AfCAP
Africa Community Access Partnership

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Development of Low Volume Road Design Manuals and update of standard specifications and detailed drawings for three AfCAP member countries in West Africa

Peer Review Report for Sierra Leone and Ghana

Civil Design Solutions

Project No. RAF 2116A

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CIVIL DESIGN SOLUTIONS

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Cover photo: Rural Road in Sierra Leone

Quality assurance and review table

Version	Author(s)	Reviewer(s)	Date
Draft	R Geddes L-J Ebels S Barnes F Odametey G Hearn C Bopoto C Adams A Beckley	H Goldie-Scot (CDS)	9 July 2018
		P Agyekum (PMU)	28 September 2018
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Contents

Tables

Abstract

ReCAP is funding the preparation of manuals for Low Volume Roads for Liberia, Sierra Leone and Ghana. These draw on existing material available in these countries, as well as relevant documentation developed in other ReCAP participating countries. Inputs by local experts are supplemented by inputs by international experts with experience in rural roads. The preparation of the manuals includes local stakeholder participation through workshops and a peer review process.

In January 2018 a "zero draft" of each Part of the Sierra Leone and Ghana manuals was discussed at two-day in-country workshops. This enabled the preparation of the first draft of these manuals, which were then reviewed by National Peer Reviewers and an International Peer Reviewer. The purpose of the peer review process was to ensure that the documents are technically sound, of a consistently high quality, relevant to the target country, and free of errors.

The peer review of these two manuals was generally favourable concerning the scope and content of the manuals. Suggestions made for some possible restructuring have been considered by the authors and partially accepted in that some sections will be relegated to Annexes. Responses have been prepared to the detailed technical issues raised by the reviewers and resulting improvements will be incorporated in the final drafts. Minor errors noted by the reviewers will be corrected.

Key words

Manuals, Low Volume Roads, Capacity Building, West Africa

Acknowledgements

The authors would like to acknowledge the meticulous work carried out by the Peer Reviewers and their contribution to the successful outcome of the project.

Acronyms and Initialisms

AfCAP	Africa Community Access Partnership
ALCC	Association of Liberian Construction Contractors
CBR	California Bearing Ratio
CDS	Civil Design Solutions
CI	Complementary Intervention
DCP	Dynamic Cone Penetrometer
DFID	Department for International Development
DN	DCP Number (mm/blow)
EOD	Environmentally Optimised Design
EPA	Environmental Protection Authority
ESA	Equivalent Standard Axles
FR	Feeder Road
FRAMP	Feeder Roads Alternative and Maintenance Programme
FRP	Feeder Roads Programme
GIZ	Gesellschaft für Internationale Zusammenarbeit – German Development Agency
GPS	Global Positioning System
IRI	International Roughness Index
LSFRP	Liberian Swedish Feeder Roads Project
LVR	Low Volume Road
LVSR	Low Volume Sealed Road
M&E	Monitoring and Evaluation
MPW	Ministry of Public Works
MS	Microsoft
ORN	Overseas Road Note
PMU	Project Management Unit
RAI	Rural Access Index
ReCAP	Research for Community Access Partnership
SI	Site Investigation
TA	Technical Assistance
TRH	Technical Recommendations for Highways (RSA)
TRL	Transport Research Laboratory (UK)
UK	United Kingdom (of Great Britain and Northern Ireland)
USAID	United Stated Agency for International Development
WHH	Welthungerhilfe (Liberia)

1 Introduction

1.1 Background to the Project

The Research for Community Access Partnership (ReCAP) is seeking to influence future policy in the roads sector by helping ensure that recommendations arising from high quality research established under the Africa Community Access Partnership (AfCAP) Phase 1 are put into practice. As part of this approach, new design manuals specifically for Low Volume Roads (LVRs) customised to national needs and practice are being developed. Such manuals have so far been published under ReCAP/AfCAP in Ethiopia, South Sudan, Malawi, Tanzania, Mozambique and Kenya. These manuals are based on the results of over 30 years of research on low volume rural roads, both paved and unpaved.

1.2 Objectives

The objective of the project is to prepare manuals for low volume roads in Ghana, Sierra Leone and Liberia based on a review, adaption and expansion of previous AfCAP LVR manuals, local manuals that are available in these countries and other relevant international documentation.

The objective of the manuals is to provide, in each country, a relevant resource, based on recognised good practice, that will help build capacity and result in improved sector performance.

1.3 Approach

The approach to the development of the manuals has been extended beyond the original scope, which focussed mainly on road design standards. It is accepted that the sustainable provision of low volume rural roads depends on a holistic approach that also recognises the importance of other considerations including design procedures, works specifications, procurement of works and supervision services, construction methods, and quality management. Increasing emphasis is being given to road maintenance as part of rural roads asset management. The approach provides opportunities for local stakeholders to provide their input to the manuals preparation process to ensure that the final outputs are relevant to the local context.

1.4 Structure of the Manual

The basic structure of the manual is as follows:

- Part A: Policy, Geometric Design and Road Safety;
- Part B: Materials, Pavement Design and Construction;
- Part C: Hydrology, Drainage and Roadside Stabilisation;
- Part E: Maintenance (Liberia and Sierra Leone).

Part D is expected to comprise a manual on surfacings for low volume roads to be produced under a separate ReCAP research project.

1.5 Peer Review

The project is required to conduct a “national” and “international” peer review on the draft design manuals, revised specification and drawings. This is part of the process to finalise the project outputs. The purpose of the peer review is to ensure that the documents are technically sound, of a consistently high quality, relevant to the target country, and free of errors. The peer reviewers are required to review in detail each document provided for review including all text, figures and tables. The peer review is taking place after the second project workshops in each country and incorporation of feedback from the workshops into the draft manuals. The peer reviewers were asked to provide specific comments and recommendations through marked up MS Word versions of the documents using “track changes” and “comments”. The International Peer Reviewer provided checklists of key issues for each document reviewed and the National Peer Reviewers provided a short report on their overall findings.

The second workshops were held in Sierra Leone and Ghana in January 2018. As a result of delays due to the national elections, the second workshop for Liberia was postponed to May. The peer review process for Sierra Leone and Ghana has therefore proceeded in advance of that for Liberia.

The peer reviewers are as follows:

- International Peer Reviewer: Charles Bopoto;
- National Peer Reviewer for Sierra Leone: Akindele Beckley; and
- National Peer Reviewer for Ghana: Charles Adams.

1.6 International Peer Reviewer Checklists

In addition to providing marked-up versions of each draft document, the International Peer Reviewer prepared checklists of key issues reviewed. These are included as separate tables in Chapter 2 to Chapter 5. The checklists are largely common between the Sierra Leone and Ghana versions of the manual.

1.7 Marked up Drafts

The drafts of each part of the manuals, marked up with suggested corrections and comments by the peer reviewers, can be found in the project DropBox folders which have been shared with ReCAP management. The key issues arising from the peer review have been summarised in separate tables for each Part of the manual, together with a response from the authors of the manual. These tables are included in Chapter 2 to Chapter 5. The comments are largely common between the Sierra Leone and Ghana versions of the manual.

1.8 National Peer Reviewer Reports

In addition to marking up their respective manuals with suggested corrections and comments, the National Peer Reviewers provided short reports on their overall impression of the manuals. These are included in Chapter 6 (Sierra Leone) and Chapter 7 (Ghana).

2 Part A: Policy, Geometric Design and Road Safety

Table 1: International Peer Reviewer Checklist Part A

PART A: POLICY, GEOMETRIC DESIGN AND ROAD SAFETY (GHANA AND SIERRA LEONE)				
Section	**Item**	**Verified**	**Comments/Changes**	**Author's Response**
Branding	The purpose of the document is clear and complete.	☑	Clear; to apply to LVR with AADT<300.	No action required.
	The scope of the document is accurate and complete.	☑	Scope of document is very wide - Policy, Planning, Geometric Design, CI's. This led to cursory attentions to some aspects. Could have split the manual into two: Policy and Planning AND Geometric Design.	The intention is to provide only an overview of policy for rural roads and an introduction to planning techniques and options. A comprehensive planning manual is beyond the scope of the LVR manual.
	The title page includes agency information (e.g., logo, ministry name, department details, project and document title).	☑	Sierra Leone - Name of responsible ministry missing; maybe not necessary?	SLRA is the lead agency. Cover page will be verified by SLRA before final submission.
	Correct and current logos have been used.	☑		No action required.
	Version numbers and release dates are accurate.	☑	Still draft; however a pro-forma showing versions must be included eventually.	A date will be included on the cover of each document. Any updated versions will have an updated date and should include a sheet summarising the revisions made.
	All known audiences/customers/users are identified and named accurately.	☑	Listing of stakeholders and potential users recommended.	The target groups are summarised in Section 1.1.1 "Purpose of the Manual".
	Check the title page for text and correct use of styles.	☑		To be verified in final versions.
	Document allows users to submit comments in a transparent and easy-to-use manner.	☑	Not adequately provided for. Recommendations made in comments to document to provide stand-alone form and contact details etc.	The Preface advises users to submit comments in writing to the National Director of the SLRA or Director of DFR. It is not necessary to provide a standard form and it is unlikely that it would be used.
Pagination	The table of contents reflects correct page numbers and section names.	☑	Must be reviewed thoroughly at document publishing stage after edits etc.	The TOC is generated automatically by MS Word.

PART A: POLICY, GEOMETRIC DESIGN AND ROAD SAFETY (GHANA AND SIERRA LEONE)				
Section	**Item**	**Verified**	**Comments/Changes**	**Author's Response**
	Check for correct pagination at the beginning and end of each chapter.	☑		No action required.
	Spot-check three cross-references per chapter, especially to locations in other chapters.	☑		No action required.
	Check the first and last page number references for each chapter in the main table of contents.	☑		No action required.
	Look for page breaks that leave widows or orphans, and for lists or tables that are separated from their lead-in sentences.	☑	Figure A.1.4., Table A.3.2., Figure A.4.1., Table A.4.1., Table A.4.3., Figure A.5.1., Figure A.5.5., Table A.5.7., Figure A.5.7., Table A.5.12. have their lead in sentences on a different page. I guess these matters will be addressed at publishing stage.	Final formatting to be addressed at publishing stage.
	Notes separated from the previous paragraph.	☑		Final formatting to be addressed at publishing stage.
	Tables that flow to the next page with less than two rows (not counting the header row).	☑	**Sierra Leone**: The following tables flow to the next page with less than two rows: Figure A.1.2., Table A.4.2., Table A.5.7., Table A.7.1. ,…. Title of Table A.6.9. is on a different page. **Ghana:** Pg 26. Table A.3.3; Pg 32 Table A. 4.2; Pg104 Table A. 7.2; Pg 106 Table A. 7.3	Final formatting to be addressed at publishing stage.
	Procedure starting statements separated from procedure steps.	☑	5.6.2. Curve length: the locations are found on the next page.	Final formatting to be addressed at publishing stage.
	A single procedure step (a minimum of 2 procedure steps should be together).	☑		No action required.
	No single line paragraph (a minimum of two lines) Verify that no pages or sections are missing.	☑	There is extensive use of single line paragraphs in document; consider rewording or adding more information.	Noted. This will be looked into and single line paragraphs removed where possible.

PART A: POLICY, GEOMETRIC DESIGN AND ROAD SAFETY (GHANA AND SIERRA LEONE)				
Section	**Item**	**Verified**	**Comments/Changes**	**Author's Response**
Chapter titles, headers and footers	Header contains standard information (e.g., logo, document title).	☑		To be verified in final editing.
	Footer contains standard information (e.g., confidentiality statement, page number, date).	☑		To be verified in final editing.
	Headings match standard font, colour, size styles.	☑		To be verified in final editing.
	Body text matches standard font, colour, size styles.	☑	Thorough check required before publishing.	To be verified in final editing.
	Verify footer text is correct in all sections.	☑		To be verified in final editing.
	Verify that header and footer lines (if present) line up.	☑		To be verified in final editing.
Content Editing	The document flow and structure logical for the users to follow.	☑	The geometric design section needs cleaning up and improving. An element of repetition was detected – e.g. section on Standards relative to the one on Cross-sections.	Noted. This will be looked into and repetition removed.
	The document text is concise and clear.	☑	A number of sections are unnecessarily long-winded considering that relatively experienced persons are to use the document.	Noted. This will be looked into and the text shortened where possible.
	Document reads as a manual and is instructive? Not as guideline or text-book.	☑	The document provides excessive background information in many cases. Some parts read more as guidelines than as instructive manuals.	It is considered by the authors that it is better to err on the side of too much content n the main text of the manual than too little, while facilitating navigation through a modular structure. In the case of Sierra Leone there are no other reference documents for rural roads.
	Check headings for parallelism + coordination, topics at same level to same significance.	☑	Refer to comments in text.	Comments in text will be actioned.
	Check sub-headings for subordination and division, not less than two sub-headings.	☑	Refer to comments in text.	Comments in text will be actioned.

PART A: POLICY, GEOMETRIC DESIGN AND ROAD SAFETY (GHANA AND SIERRA LEONE)				
Section	**Item**	**Verified**	**Comments/Changes**	**Author's Response**
	Check for focus, sections should be balanced in terms of sub-sections, too many in one call for section to be separate document.	☑	Refer to comments in text.	Comments in text will be actioned.
	Check for missing sections, each section to have introductory and concluding para, sub-sections follow same trend in paragraphs.	☑	Refer to comments in text.	Comments in text will be actioned.
	Technical content is accurate and reflects current and best practice.	☑	Refer to comments in text.	Comments in text will be actioned.
	Adequate drawings have been provided and have necessary detail.	☑	**Sierra Leone**: Include standard drawings. **Ghana**: Part does not call for standard drawings; more of sketches. Photographs.	Standard drawings for road cross sections are included in Part A. Other standard drawings for LVRs are included in Part C. Many sketches are included. Additional photos will be included where possible.
	Useful and relevant case studies/situations have been cited.	☑	Not many given; some given are too summarised.	No information in this regard has been available for Sierra Leone. We are trying to keep the manual reasonably concise without losing relevant content. A case study has been included for MCA under Route Selection.
	Practical examples have been included.	☑	None.	Practical examples are provided in Part B and Part C. Authors will review potential for inclusion or expansion of examples in Part A.
Procedures	Checklists are provided and are adequate for the purpose intended.	☑	None provided. Consider including such for most processes e.g. MCA and prioritisation.	Several flow charts are provided. These serve as checklists. Some will be improved following comments from the Liberia workshop.
	All steps in the procedures are accurate and complete.	☑		No action required
	Check that procedures are numbered in sequence.	☑	Flowchart on selection of standard/cross-section has no clear hierarchy definition.	Noted. This will be clarified.
	Check that procedure steps are stated the same way.	☑	Variations exist in the Part as well as across manual. Some steps are simple statements and are not as instructive as they should be.	Noted. Any inconsistency will be sorted out at final editing stage. Simple statements will be elaborated as appropriate.

PART A: POLICY, GEOMETRIC DESIGN AND ROAD SAFETY (GHANA AND SIERRA LEONE)				
Section	**Item**	**Verified**	**Comments/Changes**	**Author's Response**
	All steps in the procedure are accurate and complete.	☑		No action required.
	Text and screen shots are accurate and complete.	☑	None used.	No action required.
	For software use all corresponding screen shots accurately display the current version of the software.	☑	None referred to.	No action required.
Graphics, Drawings	Check graphics for proper placement in relation to topic under consideration.	☑	Mostly in correct topics.	To be verified in final editing.
	Check there is enough space between them and the text that precedes and follows them.	☑	To be considered at publishing stage?	Final formatting to be addressed at publishing stage.
	Check quality of graphics for originality.	☑	Some need improvement; see comments in text.	Noted. Will attempt to source higher quality images, otherwise will need to be re-prepared.
	All charts, graphs, and diagrams are labelled accurately and consistently.	☑	Labelling is poor in some, refer to comments in text.	Comments will be actioned.
	Check that graphics are uniformly indented from the left side of the page.	☑	Must be finalised at publishing, after edits are completed.	To be verified in final editing.
	The standard drawings have full title block and correct details, drawing numbering clear.	☑	No standard drawings	Standard drawings have been provided for road cross-sections.
Notes, Citations and Cross References	In cross-references, check that the text drawn from the cross-referenced heading has quotes around it.	☑		To be verified in final editing.
	All URL addresses have been tested and work.	☑	None	No action required.
	All hyperlinks have been tested and work.	☑	None	No action required.

PART A: POLICY, GEOMETRIC DESIGN AND ROAD SAFETY (GHANA AND SIERRA LEONE)				
Section	**Item**	**Verified**	**Comments/Changes**	**Author's Response**
	Check completeness bibliography.	☑	A thorough scan must be completed; some documents published by GHA not included in bibliography.	GHA referenced will be added. Suggestions given in the marked-up version will be actioned.
Copy Editing	Scan for glaring errors and typos.	☑	Refer to in-document edits.	Suggestions given in the marked-up versions for spelling and grammar changes will be considered.
	Spelling and grammar check are complete.	☑	Refer to in-document edits.	Suggestions given in the marked-up versions for spelling and grammar changes will be considered.
	Scan for hyphenated words. There should be very few, used only for multiple-word phrases (like this one), and not for splitting long words.	☑	Very few found throughout the document.	Suggestions given in the marked-up versions for spelling and grammar changes will be considered.
	Scan for consistent use of styles.	☑	Styles are consistent throughout.	Suggestions given in the marked-up versions for spelling and grammar changes will be considered.
	All ACRONYMS are spelled out completely in the first instance or included in Table of Acronyms.	☑	A few were missing but were added on to the Table of Acronyms.	Missing initialisms and acronyms will be included in next draft.
	Correct grammar with subject/verb agreement.	☑	Refer to in-document edits.	Suggestions given in the marked-up versions for spelling and grammar changes will be considered.
	Check for proper capitalization.	☑	Capitalisation inconsistent with Designer Engineer half way through the document. PCU is capitalised in most instances and not in some cases.	Capitalisation will be reviewed and corrected for the final drafts.
Copyright	Sources of information acknowledged.	☑	Most information in standards tables may need source to be pointed out, consider accordingly.	Source will be clarified, including when it is the Ethiopia Manual for Low Volume Roads.
	Company-specific product names and industry terminology used consistently throughout the document.	☑	None used.	No action required.
	All safety, privacy, and/or other details are specified..	☑	Caution in use of some of the standards has been pointed out where necessary.	No action required.

Table 2: Peer Reviewer Comments and Author Responses, Part A

Item	Comments in Manuals from Peer Reviewers	Author's Response
Ghana Manual (most of these comments are also relevant to the Sierra Leone manual)		
Cover page	If it were allowable, to make the manual user friendly, the more it is disaggregated the better, in my opinion. The parts could be arranged as: A. Policy and Planning B. Geometric Design and Safety C. Materials, Pavement Design and Surfacings D. Hydrology, Drainage and Road Side Stabilisation E. Construction and Maintenance	Policy and planning documents and tools already exist for the roads sector in Ghana. There is no need for a new detailed planning manual. Policy and planning issues are covered only as an introduction and there is not sufficient material to warrant a separate manual. Road surfacing is expected to form a separate manual to be prepared under the ReCAP/Aurecon project- however it could be incorporated in Part B is it is not too substantial. No maintenance manual was requested for Ghana.
Preamble	Preamble or Preface? Sierra Leone manuals refer to Preface	To be discussed in the team. A Foreword or a Preamble are normally written by someone other than the author in order to add authority or credibility to the document, while a Preface is normally written by the author to clarify its scope and purpose. In the case of Part A both the Foreword (written by the Minister), and the technical Preamble (written by the Chief Director) are relevant to all Parts of the Manual, but are not repeated in other Parts, which simply start with a Preface prepared by the Author.
Preamble Manual Updates	It is suggested that this be taken out of the preface and a separate standardised revisions request form be inserted with contact details etc. The same must indicate where copies of the manual can be obtained, including websites if available	It is unlikely that there will be many submissions for changes to the manual. It is sufficient for these to be submitted in writing to the Director of the DFR who is responsible for coordinating any updates.
Chapter 1 Introduction	For greater impact, Sections 1 of all parts should be edited, and the certain elements be common to all parts, maybe as a Background and How to Use the Manual Tool. Or could be a separate part of the manual if there was re-ordering - as Part A – General? It is also proposed to insert a table that will be common to all Parts of the manual listing the Parts, with the subject part shaded/highlighted (ref to Ethiopia manual for an example).	The background and how to use the manuals are covered by the Foreword and Preface. There are only three (possibly four with surfacings) parts to the Ghana manual and these are listed in Section 1.1.2.
Fig. A.1.2	Include a key showing classes of roads. Note that map size may not make for easy reading.	Key will be provided. The map is only indicative of the extent of the road network in Ghana.
Section 1.2 Road Network Classification	“Geometric standard” as a term, is first introduced here; manual user gets the definitions of the types in Sub-sub section 5.3.12 wherein it becomes clear that it is about “Cross-section” type or configuration. This needs to be clarified early in the document	A definition of “Geometric Standard” will be included in the Glossary of Terms.
Section 1.2	Definitions to be revised in accordance with Maintenance Operation & RCS manuals. Large vehicles to be defined.	Definitions will be revised accordingly. A definition will be added for large Vehicle.

Item	Comments in Manuals from Peer Reviewers	Author's Response
Road Network Classification		
Section 1.2 Road Network Classification	Revise the table or chart to reflect fact that Inter Regional roads have higher standard than Regional Roads. There are many Urban (Metropolitan/Municipal/District) roads which have standards above LVR. Check if some national roads have les than 300 vpd as shown.	Table will be revised. Text will be included to explain that the classification table is indicative, and (for example) some national roads might have low traffic volumes.
Fig. A.1.3	Geometric Std/Type to be clarified & introduction to Type 1 - 4 reqd.	Additional text will be added to clarify classification scheme.
Section 1.5.1 Context Sensitivity	Should this section be subordinate to the foregoing Section 1.5 "The Environment"?	We will consider upgrading Section 1.5.1 to Section 1.6.
Section 1.5.1 Context Sensitivity	The sub-section needs to be supported with practical tools for use by the engineers or planners to address the many crucial aspects listed therein. One way is to guide the user to other documents that tackle these areas in detail – through hyperlinks or weblinks. Could also have simple pro-forma of sorts which assists user in gauging the status of the environment.	A description of each item in the Framework for Sustainable Provision of Low Volume Roads is given in the sections 1.5.1 to 1.5.8. This information is provided for information of the user of the manual. It's purpose is to provide a context for the provision of low volume roads but is not a key element of the manual that will be frequently referred to requires detailed explanation.
Section 1.5.2 Political Support	This paragraph, in my opinion, reinforces the call for a separate policy and planning manual that would guide the practitioners in dealing with politicians and the public (stakeholders). If politicians and stakeholders are not convinced, then the concept of LVR will always be viewed in a negative light. A separate Policy and Planning Manual would be a document that such constituencies can be referred to without being threatened by technical information	A separate Policy and Planning manual is not envisaged in the scope of this project. Ghana has clear policies for Rural Roads and planning tools within the DFR.
Fig. A.1.6	Should not the Politically supported box be client responsibility and shaded blue?	Political support is an external factor beyond the direct control of the road agency (the client).
Section 1.6 Policy and Legislative Controls	Section has very important pointers to how leakages from the road sector can be plugged. However, in this format users will simply read and not apply the suggested checks and balances. Authors are encouraged to find ways of incorporating checklists, sign-off forms, etc into the design process.	We assume that this comment refers to Section 1.7 Good Governance and Transparency. A checklist of data to be disclosed by procuring entities in provided in Figure A.1.8. Flow charts are provided throughout the manual for each principal design process, which act as checklists for the designer.
Chapter 2 Planning	Planning of LVR, or any class of road for that matter, must include planning in advance. This would include real life activities such as	Detailed guidance on planning is beyond the scope of the manual. It is covered by other existing documents in Ghana.

Item	Comments in Manuals from Peer Reviewers	Author's Response
	securing road servitudes, controlling development, planning for compensation etc. This maybe beyond the scope of the project??	
Section 2.2. Stages in the Planning Process: Prioritisation	This statement can be confusing to users of the manual. As worded, e.g. if a road is gravel and there is need to upgrade to paved, should it not be compared with other projects as part of feasibility studies.	Text will be clarified.
2.4 Planning Tools	Consider providing worksheets for these or referring user to proprietary information and software – where applicable. Section presents a broad information on a range of tools that will be very useful to planners and engineers, there is need to make them usable.	Detailed guidance on planning is beyond the scope of the manual. Such guidance is available elsewhere. Text will be added to explain this.
2.4.8 Stakeholder consultations Types of stakeholders	This could be included in the introductory section 1.0 as a full list of stakeholders. That would build ownership of the manual.	The list of stakeholders in the introductory section will be expanded.
2.4.8 Stakeholder consultations Consultation Techniques	If possible, guide users to resources that are applicable to LVR.	Additional references will be provided where possible.
Section 3.1	Change priority, to priority;	No, leave as is.
Section 3.1.2	Change text 'either a quantitative…'	No, leave as is.
Section 3.2 MCA Case Study	Case study too summarised; not usable by users to the extent it can be. Reads as an Executive Summary.	The text is succinct and can be understood. Permission would be required from AML to provide significantly more information.
Section 3.2	Include DEM in acronyms.	Agreed.
Section 4.2 Traffic Counts	Expand Chapter to include methods for NMT, motor cycles etc. Can include shorter count periods for very lowly trafficked roads – maybe counting only around a market day. Standard forms??	Additional text will be added. DFR standard traffic count form will be included.
Table A.4.2	Compare values to GHA RDG, SATCC, AASHTO Greenbook & SADC standards.	The given references will be consulted.
Table A.4.2	Compared to, e.g. SATCC standards, these characteristics are generally higher. Compare e.g. Turning radii for Truck and Trailer in SADC is 11m compared with 13.7m.	Data are taken from ERA LVR manual but will be checked against other regional guidelines.

Item	Comments in Manuals from Peer Reviewers	Author's Response
Table A.4.3	Type 4 = DV5 not included in Table A.4.2?	The error will be corrected.
Section 4.7.1	Consider insertion of a full example, with flowcharts showing how designer can use traffic survey results first before defaulting to some of the figures stated in the text.	The current worked example will be reviewed.
Section 5.1 How the Standards are Used	It is not immediately clear to the reader what standards are being referred to by this heading. This parent heading is not directly related to some of its lower levels. Consider making sub-sections to this level stand-alone sub-sections, reordered in a relevant manner	The standards are for low volume roads. This will be clarified. The layout of this section will be reviewed.
Section 5.2 How the Standards are Used	This section 5.2 is long-winded for a manual and can be seen as not being adequately instructive; reads more as a guideline. To ensure the manual comes across as practical document for everyday use, consider moving this information into an advisory annex.	The text comes from the ERA LVR Manual. It will be reviewed and sections taken to an annex as appropriate.
Section 5.2 How the Standards are Used	It is not immediately clear to the reader what standards are being referred to by this heading. This parent heading not directly related to some of its lower levels. Consider making sub-sections to this level stand-alone sub-sections, reordered in a relevant manner	The headings to the sub-sections and their level will be reviewed.
Section 5.2.4 Designing a New Road	Sub-section is attending more to planning issues than design. Manual user is not fully informed on what the difference to other types of design is.	Clarification will be provided in the text.
Section 5.2.5 Topographical survey	Provide practical guidance for designer: a table of types and extent of surveys would help. Could summarise this text into a practical decision flowchart.	This will be investigated and options assessed.
Section 5.2.6 Design Procedure – Selecting the Standard	Provide worked example and worksheets for ease of use by designers to complement the flowchart provided.	The design process is straightforward and guided by the flow chart. However we will review the need for a worked example.
Fig. A.5.1	Flowchart sequence has split steps for Step 1, refer to Step 1(s) and Step 1(b). Hierarchy of Steps 3, 4, and 5 not clear, consider having a full flowchart with one step sequentially after another	We will review the flow chart to make it clearer.
Section 5.3 Principal Factors	Consider making this section come before “How Standards are Used” Section because information given therein is more	This proposal will be considered and some text relegated to the annexes if appropriate.

Item	Comments in Manuals from Peer Reviewers	Author's Response
Affecting Geometric Standards	introductory than instructive. As per comments elsewhere above, this text could be relegated to an annex.	
Section 5.3.2Traffic Volume and Composition	Traffic vol. & composition not clear how affects geometrics?	This will be explained in more detail in the text.
Section 5.3.7 Safety	Use of wider shoulders? This needs to be qualified as wider shoulder without segregation triggers higher speeds and increases vulnerability of pedestrians.	A comment will be added to highlight this important issue.
Fig. A.5.2	Move table to section of Road Safety	This recommendation is being considered.
Section 5.3.8 Construction Technology	It may be important to mention and emphasise the non-use of child labour in any of the supply chain operations e.g., quarry	We will add a note on responsible labour practices.
Section 5.3.12	This is the part of the manual A that will be referred to the most. Make more prominent; Reference to “Standards” can be confusing as most aspects of the manual are standards – x-section, design speeds, horizontal and vertical alignment etc. Essentially this sub-section 5.3.12 is about selecting the appropriate cross-section, can make it more prominent to reflect the same.	We will consider elevating Section 5.3.12 to Section 5.4.
Section 5.4 Design Speed and Geometry	Sub-section contains key information on geometric design. The text is concise in some sub-sub-sections and not in the other. Users of the manual will benefit more from concise information	This text will be simplified and clarified.
Table A.5.1	Important to define what “populated” means. A design/operational speed of 50 is on the high side. Consider adopting 40km/hr	50km/h is the design speed, but actual speed limits might be set at lower levels.
Section 5.5 Cross Sections	Consider incorporating into Section 5.3.12 & include diagram showing cross-sectional elements	This will be considered and a diagram will be added.
Section 5.5.1 Width Standards	Consider aspect of wider cross sections in sharp curves and blind rises where single lane roads are provided.	Widening is covered in Section 5.6.3.
Section 5.5.1 Width Standards	*For LVRs with an AADT >75, with the exception of gravel roads, shoulders are recommended particularly if the proportion of heavy vehicles in the traffic stream is high* - This is not consistent with the DFR standards	DFR standards will be reviewed to ensure consistency.
Section 5.5.4	*No superelevation of unpaved roads* - does this not introduce unsafe conditions especially in sharp curves?	Design speeds are low on unpaved roads and vehicles drive in the centre of the road. On curves vehicles can (provided adequate sight distances are provided) move to the inside of the curve to benefit from the cross-fall

Item	Comments in Manuals from Peer Reviewers	Author's Response
		without providing superelevation. Superelevation is specified for all paved LVRs and unpaved secondary roads.
Table A.5.10	*Widening of single lane roads* - Full lane width widening for safety for paved roads is sometimes considered and applied.	Widening guidelines will be reviewed.
Section 5.7 Vertical Alignment	Include checklist for designers	The procedure for selecting design standards is summarised as a series of steps and a flow chart in Section 6.10 (previously Section 5.10). On higher traffic LVRs the vertical alignment is generated by a computer program from the topographical survey. On lower traffic LVRs the designer should check that any critical vertical curves comply with the required standards.
Section 5.8 Summary of Geometric Standards for each Road Type	Consider compiling these table and drawings as an Annex for ease of reference? Reference to Client? Must refer to responsible road authority functional within the same.	We prefer to retain these standards in the main part of the document. The responsible authority could be DFR or GHA.
Section 5.9 Harmonisation of Horizontal and Vertical Alignment	Consider incorporating a worksheet or checklist that can be used by designers. Information given here is very useful and critical in providing safe roads. Can also incorporate the checks in the section where horizontal and vertical standards are presented instead.	The issues to be considered are already presented concisely as a checklist. Cross references will be provided to the sections where horizontal and vertical standard are given.
Figure A.5.9	Use of 1:3 side slope for mountainous terrain may be impractical and not economical. Consider a steeper slope such as 1:2; 1:1.5	Steeper side slopes will be considered.
Chapter 6	Improve drawing quality & appropriateness to Ghana	Noted. Will attempt to source more appropriate & higher quality images, else will be reproduced.
Section 6.2 Traffic Signs	*It is therefore recommended that the judgement of an experienced road safety expert is obtained at the design stage* - Such experts may not be easy to come because of various constraints. Manual must adequately guide potential users.	For traffic signs the users are directed to the Ministry of Roads and Highways Standard Details, Road Signs and Markings for Urban and Trunk Roads (1991)
Section 6.4.2 Road studs	Add more information on types, placement, properties.	Additional information will be provided.
Section 6.6 Safety Barriers	Section too brief. Expand and include guard rails, etc	Additional information will be provided.
Section 6.7 Safety Audits	A simple check list may be useful for use by designers.	A checklist of key issues will be included.
Section 7.1 Context and Application	Throughout the Chapter there is reference to Contractor and Consultant. The chapter should be service provider neutral. Most likely, the manual will be mostly used by engineers and other	We will review the use of the words “consultant” and “contractor”.

Item	Comments in Manuals from Peer Reviewers	Author's Response
	personnel who will be in the direct employ of local authorities, or rural road agencies.	
	Sierra Leone Manual (additional issues to those listed under Ghana above)	
Cover page	If the Manual is to be applied by SLRA, districts and other agencies in Sierra Leone it may be more appropriate for ownership of the manual and standards to be with the Public Works Ministry.	SLRA is the lead agency for determining standards in the road sector in Sierra Leone.
Section 1.2 Road Network Classification	Is the length of each Category F available (breakdown of 4300km)	We will check the Feeder Road Policy and with SLRA.
Section 1.4 Definition of a Low Volume Road	In Sierra Leone climate severely affects road condition hence performance. Deterioration (material loss) is experienced both in the dry and wet seasons.	This point will be added to the text.
Section 1.6. Policy	*National Feeder Roads Policy (2011)*- Include as Annexure to manual for ease of reference by users, or weblink if available	The Policy is widely available in hard copy in Sierra Leone and is a fairly substantial document. It is not necessary or appropriate to include it as an annex.
Table A.1.2 Relevant Legislation	Include concise description of scope of each legislation.	Short descriptions will be provided.
Section 5.3.4 Roadside Population (Open Country or Populated Areas)	Typical cross section of Class A road is carriageway 7.3 metre and shoulder 1.5 metre on either side.	The standards are for low volume roads, not Class A roads.
Chapter 6 Road Safety	There remains a significant proportion of unreported accidents in Sierra Leone especially with Okaidas and Taxis The statement may be applicable to rural LVR.	This point will be noted in the text.
Fig. A.6.11	Road signs R75, IO1 etc not in Appendix	These signs will be added to the annex.
Fig A.6.15	M21 and M22 – not clear to the reader what these codes mean, if reference to line type then need to include in standard drawings.	More details will be provided.
Section 7.2 Planning, Identification and Implementation of CIs	This is relevant for all categories of roads. Focus should be on corridor development rather providing a road to link A and B. Emphasis should be where possible in promoting socio- economic activities that could eventually provide funding for the maintenance of the road. Corridor development must serve as a catalyst for development.	This point will be added to the text.

3 Part B: Materials, Pavement Design and Construction

Table 3: International Peer Reviewer Checklist Part B

PART B: MATERIALS, PAVEMENT DESIGN AND CONSTRUCTION (GHANA AND SIERRA LEONE)				
Section	**Item**	**Verified**	**Comments/Changes**	**Author's Response**
Branding	The purpose of the document is clear and complete	☑	Clear: to apply to LVR with AADT<300 or load <1.0msais in line with manuals for other SSA countries.	No action required.
	The scope of the document is accurate and complete	☑	Design of roads through greenfield situations could be expanded on. The DCP-DN procedure given focussed on existing roads that are being upgraded. Consider making Construction a stand-alone Part and including sections on construction from Part C; certain component in this part could also be carried to Part A, especially those dealing with effects on the communities	The DCP-CBR method is recommended for greenfield sites. The option of a stand alone construction manual was considered but it was decided that it would be too small to warrant a separate document.
	The title page includes agency information (e.g., logo, ministry name, department details, project and document title)	☑	Sierra Leone - Should the logo for Ministry of Works not be included?	The lead agency for the manual is the SLRA in Sierra Leone. A final decision will be made on this before publishing of the manuals.
	Correct and current logos have been used	☑		No action required.
	Version numbers and release dates are accurate	☑	To be inserted at publishing, still draft	The date at publishing will be included.
	All known audiences/customers/users are identified and name accurately	☑	Listing of stakeholders and potential users recommended in Section A and should be common for all parts	The target groups are summarised in Section A.1.1.1 "Purpose of the Manual".
	Check the title page for text and correct use of styles	☑		Will be checked for the final version.
	Document allows users to submit comments in a transparent and easy-to-use manner	☑	Not adequately provided for. Recommendations made in comments to document to provide stand-alone form and contact details etc.	The Preface advises users to submit comments in writing to the National Director of the SLRA or Director of DFR. It is not necessary to provide a standard form and it is unlikely that it would be used.

PART B: MATERIALS, PAVEMENT DESIGN AND CONSTRUCTION (GHANA AND SIERRA LEONE)				
Section	**Item**	**Verified**	**Comments/Changes**	**Author's Response**
Pagination	The table of contents reflects correct page numbers and section names	☑		This will be sorted out in final version
	Check for correct pagination at the beginning and end of each chapter	☑		This will be sorted out in final version
	Spot-check three cross-references per chapter, especially to locations in other chapters	☑		Cross-references will be checked for the final versions.
	Check the first and last page number references for each chapter in the main table of contents	☑		Table of contents will be checked.
	Look for page breaks that leave widows or orphans, and for lists or tables that are separated from their lead-in sentences	☑	Many paragraphs and tables are broken and flow from one page to the other. This was taken as a matter to be attended to at publishing stage	This will be sorted out before final publishing.
	Notes separated from the previous paragraph	☑	See above comment	This will be sorted out before final publishing
	Tables that flow to the next page with less than two rows (not counting the header row)	☑	Many paragraphs and tables are broken and flow from one page to the other. This was taken as a matter to be attended to at publishing stage	This will be sorted out before final publishing
	Procedure starting statements separated from procedure steps	☑		This will be sorted out before final publishing
	A single procedure step (a minimum of 2 procedure steps should be together)	☑		This will be sorted out before final publishing
	No single line paragraph (a minimum of two lines)	☑	The single line paragraphs are highlighted within the document.	We will go through the document and address where this occurs.
Chapter titles, headers and footers	Header contains standard information (e.g., logo, document title).	☑		No action required.
	Footer contains standard information (e.g., confidentiality statement, page number, date).	☑		No action required.
	Headings match standard font, colour, size styles.	☑	Thorough check required; there is variation in use of CAPS and smalls in headings.	This will be sorted out before final publishing.

PART B: MATERIALS, PAVEMENT DESIGN AND CONSTRUCTION (GHANA AND SIERRA LEONE)				
Section	**Item**	**Verified**	**Comments/Changes**	**Author's Response**
	Body text matches standard font, colour, size styles.	☑	Largely uniform, final check required at publishing.	This will be sorted out before final publishing.
	Verify footer text is correct in all sections.	☑		No action required.
	Verify that header and footer lines (if present) line up.	☑		This will be sorted out before final publishing.
Content Editing	The document flow and structure logical for the users to follow.	☑		No action required.
	The document text is concise and clear.	☑	Some sections can be edited to be more concise, see comments in document.	We have done this to a certain extent already in preparing the working documents / revisions so far. Some material has been placed in annexes. We will have another go at this based on review comments and updating.
	Document reads as a manual and is instructive? Not as guideline or textbook.	☑	Worksheets can help users apply the methods proposed. Otherwise manual is in line with others produced in Malawi, Ethiopia, Tanzania, etc.	We tried to include practical examples where appropriate and probably taken it a bit further than other comparable manuals.
	Check headings for parallelism + coordination, topics at same level to same significance.	☑	Refer to comments in text.	Comments will be actioned.
	Check sub-headings for subordination and division, not less than two sub-headings.	☑	Refer to comments in text.	Comments will be actioned.
	Check for focus, sections should be balanced in terms of sub-sections, too many in one call for section to be separate document.	☑	Refer to comments in text.	Comments will be actioned.
	Check for missing sections, each section to have introductory and concluding para, sub-sections follow same trend in paragraphs.	☑	Refer to comments in text	Comments will be actioned.
	Technical content is accurate and reflects current and best practice.	☑	Refer to comments in text	Comments will be actioned.
	Adequate drawings have been provided and have necessary detail.	☑	Include standard drawings	There are no standard drawings for pavements and materials.

PART B: MATERIALS, PAVEMENT DESIGN AND CONSTRUCTION (GHANA AND SIERRA LEONE)				
Section	**Item**	**Verified**	**Comments/Changes**	**Author's Response**
	Useful and relevant case studies/situations have been cited.	☑	Not many given	Where information was available, we have included this
	Practical examples have been included.	☑	None	There are worked examples in the appendices.
Procedures	Checklists are provided and are adequate for the purpose intended.	☑	Consider providing worksheets, pro-forma for use by designers; could also include guidance in preparing design reports.	We will discuss the use and inclusion of worksheets further within the team. Flow charts are provided in the manual showing the steps in the design process.
	All steps in the procedures are accurate and complete.	☑	See comments in documents, some procedures need augmentation.	Comments will be actioned.
	Check that procedures are numbered in sequence.	☑		Procedures are numbered in sequence.
	Check that procedure steps are stated the same way.	☑	Varies amongst parts.	Noted. Any inconsistency will be sorted out at publishing stage.
	Adequate reference is made other relevant procedures or methods.	☑	Accepted testing procedures can be listed and source of guidelines provided (as an Annex).	Manual includes extensive references and includes standard test procedures in tables in the main document.
	Text and screen shots are accurate and complete.	☑	Screenshots of DCP software included; ensure are legible in final document.	This will be sorted out in final version.
	For software use all corresponding screen shots accurately display the current version of the software.	☑	Yes, for DCP. Include details of how the software can be purchased of obtained; link to a website?	Good suggestion, will be included.
Graphics, Drawings	Check graphics for proper placement in relation to topic under consideration.	☑	Mostly in correct topics	No action required.
	Check there is enough space between them and the text that precedes and follows them.	☑	To be considered at publishing stage?	Final formatting will be carried out after agreement on the technical content.
	Check quality of graphics for originality.	☑	Some need improvement; see comments in text; labelling is poor.	Noted. Will attempt to source higher quality images or will reproduce those that are not clear.
	All charts, graphs, and diagrams are labelled accurately and consistently.	☑	Labelling is poor in some, refer to comments in text.	Comments will be actioned.
	Check that graphics are uniformly indented from the left side of the page.	☑	Must be finalised at publishing, after edits are completed.	Final formatting will be carried out after agreement on the technical content.

PART B: MATERIALS, PAVEMENT DESIGN AND CONSTRUCTION (GHANA AND SIERRA LEONE)				
Section	**Item**	**Verified**	**Comments/Changes**	**Author's Response**
	The standard drawings have full title block and correct details, drawing numbering clear.	☑	No standard drawings.	Not applicable to Part B
Notes, Citations and Cross References	In cross-references, check that the text drawn from the cross-referenced heading has quotes around it.	☑		No action required.
	All URL addresses have been tested and work.	☑	None.	No action required.
	All hyperlinks have been tested and work.	☑	Numerous links to tables and figures have been broken; restore.	This will be done and all cross-references to tables and figures will be restored.
	Check completeness bibliography.	☑	A thorough scan must be completed; some documents published by GHA not included in bibliography.	Noted. This will be checked.
Copy Editing	Scan for glaring errors and typos.	☑	Refer to in-document edits.	Comments will be actioned.
	Spelling and grammar check are complete	☑	Refer to in-document edits.	Comments will be actioned.
	Scan for hyphenated words. There should be very few, used only for multiple-word phrases (like this one), and not for splitting long words.	☑	Very few found throughout the document.	No action required.
	Scan for consistent use of styles.	☑	Styles are largely consistent throughout.	No action required.
	All ACRONYMS are spelled out completely in the first instance or included in Table of Acronyms.	☑	A few were missing but were added on to the Table of Acronyms.	Added initialisms and acronyms will be included.
	Correct grammar with subject/verb agreement.	☑	Refer to in-document edits.	Comments will be actioned.
	Check for proper capitalization.	☑	Refer to in-document edits.	Comments will be actioned.
Copyright	Sources of information acknowledged.	☑	On the whole sources have been acknowledged, final check required.	Will be checked in final review.
	Company-specific product names and industry terminology used consistently throughout the document.	☑	None used.	No action required.

PART B: MATERIALS, PAVEMENT DESIGN AND CONSTRUCTION (GHANA AND SIERRA LEONE)				
Section	**Item**	**Verified**	**Comments/Changes**	**Author's Response**
	All safety, privacy, and/or other details are specified.	☑	Caution given where necessary in the use of the manual's recommendations.	Noted. No action required.

Table 4: Peer Reviewer Comments and Author Responses, Part B

Chapter	Section	Table/Figure	Reviewer	Comment / suggested change	Response / action taken
Cover page			CTB	If it were allowable, to make the manual user friendly, the more it is disaggregated the better, in my opinion. The parts could be arranged as: F. Policy and Planning G. Geometric Design and Safety H. Materials, Pavement Design and Surfacings I. Hydrology, Drainage and Road Side Stabilisation Construction and Maintenance	See response to same query in Table 2.
Preface			CTB	Preface must largely be about Part B	Preface will be edited to make it more relevant to Part B.
Preface			CTB	Preface or Preamble – Part A refers to **Preamble**	To be discussed by the team leaders. Part A is intended to include (in the Foreword and technical Preamble) some political endorsements and descriptions of the entire manual that are not repeated in subsequent parts, which instead start with a Preface written by the authors.
Foreword			CTB	Also include the foreword from part A in this manual for completeness.	To be discussed by the team leaders.
Manual Updates			CTB	Make stand-alone section with pro-formas for recording version, requesting copies, noting corrections required, guiding user to website for accessing this and other parts as pdf files	See response to same query in Table 2.
List of Figures			CTB	Labelling of figures could exclude the B. for neatness. Whenever a figure from another part is referred to it will always be prefixed with reference to the Part: e.g. “Part A Figure 1.1”. The same is suggested for Tables.	To be discussed by the team leaders.
1 Introduction	1.2		CTB	Define “Standard” early in the document for users to understand this text and Figure 1.2 below	“Standard” will be added to the Glossary.
1 Introduction	1.2		CTB	Create a separate sub-section on LoS and provide statement of adoption of these standards by GHA. These definitions closely mimic the	The Foreword will be signed by the Minister, signifying that the government endorses the standards (including

Chapter	Section	Table/Figure	Reviewer	Comment / suggested change	Response / action taken
				HCM Manual albeit with a useful adaptation for local use.	those related to Level of Service) described in the manual.
1 Introduction	1.2	Figure B.1.2	CAA	Please make the changes indicated in Part A of the LVR manual to reflect the limits of LVR in Ghana	Changes will be made as noted in Table 2.
1 Introduction	1.7		CTB	Indicate how the EOD approach is applied in this manual	Additional text will be added after discussing with the Team Leader.
1 Introduction	1.6.3	Table B.1.1	CTB	Headings for each column to aid understanding?	Headings will be updated.
1 Introduction	1.8.1		CTB	This aspect is not demonstrated in the manual; the manual encourages detailed analysis to arrive at optimised solutions; thereafter there is no deliberate reduction of number or thickness of layers.	Yes, we will have another critical look at the pavement design catalogues and outcomes of the proposed methods in relation to the layer thicknesses, no. of layers and material usage.
1 Introduction	1.8.2		CTB	Indicate relative reduction in P_0(tyre pressure) for a typical situation, as an example.	We will look into this and include a practical example if appropriate
1 Introduction	1.8.5		CTB	Title of figure not referring to stages in upgrading	Will change title to "stages of upgrading in relation to demand on resources"
2 Traffic Loading	2.4		CTB	Well structured section, consider using this in Part A for both Ghana and Sierra Leone; Section could come before Section 2.2 in this subject manual.	To be discussed in the team whether to include this section in Part A. However, it should not be repeated in Part A and Part B.
2 Traffic Loading	2.2.2	Table B.2.1	CTB	Link to IRI implied in Figure B.2.2 and associated text not clear. Especially for gravel roads – it is not practical to relate design life to IRI for unpaved roads	Design life is not directly linked to IRI here, however an explanation of riding quality and IRI is needed to place some context on the link between travel speed, riding quality and LoS.
2 Traffic Loading	2.2.2		CAA	Example is not consistent with the diagram below. Fig B 2.2	Will be updated to 50 km/h.
2 Traffic Loading	2.2.4		CTB	Include the importance of examining development plans pertaining to the road to be designed; cases of mines or factories opening can introduce large volumes of new traffic.	Noted and will be added.
2 Traffic Loading	2.2.5		CTB	Procedure must take into account the likely growth in axle load equivalency factors, not just volume of traffic as set out in previous steps.	Each vehicle class can be assigned its own growth rate if needed. This is indicated in the first sentence of step 6.

Chapter	Section	Table/Figure	Reviewer	Comment / suggested change	Response / action taken
2 Traffic Loading	2.2.5	Table B.2.2	CTB	Applicability/application of this column not clear.	We will add clarification, because there is use for it.
2 Traffic Loading	2.2.5		CAA	8200?	Will be changed to 80 kN.
2 Traffic Loading	2.4.2		CTB	Volumes fall on all types of roads or unpaved? This statement maybe too sweeping.	This is a general statement, it is not intended for the practitioner to use this to calculate dry/wet season traffic. It is meant to illustrate the importance of timing of the survey.
2 Traffic Loading	2.4.2	Table B.2.6	CTB	Include motor cycles and NMTs.	This is not needed for pavement design.
2 Traffic Loading	2.4.4		CTB	This is a very practical method; indicate likely level of accuracy if known.	Typical values are provided, which have a reasonable accuracy. In the absence of actual axle load data, it is the next best thing.
2 Traffic Loading	2.4.5	Adjustment for season	CAA	Check whether Mw+Md=12	Note to be added that Mw+Md=12.
3 Site Investigation	3.2.1		CTB	Indicate sources (of mapping), guide on how they are obtained, include contacts, could tabulate. This is practical information that road designers value and desperately. Same for rainfall, land use, climate, masterplans etc	Reference is made to the Geological Survey Authority. Providing names and numbers is not standard practice and would become superseded very quickly.
3 Site Investigation	3.2.1		AB	Confirm the Directorate of Geological Surveys in SL is the correct name.	Yes, correct.
3 Site Investigation	3.3		CTB	Section has invaluable text that can be made part of Section 1 of all parts to fully describe the design process. In this section it must focus on site investigations only as it feeds into pavement design; lest designers be lost in the text and ignore or miss the vital components.	Good suggestion which will be discussed in the team for appropriate action.
3 Site Investigation	3.5		CTB	Put Subgrade Assessment as far as 3.5.1 Trial pitting in an appendix.	Good suggestion. Detailed and specialist text could be moved to an appendix. Will be discussed in the team.
3 Site Investigation	3.2.1		CTB	If website is available provide link.	Link will be provided.

Chapter	Section	Table/Figure	Reviewer	Comment / suggested change	Response / action taken
3 Site Investigation	3.5.1		CTB	It is recommended to move all text before this heading to a guideline/advisory annex. Sub-section 3.5.1 onwards give the information that will largely be referred to by designers.	Good suggestion which will be discussed in the team for appropriate action.
3 Site Investigation	3.5.1		CTB	Consider listing relevant test methods and standards in a table for all site investigations; also to indicate where official documents of the same can be obtained.	BS5930 contains text, tables and diagrams for site investigation. It is not necessary to repeat these in the manual.
3 Site Investigation	3.8.4		AB	Is crushed rock suitable as base course on LVRs?	Yes, if no natural gravels are available.
3 Site Investigation	3.8.5		CTB	This text appears to belong elsewhere – cross-check.	The text is part of prospecting, and so is not out of place.
3 Site Investigation	3.8.6	Table B.3.9	CTB	Could include tests to determine suitability for cement or lime stabilisation Rockfill??	Cement stabilisation does not feature significantly in this manual for low volume roads. Consideration will be given to expanding the text in Part B to include options for lime stabilisation, using text on plasticity and grading from the ERA Geotechnical Design Manual. Rockfill is covered elsewhere in Part B, but could be expanded. Selection is based on field assessment not lab testing.
4 Subgrade	4.1		CTB	There are such paragraphs etc throughout the document which ably summarise the design requirements. If there was a way these should be emphasized or made to stand out as boxes. Many designers scout documents looking for such information more than anything else.	Noted. This can be added in using a box for emphasis
4 Subgrade	4.5		CTB	Addenda was issued adding a new Section 4.5 on geotextiles. The text gives useful information but falls short on detail of selection of type of geotextile. Mention of proprietary products should be considered, or recommendations can be part of the section on construction.	We would prefer not to include too much detail, but rather refer to other manuals that specifically deal with this. The intention is to provide brief background and reference. Would not want to include reference to proprietary products.
4 Subgrade	4.2.5		CTB	How does the variation of the material depth as affected by the vertical alignment design affect the application of the DCP-DN method? Should road sections in embankments of height greater	The material depth is not affected by the presence of an embankment or its height. The material depth is the depth to which the Engineer should confirm that the nominal subgrade strength is available.

Chapter	Section	Table/Figure	Reviewer	Comment / suggested change	Response / action taken
				than nominal “material depth” and where fill will be placed be assigned default SC4?	
4 Subgrade	4.4.3	Figure B.4.10	CTB	Method was extensively used in Zimbabwe and was successful; very practical way of dealing with expansive soils.	Noted.
4 Subgrade	4.4.4	Figure B.4.16	CTB	Of the surfacing in this photo? Base layer or wearing course??	Noted. Will be corrected.
5 Construction Materials	5.2	Table B.5.2	CTB	Classification system G7, G15 etc. is introduced here; reader could benefit from a paragraph in the text explaining the system.	Noted. Will be added.
5 Construction Materials	5.3		CTB	Consider adding specifications for Sands where they are used as sub-base or base.	Will consider, with reference to AfCAP research on the use of sands.
5 Construction Materials	5.3.4		CTB	Important topic; add more guiding information	Mechanical improvement is dealt with elsewhere in the manual, will provide cross reference. (Section 5.5.3).
5 Construction Materials	5.3.8	Table B.5.8	CTB	The description of suitable rock for use in gabions was issued and noted. The text here includes guidance on placement etc, consider taking text on method of construction to construction section.	To be discussed further in the team.
5 Construction Materials	5.3.9		CTB	Add section on Stabilisation only; it should be an option which can be considered for TLC1.0 in situations where good gravels are scarce.	Chemical stabilisation is normally not appropriate for LVRs. Guidance can be found in manuals for high volume road design.
5 Construction Materials	5.4.1		CTB	Include details of reference publication.	Noted. Will be added.
5 Construction Materials	5.4.1		CTB	It usually very difficult to assure maintenance of design moisture contents especially with the record of poor maintenance in Sub-Sahara Africa.	Noted, but lack of maintenance is not a good reason for over-design.
5 Construction Materials	5.5.3		CTB	Indicate that the method is being applied to an example of materials of properties in Table 5.10	Noted. Will be added.
6 Pavement Design Paved Roads	6.2.2		CTB	What of new roads?? Through greenfield situation?	The DCP-CBR method is recommended for new roads. This will be made clearer.

Chapter	Section	Table/Figure	Reviewer	Comment / suggested change	Response / action taken
6 Pavement Design Paved Roads	6.2.2	Step 7	CTB	Treatment of sections on embankments needs clarification; are certain default DCP-DN values to be assigned?	The DCP-DN value is not affected by the presence of an embankment. This will be made clearer.
6 Pavement Design Paved Roads	6.2.2	Step 8	CTB	A key assumption in the DCP-DN method is that, in the case of existing roads, the geometric profile does not call for deep cuts or high fills. The manual is silent on how such situations must be handled in terms of applying the Cusum (cumulative sum) sectioning method.	Will add a paragraph on how to deal with deep cuts and high fills when assessing soil conditions on existing alignment. For cuts it is necessary to record the DN value in the subgrade below the final cut level. For fill the DN value of the fill material is assessed in the laboratory at the expected in-service density and moisture content.
6 Pavement Design Paved Roads	6.2.3	Wet Climatic Zone	CTB	What if the road is in both embankments and cuts? There is need to clarify how such situations are treated.	Guidance will be given in the text. Sections in cut are treated separately from sections on fill.
6 Pavement Design Paved Roads	6.3.2		CTB	Guide user to sizes (aggregate for water bound macadam) applicable to each traffic class	We will look for references to macadam materials and include if appropriate.
6 Pavement Design Paved Roads	6.3.5		CTB	To avoid confusion could insert edited table B.6.10	This seems fairly straight forward. We could add in for clarity.
6 Pavement Design Paved Roads	6.3.6		CTB	If a handbook for laying this type of surfacing, can refer to it to guide users, comment applies to all non-bituminous surfacings	We will look for references and include if appropriate
7 Pavement Design Unpaved Roads	7.2		CTB	Design process not clear; there is need to make the recommendations clear. Text reads more as a guideline	The guideline approach gives information behind the theory of earth roads, with a suggestions at the end that maintenance costs may become expensive over time….therefore encouraging the use of gravel roads instead. The intended meaning, and relevance, will be clarified.
7 Pavement Design Unpaved Roads	7.3.1		CAA	In Ghana gravel roads are constructed to subbase level with 100-150mm subbase material. When gravel thickness falls below 50mm road may be due for regravelling.	A phased approach of constructing surfaced roads by using a gravel road as an interim road is not recommended for various reasons. This will be detailed in the text.

Chapter	Section	Table/Figure	Reviewer	Comment / suggested change	Response / action taken
7 Pavement Design Unpaved Roads	7.3.4		CTB	Is this loss per 100 vpd?	Yes, will be added.
9 Road Construction			CTB	Section is in line with other manuals prepared for Sub-Saharan environment e.g. Ethiopia, Tanzania. Sections 9 and 10 could be a stand-alone Part; and also incorporate construction matters in Part C.	It is felt that there is not enough material on construction to warrant a separate Part. Most of the key construction issues relate to the pavement.
10 Borrow Pit Management	10.2.6		CTB	Consider taking this issue to planning section and treat it in detail. It is always an issue that has big impact on communities through which the LVR are constructed. A question of what is fair compensation always arises.	Roads agencies have set policies that they follow for land appropriation and compensation. Policy issues are discussed in Part A. Compensation is an issue beyond the scope of this manual.
10 Borrow Pit Management	10.5.2		AB	Easier to remove topsoil with a dozer rather than a grader.	Yes this is normally the case. Text will be revised.
11 Quality Assurance and Control			CTB	Include site survey/setting out of curves and structures/level checking etc	Will consider including in construction chapter rather than QA.

4 Part C: Hydrology, Drainage Design and Roadside Slope Stabilisation

Table 5: International Peer Reviewer Checklist Part C

PART C: HYDROLOGICAL AND DRAINAGE DESIGN AND ROADSIDE STABILISATION (GHANA AND SIERRA LEONE)				
Section	**Item**	**Verified**	**Comments/Changes**	**Response**
Branding	The purpose of the document is clear and complete	☑	Does not cater for bridges longer than 6m. For the 6m bridge mentioned standard drawings not provided.	The scope of the manual does not cover design of bridges generally. Reference will be made to ORN 9 which deals with design of small bridges. This will be clarified in the text.
	The scope of the document is accurate and complete	☑	Bridges structural design not treated fully, designers in district councils always struggle when they come across situations where they can't apply standard drawings. Could also consider including guidance on what constitutes a DESIGN REPORT (apply comment to all Parts).	The scope of the manual does not cover design of bridges. However, brief guidance notes are provided for the information of users. District engineers are encouraged to seek advice from the roads authority for difficult situations.
	The title page includes agency information (e.g., logo, ministry name, department details, project and document title)	☑	Include name of parent ministry. Document is entitled as if will apply to SLRA only; use of parent ministry will result in adoption by all.	SLRA is the lead agency for the manual.
	Correct and current logos have been used	☑		No action required
	Version numbers and release dates are accurate	☑	To be inserted at publishing, still draft.	A date will be included on the cover of each document. Any updated versions will have an updated date and should include a sheet summarising the revisions made.
	All known audiences/customers/users are identified and name accurately	☑	Listing of stakeholders and potential users recommended.	The target groups are summarised in Section 1.2 "Purpose of Part C".
	Check the title page for text and correct use of styles	☑		No action required
	Document allows users to submit comments in a transparent and easy-to-use manner.	☑	Not adequately provided for. Recommendations made in comments to document to provide stand-alone form and contact details etc.	Users are instructed to submit comments in writing to the Director General of the SLRA and the Director of the DFR.

PART C: HYDROLOGICAL AND DRAINAGE DESIGN AND ROADSIDE STABILISATION (GHANA AND SIERRA LEONE)				
Section	**Item**	**Verified**	**Comments/Changes**	**Response**
Pagination	The table of contents reflects correct page numbers and section names.	☑		No action required
	Check for correct pagination at the beginning and end of each chapter.	☑		No action required
	Spot-check three cross-references per chapter, especially to locations in other chapters.	☑		No action required
	Check the first and last page number references for each chapter in the main table of contents.	☑		No action required
	Look for page breaks that leave widows or orphans, and for lists or tables that are separated from their lead-in sentences.	☑	Many cases encountered; tables flow onto next page in many instances; must review and restructure in detail after edits.	The final formatting will be carried out once the content is agreed.
	Notes separated from the previous paragraph.	☑		No action required
	Tables that flow to the next page with less than two rows (not counting the header row).	☑		No action required
	Procedure starting statements separated from procedure steps.	☑		No action required
	A single procedure step (a minimum of 2 procedure steps should be together).	☑		No action required
	No single line paragraph (a minimum of two lines). Verify that no pages or sections are missing.	☑	The single line paragraphs are highlighted within the document. Marry with previous text or add more information.	These will be corrected.
Chapter titles, headers and footers	Header contains standard information (e.g., logo, document title).	☑		No action required
	Footer contains standard information (e.g., confidentiality statement, page number, date).	☑		No action required
	Headings match standard font, colour, size styles.	☑		No action required
	Body text matches standard font, colour, size styles.	☑	Check labelling of tables and figures vis a vis use of CAPS and smalls.	Noted. Will be checked

PART C: HYDROLOGICAL AND DRAINAGE DESIGN AND ROADSIDE STABILISATION (GHANA AND SIERRA LEONE)				
Section	**Item**	**Verified**	**Comments/Changes**	**Response**
	Verify footer text is correct in all sections.	☑		No action required
	Verify that header and footer lines (if present) line up.	☑		No action required
Content Editing	The document flow and structure logical for the users to follow.	☑	Section 4 could come before section 3.	Will be considered.
	The document text is concise and clear.	☑	Some sections (as indicated in document) are too long and can be edited down.	Noted. Will be addressed accordingly.
	Document reads as a manual and is instructive? Not as guideline or text-book.	☑	Could be improved by including worksheets.	Noted. Worked examples are included for culvert design.
	Check headings for parallelism + coordination, topics at same level to same significance.	☑	Refer to comments in text.	Comments will be actioned.
	Check sub-headings for subordination and division, not less than two sub-headings.	☑	Refer to comments in text.	Comments will be actioned.
	Check for focus, sections should be balanced in terms of sub-sections, too many in one call for section to be separate document.	☑	Construction methods could be combined with similar section in Part B and be a stand-alone Part.	This option was considered but it was decided to retain the construction of drainage structures in Part C. The methods given are specific to drainage structures. A separate Construction manual would be a very short document.
	Check for missing sections, each section to have introductory and including para, sub-sections follow same trend in paragraphs.	☑	Refer to comments in text.	Comments will be actioned.
	Technical content is accurate and reflects current and best practice.	☑	Refer to comments in text.	Comments will be actioned.
	Adequate drawings have been provided and have necessary detail.	☑	Provide drawings for bridges; provide link to source of DWG versions.	Bridges are outside the scope of this manual. Reference will be made to ORN 9.
	Useful and relevant case studies/situations have been cited.	☑	Not many given.	Worked examples are included for culvert design.
	Practical examples have been included.	☑	None.	There are work examples for peak flow estimation and culvert sizing are included.

PART C: HYDROLOGICAL AND DRAINAGE DESIGN AND ROADSIDE STABILISATION (GHANA AND SIERRA LEONE)				
Section	**Item**	**Verified**	**Comments/Changes**	**Response**
Procedures	Checklists are provided and are adequate for the purpose intended.	☑	More could be provided to make the document usable and practical.	Flow charts are provided for all of the main processes. These act as checklists.
	All steps in the procedures are accurate and complete.	☑		No action required.
	Check that procedures are numbered in sequence.	☑	Flowchart on selection of standard/cross-section has no clear hierarchy definition.	Flowchart will be checked and improved if necessary.
	Check that procedure steps are stated the same way.	☑	Varies amongst parts.	This will be reviewed between the manual Parts.
	All steps in the procedure are accurate and complete.	☑		No action required
	Text and screen shots are accurate and complete.	☑	None used.	No action required.
	For software use all corresponding screen shots accurately display the current version of the software.	☑	Provide links to sources of software mentioned.	Noted. Links will be provided.
Graphics, Drawings	Check graphics for proper placement in relation to topic under consideration.	☑	Mostly in correct topics.	No action required.
	Check there is enough space between them and the text that precedes and follows them.	☑	To be considered at publishing stage?	Final formatting will be applied after technical content is agreed.
	Check quality of graphics for originality	☑	Some need improvement; see comments in text; labelling is poor	Ok. Noted and will be corrected. Improved photos are being sought where necessary.
	All charts, graphs, and diagrams are labelled accurately and consistently.	☑	Labelling is poor in some, refer to comments in text.	Comments will be actioned.
	Check that graphics are uniformly indented from the left side of the page.	☑	Must be finalised at publishing, after edits are completed.	Final formatting will be applied after technical content is agreed.
	The standard drawings have full title block and correct details, drawing numbering clear.	☑	Some standard drawings do not have title blocks. Also consider converting drawings provided as Excel files to DWG format. Include mesh wire details on side drain types etc.	OK. Noted. Appropriate modifications will be made.
Notes, Citations and Cross References	In cross-references, check that the text drawn from the cross-referenced heading has quotes around it.	☑		No action required

PART C: HYDROLOGICAL AND DRAINAGE DESIGN AND ROADSIDE STABILISATION (GHANA AND SIERRA LEONE)				
Section	**Item**	**Verified**	**Comments/Changes**	**Response**
	All URL addresses have been tested and work.	☑		No action required
	All hyperlinks have been tested and work.	☑		No action required
	Check completeness bibliography.		A thorough scan must be completed; some documents published by GHA not included in bibliography.	OK. Noted and will be carried out.
Copy Editing	Scan for glaring errors and typos.	☑	Refer to in-document edits.	Comments will be actioned.
	Spelling and grammar check are complete.	☑	Refer to in-document edits.	Comments will be actioned.
	Scan for hyphenated words. There should be very few, used only for multiple-word phrases (like this one), and not for splitting long words.	☑	Very few found throughout the document.	No action required.
	Scan for consistent use of styles	☑	Styles are largely consistent throughout	No action required.
	All ACRONYMS are spelled out completely in the first instance or included in Table of Acronyms.	☑	A few were missing but were added on to the Table of Acronyms, check thoroughly before publishing.	OK. Noted.
	Correct grammar with subject/verb agreement.	☑	Refer to in-document edits.	Comments will be actioned.
	Check for proper capitalization.	☑	Refer to in-document edits.	Comments will be actioned.
Copyright	Sources of information acknowledged.	☑	Most information in standards tables may need source to be pointed out, consider accordingly.	Noted. Will address the issue accordingly.
	Company-specific product names and industry terminology used consistently throughout the document.	☑	None used.	No action required.
	All safety, privacy, and/or other details are specified.	☑	Caution in use of some of the standards has been pointed out where necessary.	OK. Noted

Table 6: Peer Reviewer Comments and Author Responses, Part C

Chapter	Section	Table or Figure	Comments/Changes	Responses
Cover page			If it were allowable, to make the manual user friendly, the more it is disaggregated the better, in my opinion. The parts could be arranged as: A. Policy and Planning B. Geometric Design and Safety C. Materials, Pavement Design and Surfacings D. Hydrology, Drainage and Road Side Stabilisation E. Construction and Maintenance	See response to same comment in Table 2.
Foreword			Foreword by the Minister can be included in all parts.	To be discussed by the team leaders. The intention was, where possible, to avoid undue repetition, and for Part A to include more introductory and scene-setting content than subsequent Parts, which are more focussed on specific technical considerations.
Preface			Preface could be just about Part C and move information on the structure of the full manual to Section 1.	This recommendation will be considered.
Manual updates	v		Make stand-alone section with pro-formas for recording version, requesting copies, noting corrections required, guiding user to website for accessing this and other parts as pdf files	See response to same comment in Table 2.
1 Introduction	1.2		Carry information on the structure of the manual from the preface to a new sub-section before 1.2	Agreed- as seen in Part A and Part B.
1 Introduction	1.3		Could be 4 – including structural design	Noted. However, structural design is considered a different discipline.
1 Introduction	1.4.1		Inconsistent capitalisation in headings	This will be checked across the whole document
1 Introduction	1.4.3		Very important aspect of the design process; there is need to include more guidance on how the approval can be sought during the design phase and from who. Consider including a pro-forma for the purpose.	The designer is required to give reasons convincing enough why it is necessary to depart from the standard to the relevant authority. Users of the manual will be aware of the authority that they should consult if departing from the standards.
1 Introduction	1.5.1		No explanation of reason for minimum culvert size being to facilitate maintenance	This will be clarified, together with the associated implication that 600 mm diameter can be acceptable for short lengths, such as in the case of access culverts, or narrow tracks.
1 Introduction	1.5.3	Table C.1.4	It is better presentation for a table to fit on just one page unless it is too big to fit and has to span over more than one page	Corrected

Chapter	Section	Table or Figure	Comments/Changes	Responses
1 Introduction	1.5.5		Throughout document consistency required in use of CAPS or smalls in headings and sub-headings	Noted and will be corrected.
1 Introduction	1.5.6		Include minimum apron extension length for box culverts as well	Have not found in any literature but guidance will be provided from experience.
1 Introduction	1.5.8		Replace “plan” with “plain”, remove “at” and replace “misdirect” with “divert”	Accepted
1 Introduction	1.6.1	Table C.1.5	Replace “Min.” with “Minimum”. Re-word reference to “maximum dimensions”	Re-word to “minimum dimensions and acceptable range of side slopes”
1 Introduction	1.6	Tables	Inconsistent capitalisation and formatting	Adjust as suggested
1 Introduction	1.6.1		Table overflowing onto next page; check this aspect throughout document	Noted and Corrected
1 Introduction	1.6.2	Table C.1.8	Usually there is negligible scour at all velocities, specifying a maximum may not be necessary (concrete lined drain).	Noted. There can be significant scouring at high velocities hence the need for max. velocities.
1 Introduction	1.6.2	Table C.1.8	Check. Is lower than for earth?	Max. velocities for open earth drains corrected.
1 Introduction	1.7.2		Deleted: Structures	Deletion accepted. Changed to structure.
1 Introduction	1.7.3		Word order- consider changing it to “as far from the roadway as practicable”.	Accepted. Change effected.
1 Introduction	1.8	Bullet point 4	Maybe side drain can be V-drain.	V-drain are not recommended because their poor performance and prone to erosion and siltation.
1 Introduction	1.8	Bullet point 6	Repetition of the phrase “uphill side in the same sentence” You may omit this second one.	Deleted
1 Introduction	1.8	Bullet point 18	Diagram is not clear. The access culvert appears to be standing above the road level.	Noted. Diagram will be improved.
1 Introduction	1.8	Bullet point 19	Labelling of flood level guides not clear.	Noted. Reference is made to the details on page 49 but labelling will be improved.
1 Introduction	1.8	Bullet point 20	Improve labelling legibility.	Noted. Reference is made to the details on page 50 but labelling will be improved.
1 Introduction	1.8	Bullet point 21	Practice in other countries tends to specify “bridge” spans as greater than 5-6m	The maximum span of 3m is OK for LVR.
1 Introduction	1.8	Bullet point 21	Why no definition of Box Culvert in the this list?	Box culvert will be added, and a clearer statement made as to the limiting span of what is considered to be a Box Culvert

Chapter	Section	Table or Figure	Comments/Changes	Responses
1 Introduction	1.9.1		Improve drawing, reduce relative sizing of perforated pipe, show filter material surround, etc	Drawing will be improved.
1 Introduction	1.9.1 i		Replace “produce” with “produced”	Accepted
1 Introduction	1.9.1 iii		An incomplete word is making this statement difficult to comprehend	Noted. The sentence explains why the need for slope drainage. Will be reworded for clarity.
1 Introduction	1.9.2		Sub-sub section is describing a process? Review and reword accordingly	Noted. An introductory note will be included.
2 Internal Drainage	2.1		Adjust wording. Road Pavement. ingress and egress.	
2 Internal Drainage	2.1	Table C.2.1	What about other failures such as potholes, ponding in depressions etc? References to “intact” layers not clear	The table deals with mechanisms of water movement through a road pavement rather than the local source of the water. However, will adjust wording to clarify.
2 Internal Drainage	2.2		Should it not be 300 at 12%?	No, but units are incorrect. Correct to: “300 pm/s at 2% air voids to 30 µm/s at 12% air voids” , and add details of reference (Handbook of Road Technology, R.G. Lay, 4th edition, 2009) to Chapter B.9.
2 Internal Drainage	2.3	Fig C.2.1	D is not shown as extending from the centreline.	The Figure will be modified.
2 Internal Drainage	2.3	Fig C.2.1	Need to check consistency of wording style in describing Figures	Figure descriptions will be checked for consistency in capitalisation, wording style, tense etc.
2 Internal Drainage	2.3		Again the issue of tables not fitting on one page and spilling over	Corrected
2 Internal Drainage	2.4		Repetition	We would prefer to leave it unchanged for clarity.
2 Internal Drainage	2.4		Consider moving text under this heading to be simple first paragraph of 2.4	Text under the heading moved to first paragraph of section 2.4
2 Internal Drainage	2.6	Fig C.2.5	Improve legibility of labelling	Figure will be improved, possibly simply by re-sizing
2 Internal Drainage	2.6		Replace “entering the pavement” with “entering the road pavement”	Accepted
2 Internal Drainage	2.6		Re-word “in the road” to be more specific	Accepted
3 Hydrological Studies	3.1		Change to “road projects”.	Change made.

Chapter	Section	Table or Figure	Comments/Changes	Responses
3 Hydrological Studies	3.3		Reference to “Geodetic” Engineer is limiting. More appropriate to use the term “Geomatic”	Accepted.Though “Geodetics” is still widely used,“Geomatics” is indeed increasingly used to describe the discipline of gathering, storing, processing, and delivering geographic information or spatially referenced information.
3 Hydrological Studies	3.3		This might be seen as excluding most engineers, especially the young.	Taking engineering decisions based on field observation requires experience. This is not to exclude anyone on the basis of their age, but it does highlight the need for practical experience, ideally with associated professional mentoring.
3 Hydrological Studies	3.3		Can a diagram be used to illustrate the meaning of Q=V*A ?	This is already a simplified version of a basic concept with which most readers will already be familiar.However its presentation will be reviewed to ensure that the meaning is clear, and a diagram added if considered necessary.
3 Hydrological Studies	3.4.1	Fig. C.3.1	Insert flowchart arrow leading from fieldwork to next stage; In text related to this figure, rational method indicated as applicable to catchment area <10km^2; in chart it is given as 2km^2?	Noted. Corrections will be made to the flow chart.
3 Hydrological Studies	3.4.1		Insert “catchment size” after “Beyond this”	Accepted
3 Hydrological Studies	3.4.1		Check for consistent use of either “Area” or “Areal” in ARF	Both can be used, but in Ghana the preference is “Area”. Will check for consistent use.
3 Hydrological Studies	3.4.2 (i)		In describing where mapping is available, providing the physical location of a central office is unnecessarily limiting and could in any case change over time. Regional and online sources should be envisaged	Accepted. Will re-word to reflect this
3 Hydrological Studies	3.4.2d		Topo survey can be for new structures as well, detailed surveys upstream and downstream at potential locations required.	Sentence has been revised to include the comments made.
3 Hydrological Studies	3.4.3		Distorted Formatting	Table C.3.1 reinserted
3 Hydrological Studies	3.4.7		Catchment area can be now be derived using methods other than a planimeter	Accepted. Wording will be adjusted to reflect alternative digital methods now available, and the spelling of planimeter corrected.
3 Hydrological Studies	3.8		Consider use of highlight boxes for case studies and examples	Noted.

Chapter	Section	Table or Figure	Comments/Changes	Responses
4 Selection of Drainage Structure	4		Chapter is more about general descriptions of drainage structures and repeats (in more detail) what is in Section 1. Title can be misleading as one may take it mean guidance on how to select one type of structure over another, or determining the sizing of the required structure	Title changed from "selection of drainage structures" to "types of drainage structures"
4 Selection of Drainage Structure	4.1		Introduction is about provision of camber only whilst the topic is wider. Reword to introduce all drainage structures (in general)	The introduction has been reworded as suggested
4 Selection of Drainage Structure	4.4	Figure C.4.4	Annotate picture to clarify the location of the mitre drain	Noted.
4 Selection of Drainage Structure	4.6	Fig C.4.6	Standard drawings provide for concrete haunch/concrete surround which can be an expensive solution in some cases; review accordingly.	The standard drawings will be reviewed.
4 Selection of Drainage Structure	4.6		Check that 2% is correct as a minimum gradient for a culvert gradient to mitigate the risk of silting	2% is widely accepted on this basis
4 Selection of Drainage Structure	4.6		Need for consistency on location of dimensions, eg 900 mm, or 900mm	Accepted. Will review in light of related manuals, but inclined to use 900mm
4 Selection of Drainage Structure	4.6	Table C.4.2	Place units in parenthesis at head of columns in table.	Noted. Applies to all tables.
4 Selection of Drainage Structure	4.7.3		Culvert pipes or “causeway pipes”?	In the context, just “pipes” is clear
5 Hydraulic Analysis	5.2.2	Fig. C.5.1	Points A and D imply top of drain lining in this figure, not to highest point of wetting.	Corrections will be made to bring points A and D to the points of intersection of the horizontal line (water surface line) with the channel.
5 Hydraulic Analysis	5.2.2	Table C.5.1	In Table C.1.8 minimum velocity of flow for all types of surfaces specified as 0.6m/s; rationalise. Specified maximum for concrete surface can introduce unnecessarily expensive solutions, concrete can withstand higher velocities.	Table C.1.8 will be revised. The issue of maximum velocities has also been addressed earlier. High velocities can lead to erosion of concrete lining.

Chapter	Section	Table or Figure	Comments/Changes	Responses
5 Hydraulic Analysis	5.2.3		Steps indicated by bullets not properly introduced as a process. Discharge and comparison with peak flow are outputs as well.	The computer-based process will be better explained.
5 Hydraulic Analysis	5.3.2		Type of bullets must be consistent throughout the document.	Bullets will be corrected for consistency.
5 Hydraulic Analysis	5.3.2	Figure C.5.3	Combining these guiding notes on steps with flowchart will make for ease of reference/use.	On balance we consider it preferable to keep the flow chart simple and the explanations separate.
5 Hydraulic Analysis	5.3.2		Introduce document with columns that is being referred to.	The hand calculation form showing the columns is included as an appendix and will be referred to here.
5 Hydraulic Analysis	5.3.2		Take this introduction to before the steps. Make spreadsheet available off DFR website as a resource; direct to the same via a weblink	The introduction will be moved. The form for hand calculation is included as an Appendix.
5 Hydraulic Analysis	5.3.2	Fig. C.5.6	Provide unmarked nomograms as an annex for accessing by users/designers	The nomographs are originally marked as an example for the user to follow. The marking does not affect the usefulness of the nomographs.
5 Hydraulic Analysis	5.3.3		Section not reading well, lacks continuity; Heading Input Data introduced rather randomly, re-write and provide clear summary guidance on HY8; if necessary introduce screenshots of software.	Noted. The introduction will be re-written for more clarity.
5 Hydraulic Analysis	5.6		This is the first point in the document where Bridges are considered to some detail. All standards etc included up to this point refer only to side drains and culverts.	Bridges are not covered in detail in the manual. Description of a "bridge" as span > 3m or span > 6m will be rationalised.
5 Hydraulic Analysis	5.6.1		Compared to Culverts, section too brief. Expand.	The manual does not cover bridge design. ORN 9 can be referred for details. A note will be added to the text.
6 Structural Design	6.1	Table C.6.1	Breakdown and introduce separate rows as above for uniformity	Noted. Subjects will be put in separate rows as suggested for uniformity.
6 Structural Design	6.2	Table C.6.2	Cut off walls generally too deep. Foundation depths not practical, cross-check.	Depths will be reviewed.
6 Structural Design	6.3		Sand and gravel layer - Compaction required, indicate level of compaction Foundation concrete - Class B15/C15.	Additional details will be given.
6 Structural Design	6.8.3		"Wing wall" is 2 words	Both "Wingwall" and "Wing wall" are commonly used. The latter is more common, but the former has been used in previous LVR manuals. Will consult further before deciding which to (consistently) adopt.

Chapter	Section	Table or Figure	Comments/Changes	Responses
6 Structural Design	6.9.1	Table C.6.12	No units indicated	Add (m/s) to heading in Table
6 Structural Design	6.9.2		Text irrelevant, can be in construction section.	Text deleted
6 Structural Design	6.9.3		Figure referenced does not show masonry slabs etc Stilling basin (instead of “sump”).	Reference will be corrected. Use of term “stilling basin” is accepted
6 Structural Design	6.9.3	Fig C.6.8	No text associated with this Figure C.6.8.	Location of this figure will be reviewed.
6 Structural Design	6.9.4		Statement not very clear especially the reference to a single labourer.	Sentence will be deleted.
6 Structural Design	6.11		Compared to the detailed treatment given to other sections of the manual, such as hydrology, this bridge design section is too brief and the steps are too summarised, there is no inclusion of flowcharts etc.	For bridge design the user will be referred to ORN 9.
6 Structural Design	6.11.4		Bridge structural design process not attended to, the load specification here is appropriate, but use of the same is not given, becomes more of general information	Consideration will be given to deleting this section and referring the user to ORN 9.
6 Structural Design	6.12.2	Fig. C.6.14	Consider replacing this with a better image as this is showing passage of water on the road side of the scour check, which may lead to erosion of the embankment	We will look for a better photo.
7 Roadside Slope Stabilisation	7.1		Delete 'such cases are rare in Ghana'.	Agreed, delete, as it is repetition.
7 Roadside Slope Stabilisation	7.2.1		Land use is very important can lead to catastrophic failures.	This point will be further emphasised through slight re-wording
7 Roadside Slope Stabilisation	7.2.2	Fig. C.7.5	Remove 'Vulnerable to failure if cut too steeply' from figure caption and put in text.	This would risk losing the intended meaning attached to the Figure. Leave in caption and also include in text.
7 Roadside Slope Stabilisation	7.2.2	Fig C.7.6	Improve quality of figure.	The figure is available in high resolution, so can be made slightly larger in order to improve legibility

Chapter	Section	Table or Figure	Comments/Changes	Responses
7 Roadside Slope Stabilisation	7.5.1		Revise the sentence 'Standard details…backfill strength'.	Agreed the sentence is unclear. It will be deleted without loss of meaning.
7 Roadside Slope Stabilisation	7.5		Please check, this sentence does not seem to portray its actual intention. Consider re-phrasing.	Sentence will be re-phrased.
8 Construction Materials	8.2.2.		After placement, it gains strength through the curing process for up to 28 days	Noted. Sentence replaced with suggested one
8 Construction Materials	8.2.4	Table C.8.1	Add C30 for completeness	C30 added as suggested
8 Construction Materials	8.2.4	Table C.8.2	Add C30 for completeness	C30 added as suggested
8 Construction Materials	8.2.5	Table C.8.3	Add C15 & C30 for completeness	C15 & C30 added as suggested
8 Construction Materials	8.2.8		Batching guidelines given for up to C25 only, add C30	C30 has been added
8 Construction Materials	8.2.8		Guidance required; some environments in SL and Ghana will be close to the sea hence may require thicker cover.	Minimum cover to reinforcing will be given.
8 Construction Materials	8.2.9		Photograph shows an inappropriate method for compacting concrete. Consider replacement with one in which a poker vibrator is in use	We will look for better photo but the one included is typical of local conditions.
8 Construction Materials	8.3.1		Is this to be used in plural?	Yes
9 Construction Methods	9.2.4	Table C.9.1	Checklist or simple listing of cost elements. Relationship to preparation of a construction programme not clear.	This will be clarified. Part of the sentence will be deleted.
9 Construction Methods	9.3	Table C.9.2 & C.9.3	Restructure checklists as documents that a designer can pull out/copy and use to tick-off what would have been satisfied.	The checklist is OK for designers to pull out and use. A blank column will be provided for designers to tick when an activity has been carried out.
9 Construction Methods	9.3	Table C.9.4	Change “output” to “output rates”	Will change to “productivity norms”
9 Construction Methods	9.3	Table C.9.4	Expand and include rates for typical equipment and typical teams/gangs. This information is important for Part B as well.	This table provides a reasonable basis for planning labour requirements. Expanding this guidance is beyond the scope of the assignment.

Chapter	Section	Table or Figure	Comments/Changes	Responses
9 Construction Methods	9.3	Table C.9.4	Size of trees, could indicate three sizes?	The guideline of 1 tree stump per worker day in an average for different sizes of tree. If all of the tree tumps are small, or big, the engineer will have to use their judgement in deciding an appropriate task rate.
9 Construction Methods	9.4.3		This is a design treatise, not site works, move to relevant section or manual part	It provides the user with a clearer picture of the types of camber, so it is appropriate to retain it. But the reference to "outwards cross-slope" may be removed following further stakeholder consultation.
9 Construction Methods	9.4.7	Fig C.9.16	Example is for setting our 600 mm diameter pipe, when such size is discouraged; use 900mm if possible.	600mm dia pipes are still used for access culverts, and remain relevant in some other circumstances in the case of narrow tracks
10 Drainage Structural Drawings		Drawings	All drawings to have frame and title block. Show mesh reinforcement details for lined drains if possible.	Standard drawings will be formatted for the final version. Mesh reinforcing will be shown for concrete lined drains.
Appendix C Drawings			Include list of standard drawings. Standard drawings must all have Model title blocks. Include standard drawings of a 6m bridge.	Standard drawings will be formatted for the final version. Users are referred to ORN9 for the design of 6m long bridges.

NOTE:

Part B of the Ghana Manual does not contain a Chapter on Construction Materials, as this is adequately covered in another Manual. Construction Methods are therefore addressed in Chapter 8, rather than in Chapter 9 as in the case of the Sierra Leone Manual.

5 Part E: Road Maintenance (Sierra Leone only)

Table 7: International Peer Reviewer Checklist Part E

PART E: ROAD MAINTENANCE (SIERRA LEONE)				
Section	**Item**	**Verified**	**Comments/Changes**	**Response**
Branding	The purpose of the document is clear and complete	☑	The document reads as methods and maintenance spec	The document included activities to correct defects on the road and specs for each activity.
	The scope of the document is accurate and complete	☑	Could widen the scope to include maintenance management issues, more guidance on managing works on a day to day basis including reporting	Addition of more maintenance management tools will be considered but there is a limitation since the method of organising maintenance in Sierra Leone is not well established in terms of policy.
	The title page includes agency information (e.g., logo, ministry name, department details, project and document title)	☑	Include name of parent ministry. Document is entitled as if will apply to SLRA only; use of parent ministry will result in adoption by all	SLRA is the lead agency but the cover will be confirmed by the SLRA and Ministry before publication.
	Correct and current logos have been used	☑		No action required.
	Version numbers and release dates are accurate	☑	To be inserted at publishing, still draft	The final version will show its current date and future revisions will have new dates.
	All known audiences/customers/users are identified and name accurately	☑	Listing of stakeholders and potential users recommended	The target groups for the manual are listed in Part A.
	Check the title page for text and correct use of styles	☑		No action required.
	Document allows users to submit comments in a transparent and easy-to-use manner	☑	Not adequately provided for. Recommendations made in comments to document to provide stand-alone form and contact details etc	Users are required to submit comments in writing to the Director General of SLRA.
Pagination	The table of contents reflects correct page numbers and section names	☑		To be verified in final editing.
	Check for correct pagination at the beginning and end of each chapter	☑		To be verified in final editing.

PART E: ROAD MAINTENANCE (SIERRA LEONE)				
Section	**Item**	**Verified**	**Comments/Changes**	**Response**
	Spot-check three cross-references per chapter, especially to locations in other chapters.	☑		To be verified in final editing.
	Check the first and last page number references for each chapter in the main table of contents.	☑		To be verified in final editing.
	Look for page breaks that leave widows or orphans, and for lists or tables that are separated from their lead-in sentences.	☑	Many cases encountered; tables flow onto next page in many instances; must review and restructure in detail after edits	To be corrected in final editing.
	Notes separated from the previous paragraph.	☑		To be corrected in final editing.
	Tables that flow to the next page with less than two rows (not counting the header row).	☑		To be corrected in final editing.
	Procedure starting statements separated from procedure steps.	☑		To be corrected in final editing.
	A single procedure step (a minimum of 2 procedure steps should be together).	☑		To be corrected in final editing.
	No single line paragraph (a minimum of two lines).	☑	There are many line paragraphs in the document. Marry with previous text or add more information; also numerous incomplete bullet statements.	To be corrected in final editing.
Chapter titles, headers and footers	Header contains standard information (e.g., logo, document title).	☑		To be verified in final editing.
	Footer contains standard information (e.g., confidentiality statement, page number, date)	☑		To be verified in final editing.
	Headings match standard font, colour, size styles	☑		To be verified in final editing.
	Body text matches standard font, colour, size styles.	☑	Check labelling of tables and figures vis a vis use of CAPS and smalls	To be verified in final editing.
	Verify footer text is correct in all sections	☑		To be verified in final editing.
	Verify that header and footer lines (if present) line up.	☑		To be verified in final editing.

PART E: ROAD MAINTENANCE (SIERRA LEONE)				
Section	**Item**	**Verified**	**Comments/Changes**	**Response**
Content Editing	The document flow and structure logical for the users to follow	☑		No action required.
	The document text is concise and clear.	☑	Unlike the other parts of the manual, Part E is severely concise, too brief	Consideration will be given to adding more maintenance management information and tools.
	Document reads as a manual and is instructive? Not as guideline or text-book.	☑	Could include pro-forma for visual inspections, managing resources, reporting, etc.	Noted and will be considered.
	Check headings for parallelism + coordination, topics at same level to same significance.	☑	Refer to comments in text.	Comments in text will be actioned.
	Check sub-headings for subordination and division, not less than two sub-headings.	☑	Refer to comments in text.	Comments in text will be actioned.
	Check for focus, sections should be balanced in terms of sub-sections, too many in one call for section to be separate document.	☑		Not applicable.
	Check for missing sections, each section to have introductory and concluding para, sub-sections follow same trend in paragraphs.	☑	Refer to comments in text.	Comments in text will be actioned.
	Technical content is accurate and reflects current and best practice.	☑	Refer to comments in text.	Comments in text will be actioned.
	Adequate drawings have been provided and have necessary detail.	☑	No drawings provided.	Many drawings are provided.
	Useful and relevant case studies/situations have been cited.	☑	Yes, photographs etc.	Some more photos are required.
	Practical examples have been included.	☑	Yes, in form of photographs and sketches, very appropriate.	Some more photos are required.
Procedures	Checklists are provided and are adequate for the purpose intended.	☑	None provided, refer to other comments above and in text, more needed	Noted and will be considered.
	All steps in the procedures are accurate and complete	☑		This will be verified in the final draft.
	Check that procedures are numbered in sequence	☑		To be verified where appropriate.

PART E: ROAD MAINTENANCE (SIERRA LEONE)				
Section	**Item**	**Verified**	**Comments/Changes**	**Response**
	Check that procedure steps are stated the same way	☑		To be verified where appropriate.
	All steps in the procedure are accurate and complete	☑		To be verified where appropriate.
	Text and screen shots are accurate and complete	☑	None used	Not applicable.
	For software use all corresponding screen shots accurately display the current version of the software	☑	None used	Not applicable.
Graphics, Drawings	Check graphics for proper placement in relation to topic under consideration	☑	Mostly in correct topics	To be verified where appropriate.
	Check there is enough space between them and the text that precedes and follows them	☑	Proper positioning must be considered at publishing stage?	To be verified in final editing.
	Check quality of graphics for originality	☑	Some need improvement; see comments in text; labelling is poor	Comments in text will be attended to.
	All charts, graphs, and diagrams are labelled accurately and consistently.	☑	Photographs and sketches not labelled	Labels will be provided where relevant.
	Check that graphics are uniformly indented from the left side of the page	☑	Must be finalised at publishing, after edits are completed	To be verified in final editing.
	The standard drawings have full title block and correct details, drawing numbering clear	☑	No standard drawings used	Not applicable.
Notes, Citations and Cross References	In cross-references, check that the text drawn from the cross-referenced heading has quotes around it	☑		Not applicable.
	All URL addresses have been tested and work	☑		Not applicable.
	All hyperlinks have been tested and work.	☑		Not applicable.
	Check completeness bibliography	☑	A thorough scan must be completed	To be verified at final editing stage
Copy Editing	Scan for glaring errors and typos	☑	Refer to in-document edits	Comments in text will be attended to.
	Spelling and grammar check are complete	☑	Refer to in-document edits	Comments in text will be attended to.
	Scan for hyphenated words. There should be very few, used only for multiple-word	☑	Very few found throughout the document.	No action required.

PART E: ROAD MAINTENANCE (SIERRA LEONE)				
Section	**Item**	**Verified**	**Comments/Changes**	**Response**
	phrases (like this one), and not for splitting long words.			
	Scan for consistent use of styles	☑	Styles are largely consistent throughout	No action required.
	All ACRONYMS are spelled out completely in the first instance or included in Table of Acronyms	☑	A few were missing but were added on to the Table of Acronyms, check thoroughly before publishing	Acronyms and initialisms added to table will be verified.
	Correct grammar with subject/verb agreement	☑	Refer to in-document edits	Comments in text will be attended to.
	Check for proper capitalization	☑	Refer to in-document edits	Comments in text will be attended to.
Copyright	Sources of information acknowledged	☑	Most information in standards tables may need source to be pointed out, consider accordingly	Main sources of information noted in Acknowledgements.
	Company-specific product names and industry terminology used consistently throughout the document	☑	None used	No action required.
	All safety, privacy, and/or other details are specified	☑	Most photographs of men at work show poor PPE practices; improve.	Difficult to find good photos showing high standards of Personal Protective Equipment use in a context that is relevant to this manual..

Table 8: Peer Reviewer Comments and Author Responses, Part E

Chapter	Section	Subject	Reviewer	Comment / suggested change	Response / action taken
TOC		TOC	CTB	Make styles the same across all manuals, i.e. for headers, tables etc.	Formatting will be consistent for the final drafts.
Preface		Preface	CTB	Refer to comments to Parts A, B and C: Preface and preambles should be uniformly structured	To be discussed by the team leaders. Part A is intended to include (in the Foreword and technical Preamble) some political endorsements and descriptions of the entire manual that are not repeated in subsequent parts, which instead start with a more targeted Preface written by the authors.
Preface		Preface	CTB	Separate section for recording versions, noting errors, requesting copies, website addresses, etc can be considered.	This has been considered but it is considered that it is adequate to advise users of the manual to send any comments/revisions to the Director General of the SLRA.
Acknowledgements		Acknowledgements	CTB	Acknowledgements and general format of prefaces (including content) must be the same across manual parts.	Structure and format of acknowledgements will be consistent for the final drafts, and consistently applied.
1. Aims of the Maintenance Manual		Contents of the manual - How to set priorities and how to organise and plan the work.	CTB	Not adequately covered; is a very important area; could include pro-formas to aid visual inspection of the roads; assessment of data so collected; preparing reports to access funding; daily planning and reporting on ongoing works, progress reporting. I believe the above would go a long way in making the invaluable information provided by this manual usable.	Relevant standard forms from the GEM (Growth through Effective Road Asset Management) project will be included where they exist, together with some fresh text on managing maintenance.
2 Road Features		Overall	CTB	Improve section, borrowing from other parts. The chapter is extremely brief! A lot more can be said about road features.	The users of the manual have access to the other Parts, particularly Part A and Part C regarding road features. We can't reproduce Part A and Part C within Part E.
3 Terminology		Overall	CTB	Import descriptions from other parts which are more detailed and offer more guidance.	The list of terminology will be reviewed where appropriate.
5 The Purpose of Maintenance		Overall	CTB	The lists do not read as activities.	The list will be reworded.

Chapter	Section	Subject	Reviewer	Comment / suggested change	Response / action taken
7 Maintenance Activities		Table E.7.5 Cleaning road signs.	CTB	Could make part of routine maintenance.	Cleaning road signs will be included under routine maintenance.
7.3 Maintenance Activities		Road safety	CTB	Safety is of utmost importance, please provide more guidance.	More detailed requirements for road safety are given in the Specifications. A reference will be provided here.
7.3 Maintenance Activities	Defect 5	Culvert or drift cleaning.	CTB	Photo tells a huge story about unsafe working conditions and non-use of Personal Protective Equipment. Child on the road!	We will look for a better photo.
7.3 Maintenance Activities	Defect 8	Gabion construction.	CTB	Text does not guide the reader to the un-titled figure on two pages on.	Text will be improved.
7.3 Maintenance Activities	Defect 16	Compaction of gravel without watering.	AB	From my experience this should not be included in the Manual. Without the right MC compaction will not be achieved	Reference to dry compaction will be removed.
7.3 Maintenance Activities	Defect 17	Bleeding of bituminous surface.	AB	Bleeding can be a defect on bituminous treated LVR; how should it be treated?	Guidance on treating bleeding will be included.
7.3 Maintenance Activities	Defect 17	Pothole or Spot Repair.	AB	(Provide a) list of hand tools as a guide.	List of tools will be included.
9 Work Options	Option 5	Compulsory/Voluntary Labour.	AB	This has never been satisfactory. I believe it has been discontinued in Sierra Leone.	The use of voluntary labour be effective in specific situations where the resulting benefits to a community are particularly clear. However, a note will be added that the use of voluntary labour is rare in SL.
APPENDIX G.1: BRIDGES AND STRUCTURES	Bridge Maintenance	Inspections should be formulated on a regular basis.	CTB	How regular? Every year? Provide pro-formas.	A sample bridge inspection form will be included.
Appendix G.2: Specifications for Maintenance of Low Volume Roads	Coding & Measurement System		CTB	Consider providing model spreadsheet for measurements etc.	Inclusion of Bills of Quantities is beyond the scope of this project.
Appendix G.2: Specifications for Maintenance of Low Volume Roads	Item 2-01	Grass cutting.	AB	No mention of treatment (extent of grass cutting) at curves to enhance visibility.	Text will be added under Section 7.3 Defect 2 on cutting grass on curves.

6 National Peer Reviewer Report, Sierra Leone

6.1 Introduction

The Manuals for Low Volume Roads have been reviewed and attestation is given that the Manuals will definitely promote the rational, appropriate, and affordable provision and maintenance of Low Volume Roads in Sierra Leone. Also, the aim to make cost effective and sustainable use of local resources will be achieved. The Manuals extensively reflect local experience and advance in low volume road technology gained from several sub-Saharan countries and international best practice.

The Manuals will be of immense use to road engineers, consultants and contractors responsible for the design, construction and maintenance of Low Volume Roads in particular and other roads in general. One only has to be aware of the capability, limitation and competence of the local construction industry especially in the rural areas. Intense exposure will be required by the Sierra Leone Roads Authority(SLRA) to achieve the desired outcome.

The Manuals is in four Parts:

- Part A: Policy, Geometric Design and Road Safety
- Part B: Materials, Pavement Design and Construction
- Part C: Hydrology, Drainage and Roadside Stabilisation
- Part E: Maintenance

6.2 General Comments on Manuals

- Very detailed and highly informative;
- Principles and methodology applicable and adaptable for almost all classes of roads in Sierra Leone;
- Excellent document much beyond the requirements of LVR;
- Highly sophisticated and too detailed for LVR especially Part B Materials, Pavement Design and Construction: HVR can benefit from the principles and methodology;
- SLRA may have to consider how to disseminate to rural environment where a more simplified interpretation and approach will be required based on the available skills, resources and facilities;
- Can be utilised as a resource educational document with the very rich materials and references; and
- All Four Parts are suitable for training modules for the Civil Engineering program at Fourah Bay College.

6.3 Specific Comments

The following specific comments are provided on each Part of the Manual.

Part A- Policy, Geometric Design and Road Safety

- The Project Cycle is an extremely useful tool which covers all steps including planning, preparation, implementation, monitoring and coordination.
- Policies are very well addressed in document; these are dynamic and the need for regular reviews and update to reflect prevailing conditions and experience should be established.
- Regulations should accompany the various Acts to ensure practical implementation and expected benefits; especially the relationship between all stakeholders. Sierra Leone Road Authority and Road Maintenance Fund Administration are two examples.

- All elements of road design and safety are well treated in accordance with best practice.

Part B - MATERIALS, PAVEMENT DESIGN AND CONSTRUCTION

- The section on Procurement Process/Project Cycle provides detailed guidelines on project identification, studies, designs, implementation, operations and maintenance the bedrock of project procedure.
- Framework for sustainable provision of Low Volume Roads very clear and easy to follow, however I believe there is more material given than is required for LVR.
- Even though the approach to LVR Pavement Design differs in some respect from that of HVRs, the same principles and methodology apply.
- Very good graphical illustrations and figures to support technical presentation and materials.
- All laboratory tests are in order for eventual quality control and durability.
- Pavement Design for Unpaved Roads - Significant portion of the road network in Sierra Leone consists of unpaved roads and are LVR. These roads provide communities with access to important services (schools, clinics, hospitals and markets) and are the basis of a thriving market which impacts on the economy and social environment. However, all factors relating to designs and construction have been adequately captured.

PART C: HYDROLOGICAL AND DRAINAGE DESIGN AND ROADSIDE SLOPE STABILISATION

- The Manual very well establishes that the most important aspects of road design and durability are drainage within and outside the road prism. Water is the major cause, whether directly or indirectly, of roadway destruction or pavement failure. In Sierra Leone where the intensity of rainfall is very high, concentrated over a period of time annually, it is necessary to give careful consideration to proper design of drainage structures for pavements and other road facilities.
- Furthermore, the Manual recognises that drainage associated with any road can be divided into two broad categories: the drainage of the catchment area traversed by the road, and the drainage of the road prism and the carriageway. However, treatment of roads over swamps can be less expensively treated with rock ballasting on LVR instead of geo-textile which has to be imported.
- The Manual makes adequate provision throughout the road for efficient collection and discharge of rain water falling onto the area of the road reserve. Rainwater should be discharged as frequently as possible away from the road to minimize erosion damage to the road, the drainage system and to the adjacent land.
- Hydrological data and other information required for the hydraulic analysis and design of drainage structures and for sizing up the different components of these structures have been adequately provided.
- Tables, formulae, charts and design guidelines are in accordance with proven best practice.

Part E: MAINTENANCE

The Maintenance Manual must also incorporate the Maintenance Planning Cycle, providing detailed guidelines on Road Asset Management, establishing base line data on inventory, road condition (road maintenance management system) in order to prioritise and to effectively utilise budgetary allocations and available resources.

This can then be followed with focus on maintenance activities as treated in the manual:

- What needs to be done to achieve all-year Basic Road Access;
- How to identify the main problems/defects on roads and how to solve them;
- How to make the most of local materials and skills;

- How to maintain the road access at low cost;
- How to maintain drainage and other structures;
- How to set priorities;
- How to organise and plan the work; and
- How to specify road maintenance activities.

All the above have been well captured with excellent illustration and diagrams in the Manual in accordance with best practice.

Track changes, highlight, corrections, comments etc. have been captured in the reviewed documents (Parts A,B,C &E).

7 National Peer Reviewer Report, Ghana

7.1 Introduction:

The three parts of the Manuals for Low Volume Roads (LVRs) have been reviewed and attestation is given that they will definitely promote the rational, appropriate, and affordable planning, provision and maintenance of LVRs in Ghana. Also, the aim to provide guidance and objective basis for the cost effective and sustainable use of local resources will be achieved if the principles and methods are followed. The Manuals as reviewed extensively reflect local experience and advances in LVR technology gained from several sub-Saharan countries and international best practice.

The Manuals will be of immense use to road engineers, consultants and contractors responsible for the design, construction and maintenance of LVRs in particular and other roads in general. As a foundation text, it will be useful for both undergraduate and graduate students undertaking the planning, design and construction of low volume and other roads in Ghana. It sheds light on the characteristics of roads in the rural context and recognises the constraints, capability and low competence levels of the local construction industry especially in the rural areas. Even though the development of roads is more advanced in Ghana than many other countries in the West Africa sub-region, the emphasis this manual places on the rural road context is very important because the majority of roads in Ghana are low volume and the principles and standards may be applicable. The three volumes are recommended as essential reading and reference manual for all road engineers in Ghana when published. Foreign consultants working in the developing country environment in Africa will find the material in this manual very useful for training their new staff.

The Manuals are in three Parts:

- Part A: Policy, Geometric Design and Road Safety
- Part B: Materials, Pavement Design and Construction
- Part C: Hydrological, Drainage and Road side Slope Stabilisation

7.2 General Comments on Manuals

- Very detailed and highly informative; essential reading for every professional dealing with roads in Africa;
- Excellent document bringing all the essentials of LVR knowledge and technologies in the three parts;
- Very useful tool for geometric designers, pavement engineers and those responsible for the construction and maintenance of roadways and drainage systems as the same principles and methodologies apply;
- Road agencies such as Department of Feeder roads, engineers in Metropolitan, Municipal and District Assemblies in charge of LVR should be tutored using the manual as a way of disseminating best practices for the design, construction and maintenance of rural roads in a sustainable manner.
- Principles and methodology applicable and adaptable for almost all classes of roads, could be useful for expatriate consultants to train their staff;
- Its wide coverage makes it a useful resource for the training of mid-career professionals in charge of rural rods;
- All three parts are suitable as additional reading for the training of undergraduate and introduction text for graduate students in civil engineering in universities in Ghana.

7.3 Specific Comments

The following specific comments are provided on each Part of the Manual.

Part A: POLICY, GEOMETRIC DESIG AND ROAD SAFETY

- The Project Cycle has been well covered and this is a very useful tool which covers all steps including planning, preparation, implementation, monitoring and coordination;
- The current polices in the road sector regarding LVR design have been captured or cross referenced. Since policies are dynamic the need for periodic reviews and update to reflect prevailing conditions and experience should be established;
- For Ghana, the manual has brought to focus and elaborated various policies and procedures which have been used but not adequately documented including the road classification system;
- The influence of road context on project success and framework for sustainability has been covered to educate the practitioner who may be under training and may not have ready access to such information;
- The manual provides a very elaborate coverage and guidance on traffic survey and analysis for the design of roads in general and LVR in particular;
- The manual provides for types of cross sections for the design of LVR. This is very good for uniformity and cost effectiveness and could facilitate rapid project preparation;
- The coverage of intersections is rather scanty. It is important to observe that whenever LVR intersects higher class roads, safety at the intersection is paramount and needs to be addressed;
- Even though safety considerations are well treated in accordance with best practice, much of the interventions assume that the surfacing is bituminous which is usually not the case, vulnerable road users are pedestrian, bus passengers and motorcycle ad tricycle users. The safety interventions need to give treatment needs of these groups;
- The manual deals with an emerging subject of complimentary interventions and how they should be addressed. Three types of CI are identified and guidance on how to include them in a project is elaborated. This will be most helpful to the roads sector in Ghana.

Part B: MATERIALS, PAVEMENT DESIGN AND CONSTRUCTION

- In the introduction the structure of the three part manuals are presented along with the main introduction. The section on Procurement Process/Project Cycle provides detailed guidelines on project identification, studies, designs, implementation, operations and maintenance the bedrock of project procedure;
- The framework for sustainable provision of Low Volume Roads presented is very clear, easy to follow and informative as an overview. The material covers more areas not usually required for LVR but nevertheless very useful for any road professional to know;
- Even though the approach to LVR Pavement Design differs in some respect from that of HVRs, the same principles and methodology provided herein are applicable therefore the manual will be a useful reference for all road engineers to apply;
- In many places, very good graphical illustrations and figures have been used to simplify and support elaborate technical presentation and materials which improves readability and understanding;
- All laboratory tests for unbound gravel materials have been provided along with the relevant standard guidelines of the Ministry of Roads and Highways specifications for roads to aid quality control of roadworks and durability;
- Pavement Design for Unpaved Roads - Significant portion of the road network in Ghana has unpaved surfaces and qualify as LVR. These roads provide communities with access to important

services (schools, clinics, hospitals and markets) and are the basis of a thriving market which impacts on the economy and social environment. The manual captures all the factors relating to designs and construction of unpaved roads and their construction and maintenance;

- A very useful section on subgrade and borrow material investigation and testing including standard are provided;
- Both the CBR and DCP methods of designing LVR pavement are elaborated for existing roads and for new or upgrading facilities;
- The coverage on lifecycle costing, borrow pit management and road construction are very enriching especially as the manual also make cross references to other relevant DFR documents. Since the main task of most trained road engineers involve the construction and management of gravel surfaced roads, this manual will be a very helpful tool and contribute to the effort to make road pavements sustainable in Ghana.

PART C: HYDROLOGICAL AND DRAINAGE DESIGN AND ROADSIDE SLOPE STABILISATION

- The Manual establishes very well the importance of the drainage system for the durability and functional performance of the road network especially within the road prism. Water is the major contributory factor or cause, whether directly or indirectly, of roadway deterioration or pavement failure.
- In Ghana where there are distinct zones of rainfall intensities, in the wet zone(s) where the intensity of rainfall may be very high, concentrated over a period of time annually, it is necessary to give careful consideration to proper design and maintenance of drainage structures for pavements and other road facilities.
- Furthermore, the Manual recognises that drainage associated with any road can be divided into two broad categories: the drainage of the catchment area traversed by the road, and the drainage of the road prism and the carriageway. However, treatment of road over swamps can be less expensively treated with rock ballasting on LVR instead of geo-textile which has to be imported.
- The Manual uses various illustrations to show how efficient collection and discharge of rain water falling onto the area of the road reserve should be done. It emphasises why rainwater should be discharged speedily from the road surface and its environs to minimize erosion damage, flooding on the road the drainage system and to the adjacent land.
- The manual presents in a simple but easy to read format the Hydrological data and other information required for the hydraulic analysis and design of drainage structures, and the approach for sizing up the different drainage systems and structures with worked examples to guide the user;
- The tables, formulae, charts and design guidelines are in accordance with the most recent guidelines and estimates from the meteorological agency of Ghana manuals and other proven best practices.
- Worked examples using simple easy to use approaches and charts have been provided.

***Track changes, highlight, corrections, comments etc. have been captured in the reviewed documents*(Parts A, B, &C).**

8 Next Steps

The comments from the peer reviewers will be incorporated in the manuals for Ghana and Sierra Leone in order to produce the final drafts in MS Word version. The comments will also be incorporated in the drafts for Liberia, which are still to go through the peer review process.

The final MS Word versions of the documents are expected to be completed in August for Ghana and Sierra Leone. The Liberia version will follow, depending how long the peer review process for Liberia takes. One hard copy of each Part will be sent to the DFR and the SLRA for approval prior to starting the desktop publishing process.