Specialist:	Provide sing boards at railway crossing of Samagipura station. It may need to be removed the electric tower for constructing road.



The road alignment will be finalized with the best efforts to address the above issues

Countersigned

From PS/DSD/GND/ RDA PMU

	Name (නම)	Designation (තනතුර)	Signature (අත්සන)
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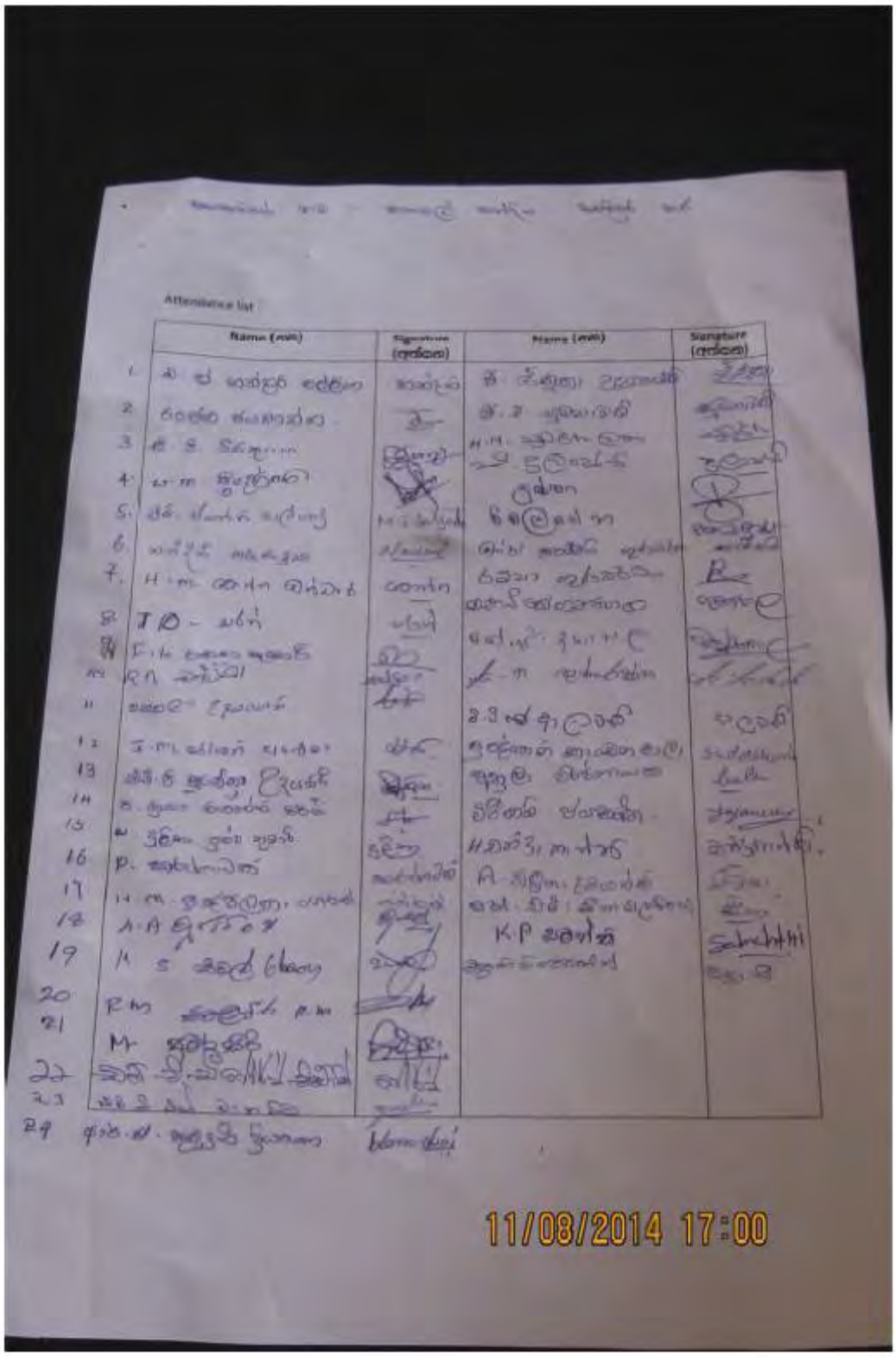

Attendance list

	Name (අත්)	Signature (අත්සන)	Name (අත්)	Signature (අත්සන)
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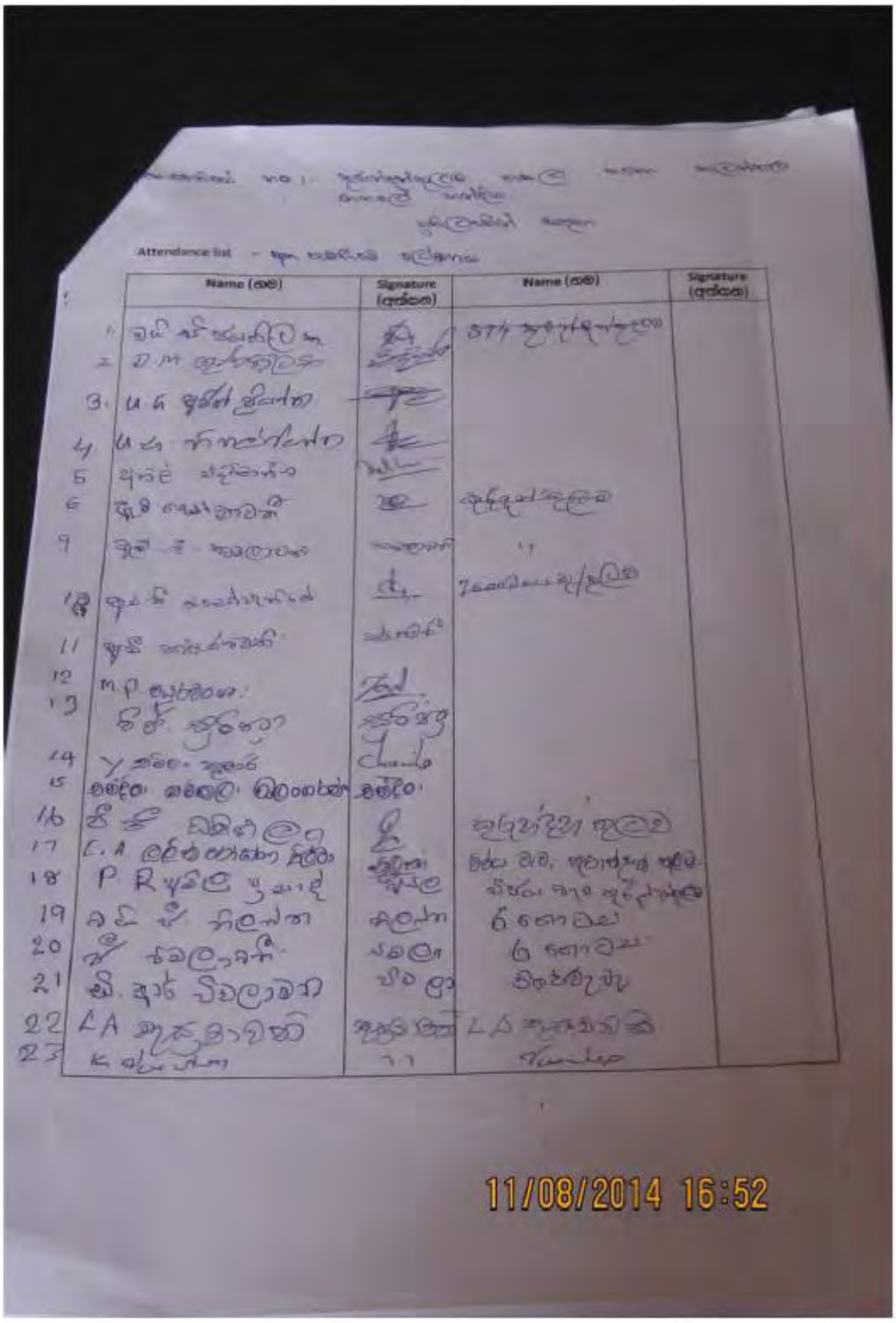
11/08/2014 17:00

FORMAT FOR RECORDING TRANSECT WALK & CONSULTATIONS WITH THE AFFECTED PERSONS

1) Name of Road:	Kurundankulama School Via Mathale Junction Road
2) Villages:	Kurundankulama
3) GND	Kurundankulama
4) District:	Anuradhapuraya
5) Date; Time:	7 Auguest,2014, at 14.30 hours
6) Total Number of Participants in theTransectwalk:	Forty five
7) Numbers of Participants falling in the following categories:	
Indigenous Persons:	None
Disabled:	None
Households losing structure:	None(No family is losing structures)
Women:	Twenty two
8) Name & Designation of the Key Participants: From RDA/PIU From PS/DSD/GND	Please refer the attendance sheet
9) Issues and suggestions raised by the Participants	
i) Road alignment and design in general	It was suggested to raise the road, because the road get under by water of rainy season
ii) Road width and land availability:	Even though the existing way was about 3.00 – 3.5 m wide there is sufficient ROW for road widening if required (3.00 - 4. 00m)
iii) Land owned/used by vulnerable groups of people:	No land adjacent to the ROW is inhabited by a group of vulnerable people
iv) Sensitive locations (forests, cultural properties,etc.):	None
v) Water-related issues (drainage lines, rivers and water crossings, irrigation water courses, other water bodies, etc.):	There is a need of more Box culverts, culverts are needed along the road. There is a water line side of the road. Drains system is to be needed.
vi) Suggestion on location of Contractor's camp site:	Many lands are available for the contractors to settle. It may be selected by the contractor As his wish.
vii) Suggestions on alternate routes during construction:	Not required as the ROW is sufficient for any temporary diversion
viii) Road safety-related issues (major junctions, curves, bends, hospitals, schools etc.):	Special sing boards will be required near the major junctions, School and bends
ix) Other suggestions (such as regarding cattle crossing, borrow pits, etc.):	None
10) Major Out comes of the Transect Walk (Summary):	
i) Changes / inputs to be incorporated in the design (alignment, road safety, drains, irrigation water crossing etc.)	Drains are required by them near their home land entrance. They required road safety sing boards
ii) Extent of land take and willingness / unwillingness of land owner / users for donation:	Not required as there is sufficient ROW
iii) Environmental issues to be resolved (Ponds, water logging etc.):	There are Two tanks in this village. Therefore drains system must be leveled to the tanks.
iv) Other issues:	None
11) Brief Summary of consultation held during transect walk:	
Major Issues discussed during the Consultation:	The need of expediting the road construction work was emphasized by the public Public was confident that the new road will be better road as it will be constructed by RDA
Recommendations of the Social Safe guard Specialist:	Provide sing boards for necessary places.


8185
07/08/2014 16:36



Attendance list

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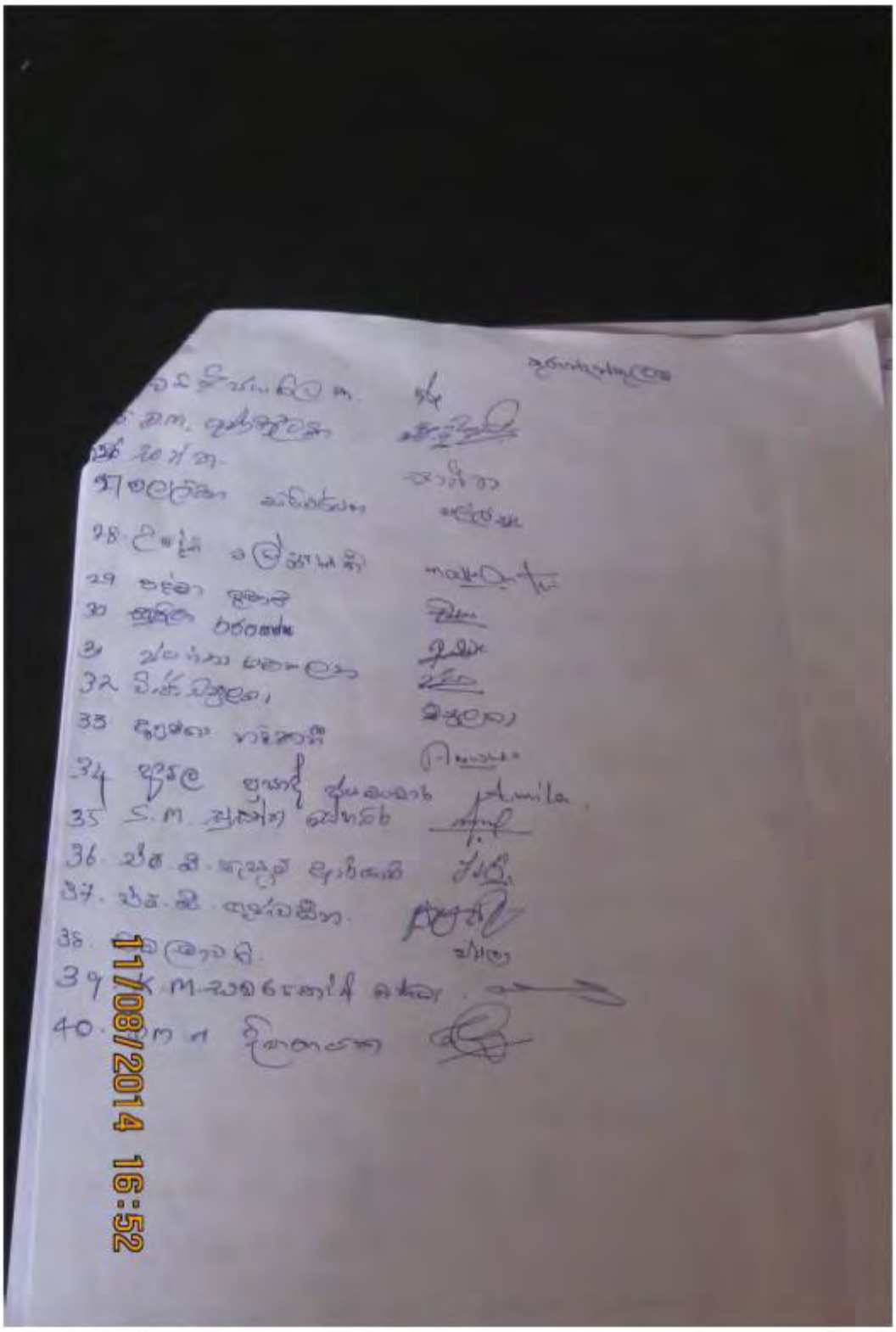
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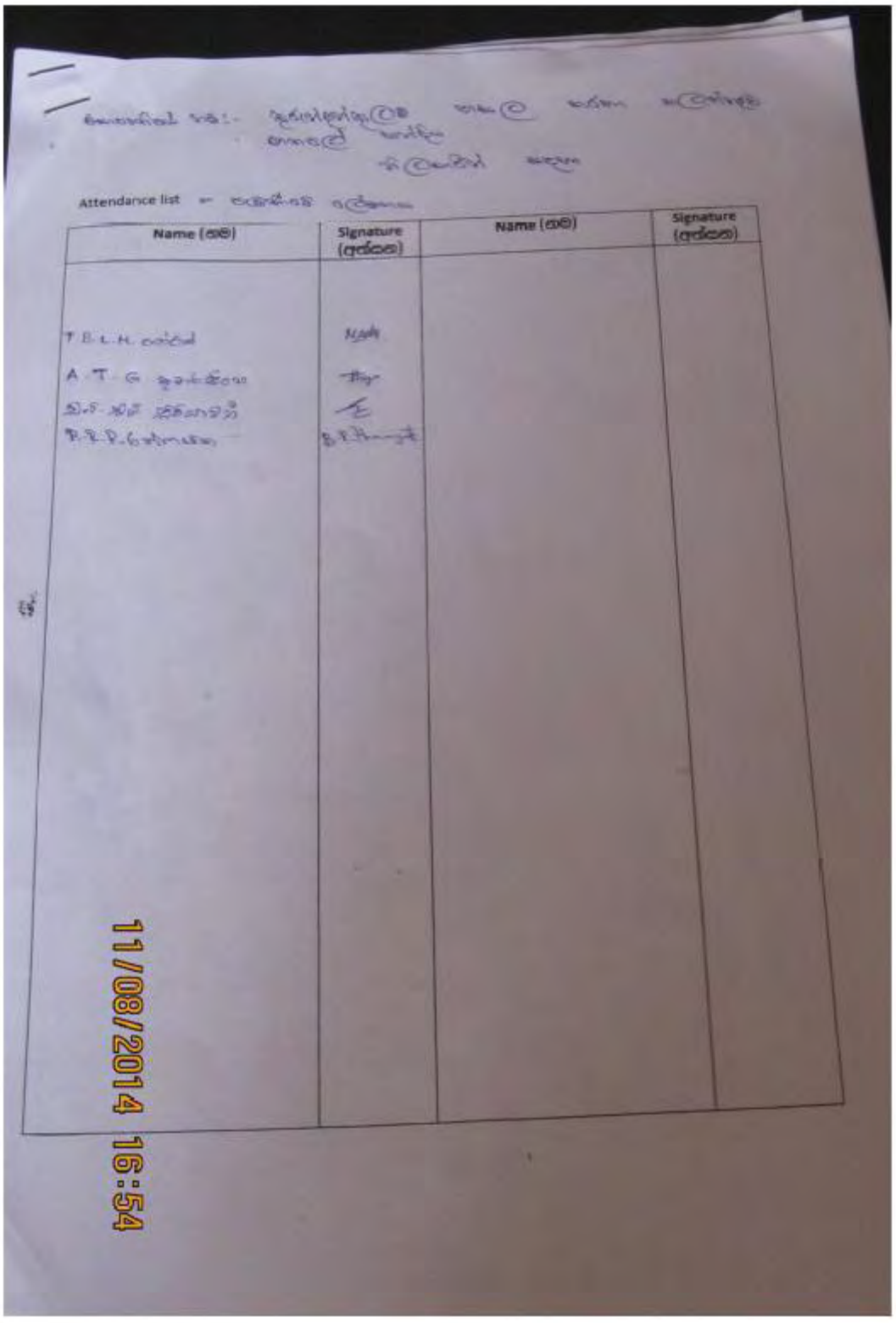

Attendance list

Name (නම)	Signature (අත්සන)	Name (නම)	Signature (අත්සන)
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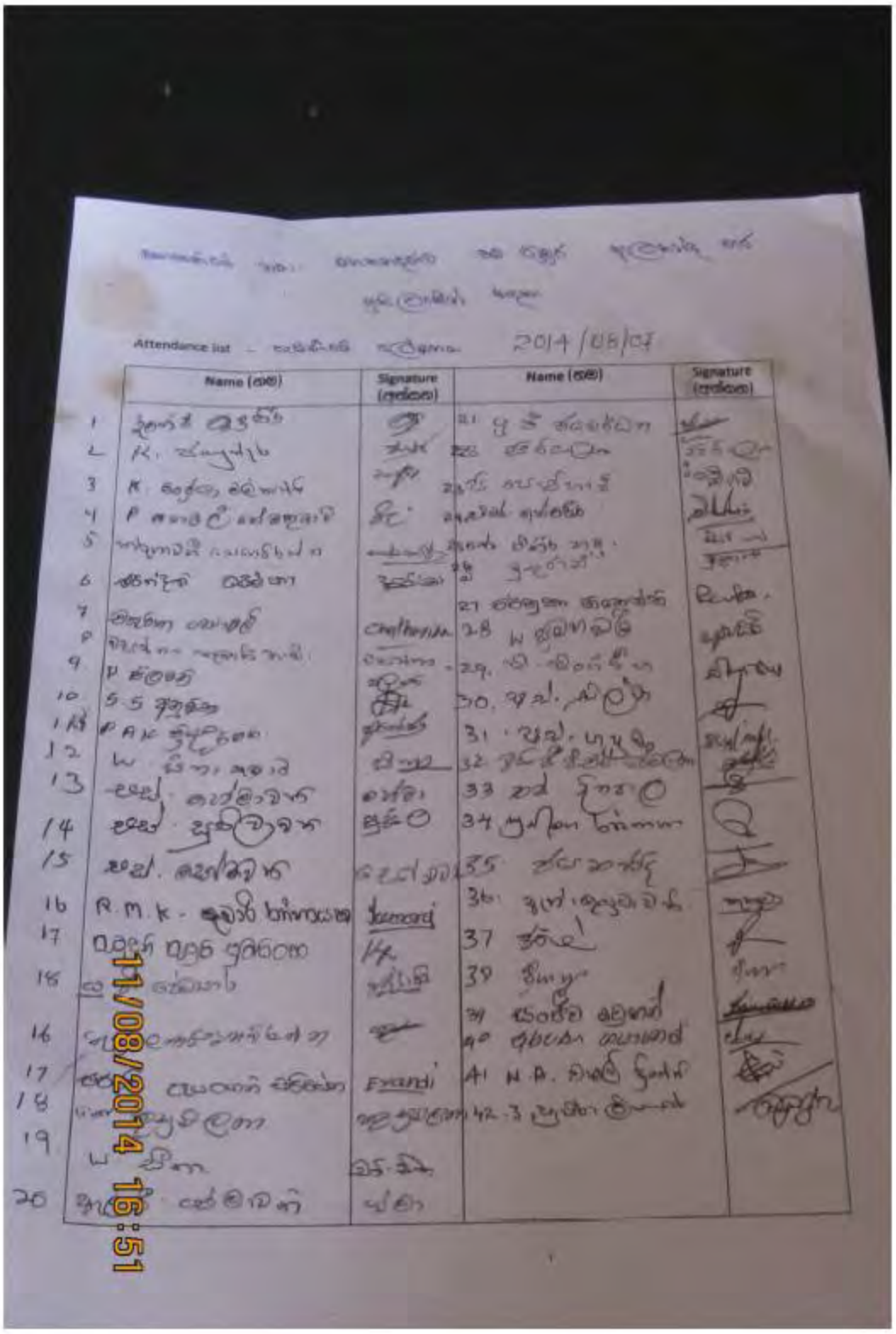
A.T.G.			

11/08/2014 16:54

FORMAT FOR RECORDING TRANSECT WALK & CONSULTATIONS WITH THE AFFECTED PERSONS

1) Name of Road:	Mahakanadarawa left bank Elakanda Road
2) Villages:	Mahakanadarawa Yaya 01,02,03
3) GND	Mahakanadarawa Yaya 01,02,03
4) District:	Anuradhapuraya
5) Date; Time:	07 Auguest,2014, at 11.00 hours
6) Total Number of Participants in theTransectwalk:	Forty Eight
7) Numbers of Participants falling in the following categories:	
Indigenous Persons:	None
Disabled:	None
Households losing structure:	None(No family is losing structures)
Women:	Thirty one
8) Name & Designation of the Key Participants: From RDA/PIU From PS/DSD/GND	Please refer the attendance sheet
9) Issues and suggestions raised by the Participants	
i) Road alignment and design in general	It was suggested to raise the road, because the road get under by water of rainy season
ii) Road width and land availability:	Even though the existing way was about 2.8 – 3.5 m wide there is sufficient ROW for road widening if required (3.00 - 4. 00m)
iii) Land owned/used by vulnerable groups of people:	No land adjacent to the ROW is inhabited by a group of vulnerable people
iv) Sensitive locations (forests, cultural properties,etc.):	A section of the existing road passes through a cultural property of Nuga tree. It may be removed. But all they like remove it, in case of developing road.
v) Water-related issues (drainage lines, rivers and water crossings, irrigation water courses, other water bodies, etc.):	There is a need of more Box culverts, culverts along the road. There is a water line in right side of the road. It may be removed the shoe bridge (sapatthu palama) and to be built necessary bridge
vi) Suggestion on location of Contractor's camp site:	-
vii) Suggestions on alternate routes during construction:	Not required as the ROW is sufficient for any temporary diversion
viii) Road safety-related issues (major junctions, curves, bends, hospitals, schools etc.):	Special sing boards will be required near the major junctions.
ix) Other suggestions (such as regarding cattle crossing, borrow pits, etc.):	None
10) Major Out comes of the Transect Walk (Summary):	
i) Changes / inputs to be incorporated in the design (alignment, road safety, drains, irrigation water crossing etc.)	Drains are required by them near their home land entrance. There are many canels in this village.
ii) Extent of land take and willingness / unwillingness of land owner / users for donation:	Not required as there is sufficient ROW
iii) Environmental issues to be resolved (Ponds, water logging etc.):	No such special issues to be resolved.
iv) Other issues:	None
11) Brief Summary of consultation held during transect walk:	
Major Issues discussed during the Consultation:	The need of expediting the road construction work was emphasized by the public Public was confident that the new road will be better

	road as it will be constructed by RDA
Recommendations of the Social Safe guard Specialist:	Provide sing boards . It must be taken permanent decision to the Canel system



Attendance list – 2014/08/07

	Name (නම)	Signature (අත්සන)	Name (නම)	Signature (අත්සන)
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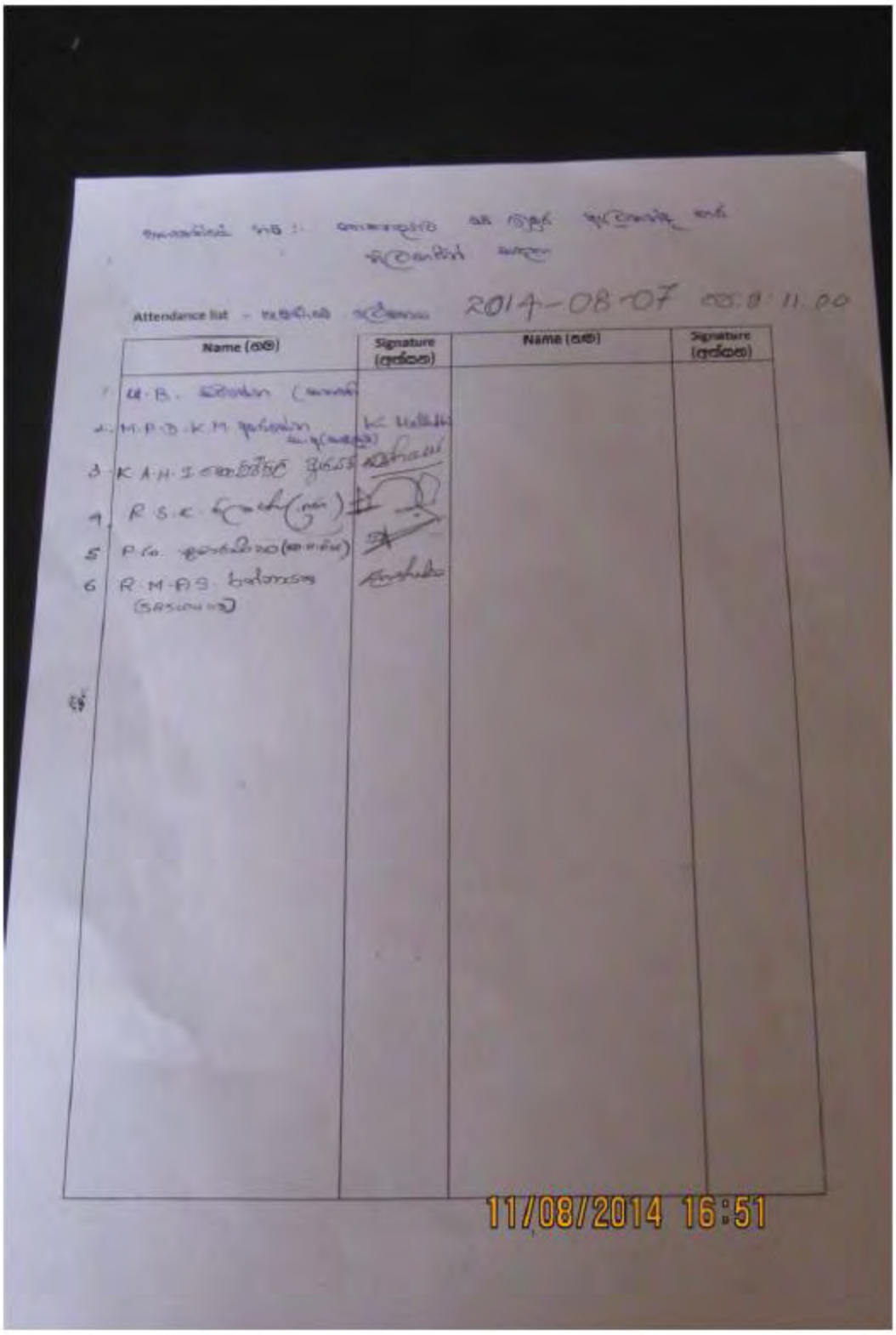

Attendance list – 2014-08-07 08.8 11.00

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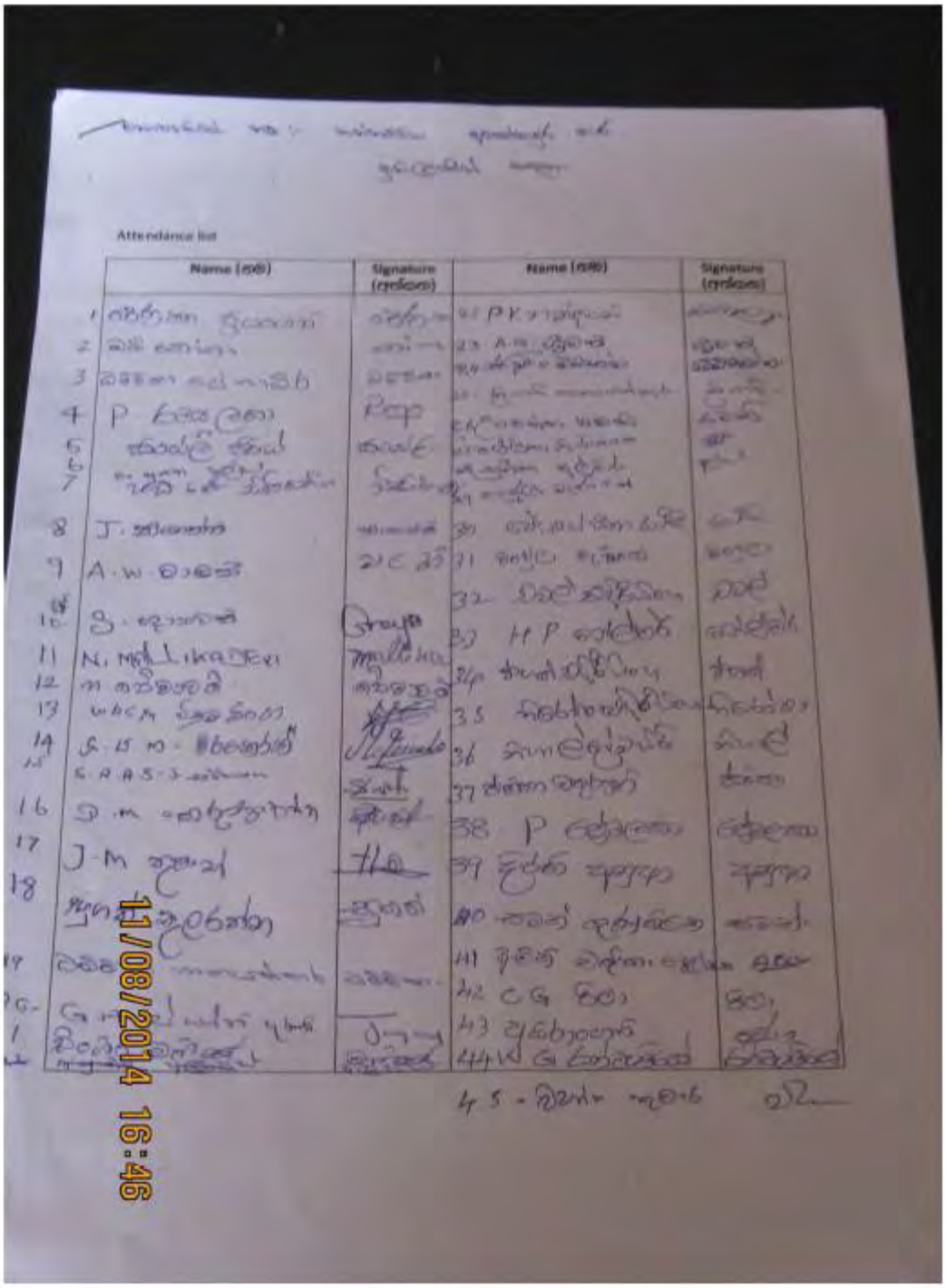
1	U.B.			
2	M.P.D.K.M			
3	K.A.H.I			
4	R.S.K.			
5	P.G.			
6	R.M.A.S.			

11/08/2014 16:51

FORMAT FOR RECORDING TRANSECT WALK & CONSULTATIONS WITH THE AFFECTED PERSONS

1) Name of Road:	Kannattiya Ashokapura Road
2) Villages:	Ashokapura
3) GND	Kannattiya
4) District:	Anuradhapuraya
5) Date; Time:	7 Auguest,2014, at 9.00 hours
6) Total Number of Participants in theTransectwalk:	Fifty One
7) Numbers of Participants falling in the following categories:	
Indigenous Persons:	None
Disabled:	None
Households losing structure:	None(No family is losing structures)
Women:	Thirty
8) Name & Designation of the Key Participants: From RDA/PIU From PS/DSD/GND	Please refer the attendance sheet
9) Issues and suggestions raised by the Participants	
i) Road alignment and design in general	It was suggested to raise the road, because the road get under by rainy season
ii) Road width and land availability:	Even though the existing way was about 3.00 – 3.5 m wide there is sufficient ROW for road widening if required (3.00 - 4. 00m)
iii) Land owned/used by vulnerable groups of people:	No land adjacent to the ROW is inhabited by a group of vulnerable people
iv) Sensitive locations (forests, cultural properties,etc.):	A section of the existing road passes a forest of reservation by government
v) Water-related issues (drainage lines, rivers and water crossings, irrigation water courses, other water bodies, etc.):	There is a need of more Box culverts, culverts along the road. There is a water line in side of the road.
vi) Suggestion on location of Contractor's camp site:	Many lands are available for the contractors to settle. It may be selected by the contractor As his wish.
vii) Suggestions on alternate routes during construction:	Not required as the ROW is sufficient for any temporary diversion
viii) Road safety-related issues (major junctions, curves, bends, hospitals, schools etc.):	Special sing boards will be required near the Mathale junctions.
ix) Other suggestions (such as regarding cattle crossing, borrow pits, etc.):	None
10) Major Out comes of the Transect Walk (Summary):	
i) Changes / inputs to be incorporated in the design (alignment, road safety, drains, irrigation water crossing etc.)	Drains system are required It may be leveled for Kannattiya Tank
ii) Extent of land take and willingness / unwillingness of land owner / users for donation:	Not required as there is sufficient ROW
iii) Environmental issues to be resolved (Ponds, water logging etc.):	No such special issues to be resolved.
iv) Other issues:	None
11) Brief Summary of consultation held during transect walk:	
Major Issues discussed during the Consultation:	The need of expediting the road construction work was emphasized by the public Public was confident that the new road will be better road as it will be constructed by RDA

Recommendations of the Social Safe guard Specialist:	Provide sing boards at Mathale junctions . It may be wided the road at Mathale junction



Attendance list

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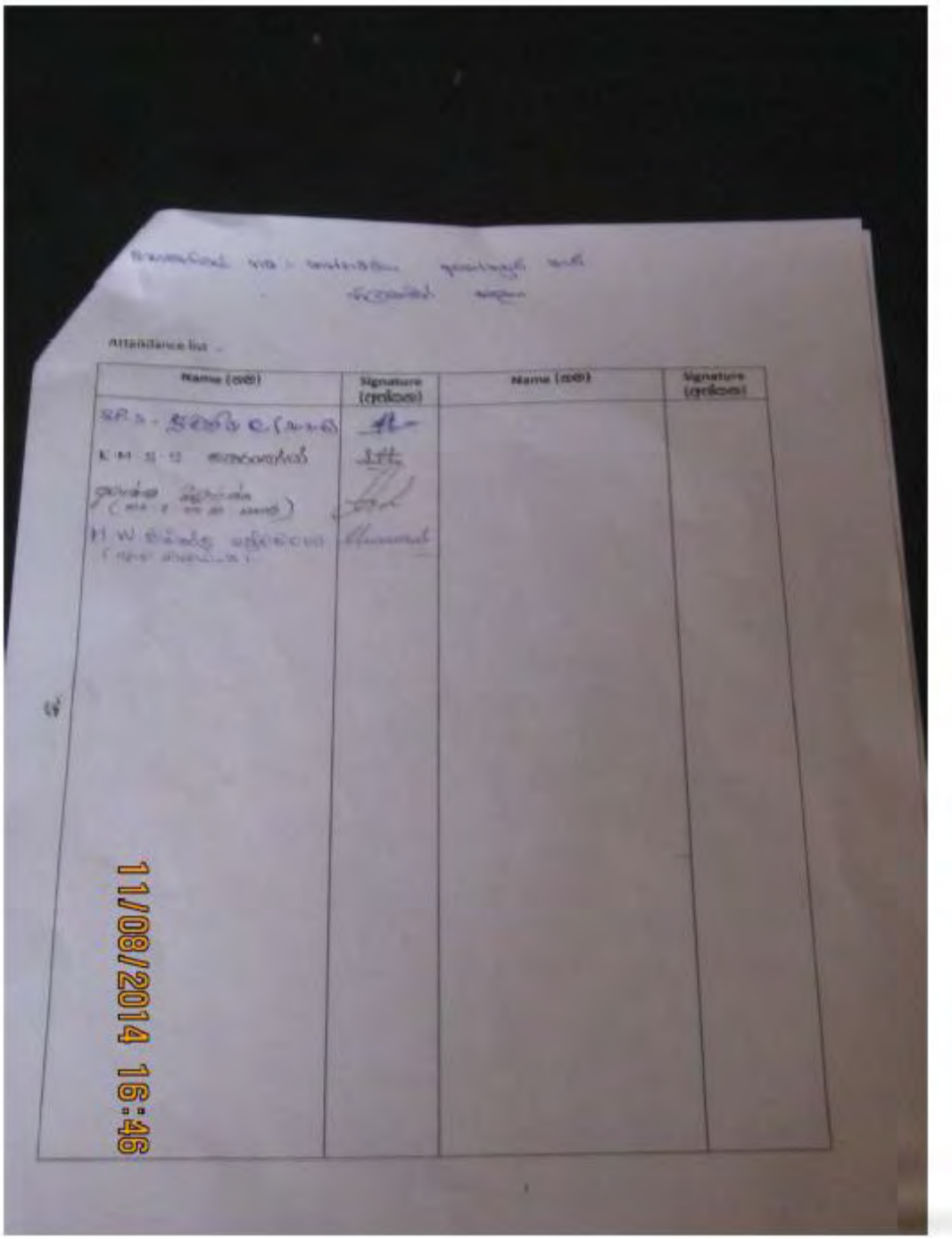
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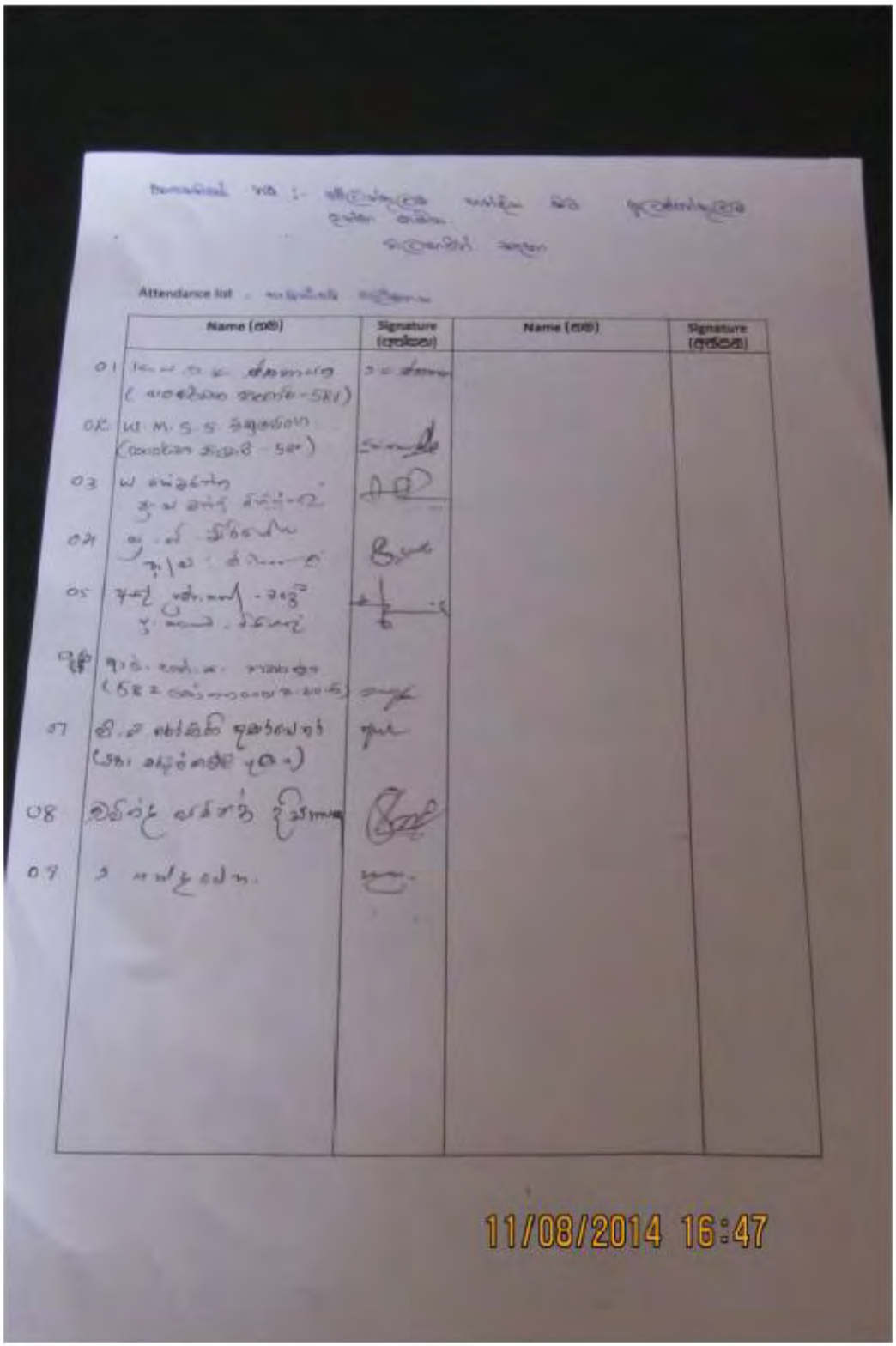
FORMAT FOR RECORDING TRANSECT WALK & CONSULTATIONS WITH THE AFFECTED PERSONS

1) Name of Road:	Welankulama Junction Alappankulama Road
2) Villages:	Kirindegaka, Karadikkulama, Elappankulama
3) GND	Bogahayaya, Maradankalla
4) District:	Anuradhapuraya
5) Date; Time:	7 Auguest,2014, at 12.30 hours
6) Total Number of Participants in theTransectwalk:	Sixty six
7) Numbers of Participants falling in the following categories:	
Indigenous Persons:	None
Disabled:	None
Households losing structure:	None(No family is losing structures)
Women:	Twenty
8) Name & Designation of the Key Participants: From RDA/PIU From PS/DSD/GND	Please refer the attendance sheet
9) Issues and suggestions raised by the Participants	
i) Road alignment and design in general	It was suggested to raise the road about 4 or 3 ft., because the road get under by water of rainy season
ii) Road width and land availability:	Even though the existing way was about 3.00 – 3.5 m wide there is sufficient ROW for road widening if required (3.00 - 4. 00m)
iii) Land owned/used by vulnerable groups of people:	No land adjacent to the ROW is inhabited by a group of vulnerable people
iv) Sensitive locations (forests, cultural properties,etc.):	A section of the existing road passes through a cultural property 0f temples
v) Water-related issues (drainage lines, rivers and water crossings, irrigation water courses, other water bodies, etc.):	It may be need to be built a bridge at Moodawa mahawatta. There is a need of more Box culverts, culverts along the road. There is a water line in side of the road.
vi) Suggestion on location of Contractor's camp site:	Many lands are available for the contractors to settle. It may be selected by the contractor As his wish.
vii) Suggestions on alternate routes during construction:	Not required as the ROW is sufficient for any temporary diversion
viii) Road safety-related issues (major junctions, curves, bends, hospitals, schools etc.):	Special sing boards will be required near the major junctions. It may be built round around
ix) Other suggestions (such as regarding cattle crossing, borrow pits, etc.):	None
10) Major Out comes of the Transect Walk (Summary):	
i) Changes / inputs to be incorporated in the design (alignment, road safety, drains, irrigation water crossing etc.)	Drains are required by them near their home land entrance
ii) Extent of land take and willingness / unwillingness of land owner / users for donation:	Not required as there is sufficient ROW
iii) Environmental issues to be resolved (Ponds, water logging etc.):	No such special issues to be resolved.
iv) Other issues:	None
11) Brief Summary of consultation held during transect walk:	
Major Issues discussed during the Consultation:	The need of expediting the road construction work was emphasized by the public Public was confident that the new road will be better road as it will be constructed by RDA

Recommendations of the Social Safe guard Specialist:	Provide sing boards at road junction.



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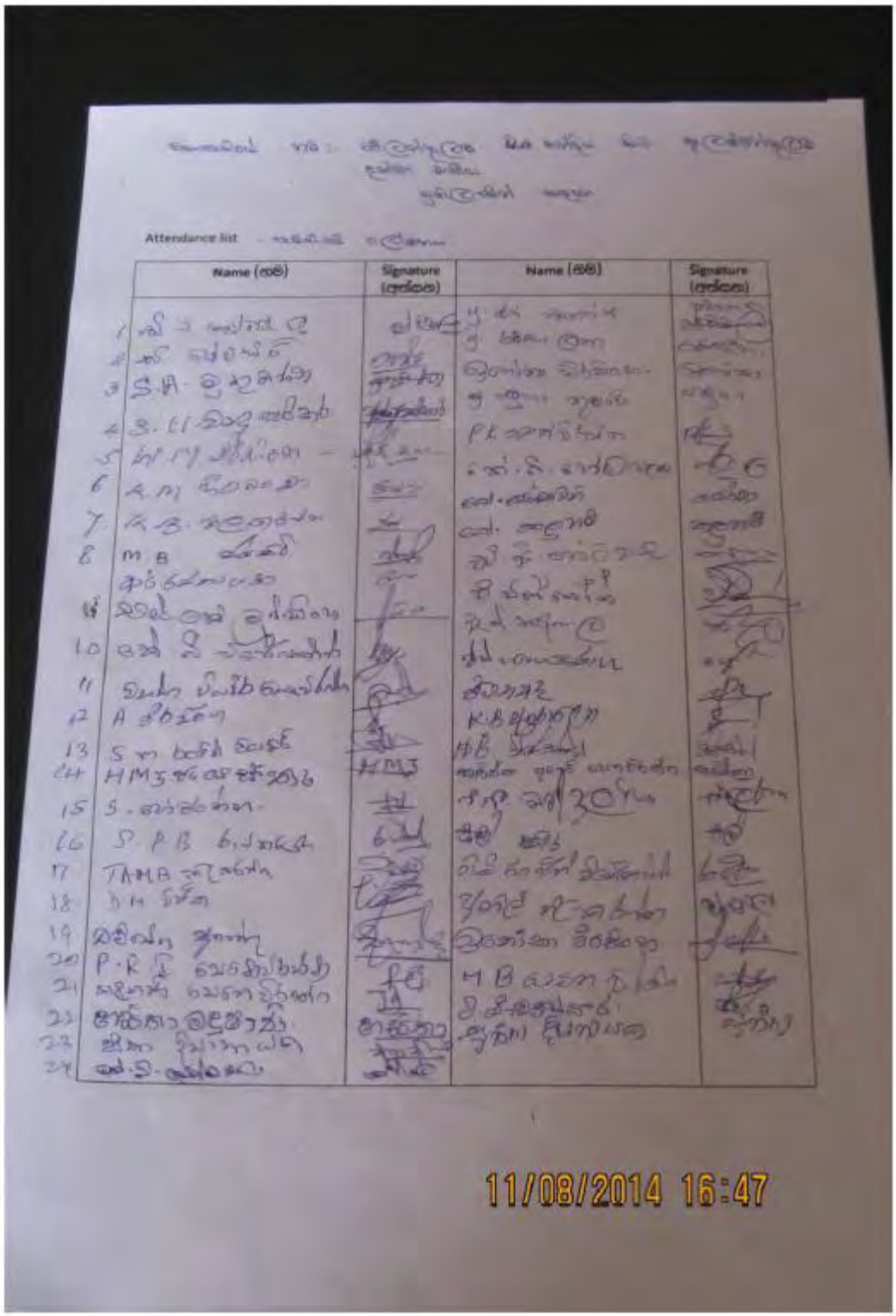

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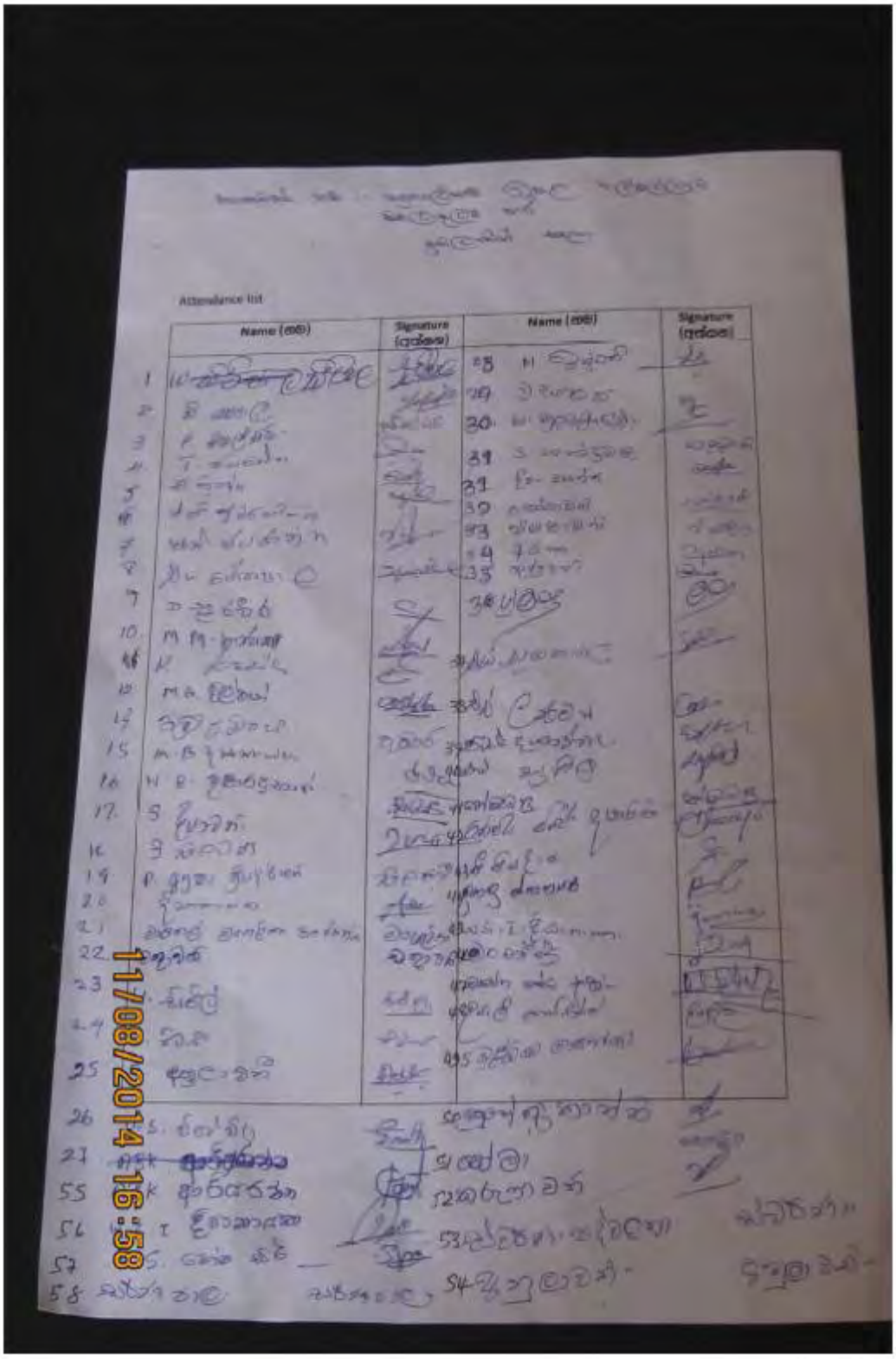
FORMAT FOR RECORDING TRANSECT WALK & CONSULTATIONS WITH THE AFFECTED PERSONS

1) NameofRoad:	Katukeliyawa, Ihala Halmillawa, Siwalakulama Road
2) Villages:	katukeliyawa, pahala Halmillawa, Ihala Halmillawa
3) GND	Katukeliyawa,Kattabuwagama
4) District:	Anuradhapuraya
5) Date; Time:	8 Auguest,2014, at 12.30 hours
6) Total Number of Participants in theTransectwalk:	Ninety Two
7) Numbers of Participants falling in the following categories:	
Indigenous Persons:	None
Disabled:	None
Households losing structure:	None(No family is losing structures)
Women:	Fifty one
8) Name & Designation of the Key Participants: From RDA/PIU From PS/DSD/GND	Please refer the attendance sheet
9) Issues and suggestions raised by the Participants	
i) Road alignment and design in general	It was suggested to raise the road, because the road get under by water of rainy season
ii) Road width and land availability:	Even though the existing way was about 2.8 – 3.5 m wide there is sufficient ROW for road widening if required (3.00 - 4. 00m)
iii) Land owned/used by vulnerable groups of people:	No land adjacent to the ROW is inhabited by a group of vulnerable people
iv) Sensitive locations (forests, cultural properties,etc.):	A section of the existing road passes through a cultural property of Temples
v) Water-related issues (drainage lines, rivers and water crossings, irrigation water courses, other water bodies, etc.):	There is a need of more Box culverts, culverts along the road. There is a water line in side of the road.
vi) Suggestion on location of Contractor's camp site:	Many lands are available for the contractors to settle. It may be selected by the contractor As his wish.
vii) Suggestions on alternate routes during construction:	Not required as the ROW is sufficient for any temporary diversion
viii) Road safety-related issues (major junctions, curves, bends, hospitals, schools etc.):	Special sing boards will be required near the major junctions, bends,hospital
ix) Other suggestions (such as regarding cattle crossing, borrow pits, etc.):	None
10) Major Out comes of the Transect Walk (Summary):	
i) Changes / inputs to be incorporated in the design (alignment, road safety, drains, irrigation water crossing etc.)	Drains are required by them near their home land entrance
ii) Extent of land take and willingness / unwillingness of land owner / users for donation:	Not required as there is sufficient ROW
iii) Environmental issues to be resolved (Ponds, water logging etc.):	No such special issues to be resolved.
iv) Other issues:	None
11) Brief Summary of consultation held during transect walk:	
Major Issues discussed during the Consultation:	The need of expediting the road construction work was emphasized by the public Public was confident that the new road will be better road as it will be constructed by RDA
Recommendations of the Social Safe	Provide sing boards at major junction.

guard Specialist:	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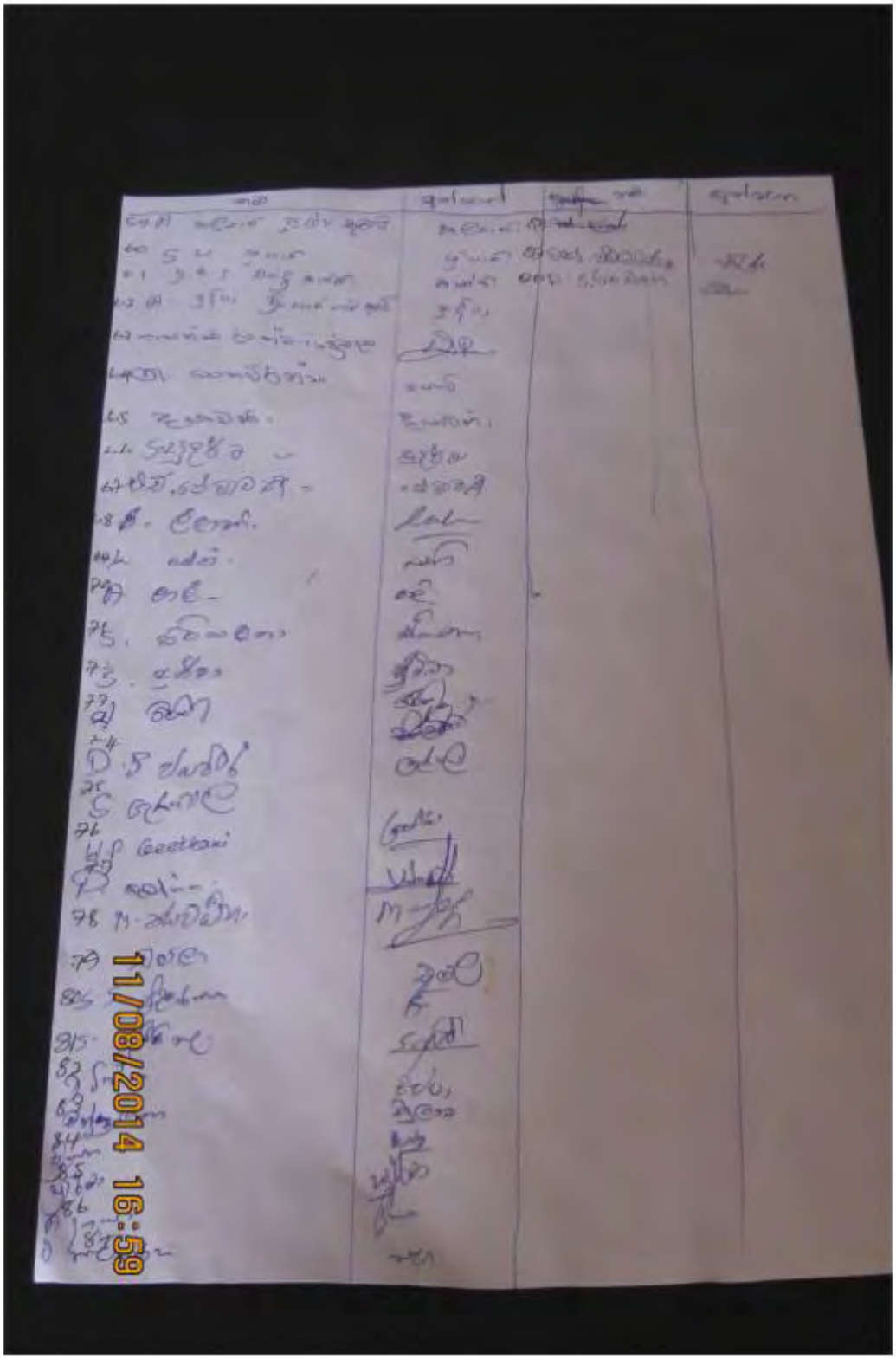
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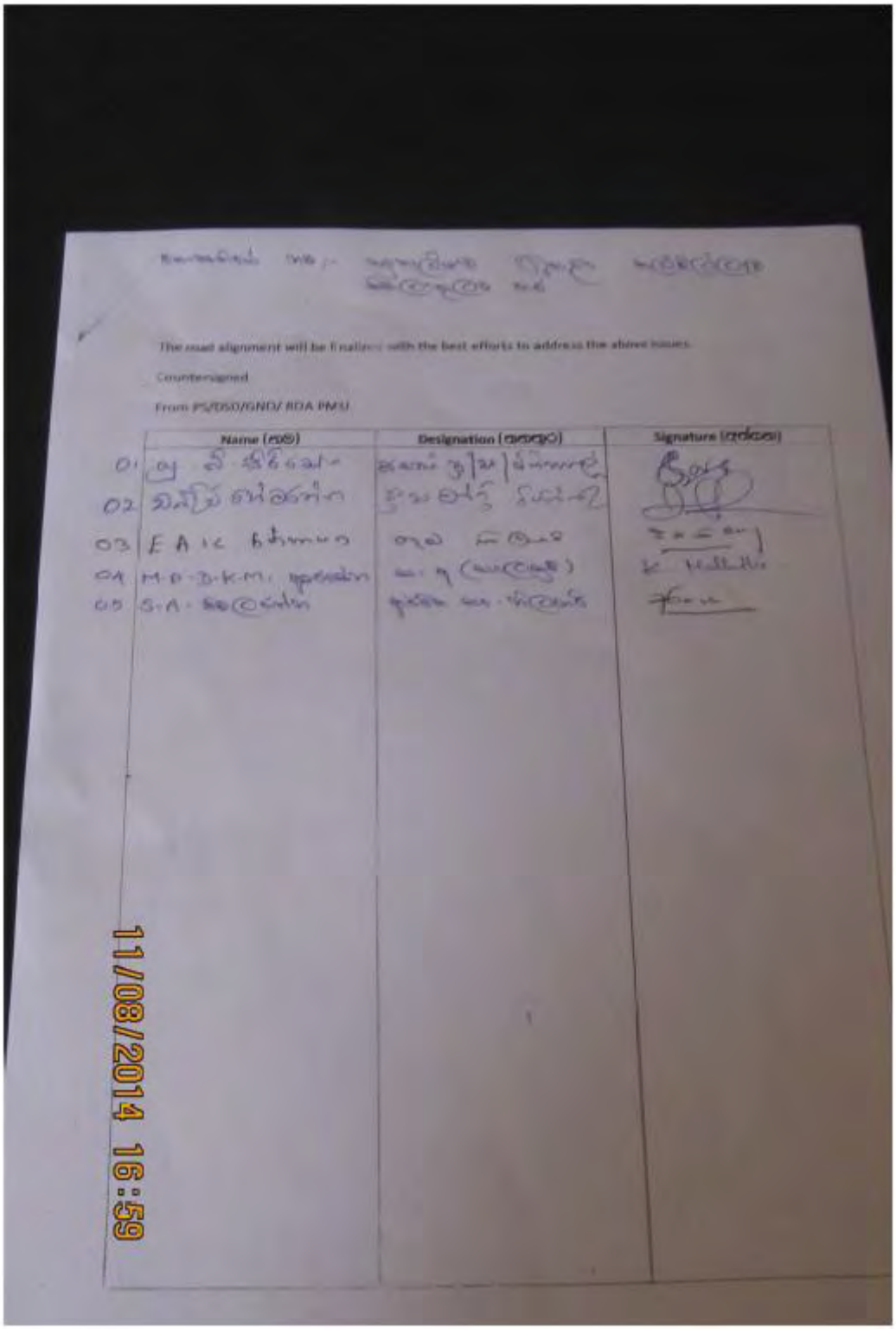

The road alignment will be finalized with the best efforts to address the above issues.

Countersigned

From PS/DSD/GND/ RDA PMU

	Name (නම)	Designation (තනතුර)	Signature (අත්සන)
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04	M.D.D.K.M.		
05	S.A.		

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