PL-AFR-141

AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D.C. 20523

NOTICE OF MEETING

TO: See Distribution

FROM: AFR/PD, Timothy J. Bork, VB. Bolling for

SUBJECT: Kafue-Lusaka Road Rehabilitation Project Paper Review (690-0254)

ISSUES		ECPR	
DATE:	Tuesday, October 24	DATE:	Tuesday, October 31
TIME:	10:00 a.m.	TIME:	2:00 p.m.
PLACE:	6941 NS	PLACE:	6941 NS
CHAIR:	Sidney Bliss, AFR/PD/SA	CHAIR:	Larry Saiers, DAA/AFR

Distribution:
A/AA/AFR:WBollinger 6936 NS
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SER/OP/OS:MDarvin (2) 733 SA-14
OSDBU/MRC:LDrummond 648 SA-14
PRE/PD:RAnderson 3208 NS
BIFAD/S:JOweis 5314A NS

Project Committee Members:
AFR/PD/SA:SBliss 2638 NS
AFR/DP/PAB:TBethune 3917 NS
AFR/DP/PAR:LRosenberg 3909 NS
AFR/SA:KFinan 3921 NS
AFR/TR:ATumarello 2926 NS
GC/AFR:MAKleinjan 6891 NS

Please provide written issues to Sidney Bliss, AFR/PD/SA by Friday, October 20, 1989.

4754L

UNITED STATES GOVERNMENT

memorandum

DATE: 21 September, 1989

REPLY TO ATTN OF: Allison Herrick, Director, USAID/Zimbabwe

SUBJECT: Kafue-Lusaka Road Rehabilitation Project (690

TO: Cynthia Rozell, Director, AFR/PD/SA

USAID/Zimbabwe is pleased to transmit the attached Project Paper to A.I.D./Washington for final review and authorization.

This project has been developed as a sub-component of the "umbrella" sector-wide approach to addressing regional transportation constraints, approved under PID 690-0237. It is fully-consistent with criteria established for the selection of sub-component project activities within that sectoral framework.

The proposed project activities will complete a program of trunk road rehabilitation begun in 1982 with the Regional Transport and Storage: Makuti-Chirundu Road project (690-0209), followed by the Kafue-Chirundu Road Rehabilitation project (690-0209.02) in 1984-1989. The rationale for the selection of these regional transportation linkages for A.I.D.-financed rehabilitation remains as valid now as at the time of the earlier project authorizations, if not more so.

The project is consistent with the Southern Africa Regional Program strategy, as embodied in our recently-approved RDSS and is given a high priority in the SADCC Programme of Action.

The attached Project Paper has been designed in close collaboration with USAID/Zambia and has been reviewed and approved in both Lusaka and Harare.

OPTIONAL FORM NO. 10
(REV. 1-80)
GSA FPMR (41 CFR) 101-11.6
5010-114
* USGPO: 1988-491-248/20641

2.

PAGE 01 HARARE 05453 00 OF 02 130907Z 2402 025559 AID7483
ACTION AID-00

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INFO AFEA-03 AFSA-03 AFDP-06 AFCO-02 AFTR-05 AAAF-03 SAST-01
FFPB-02 SC-01 GCAF-02 GCCM-01 FVA-01 PVC-02 ES-01 STRD-01
FDR-01 FPA-02 FM-02 RELO-01 TELE-01 FMBD-02 /047 A3 HL13

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INFO AMEMBASSY NAIROBI
SECSTATE WASHDC 1026

UNCLAS HARARE 05453

AIDAC

NAIROBI FOR REDSO/ESA, PETER ARGO
AID/W FOR AFR/PD/SA

E.O. 12356: N/A
SUBJECT: USAID/ZIMBABWE REVIEW OF KAFUE-LUSAKA ROAD
- REHABILITATION PP

1. THIS IS AN ACTION CABLE FOR USAID/ZAMBIA, SEE PARA 3.

2. USAID/ZIMBABWE CONDUCTED A MISSION REVIEW OF SUBJECT PP ON SEPTEMBER 11, 1989. ISSUES RAISED AND PRINCIPAL CONCLUSIONS WERE AS FOLLOWS:

A. VENUE FOR PROJECT AUTHORIZATION
- ---

THE PROJECT WILL BE AUTHORIZED IN AID/W AS STIPULATED IN THE ABS REVIEW CABLE (STATE 251799).

B. TIMING AND AMOUNT OF OBLIGATIONS
- ---

USAID/ZIMBABWE WILL SEND A FINAL DRAFT PP TO AID/W DURING THE WEEK OF SEPTEMBER 16 AND REQUEST THAT AID/W REVIEW BE SCHEDULED FOR THE WEEK OF OCTOBER 23, TAKING INTO ACCOUNT DELAYS HISTORICALLY ENCOUNTERED IN PHYSICAL DUPLICATION OF A PP OF THIS SIZE AND THE TIME REQUIRED FOR WASHINGTON DISTRIBUTION AND REVIEW.
USAID/ZIMBABWE CONCURS IN USAID/ZAMBIA REQUEST FOR FY 1990 OBLIGATION OF DOLS 12 MILLION.

C. REQUIREMENT FOR A PSC ENGINEER
- ---

USAID/ZIMBABWE ACCEPTS THE PP RATIONALE FOR A PROJECT-FUNDED PSC ENGINEER TO ASSIST IN PROJECT MONITORING AND IMPLEMENTATION.

D. GRZ ROAD MAINTENANCE CAPACITY
- ---

THIS ISSUE WAS HIGHLIGHTED IN THE PP, THE ACTION MEMORANDUM AND IN COMMENTS RECEIVED FROM REDSO/ESA REO, PETER ARGO. USAID/ZIMBABWE RECOGNIZES THAT THIS PROJECT DOES NOT FOCUS DIRECTLY ON INSTITUTION BUILDING AT THE GRZ DEPARTMENT OF ROADS AND THAT THE FUTURE CAPACITY OF THE GRZ TO MAINTAIN THIS AND OTHER DONOR-REHABILITATED ROADS IS SUSPECT IN LIGHT OF PAST PERFORMANCE AND BUDGETARY AND STAFFING CONSTRAINTS. THE QUESTION REMAINS HOW BEST TO ADDRESS THIS ISSUE WITHIN THE CONTEXT OF A DISCRETE ROAD REHABILITATION ACTIVITY WHICH IS OTHERWISE

HARARE 05453 00 OF 02 130907Z 2402 025559 AID7483
JUSTIFIED ON REGIONAL, ECONOMIC AND TECHNICAL BASES. THE PP REVIEW NOTED THE MEASURES PROPOSED TO FACILITATE FUTURE ROAD MAINTENANCE INCLUDED AS PART OF THE PROPOSED PROJECT DESIGN, E.G. PROVISIONS FOR TRAINING AND MAINTENANCE EQUIPMENT AND SPECIFIC COVENANTS AND CPS RELATING TO FUTURE MAINTENANCE CONCERNS. OTHER DONOR ACTIVITIES AIMED AT IMPROVING THE INSTITUTIONAL CAPACITY OF THE DEPARTMENT OF ROADS ARE ALSO ENCOURAGING.

NONETHELESS, USAID/ZIMBABWE PERCEIVES A NEED TO ADDRESS THE ISSUE MORE DIRECTLY THROUGH TWO ADDITIONAL COVENANTS AND AN AMENDMENT TO CONDITION PRECEDENT NUMBER FOUR. THE FIRST NEW COVENANT WILL REQUIRE THE GRZ TO INITIATE A STUDY WHICH WILL ASSESS THE FEASIBILITY OF LEVYING ROAD USER FEES TO ENSURE THAT TRANSPORTERS BEAR A GREATER PROPORTION OF RECURRENT MAINTENANCE COSTS. SECONDLY, THE GRZ WILL BE ASKED TO COVENANT THAT THEY WILL STUDY THE POTENTIAL FOR PRIVATIZATION OF ROAD MAINTENANCE SERVICES. THESE TWO COVENANTS ARE INTENDED TO EXPRESS A.I.D. CONCERNS ON THE RECURRENT COST AND MAINTENANCE ISSUES AND TO SUGGEST POSSIBLE APPROACHES. IN ADDITION, THE GRZ WILL BE ASKED TO AGREE TO AN AMENDMENT OF CP NUMBER FOUR CONCERNING WEIGHBRIDGE OPERATIONS TO THE EFFECT THAT PAYMENTS RECEIVED AS PENALTIES FOR OVERWEIGHT ASSESSMENTS WILL BE DEDICATED TO THE NATIONAL ROAD MAINTENANCE PROGRAM.

E. FUTURE FUNDING FOR THE 3.9 KM STRETCH TO THE KAFUE
- ROUNDABOUT
- ---

USAID/ZIMBABWE HAS DETERMINED THAT IT WILL NOT BE POSSIBLE TO PROVIDE FUTURE REGIONAL PROGRAM FUNDS FOR THE 3.9 KM SEGMENT INTO LUSAKA CITY CENTER AS THIS SUPPLEMENTAL WORK CANNOT BE ECONOMICALLY JUSTIFIED WITHIN THE REGIONAL CONTEXT OF THE PROJECT.

3. USAID/ZAMBIA IS REQUESTED TO NEGOTIATE THE INCLUSION OF THE ADDITIONAL COVENANTS CITED IN PARA 2D AND TO PROVIDE WORDING AGREED WITH GRZ BY IMMEDIATE CABLE FOR INCLUSION IN THE FINAL DRAFT PP.

4. ADDITIONAL SUBSTANTIVE AND EDITORIAL CHANGES, PARTICULARLY WITH RESPECT TO THE PROPOSED TIMING OF IMPLEMENTATION ACTIVITIES AND THE MECHANISM AND EXPRESSION OF KWACHA COUNTERPART FUNDING WILL BE COORDINATED WITH USAID/ZAMBIA THROUGH SEPARATE COMMUNICATIONS.

5. USAID/ZIMBABWE IS CONFIDENT THAT THE PROPOSED PROJECT ACTIVITY WILL BE AUTHORIZED IN A.I.D/W AND THAT THE OBJECTIVES OF THE PROJECT WILL BE ACHIEVED, TO THE BENEFIT OF ZAMBIA AND THE SOUTHERN AFRICA REGION AS A WHOLE. FUGIT

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ACTION MEMORANDUM FOR THE DIRECTOR, USAID/ZIMBABWE

FROM: Brad Wallach, USAID/Zimbabwe
Office of Project Development and Implementation Support

SUBJECT: Kafue-Lusaka Road Rehabilitation (690-0254) Project Paper Approval

ACTION REQUESTED: You are requested to approve the attached Project Paper which recommends A.I.D./Washington authorization of a grant to the Government of the Republic of Zambia (GRZ) for rehabilitation of the Kafue-Lusaka road. If authorized, the grant will be funded from the Southern Africa Development Fund (SADF) appropriation, in the life-of-project amount of $21,050,000. The FY 1990 obligation for the project will be $12 million.

DISCUSSION: Rehabilitation of the Kafue-Lusaka road will complete a program of road improvement between Zambia and Zimbabwe begun under project 690-0209, Regional Transport and Storage Development. Under that project, two sections of road were rehabilitated: Makuti-Chirundu in Zimbabwe and Kafue-Chirundu in Zambia. When the final section from Kafue to Lusaka is completed, this multi-phase rehabilitation program will provide an improved road transportation system for traffic destined for intraregional markets and the Mozambican port of Beira. Successful project implementation will remove existing traffic bottlenecks between Lusaka, Harare and the Beira port, thereby: a) allowing a higher volume of heavy traffic to travel at higher speeds; b) reducing accident and breakdown rates; and c) reducing transportation costs.

This project, along with others in the USAID/Zimbabwe, Southern Africa Regional Program portfolio, will contribute to the SADCC transport sector objective of assisting the majority-ruled nations of southern Africa to overcome regional transport constraints that constitute a serious obstacle to the region's economic growth and development. Rehabilitation of the Kafue-Lusaka road has been identified as a priority project for donor assistance by the SADCC Council of Ministers and appears in the transport sector Programme of Action as Project 1.8.3. It has also been given a high priority in the USAID/Zimbabwe-sponsored assessment of regional transportation projects based on such criteria as economic feasibility, regional impact and absorptive capacity.

The purpose of the project is to continue and expand efforts to relieve capacity constraints on the region's trunk road system by rehabilitating the Kafue-Lusaka road. The road from the Kafue River tp the Lusaka city suburb of Makeni is 49.4 kilometers long. Assistance provided under this project will improve the carrying capacity of the road to accomodate an anticipated 2.5% annual increase in vehicle traffic; it will reduce road accidents and vehicle breakdowns resulting in transportation cost savings to vehicle owners and secondary beneficiaries; and it will provide year round reliable access for all road users.

Project-funded road rehabilitation will take place during two consecutive dry seasons in 1992 and 1993, followed by a one-year period during which the construction contractor will be responsible for remedying any defects. Road rehabilitation and reconstruction activities will include:

- 9.85 kilometers of reconstruction;
- 29.85 kilometers of overlay and seal;
- 9.70 kilometers of patch and seal;
- road realignment in two locations;
- drainage structure repair and new drainage culverts; and,
- shoulder widening to conform to Zambia road standards 1A and 1B.

Project road reconstruction and rehabilitation have been designed to 10 year (minimum maintenance) life specifications. This standard was chosen as the alternative which produces the highest rate of return for the investment, in comparison with other possible road maintenance and rehabilitation options. An internal rate of return for this rehabilitation option was estimated to be in the range of 25 to 30%.

Project funds will be used to procure construction supervision services and project management support. Other components of the project will include training for Zambia Department of Roads personnel and the provision of equipment to help ensure post-project maintenance of the rehabilitated road.

Project beneficiaries will include private and public sector users of the road, particularly those involved in intraregional export activities. A target for the employment of women has been established at 20% of all project-funded roadworkers.

Although FAA Section 110(A) requiring a 25 percent host country contribution is not applicable to this regional project, the GRZ will contribute 53.5 million kwacha ($3.35 million at the September 1989 official exchange rate) toward the achievement of project objectives. These local currency funds will be used to pay a portion of construction costs, in-country training, and the kwacha-denominated elements of project monitoring and administration. The GRZ Department of Roads will have primary implementation responsibility for the work to be carried out under this project. All services, with the exception of a project engineer to be assigned to USAID/Zambia, will be procured on a host-country contract basis. The capability of the Department of Roads to assume this responsibility has been demonstrated by its performance in a similar capacity under the A.I.D.-funded Kafue-Chirundu project.

Contracting will be in accordance with standard GRZ and A.I.D. host-country contracting procedures and A.I.D. will approve the Request for Technical Proposals (RFTP) and contract documents before issuance.

The institutional capacity of the Department of Roads and its ability to maintain the Kafue-Lusaka road after project-funded rehabilitation is completed has been assessed as part of the Project Paper analyses. Though there is some cause for concern based upon historic budgetary and staffing constraints, the design team has concluded that the GRZ will have the necessary institutional capacity, resources and commitment to properly maintain the road.

Moreover, the project will undertake several initiatives to improve the institutional capacity of the Department of Roads. Specifically, the project will provide training for Department mechanics and engineers, maintenance equipment and spare parts, contract project construction supervision and technical assistance to facilitate project monitoring and administration. Conditions Precedent to disbursement of project funds will require the GRZ to develop an appropriate maintenance plan for the project road and to dedicate sufficient staff and budgetary resources to achieve the plan's objectives. Covenants in the Project Grant Agreement will record the government's commitment to study: 1) the feasibility of assessing road user fees to ensure that transporters bear a greater share of recurrent maintenance costs; and 2) the possibility of privatizing road maintenance activities. Finally, to limit the deterioration of the project road, the GRZ will commit itself to develop a vehicle weight control program and to strictly enforce existing weight limitations for vehicles travelling on the Kafue-Lusaka road.

Other donors, notably FINNIDA and AfDB, are developing additional proposals to improve the capacity of the Department of Roads to maintain all trunk roads under its jurisdiction.

Summary Project Budget
(000)

Budget Line Item (A.I.D. Funds)	Estimated Cost
Final Design	$390
Construction Supervision	$1,000
Construction	$15,100
Maintenance Equipment	$860
Training	$20
PSC Engineer	$820
Evaluations and Audits	$100
Contingency (15%)	$2,740
TOTAL, A.I.D.	$21,030
Rounded to	$21,050

Budget Line Item (GRZ Funds)	Estimated Cost
Construction	K40,000
Maintenance Equipment	K400
Training	K750
Contingency (30%)	K12,345
TOTAL, GRZ	K53,495
Rounded to	K53,500

Note: U.S.D. Equivalent = $3,343,750 rounded to $3,350,000 at 9/89 official exchange rate.

It has been concluded from the analysis in the project paper that:

1. the project is technically and economically sound and socially acceptable;
2. the technical design and cost estimates are reasonable and adequately planned, thereby satisfying the requirements of Section 611(a) of the Foreign Assistance Act of 1961, as amended;
3. the timing and funding of project activities are appropriately scheduled;
4. sufficient planning has been done for the implementation, monitoring and evaluation of project progress; and,
5. all statutory criteria have been satisfied.

The Initial Environmental Examination, contained in Annex I(F) of the Project Paper has been reviewed and a negative determination has been approved by the AFR Bureau Environmental Officer.

Conditions and covenants applicable to this project are to insure sound project implementation and maintenance after the road rehabilitation is completed. These conditions and covenants include, inter alia:

1. The provision of 30 million Zambian kwacha prior to disbursement of dollar funds;

2. The provision of a maintenance plan and schedule of resources to carry out that plan prior to the disbursement of dollar funds;

3. A commitment to enforcing weight limitations for vehicles using the project road.

These conditions and covenants and others cited in Sections 6.1 and 6.2 of the attached Project Paper have been discussed with the GRZ and determined to be acceptable.

Project procurement under Geographic Code 941 (selected free world) is authorized under State 074147. The RLA concurred in this determination in Nairobi 022537. Two source/origin waivers are requested to permit the procurement of laboratory equipment, tipper trucks and spare parts in the approximate total amount of $315,000, from Geographic Code 935 (special free world) sources. These waivers have been cleared by the RLA and are attached in Annex I(G).

A project review meeting was held with USAID/Zambia senior staff on August 25, 1989. With respect to Zambia-specific issues, the RLA has determined that the legislation under which SADCC funds are appropriated specifically exempts projects funded with these resources from compliance with the terms of the Brooke-Alexander Amendment and Section 620(q) of the Foreign Assistance Act. Nonetheless, the Director, USAID/Zambia has stipulated that he requires AA/AFR concurrence with the proposed obligation of funds prior to signing a Grant Agreement with the GRZ, if Zambia is still under Brooke-Alexander funding constraints..

The Kafue-Lusaka Road Rehabilitation Project Paper development is justified on the basis of an "umbrella" PID approved in 1986, which established the rationale for a sector-wide approach to alleviating transportation constraints in the SADCC region. That PID (690-0237) establishes criteria for the selection of subproject activities to be carried out under the rubric of this regional sector-wide approach. A discussion of the project's conformance to those criteria is included in the Economic Analysis in Annex III(B).

RECOMMENDATION: That you approve the attached Project Paper for final review and authorization in A.I.D./Washington.

APPROVED G B Hermik

DISAPPROVED _____

DATE 22 September 1989

Attachments:

1. Project Authorization
2. Project Paper with Annexes.

Clearances: RLA (draft)
Director, USAID/Zambia (draft)

PI-ABA-141

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT DATA SHEET

1. TRANSACTION CODE: A (A = Add, C = Change, D = Delete) — Amendment Number

DOCUMENT CODE: 3

2. COUNTRY/ENTITY: Southern Africa Regional

3. PROJECT NUMBER: 690-0254

4. BUREAU/OFFICE: USAID/Zimbabwe — 06

5. PROJECT TITLE (maximum 40 characters): Kafue-Lusaka Road Rehabilitation

6. PROJECT ASSISTANCE COMPLETION DATE (PACD): MM 12 DD 31 YY 94

7. ESTIMATED DATE OF OBLIGATION (Under 'B.' below, enter 1, 2, 3, or 4)
A. Initial FY 90 B. Quarter C. Final FY 91

8. COSTS ($000 OR EQUIVALENT $1 = K16)

A. FUNDING SOURCE	FIRST FY 1990 B. FX	C. L/C	D. Total	LIFE OF PROJECT E. FX	F. L/C	G. Total
AID Appropriated Total	12000		12000	21050		21050
(Grant)	(12000)	( )	(12000)	(21050)	( )	(21050)
(Loan)	( )	( )	( )	( )	( )	( )
Other U.S. 1.						
Other U.S. 2.						
Host Country		1875	1875		3350	3350
Other Donor(s)						
TOTALS			13875			24400

9. SCHEDULE OF AID FUNDING ($000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH. CODE 1. Grant	2. Loan	D. OBLIGATIONS TO DATE 1. Grant	2. Loan	E. AMOUNT APPROVED THIS ACTION 1. Grant	2. Loan	F. LIFE OF PROJECT 1. Grant	2. Loan
(1) SADF	800	821				21050		21050	
(2)									
(3)									
(4)									
TOTALS								21050	

10. SECONDARY TECHNICAL CODES (maximum 6 codes of 3 positions each): 220

11. SECONDARY PURPOSE COD: 710

12. SPECIAL CONCERNS CODES (maximum 7 codes of 4 positions each)
A. Code
B. Amount

13. PROJECT PURPOSE (maximum 480 characters)

To continue and expand efforts to relieve capacity constraints on the region's trunk system by rehabilitating the Kafue-Lusaka Road.

14. SCHEDULED EVALUATIONS
Interim MM 01 YY 93 MM YY Final MM 12 YY 94

15. SOURCE/ORIGIN OF GOODS AND SERVICES
☐ 000 ☒ 941 ☐ Local ☐ Other (Specify)

16. AMENDMENTS/NATURE OF CHANGE PROPOSED (This is page 1 of a ____ page PP Amendment.)

Controller

17. APPROVED BY
Signature: Allison B. Herrick
Title: Director USAID/Zimbabwe
Date Signed: MM 09 DD 21 YY 89

18. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION
MM 09 DD 25 YY 89

AID 1330-4 (8-79)

PROJECT AUTHORIZATION

KAFUE-LUSAKA ROAD REHABILITATION PROJECT NO. 690-0254

1. Pursuant to Title II of the Foreign Operations, Export Financing, and Related Programs Appropriations Act of 1989 (Southern Africa, Development Assistance) and the Foreign Assistance Act of 1961, as amended, I hereby authorize the Kafue-Lusaka Road Rehabilitation Project for the Republic of Zambia involving planned obligations not to exceed twenty one million, fifty thousand dollars ($21,050,000) in grant funds over a five year period from the date of authorization, subject to the availability of funds in accordance with the A.I.D. OYB/Allotment process, to help in financing foreign and local currency costs for the Project. The planned life of the Project is five years from the date of initial obligation.

2. The Project consists of reconstruction and rehabilitation of approximately 50 kilometers of road between Kafue and Lusaka. Interventions include design, construction and supervision services; training and the supply of equipment and materials.

3. The Project Agreement which may be negotiated and executed by the officers to whom such authority is delegated in accordance with A.I.D. regulations and Delegations of Authority, shall be subject to the following essential terms and covenants and major conditions, together with such other terms and conditions as A.I.D. may deem appropriate.

4. Source and Origin of Commodities, Nationality of Services

   Except as A.I.D. may otherwise agree in writing:

   (a) Commodities financed by A.I.D. under the Project shall have their source and origin in countries included in A.I.D. Georgraphic Code 941 and Zambia.

   (b) Except for ocean shipping, the suppliers of commodities or services financed by A.I.D. under the project shall have countries included in A.I.D. Geographic Code 941 and Zambia as their place of nationality.

   (c) Ocean shipping financed by A.I.D. under the Project shall be financed only on flag vesssels of the countries included in A.I.D. Geographic Code 941 and Zambia, subject to the 50/50 shipping requirements under the Cargo Preference Act and the regulations promulgated thereunder.

5. Conditions Precedent

Prior to the first disbursement, or the issuance of any commitment under the Project Agreement, the Government of the Republic of Zambia (GRZ) shall, except as A.I.D. may otherwise agree in writing:

(a) Deposit the amount of Zambian Kwacha 30,000,000 (thirty million) in an interest bearing account controlled by the Roads Department at a commercial bank located in Lusaka;

(b) The GRZ will provide USAID/Zambia with a plan, in form and substance satisfactory to USAID, describing the steps it plans to take to ensure proper maintenance of the Kafue-Lusaka road after project-funded rehabilitation is completed, as well as the schedule of resources to be made available for this purpose.

(c) The GRZ will provide USAID a letter of commitment, in form and substance satisfactory to USAID, allocating to the Kafue-Lusaka road first priority use of any maintenance equipment previously financed by USAID for road maintenance activities, to the extent that such equipment is not required under the previously-financed activities. The allocation of such equipment will be as detailed in the Kafue-Lusaka road maintenance plan approved by USAID as a condition precedent to disbursement under this project.

(d) The GRZ will commence operation of the weighbridge station financed by USAID under the Kafue-Chirundu Road Rehabilitation Project (690-0209.02).

6. Covenants

(a) The GRZ covenants to carry out appropriate maintenance on the Kafue-Lusaka Road after the contractor has completed the rehabilitation work and to make provisions for the necessary staffing, training and budgetary resources to achieve this purpose.

(b) The GRZ covenants to include provision for the Kafue-Lusaka road maintenance in the Ministry of Power, Transport and Communications budget request to Parliament.

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(c) The GRZ covenants that maintenance equipment provided under this project shall be allocated on a first-use basis for maintenance of the Kafue-Lusaka road. The use of project financed equipment not immediately required for Kafue-Lusaka road maintenance will be allocated on a first-priority basis to other A.I.D. funded road rehabilitation project activities in Zambia, as necessary.

(d) The GRZ covenants to provide, in a timely manner, the import licences, work permits/temporary resident visas required by personnel of the design/construction supervision contractor and construction contractor.

(e) The GRZ covenants to enforce existing road weight limitations and to enact any additional weight limitations as may be required to ensure that traffic on the Kafue-Lusaka road does not exceed the design carrying capacity of the road surface.

(f) The GRZ covenants to give maximum consideration to the dedication of payments received as penalties for overweight assessments to provide supplemental funding for the national road maintenance program.

(g) The GRZ covenants to initiate a study to assess the feasibility of levying road-user fees to ensure that transporters bear a greater proportion of recurrent maintenance costs.

(h) The GRZ covenants to study the potential for privatization of road maintenance services.

Waivers

(a) The following waivers to A.I.D. regulations are approved:

(1) Procurement source/origin waiver from A.I.D. Geographic Code 941 to Code 935 for soils laboratory testing equipment in an amount of approximately $75,000 and;

(2) Procurement source/origin waiver from A.I.D. Geographic Code 941 to Code 935, with approval of proprietory procurement, for one truck-mounted bitumen distributor and two tipper trucks, with associated spare parts, in an amount of approximately $240,000.

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(b) I certify that the exclusion of the procurement of the above described commodities from Free World Countries other than the Cooperation Country and countries included in A.I.D. Geographic Code 941 would seriously impede the attainment of U.S. foreign policy objectives and objectives of the foreign assistance program.

(c) With respect to the truck-mounted bitumen distributor and tipper trucks, I find that special circumstances exist justifying a waiver of the requirements of Section 636 (i) of the Foreign Assistance Act of 1961, as amended.

_____

DEPUTY ASSISTANT ADMINISTRATOR FOR AFRICA

_____

DATE

Regional Transportation Development II

Kafue-Lusaka Road Rehabilitation

(690-0254)

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1. Summary and Recommendation

1.1 Project Summary

The project will finance the reconstruction and rehabilitation of 49.4 kilometers of road between the Kafue River bridge and a point of intersection with a four-lane highway ten kilometers inside Lusaka city. The project will be implemented primarily through a host-country contract between the Government of the Republic of Zambia and a construction contractor who will undertake the complete reconstruction of 9.8 kilometers of the project road and widening and repairing on the remaining 39.55 kilometers.

Other components of the project include training for Zambia Department of Roads personnel and the provision of equipment to help ensure post-project maintenance of the rehabilitated road. Project funds will also be used to procure construction supervision services and project management support.

Rehabilitation of the Kafue-Lusaka road will complete a program of road improvement between Zambia and Zimbabwe begun under project 690-0209, Regional Transport and Storage Development. Under that project two sections of road were rehabilitated: Makuti-Chirundu in Zimbabwe and Kafue-Chirundu in Zambia. When the final section from Kafue to Lusaka is completed, this multi-phase rehabilitation program will provide an improved road transportation system for traffic destined for intraregional markets and the Mozambican port of Beira. Successful project implementation will remove existing traffic bottlenecks between Lusaka, Harare and the Beira port, thereby: a) allowing a higher volume of heavy traffic to travel at higher speeds; b) reducing accident and breakdown rates; and c) reducing transportation costs.

Benefits will accrue to private and public sector users of the road, particularly those involved in intraregional export activities.

Rehabilitation of the Kafue-Lusaka road has been identified as a priority project for donor assistance by the SADCC Council of Ministers and figures in the SADCC Programme of Action (project 1.8.3). The project has also been given a high priority in the USAID/Zimbabwe-sponsored assessment of regional transportation projects based on such criteria as economic feasibility, regional impact and absorptive capacity.

1.2 Recommendation

That the Director, USAID/Zimbabwe, approve the project as described and submit the Project Paper to A.I.D./Washington for authorization of a grant of $21,050,000 (twenty-one million, fifty thousand dollars) in SADF funds to the Government of the Republic of Zambia (GRZ) to implement rehabilitation of the Kafue-Lusaka road.

2. Project Rationale

2.1 Problem Statement

Several major road systems serve intra-regional and overseas trade of the

Southern Africa Development Coordination Conference (SADCC) region. Botswana, Zambia, Malawi, Zimbabwe and Tanzania are linked through a series of road connections including the Lusaka-Kafue-Chirundu-Harare-Beira network. Although built to satisfactory standards, many of the trunk roads which serve international trade require rehabilitation. This is the result of poor maintenance, excessive vehicle loads, civil disturbances and general neglect associated with a historical lack of emphasis on regional development.

Efficient transportation within the region is vitally important for economic growth and regional integration. SADCC intra-regional trade is compromised by unreliable deliveries and costs associated with deteriorating road and rail infrastructure. SADCC trade with the outside world is highly dependent on expensive alternative transportation routes. The present high cost of transporting the region's commodities to external markets through the ports of the Republic of South Africa, compared with potentially lower costs through efficiently operating SADCC corridors, significantly increases the delivered price of SADCC goods and renders them less competitive on international markets.

Although much of the region's international trade is shipped by rail, certain types of cargo can be more efficiently moved by road. In Zimbabwe and Zambia, a missing rail link between Harare and Lusaka is supplanted by road, and a road also parallels the Livingstone-Lusaka railway. The two roads combine at Kafue for the final leg into Lusaka. Rehabilitation of the Kafue-Lusaka segment is necessary because of serious deterioration of the existing road surface due to heavy traffic and lack of maintenance.

2.2 Relation to A.I.D. and SADCC Priorities

A.I.D.'s support to SADCC and its programs began in 1982. In 1984, A.I.D. first articulated a regional strategy for providing assistance to the SADCC region that focussed on three sectors: transport, agricultural research and training. The Southern Africa Regional Program, Regional Development Strategy Statement (RDSS) for the period FY 1991-1995 retains the emphasis on transportation and includes plans to allocate more than half of all A.I.D. resources available during the planning period to this sector. The selection of this project for funding under the regional program strategy is fully consistent with the RDSS objective "to install capacity and improve efficiency in infrastructure that serves regional cooperation, provides access to regional and external markets and fosters economic growth".

This project contributes to the SADCC transport sector objective of "assisting the majority ruled nations of southern Africa to overcome regional transport constraints which are a serious obstacle to the economic growth and development of the region".

The proposed project, along with others in the regional program portfolio, will contribute to the A.I.D. Africa Bureau goal of sustainable, broad-based economic growth in Africa. In contributing to this overarching goal, the project purpose reflects the Africa Bureau's FY 1989-91 Action Plan, Strategic Objective 1-3: "to improve equity and efficiency in providing key goods, including transportation".

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A.I.D.'s support of regional efforts in Southern Africa complements existing and planned A.I.D. bilateral programs. Although regional by virtue of its impact and linkages with other SADCC member-countries, the project implementation activities will occur exclusively within the Republic of Zambia. As such, it has been developed in close collaboration with USAID/Zambia and is consistent with the Zambia Mission's bilateral strategy, as described in the FY 1989 Country Development Strategy Statement, to "increase production (especially for export) and real income from both a) small farms and b) small scale rural and agri-business enterprises". Insofar as the project seeks to reduce transportation constraints for Zambian exporters and increase the profitability of Zambian exports through transport cost savings, the Kafue-Lusaka Road Rehabilitation Project is consistent with and responsive to the Mission's strategic priorities.

The Kafue-Lusaka Road Rehabilitation Project Paper development is justified on the basis of an "umbrella" PID approved in 1986, which established the rationale for a sector-wide approach to alleviating transportation constraints in the SADCC region. That PID (690-0237) sets out the following criteria for selection of subproject activities to be carried out under the rubric of this regional sector-wide approach:

1. short to medium term importance of transportation constraints to the import/export sector of SADCC countries;

2. relative priority within SADCC countries;

3. economic feasibility of the project as measured by the estimated internal rate of return;

4. total system reliability within the proposed project corridor;

5. capability of host country to finance recurrent costs and maintain the project;

6. medium to long term impact of the transportation system on economic growth in the region;

7. priority of the project within SADCC programs; and

8. system security within proposed project corridor.

These selection criteria are reviewed in the Economic analysis attached in Annex III(B). Justification for the Kafue-Lusaka road project has been measured against these parameters and determined to be fully appropriate.

2.3 Other Donor Activity

A number of other donors are either actively implementing or considering major road rehabilitation projects in Zambia.

The Government of the Peoples' Republic of China and the German Technical Assistance program (KfW) are rehabilitating national "feeder" roads in the

Central and North Western provinces. The Chinese project covers 400 kms from Lusaka to Kaoma. The Germans are rehabilitating approximately the same length of road further north and west (M8) connecting the town of Zambezi with the Mutanda Mission (see map on the following page).

The Danish foreign assistance program, DANIDA, is appraising a project to reconstruct a road through the Copperbelt connecting Chillabombwe with Kapiri Mposhi and then veering north towards Tanzania, from Kapiri Mposhi to Mkushi. A decision on this project is expected in calender year 1989.

Somewhat further along in the design and mobilization stages are European Economic Community (EEC) and Norwegian foreign assistance (NORAD) trunk-road rehabilitation project initiatives on the main road between the copperbelt in the north and Lusaka and the front line states to the south. The Norwegian assisted-effort will cover part of the distance (115 kms) between the border town of Livingstone and the city of Kafue, connecting north, over the USAID-rehabilitat d road to Lusaka, or south, over the USAID-rehabilitated road to Chirundu and Zimbabwe. A construction contract for the NORAD project will be signed in October, 1989. The EEC project will provide 200 kms of major road reconstruction between Lusaka and Kapiri Mposhi, passing through the provincial capital of Kabwe. The EEC has selected an Italian firm, Initec, as the principal construction contractor for this work, however, the final tendering process is not expected to be completed until the end of 1990.

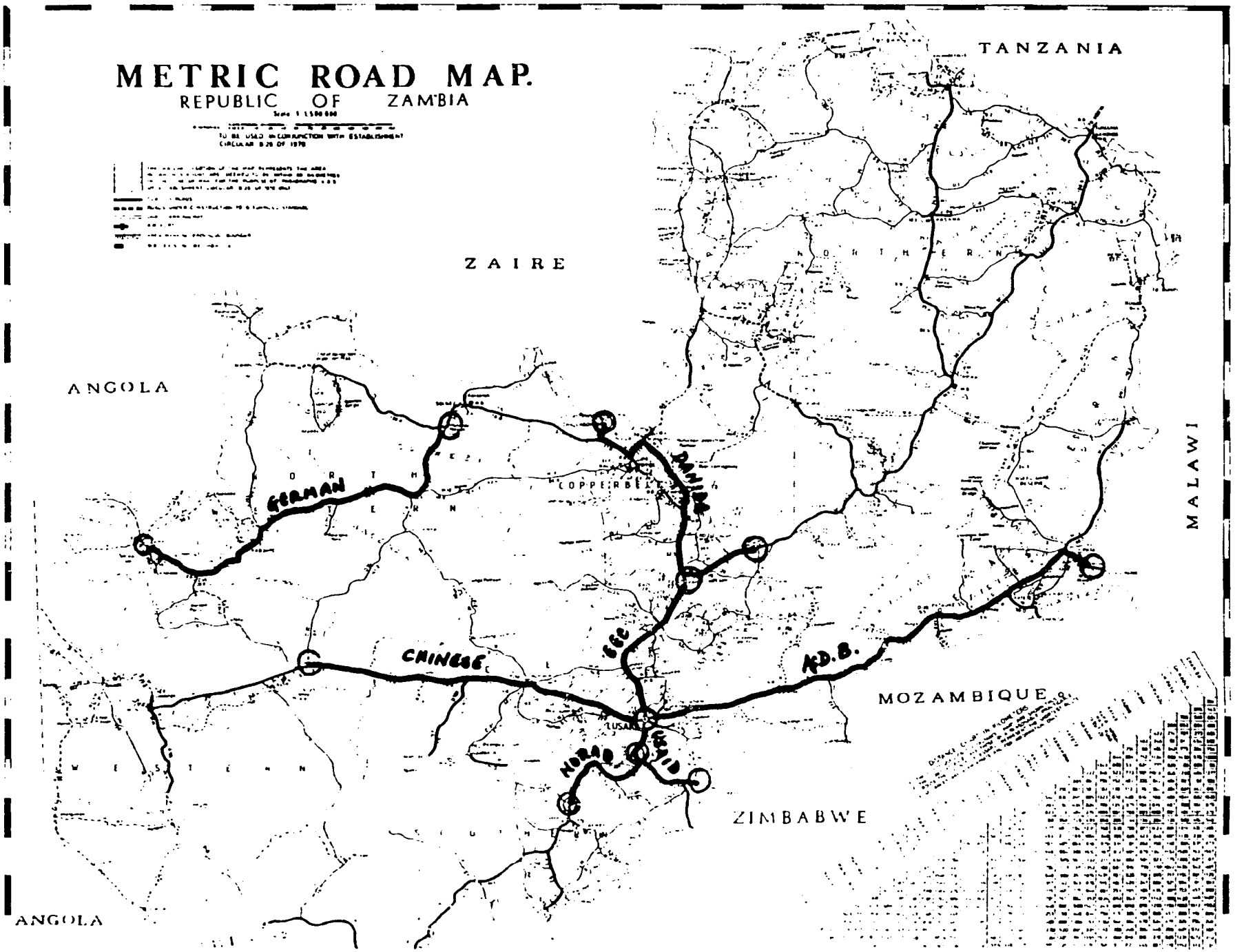
The longest and most technically-difficult stretch of road under consideration for donor-funded rehabilitation runs due east from Lusaka to the Malawi border town of Mchinji, some 600 kms in all. This project is being appraised by the African Development Bank and a presentation to their Board of Directors is expected before the end of the year.

Other donor-funded activities involving the Department of Roads but not directly focussed on road rehabilitation include an Italian project underway since 1985 to construct 320 kms of new road in the Northern Province. This project is 80% completed, with a life-of-project budget estimated at over $51 million.

Both the Japanese and the Canadians have provided plant and equipment for road works. The Japanese contributed $2 million in 1982 and $1.2 million in 1987/8 for the purchase of heavy trucks and resealing units. The Canadians donated 80 road graders in 1978.

All of these activities are coordinated by the GRZ Department of Roads and reflect the high priority that donors have ascribed to the rehabilitation of the road transportation network within and through the Republic of Zambia. Each project is a discrete activity, wholly-funded by the sponsoring donor agency and the GRZ. Co-financing of road rehabilitation work has not been attempted, primarily because of difficulties in coordinating the approval and contracting processes and in light of the abundant opportunities for each donor to directly undertake rehabilitation work on high priority and badly deteriorated road linkages in the country.

ACTUAL OR PROSPECTIVE
DONOR-FUNDED
ROAD REHABILITATION



2.4 Previous A.I.D. Experience with Road Rehabilitation Projects in Southern Africa

A.I.D. has implemented several transportation projects in southern Africa, including the Botswana-Zambia (BOTZAM) road, the Blantyre-Tete-Harare road, the Southern Perimeter road in Lesotho and the Makuti-Chirundu-Kafue road connecting Zimbabwe and Zambia. Experience in the rehabilitation of the Kafue-Chirundu road is most directly relevant to the proposed Kafue-Lusaka road rehabilitation, as it employed virtually identical project implementation, procurement and monitoring mechanisms. Lessons learned from this earlier activity have been carefully incorporated into the current project design and host-country counterpart officials, having traveled well down the "learning curve" as a function of their involvement in the Kafue-Chirundu road implementation, will be better prepared to work within the A.I.D. regulatory framework.

General experience with transport infrastructure projects financed by A.I.D. and other donors has revealed that economic returns are highest for rehabilitation and maintenance projects. This has been consistently borne out in the economic analyses of projects in southern Africa and is demonstrated to be the case for the Kafue-Lusaka road rehabilitation as well.

3. Project Description

3.1 Project Objectives

The goal of the project is to support the development of a stronger foundation for economic growth in southern Africa. This goal will be achieved through:

1) increased regional exports as a function of improved road reliability and concommitant transportation cost savings making regional products more competitive in SADCC markets;

2) increased extra-regional trade using more cost-effective SADCC transportation corridors; and,

3) foreign exchange savings as vehicle mechanical wear, breakdown and accident rates are reduced.

The project purpose is to continue and expand efforts to relieve capacity constraints on the region's trunk road system by rehabilitating the Kafue-Lusaka road. Project-financed road reconstruction and rehabilitation will increase the traffic carrying capacity of the road and assure year-round reliable access for all road users.

Following completion of the project there will be: 49.4 kms of rehabilitated road; an annual increase in road traffic of 2.5%; better trained and equipped personnel at the Zambia Department of Roads; and a decrease in road accidents and vehicle breakdowns.

3.2 Project Components

3.2.1 Final Design and Construction Supervision

The project will provide an estimated $1.39 million for final engineering design and construction supervision services. A consulting engineering firm will be hired to carry out final road reconstruction design (including the preparation of appropriate tender documents), soils collection and analysis, and continuous site inspections to ensure that the construction contractor adheres to design standards and specifications. The consulting engineering firm will provide monthly reports to the USAID/Zambia project officer, through the Ministry of Power, Transport and Communications. These reports will provide objective assessments of the performance of the construction contractor and recommendations for the improvement of project implementation. A representative of the consulting engineering firm will participate in periodic meetings with the GRZ Department of Roads and the construction contractor to discuss and resolve any issues arising from inspection site visits or implementation progress reports.

3.2.2 Construction

The project will undertake to reconstruct 9.85 kms of road, to overlay and seal 29.85 kms and to patch and seal 9.7 kms. Additional project-funded construction will include the realignment of 2 stretches of road to improve visibility and road widening to ensure conformance with Zambia road specifications.

This construction work will be procured through a host-country construction services contract with a Zambian or other geographic code 941 firm. The contractor will be responsible for completing all proposed roadwork in accordance with final design drawings and specifications. Based upon previous A.I.D. experience in Southern Africa, it is reasonably certain that a sufficient number of U.S. or code 941 firms in Zimbabwe, Kenya, Malawi and Zambia will be both available and technically qualified to undertake the construction.

3.2.3 Training

The project will provide specialized training to Department of Roads personnel as part of an effort to ensure that the Kafue-Lusaka road will be properly maintained after project-funded rehabilitation is completed.

Ten field mechanics, selected by the Department, will attend a four-week training program offered twice a year. The curricula will be tailored to meet the requirements of the Department of Roads and will focus on heavy equipment maintenance and repair, including: engines, gearboxes, brakes and hydraulic systems. This training is intended to reinforce and broaden the skills base of field mechanics working on a wide variety of roadwork equipment. The curriculum will specifically include the maintenance and repair of equipment to be procured for the Kafue-Lusaka road rehabilitation.

The project will also sponsor one Roads Department engineer each year, to attend a four-week Road Maintenance and Construction Management course in Tanzania. Participants will be selected on a rotating basis, in collaboration with other-donor sponsored candidates, to ensure that the entire Roads Department engineering staff will eventually have an opportunity to attend the course. Course curriculum focusses on management rather than technical issues and is intended for senior road engineers from the SADCC region. It allows participants the opportunity to learn how construction and maintenance management techniques are applied in practice to improve the overall planning and management of road maintenance.

3.2.4 Maintenance Equipment

Project funds will be provided for the procurement of road maintenance equipment to be used, on a priority basis, for the maintenace of the Kafue-Lusaka road after rehabilitation is completed. This equipment will be consigned to the GRZ Department of Roads, which will be responsible for its periodic maintenance and repair. A letter of commitment from the Ministry of Power, Transport and Communications, attesting that the project road will be given first priority use of the equipment provided has been established as a Condition Precedent to Disbursement of project funds.

Maintenance equipment to be procured will include:

- a mechanical horse (truck tractor) and spares
- a roller unit and spares
- a trailer
- 2 tippers (dumptrucks)
- a bitumen distributor
- 2 chip spreaders
- a sweeper
- a line striper, and
- a farm tractor and spares.
- a vibratory (or impact) compactor
- a bitumen storage tank
- a fuel storage tank

This set of equipment is similar in nature and composition to that provided under the Kafue-Chirundu project. This equipment is the minimum sufficient for project road maintenance and is not in excess of project requirements. Maintenance equipment procured for Kafue-Chirundu will be at or near the end of its useful life by the time it would be required for Kafue-Lusaka maintenance. However, an additional Condition Precedent to Disbursement has been established to ensure that any such previously-procured equipment which could be of use in the maintenance of the Kafue-Lusaka road after rehabilitation will be made available for that purpose.

3.2.5 Project Administration

3.2.5.1 Implementing Agency Responsibilities

The Roads Department of the GRZ Ministry of Power, Transport and Communications will have primary implementation responsibility for the work

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done under this project. The Director, Department of Roads, will serve as the GRZ Project Coordinator. He will be assisted by the Roads Department administrative and technical staff and by an engineering consulting firm engaged to supervise final engineering design and construction.

The scope of work and request for technical proposals (RFTP) for the engineering consultancy will be developed by the Department with some assistance from the USAID/Zambia Project Manager. Contracting will be in accordance with standard GRZ and A.I.D. host-country contracting procedures and A.I.D. will approve the RFTP and contract documents before issuance.

All services to be provided under the project, with the exception of a project engineer to be assigned to USAID/Zambia, will be procured on a host-country contract basis. The capability of the Department of Roads to assume this responsibility has been demonstrated by its performance in a similar capacity under the Kafue-Chirundu project (690-0209). Preparation of the invitation for bids (IFB) for construction services will be done jointly by the Department of Roads and the consulting engineers. The contract documents will be prepared in the standard GRZ format with appropriate A.I.D. regulatory clauses appended as required. Project monitoring, reporting and financial arrangements will remain as established for the Kafue-Chirundu project.

3.2.5.2 A.I.D. Responsibilities

Although this project will be funded from the Southern Africa Development Fund, project implementation authority will be delegated to USAID/Zambia after authorization. A Project Manager will be designated by the Director, USAID/Zambia. He/she will be responsible for project monitoring, periodic reporting, management of A.I.D. project evaluations and audits, and liaison between USAID/Zambia and the GRZ Project Coordinator on matters relating to project implementation.

The project accounting station will be the USAID/Zimbabwe Controller's Office. Engineering support will be provided by the USAID/Zimbabwe Regional Engineering Officer (REO), as required. A schedule of routine engineering oversight will be established by the USAID/Zambia Project Manager and the USAID/Zimbabwe REO. Legal assistance will be provided as necessary, by the Regional Legal Advisor (RLA) at the REDSO/ESA office in Nairobi, Kenya. The Regional Contracting Officer (RCO) also located in REDSO/ESA, Nairobi, will be involved in consultations on contracts preparation and approvals. The A.I.D. project development backstop officer (AFR/PD/SA) will assist in arrangements for CBD publications and receipt of prequalification data.

3.3 Cost Estimate and Summary Financial Plan

3.3 SUMMARY COST ESTIMATE AND FINANCIAL PLAN
(000)

ACTIVITY	AID		Host Country		Total	
	US $	Kwacha	US $	Kwacha	US $	Kwacha
Final Design	390.00 (A)	0.00	0.00	0.00	390.00	0.00
Construction Supervision	1000.00 (A)	0.00	0.00	0.00	1000.00	0.00
Construction	15100.00 (B)	0.00	0.00	40000.00 (G)	15100.00	40000.00
Maintenance Equipment	860.00 (C)	0.00	0.00	400.00 (H)	860.00	400.00
Training	20.00 (D)	0.00	0.00	750.00 (I)	20.00	750.00
PSC Engineer	820.00 (E)	0.00	0.00	0.00	820.00	0.00
Evaluations, Audits	100.00 (F)	0.00	0.00	0.00	100.00	0.00
Contingency/Inflation (15 % for $) (30 % for Kwacha)	2743.50	0.00	0.00	12345.00 (J)	2743.50	12345.00
Total	21033.50	0.00	0.00	53495.00	21033.50	53495.00
Total (Rounded)	21050.00	0.00	0.00	53500.00	21050.00	53500.00

Notes:

(A) Taken from Section 14.3 of Feasibility Study/Cost Analysis, prepared by John Burrow and Partners,dated August 1989. Amount represents an adjustment to John Burrow estimate to eliminate work on 3.9 km from Lusaka to Makeni.

(B) Taken from Section 14.3 of Feasibility Study/Cost Analysis, prepared by John Burrow and Partners,dated August 1989. See costs section of Engineering Technical Analysis for further details of cost build-up.

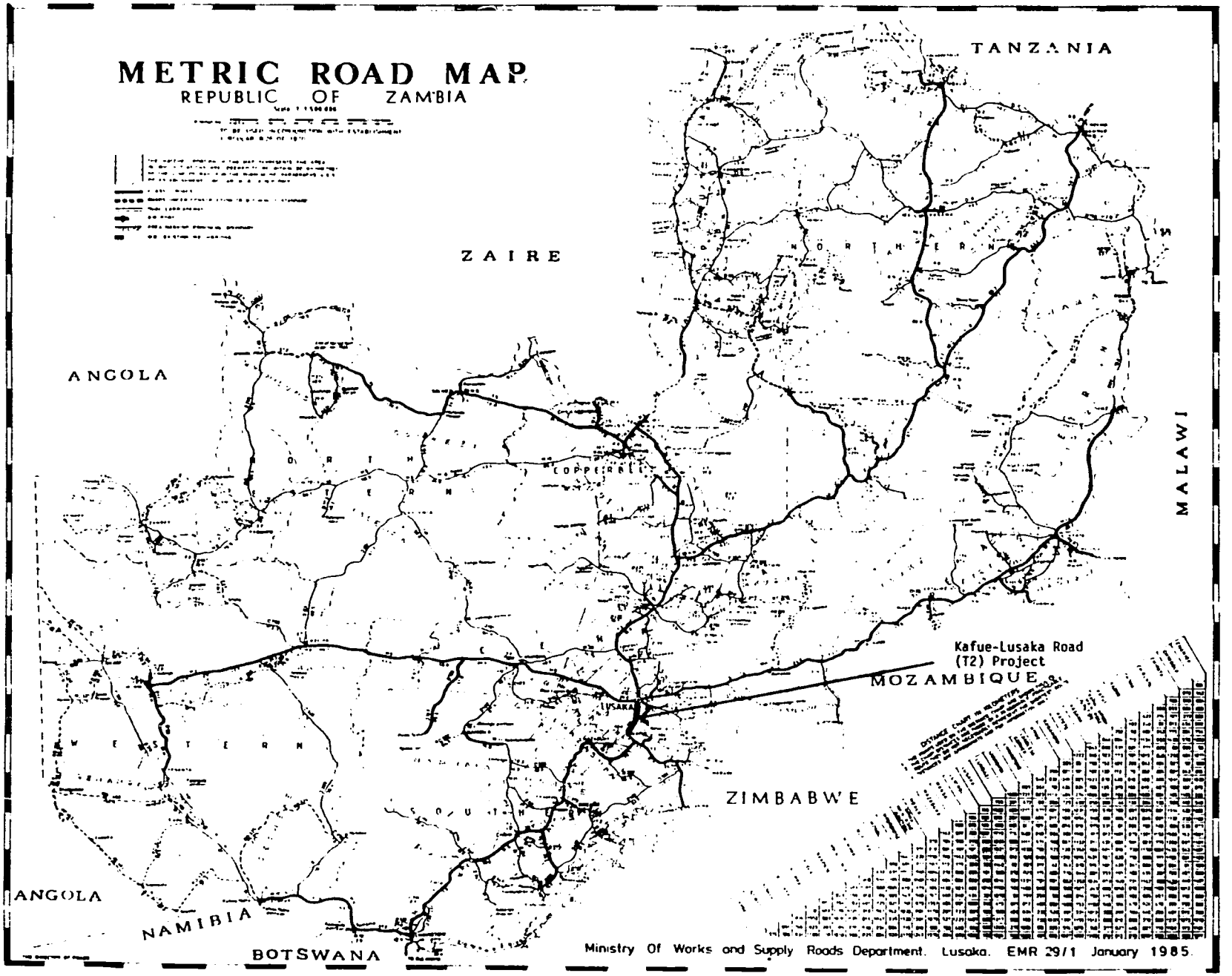
(C) Taken from actual costs of similar equipment procured competively by the Roads Department in Nov/Dec 1988 using A.I.D. HB 11 procedures. Prices were adjusted upward by 15% to cover inflation. See illustrative Equipment List in Procurement Plan.

(D) Taken from cost estimates provided by Roads Department and the designated training institutions.

(E) Taken from actual long-term PSC costs provided by the Executive Office, USAID/Zambia.

(F) Based on contract TA to supplement REDSO/ESA staff on 1 mid-term and 1 final evaluation ($60,000), and 1 non-federal Final Audit ($40,000).

(G), (H), (I) and (J) Funds to be provided through standard USAID/GRZ Counterpart Agreement.


METRIC ROAD MAP
REPUBLIC OF ZAMBIA
TANZANIA
ZAIRE
ANGOLA
MALAWI
COPPERBELT
LUSAKA
Kafue-Lusaka Road
(T2) Project
MOZAMBIQUE
ZIMBABWE
ANGOLA
NAMIBIA
BOTSWANA
Ministry Of Works and Supply Roads Department. Lusaka. EMR 29/1 January 1985.

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4. Project Implementation

4.1 Implementation Responsibilities

4.1.1 Department of Roads/Ministry of Power, Transport and Communication

The Department of Roads of the Ministry of Power, Transport and Communication (MOPTC) will have the primary responsibility for rehabilitation work to be done under this project. The work will be carried out using A.I.D.-approved host country contracting procedures. Rehabilitation work will be completed by a construction contractor which will be supervised on-site by a consulting engineering/construction supervision contractor. To create a division of contracting responsibilities for control purposes, the MOPTC will act as the employer and the Director of Roads will be the Engineer in charge of the construction work. The consulting engineers will complete final design, and provide construction supervision services. As Engineer in charge of the works, the Director of Roads will direct the construction supervision services contractor. The Director will delegate necessary powers to the Chief consulting engineer (Resident Engineer) to effectively monitor and control the quality, pace and cost of construction work. Upon completion of final design and tender documents by the consulting engineer, construction services will be procured by the employer under a separate host country construction contract.

The Director of Roads is an experienced, competent engineer with knowledge of both field operations and contract administration. Actual project management will be delegated to the Deputy Director, or another senior engineer, both of whom have extensive experience in managing major road rehabilitation projects. This experience includes the successful management of the recently completed A.I.D.-financed Kafue-Chirundu Road Project (690-0209.02). The Deputy Director or his designee will have direct line management authority over the final design/supervisory engineering firm hired to monitor construction work. Due to the large number of major planned trunk road rehabilitation projects during the time frame of the Kafue-Lusaka Project, it is envisaged that the supervisory engineering firm will be delegated a wide range of powers by the Director of Roads. This is the normal mode of operations employed by the Roads Department to maximize their limited staff resources. With close coordination between the chief engineer of the construction supervision firm and the Roads Department project manager, this procedure has been proven effective on the Kafue-Chirundu Road Project.

The Department of Roads has demonsrated the ability to effectively administer host country contracts for both construction supervision and construction services under the Kafue-Chirundu Road Rehabilitation Project. A key to this success was a recognition by the Director of Roads that both the construction supervision firm and USAID as the financier were integral team members in achieving project objectives. Throughout the duration of construction, the Roads Department maintained a spirit of cooperation and open communication with USAID and adhered to guidelines established with regard to required A.I.D. approvals, payment procedures, etc. In the audit of the Kafue-Chirundu Road Rehabilitation Project, "AUDIT Report No. 3-690-89-17" RIG/A/N stated:

"The audit disclosed that the project objective of facilitating movement of key commodities between Zambia and Zimbabwe was achieved, as construction was substantially complete, the overall quality of construction was excellent, and provisions were made for future maintenance of the road. In addition, internal controls over $12.1 million of disbursements were adequate to ensure that work was satisfactorilly completed in conformance with applicable contractual requirem nts and A.I.D. regulations."

A prequalification solicitation for final design/ construction supervision services will be prepared by the Department of Roads, in consultation with USAID, RLA and the Regional Engineer. The solicitation, requesting expressions of interest, qualifications, financial capability, details of ownership, etc., will be advertised in both the Commerce Business Daily and regional newspapers. The Department of Roads will provide prequalified firms with an A.I.D.-approved Request for Technical Proposals. Upon receipt of USAID approval of the Department's evaluation of technical proposals, the Department of Roads will negotiate with the highest ranked firm, and subject to successful completion of negotiations, will submit a draft contract to USAID for review, comments and approval. After approval by USAID the contract will be submitted to the GRZ Central Tender Board for approval. Pursuant to Tender Board approval, the contract will be signed and funds committed by A.I.D.

Construction services will be procured using HB 11 formal competitive bidding procedures. The Department of Roads, through the consulting engineer, will be responsible for development of the prequalification questionnaire and Invitation for Bids (IFB). After the appropriate approvals by A.I.D. the prequalification advertisement will be placed in the Commerce Business Daily and regional newspapers. The Department will receive and evaluate bids, with the assistance of the final design and construction supervision contractor. Results of the evaluation will be submitted to USAID/Zambia for review and approval. Upon approval of the Department's evaluation of contractor's capabilities to perform the work, A.I.D.-approved IFB's will be sent to prequalified construction firms. The Department of Roads will receive/evaluate bids and propose an award to USAID for approval. If approved by USAID, GRZ Central Tender Board approval will be secured, the contract signed, and funds will be committed.

In addition to contract administration, Roads will review documentation and approve all payments to both the construction supervision and construction contractors. Payment documents will be reviewed by the Department's Executive Engineer for Contracts, and approved by the Director of Roads prior to submission to USAID for disbursement of project dollar funds. The construction contractor will also be paid from a kwacha-denominated construction line-item budget (K40 million) which will be disbursed as a percentage of each invoice. The Director of Roads will authorize the MOPTC to make these payments from a project working account established at a local commercial bank.

Maintenance equipment will be procured using A.I.D.-approved host country contracting procedures. However, the procurement will be carried out on behalf of the Department of Roads by the construction supervision contractor. Handbook 11 (HB 11) procedures will be utilized.

4.1.2 A.I.D. Responsibilities

The project officer will be the USAID/Zambia Assistant Project Development Officer (PDO). To assist in daily monitoring and implementation activities, the project will fund an experienced engineer under a personal services contract (PSC) who will report to the Asst. PDO. The PSC engineer's primary tasks will be on-site monitoring, advice to mission management on technical issues and implementation progress, resolution of implementation problems and assistance in the preparation of project related documentation. The role of the PSC engineer will be particularly important during the period of project implementation for several reasons. For the next five years, it appears that the Department of Roads will be under an unusually heavy workload of monitoring and contract administration actions resulting from a massive GRZ trunk road rehabilitation program. It is conceivable that, in addition to normal activities for road maintenance and rehabilitation activities, four other major rehabilitation efforts will be funded by NORAD, EEC, AfDB and DANIDA. Thus, it will be prudent for USAID to maintain especially close contact with the Department to stay abreast of critical events and to assist in averting or minimizing potential bottlenecks. These troublesome areas could include shortages of necessary inputs such as bitumen and cement as well as an overload of administrative work at the Department. The PSC engineer will provide market intelligence on the projected availabily of local materials in relation to the demands of the major road rehabilitation projects, identify and assist in the resolution of holdups with required work permits and import licences, and encourage the Roads Department to make timely decisions and prompt contract administration actions.

As shown in the implementation schedule, the Regional Engineer and the Controller based at USAID/Zimbabwe will be critical to effective project implementation. The REO will make routine visits to monitor construction progress, advise Mission management on technical issues, assist with the preparation of project documentation and provide required clearances for implementation actions by the Mission. The assistance of the REO will be especially critical during the early stage of the project to provide necessary inputs on the review of advertisements, prequalification documentation, and host country contracts.

The Office of the Controller in Harare will be the accounting station for both dollar and local currency disbursements. Direct Letters of Commitment will be issued to make dollar disbursements to the final design and construction supervision contractor, the construction contractor, suppliers of road maintenance equipment for the Department of Roads and the institution providing international training. Local currency disbursements will be made by MOPTC under a standard GRZ/ USAID counterpart funds agreement but monitored by USAID/Zambia and the Controller in Harare.

The RLA, REDSO/ESA will provide legal assistance throughout the duration of project implementation. He/she will confirm the satisfaction by the GRZ of Conditions Precedent and review and approve advertisements, prequalification documentation, and host country contracting

procedures and contract documents. Periodically he/she will review and clear project implementation documentation and advise Mission management if and when legal issues such as host country contractual disputes arise.

The RCO, REDSO/ESA will provide assistance as needed for the A.I.D. review of host country contracts for design and construction supervision and for construction contracts. It should be noted that the Department of Roads is familiar with procedures and appreciates the rationale behind HB 11 contracting procedures due to recent experience in the Kafue-Chirundu Road Rehabilitation Project. It is therefore not likely that issues related to a lack of understanding of A.I.D. rules and regulations will arise.

Necessary administrative arrangements for training will be made by the USAID/Zambia project and training officers.

4.2 Implementation Schedule

The timetable of implementation actions that follows has been divided into four principal areas. Several actions will be taken to compress the contracting period for the procurement of both final design and construction supervision services and construction services. Advertisements for the prequalification of both contractors will be made at the earliest possible times. The advertisement for design and supervision services will be placed in October, prior to the actual obligation of funds. The advertisement will request expressions of interest and qualifications from firms eligible for rehabilitation work, subject to the availability of funds. A similar advertisement for the prequalification of construction firms will be placed early in the final design process so that prequalified firms may be issued IFB's immediately upon completion of the design and tender document development process.

Implementation Schedule

Proposed Dates	Activity	Responsible Organization
1. Initial/General		
09/89	Project Paper completed	USAID/Zimbabwe
11/89	Project authorized	AID/W
01/90	Project Grant Agreement signed	USAID/Zambia, GRZ
01/90	Conditions Precedent satisfied	USAID/Zambia, GRZ
12/94	PACD	
2. PSC for Monitoring Project		
10/89	Draft PIO/T for PSC engineer	USAID/Zambia, REO
01/90	Issue PIO/T for PSC engineer	USAID/Zambia
01/90	Issue world wide cable, place advertisement in Engineering News and Civil Engineering Magazine	AID/W, USAID/Zambia
03/90	Receive CV's and SF-171 from interested applicants	USAID/Zambia
04/90	Review CV's and issue recommendation on prospective candidate for PSC	USAID/Zambia, REO
05/90	PSC contract signed	USAID/Zambia
07/90	PSC candidate arrives in Zambia	USAID/Zambia, PSC
3. Engineering Supervision Final Design Consultant		
09/89	Draft ad for prequalification	USAID/Zambia, REO, GRZ

Proposed Dates	Activity	Responsible Organization
10/89	Publication in Commercial Business Daily (CBD) and local/regional newspapers	USAID/Zambia, GRZ
10/89	Draft and Review Scope of Work and RFTP	USAID/Zambia, REO, GRZ
11/89	Review of prequalification documents	USAID/Zambia, RLA, GRZ
02/90	RFTP issued to prequalified engineering firms	Department of Roads
04/90	Receipt of technical proposals by Department of Roads	GRZ/CTB
05/90	A.I.D. approval of evaluation and authorization to Department of Roads to negotiate with No. 1 engineering firm.	GRZ/CTB, USAID/Zambia, REO
07/90	Dept. negotiates and submits draft contract to A.I.D.	GRZ/USAID/Zambia/ RLA
07/90	AID approval of contract provided	USAID/Zambia, RLA
12/90	Preliminary design drawings completed	Engineer
12/90	Preliminary tender documents completed	Engineer
02/91	Final design drawings/tender documents complete	Engineer
03/91	Final design drawings/tender documents reviewed and approved by A.I.D.	USAID/Zambia USAID/Zimbabwe, GRZ
03/92	Mobilize engineering personnel at construction site	Engineer
12/93	Complete construction supervision	Engineer

4. Prequalification of Construction Contractor

08/90	Prequalification documents drafted	GRZ, REO, USAID/Zambia, Engineer
09/90	Prequalification questionnaire reviewed/approved	USAID/Zambia, REO, Engineer

Proposed Dates	Activity	Responsible Organization
09/90	Draft advertisement for prequalification	GRZ, USAID/Zambia, Engineer
10/90	Publication of prequalification advertisement in CBD and regional/local newspapers	AID/W, USAID/Zambia, Regional USAID, GRZ, Engineer
12/90	Receipt of prequalification data	GRZ, USAID/Zambia, Engineer
01/91	Review/recommend shortlist	GRZ, USAID/Zambia, REO, Engineer
02/91	Approval of shortlist	GRZ, USAID/Zambia, REO

5. Construction Contractor Selection

03/91	IFB approved	REO, USAID/Zambia, RLA
03/91	IFB issued	GRZ Engineer, USAID/Zimbabwe USAID/Zambia, RLA
04/91	Site visit	GRZ, REO, USAID/Zambia, Prospective Contractors
06/91	Bids received and evaluated	GRZ/CTB
07/91	Dept. of Roads recommend contractor award to Central Tender Board	GRZ/CTB
09/91	Review and approval of contract	USAID/Zambia, RLA, REO
12/91	Contract awarded and contractor notified to proceed	GRZ
03/92	Mobilize/start work	Contractor
12/93	Construction completed	Contractor

Note: Commodity procurement schedule is included in section 4.3.9, page 25.

4.3 Procurement Plan

The Project Paper design team has determined that the Department of Roads (Department) has the institutional capability to effectively implement host country contracts for the three basic elements included in the project: final design and construction supervision services, construction services and the procurement of road maintenance equipment. As discussed in the institutional analysis, it is the standard practice of the Department to contract for major trunk road rehabilitation such as the rehabilitation of the Kafue-Lusaka Road.

Host country contracting is the only practical alternative to carry out major construction such as the rehabilitation of the Kafue-Lusaka Road. Only the Department has the required expertise and authority in Zambia to direct construction, issue variation orders, provide engineers decisions, acquire land, and a host of other day-to-day actions. A.I.D. has neither the expertise on Zambian laws and regulations nor the authority to administer a construction contract in Zambia. Further HB 11, Chapter 2 states that it is usually appropriate that the borrower/grantee, acting through a designated contracting agency other than A.I.D., contract for construction services required to implement projects. The construction supervision contractor acts as an extension of the Director of Roads in monitoring the quality, cost and schedule of construction so it would not be practical to attempt an A.I.D. Direct contract.

The Department faces a number of significant management-related obstacles in carrying out its mandate to administer the construction and maintenance of major roads. However, the major workload of Kafue-Lusaka Project implementation will be carried out by a final design and construction supervision and a construction services contractor. A contract will be finalized at the beginning of project implementation with an engineering consultancy firm for final design and construction supervision. Thereafter, major involvement of the Department will be to monitor construction progress through the consultant and approve payments. The Department has already proven its capability to satisfactorily carry out these functions under the Kafue-Chirundu Project (690-0209). The maintenance equipment will be procured under HB 11 host country procedures. Purchasing will be carried out by the construction supervision firm on behalf of the Department.

It has been demonstrated under the Kafue-Chirundu Project that the most critical element in construction project implementation is the thorough and thoughtful selection of both a final design and construction supervision and a construction services contractor. The Kafue-Chirundu Project foundered under a weak construction contractor but proceeded on to successful completion once a capable contractor was hired. It is therefore imperative that the Department exert the utmost care and diligence in the prequalification and selection of both contractors.

It is equally important that A.I.D. provide sufficient technical expertise to complete necessary reviews and approvals at critical points in the procurement process. As detailed in the following Procurement Schedule, the RLA and Regional Engineer are being programmed by the Mission to provide TDY assistance at appropriate times to review and approve host country documents and procedures. These include prequalification, solicitation and contract documents, as well as the GRZ evaluation of bids and award proposals. The process of timely review by A.I.D. will be facilitated by specifying that copies of prequalification data, technical proposals, and bids be sent to USAID/Zambia along with original submissions to the Roads Department. In addition, the Mission will hire an experienced PSC engineer under a Personal Services Contract to coordinate closely with the Department during all phases of project implementation. The PSC will advise the GRZ on A.I.D. HB 11 contracting procedures and keep the Mission's Project Officer informed of implementation progress at all times. Given the size and complexity of the proposed host country contracting process, recent experience of the Mission dictates that close monitoring of implementation is a critical element to achievement of project objectives.

The source and origin and nationality requirements for the project will be limited to A.I.D. Geographic Code 941 and Zambia. It is therefore considered to be of utmost importance to include sufficient RLA assistance in the review of eligibility requirements on prequalification documents submitted by both design and supervision and construction firms. For instance, ownership of many firms based in Zambia and the region will undoubtedly be presented in less than a straight forward manner. The RLA will have to look closely to differentiate between actual Code 941/Zambian firms and 935 firms based in Zambia and the Region.

4.3.1 Final Design and Construction Supervision

With the assistance of USAID/Zambia, the RLA and the REO, the Department will place an advertisement in the Commerce Business Daily, local and regional newspapers for expressions of interest and qualifications to conduct final design and construction supervision. The advertisements will be placed early in October 1989, prior to obligation, to expedite the prequalification and contracting for design and supervision services. Subject to obligation and availability of funds, it is anticipated that a final design/supervision contract will be signed by July 1990. The objective is to complete the design, preparation of A.I.D.-approved IFB's for construction services, and prequalification of construction contractors by March, 1991.

These activities must be completed thoroughly to ensure satisfactory road rehabilitation, and on schedule to allow enough time to complete the selection process and signing of a construction contract by December 1991 (see Project Timeline in Annex II(B).

An RFTP for design and supervision services will be prepared in October 1989 by the Roads Department in close consultation with the Regional Engineer. The document will be reviewed by RLA and RCO prior to issuance to prequalified contractors.

The Department will receive and evaluate technical proposals from prequalified engineering consultants and submit its ranking to the Mission for review and approval. If the evaluation methodology is judged sound by USAID/Zambia, the Regional Engineer and the RLA, the Department will be instructed to negotiate with the firm ranked number one technically. The Department and this firm will negotiate and propose a draft design and supervision contract for A.I.D. approval.

The contracting process will be implemented by the host country, yet it will nevertheless be essential for the Mission's project officer and PSC engineer to be in close contact with the Department at all times during the prequalification, selection, contract negotiation and award process to ensure that HB 11 contracting rules and regulations are adhered to. Timely TDY's by the Regional Engineer and RLA will be critical. Close coordination with RCO and RFMC will be essential on the negotiation and formulation of the draft contract by the Department so that A.I.D. will be able to approve the document without a serious delay in project implementation. For instance, it is anticipated that the contract format should reflect monthly billing rates for the provision of manpower and reimbursement for items such as travel, communications and household effects. It is critical that A.I.D. provide this type of input at the beginning of negotiations to ensure that the Department knows the parameters acceptable to A.I.D. An A.I.D. representative will act as an observer during negotiations to answer questions on rules and regulations.

4.3.2 Construction Services

A.I.D. approved advertisements advising U.S., local and code 941 construction firms of the availability of prequalification forms will be placed in the CBD, local and regional newspapers in approximately October 1990. Prequalification forms, approved by the RLA and the Regional Engineer, will be available from the Zambian Embassy in Washington and various USAID's around the SADCC Region. It is anticipated that A.I.D. will approve the Department's prequalification of contractors and that IFB's developed by the Department and approved by A.I.D. will be sent to prequalified firms by March, 1991. As in the final design and construction supervision contracting process, copies of prequalification data and bids will be sent to A.I.D. along with original submissions to the Department.

Prior to the submission of bids, all firms receiving IFBs will be advised of a pre-bid site visit and follow-up meeting at which the Department will receive questions and provide official responses. It is anticipated that the Department will receive bids in June, 1991 and that A.I.D. will approve a contract by September, 1991. The Department will then seek GRZ Central Tender Board approval and a contract will be signed by December, 1991. This will allow the contractor 3 months to mobilize, with construction work starting in March, 1992.

Adherence to the timing of events detailed in the following procurement schedule is critical to allow the contractor two full dry seasons to complete the work. As in the procurement of construction supervision services, it is essential that the Mission coordinate closely with the Department to insure that all host country procurement documentation and procedures conform to HB 11 regulations. This will be especially critical on the development of prequalification forms and the IFB. Although the Department has previously developed documents in conformance with A.I.D. rules, A.I.D. administrative procedures are sufficiently complex that the Department will require intensive assistance from the Mission to facilitate their work. It is anticipated that the PSC engineer hired under the project will concentrate his efforts on coordination with the Department during this phase of implementation. Timely assistance from RLA and the Regional Engineer will be required to review documentation and provide necessary approvals. The controller from USAID/Zimbabwe will assist in the approval of the contract, and in particular, payment procedures.

4.3.3 Road Maintenance Equipment

4.3.3.1 Responsible Agency

The Department will be the responsible agency for the procurement of road maintenance equipment which will be procured under HB 11 host country contracting procedures. The Department has demonstrated its capability to administer A.I.D.-financed procurements under the Kafue-Chirundu Road Project for which a similar set of equipment was competitively procured. The Department recently implemented A.I.D. approved host country contracting procedures from Chapter 3 of HB 11 for a very similar procurement of road maintenance equipment. Even though the Department was faced with an extremely tight time schedule imposed by the Kafue-Chirundu Road Project PACD, all units were procured and shipped on time. Several pieces of equipment have already arrived in country and the remainder is currently in transit to Zambia.

However, due to an anticipated heavy workload at the Department, (monitoring a number of major country-wide road rehabilitation projects) the procurement will be carried out by the engineering consulting firm contracted to provide final design and construction supervision services. Procurement capabilities of potential contractors will be assessed in the prequalification of consultants. A further examination of procurement capabilities will be made during the Department's evaluation of technical proposals and the A.I.D. review of award proposals.

Responsibilities of the final design and construction supervision contractor acting as procurement agent will include the review and refinement of specifications prepared by the Department. Due to the dollar amount and rather standard nature of the required equipment, it is anticipated that formal bidding (IFBs) will be utilized. It will therefore be important to define specifications more precisely than is normally done by the Department, which generally procures competitively through an informal solicitation of

quotes. The procurement agent will develop IFBs, advertise the procurements in the appropriate A.I.D. bulletin, receive and evaluate bids, and submit results of the evaluation to the Department for approval. Upon approval of awards by USAID/Zambia, the Controller, USAID/Zimbabwe will issue Direct Letters of Commitment to suppliers. The procurement agent will arrange for insurance and CIF Lusaka shipments, and ensure that the necessary information and clearance documentation is received by the buyer in a timely manner. The procurement agent must also process insurance claims on behalf of the Department if necessary.

A fixed price for the above services will be negotiated with the final design and construction supervision consultant.

4.3.3.2 Source and Origin

Except as specifically authorized by waivers, all commodities and commodity-related services will have their source and origin in countries included in A.I.D. Geographic Code 941 and Zambia. Code 941 eligibility for ocean shipments will be subject to 50-50 cargo preference which will be monitored by the GRZ as detailed in instructions issued by A.I.D. in a Project Implementation Letter (PIL). Shipments on appropriate vessels will be arranged by the procurement agent of the Department.

4.3.3.3 Procurement Method

All procurements will be made under host country contracts in conformance with rules contained in Chapter 3 of HB 11. Formal competitive bidding will be utilized with advertisements placed in the appropriate A.I.D. bulletin. The procurement will be carried out by the engineering consultant contracted to supervise construction and the Commodity Management Officer assigned to Zambia will coordinate closely in drafting and placement of advertisements, drafting of IFB's, review of procurement procedures and other A.I.D. requirements such as approval of awards.

4.3.3.4 Financing Method

Controller, USAID/Zimbabwe will issue a Direct Letter of Commitment to the engineering consultant to provide final design and construction supervision and procurement services.

4.3.4 Commodity Procurement Waivers

4.3.4.1 Road Maintenance Equipment

The Department had standardized on either Mitsubishi or Mercedes tipper trucks, and either Mitsubishi/Hotta or Mercedes/Benninghoven truck-mounted bitumen distributors. (Hotta and Benninghoven manufacture the bitumen distributors). Under the Kafue Chirundu Road Project, proprietory procurement was authorized to procure either Mitsubishi or Mercedes-Benz tipper trucks and

a truck-mounted bitumen distributor. Since Mitsubishi and Mercedes-Benz units are not manufactured in Code 941 countries or Zambia, a corresponding source/origin waiver is required to allow procurement from Code 935. A waiver to allow the procurement of either Mitsubishi or Mercedes units is included as Annex I(G). This procedure is absolutely necessary to improve Departmental capability to provide adequate inventories of spare parts and to achieve the benefits of familiarity with the units by operating personnel and mechanics.

4.3.4.2 Soils Laboratory Testing Equipment

Under the Kafue-Chirundu Road Project, a source/origin waiver was approved to permit the purchase by the construction contractor of various soils testing equipment. The equipment was critical to successful implementation to insure that the quality of materials used in construction met contract specifications. A source/origin waiver from Code 941 and Zambia to Code 935 was necessary because project equipment had to be compatible with on-hand British equipment at the Department. Further, the equipment had to be familiar to local technicians who were used to operating British makes and modes. The present situation parallels the past as British made equipment is still the only practical alternative. A Code 935 source/origin waiver is included as Annex I(G)2.

4.3.4.3 Vehicles

Approximately four right hand drive vehicles (pick-ups) will be procured by the construction contractor for use by the construction supervision contractor to monitor the works. These vehicles will be maintained by the construction contractor during the course of construction and will revert to the Department upon completion of supervision services. These vehicles will be procured under the authority of the blanket source/origin waiver for light weight, right hand drive vehicles contained in STATE 79274 (or the annual follow-on waiver).

4.3.5 Shipping

The eligible source for ocean shipments financed under the project will be A.I.D. Geographic Code 941 and Zambia. The GRZ will monitor 50/50 cargo preference shipping requirements through the Department's procurement agent.

4.3.6 Receipt and Utilization of Commodities

The road maintenance equipment comprises a complete maintenance resealing unit. The equipment will be consigned to, received and utilized by the Department. Upon completion of customs clearance, the equipment will first be checked by a representative of the Director of Roads and then included in the Department's master inventory. Pursuant to a covenant in the Grant Agreement, the equipment will be allocated on a first use basis to maintenance of the Kafue-Lusaka Road. The road maintenance equipment detailed in the equipment list below is the minimum requirement sufficient to maintain the project road. The units to be financed are not in excess of project requirements, even though some of the units have a capacity somewhat in excess of minimum requirements. For instance, the bitumen distributor will allow

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for the resealing of many kilometers, but obviously, it is not divisible to match its capacity exactly with that of project requirements. After which, the equipment will be deployed by the Director of Roads to a province where a section of trunk road is scheduled for resealing. The Provincial Roads Engineer in that Province will be responsible for the maintenance and safeguarding of the equipment until the resealing unit is deployed by the Director of Roads to another resealing maintenance activity.

The soils testing equipment, procured by the construction contractor as a provisional sum item in the construction contract bill of quantities, will be initially entrusted to the construction supervision firm. The equipment will be utilized by the supervision contractor, at a temporary laboratory set up at the construction camp, to test the quality of materials used in the construction works. During construction, the construction contractor will be responsible for the maintenance/repair of the equipment. Upon completion of the works, the equipment will revert to the Department and be deployed to the Department's Laboratory at Headquarters in Lusaka.

The vehicles used by the supervision firm will be maintained/repaired by the construction contractor throughout construction and will revert to the Department upon completion of supervision. At that point, they will be logged into the Departmental inventory and deployed by the Director of Roads as needed to carry out the normal functions of road maintenance.

4.3.7 Personal Services Contractor

An engineer will be hired under a personal services contract (PSC) to assist USAID/Zambia with project implementation. The contractor's salary will be paid in dollars. A PIO/T will be issued by the Executive Officer, USAID/Zambia (or RCO REDSO/ESA if the contract amount will exceed the EXO's authority) requesting advertisement and eventual execution of a personal services contract pursuant to evaluation of offers by USAID/Zambia. The advertisement will be placed in a world wide State cable, in regional newspapers and in several engineering journals.

It is anticipated that offers will be received and evaluated, and a contract signed by May, 1990. The contractor should be on the job in Zambia by July, 1990. The duration of the contractor's services is anticipated to be three and a half years.

Household furnishings for the Personal Services Contractor will be procured by the Executive Officer (EXO), USAID/Zambia and paid from project funds. Housing will be leased and other support services will be provided by the EXO.

4.3.8 Gray Amendment

The nature of the design, supervision and construction services, and the institutional relationships under which the contractors for those services will operate, dictate that the contracts be host country, rather than A.I.D. direct contracts. The contractors who will carry out the final design and construction supervision and the construction services will both be under contract to the GRZ. This is the case since only the GRZ Department of Roads has the required expertise and authority in Zambia to direct road construction, issue construction contract variation orders, provide engineer's decisions, acquire land and carry out other required actions.

There is no formal mechanism for A.I.D. to direct that the Government award either contract to a firm covered by the Gray Amendment. However the Requests for Technical Proposals (RFTPs) and the Invitations for Bids (IFBs) for construction will state that responding firms of U.S. origin or consortia of U.S. and geographic code 941 are encouraged to sub-contract, wherever possible, with Gray Amendment firms. The eventual prime contractors will also be encouraged to sub-contract with Gray Amendment firms for any procurement of U.S.-origin goods or services subsequent to the award of the prime contracts.

4.3.9 Procurement Schedule for Maintenance Equipment, Audit and Evaluations

Proposed Dates	Activity	Responsible Organizations
06/92	PIO/T issued for mid-term evaluation team	USAID/Zambia
10/92	PSC/institutional contracts signed with evaluation contractors	USAID/Zambia
10/92	Ads placed in A.I.D. Bulletin for road maintenance equipment	AID/W
11/92	Competitive procurement IFBS issued for road maintenance equipment on behalf of GRZ utilizing HB 11 procedures	Construction supervision contractor

Proposed Dates	Activity	Responsible Organizations
04/93	Road maintenance equipment contracts signed	Construction supervision contractor
01/94	Road maintenance equipment begins to arrive in Zambia and is cleared through customs	Roads Dept.
05/94	PIO/T issued for final project evaluation	USAID/Zambia
05/94	PIO/T issued for contractor to carry out non Federal Audit	USAID/Zambia
09/94	PSC/institutional contracts signed with evaluation contractors	USAID Exo
10/94	PSC contract signed with non-federal auditor	USAID/Exo

4.4 Training Plan

4.4.1 Objectives

4.4.1.1 Mechanical Training

The GRZ Department of Roads places high priority on the continuing education of staff mechanics and engineers. The Department of Roads is responsible for the routine maintenance and repair of a wide variety of equipment obtained from different donor agencies and GRZ sources. The mechanical equipment under their charge, including: bulldozers, graders, compressors, tractors, stone crushers, dumptrucks, loaders and tippers, is a matter of particular concern, as mechanics must continually up-grade their skills to effectively service this varied physical plant.

Training provided under the project will be tailored to the requirements of Department of Roads mechanics and cover engines, gearboxes, brakes and hydraulic systems. It will be conducted bi-annually in Lusaka for a duration of 3 to 4 weeks. This training is intended to reinforce and broaden the skills base of field mechanics working on Department of Roads equipment in every province in the Republic of Zambia. The curriculum will include the maintenance and repair of equipment to be procured for the Kafue-Lusaka road rehabilitation.

4.4.1.2 Road Maintenance and Construction Management

One engineer, designated by the Director, Department of Roads, will attend a four-week road maintenance, planning and management course during each year of project activities. The course will focus on management rather than technical issues for an intended audience of senior road engineers. The objectives of the course will be: 1) to bring together those involved in the management and planning of road maintenance; 2) to improve skills and knowledge of the participants in the management and planning of road maintenance; and 3) to indicate how various techniques, including vehicle operating cost calculations, management systems and others, are applied in practice to improve the overall planning and management of road maintenance.

4.4.2 Institutions

4.4.2.1 Mechanical Training

The mechanical training will be conducted at the Industrial Training Centre (ITC), based in Lusaka. ITC is a training institute registered with the Department of Technical Education and Vocational Training in Zambia. It was founded in 1985 as a cooperative venture between the Federal Republic of Germany and the GRZ. It is governed by a Board of Directors which includes representatives from private industry and Government enterprises. The ITC is run independently in management, finance and program administration, is staffed with qualified Zambian and German expatriate lecturers and operates both long and short-term courses focussing on theoretical (25%) and practical (75%) mechanical training. The training centre is equipped with new and modern maintenance and testing equipment provided by the German foreign assistance program.

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4.4.2.2 Road Maintenance and Construction Management

Training in road maintenance and construction management will be provided by the Eastern and Southern African Management Institute (ESAMI) in Tanzania. ESAMI is a management training institute specializing in continuing education for engineers and management professionals. It was established in 1976 as a joint venture between the Government of Tanzania and the International Labor Organization (ILO). ESAMI offers an annual four-week course on road maintenance, planning and management which has been attended in the past by engineers from the GRZ Department of Roads. The Department of Roads has requested that project funds be provided to finance the attendance of one engineer at the annual course, during each year of project activities. The project-financed engineer will be accompanied by two other Department engineers funded by NORAD and ODA respectively.

4.4.3 Participants

4.4.3.1 Mechanical Training

One Department of Roads mechanic from each province in Zambia will be selected to participate in each ITC course. The course curricula will be modified or varied as a function of Department of Roads requirements. Therefore, selection of course participants will be made on the basis of 1) the particular types of equipment being maintained by the prospective participants, and 2) their respective workloads and availability during the training periods. Participants may be allowed to attend more than one project-funded course.

4.4.3.2 Road Maintenance and Construction Management

The project will provide funding for an engineer, chosen from the Department of Roads staff, to attend the ESAMI Road Maintenance and Planning Management Course in Tanzania. As the course content does not vary from year to year, different individuals will be chosen to participate in each of the four years covered within the life of project. Other donors are expected to continue to fund additional participants at the ESAMI course. Participants will be selected on a rotational basis, and by the end of the four years of project-financed training, virtually the entire engineering field staff (numbering 22 in August, 1989) will have attended the course.

4.4.4 Training Costs

4.4.4.1 ITC

ITC presently charges 600 Zambian Kwacha per participant, per week, for tuition only. Lunch for participants costs 30 kwacha per day. The ITC director estimates that tuition and other costs will escalate by 50% per year for each of the next five years to cover inflation, kwacha devaluation and to allow for the eventual elimination of German foreign assistance subsidies. ITC training costs for 1990 can therefore be estimated as follows:

10 participants @ 900 K/week X 8 weeks (two 4-week sessions) = 72,000 K
+ 400 lunches X 45 K = 18,000 K. Total 1990 = 90,000 K.

Applying the cost escalator for subsequent years yields: 1991 = 135,000 K; 1992 = 202,500 K; 1993 = 303,750 K.

Total estimated ITC training costs: 731,250 Kwacha ($45,703 in 1989 dollars).

The GRZ will contribute transportation costs, housing and salaries for training participants.

4.4.4.2 ESAMI

The four-week ESAMI course currently costs $3,200 per participant. This includes: roundtrip transportation from Zambia, housing, food, insurance, tuition and a pocket allowance. These costs are based on a 1989 NORAD-funded course participant. Assuming a 20% annual cost escalation for the Tanzania-based institute, total ESAMI training costs will amount to $20,612.

The GRZ will contribute transportation costs within Zambia, housing within Zambia and salaries for training participants.

4.4.5 Training Administration

The implementing agency for project-funded training activities will be the GRZ Department of Roads. The selection of participants, establishment of curricula at ITC, enrollment and registration payments and logistical arrangements will be coordinated from the Department headquarters in Lusaka. Foreign exchange components of the ESAMI training will be payable from USAID/Zambia project accounts upon request and certification by the Director, Department of Roads.

4.5 Monitoring, Evaluation and Audit Plan

4.5.1 A.I.D. Project Monitoring

The USAID Project Officer will review monthly implementation reports prepared by the construction supervision contractor and submitted to USAID/Zambia through the GRZ Ministry of Power, Transport and Communications. Monthly implementation reports will include at least the following:

-assessment of progress to date;

-problems encountered during the reporting period;

-recommended solutions to problems identified;

-adherence to work plan and schedule;

-comparison of project construction expenditures with physical progress of the work and any related recommendations;

-general recommendations.

The Project Officer, accompanied by the PSC engineer and/or the Regional

Engineering Officer (REO), will make on-site inspections and verify progress toward meeting project objectives. These inspections will generally be made on a monthly basis, in conjunction with scheduled site visits by the GRZ Roads Department Project Manager or his designee. Follow-up meetings, chaired by the Roads Department Project Manager and attended by the construction supervision contractor, will be held to discuss any implementation issues arising from the ite visits and to allow the construction contractor an opportunity to respond to those issues. The USAID Project Officer and REO will endeavor to attend these meetings as observers.

4.5.2 Project Evaluation

Two project evaluations will be held prior to the PACD. A mid-term evaluation will be conducted after the first dry-season construction period and a final evaluation will be scheduled after the second year of construction activities.

To test purpose level assumptions, both evaluations will compare baseline traffic count data collected during project design with similar data collected at the time of the evaluation. These data will be used to verify assumptions relating to road access, road usage and beneficiaries. Specifically, the traffic counts will determine: the type and weight of vehicles using the road, the origin/destination of the vehicles, and the types and amounts of cargo transported.

Other data to be collected for project evaluation purposes will include: average vehicle operating, maintenance and repair costs; road-user accident rates; project-financed equipment utilization patterns; and qualitative measures of the effectiveness of project-funded training activities.

Project evaluations at the output and input levels will address the following issues:

1. Adequacy of the resealing and rehabilitation design;

2. Performance of the engineering construction supervisor;

3. Performance of the construction contractor. Specifically, whether the construction work was carried out to specification and in a timely manner;

4. Performance of the GRZ Roads Department in project administration;

5. Re-evaluation of the GRZ road maintenance capabilities;

6. Performance of the PSC engineer in facilitating project monitoring and implementation;

7. Performance of the USAID Project Officer.

The mid-term evaluation team will identify critical implementation issues, if any, and make recommendations for improvement. The final examination will focus on lessons learned from the project design and implementation experience.

From a social soundness perspective, the project evaluations will further analyze:

1. The employment of women in project-funded activities;

2. The identification and distribution of project beneficiaries; and,

3. The performance of the construction contractor in minimizing disruption and destabilization of the physical and cultural environment in the immediate impact zone of the project.

The evaluation teams will be composed of the following techncial specialists:

-A Project Evaluation Officer

-A Civil Engineer

-A Social/Behavioral Scientist

-A Transportation Economist

-Appropriate GRZ Officials.

Project funds will be allocated for the purposes of conducting the two proposed evaluations. Additional funds will be earmarked for a non-federal audit of the effectiveness of project controls over expenditures, and related issues. It is anticipated that the evaluation and audit teams will be comprised of REDSO/ESA specialists, supplemented, where necessary, by contract technical assistance procured through a REDSO/ESA or AID/W project evaluation IQC.

5. Summaries of Analyses

5.1 Engineering Technical Analysis Summary

5.1.1 Current Status of the Project Road

The project road consists of the Zambia trunk road T2 between Lusaka and the Kafue bridge. The total length of the road is 53.3 kms, linking the capital, Lusaka, with the important industrial town of Kafue and continuing to the bridge crossing at the Kafue River. The dual carriageway section of road between km 0.0 and km 3.9 will not be part of this project.

The road has been in service approximately 20 years. It has not been properly maintained during this period, and as a consequence, it is now in varying stages of distress. There are some sections where the pavement condition is relatively good, with only limited areas of block cracking and good riding quality. However, there are sections of road where the pavement exhibits cracking at the surface which permits moisture to penetrate the protective surface membrane, affecting the base, sub-base and sub-grade causing road failure at these sections. Contributing to the general road deterioration is a growth of vegetation and silting of side and mitre drains which resulted in failure of the underlayers and deformation of the surface, evidenced by block cracking in the pavement. Lack of shoulder maintenance has resulted in dangerous dropoffs and edge ravelling on virtually the entire length of the project road. Longitudinal cracking and edge failures are also evident

In order to assess the current condition of the road and the rehabilitation requirements, engineering consultants, John Burrow and Partners Zambia Ltd., were hired to perform an engineering feasibility, preliminary design and cost analysis in June, 1989. As part of the engineering design, pavement deflections (Benkelman beam test), soil analysis (test pits and dynamic cone penetration tests), roughness, potholes and drainage surveys were conducted. In addition to the surveys, a pavement assessment and economic analysis using HDM III, The World Bank Highway Design and Maintenance Standard Model, were undertaken and rehabilitation proposals were formulated.

5.1.2 Proposed Interventions, Design Standards and Methodology

The information obtained from the Burrow's report has been incorporated into the Technical Analysis. The rehabilitation program proposed in the Burrow's report will upgrade the road to its original class standard, adequate to handle the projected 2.5% annual traffic increase for a geometric design life of 20 years. The Burrow's report was reviewed by USAID/Zimbabwe REO and REDSO/ESA engineer and found to be based on sound road engineering principles. Traffic data was obtained from a traffic study conducted by Coopers and Lybrand Associates, Zambia Ltd., and available traffic data from the GRZ Roads Department. The traffic data has been reviewed and the resultant design criteria are based on the Zambia Roads Department standard road design for the weight and number of axle loadings. Design criteria were also based on a number of other reliable sources which can be found in the reference section of the Technical Analysis.

Road sections which have extensive damage in the form of severe pavement deformation, extensive cracking and potholing have high Benkelman beam deflections. These sections will either require reconstruction or strengthening by overlaying with additional layers of pavement material. The analysis has identified which sections require strengthening and which require overlay. Overlay thickness requirements greater than 120 mm will be reconstructed by removing and discarding the existing bituminous layer, scarifying and recompacting the roadbase and adding a 300mm selected gravel sub-base and 150 mm crushed stone roadbase, with a double bituminous surface treatment. Sections where the lower pavement layers are structually sound but require strengthening as indicated by high Benkelman beam deflections will be overlaid with a dense bitumen macadam (DBM) base course material (50-120 mm thickness depending on deflection readings and subgrade strength) including a single surface bituminous treatment as a crack reflection layer before the DBM is placed and a double surface bituminous treatment afterwards to improve riding quality and reduce oxidation effects on the DBM layer. Finally, sections which are structurally sound and have a rough riding surface and surface cracking will have any potholes patched and will receive a double bituminous surface treatment.

5.1.3 Reconstruction and Rehabilitation

The proposed rehabilitation will conform to the Zambian Road Department's Design Classes as discussed in Section 2.1B in the Technical Analysis.

The project will finance the reconstruction (including drainage structure modification and replacement where necessary) of 9.85 kms, overlay and seal of 29.85 kms and patch and seal of 9.70 kms of the Kafue-Lusaka Road during the 1992 and 1993 dry seasons ending in mid-December, 1993. The existing alignment is generally acceptable, however, there are two locations (km 7.5 and km 12.5) where realignment will be necessary. The following chart identifies the section of road and the type of rehabilitation proposed. The estimated costs to perform the rehabilitation (including realignment and drainage structure work) are shown as follows:

		A.I.D. Contribution (U.S. $)	H.C. Contribution (Kwacha)
1.	Preliminaries	2,738,941	7,263,280
2.	Accommodation of Traffic	1,087,013	2,882,604
3.	Borrow Pits	376,242	997,740
4.	Site Clearance and Topsoil Stripping	530,368	1,406,460
5.	Earthworks	993,435	2,634,448
6.	Shoulders to Existing Pavement	369,856	980,807
7.	Existing Pavement Preparation	368,524	977,274
8.	Sub-base and base	2,672,283	7,086,513
9.	Dense Bituminous Macadam Base	2,167,825	5,748,762
10.	Surface Treatment/Crack Sealing	1,961,833	5,202,502
11.	Pavement Repair Work	188,213	499,114
12.	Drainage Improvement	1,354,747	3,592,596
13.	Miscellaneous Items	274,487	727,900
(A)	Subtotal	15,083,767	40,000,000
(B)	Detailed design	386,400	0
(C)	Construction supervision	1,000,000	0
	Total (A)+(B)+(C)	16,470,167	40,000,000
	Contingency 15% of U.S.$	2,470,525	
	Contingency 30% of Kwacha		12,000,000
	Total Construction Cost	18,940,692	52,000,000
	Rounded to	18,940,000	52,000,000

A detailed description of the construction components indicated above is presented in the Technical Analysis in Annex III.

The Foreign Assistance Act, Section 611(a) requires that no agreement or grant involving an obligation of over $100,000 of U.S. funds shall be made until engineering, financial and other plans necessary to carry out such assistance and a reasonably firm estimate of the cost has been made. The cost estimate for the reconstruction and rehabilitation program was reviewed and adjusted for inflation and contingency by the Regional Engineering Officer. The base cost estimates were prepared by a consulting engineering firm (John Burrow and Partners) located in Lusaka, Zambia. The firm undertook comprehensive site surveys of the existing road alignment, drainage areas and roadway platform and pavement. The firm also investigated water and quarry sites to ascertain the availability of construction materials. The work performed by the Burrow's consultants will serve as the basis for the final

Kafue-Lusaka Road (Phase I)
Rehabilitation Program

KAFUE BRIDGE	53.5		1.15	
	52.15	.2		
	51.95		1.75	
	50.2	.2		
	50.0		.3	
	49.7	.2		
	49.5		5.0	
	44.5	.45		
	44.05		1.45	
	42.6	.2		
	42.4			2.8
	39.6	.2		
	39.4			3.75
	35.65	.2		
	35.45			3.15
	32.3	.6		
	31.7		4.7	
	27.0	.5		
	26.5		1.0	
	25.5	.2		
	25.3		.3	
	25.0	.2		
	24.8		2.3	
	22.5	.2		
	22.3		.2	
	22.1	.6		
	21.5		3.0	
	18.5	.4		
	18.1		.8	
	17.3	.5		
	16.8		1.3	
	15.5	.2		
	15.3		.1	
	15.2	.1		
	15.1		.3	
	14.8	.2		
	14.6		1.0	
	13.6	.3		
	13.3		.6	
	12.7	.6		
	12.1		1.3	
	10.8	.7		
	10.1		1.0	
	9.1	.3		
	8.8		1.0	
	7.8	.3		
	7.5		.4	
	7.1	.4		
	6.7		.9	
	5.8	1.9		
	3.9			
Total		9.85km (Reconstruct)	29.85km (Overlay & Seal)	9.70km (Patch & Seal)
LUSAKA	0.0			

□ = Reconstruct

▥ = Overlay & Seal

■ = Patch & Seal

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construction drawings and contract documents, supplemented as appropriate by Roads Department estimates to be prepared at the time of the construction contract tender.

Costs have been denominated in dollars. Where local currency expenditures are envisaged, Kwacha equivalencies are calculated on the basis of a floating exchange rate approximating Kwacha 30 = $1. This is in keeping with GRZ regulations allowing companies involved in activities yielding foreign exchange earnings to exchange foreign currency at whatever rate is negotiated on an ad hoc basis with principal officers of the National Bank of Zambia.

The host-country contribution to the project budget is in the form of a fixed amount of Zambian Kwacha, generated from USAID/Zambia-funded commodity import and food assistance programs. These Kwacha are currently held in a trust account controlled by the GRZ. In order to accomodate this local currency input into the construction costs, the estimate of Kwacha required by budget line item was calculated with reference to the highest prevailing legal exchange rate allowable (e.g. thirty-to-one against the U.S. dollar). In addition, a large local currency contingency has been budgeted to assure that there will not be a funding shortfall due to future devaluations of the Kwacha.

A 15% dollar contingency has been budgeted which is intended to cover, inter alia, any unanticipated Kwacha devaluations or inflation.

In view of the above the Regional Engineering Officer has determined that 611(a) requirements have been satisfied.

5.1.4 Maintenance

Road maintenance, or the lack thereof, has been and continues to be a major problem in Zambia. Planning and coordination of this activity has not been lacking, however, declining foreign exchange earnings have caused stagnant allocations for road maintenance recurrent costs. Preventative maintenance is virtually non existent and much of the maintenance that is performed is done on an emergency basis. Shortages of operating funds, maintenance staff, planners and engineers, spare parts and new capital equipment are common, and are due to the lack of GRZ budgeting resources.

The project envisaged cannot by itself greatly improve the Roads Department's maintenance capability, however, there are several initiatives which will be included as part of the project which will ensure that adequate maintenance will be carried out on the road. First, a PSC Engineer will be hired as part of this project to manage the project. He/she will forcefully and persistently present the case for routine maintenance and stress the potential savings that will be realized in the long-term if roads are properly maintained. Secondly, the Director, USAID/Zambia or his/her designee will take-up the discussion with senior GRZ officials, particularly in the Ministry of Finance, stressing the importance A.I.D. attaches to sound maintenance practices as the best way of protecting this capital investment. Third, as a condition precedent to disbursements, A.I.D. will require the GRZ to provide an acceptable plan describing the steps it plans to take to ensure proper maintenance of the road as well as the schedule of inputs to be available for these purposes. This plan would be expected to include the development of

innovative and self-help measures, using area inhabitants to carry out routine maintenance tasks, and better servicing and allocation of maintenance equipment. The USAID/Zimbabwe Regional Engineer and the PSC Engineer will be involved in monitoring the activities of the plan. Fourth, covenants will require: (1) that the GRZ will include a line item in the recurrent budget indicating funding to be allocated to the road; (2) that maintenance equipment provided under this project will be used exclusively for maintenance of the road; (3) that the GRZ will give maximum consideration to the dedication of payments received as penalties for overweight assessments to provide supplemental funding for the national road maintenance program; (4) that the GRZ will initiate a study to assess the feasibility of levying road-user fees to ensure that transporters bear a greater proportion of recurrent maintenance costs; (5) that the GRZ will study the potential for privatization of road maintenance services; and (6) that existing road weight limitations shall be enforced to ensure that traffic does not exceed the design carrying capacity. The latter shall be accomplished by fully-utilizing the weighbridge station funded under the Kafue-Chirundu Road Project (690-0209). Finally, project funds will be provided to procure necessary maintenance equipment and to conduct training in mechanical and management skills for Department of Roads personnel.

5.1.5 Future Maintenance Requirements

The rehabilitated 49.4 kms will require periodic chip and spray treatment (double surface bituminous treatment at 7 year intervals) commencing in the year 2000. The road will also require routine maintenance of surface shoulders and drainage structures. See the chart below for a proposed schedule for periodic maintenance actions.

Major Periodic Maintenance for the Years 2000 - 2021

Year	Section
	Km 3.90 - 53.4
2000	Double Surface Treatment
2007	Double Surface Treatment
2014	Double Surface Treatment
2021	Double Surface Treatment

5.2 Economic Analysis

5.2.1 Methodology

In conducting the economic analysis of the Kafue-Lusaka road segment, the usual with-and-without-project analysis was employed to arrive at an estimate of the internal rate of return for the investment. To accomplish the task, the World Bank's Highway Design and Standards Model (HDM III) was used to produce a set of alternative construction scenarios. Traffic figures were taken from the Department of Roads while the usual vehicle operating costs (VOC) were based on experience in other parts of Africa, especially Kenya, on similar roads under similar conditions. The relationships between the various VOC variables, the road type, and their consequent values are incorporated in the model as default values.

The official rate of exchange of US$1 = K10 was used for the financial analysis and a shadow price of US$1 = K50 for the economic analysis. The shadow price of US$1 = K50 was arrived at by adjusting the existing parallel market rate of US$1 = K60 by about 80 percent to take into account the fact that road construction of the type contemplated in the project consist of about 80% foreign costs.

Under the HDM III model, 6 alternatives were considered: 3 maintenance alternatives starting from a bare minimum of just maintaining the existing road through normal maintenance and 100% pothole patching to one which includes some surface dressing; and 3 design alternatives which widen the road to Class IA and IB standards and have useful lives ranging from 10, 15, and 20 years. The alternatives were applied to two one-kilometer sample lengths of road representing average conditions: one in the Makeni-Chilanga section and the other in the Chilanga-Kafue section.

5.2.2 Principal Findings

As the following table indicates, the 2 least cost options of the 6 considered were the high end option of the maintenance alternatives (Option 3) and the 10 year design alternative (Option 4), with the former being slightly less expensive. Option 3 was not considered, however, because of the preceived high risk that its large annual maintenance requirement will not be met and that the transport costs inherent in the option are understated from what is likely to actually occur over the time span of the analysis, and because there exists in Option 4 an alternative at almost the same cost which is much less maintenance intensive.

To determine whether the least cost option, Option 4, would produce enough transport savings to justify the road expenditure, an internal rate of return analysis was conducted. The minimum maintenance alternative (Option 1) was considered to represent the without-project case. That is, the analysis assumes that the GRZ will carry out the expenditures contained in the minimum alternative, even in the absence of the project.

The incremental benefits were assumed to be the reduction in transport costs resulting from the road improvement while the incremental costs were those associated with the higher costs required to raise the standard of the road design. Based on this approach, the IRRs for the two road segments range from 24.6% to 29.9%.

These high IRRs were obtained using rather conservative values for costs and traffic flows. It would take unrealistic changes in the variables to reduce the IRR below 12%, the point at which we might begin to question the feasibility of the investment. For that reason, no sensitivity analysis was deemed necessary. Furthermore, no attempt has been made to quantify the benefits that are likely to occur as a result of a decrease in road accidents.

Based on the least cost and the internal rate of return analyses conducted for this project, the Mission is confident that the project will provide a rate of return in the range of 25%-30%.

Average Road Cost (Million Zambian kwacha) Per Year/Per Km.

Option	Cost Category	Section A (Makeni-Chilanga)		Section B (Chilanga-Kafue)	
		Discount Rate* 0%	12%	Discount Rate* 0%	12%
1 (Minimum)	Financial	19.26	4.17	7.00	1.57
	Economic	47.01	10.11	17.17	3.82
2 (Periodic Maint.)	Financial	17.34	3.83	6.33	1.40
	Economic	42.28	9.28	15.60	3.43
3 (Periodic Maint.)	Financial	14.19	3.55	4.98	1.26
	Economic	34.27	8.56	12.11	3.06
4 (Rehab, 10-year)	Financial	14.21	3.68	5.05	1.38
	Economic	34.21	8.78	12.23	3.28
5 (Rehab, 15-year)	Financial	14.28	3.69	5.17	1.40
	Economic	34.40	8.84	12.29	3.33
6 (Rehab, 20-year)	Financial	14.35	3.73	5.12	1.42
	Economic	34.56	8.89	12.39	3.37

Source: Kafue-Lusaka Project Feasibility Study/Cost Analysis, John Burrow and Partners, 1989.

5.3 Social Soundness Analysis

5.3.1 Intraregional Context of the Road

The Kafue-Lusaka road directly contributes to the intraregional flow of commodities in southern Africa. This is especially true for Zimbabwe, Zambia, Malawi, Botswana and eastern Zaire which utilize the road for imports and exports. While most of the commodities originate from and are destined for countries within the region, a small proportion of the traffic consists of international trade outside the region. The road also facilitates the movement of passengers from one country to the next.

Information on traffic crossing the Chirundu, Kazungula and Victoria Falls border posts indicates the importance of the Kafue-Lusaka road in intraregional trade. Out of a total of 354,859 tons of cargo which passed through the three posts in 1988, 58 percent was transit cargo, that is, not from or for Zambia.

The major importance of this and all SADCC transport routes is to lessen the countries' dependency on routes through the Republic of South Africa and to strengthen trade between SADCC nations.

5.3.2 The National Context of the Road

5.3.2.1 The Immediate Impact Zone

The immediate impact zone is from the Lusaka suburb of Makeni to the Kafue River bridge, approximately 50 kms.

Chilanga, 14 kms from Lusaka, is the only town between Lusaka and Kafue. It is the site of Chilanga Cement Ltd, an agricultural research station, a botanical garden, shops and normal social facilities.

Kafue town currently has a population of some 21,000 people. The largest employers are Kafue Textiles and Nitrogen Chemicals of Zambia.

Several businesses are adjacent to the road outside of city limits. These include a soybean oil processing plant, a stone quarry and other medium-size manufacturers. Some 15 sellers of crushed stones line the road in front of the quarry and a few people sell handicraft items and food.

5.3.2.2 The Zambian Context

Kafue-Lusaka is part of the major road route which connects southern and northern Zambia. This section of road will effectively be an extension of the recently completed Kafue-Chirundu Road Rehabilitation Project (690-0209) and will complete an unbroken stretch of high standard trunk road between Lusaka and Harare. It plays a role in Zambian imports and exports as well as in domestic traffic.

An analysis of cross-border traffic movements at Chirundu, Kazungula and Victoria Falls for the year 1988 reveals that 147,536 tons of Zambia's external trade passed through the three border posts. Sixty-one percent of

the volume of imports was destined for locations other than Kafue or Lusaka and 66 percent of the export tonnage originated in locations other than Lusaka and Kafue. Virtually all of the traffic used the project road.

In addition to the external trade traffic on the road, the Kafue-Lusaka road also plays a major role in domestic marketing of agricultural commodities. Commercial farmers in the Southern Province and the sections of the Central Province within the r ad catchment area produce cash crops and rely on commercial agricultural inputs such as fertilizer. Since nearly 50 percent of the population of Zambia is urban based, road transport of food to the urban areas is an integral part of the agricultural marketing system. Conversely farmers purchase fertilizer and other agricultural inputs from Nitrogen Chemicals of Zambia (NCZ), most of which will be hauled by road to 10 regional depots. Up to seventy-five percent of Zambia's fertilizer use occurs in Southern, Central and Eastern provinces with direct or indirect linkages from the NCZ plant in Kafue, over the project road.

5.3.3 Direct Beneficiaries

5.3.3.1 Road Construction Workers and Supervisors

An estimated 500 jobs will be created to implement the project. Twenty percent of the new jobs created will be targetted for women. Discussions with large construction firms in Zambia have confirmed that this target is feasible.

In addition, members of the Roads Department will receive short-term out of country training to improve mechanical services and management of road maintenance crews.

5.3.3.2 Commercial Transporters

Commercial transporters will benefit in terms of: a) reduced hauling time, b) fewer accidents, c) reduced operating costs.

5.3.3.3 Other Commercial Users

Besides the commercial transporters, there are numerous other types of companies which use the Kafue-Lusaka road with their own vehicles. This traffic is primarily domestic rather than intraregional and involves commercial farmers, wholesale traders and manufacturers.

5.3.3.4 Passengers

All passengers will benefit from an improved flow of traffic due to better road surface and improved shoulders and laybys which should lessen travel time. People living within the immediate impact zone will benefit from better bus stops.

5.3.3.5 Pedestrians

Currently the road shoulder is often less than a meter wide. Under the project the shoulder shall be two meters wide, except for a stretch of some 7 kms in the Chilanga area which will be three meters wide. The extension of the shoulders will make walking along this major highway much safer for pedestrians.

5.3.4 Indirect Beneficiaries

5.3.4.1 Malawi, Zaire and Zimbabwe

All socioeconomic classes in neighboring countries will indirectly benefit from the rehabilitated road facilitating external trade. The poor shall benefit when food is imported (such as relief food supplies to Malawi in 1988) and from the availability of essential products like kerosene for lighting. Owners of medium and large scale farming operations will acquire imported fertilizer more cost-effectively and should be able to export their cash crops more efficiently. Vehicle owners will have better access to petrol and diesel fuel.

5.3.4.2 Zambian Companies

The main Zambian company utilizing the project road is Zambia Consolidated Copper Mines (ZCCM), owned by the Zambia Industrial and Mining Corp. (ZIMCO). A large proportion of the imports transported on the project road are directly or indirectly for ZCCM and its 94 principal subsidiaries. As of March, 1988 employment in ZIMCO and its subsidiaries accounted for some 38 percent of formal sector employment.

5.3.4.3 Zambian Consumers

Rural and urban consumers will benefit from improved efficiency in marketing.

5.3.5 Sociocultural Feasibility

5.3.5.1 Female Road Workers

The target of 20 percent for employment of women on the roadworks is deemed feasible based on conversations with representatives of construction firms and rural men and women in the immediate impact zone.

5.3.5.2 Disruption and Displacement

Some trading stalls of semi-permanent materials which are selling fruits and vegetables are in the road corridor. In addition, there are approximately 30 family compounds within the corridor. Legally, these people with houses and other structures within the road corridor do not have to be compensated and can be ordered to depart. However, the project and/or the GRZ will offer to compensate the people affected and may offer casual employment to a family member. The estimated cost of this compensation is less than Kwacha 20,000.

5.3.5.3 Diversion of Traffic

Diversion of traffic will necessitate a path parallel to the existing road and within the road corridor. Seven sites have been identified where the deviation road could pose a threat to the inhabitants of compounds near the diversion road. The project contractor will take measures to minimize the disruption caused by diverting the existing road in the proximity of existing households and will compensate those most affected to allow them to build houses further from the flow of traffic.

5.3.5.4 Realignments

Two realignments will occur near Lusaka to eliminate dangerous blind spots. Compensation will be paid to three or four smallscale farmers where the realignment cuts through existing fields. In consideration of intrahousehold social dynamics, the amount of compensation will be made known to all adult family members, not just to the male head of the affected household.

5.4 Institutional Analysis Summary

5.4.1 Overview of the Roads Department

The Roads Department of the Ministry of Power, Transport and Communication is responsible for the construction of 21,000 kms of primary and secondary roads. The Department is comprised of a headquarters in Lusaka and 9 provincial organizations. The headquarters is responsible for coordination, planning and centralized provision of services. The provincial organizations carry out the Department's primary task of road maintenance.

5.4.2 Organization of the Roads Department

Headquarters is comprised of the Offices of the Director and Deputy Director of Roads and functional Sections of Planning and Design, Maintenance, Administration and Contracts. Headquarters also is directly responsible for the Soils Testing Laboratory, a Training School and the Mumbwa Workshop. The Director of Roads will be the Engineer in charge of project construction works, but will delegate powers necessary to monitor road rehabilitation to the construction supervision contractor. A senior executive engineer will be delegated project management responsibilities by the Director. Contracts will be the only functional section with major project implementation responsibilities. The Executive Engineer for Contracts is experienced in A.I.D. host country contracting and will have the primary responsibility for the development of prequalification, solicitation and contract documents as well as selection of both the final design/construction supervision and construction services contractors. Contracts will review and certify all payments to these contractors prior to requesting dollar disbursements by A.I.D.

Training is provided for road foremen at a Departmental facility located in Lusaka. By the end of September 1989, 90 road foremen will have graduated and been deployed to supervise road maintenance crews in the provinces.

Provincial organizations headed by Provincial Roads Engineers are responsible for the maintenance of primary and secondary roads within each of the nine provinces. Each province is broken down into districts and further subdivided into maintenance zones. (There are 127 zones country wide). Each district and zone has a manager, functional staff and a basic complement of maintenance equipment. Periodic maintenance is done in-house, whereas major maintenance and rehabilitation/reconstruction works are contracted out.

5.4.3 Institutional and Management Capability

Adequate staffing is a serious ongoing problem at the Department, particularly at the managerial and prfessional level. The main cause is the low salary and weak benefit package imposed on the Department by GRZ

regulations. Therefore, the Department must rely on expatriates provided through foreign assistance or local contracts to fill most senior engineering positions. For instance, the Deputy Director, Senior Engineers in the Contracts and Maintenance Sections and 7 of 8 Provincial Roads Engineers are expatriates. The Department has experienced more positive results in the hiring and retention of technicians and clerical staff, due possibly to a salary/benefit package at this level which is more competitive with the private and parastatal sectors.

Training is provided in maintenance management at ESAMI in Tanzania for Provincial Roads Engineers and other mid to senior level managers. In-house training for road foremen at the Lusaka school has proven successful and has developed into the cornerstone of a bottom-up training philosophy employed by the Director of Roads. Since retention of road foremen has been higher than professional level staff, the bottom-up staff development program has proved beneficial.

While the Department faces major obstacles in hiring and maintaining adequate staff, this will not be a major constraint to project implementation. Since the Kafue-Lusaka Road Project involves major rehabilitation, all works will be contracted out to a construction firm which will be supervised by an engineering consulting firm. Further, the Contracts Section, with primary responsibility for project implementation responsibilities, is headed by an expatriate engineer who is experienced both with Zambian and A.I.D. procedures. Road maintenace is a problem area, as it is in most developing countries. However, the project will provide training in both maintenance management and shop floor procedures for mechanics. Additionally, road maintenance equipment with sufficient capacity to maintain the Kafue-Lusaka road will also be financed by the project.

5.4.4 Equipment

Equipment is deployed by the Director of Roads to the provinces as needed. The Department has a sizable inventory of plant/vehicles/equipment but experiences problems with repair, periodic maintenance and stocking of spare parts. A significant amount of spares will be procured along with A.I.D.-financed road maintenance equipment to ensure an adequate safety stock of parts for several years of operations.

5.5 Environmental Analysis

A negative determination was approved in the Initial Environmental Examination (IEE) on July 27, 1989 for the Kafue-Lusaka Road Rehabilitation Project. No further environmental analyses are deemed necessary. See Annex I(F) for further discussion.

6. Conditions, Covenants and Negotiating Status

6.1 Conditions Precedent to Disbursement

1. The GRZ will provide to USAID/Zambia, local currency counterpart funds in the amount of fifty three million five hundred thousand Zambian kwacha (K53,500,000). These funds will be provided through a standard GRZ/USAID local currency agreement from kwacha generated by USAID-financed commodity importation and food assistance programs such as PL 480. These

funds will be deposited in a working account at a local commercial bank controlled by the Roads Department and will be used for project-related purposes as detailed in the counterpart funds agreement. The transfer of Kwacha 30,000,000 (thirty million) in counterpart funds to the aforementioned working account will be completed prior to the disbursement of U.S. dollars.

2. The GRZ will provide USAID/Zambia with a plan, in form and substance satisfactory to USAID, describing the steps it plans to take to ensure proper maintenance of the Kafue-Lusaka road after project-funded rehabilitation is completed, as well as the schedule of resources to be made available for this purpose.

3. The GRZ will provide to USAID a letter of commitment, in form and substance satisfactory to USAID, allocating to the Kafue-Lusaka road first priority use of any maintenance equipment previously financed by USAID for road maintenance activities, to the extent that such equipment is not required under the previously-financed activities. The allocation of such equipment will be as detailed in the Kafue-Lusaka road maintenance plan approved by USAID as a condition precedent to disbursements under this project.

4. The GRZ will commence operation of the weighbridge station financed by USAID under the Kafue-Chirundu Road Rehabilitation Project (690-0209.02).

6.2 Covenants:

1. The GRZ covenants to carry out appropriate maintenance on the Kafue-Lusaka road after the contractor has completed the rehabilitation work and to make provisions for the necessary staffing, training and budgetary resources to achieve this purpose.

2. The GRZ covenants to include provision for the Kafue-Lusaka road maintenance in the Ministry of Power, Transport and Communications budget request to Parliament.

3. The GRZ covenants that maintenance equipment provided under this project shall be allocated on a first-use basis for maintenance of the Kafue-Lusaka road. The use of project financed equipment not immediately required for Kafue-Lusaka road maintenance will be allocated on a first-priority basis to other A.I.D.-funded road rehabilitation project activities in Zambia, as necessary.

4. The GRZ covenants to provide, in a timely manner, the import licences, work permits/temporary resident visas required by personnel of the design/construction supervison contractor and construction contractor.

5. The GRZ covenants to enforce existing road weight limitations and to enact any additional weight limitations as may be required to ensure that traffic on the Kafue-Lusaka road does not exceed the design carrying capacity of the road surface.

6. The GRZ covenants to give maximum consideration to the dedication of payments received as penalties for overweight assesments to provide supplemental funding for the national road maintenance program.

7. The GRZ covenants to initiate a study to assess the feasibility of levying road-user fees to ensure that transporters bear a greater proportion of recurrent maintenance costs.

8. The GRZ covenants to study the potential for privatization of road maintenance services.

6.3 Negotiating Status

The aforementioned conditions precedent and covenants have been discussed with the Director of the GRZ Department of Roads who has agreed to them both in form and in content.

ANNEX I: LEGAL EXHIBITS

A. PID Approval Cable (690-0237)

B. Statutory Checklist

C. GRZ Request for Assistance

D. SADCC Programme of Action Listing

E. FAA, Section 611(e) Certification

F. Environmental Determination

G. Waivers

ANNEX B

ACTION: AID-2 INFO: AMB DCM ECON

VZCZCLG0416
RR RUEHLG
DE RUEHC #6125/01 1472316
ZNR UUUUU ZZH
R 2723122Z MAY 86
FM SECSTATE WASHDC
TO RUEHSB/AMEMBASSY HARARE 0098
RUEHLG/AMEMBASSY LILONGWE 9556
INFO RUEHMB/AMEMBASSY MBABANE 7992
RUEHRU/AMEMBASSY MASERU 9616
RUEHLS/AMEMBASSY LUSAKA 0825
RUEHGR/AMEMBASSY GABORONE 9255
IT
UNCLAS SECTION 01 OF 03 STATE 166125

LOC: 36/37 39
24 MAY 86 2330
CN: 24095
CHRG: AID
DIST: AID

AIDAC NAIROBI, FOR REDSO

E.O. 12356: N/A
TAGS:
SUBJECT: SOUTHERN AFRICA REGIONAL TRANSPORT PID
(690-0237)

1. ECPR FOR SUBJECT PID TOOK PLACE ON MAY 5 UNDER CHAIRMANSHIP OF DAA SAIERS. PID WAS APPROVED, BOTH WITH RESPECT TO THE OVERALL FRAMEWORK FOR A CONTINUING SERIES OF TRANSPORT DEVELOPMENT ACTIVITIES IN THE SADCC REGION, AS WELL AS THE TWO SPECIFIC ACTIVITIES PROPOSED IN THE PID. THE SARP/HARARE OFFICE IS AUTHORIZED TO PROCEED WITH FINAL DESIGN OF THESE TWO ACTIVITIES, THE MALAWI NORTHERN CORRIDOR AND THE UNCTAD GRANT FOR TECHNICAL ASSISTANCE AND TRAINING. THE FOLLOWING CONCLUSIONS EMERGED FROM ISSUES DISCUSSED AT THE ECPR MEETING AND SHOULD SERVE AS GUIDANCE FOR PREPARATION OF THE TWO PROJECT PAPERS.

-- A. PROJECT FORMAT AND PROCEDURES - AGREEMENT WAS REACHED THAT THE TRANSPORT SECTOR IS SUFFICIENTLY CRITICAL FOR THE SADCC REGION TO LAY CLAIM TO A MAJOR PORTION OF THE FUNDS LIKELY TO BE AVAILABLE TO THE SA REGIONAL PROGRAM OVER THE NEXT FIVE YEARS. THE SECTOR

CONCEPT OF THE PID WAS ACCEPTED, AND THE COMMITTEE AGREED THAT THE PID PROVIDED A GOOD RATIONALE FOR MAJOR AID ASSISTANCE IN THE TRANSPORT SECTOR FOR THE NEXT SEVERAL YEARS. IT WAS NOTED THAT THE LOLS 50 MILLION LCP TOTAL IN THE PID WILL NOT ACTUALLY BE AUTHORIZED AT ONCE, BUT WILL BE DEPENDENT ON THE PIECEMEAL APPROVAL OF EACH INDIVIDUAL ACTIVITY. THE MISSION SHOULD TAKE CARE TO ENSURE CONSISTENT TREATMENT OF FUTURE ACTIVITIES, SINCE A POTENTIAL FOR CONFUSION IN PROJECT ACCOUNTING EXISTS FOR THIS KIND OF UMBRELLA ACTIVITY. AID/W UNDERSTANDS THE MISSION INTENDS TO TREAT EACH ACTIVITY AS A SEPARATE PROJECT, INCLUDING SEPARATE PROJECT NUMBERS AND CNS INDICATING THAT EACH PROJECT IS AN

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INDEPENDENT ENTITY. IN THIS CASE THE FIELD CAN EXERCISE DOLS 10 MILLION AUTHORITY FOR EACH ACTIVITY. ALTERNATIVELY, IF A SINGLE DOLS 50 MILLION PROJECT WITH SUB-ACTIVITIES IS INTENDED, AN AD HOC DOA MUST BE REQUESTED ONCE THE CUMULATIVE TOTAL OF ACTIVITIES EXCEEDS DOLS 10 MILLION. SINCE THIS AMOUNT IS EXCEEDED WITH THE FIRST TWO PROJECTS, EFFECTIVELY THIS MEANS AN AD HOC DOA WITH EACH SUBSEQUENT ACTIVITY. THE TWO FORTHCOMING PPS, AND FUTURE PPS, SHOULD BE BOTH CLEAR AND CONSISTENT ON THIS POINT.

THE PROPOSAL FOR SYNOPSIS CABLES ON FUTURE ACTIVITIES, WITH FIELD APPROVAL LIKELY FOR MOST PPS, WAS ACCEPTABLE TO THE COMMITTEE AND CHAIRMAN, WHO CONSIDERED THAT POLICY CONSIDERATIONS AND THE RELATIVE RANKING OF PROPOSALS COULD BE ADDRESSED ON THE BASIS OF THE SYNOPSIS CABLES, AND THAT TECHNICAL FACTORS COULD BE DEALT WITH MOST EFFECTIVELY IN THE FIELD BY SARP/HARARE, REDSO AND THE MISSIONS INVOLVED.

-- B. PROHIBITED COUNTRIES - OF THE TWO ACTIVITIES IN THE PID, THE MALAWI NORTHERN CORRIDOR, ON THE BASIS OF FACTS KNOWN TO THE ECPR, APPEARS TO POSE NO PROBLEM REGARDING PROHIBITED COUNTRIES. CARE SHOULD BE TAKEN, HOWEVER, THAT THE TA GRANT TO UNCTAD DOES NOT PROVIDE DIRECT ASSISTANCE TO THE PROHIBITED COUNTRIES. AS IS STANDARD WITH THE REGIONAL PROGRAM, A LEGAL OPINION PREPARED BY THE RLA SHOULD BE ANNEXED TO THE PP FULLY REVIEWING THE RELEVANT FACTS AND DEMONSTRATING THAT UNDER THE PROJECT AS DESIGNED, DIRECT AID ASSISTANCE WILL NOT BE PROVIDED TO THE PROHIBITED COUNTRIES. THE ISSUE OF THE PROHIBITED COUNTRIES SHOULD ALSO BE DISCUSSED IN THE SYNOPSIS CABLE FOR EACH ACTIVITY.

C. DONOR COORDINATION - ALTHOUGH THIS IS BASICALLY A WORLD BANK RESPONSIBILITY, THE MALAWI NORTHERN CORRIDOR PP DESIGN SHOULD ENSURE THAT AID REQUIREMENTS ARE BUILT INTO BID DOCUMENTS. THIS WILL REQUIRE CLOSE MONITORING BY SARP ENGINEER, RLA AND IQC ENGINEERS. THE WORLD BANK IS EXPECTING TO MANAGE AND FINANCE A&E AND SUPERVISION OF CONSTRUCTION FOR THE NORTHERN CORRIDOR AS A WHOLE. DESPITE A SUGGESTION BY AFR/TR/ENG THAT AID ASSUME RESPONSIBILITY FOR THIS FUNCTION ON THE PORTION OF THE OVERALL PROJECT WHICH WE ARE FINANCING, THE CHAIRMAN SAW NO COMPELLING REASON TO DISTURB THE ARRANGEMENTS MADE BY THE WORLD BANK FOR A&E WORK AND CONSTRUCTION SUPERVISON. THIS ALTERATION WOULD COST AID MORE, COULD COMPLICATE AND DELAY PROJECT IMPLEMENTATION, AND IN ANY CASE WAS DEEMED TO BE UNNECESSARY IN VIEW OF THE PROPOSED USE OF A U.S. IQC FIRM TO REVIEW SPECIFICATIONS AND BID DOCUMENTS PREPARED BY THE BANK-FINANCED FIRM. AS A MULTI-DONOR EFFORT, ASSURANCES MUST BE SOUGHT FROM OTHER ET

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AIDAC NAIROBI, FOR REDSO

DONORS THAT THEIR PLEDGED INPUTS WILL BE DELIVERED ON TIME. CP PRIOR TO DISBURSEMENT CAN BE USED AS SAFEGUARD, BUT THE PP SHOULD ALSO STATE, WITH SUPPORTING FACTS, THAT WE HAVE REASONABLE ASSURANCES PRIOR TO OBLIGATION THAT OTHER DONOR AID WILL BE FORTHCOMING IN A TIMELY MANNER. BANK AND GOM ARE IN BEST POSITION TO COORDINATE THIS MATTER.

-- D. TECHNICAL HELP ON DESIGN - PER DISCUSSION WITH MORRIS AND LIGHT, WE ARE PROCEEDING WITH IQC HELP ON PREPARATION OF BID DOCUMENTS AND RFP. WOULD APPRECIATE CABLED SOW FROM SARP TO EXPEDITE PROCESSING OF WORK ORDER. ALSO AFR/TR/ENG IS EXPLORING POSSIBILITY OF SENDING ENGINEER WITH PORT CONSTRUCTION EXPERIENCE IN MID-JUNE TO SERVE ON PP TEAM.

-- E. GOM-GOT AGREEMENT - WHAT IS STATUS OF GOM-GOT AGREEMENT ON THE AUTONOMOUS USE OF PORT FACILITIES AT DAR, SIMILAR TO AGREEMENT WITH ZAMBIA? MISSION SHOULD CHECK TO DETERMINE WHETHER THIS AGREEMENT WILL BE SIGNED BY THE TIME THE PP IS COMPLETED. WORLD BANK EAST AFRICA TRANSPORT OFFICE PREDICTS A JUNE SIGNING OF GOM-GOT AGREEMENT, BUT THIS SHOULD BE MONITORED CLOSELY BY THE MISSION AND DESCRIBED IN THE PP, INCLUDING ASSESSMENT OF HOW MUCH AUTONOMY MALAWI WILL HAVE. SINCE A SUCCESSFUL GOM-GOT AGREEMENT ON PORT FACILITIES IS ONE OF THE MAJOR PILLARS ON WHICH THE ECONOMIC RATIONALE OF THE OVERALL NORTHERN CORRIDOR CONCEPT RESTS, THE PP MUST STATE THE BASIS FOR ASSURANCES THAT THE GOM-GOT PORT AGREEMENT WILL BE SUCCESSFULLY REACHED AND SIGNED WITHIN A

REASONABLE TIME PERIOD WHICH WILL NOT ADVERSELY AFFECT THE PROJECT'S IMPLEMENTATION SCHEDULE. FURTHERMORE, IF THE GOM-GOT PORT AGREEMENT IS NOT SIGNED BY THE TIME OUR PROJECT IS OTHERWISE READY TO BE OBLIGATED, A CONDITION PRECEDENT TO DISBURSEMENT WILL BE MADE PART OF THE GRANT AGREEMENT, REQUIRING A SATISFACTORY PORT AGREEMENT BETWEEN THE TWO GOVERNMENTS.

-- F. MISSION RESPONSIBILITY - COMMITTEE CONSENSUS, SUPPORTED BY CHAIRMAN, WAS THAT QUESTION OF MISSION VS REGIONAL MANAGEMENT RESPONSIBILITY IS A MATTER TO BE DECIDED FOR EACH PROJECT ON A CASE-BY-CASE BASIS. IN MALAWI NORTHERN CORRIDOR PROJECT, THE COMMITTEE AGREED THAT CIRCUMSTANCES SUPPORT GIVING USAID/MALAWI OVERALL MANAGEMENT RESPONSIBILITY, WITH ONGOING HELP FROM SARP AND REDSO AS NEEDED. PP SHOULD REFLECT THIS DECISION, ALONG WITH A FULL EXPLANATION OF THE DIVISION OF LABOR AMONG AID MANAGEMENT ENTITIES. SINCE PROJECT APPROVAL AND IMPLEMENTATION AUTHORITY FOR THE SARP PROGRAM IS FORMALLY DELEGATED TO THE DIRICTOR OF USAID/ZIMBABWE, A REDELEGATION BY USAID/Z TO USAID/MALAWI WOULD BE REQUIRED.

-- G. FINAL TECHNICAL DESIGN AND COST ESTIMATE - SINCE THE OVERALL FINAL DESIGN AND BUDGET FOR MALAWI CORRIDOR

ARE BEING DONE BY GERMAN FIRM OF GITEC AND WILL NOT BE READY BEFORE THE END OF JUNE AND PERHAPS LATER, OUR PP BUDGET WILL PROBABLY HAVE TO BE BASED MAINLY ON PRELIMINARY TECHNICAL DESIGN. HOWEVER, SINCE CHANGES IN TECHNICAL OPTIONS CAN AFFECT COSTS SUBSTANTIALLY AND SINCE BUDGET NOW BEING PREPARED BY GITEC MAY BE SIGNIFICANTLY ABOVE EARLIER ESTIMATES (ACCORDING TO BANK'S EAST AFRICA TRANSPORT DIVISION), THE PP TEAM SHOULD ENSURE THAT THE LATEST AVAILABLE TECHNICAL AND COST INFORMATION IS TAKEN INTO ACCOUNT AND SHOULD MAINTAIN CLOSE COORDINATION WITH WORLD BANK AND GOM ON THE MATTER OF THE CONSTRUCTION DESIGN AND COST ESTIMATES. IN LIGHT OF THESE ANTICIPATED COST INCREASES BEYOND THE PAIP ESTIMATE OF DOLS 9.5 MILLION FOR THE NORTHERN CORRIDOR, THE DOA IN PARA 3 BELOW IS WRITTEN WITH SOME FLEXIBILITY TO PERMIT AUTHORIZATION OF A MAXIMUM AMOUNT OF DOLS 11.5 MILLION, IF NECESSARY, TO AVOID THE NEED FOR AN AMENDED DOA.

-- H. PROJECT SELECTION CRITERIA - CRITERIA OF PAGE 9 OF PID WERE GENERALLY ACCEPTED, BUT SHOULD BE EXPANDED,

REFINED, RANKED AND REVIEWED PERIODICALLY IN THE COURSE OF SARP DISCUSSIONS WITH SATCC. FUTURE SYNOPSIS CABLES SHOULD DEMONSTRATE HOW SELECTED ACTIVITIES MEET THESE CRITERIA BETTER THAN POSSIBLE ALTERNATIVE CHOICES.

-- I. INVOLVEMENT OF OTHER AID MISSIONS - RELEVANT AID MISSIONS IN SADCC COUNTRIES SHOULD BE CONSULTED AT THE FORMATIVE STAGE OF PROPOSALS FOR FUTURE TRANSPORT ACTIVITIES UNDER THIS PROJECT.

-- J. PROJECT ANALYSES FOR NORTHERN CORRIDOR PP - THE PROJECT PAPER SHOULD INCLUDE FINANCIAL AND ADMINISTRATIVE ANALYSES, NOT MENTIONED IN PID OUTLINE OF

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PP REQUIREMENTS. COSTS ASSOCIATED WITH RELATED ACTIVITIES IN TANZANIA SHOULD BE TAKEN INTO ACCOUNT. ECONOMIC ANALYSIS SHOULD PROVIDE REASONABLE BASIS FOR ASSUMPTION THAT REDUCTION IN TRANSPORTATION COSTS WILL HAVE A WIDESPREAD IMPACT ON DEVELOPMENT AND GROWTH.

-- K. PROCUREMENT AND CONTRACTING GUIDELINES - PER PRINCIPLES ESTABLISHED IN STATE 74107 ON REGIONAL MANPOWER MANAGEMENT PROJECT (MADREC), THE APPROPRIATE AUTHORIZED GEOGRAPHIC CODE FOR THE NORTHERN CORRIDOR PROJECT WOULD BE CODE 941 FOR FOREIGN EXCHANGE COSTS AND ANY BENEFICIARY SADCC COUNTRY FOR LOCAL COSTS. HOST COUNTRY CONTACTING IS CONSIDERED APPROPRIATE IN VIEW OF MALAWI'S FAVORABLE PAST RECORD IN MANAGING AID-FUNDED CONSTRUCTION CONTRACTS.

-- L. 611(E) CERTIFICATION - THE MISSION IS REMINDED OF THE NEED FOR AA/AFR CONCURRENCE IN THE DIRECTOR'S 611(E) CERTIFICATION, WHICH IS NOT INCLUDED IN THE DOA. THIS CAN BE ACCOMPLISHED BY AN EXCHANGE OF CABLES.

M. IEE - APPROVAL OF INITIAL ENVIRONMENTAL EXAMINATION WILL FOLLOW BY SEPTEL.

2. SARP, AND IN THE CASE OF THE NORTHERN CORRIDOR ACTIVITY, USAID/MALAWI, SHOULD TAKE ACCOUNT OF ABOVE COMMENTS DURING PREPARATION OF PPS. UNDER NORMAL DOA 140 PROCEDURES, DIRECTOR OF USAID/ZIMBABWE, IN CAPACITY AS DIRECTOR OF SARP, MAY AUTHORIZE THESE TWO PROJECTS WITH REDSO CONCURRENCE WHEN DESIGN IS COMPLETED, WITH THE GRANT AGREEMENT FOR NORTHERN CORRIDOR EXECUTED WITH THE GOVERNMENT OF MALAWI. HOWEVER, IN THIS INSTANCE, IN VIEW OF OUR DESIRE TO HAVE THESE TWO ACTIVITIES AUTHORIZED BY JUNE 30 IF AT ALL POSSIBLE, WE BELIEVE

THAT MISSION APPROVAL WITHOUT FORMAL REDSO CONCURRENCE IS WARRANTED. THIS EXCEPTION IS BASED ON THE MISSION'S FULL CAPACITY TO REVIEW AND APPROVE THE PROJECTS AND THE EXTENSIVE REDSO INVOLVEMENT IN THE ECONOMIC ANALYSIS AND ENVIRONMENTAL ASSESSMENT FOR THE NORTHERN CORRIDOR AND THE PARTICIPATION OF AN AID/W PROJECT OFFICER AND PERHAPS AN AID/W PORT ENGINEER ON THE PP TEAM.

3. AA/AFR HEREBY DELEGATES AUTHORITY TO THE DIRECTOR, USAID/ZIMBABWE, TO AUTHORIZE THE NORTHERN CORRIDOR PROJECT IN AN AMOUNT NOT TO EXCEED DOLS 11.5 MILLION AND THE REGIONAL TECHNICAL ASSISTANCE AND TRAINING PROJECT IN AN AMOUNT NOT TO EXCEED DOLS 1.5 MILLION. THESE AD HOC DELEGATIONS OF AUTHORITY SHALL BE EXERCISED ON ALL THE TERMS AND CONDITIONS OF DOA 140 EXCEPT FOR THE AMOUNT IN THE CASE OF THE NORTHERN CORRIDOR PROJECT AND THE REQUIREMENT FOR REDSO CONCURRENCE. SHULTZ
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5C(2) - PROJECT CHECKLIST

Listed below are statutory criteria applicable to projects. This section is divided into two parts. Part A includes criteria applicable to all projects. Part B applies to projects funded from specific sources only: B(1) applies to all projects funded with Development Assistance; B(2) applies to projects funded with Development Assistance loans; and B(3) applies to projects funded from ESF.

CROSS REFERENCES: IS COUNTRY CHECKLIST UP TO DATE? HAS STANDARD ITEM CHECKLIST BEEN REVIEWED FOR THIS PROJECT?

A. GENERAL CRITERIA FOR PROJECT

1. FY 1989 Appropriations Act Sec. 523; FAA Sec. 634A. If money is sought to obligated for an activity not previously justified to Congress, or for an amount in excess of amount previously justified to Congress, has Congress been properly notified? — Yes CN expired on

2. FAA Sec. 611(a)(1). Prior to an obligation in excess of $500,000, will there be (a) engineering, financial or other plans necessary to carry out the assistance, and (b) a reasonably firm estimate of the cost to the U.S. of the assistance? — Yes

3. FAA Sec. 611(a)(2). If legislative action is required within recipient country, what is the basis for a reasonable expectation that such action will be completed in time to permit orderly accomplishment of the purpose of the assistance? — N/A

4.	FAA Sec. 611(b); FY 1989 Appropriations Act Sec. 501. If project is for water or water-related land resource construction, have benefits and costs been computed to the extent practicable in accordance with the principles, standards, and procedures established pursuant to the Water Resources Planning Act (42 U.S.C. 1962, et seq.)? (See A.I.D. Handbook 3 for guidelines.)	N/A
5.	FAA Sec. 611(e). If project is capital assistance (e.g., construction), and total U.S. assistance for it will exceed $1 million, has Mission Director certified and Regional Assistant Administrator taken into consideration the country's capability to maintain and utilize the project effectively?	Yes
6.	FAA Sec. 209. Is project susceptible to execution as part of regional or multilateral project? If so, why is project not so executed? Information and conclusion whether assistance will encourage regional development programs.	Yes. It is a regional project under Southern African Development Assistance
7.	FAA Sec. 601(a). Information and conclusions on whether projects will encourage efforts of the country to: (a) increase the flow of international trade; (b) foster private initiative and competition; (c) encourage development and use of cooperatives, credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture and commerce; and (f) strengthen free labor unions.	(a) Yes, a major objective is to increase imports and exports (b) N/A (c) N/A (d) N/A (e) Yes, the projec will increase efficiency of marke ing by reducing transport times and costs (f) N/A
8.	FAA Sec. 601(b). Information and conclusions on how project will encourage U.S. private trade and investment abroad and encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise).	N/A

9. FAA Secs. 612(b), 636(h). Describe steps taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services, and foreign currencies owned by the U.S. are utilized in lieu of dollars.	The host country is contributing local currency to finance local costs of the construction.
10. FAA Sec. 612(d). Does the U.S. own excess foreign currency of the country and, if so, what arrangements have been made for its release?	No
11. FY 1989 Appropriations Act Sec. 521. If assistance is for the production of any commodity for export, is the commodity likely to be in surplus on world markets at the time the resulting productive capacity becomes operative, and is such assistance likely to cause substantial injury to U.S. producers of the same, similar or competing commodity?	N/A
12. FY 1989 Appropriations Act Sec. 549. Will the assistance (except for programs in Caribbean Basin Initiative countries under U.S. Tariff Schedule "Section 807," which allows reduced tariffs on articles assembled abroad from U.S.-made components) be used directly to procure feasibility studies, prefeasibility studies, or project profiles of potential investment in, or to assist the establishment of facilities specifically designed for, the manufacture for export to the United States or to third country markets in direct competition with U.S. exports, of textiles, apparel, footwear, handbags, flat goods (such as wallets or coin purses worn on the person), work gloves or leather wearing apparel?	No
13. FAA Sec. 119(g)(4)-(6) & (10). Will the assistance (a) support training and education efforts which improve the capacity of recipient countries to prevent loss of biological diversity; (b) be provided under a long-term agreement in which the recipient country agrees to protect ecosystems or other	No

wildlife habitats; (c) support efforts to identify and survey ecosystems in recipient countries worthy of protection; or (d) by any direct or indirect means significantly degrade national parks or similar protected areas or introduce exotic plants or animals into such areas?

14. FAA Sec. 121(d). If a Sahel project, has a determination been made that the host government has an adequate system for accounting for and controlling receipt and expenditure of project funds (either dollars or local currency generated therefrom)? N/A

15. FY 1989 Appropriations Act. If assistance is to be made to a United States PVO (other than a cooperative development organization), does it obtain at least 20 percent of its total annual funding for international activities from sources other than the United States Government? N/A

16. FY 1989 Appropriations Act Sec. 538. If assistance is being made available to a PVO, has that organization provided upon timely request any document, file, or record necessary to the auditing requirements of A.I.D., and is the PVO registered with A.I.D.? N/A

17. FY 1989 Appropriations Act Sec. 514. If funds are being obligated under an appropriation account to which they were not appropriated, has prior approval of the Appropriations Committees of Congress been obtained? N/A

18. State Authorization Sec. 139 (as interpreted by conference report). Has confirmation of the date of signing of the project agreement, including the amount involved, been cabled to State L/T and A.I.D. LEG within 60 days of the agreement's entry into force with respect to the United States, and has the full text of the agreement been pouched to those same offices? (See Handbook 3, Appendix 6G for agreements covered by this provision). N/A

B. FUNDING CRITERIA FOR PROJECT

1. Development Assistance Project Criteria

a. FY 1989 Appropriations Act Sec. 548 (as interpreted by conference report for original enactment). If assistance is for agricultural development activities (specifically, any testing or breeding feasibility study, variety improvement or introduction, consultancy, publication, conference, or training), are such activities (a) specifically and principally designed to increase agricultural exports by the host country to a country other than the United States, where the export would lead to direct competition in that third country with exports of a similar commodity grown or produced in the United States, and can the activities reasonably be expected to cause substantial injury to U.S. exporters of a similar agricultural commodity; or (b) in support of research that is intended primarily to benefit U.S. producers?	N/A
b. FAA Secs. 102(b), 111, 113, 281(a). Describe extent to which activity will (a) effectively involve the poor in development by extending access to economy at local level, increasing labor-intensive production and the use of appropriate technology, dispersing investment from cities to small towns and rural areas, and insuring wide participation of the poor in the benefits of development on a sustained basis, using appropriate U.S. institutions; (b) help develop cooperatives, especially by technical assistance, to assist rural and urban poor to help themselves toward a better life, and otherwise encourage democratic private and local governmental	(a) The project will employ 400-500 laborers to carry out intensive road rehabilitation. Advertisements for construction supervision and construction services will be placed in the U.S. (b) N/A

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	institutions; (c) support the self-help efforts of developing countries; (d) promote the participation of women in the national economies of developing countries and the improvement of women's status; and (e) utilize and encourage regional cooperation by developing countries.	(c) The rehabilitated road will support self-help efforts to increase efficiency of agricultural marketing. (d) The construction contractor will have a 20% target for employment of women. (e) Improved regional road network will stimulate intra-regional trade.
c.	FAA Secs. 103, 103A, 104, 105, 106, 120-21; FY 1989 Appropriations Act (Development Fund for Africa). Does the project fit the criteria for the source of funds (functional account) being used?	Yes
d.	FAA Sec. 107. Is emphasis placed on use of appropriate technology (relatively smaller, cost-saving, labor-using technologies that are generally most appropriate for the small farms, small businesses, and small incomes of the poor)?	N/A
e.	FAA Secs. 110, 124(d). Will the recipient country provide at least 25 percent of the costs of the program, project, or activity with respect to which the assistance is to be furnished (or is the latter cost-sharing requirement being waived for a "relatively least developed" country)?	N/A. This is a regional project under Southern Africa, Development Assistance. The GRZ, however, is contributing K50,000,000 to the project.
f.	FAA Sec. 128(b). If the activity attempts to increase the institutional capabilities of private organizations or the government of the country, or if it attempts to stimulate scientific and technological research, has it been designed and will it be monitored to ensure that the ultimate beneficiaries are the poor majority?	N/A

g. FAA Sec. 281(b). Describe extent to which program recognizes the particular needs, desires, and capacities of the people of the country; utilizes the country's intellectual resources to encourage institutional development; and supports civil education and training in skills required for effective participation in governmental processes essential to self-government.	The program will improve transportation within the country.
h. FY 1989 Appropriations Act Sec. 536. Are any of the funds to be used for the performance of abortions as a method of family planning or to motivate or coerce any person to practice abortions?	No
Are any of the funds to be used to pay for the performance of involuntary sterilization as a method of family planning or to coerce or provide any financial incentive to any person to undergo sterilizations?	No
Are any of the funds to be used to pay for any biomedical research which relates, in whole or in part, to methods of, or the performance of, abortions or involuntary sterilization as a means of family planning?	No
i. FY 1989 Appropriations Act. Is the assistance being made available to any organization or program which has been determined to support or participate in the management of a program of coercive abortion or involuntary sterilization?	No
If assistance is from the population functional account, are any of the funds to be made available to voluntary family planning projects which do not offer, either directly or through referral to or information about access to, a broad range of family planning methods and services?	N/A

j.	FAA Sec. 601(e). Will the project utilize competitive selection procedures for the awarding of contracts, except where applicable procurement rules allow otherwise?	Yes
k.	FY 1989 Appropriations Act. What portion of the funds will be available only for activities of economically and socially disadvantaged enterprises, historically black colleges and universities, colleges and universities having a student body in which more than 40 percent of the students are Hispanic Americans, and private and voluntary organizations which are controlled by individuals who are black Americans, Hispanic Americans, or Native Americans, or who are economically or socially disadvantaged (including women)?	Because host country contractors will be utilized, it is likely that little or no portion of the funds will be available for such groups
l.	FAA Sec. 118(c). Does the assistance comply with the environmental procedures set forth in A.I.D. Regulation 16? Does the assistance place a high priority on conservation and sustainable management of tropical forests? Specifically, does the assistance, to the fullest extent feasible: (a) stress the importance of conserving and sustainably managing forest resources; (b) support activities which offer employment and income alternatives to those who otherwise would cause destruction and loss of forests, and help countries identify and implement alternatives to colonizing forested areas; (c) support training programs, educational efforts, and the establishment or strengthening of institutions to improve forest management; (d) help end destructive slash-and-burn agriculture by supporting stable and productive farming practices; (e) help conserve forests which have not yet been degraded by helping to increase	Yes (a) - (i) N/A

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production on lands already cleared or degraded; (f) conserve forested watersheds and rehabilitate those which have been deforested; (g) support training, research, and other actions which lead to sustainable and more environmentally sound practices for timber harvesting, removal, and processing; (h) support research to expand knowledge of tropical forests and identify alternatives which will prevent forest destruction, loss, or degradation; (i) conserve biological diversity in forest areas by supporting efforts to identify, establish, and maintain a representative network of protected tropical forest ecosystems on a worldwide basis, by making the establishment of protected areas a condition of support for activities involving forest clearance or degradation, and by helping to identify tropical forest ecosystems and species in need of protection and establish and maintain appropriate protected areas; (j) seek to increase the awareness of U.S. government agencies and other donors of the immediate and long-term value of tropical forests; and (k)/utilize the resources and abilities of all relevant U.S. government agencies?

m. FAA Sec. 118(c)(13). If the assistance will support a program or project significantly affecting tropical forests (including projects involving the planting of exotic plant species), will the program or project (a) be based upon careful analysis of the alternatives available to achieve the best sustainable use of the land, and (b)/take full account of the environmental impacts of the proposed activities on biological diversity? N/A

n. FAA Sec. 118(c)(14). Will assistance be used for (a) the procurement or use of logging equipment, unless an environmental assessment indicates that all timber harvesting operations involved will be conducted in an environmentally sound manner and that the proposed activity will produce positive economic benefits and sustainable forest management systems; or (b) actions which will significantly degrade national parks or similar protected areas which contain tropical forests, or introduce exotic plants or animals into such areas? — No

o. FAA Sec. 118(c)(15). Will assistance be used for (a) activities which would result in the conversion of forest lands to the rearing of livestock; (b) the construction, upgrading, or maintenance of roads (including temporary haul roads for logging or other extractive industries) which pass through relatively undegraded forest lands; (c) the colonization of forest lands; or (d) the construction of dams or other water control structures which flood relatively undegraded forest lands, unless with respect to each such activity an environmental assessment indicates that the activity will contribute significantly and directly to improving the livelihood of the rural poor and will be conducted in an environmentally sound manner which supports sustainable development? — N/A

p. FY 1989 Appropriations Act. If assistance will come from the Sub-Saharan Africa DA account, is it (a) to be used to help the poor majority in Sub-Saharan Africa through a process of long-term development and economic growth that is equitable, participatory, environmentally sustainable, and self-reliant; (b) being provided in accordance with the policies contained in section 102 of the FAA; — N/A (a - e)

(c) being provided, when conistent with the objectives of such assistance, through African, United States and other PVOs that have demonstrated effectiveness in the promotion of local grassroots activities on behalf of long-term development in Sub-Saharan Africa; (d) being used to help overcome shorter-term constraints to long-term development, to promote reform of sectoral economic policies, to support the critical sector priorities of agricultural production and natural resources, health, voluntary family planning services, education, and income generating opportunities, to bring about appropriate sectoral restructuring of the Sub-Saharan African economies, to support reform in public administration and finances and to establish a favorable environment for individual enterprise and self-sustaining development, and to take into account, in assisted policy reforms, the need to protect vulnerable groups; (e) being used to increase agricultural production in ways that protect and restore the natural resource base, especially food production, to maintain and improve basic transportation and communication networks, to maintain and restore the renewable natural resource base in ways that increase agricultural production, to improve health conditions with special emphasis on meeting the health needs of mothers and children, including the establishment of self-sustaining primary health care systems that give priority to preventive care, to provide increased access to voluntary family planning services, to improve basic literacy and mathematics especially to those outside the formal educational system and to improve primary education, and to develop income-generating opportunities for the unemployed and underemployed in urban and rural areas?

q. FY 1989 Appropriations Act Sec. 515. If deob/reob authority is sought to be exercised in the provision of DA assistance, are the funds being obligated for the same general purpose, and for countries within the same general region as originally obligated, and have the Appropriations Committees of both Houses of Congress been properly notified? N/A

2. Development Assistance Project Criteria (Loans Only) N/A

a. FAA Sec. 122(b). Information and conclusion on capacity of the country to repay the loan at a reasonable rate of interest.

b. FAA Sec. 620(d). If assistance is for any productive enterprise which will compete with U.S. enterprises, is there an agreement by the recipient country to prevent export to the U.S. of more than 20 percent of the enterprise's annual production during the life of the loan, or has the requirement to enter into such an agreement been waived by the President because of a national security interest?

c. FAA Sec. 122(b). Does the activity give reasonable promise of assisting long-range plans and programs designed to develop economic resources and increase productive capacities?

3. Economic Support Fund Project Criteria N/A

a. FAA Sec. 531(a). Will this assistance promote economic and political stability? To the maximum extent feasible, is this assistance consistent with the policy directions, purposes, and programs of Part I of the FAA?

b. FAA Sec. 531(e). Will this assistance be used for military or paramilitary purposes?

c. FAA Sec. 609. If commodities are to be granted so that sale proceeds will accrue to the recipient country, have Special Account (counterpart) arrangements been made?

81.

Communications should be addressed to the Permanent Secretary

Telephone: LUSAKA 213872

Telegrams: FINANCE, RIDGEWAY

REPUBLIC OF ZAMBIA

MINISTRY OF FINANCE

ACTION CD | DUE DATE 9/6
TRANSFER | INFO
ACTION TAKEN Project Paper
DATE 8/30 | INITIALS

In reply please quote: No. MFAL/102/12/607

AUG 30 1989

P.O. BOX 50062
LUSAKA

23rd August, 1989.

Mr. Leslie A. Dean,
Mission Director,
USAID/Zambia,
LUSAKA.

Dear Sir,

SUBJECT: **ZAMBIA: REGIONAL TRANSPORT DEVELOPMENT, KAFUE-LUSAKA ROAD REHABILITATION PROJECT (690-0254)**

Zambia welcomes support from donors to help the Government and the Zambian people to update and rehabilitate existing trunk road links. The Roads Department in the Ministry of Power, Transport and Communications is charged with the responsibility for the construction, maintenance and rehabilitation of these vital roads.

The Kafue-Lusaka Road Rehabilitation Project addresses key Regional and Zambian Government priorities in a number of respects. Particularly, the project will:

- reduce shipment time, alleviate vehicle operation costs and other related problems which are currently very detrimental to economic development;
- stimulate import/export activity within the Region;
- reduce the current high levels of effort and expenditure presently required to maintain this section of seriously deteriorated road; and
- complement other major rehabilitation planned efforts of Zambian trunk roads.

On behalf of the Government of the Republic of Zambia, therefore, I would like to request that the United States Government provide funding for the Kafue-Lusaka Road Rehabilitation Project in order to carry out the rehabilitation work on the vital section of road from Kafue-Lusaka. In view of the importance and urgency of this project, the Government of the Republic of Zambia earnestly hopes that the Agency for International Development will take immediate steps to provide funds as soon as possible. I hope this request will meet with favourable consideration, and we look forward to our

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continuing warm and productive relationships during the implementation of the project.

Yours faithfully,

L. Nkhata
SENIOR PERMANENT SECRETARY
MINISTRY OF FINANCE

c.c. Mr. N. B. Nyoni,
Permanent Secretary,
Ministry of Power, Transport and Communications,
LUSAKA.

c.c. Director,
Department of Roads,
LUSAKA

LN/dm.

1.8.1 Study on Angola-Zambia Road Link, Zambia

Estimated Costs
Total : USD 0.2 million
Foreign : USD 0.2 million
Local : USD 0.0 million

Funding Secured
Foreign : USD 0.2 million
Local : USD 0.0 million

Funding Under Negotiation
Total : USD 0.0 million

Financing Gap:
Total : USD 0.0 million

Executing Agency:
Ministry of Works and Supply, Zambia
Start :
Duration:

Objectives : Feasibility study on the construction of an all-weather heavy traffic road connecting Kasama in Zambia with Luebala in Angola, about 370 km.

The proposed road Kasama – Borderpost at Chiparde – Luebala – Luena will be one of the few road links between Zambia and Angola and will be essential for road transports to the Lobito Port.

Progress : In Angola the road section Luena – Lucusse has been completed and the section Lucusse – Luebala is under construction up to paved standard. About 50km to the Borderpost at Chiparde remains to be upgraded.

In Zambia the road follows mainly existing unclassified gravel or earth roads.

Construction costs are estimated roughly at USD 80 million (1983 prices).

Status : The feasibility study financed by EEC was started in 1980. Preliminary findings based on work in Zambia were presented in 1981. Further work adjourned for the time being. The project to be reviewed in the context of the Lobito Port Transport System, as a potential road connection between Angola and Zambia.

September 1988

1.8.3 Rehabilitation of the Lusaka- Kafue-Livingstone-Kazungula Road, Zambia

Estimated Costs
Total : USD 30.1 million
Foreign : USD 19.0 million
Local : USD 11.1 million

Funding Secured
Foreign : USD 12.5 million
Local : USD 11.1 million

Funding Under Negotiation
Total : USD 0.0 million

Financing Gap
Total : USD 6.5 million

Executing Agency:
Ministry of Works and Supply, Zambia
Start : 1988
Duration: 3 years

Objectives : Rehabilitation and upgrading of the road Lusaka – Kafue – Livingstone – Kazungula, 470 Km.

Description: Upgrading work has been completed in 1986 on the section Zimba-Livingstone (42 Km) with financing from Norway. That road section has been upgraded from a 3.5 m wide surface to a 6.1 – bitumen surface with 2 m shoulders (USD 5 million). The remaining sections are of varying standards and show signs of deterioration. The normal recurrent maintenance funds are not sufficient for the necessary works.

Status : Denmark has financed feasibility and engineering studies (USD 0.7 million), together with 3 other roads in Zambia (projects 1.8.5, 1.8.6, 1.8.7). Studies have been completed in early 1986.

Recently, Norway has pledged USD 7.0 million for the section Kafue-Nana (approx. 100Km). The works on this section are to start towards the end of 1988. Denmark has also been approached.

The section Lusaka-Kafue junction (54 Km) is included in the Beira Port Transport System Development Plan (see Project 1.5.1).

September 1988

SECTION 611(e) CERTIFICATION

REGIONAL TRANSPORTATION DEVELOPMENT II - KAFUE-LUSAKA ROAD

I, Leslie A. Dean, the principal officer of the Agency for International Development in the Republic of Zambia, having taken into account, among other things:

-the maintenance and utilization of projects in Zambia previously financed or assisted by the United States;

-commitments by the Government of the Republic of Zambia to provide, by the end of the project, adequate resources to maintain the project road;

-the likelihood of A.I.D. and/or other donor support for projects to improve Zambia's road maintenance capability; and

-the Government of the Republic of Zambia's present commitment of resources to road maintenance activities;

do hereby certify that in my judgement the Government of the Republic of Zambia has both the financial capability and human resource capability to effectively maintain and utilize the capital assistance to be carried out under this project.

Leslie A. Dean

Leslie A. Dean
Mission Director

Date: August 9, 1989

611(e) Justification

The institutional capacity of the Department of Roads and their ability to effectively maintain and utilize the Kafue-Lusaka road after completion of project-funded rehabilitation has been assessed as part of the Project Paper analyses. While there is some cause for concern based upon historic budgetary and staffing constraints, the design team has concluded that the GRZ will have the necessary institutional capacity, resources and commitment to effectively maintain and utilize the road, based on the considerations summerized below.

In furtherance of this objective, the project will undertake several initiatives to supplement the institutional capacity of the Department of Roads. Specifically, the project will provide training for Roads mechanics and engineers, maintenance equipment and spare parts, and contract project construction supervision and administrative support. Covenants and Conditions Precedent will require the GRZ to develop an appropriate maintenance plan for the project road and to dedicate sufficient staff and budgetary resources to achieve the plan's objectives. Finally, the GRZ has agreed to develop a vehicle weight control program and to strictly enforce existing weight limitations for vehicles travelling on the Kafue-Lusaka road.

The measures proposed under the Project are sufficient to provide for effective maintenance of the Kafue-Lusaka Road. However, in addition to efforts proposed by A.I.D., other donors, notably FINNIDA and NORAD are currently involved in the upgrading of departmental maintenance capability. FINNIDA has funded a pilot road maintenance project in the Lusaka Province under which 3 long-term technical advisors are training the staff of the Provincial Roads Engineer in maintenance procedures and techniques. The project will be ongoing through 1993 and is currently envisaged to be expanded to other provinces, with the life of project extended accordingly. NORAD is actively involved in Road Maintenance planning, coordination and administration by providing long-term technical assistance at the Headquarters in Lusaka. Additionally, the AFDB is contemplating a road maintenance study in its proposed rehabilitation of Great East Road from Lusaka to Chipata.

C:JUSTIFIC: P1

INITIAL ENVIRONMENTAL EXAMINATION

Project Location: Southern Africa Regional (Zambia)

Project Title: Regional Transport Development II - Kafue-Lusaka Road (Project 690-0254)

Funding: FY 90 Obligation - $18.0 Million
FY 91 Obligation - 0 - Million

Life of Project: FY(S) 90-94

IEE Prepared By: Ernest R. Rojas, Assistant Regional Engineer
USAID/Zimbabwe

Environmental Action Recommended: Negative Determination

See attached justification

Action Requested By: Allison B. Herrick
Director, USAID/Zimbabwe

Approved: _____

Disapproved: _____

Date: 22 Sept 1989

Bureau Environmental Officer Concurrence: Approved: X
Bessie L. Boyd, AFR/TR/ANR Disapproved: _____
Date: 7/27/89

Clear:RLA OK

Clearances:
FDL FDL,REO
FAZ,DD

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Regional Transport Development II - Kafue-Lusaka Road

Project Description

The road from Lusaka to the Kafue Bridge crossing is 53.3 kilometers in length and is in varying stages of distress. The road links the capital city of Lusaka with the industrial town of Kafue, and continues southward to the bridge crossing at the Kafue River. A.I.D. will finance the resealing, pavement strengthening and or complete reconstruction of 49.4 kilometers of this road. The section of road (dual carriageway) which starts from downtown Lusaka and runs to km 3.9 will not be rehabilitated as part of this project.

The Government of the Republic of Zambia will use road maintenance equipment provided by this project to provide maintenance of this sector of Road. The Project Grant Agreement will include conditions Precedent and Covenants which will address this road maintenance issue.

The road to be rehabilitated passes through flat and rolling terrain. Rainfall averages 33 inches per year with the heaviest rains occurring in the December through March period. The area varies from densely populated, 3500 to 5000 people per square kilometer in Lusaka and nearby vicinity to sparsely populated, 5 to 10 people per square kilometer near the Kafue River bridge crossing. From Lusaka to Kafue the vegetation is comprised of maize, wheat, soyabeans and vegetables grown mostly on commercial farms. After the town of Kafue the vegetation is primarily bush with very little economic value.

The project road provides a vital economic and social link between Zambia and Zimbabwe and is also a transit road link for the countries to the north and south of Zambia. Current average traffic flows (1989 estimates) average 900 vehicles per day, made up of 66% light vehicles, 2% buses, 18% single trucks and 14% articulated vehicles including commercial vehicles. It is estimated that 24% of all trunk traffic using the road is "international" and 9% is "transit." On average traffic flows over the past 7 years have been fairly even, except for commercial traffic which has more than doubled over the same period.

Discussion of Environmental Impacts

A. Land Use

The work proposed will require minimal additional land use since the existing right-of-way will be used. However there will be two locations where the existing road will be realigned, that is in the vicinity of km 7.5 and km 12.5. However none of the realignment will be outside the existing right of way.

There will also be a deviation constructed for road traffic during rehabilitation of the road between km 3.9 and km 14.0 however this deviation will be along the existing road within the existing right-of-way. Other deviations will be along existing roads. Runoff in the flat terrain has been a problem causing flooding over the existing road. The proposed work will improve the drainage ditches and channels, culvert inlets and outlets and result in controlled runoff which will eliminate problems with flooding. Fill material to be imported will be from existing or extension of gravel and borrow pits and is unlikely that major additional land will be used for such purposes.

B. Water Quality

Minimal impact on water quality is expected because no change in natural water ways is anticipated. In addition, controlled drainage will minimize the flow of sediment. Drainage will be improved as discussed in A above.

C. Atmosphere

Pollution due to dust can be expected during the reconstruction period, but will not be excessive. In areas which are heavily populated, attempts will be made to keep dust down to a minimum. Noise and exhaust fumes from the construction effort will not be more objectionable than that being experienced from the cement trucks and other heavy goods trucks now using the road. In addition, traffic deviations will be alongside the existing road or on other existing roads. The road improvement is not anticipated to generate major quantities of new traffic.

D. Natural Resources

The project will not cause any inefficient utilization or wastage of natural resources in the area. Usage will be limited to gravel or borrow pits. Wildlife in the area have adjusted to the existing road and no additional obstruction to their movement will occur. Some dislocation of local residents may take place during construction, but the effects will be temporary. With the exception of temporary changes, no negative impact on vegetation is anticipated.

E. Cultural

No additional dilution of cultural patterns will occur as a result of this road improvement.

F. Socio-Economic

Positive changes will result from improved, year-round access of the population to regional markets and government social services.

Recommendations for Environmental Action

The proposed improvements of this road will have numerous positive effects of a socio-economic nature, not only on the population within the road's zone of influence, but also in terms of food availability to the population of Zambia. Other environmental impacts will either be minimally negative (land use), temporarily negative (water quality, atmospherics, natural resources) or neutral (cultural). Since the proposed improvements including realignments envisage total utilization of the existing road's right of way, the overall impact of the project will be negative. In the event that any major realignments are developed during engineering design, the REDSO Regional Environmental Officer will examine the acceptability of the proposed changes to ensure that appropriate corrective measures are incorporated into the final plans and specifications. In view of the preceding a negative determination is requested.

Annex I(G)I

WAIVER JUSTIFICATION FOR THE DEPUTY ASSISTANT ADMINISTRATOR

PROBLEM:

Your approval is requested for a Source/Origin Waiver from A.I.D. Geographic Code 941 (Selected Free World) to Code 935 (Special Free World).

(a)	Authorization Document:	Project Paper
(b)	Nature of Funding:	Loan
(c)	Source of Funding:	SADF
(d)	Description of Goods:	Soils Laboratory Equipment
(e)	Approximate Value:	$75,000
(f)	Probable Source:	Great Britain
(g)	Probable Origin:	Great Britain

DISCUSSION:

A source/origin Waiver from Code 941 to Code 935 is required to permit the purchase of various soils laboratory testing equipment. This equipment, which is critical to the successful rehabilitation of the Kafue-Chirundu Road, must be procured from Great Britain because: (1) it must be compatible with on-hand British laboratory equipment financed by AID; and (2) it must be familiar to local technicians who are used to operating British makes and models. Although it would be theoretically possible to source at least part of the required British equipment locally or in Code 941 countries, this alternative would not be practical due to limited sources of supply.

JUSTIFICATION:

HB 1B Chapter 5.B.4.a provides that a waiver of (change in) the authorized list of eligible countries may be authorized when "...the commodity is not available from countries or areas included in the authorized geographic code."

You have the authority to approve this waiver provided that appropriate technical review has been undertaken. This waiver has been cleared by both RLA REDSO/ESA and Regional Engineer, USAID/Zimbabwe.

RECOMMENDATION:

In accord with the above discussion and waiver justification, it is recommended that you: (1) approve a source/origin waiver from AID Geographic Code 941 to AID Geographic Code 935 to permit procurement of soils laboratory testing equipment; and (2) certify that exclusion of procurement of the above-described commodities from Free World countries other than the cooperating country and countries included in Code 941 would seriously impede attainment of U.S. foreign policy objectives of the foreign assistance program.

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APPROVED: _____

DISAPPROVED: _____

DATE: _____

Clearance: J. Borns, RLA, REDSO/ESA (draft)
E. Rojas, Regional Engineer, USAID/Zimbabwe (draft)

WAIVER JUSTIFICATION FOR THE DEPUTY ASSISTANT ADMINISTRATOR

PROBLEM:

Your approval is requested for:

(1) Proprietary Procurement approval to allow the purchase of two tipper trucks manufactured by either Mitsubishi or Mercedes, one truck mounted bitumen distributor manufactured by either Mitsubishi/Hotta or Mercedes/Benninghoven and related spare parts for the three units.

(2) A Source/Origin Waiver from A.I.D. Geographic Code 941 (Selected Free World) to Code 935 (Special Free World).

(a)	Authorization Document:	Project Paper
(b)	Nature of Funding:	Loan
(c)	Source of Funding:	SADF
(d)	Description of Goods:	One truck-mounted bitumen distributor, two dumptrucks and spares
(e)	Approximate Value:	$200,000 (FOB)
(f)	Probable Source:	Japan, Germany
(g)	Probable Origin	Japan, Germany

DISCUSSION:

Proprietary procurement approval and a source/origin waiver from Geographic Code 941 to Code 935 are required to permit the purchase of one truck-mounted bitumen distributor, two dumptrucks and related spare parts. This equipment is critical to increase the Roads Department's inventory of road maintenance equipment, thereby increasing their institutional maintenance capacity and prolonging the useful life of the road being rehabilitated under the subject project. The source/origin waiver is essential because the GRZ Roads Department is standardizing its truck-mounted bitumen distributors and tipper trucks on Mitsubishi and Mercedes Benz. Bitumen distributors mounted on Mitsubishi trucks are manufactured by Hotta of Japan and those mounted on Mercedes Benz trucks are manufactured by Benninghoven of West Germany.

A proprietary procurement of the aforementioned equipment is required to ensure compatibility with on-hand equipment and achieve substantial benefits in maximizing economies in maintenance of spare parts inventories. The Roads Department has stated that it currently owns Mitsubishi and Mercedes tipper trucks and Mitsubishi/Hotta of Japan and Mercedes Benz/Benninghoven of West Germany truck mounted bitumen distributors. This equipment has proven reliable and is familiar to Road Department operators. The Roads Department wishes to standardize on these units to achieve economies in spare parts by capitalizing on compatibility with on hand equipment. This equipment is sophisticated and the Department believes it would not be a prudent use of funds to acquire a variety of different makes and models.

The required equipment is not available from Geographic Code 941 countries because it is only manufactured in Japan or West Germany. The Roads Department is attempting to standardize its fleet on Mitsubishi and Mercedes, of which it already owns 30 and 20 units respectively. Given the difficulty in maintaining equipment in Zambia, mixing other models of trucks, and truck-mounted bitumen distributors into the existing fleet would cause an unmanageable maintenance problem.

JUSTIFICATION:

HB 11 chapter 3.2.2.5 provides for proprietary procurement for reasons such as a requirement for compatibility with equipment on-hand and achievement of substantial benefits such as economies in the maintenance of spare parts inventories and greater familiarity of operating personnel through standardizing on a particular brand.

HB 1B chapter 4.B.4.a provides that a waiver of (change in) the authorized list of eligible countries or geographic codes may be authorized when "...the commodity is not available from countries or areas included in the authorized geographic code".

You have the authority to approve this waiver provided that appropriate technical review has been undertaken. This waiver justification has been cleared by RLA, REDSO/ESA and the REO, USAID/Zimbabwe.

RECOMMENDATION:

In accord with the above discussion and waiver justification, it is recommended that you:

1. Approve proprietary procurement of either the Mercedes or Mitsubishi tipper trucks and either the Mercedes/Benninghoven or Mitsubishi/Hotta bitumen distributor,

2. Approve a source/origin waiver from AID Geographic Code 941 to AID Geographic Code 935 to permit procurement of (a) the truck-mounted bitumen distributor at approximately $100,000, (b) 2 trucks with an approximate combined value of $100,000, and, (c) related spare parts for the three units with an approximate value of $40,000.

3. Find that special circumstances exist justifying a waiver of the requirements of Section 636 (i) of the Foreign Assistance Act with respect to the above-described vehicles; and

4. Certify that exclusion of procurement of the above-described commodities from Free World countries other than the Cooperating Country and

countries included in Code 941 would seriously impede attainment of U.S. foreign policy objectives and objectives of the foreign assistance program

Approved: _____

Disapproved: _____ ___

Date: _____

Clearances:
J. Borns, RLA, REDSO/ESA (draft)
E. Rojas, Regional Engineer, USAID/Zimbabwe (draft)

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ANNEX II: TECHNICAL EXHIBITS

A. Logical Framework

B. Implementation Timeline

C. Roads Dept. Organizational Chart

D. Scope of Work for PSC Engineer

E. Road Maintenance Equipment List

PROJECT LOGICAL FRAMEWORK
KAFUE-LUSAKA ROAD REHABILITATION (690-0254)

NARRATIVE SUMMARY	OBJECTIVE VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
PROJECT GOAL:	**MEASURES OF GOAL ACHIEVEMENT:**		
To support the development of a stronger foundation for economic growth in southern Africa.	1. Lower foreign exchange and local currency transportation costs for SADCC countries.	1. A) Transportation industry cost analysis. B) National budget accounts.	1. Foreign exchange and local currency cost savings stimulate economic growth.
	2. Increased regional exports as a function of cost savings and road reliability.	2. A) National and regional statistics. B) Survey of export industries.	2. Continued regional cooperation.
	3. Increased extra-regional trade using SADCC transportation corridors.	3. As above	3. Transportation corridor investments maintained by SADCC countries.
			4. No major disruption of social and political stability in the SADCC region generally and in Zambia in particular.

ANNEX II(A)

PROJECT LOGICAL FRAMEWORK
KAFUE-LUSAKA ROAD REHABILITATION (690-0254)

NARRATIVE SUMMARY	OBJECTIVE VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
PROJECT PURPOSE:	**END OF PROJECT STATUS (EOPS):**		
To continue and expand efforts to relieve capacity constraints on the region's trunk road system by rehabilitating the Kafue-Lusaka road.	1. Increased road usage.	1. Traffic counts.	1a. Road transportation costs maintain competitive advantage vis-a-vis rail.
	2. Year round reliable access for all road users assured.	2. Traffic counts and customs documentation.	1b. Demographic and economic activity trends remain within forecast limits.
	3. Road maintenance capability of Dept. of Roads improved.	3. Dept. of Roads institutional analysis.	2. Seasonal climate patterns and meteorological events (flooding, extreme heat) fall within anticipated norms and do not negate or diminish effectiveness of road resealing.
	4. Decrease in road accidents and vehicle breakdowns.	4. Police records, interviews with vehicle owners and transport companies.	3. Benefits of project-funded training and maintenance equipment are retained for Kafue-Lusaka road link.
			4. Accidents and breakdowns are caused by road deterioration.

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PROJECT LOGICAL FRAMEWORK
KAFUE-LUSAKA ROAD REHABILITATION (690-0254)

NARRATIVE SUMMARY	OBJECTIVE VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
PROJECT OUTPUTS:	MAGNITUDE OF OUTPUTS:		
1. Rehabilitation of 49.4 kms between Lusaka and Kafue.	1. 9.85 kms complete reconstruction. 2. 39.55 kms pavement strengthening.	1. Construction supervision contractor progress reports. 2. Construction contractor reports. 3. Site Inspections. 4. Payment vouchers. 5. Project evaluations. 6. Traffic counts.	1. A) Satisfactory engineering design and supervision. B) Satisfactory construction contractor performance
2. Carrying capacity of road increased.	1. Road improved to GRZ standards 1A and 1B	1. Engineering evaluations.	
3. Trained personnel at Dept. of Roads.	A) 84 persons from the Dept. of Roads trained.	A.I.D. Project Manager oversight.	2. Training recipients remain with Dept. of Roads upon completion of training.

PROJECT LOGICAL FRAMEWORK
KAFUE-LUSAKA ROAD REHABILITATION (690-0254)

NARRATIVE SUMMARY	OBJECTIVE VERIFIABLE INDICATORS			MEANS OF VERIFICATION
PROJECT INPUTS:	A.I.D. IMPLEMENTATION TARGETS: ($ MILLION)		GRZ IMPLEMENTATION TARGETS (KWACHA MILLION)	
1. Road construction services.	1.	15.10	40.00	1 Project Manager reports.
2. Final design and construction supervision services	2.	1.39		2. Contract document
3. PSC project management assistance	3.	.82		3. Payment vouchers.
4. Training.	4.	.02	.75	4. Site inspections.
5. Maintenance equipment.	5.	.86	.40	
6. Evaluations, Audits	6.	.1		
7. Contingency, inflation	7.	2.75	12.35	
		21.04	53.5	
rounded to:		21.05	53.5	

100.

Kafue-Lusaka Road Reconstruction Project Design Time Line

ANNEX II B

1 of 3 pages

Activity	Year: 1989				Year: 1990												Year: 1991							Year: 1992			Year: 1993			Year: 1994		
	Sept	Oct	Nov	Dec	Jan	Feb	Mar	April	May	June	July	August	Sept	Oct	Nov	Dec	Jan	Feb	Mar	April	May	June	Dec	Jan	June	Dec	Jan	June	Dec	Jan	June	Dec
PP Approved			------																													
CH initiated		------																														
Ad placed for prequal of design and construction supervision contractor		------																														
Roads drafts RFTP in conjunction with MEC, with review by RLA & RCB later		------																														
PIB/T issued & ads placed for PSC Engineer					------																											
Obligate funds					------																											
RLA & RCB review prequal docs/concur with Roads			------																													
A.I.D. approved RFTP sent to prequalified engineering firms						------																										
USAID reviews CVs for PSC Engineer/proposes award								------																								
RLA and RCB review review design/supervision proposals, approves negot									------																							
PSC Contract signed									------																							

Kafue-Lusaka Road Reconstruction Project Design Time Line

Activity	Year 1989				Year: 1990												Year: 1991																					
	Sept	Oct	Nov	Dec	Jan	Feb	Mar	April	May	June	July	August	Sept	Oct	Nov	Dec	Jan	Feb	Mar	April	May	June	Dec	Jan	June	Dec	Jan	June	Dec	Jan	June	Dec	Jan	June	Dec
USAID, RLA & RED approve design/supervision contract																																						
GRZ approves design/supervision contract																																						
RFCOM issued to consultant																																						
RLA, RED approve prequalification documents for construction contract																																						
Bids placed for const prequalification																																						
RLA, RED USAID review prequalification documents																																						
RLA, RED USAID approve IFB for construction services																																						
IFB sent to prequalified construction contractors																																						
RLA, RED, USAID review construction bids submitted as Roads																							SEPT															
GRZ approves Construction Contract, contractor mobilizes/supervision starts																								DEC	FEB													
Mobilization ends/ construction proceeds to completion																										MAR						DEC						
Maintenance period (1 yr)																																						

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Kafue-Lusaka Road Reconstruction Project Design Time Line

Activity	Year: 1989				Year: 1990												Year: 1991							Year: 199.			Year: 1993			Year: 1994		
	Sept	Oct	Nov	Dec	Jan	Feb	Mar	April	May	June	July	August	Sept	Oct	Nov	Dec	Jan	Feb	Mar	April	May	June	Dec	Jan	June	Dec	Jan	June	Dec	Jan	June	Dec
PIO/I issued for contract to support mid-term evaluation team																									JUNE							
Contracts signed with evaluation contractors																																
IFBs issued for maintenance equipment, procurement completed, equipment arrives in Zambia																																
Mid-term evaluation carried out																																
PIO/I issued for contract to support final evaluation																																
PIO/I issued for contract to support final non-federal audit																																
Contracts signed with contractors to support final evaluation																																
Contract signed with contractor to complete non-federal audit																																
Final evaluation carried out																																
Non-federal audit carried out																																
PACD																																

Activity	Year: 1994
	Dec
PIO/I issued for contract to support mid-term evaluation team	
Contracts signed with evaluation contractors	
IFBs issued for maintenance equipment, procurement completed, equipment arrives in Zambia	
Mid-term evaluation carried out	
PIO/I issued for contract to support final evaluation	
PIO/I issued for contract to support final non-federal audit	
Contracts signed with contractors to support final evaluation	
Contract signed with contractor to complete non-federal audit	
Final evaluation carried out	
Non-federal audit carried out	
PACD	12/31

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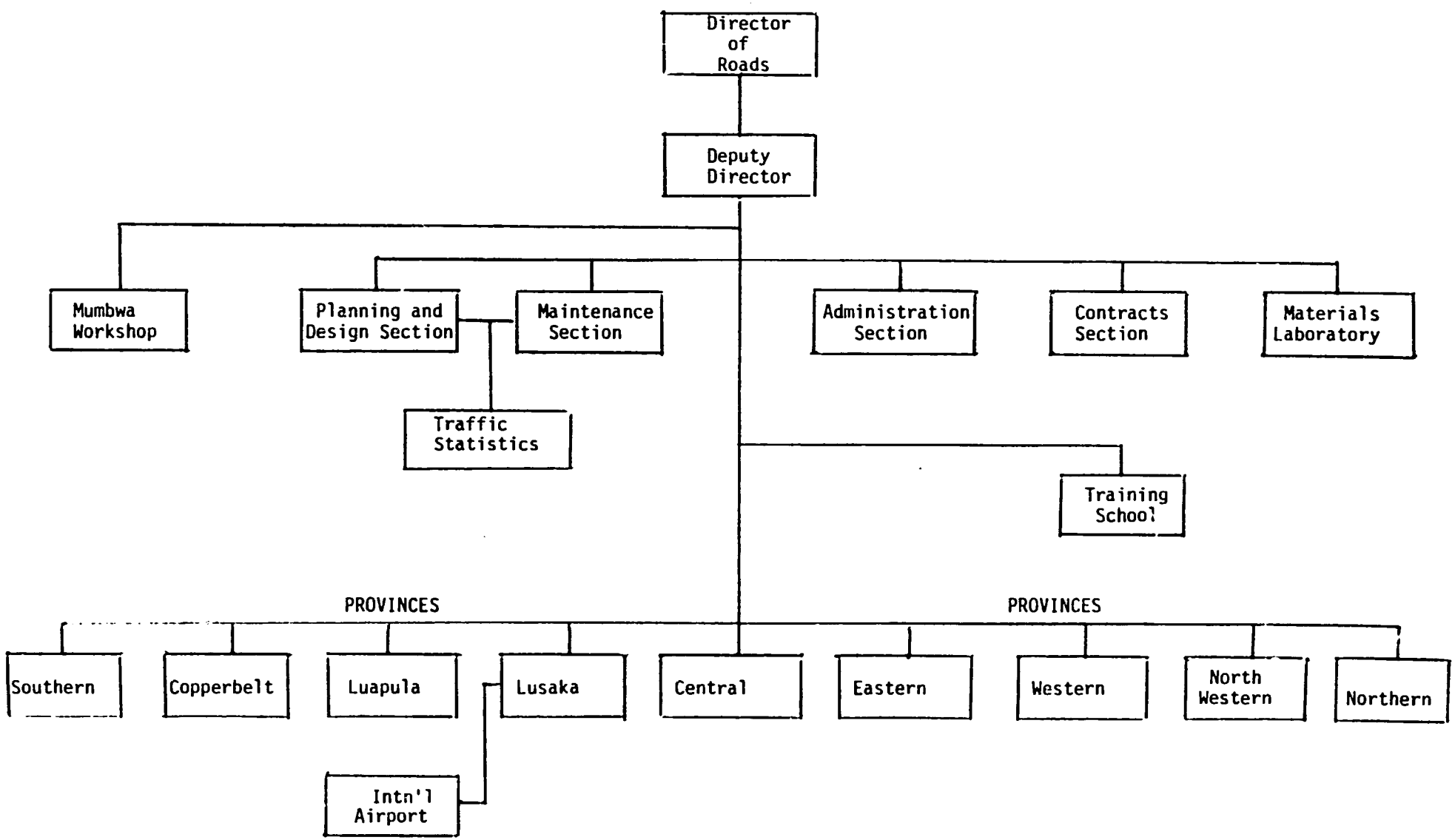
ROADS DEPARTMENT ORGANIZATIONAL CHART



ANNEX II(D) Scope Of Work for Personal Services Contractor

A. Representative Duties

1. Report to the Direct Hire Project Officer. Responsibilities are comprised of monitoring activities under the Kafue-Lusaka Road Rehabilitation Project (690-0254) and other duties as directed by USAID/Zambia Mission management.

2. Carry out the following specific project monitoring activities:

i. Monitor Progress of engineering consultant performing final design and preparation of tender documents for future contractor to be responsible for rehabilitation of Kafue-Lusaka Road.

ii. Coordinate final design activities with GRZ Roads Department, final design consultant, USAID/Zambia and REO, USAID/Zimbabwe.

iii. Assist GRZ Roads Department with issuance of prequalification documents for construction contractor.

iv. Assist GRZ Roads Department and USAID/Zambia with evaluation of prequalification documentation.

v. Assist GRZ Roads Department, USAID/Zambia and REO, USAID/Zimbabwe with IFB approval and issuance.

vi. Assist GRZ Roads Department, USAID/Zambia and REO, USAID/Zimbabwe with evaluation of bids and recommendation of contractor award.

vii. Monitor progress of construction contractor by making regular site visits, meeting with GRZ Roads Department, consultant responsible for construction supervision and contractor's project management personnel.

viii. Review monthly progress reports prepared by the contractor responsible for construction supervision and make appropriate comments.

ix. Assist USAID/Zambia Project Officer with approval of monthly invoices submitted by both the construction contractor and construction supervision contractor.

x. Assist GRZ Roads Department with evaluating variation orders (VOs).

3. Develop and prepare required engineering appraisals on the economic and technical soundness of the project including: a) cost estimates; b) preliminary engineering investigations and surveys to identify potentially significant technical problems; and c) analyses of construction operations and impediments such as local customs, laws, building codes and other regulations which may delay or increase the project cost. Develop other engineering analyses and reports on cost allocation, environmental impact and peripheral benefits.

4. Advise USAID/Zambia management on the performance of project-funded contractors. Maintain continuing surveillance of performance, progress and effectiveness of work. Provide professional engineering guidance where required. Notify the USAID/Zambia Mission Director or other responsible officials of problem areas.

5. Work with auditors and foreign assistance inspectors in resolving questions raised in audit findings on contractor performance and submit necessary documentation and reports for audit evaluation.

6. Assist in the preparation of evaluation plans and drafting of official documentation for engineering activities, and any required A.I.D. approvals to engineering host-country contracts.

B. Qualifications

1. Education

A B.S. degree in civil engineering or equivalent field of engineering from an accredited college or university is required.

Registration in the United States as a professional engineer is mandatory.

2. Experience

Experience in developing and designing civil engineering plans is required.

Experience in the construction and direction of the construction of various structures and civil engineering systems is required.

Experience in the planning and management of complex civil engineering projects is desirable.

Experience in the planning and management of rural, urban, industrial, health and other development areas is highly desirable.

Knowledge of A.I.D. regulations is highly desirable.

A minimum of ten years professional experience is required.

3. Knowledge and Abilities

Ability to advise and consult on the planning, design, and management of engineering projects in any of the specialized civil engineering disciplines is required.

Ability to advise on the money, men and materials requirements required to plan and implement civil engineering projects is required.

Annex II. Attachment to Procurement Plan

Road Maintenance Equipment List

Equipment	Quantity	Estimated Cost (FOB)	Probable Source/Origin	Waiver
Mechanical Horse (Truck Tractor)	1 ea	$98,000.00	U.S.A.	N/A
Semi-trailer	1 ea	$50,000.00	U.S.A., Code 941	N/A
Pneumatic Tire Roller	1 ea	$42,000.00	U.S.A.	N/A
Tipper Truck(Dump Truck)	2 ea	$100,000.00	W.Germany, Japan	Proprietary, Source/ Origin
Truck-mounted Bitumen Distributor	1 ea	$95,000.00	W.Germany, Japan	Proprietary, Source/ Origin
Chip Spreaders & acces-ories (Truck-mounted)	2 ea	$32,000.00	U.S.A.	N/A
Mechanical Sweeper	1 ea	$21,000.00	U.S.A.	N/A
Line Painting Machine	1 ea	$30,000.00	U.S.A.	N/A
Farm Tractor	1 ea	$30,000.00	U.S.A., Code 941	N/A
Spare Parts		$100,000.00	U.S.A., Code 941, W. Germany, Japan	N/A, except prop.& source/origin for tippers, Bitumen Dist.
Vibrating Plate Compactor	2 ea	$5,000.00	U.S.A.	N/A
Contingency for Inflation (20 %)		$119,600.00		
Total FOB		$722,600.00 (a)		
Freight & Insurance		$137,400.00 (b)		
Total CIF Lusaka		$860,000.00		

Notes:

(a) Based on actual costs for similar equipment procured in Nov/Dec 1988 by Roads Dept under A.I.D.- financed host country contracts.
(b) Based on actual Freight and Insurance charges incurred in Nov/Dec 1988 procurement.

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ANNEX III: PROJECT ANALYSES

A. Engineering Technical Analysis

B. Economic Analysis

C. Social Soundness Analysis

D. Institutional Analysis

E. Financial Analysis

Technical Analysis
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Engineering Technical Analysis

1. General

1.1 Introduction

The project road consists of the Zambia trunk road T2 between Lusaka and the Kafue Bridge. The total length of the road is 53.3 km linking the capital city, Lusaka with the important industrial town of Kafue, and continuing southwards to the bridge crossing at the Kafue River.

The dual carriageway section of road between km 0.0 (traffic circle at the junction of Kafue Road, Ben Balla Road, Cairo Road and Independence Avenue) and km 3.9 (suburb of Makeni) will not be part of this project.

1.2 Existing Condition

The road was constructed in 1968 except for the one km by-pass which was constructed in 1978. The road design was in accordance with the Zambian Highway Design Standards of 1971.

The existing pavement construction generally consists of 150 mm lateritic gravel sub-base and 150 mm stabilized lateritic gravel roadbase and a double surface dressing layer as wearing surface.

On the dual carriageway section, between the Kafue roundabout (km 0.0) and Makeni (km 3.0), the pavement condition is generally good, with only limited evidence of surface cracking or deformation. The riding quality is good, however the lane widths are narrow and should be widened. Since this road has recently been resealed, involves land acquisition, Lusaka City Council involvement (besides Zambia Roads Department) and traffic circle redesign, it will be not be considered as part of this project.

The section of road between km 3.9 and km 7.0 has sections consisting of extensive block cracking and some deformation in the wheeltracks. From km 7.0 to km 11.0 the incidence of cracking is not so extensive, however there is an area of settlement at km 7.7 and extensive potholing in the vicinity of km 10.5.

Between km 11.0 and km 12.0 the pavement condition is reasonably good with only limited areas of block cracking and good riding quality. At km 12.5 there is extensive potholing, and as far as km 14.3 (Chilanga Police Station) the road exhibits quite a lot of fine cracking, however maintains a reasonable riding quality. At km 14.3 there are extensive potholes, some of which have been temporarily backfilled with rock material protruding from the road surface.

From km 14.3 to 16.8 the pavement condition is fairly good. Between km 16.8 and km 23.0 the topography is rolling with dips in the alignment at km 17.0, km 18.3 and km 21.8. Extensive potholing is present in these dips,and there is extensive patching and block cracking from km 18.5 to km 23.0.

Between km 23.0 and km 30.0 there are three long flat low-lying stretches of road (separated by hills at km 25.0 and km 27.2) which exhibit extensive areas of patching and block cracking. From km 30.0 to km 33.0 the vertical alignment is gently rolling and the pavement condition still exhibits significant lengths of patching and block cracking.

The pavement condition and riding quality improve significantly between km 33.0 and km 41.0, although there are considerable lengths of block cracking. The block cracking is more extensive between km 41.0 and km 44.0 (in the vicinity of Kafue), with evidence of surface deformation. After km 44.0, the pavement condition is fairly good as far as km 48.0. Thereafter (from km 48.0 to Kafue Bridge at km 53.3) there are significant lengths of block cracking and patching.

1.3 Topography

The dual carriageway section (km 0.0 to km 3.9) is flat and low-lying. From km 3.9 the vertical alignment remains flat and low-lying until km 6.0 when the road level rises above the surrounding ground.

Between km 10.0 and km 11.0 the road level dips significantly in the vicinity of a stream crossing at km 10.5. The vertical alignment then rises slowly and falls again in the vicinity of km 12.5 where another stream crossing exists. The road rises significantly between 12.5 and km 13.0 and then remains fairly flat until km 16.0 (Chilanga).

From km 16.0 to km 23.0 the vertical alignment is generally rolling with dips occurring at km 17.0, 18.3 and km 21.8. Between km 23.0 to km 30.0 the vertical alignment is predominantly flat and low-lying.

From km 30.0 the horizontal alignment starts to vary as the road passes around several hilly areas, with a short escarpment section between km 37.0 and km 38.0.

Between Kafue (km 43.0) and Kafue Bridge (km 53.3) the vertical alignment remains predominantly flat, with a short rolling section near km 50.0.

1.4 Geology

The city of Lusaka is underlaid by Late Pre-Cambrian and Lower Palaezoic rocks of the Katanga System, which in turn overlie the Pre-Cambrian Basement Complex. They consist mainly of metamorphosed gneisses, schists, quartzites, limestone, and shales. The area south from Lusaka (km 8.0) to Kafue (km 43.0) consists of dolomite, limestone, gabbro, and schists.

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Kafue is situated at the margin of the Kafue Flats, which consist of alluvium. Hills to the east of Kafue are of Muva schists and quartzites. The area south of Kafue consists of quartzites and slates of the Katanga-Kundelungu System (mostly to the southwest) and paragneisses of the Basement Complex.

1.5 Vegetation and Land Use

The Lusaka-Kafue Road is situated towards the southern margin of the Central Plateau which, in common with all plateau areas of Zambia, is predominantly covered with a form of dry deciduous woodland called 'miombo'.

Miombo woodland covers not only areas of plateau around Lusaka, but also covers a large portion of the dissection hill and escarpment country to the south and south-east side of the city, specially between Chilanga and Kafue.

Much of the road south of Lusaka is covered with a more open savanna woodland, called 'munga' which descends to open grassland on the 'flats' of the Kafue valley.

The soils beneath munga vegetation tend to be alluvial and more fertile than the plateau and escarpment soils beneath miombo. As a result much of this vegatation was cleared and the area was used for farmland and grazing.

Within the built-up area of Lusaka and as far as Chilanga, little of the original vegetation (munga) is left. Vacant land within the built-up area and considerable areas of land on the periphery of the road are intensively cultivated for maize and vegetables. South of the town of Kafue is a patch of dense deciduous thicket growing on excessively drained sandy soil which is of little use for farming.

1.6 Rainfall and Climate

The climate of Zambia is typified by one defined wet and one dry season each year. The rain falls between November and March, with these months accounting for approximately 93% of the average annual rainfall. Temperatures are generally not excessive, the hottest months being October and November and the coolest months June and July.

Climatological details for the Lusaka/Chilanga area are summarized as follows:

Mean Monthly Temperatu e	:	15.7 - 24.6 deg C (centigrade)
Absolute Max Temperature	:	31.1 deg C
Absolute Min Temperature	:	-1.6 deg C
Mean Relative Humidity	:	37 - 83 %
Mean Monthly Evaporation	:	111 - 284 mm
Mean Monthly Rainfall	:	0 - 219 mm
Average Annual Rainfall	:	836 mm

1.7 Drainage

A detailed survey has been carried out for the road from Lusaka to the Kafue Bridge. It has been generally observed that the capacity of the existing culverts are in general adequate with little or no topping being recorded in recent years. The main problem with the drainage on the road has been the lack of preventative maintenance. The side drains have been allowed to be totally covered with vegetation and mitre drains have become blocked and have not been cleaned out. In addition to these problems, some cross drainage culverts are too low and have been allowed to silt up.

2. Proposed Rehabilitation

2.1 Alignment

The existing alignment of the road is generally acceptable and complies with the Zambian Roads Department Standards. However there are two locations on the more heavily traveled section of the road (between Makeni and

Chilanga), where the overtaking sight distances can be improved by realignment of the carriageway. Since at both locations, the road level requires raising to facilitate surface drainage, it is reasonable to consider a change in horizontal alignment at the same time.

The two locations are as follows:

Location	Details
km 7.5	Left hand bend (Eureka Corner)
km 12.5	Left hand bend

2.2 Road Cross Sections

The proposed Road Design Class is summarized below:

Section	Road Class	Width (m)	
		Carriageway	Shoulder
00.0 - 03.9*	Dual 2-lane	2 x 7.3	3.0
03.9 - 15.1	1A	7.3	3.0
15.1 - 43.7	1B	6.7	2.0
43.7 - 53.3	1B	6.7	2.0

*Not included in rehabilitation schedule.

2.3 Drainage

Many of the existing drainage structures will be retained, however some will have to be added or modified. A schedule of drainage proposals is shown on Tables 1 (A) - (F).

2.4 Pavement Rehabilitation

A schedule of road (pavement) rehabilitation for 49.4 km is shown on Table 1.

2.4A Reconstruction - Single Carriageway Sections

At those sections requiring raising or reconstruction, the existing bituminous layer will be removed to expose the roadbase which will be scarified and recompacted. The new pavement construction (for both Class 1A and Class 1B Sections) will be comprised of 300 mm selected gravel subbase and 150 mm crushed treatment. The carriageway roadbase and subbase layers will be continued across the shoulders, and a sand seal surfacing applied to the shoulders.

Reconstruction details are shown in Figures 1 and 2.

2.4B Overlay and Seal

On the sections of the road which are to be overlaid, all existing poor quality patchwork must be removed and redone and any potholes must be repaired. Existing cracks shall be sealed with bitumen and if the crack width exceeds 1 mm, the existing surface shall be removed and replaced. Before application of the overlay, the existing surface (repaired where necessary) shall be sealed with a single surface dressing which will help to delay the initiation of reflection cracking.

Considerable research has been done recently concerning the problem of reflection cracking and possible ways to avoid this problem. The general conclusion is that the only way to avoid reflection cracking is to completely remove or reconstruct the existing pavement, or by applying very thick overlays.

Another way to address the problem would be to provide a partial shear break between the existing surface and the overlay. That would delay the progression of reflection cracks. A single spray and chip surface dressing would be used as a partial shear break.

The overlays for the road would be constructed using dense bitumen macadam base course material (binder course not roadbase) laid over a single spray and chip surface dressing to repair reflection cracking, and with a double bituminous road surface treatment as a final wearing surface to resist environmental oxidation of the bitumen. Overlay and seal details are shown in Figure 3.

2.4C Patch and Seal

The sections of the road which are structurally sound will have all potholes repaired and then receive a double bitumen surface treatment. Potholes are repaired by squaring up the sides of the distressed areas, cutting the sides vertically to the depth of the loose material removing all loose materials, applying a tack coat (single-surface dressing) to the edges, then compacting a new asphalt mixture into the hole with a mechanical tamper. A double bituminous surface treatment is then applied to the whole road surface area once the potholes have been repaired. First seal consists of 19 mm stone chippings while the second seal consists of 13 mm stone chippings resulting in a nominal thickness of approximately 19 mm. Patch and Seal details are shown in Figure 4.

2.5 Traffic Circle

Severe traffic congestion occurs at this circle specially during business hours. It is clear that the size of the traffic circle is insufficient for traffic levels the intersection is required to handle. Nonetheless, for reasons cited previously, reconstruction of the traffic circle will not be part of this project.

2.6 Other Junctions, Accesses and Railway Crossing

The junction and access design standard used by the Zambian Roads Department is considered adequate. The existing junction layouts will be

retained with little or no width modification. The only railway crossing on this road is near Kafue at km 40.0. The crossing is on the left hand bend on the approach from Lusaka and on the right hand bend past the crossing. The bend in itself reduces vehicle speed on approach to the crossing. This together with rumble strips on the road currently provide the control at this crossing.

2.7 Miscellaneous

2.7A Traffic Signs

All existing signs should be replaced and upgraded to international standards.

2.7B Crash Barriers and Guard Rails

Crash barriers will be provided at the edge of the shoulder where the height of the fill above adjacent ground level exceeds 2 meters. Also, crash barriers will be provided on the outside of bends through the escarpment section (km 37.0 - km 38.0) and guard rails will be provided at bridges.

2.7C Pedestrian Crosswalks

A pedestrian crosswalk will be provided at the school crossing located in the town of Chilanga.

2.7D Lay-Bys

Lay-bys will be provided at approximately km 28.0 and 5

2.8 Pavement Design/Assessment

2.8A Introduction

The first stage of formulating rehabilitation proposals is the assessment of the condition of the existing pavement. The pavement of the project road was examined both visually and by performing non destructive testing methods. Test pits were also excavated and the samples recovered were tested in the laboratory to establish the subgrade and pavement layer properties and condition. The visual assessment established the condition of the pavement and shoulder surfaces as well as the condition of the drainage system.

No proven method of overlay design exists for tropical conditions similar to those which this project road is subjected. However, an assessment of the likely performance of a bituminous overlay can be made by consulting studies such as those carried out by the United Kingdom Transport and Road Research Laboratory (TRRC) in Kenya. This study concludes that the principal mode of failure was cracking which began at the top surface and propagated downwards through the overlay.

The explanation given for this type of cracking in tropical environments is one of age hardening of the bitumen in the mix with the top few mm hardening much more, giving a very weak surface skim which easily fractures under stress. A suggested method of reducing the cracking problem is to brace bitumen rich coating on top of the overlay. This effectively protects the bituminous surface dressing overlay from harsh environmental conditions which lead to age hardening. This coating will need to be replaced periodically.

2.8B Reflection Criterion

For the project road the overlay design is based on mechanistic methods discussed in Section V, Mechanistic Analysis. This approach requires a design criterion, typically a deflection-life relationship, in order to estimate the design life from a known deflection level after overlaying has been completed. This deflection-life relationship has been derived for the Lusaka-Kafue Road. The basic approach is to classify the pavement condition for each point at which the deflection is measured, as sound, critical or

failed, on the basis of observed cracking intensity. The average critical condition is then used in conjunction with historical traffic data to establish points on the deflection-life relationship.

For the project road, axle equivalence factors (number of equivalent standard axles per commercial vehicle) have been used in assessing the design life of the roads. The cumulative number of standard axles over the 25 year life of the road has been estimated based on the 1989 traffic levels (using a 2.5% annual growth rate).

Details are given in Table 2(A). The condition classification is based on intensity of cracking alone, as defined in Table 2(B).

The 'critical' points have been plotted on a deflection vs life chart taken from TRRL Laboratory Report 833 (Ref 2) as shown on Figure 5. It is clear that the points lie on a line parallel to the TRRL 'critical condition' line.

However, it must be noted that with the data produced from the Lusaka-Kafue Road surveys, the demarkation between sound, critical and failed deflection levels is not well defined. There is some uncertainty surrounding the location of the "critical condition" on the deflection-life plot. Consequently the deflection-life relationship adopted for this study is based on the 50% probability curve presented in Figure 5. As the deflection over the life of the pavement is not uniform, a simple transformation (Figure 6) has been applied to give a direct relationship between early life deflection and expected life (msa) which is defined by the relationship:

$$N = \frac{262100}{d^{2.69}}$$

Where N = Cumulative traffic (msa) to reach a defined failure condition.

Where d = Early life deflection (mm/100) measured under a 31 kN wheel load moving at creep speed.

This relationship is shown in Figure 7.

2.8C Drainage Considerations

One of the most important aspects of the design of a road is the provision made for protecting the road from both surface water and ground water. This is provided for by ensuring that the road in general is above the adjacent ground level, ensuring that the pavement is constructed with sufficient camber so that it sheds rainwater quickly, and by providing an adequate drainage system to disperse the collected water away from the road.

At several locations on this road, the level of the road requires raising to provide adequate drainage. These sections are listed in Tables 1(A) - 1(F). Consequently the deflection analysis has not been carried out for these sections of road as it is intended that the pavement will be reconstructed. However, the extent of the pavement reconstruction at each location has been based on local deflection levels, which in general are relatively high at the sections requiring raising. The high deflection measurements also confirm that a problem exists at these locations.

2.8D Deflection Analysis

The pavement deflection data for the project road has been collected in two phases. In late 1985, Kampaz/CarlBro (Ref 3) collected data for the section between Chilanga Police Station and Kafue Bridge (km 14.3 - km 53.3). In May 1989, John Burrow & Partners carried out the field data collection (Ref 4) for the remaining section between Lusaka and Chilanga (km 0 - km 14.3), and in addition collected data at several control sections (between km 14.3 and km 53.3) in order to update the information collected by Kampsax/CarlBro in 1985. Details of the surveys carried out at the control sections are given in Section 5.4 (Ref 1).

The design of the pavement strengthening overlays has been based primarily on the measured Benkelman Beam deflection updated where necessary to appropriate 1989 and 1991 levels. The economic analysis was based on 1989

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deflection levels while the final overlay design was based on deflection levels expected in 1991, the date when rehabilitation works are programmed to commence. Additional data on existing layer thicknesses and subgrade strengths have been deduced from the test pits and DCP test results.

A design deflection has been deduced for each successive length of road having a uniform level of deflection. The design value has been taken at the 95th percentile, given by:

Design deflection = Mean + (1.645 x Standard deviation)

The 1989 design deflections are indicated on the deflection profiles contained in Appendix A (Ref 1). The growth factors used to project these deflections to 1991 levels are given in Section 5.4 (Ref 1).

2.8E Mechanistic Analysis

The overlay thickness design has been based on mechanistic analysis in preference to the direct use of overlay charts (Ref 2) derived under differen environmental and material conditions. The mechanistic approach to overlay design is summarized in Figure 8 and is based on the micro-computer elastic analysis program PAN (Ref 5). A typical pavement model representing the existing construction is shown in Figure 9.

The existing construction is represented by three layers, the roadbase, sub-base and subgrade. The existing surfacing layer (generally 25 - 35 mm thick) is not included in the model as a layer of this thickness contributes very little structural strength to the overall pavement structure, acting merely as a protective seal coat. The existing construction is defined in terms of layer thicknesses and material properties represented by the Resilient Modulus (Mr) and Poisson's Ratio (v). Values for Resilient Modulus are assigned to each layer as follows:

<u>Subgrade</u> $Mr3\ (MN/m2) = 17.6\ (CBR)^{0.64}$
where CBR - in situ CBR (%)

Maximum value 120 MN/m2, typical of insitu CBR 20% or greater.

This relationship is based on U.K. experience (Ref 6), and gives a more conservative estimate of the resilient modulus than the Shell relationship (Ref 7) given by:

Mr3 (MN/m2) = 10 (CBR)

The two relationships are shown in Figure 10.

Sub-Base Mr2 (MN/m2) = 2 Mr 3
Maximum value 240 MN/m2
This relationship is based on the findings of Shell researchers (Ref 7).

Roadbase The resilient modulus for the roadbase layer is deducted by a back analysis procedure in the analysis program PAN. Simply, if all material properties are known except Mr1, then this value is found based on the measured deflection under a known wheel load. Typical values for a lightly cemented roadbase layer are in the range 400 to 1000 MN/m2.

For each layer, the value assigned to Poisson's Ratio was 0.35.

The reduction in surface (Benkelman Beam) deflection achieved by the addition of a bituminous overlay is predicted by the addition of an extra layer to the pavement model. The resilient modulus assigned to this layer was 2500 MN/m2, representing a vehicle speed of 3 kph, corresponding to the creep speed of the Benkelman Beam vehicle. The design life of the overlaid pavement is estimated using the deflection - life relationship described in the deflection criteria.

By applying increasing thicknesses of overlay, the corresponding deflection and associated life of the overlaid pavement can be deduced, and an overlay chart produced relating design life to overlay thickness. Different design deflections (deflection before overlaying) are characterised by variations in the resilient modulus of the roadbase layer, and thus a family of curves can be produced for a range of design deflections.

2.8F Overlay Thickness Design

Based on analysis of the material laboratory test results and Dynamic Core Penetrometer (DCP) test results, the road can be represented by three different pavement models (A, B and C), based primarily on three values of design CBR, 8%, 12% and 20%. A sensitivity study has indicated that the predicted overlay thickness is not particularly sensitive to variations in existing layer thicknesses, but rather to variations in material properties. Details of the three models are given in Table 2(C), and details of the DCP results can be found in Section 6 and Appendix 13 of (Ref 1).

Using the approach outlined in Section IV, design deflections have been assigned to successive lengths of the study road. Overlay requirements for three values of design life (10, 15 and 20 years) have been predicted using the mechanistic approach described in the previous section.

For each of the three pavement models, a corresponding design chart has been produced which relates design life after overlaying to applied overlay thickness. The derivation of a typical overlay chart is summarized in Table 3, and the design charts (A, B and C) are presented in Figures 11 to 13.

The predicted overlay requirements based on 1989 deflection levels are given in Table 4. These values have been used for the economic evaluation of different maintenance strategies discussed in section 11 (Ref 1). As the rehabilitation works are programmed to commence in 1991, the final overlay thickness design is based on deflection levels for that year (using growth factors given in Table 5.2 shown in section 5.4 (Ref 1), and a design life of 10 years. Details are given in Table 5. Reconstruction has been recommended where the final overlay thickness was found to exceed 120mm, based on economic considerations. It was found that it would cost more to provide an overlay thickness greater than 120 mm than to provide a complete reconstruction because of bitumen costs.

The estimation of overlay requirements based on DCP Structure Number is described in Section 6.4. (Ref 1). However, this approach does not give good correlation with the estimated overlay requirements based on deflection analysis. It is considered that the DCP approach (as used in Section 6.4)

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gives only a general indication of overlay needs since the DCP tests were carried out at intervals of 2 km or more. The adopted overlay design approach is that based on deflections measured at intervals of 100 - 200 m. Test results for soil analysis and pavement analysis can be found in Appendixes C and D (Ref 1).

2.8G New Pavement Design

At those sections requiring reconstruction, it is envisaged that the existing roadbase layer will form the subgrade for the new construction (see Section 2.4C). The in situ CBR value of the existing roadbase, as determined from the DCP tests (refer to Section 6.4 of Ref 1) varies from 40% to 100%. At those sections where the road level requires raising from drainage considerations, the in situ CBR of the new subgrade (selected fill) is taken to be at least 15%.

The new pavement design is based on the recommendations of Road Note 31 (Ref 8) and TRH4 (Ref 9). The design is based on a minimum subgrade CBR of 15% and a life of 10 years (refer Table 6).

The new pavement for the dual carriageway section comprises 300 mm cemented natural gravel sub-base, 150 mm crushed stone roadbase and 60 mm DBM surfacing with a double surface treatment. Details are given in Figure 14.

A common design is indicated (Figure 14.) for the Road Class 1A and 1B sections, comprising 300mm natural gravel sub-base and 150 mm crushed stone roadbase with a double surface treatment.

3. Traffic Loading

3.1 Introduction

The design of pavement rehabilitation measures is based on the knowledge of the cumulative number of standard (8200 kg) axles to be carried during the road design life. Estimates for cumulative number of standard axles have been made for three values of design life, 10 years, 15 years and 20 years. Based

on economic criteria (IRR), a 10 year design life was selected.

The estimates are based on the 12 - hour traffic counts carried out at four locations, converted to a 24 hour value by applying a factor 1.25 calculated by CarlBro/Kampsax from their traffic studies. The traffic counts provided by the Roads Department enabled calculation of daily variation factors to arrive at an average daily flow. However it should be noted that when these factors were applied to the supplementary counts the average daily flows calculated gave a higher traffic volume at km 10.00 than at km 7.00. This inconsistency could have been expected as the Roads Department counts were undertaken on different days leading to a different set of daily variation factors. Thus, these factors were not applied to the supplementary traffic counts, but only used with the Roads Department traffic figures. Seasonal variation factors were not available, but are not likely to be significant.

The equivalent factors (number of standard axles/commercial vehicle) applied to each vehicle group were taken from the results of axle load surveys carried out by Kampsax/Carl Bro (Ref 3).

The estimation of the number of standard axles/12 - hour day is summarised in Table 7. The traffic forecasts for three values of design life are presented in Table 6A. The forecasts are based on the relationship:

$$S = 365 \times So \times \frac{(1+r)n - 1}{r}$$

Where S = Cumulative no standard axles over design life

So = No. standard axles/24hr day in opening year

n = design life (years)

r = annual growth rate

For annual growth rate of 2.5% (r = 0.025), this reduces to:

For design life n = 10 years, S = 4090 So

n = 15 years, S = 6545 So

n = 20 years, S = 9374 So

3.2 Total Number of Vehicles in Design Year

The selection of the appropriate road cross-section (i.e., carriageway and shoulder widths) is based on the daily total number of vehicles using the road in the design year. Estimates of the daily flow (2 - way, 24 hrs) after 10, 15 and 20 years have been made at four locations on the study road (Table 6B). The estimates have been calculated using the 12 hour traffic counts carried out in 1989 at km 1.0, km 7.0 and km 53.0, and in 1988 at km 41.0 and adjusted with daily variation factors derived from the Roads Department seven day counts and in the case of the traffic figure at km 41.0 escalated by 2.5% to take into account growth from 1983 to 1989.

$$\text{Av. daily flow} = \frac{\text{Daily flow for specific day}}{\text{Variation factor for same day}}$$

Variation factor calculated from Roads Department seven day counts = Specific day flow divided by Average daily flow.

A factor of 0.828 is used on the 12 hour count conducted at km 1.0 on Monday and a factor of 0.69 is used on the counted figure at km 7.0 to take into account the fact that the count at this location was carried out on a Tuesday. Seasonal variation factors which are normally incorporated into this calculation, were not available and have not been used.

The estimates are based on the relationship

$$Fn = Fo\ (1+r)^{n}$$

Where
- Fn = daily 2-way flow in n th year
- Fo = daily 2-way flow in n opening year
- n = design life
- r = annual growth rate

For an annual growth rate of 2.5% (r=0.025) this reduces to:

For design life n = 10 years, Fn = 1.280 Fo
n = 15 years, Fn = 1.448 Fo
n = 20 years, Fn = 1.638 Fo

3.3 Peak hour flow in design year

Estimates of the peak hour flow in the design year have been made for the most heavily trafficked sections (km 0.0 - 15.1) of the project road. The estimates are based on the 12 hour traffic counts carried out in May 1989, and incorporate a growth rate of 2.5 percent per year. Details are shown below.

Km	Section km km	Peak hour flow (May 1989) (Table 4.2, Ref.1) North Bound	South Bound	Max peak hour flow (1 - way) after 10 yrs	15 yrs	20 yrs
1.0	0 -3.9	912	1003	1280	1450	1640
7.0	3.9-15.1	267	281	360	410	460

Estimation of peak one hour flow in the design year.

4. Roughness Survey

A roughness survey was conducted on the project road by Kampsax/CarlBro Study (Ref 3). The results of the roughness surveys are given in Table 8. which shows the values obtained in each direction of travel between Lusaka and the Kafue Bridge. The average road roughness on the Lusaka-Kafue Road ranges from 1500mm/km to over 3000mm/km. For the level of traffic on this road, a roughness order of 1500 mm/km should be achieved. It should be noted that, as the road roughness (Bl value) increase so does the operating cost of a vehicle. It is the aim of all rehabilitation and maintenance projects to reduce road roughness.

The apparent roughness value was obtained using the relationship:

$$Bl = 17.28 \times (25.4 \times Bl_V)^{0.67}$$

Where Bl is the apparent roughness in mm/km.
Bl_V is the value measured by the Vehicle Mounted Bump Intergrator (VMBI) in inches/km

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5. Drainage Design

5.1 Introduction

An extremely important aspect which must be taken into consideration when designing a road is the provision made for protecting the road from surface water or ground water. If water is allowed to enter the structure of the road then the pavement will be weakened and it will be much more susceptible to damage by traffic. Water can enter the road as a result of rain penetrating the surface or as a result of the infiltration of ground water. The surface must be constructed with a camber so that the rain water on the road surface can be shed, and the road formation must be raised above the level of the local water table to prevent it from absorbing ground water.

Other harmful effects can also be caused by water on shoulders, slopes, ditches and other features. High water velocities can cause erosion which, when severe can lead to the road link being severed. Alternatively, low velocities in drainage facilities can lead to silt being deposited which, in turn, can lead to a blockage which will result in further erosion .

5.2 Drainage of Pavement Layers

The road cross section is designed either to shed water completely or alternatively permit the egress of any water which may enter the cross section. When impermeable base materials are used drainage of the base is not necessary. If permeable base materials are used, then special attention must be given to the drainage of the base layers and shoulders and to the details of the side drains.

5.3 Purpose of Drains

The main functions of drains are described as follows:

to provide a reasonable capacity to accommodate surface water run-off;
to dispose the collected water to a natural draining channel or onto the surrounding ground;

to minimize the hazard to pedestrians and vehicle traffic; and,
to ensure that the inflow and outflow of the drain causes minimal erosion.

There are various types of drainage control which can be used, however the most common ones are: side and mitre drains, embankments, box culverts and sub-soil drains.

5.4 Design Criteria

The design flood used for calculating the size of box and pipe culverts was 10 years. A design life of greater than 10 years would be uneconomical. The estimation of the design storm water drainage structure is not an exact scenario, however satisfactory methods exist in assisting in the design for the proper drainage structures. The method used was the Rational Method which is discussed in more detail in Section 9.2 and Appendix E (Ref 1).6.

6. Availability of Construction Material

6.1 Crushed Stone

The construction of the project road will require various materials in large quantities. Base and sub-base quality gravels, crushed stone for base course, overlay layer and surfacing, bitumen for overlays and surfacing, cement for stabilization, drainage works and bridge widening, sand for concrete works and water for construction and maintenance of deviations. The timely availability of the required materials at an economic cost is very critical to the implementation of the project.

Base and sub-base quality gravels are obtained wherever possible from borrow pits along the alignment of the road. Opening borrow pits, will incur costs associated with bush clearing, stripping of topsoil and overburden and reinstating the pits at the end of the project. The cost should be compared with the cost associated with hauling the material to the position where it is required on the road.

Taking an ideal case, if suitable material is available adjacent to the

road throughout the road alignment, numerous borrow pits could be opened and the material haul distances would be very small. Depending on the depth of overburden and the thickness of the gravel layer the balance distance between borrow pits can be estimated. From experience, this economic spacing is in the order of 10 km. Therefore the feasibility of establishing borrow pits at this spacing has been examined.

The following existing borrow pits were visually examined and found to have suitable material.

- At km 5 + 000 approximately 1.5 km from the left hand side of the road; large borrow pits.

- At km 8 + 000 on the right hand side of the road a large borrow pit adjacent to the road on land belonging to the Lusaka City Council.

  At km 15 + 000 on the right hand side of the road approximately 1 km from the road.

- At km 20 + 000 on the left hand side of the road very close to the road corridor.

- At km 27 + 800 on the right hand side of the road.

- Between km 35 + 000 and 45 + 000 there is sufficient visual evidence to suggest suitable gravels are available.

- At km 51 + 800 within half a km of the road on the left hand side.

- At km 54 + 300 just past the Kafue River Bridge on the left hand side of the road.

From the above it would appear that sufficient quantity of sub-base and base quality gravels will be available at an economic hauling distance throughout the road alignment.

Crushed stone will be required for the base layers of sections which are to be reconstructed, for overlays of sections which are to be sealed and for surfacing of the road throughout. The cost of the establishment required to quarry rock and crush the rock to produce stone of the required size is such that only one crushing site can be economically justified for a road project of this length. It would be more economic to haul stone for 50 km than establish, dismantle and re-establish large scale crushing plants at several locations. The availability of a single good source of stone has been preliminarily determined as follows.

At km 38 + 000 the Roads Department owns and operates a quarry which provides crushed stone for their periodic and routine maintenance operations. This quarry also supplied the stone requirements of the Kafue-Chirundu Road Rehabilitation Project (690-0209). It would appear that there is a sufficient quantity of rock available at this site and the crusher has sufficient capacity to produce adequate quantities of stone to supply the Kafue-Lusaka Road Rehabilitation Project in addition to meeting the Roads Department periodic and routine maintenance requirements.

However, it should be noted that the current layout of the quarry itself will grossly limit the amount of rock that can be taken out to crush. The current layout and method of working is in effect digging a progressively smaller and deeper hole on the side of a hill. The area available to work on at any given time limits the amount of rock that can be blasted and transported out. If the present production capacity is to be increased, which will have to be done if this quarry is to supply the stone requirements of the Kafue-Lusaka Road Rehabilitation Project, then the quarry layout and methods of working must be improved. The overburden on the upper part of the hill must be removed and a large working layer must be exposed and benched.

The Roads Department have expressed their reluctance to supply stone to the contractor for this project. One of the leading arguments is that this in effect makes them a subcontractor in addition to being the client and such a contractually conflicting situation is not desirable. One alternative that was briefly discussed and discarded due to numerous institutional problems would involve the Contractor taking over the quarry for the duration of the

road rehabilitation project and selling stone to the Roads Department at a pre-agreed price to meet the department's periodic and routine maintenance requirements. One of the significant problems associated with this approach would be the legal implications of the temporary use of machinery and equipment belonging to the Government, and another would be the reluctance on the contractors part to use the staff currently employed by the Roads Department at this quarry.

In the event that the Roads Department is not prepared to supply stone an alternative would be for the Contractor to establish a new working at a different face of this hill or indeed at the adjacent hill. The contractor will then have to set up his own crushing plant at this site. If the Contractor is to crush his own stone, it may be feasible for the Contractor to establish the crusher at the site of the old Chilanga Cement Quarry on the right hand side of the road at km 26 + 000. It would mean that rock blasted at km 38 + 000 will have to be hauled to km 26 + 000 for crushing. The significant advantage of the site at km 26 + 000 is that three phase power is readily available with the step down transformer facility to hook up to a crusher. The power for crushing at km 38 + 000 will have to be supplied by diesel generators. Another potential source of stone that is worth investigating further is an old disused quarry approximately 3.5 km from the road on the right hand side at km 27 + 800. The quality and quantity will need to be established but this location would be ideal, as it is closer to the above crusher site and is approximately at the middle of the Lusaka-Kafue Road Project, i.e., the longest crushed stone haul distance would be in the order of 27 km from this site.

6.2 Bitumen, Cement and Sand

Bitumen is produced at the oil refinery in Ndola as a by product of the oil refinery process. However the capacity of the refinery is limited and if a few major road projects are underway simultaneously in Zambia the supply from this source will not be adequate. In estimating the foreign currency requirement for this project the eventuality of having to import bitumen has been allowed for. Cement is produced at a plant with an annual capacity of 200,000 tonnes operated by Chilanga Cement at Chilanga which is at km 15 + 000

on the Kafue-Lusaka Road. No problems are envisaged with adequate supply of cement, nor are problems envisaged regarding the availability of adequate quantities of sand from existing sand quarries at Lusaka and Kafue.

6.3 Water

Large quantities of water will be required for construction works. In addition even larger quantities will be required to control the dust on the detours and deviations. It is anticipated that a fleet of three 10,000 l capacity tankers will carry on average 10 loads a day resulting in a total water demand of 300,000 l/day or 300 cu.m per day. The following watering points have been identified from a preliminary investigation.

- At km 3 + 000 water can be pumped out of the quarry operated by Crushed Stone Sales.

- At km 7 + 000 a 6000 gallon/hour borehole supply is available.

- At km 15 + 000 a large quantity of water is available at the old Chilanga Cement quarry at the present Chilanga Golf Course.

- At km 27 + 000 a very large quantity of water is available from the small lake formed by the disused Chilanga Cement Quarry.

- At km 31 + 000 there is water available on the proposed deviations from a fast flowing stream.

- At km 36 + 000 on the proposed deviation water can be drawn from a stream.

- From km 40 + 000 to km 50 + 000 water can be abstracted from small streams or with approval from the Lusaka Urban District Council from hydrants off the Kafue-Lusaka bulk water pipeline.

- At km 53 + 300 water can be abstracted from the Kafue River.

7. Cost Estimate (Based on June 1989 Prices)

The estimated cost of rehabilitating the project road (excluding the Lusaka-Makeni section) is estimated to be US$ 18,950,000 and Zambian Kwacha, 52,000,000.

The cost estimate is broken down by work items as shown: (Refer to Section 14 of Ref 1).

		A.I.D. Contribution (U.S. $)	H.C. Contribution (Kwacha)
1.	Preliminaries	2,738,941	7,263,280
2.	Accommodation of Traffic	1,087,013	2,882,604
3.	Borrow Pits	376,242	997,740
4.	Site Clearance and Topsoil Stripping	530,368	1,406,460
5.	Earthworks	993,435	2,634,448
6.	Shoulders to Existing Pavement	369,856	980,807
7.	Existing Pavement Preparation	368,524	977,274
8.	Sub-base and base	2,672,283	7,086,513
9.	Dense Bituminous Macadam Base	2,167,825	5,748,762
10.	Surface Treatment/Crack Sealing	1,961,833	5,202,502
11.	Pavement Repair Work	188,213	499,114
12.	Drainage Improvement	1,354,747	3,592,596
13.	Miscellaneous Items	274,487	727,900
(A)	Subtotal	15,083,767	40,000,000
(B)	Detailed design	386,400	0
(C)	Construction supervision	1,000,000	0
	Total (A)+(B)+(C)	16,470,167	40,000,000
	Contingency 15% of U.S.$	2,470,525	
	Contingency 30% of Kwacha		12,000,000
	Total Construction Cost	18,940,692	52,000,000
	Rounded to	18,940,000	52,000,000

*Note: The consultant (Ref 1) had included a 10% contingency in the cost estimate based on a survey of which several firms provided illustrative rates for bill of quantity items. However, after review of tender, current actual bill of quantity rates confirmed in documents for a NORAD financed road project (Kafue-Monze), the contingency was adjusted to 15% to retract a slight underestimation in rates used by John Burrow.

For description of work items see description below.

1. Preliminaries - provides for all Contractor's preliminary and general expenses, cost of providing surety and third party insurance, provision and maintenance for the contract period of offices, a laboratory, and residential facilities for the supervisory Engineer and his staff, provision and maintenance of vehicles and telephone communication for the Resident Engineer's staff and provision to pay compensation to any land owners or settlers whose developments or properties may be affected by this project.

2. Accommodation of Traffic - (Refer to Section B in Ref 1), the traffic currently using the road should be provided for throughout the construction period. A network of detours and diversions will be provided and maintained during the construction period. The bill items provide for the improvement of existing detours or construction of new deviations to an acceptable standard, provision of 150 mm layer of gravel wearing course and the maintenance of these detours and deviations for an average seven month period when they will be required.

3. Borrow Pits - For pavement and shoulder widening, for sections where the road level needs to be raised, for sections where the road is to be reconstructed and for gravel wearing course for (detours) and deviations, lateritic gravels to varying standards will be required. In this Bill provision is made to clear vegetation, topsoil and overburden at approximately five suitable borrow pit sites and reinstate the pits at the end of construction.

4. Site Clearance and Topsoil Stripping - Virtually throughout the whole of the alignment the carriageway and the shoulders have to be widened. In this bill the work items related to clearing the strip of land either side of the existing roadway and stripping topsoil has been allowed for.

5. Earthworks - Which comprises earthworks to raise the level of the road where required for drainage purposes and to build up widened shoulders.

6. Shoulders to Existing Pavement - On sections of the road where the existing pavement is only to be overlaid, or patched and sealed, the existing shoulders have to be widened. The proposed method of widening is to saw through the existing surfacing and base on the edge of the carriageway, remove the existing shoulder material and build up new shoulder to the full width from the lower layers. In this bill, these work items up to road bed level have been allowed for.

7. Existing Pavement Preparation - In the case where the road is to be reconstructed it is recommended that the existing bituminous material be removed and disposed of and the existing base course be scarified and recompacted prior to placing any reconstruction layers.

8. Subbase and base - For widening shoulders and reconstructed pavements the sub-base and base shoulder material, stabilization of sub-base gravel material and crushed stone base for new construction have been allowed for. This bill also includes all overhaul of material. In the case of lateritic gravel materials it has been assumed that borrow pits will be established at five locations along the alignment. In the case of crushed stone for new construction, carriageway and shoulder base, it has been assumed that the existing quarry at approximately km 36 + 500 will be the source.

9. Dense Bituminous Macadam Base and Regulating Course - This bill allows for the bituminous overlays and regulating course which will be used in sections of the road where the existing pavement is to be strengthened.

10. Surface Treatment and Surface Dressing Crack Sealing Layer - The whole length of the road is to be provided with a surface dressed seal layer. In addition the shoulders are to be sand sealed throughout. In the case of sections of the pavement which are to be overlaid the existing pavement must be sealed prior to placing the overlay. Items of work relating to these tasks are included in this bill.

11. Pavement Repair Work - Even where the existing pavement is to be overlaid or patched and sealed the pavement must be repaired prior to the placing of the next layer. All existing poor quality patchwork must be removed and redone and where pot-holes exist them must be repaired.

12. Drainage Improvement and Rehabilitation - As discussed, the most important aspect of road design is the provision of adequate drainage works to protect the road from surface and ground water. In this Bill, all items relating to the repair or replacement of existing culverts, provision of new culverts, as required, provision of mitre drains, catchment drains, subsoil drains and protection of drainage works has been allowed for.

13. Miscellaneous Items - Road furniture, signage, road markings and such items as guard rails and curbing has been included. In addition a lump sum has been provided for constructing walkways on either side of the existing road-over-road bridge at Chilanga.

The style and format of the Bills are similar to that used for other Road Construction and Rehabilitation works in Zambia and are in general use with international standard conditions of contract. The method of measurement is also that used on similar contracts.

8. Maintenance

8.1 Background

The maintenance of Zambia's 37,000 km of road is the responsibility of two Government Agencies - the Ministry of Power, Transport and Communication (Roads Department) and the District Councils. The latter are operating under the aegis of the Provincial and Local Government Administration Division (PLGAD). The Roads Department is responsible for the classified part of the road network comprised of approximately 21,000 km of road of which approximately 5,700 km are paved. The District Councils are responsible for the remaining 16,000 km of road which are practically all gravel and earth roads in the rural areas of the country. See table 9 for roads maintained by the Roads Department. Both road authorities have relied on capital-intensive means of road maintenance using permanent labor forces working from road camps which at one time had proper maintenance equipment. This road maintenance system worked at a reasonable level during the period that road maintenance was adequate and the access to foreign exchange was not restricted. However, this situation has changed dramatically during the past ten years, owing to

Zambia's difficult economic situation. The deterioration of road maintenance capability is partly due to declining foreign exchange earnings, reflected in the fact that Zambia's external debt is among the highest in the continent. Since allocations for road maintenance, in general, have been stagnant, (increasing at a slower pace than inflation) recent wage increases have meant that staff costs as a proportion of total expenditure have risen considerably over the past few years. This in turn means that in real terms the funds available to carry out the actual roadworks have decreased.

The situation is aggravated by the fact that the scarcity of foreign exchange has severely affected the availability of equipment and transport. Spare parts are difficult to obtain and even minor break-downs cause machines and vehicles to be off the road for long periods. Unfortunately, this has major implications in terms of the effectiveness of staff as well. Equipment operators and drivers are idle when their machines or vehicles are out of order and the labor force is confined to working in the immediate surroundings of the road camps due to lack of transport.

Therefore, not only are the resources available for road maintenance declining and presently insufficient for the regular routine maintenance of the whole of the road network but also, the existing systems are becoming less effective every year. It is evident that changes will need to be made if the level of road maintenance is not to be reduced even further.

8.2 Highway Classification

Classification of the road system is summarized on the following page. Generally the surface dressings are only applied to surfaced roads on 150 mm thick stabilized base with a neat sub-base. Gravel roads wearing courses are normally 150 mm thick.

Classification of the Road System

CLASS	Formation Width at Finished Surface Level (Meters)	Carriageway Width (Meters)	Type of Surface
Class IA	13.30	7.30	Bituminous
Class IB	10.70 to 12.70 According to Traffic needs	6.70	Bituminous
Class IC	10.10	6.10	Bituminous
Class II	10.10	Minimum 6.10	Gravel
Class III	7.50	Minimum 5.50	Gravel where necessary for all weather Standard
Unclassi-fied	Cleared and stumped track of 5.50 minimum width and Skeleton Drainage		Earth with 3.50 meter gravel surface where essential

Source: GRZ/Roads Department

8.3 Equipment

As an element of the Kafue-Chirundu Road Project (690-0209), a complete resealing unit (equipment) was purchased for use for periodic and routine maintenance. However, the useful life of this equipment is estimated to be be 5-6 years, which will mean by the time the resealing of the Kafue-Lusaka Road is necessary (2000) the equipment will be obsolete. Therefore, in order for the Roads Department to be able to provide the proper periodic and routine maintenance for the project road, road maintenance equipment will be procured (see equipment list in Annex IIE) provided that the GRZ Roads Department has demonstrated proper maintenance and use techniques for the equipment previously financed under Project 690-0209. Routine maintenance is defined as clearing and cutting weeds and brush alongside the road, keeping drainage structures free from debris, patching damaged road pavement and shoulders, repairing damaged guard rails and curbs and any other tasks associated with day-to-day activities. Periodic maintenance is defined as placing a double surface seal (spray and chip treatment) over the existing pavement once every 7 years.

8.4 Periodic Maintenance (Resealing) Costs

The GRZ Roads Department resealing unit comprised of the equipment shown below, is capable of resealing approximately 100 km of road per year. The cost of resealing 1 km of road (August 1989 prices) has been calculated below:

(August 1989) Resealing Unit Annual Cost

Plant and Equipment

1 No. Bitumen Sprayer and Chipper (diesel heater).
2 No. Dumpers.
1 No. Front End Loaders
1 No. 8-10 to. Pneumatic Tired Roller
2 No. Tractors
4 No. 7 Ton Tippers
1 No. Water Tanker
1 No. 9 Ton Flat
2 No. Inspection Vehicles

Production

Assumed production:

4.0 kilometers per week (based on a 21 day working month)

12.0 km/month, allowing for set up time working period 8 months.

Kilometers resealed per year = 12.0 x 8 = 96 km.

Labor

			P/A	P/A
1	No. F.E.L. Operator	@	K 11,500	K 11,500
2	No. Tractor Operators	@	K 9,500	K 19,000
1	No. Roller	@	K 9,500	K 9,500
1	No. Road Ganger	@	K 15,000	K 15,000
10	No. Drivers	@	K 9,500	K 95,000
20	No. Laborers	@	K 8,000	K160,000
				K310,000

Overtime* + subsistance at (60 days @ K180/Night)

= K120,000 + 35 x 60 x K180

= K120,000 + K378,000 = K 498,000

Cost per Kilometer $= \frac{310,000 + 498,000}{96}$ = K 8,417/Km

* 40% of total Labor Cost above

POL (Fuel and Lubricants)

Fuel 550 litres/day at 5.12/litre	K 2,816.00
Oil + Lubricants 50 litres/day @ K36.00/litre =	K 1,800,00
Total	K 4,616.00
Per month = 21 x 4,616.00	K 96,936.00
Cost per kilometer $= \frac{96,936}{12.0}$	K 8,078.00

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Bitumen Emulsion

Rate of Spray 1.5 l/m^2 @ K6.00/Liter

(width) (length)

= 1.5 x 6.7 x 1000 x K6.00 — K60,300.00

Haulage (average 500 km @ 4.00/Tonne/Km)

$$\frac{1.5 \times 6.7 \times 1{,}000 \times 4.00 \times 500}{1000}$$ — K20,100.00

Total — K80,400.00

Stone

Rate of application

= $100m^2/m^3$ (13mm) = Ton

Cost of Stone = $K560/m^3$

(width) (length)

Cost of Stone/Km = $\frac{6.7 \times 1000 \times 560}{100}$ — K37,520.00

Haulage to site per Km say = $\frac{6.7 \times 1000 \times 50 \times 4}{100}$ — K13,400.00

(Assuming 50km stone haul) Total — K50,920.00

Therefore Cost per Kilometer

(A) Labor	K 8,417.00
(B) Pol	K 8,078.00
(C) Bitumen Emulsion	K 80,400.00
(D) Stone	K 50.920.00
(E) Spares (Tires, Spares, Batteries)	K 7,000.00
Total cost per km (A) through (E)	K154,815.00

Rounded to — K155,000.00

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8.5 Routine Maintenance Costs

The cost of providing routine maintenance for 1 km of project road is estimated to be K50,000 (US $3,125 at August, 1989 official exchange rates).

9. Final Design/Construction Supervision

The Roads Department has no staff available for either the final design or construction supervision. A consultant will be hired to perform this work.

Final design will include; preparation of final design drawings, specifications and tender documents. Construction supervision consultant will act as Roads Department Engineer's Representative to ensure that design drawings and specifications are being adhered to by the contractor.

Definitions

1. Sub Grade - The term given to the ground below the pavement layers. It is sometimes referred to as the Road Bed.

2. Base - Sub-base - The term given to the pavement layers. The layers are numbered consecutively the uppermost layer being referred to as Base 1. Alternately the uppermost layer is referred to as base and the layer below is referred to as sub-base.

3. Falling Weight Deflectometer - A tool used to measure the deflection characteristics of the road under a load.

4. Dynamic Cone Penetrometer (DCP) - A standard rod with a cone tip driven into the pavement layers and the road bed. The resistance as measured by the number of blows is used to derive the strength of the various layers.

5. Benkelman Beam - A tool used to measure the deflection characteristics of the road when subjected to a load.

6. Compactive Effort - Defined as the density of the material after the application of the compactive effort. This is specified as a percentage Mod. AASHTO.

7. In Situ Moisture Contect (mc) - Field moisture content at time of sampling. This will vary from season to season.

8. AASHTO Classifications - System of soil classification which divides soils into seven groups designated A - 1 to A - 7 depending on physical properties (particle size distribution, liquid limit and plasticity index). The lower the classification number, the better the material is from a highway stability point of view.

9. Design CBR (CBR) - The California Bearing Ratio Value assigned to a subgrade and used to determine the required pavement thickness. It is the CBR of a sample compacted at Standard AASHTO optimum mositure content and soaked for minimum of four days.

10. Design Life - A period of years, e.g., 10, 15, or 20, selected by the designer, for which he expects a pavement to remain serviceable before requiring strengthening or reconstruction.

11. Design Traffic - The estimated number of equivalent 8200 kN single axles which will be carried by the lane during the design life of the pavement.

12. Equivalent 8200 kN Axle - The 'standard axle load' to which all heavy vehicle axles are equated in order to estimate design traffic.

13. Heavy Vehicle - This is defined as any vehicle with a net mass exceeding 2300 Kg. Such vehicle are required by law to carry reflective rear chevron markings and have been analysed to determine axle equivalences for design puposes.

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References

- 1. John Burrow & Partners Zambia, Kafue-Lusaka Road Project Feasibility Study/Cost Analysis Final Report, August 1989.

- 2. Kennedy, C.K. and Lister, N.W., "Prediction of Pavement Performance and the Design of Overlays," TRRL Laboratory Report 833, Crowthorne, 1978.

- 3. (a) Kampsax/CarlBro, "Rehabilitation of Trunk Roads", Final Design Report, January 1988.

  (b) Kampsax/CarlBro, "Investigations and documentation study for initiating rehabilitation of four major roads in Zambia", Final Economic Report, November 1988.

  (c) Appendix A: Pavement Strength and Condition

  (d) Appendix B - 1 : Traffic Surveys
  Appendix B - 2 : Population
  Appendix B - 3 : The Zambian Economy
  Appendix B - 4 : Unit Construction and Maintenance Costs
  Appendix B - 5 : The HDM III Model

  (e) Appendix C : Summary of Economic Evaluation

- 4. Lusaka Kafue Road Project (Lusaka-Chilanga Section), Pavement Data Collection Study - Final Report, John Burrow & Partners Zambia, June 1989.

- 5. McMullen, D., Snaith, M.S. and Burrow, J.C., "Back analysis techniques for pavement condition", Proc. International Conference on Bearing Capacity of Roads and Airfields, Plymouth 1986.

- 6. Powell, W.D., Potter, J.F., Mayhew, H.C. and Nunn, M.E., "The structural design of bituminous roads," TRRL Laboratory Report 1132, Crowthorne, 1984.

- 7. Heukelom, W. and Klamp, A.J.G., "Dynamic testing as a means of controlling pavements during and after construction," Proc. International Conference on the Structural Design of Asphalt Pavements, AnnArbor, Michigan, 1962.

- 8. "A guide to the Structural design of bitumen-surfaced roads in tropical and sub-tropical countries," Road Note 31, Third Edition, HMSO 1977.

- 9. "Structural Design of Interurban and Rural Road Pavements," Draft TRH4, NITRR, 1980.

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Table 1

Kafue-Lusaka Road Rehabilitation Program (Phase I)

		Total Length (km)
0.0 km - 3.9 km	Reconstruct	*
3.9 km - 5.8 km	Reconstruct	1.9
5.8 km - 6.7 km	Overlay and Seal	.9
6.7 km - 7.1 km	Reconstruct	.4
7.1 km - 7.5 km	Overlay and Seal	.4
7.5 km - 7.8 km	Reconstruct	.3
7.8 km - 8.8 km	Overlay and Seal	1.0
8.8 km - 9.1 km	Reconstruct	.3
9.1 km - 10.1 km	Overlay and Seal	1.0
10.1 km - 10.8 km	Reconstruct	.7
10.8 km - 12.1 km	Overlay and Seal	1.3
12.1 km - 12.7 km	Reconstruct	.6
12.7 km - 13.3 km	Overlay and Seal	.6
13.3 km - 13.6 km	Reconstruct	.3
13.6 km - 14.6 km	Overlay and Seal	1.0
14.6 km - 14.8 km	Reconstruct	.2
14.8 km - 15.1 km	Overlay and Seal	.3
15.1 km - 15.2 km	Reconstruct	.1
15.2 km - 15.3 km	Overlay and Seal	.1
15.3 km - 15.5 km	Reconstruct	.2
15.5 km - 16.8 km	Overlay and Seal	1.3
16.8 km - 17.3 km	Reconstruct	.5
17.3 km - 18.1 km	Overlay and Seal	.8
18.1 km - 18.5 km	Reconstruct	.4
18.5 km - 21.5 km	Overlay and Seal	3.0
21.5 km - 22.1 km	Reconstruct	.6
22.1 km - 22.3 km	Overlay and Seal	.2
22.3 km - 22.5 km	Reconstruct	.2
22.5 km - 24.8 km	Overlay and Seal	2.3
24.8 km - 25.0 km	Reconstruct	.2
25.0 km - 25.3 km	Overlay and Seal	.3
25.3 km - 25.5 km	Reconstruct	.2
25.5 km - 26.5 km	Overlay and Seal	1.0
26.5 km - 27.0 km	Reconstruct	.5
27.0 km - 31.7 km	Overlay and Seal	4.7
31.7 km - 32.3 km	Reconstruct	.6
32.3 km - 35.45km	Patch and Seal	3.15
35.45km - 35.65km	Reconstruct	.2
35.65km - 39.4 km	Patch and Seal	3.75
39.4 km - 39.6 km	Reconstruct	.2
39.6 km - 42.4 km	Patch and Seal	2.8
42.4 km - 42.6 km	Reconstruct	.2
42.6 km - 44.05km	Overlay and Seal	1.45
44.05km - 44.5 km	Reconstruct	.45
44.5 km - 49.5 km	Overlay and Seal	5.0
49.5 km - 49.7 km	Reconstruct	.2
49.7 km - 50.0 km	Overlay and Seal	.3
50.0 km - 50.2 km	Reconstruct	.2
50.2 km - 51.95km	Overlay and Seal	1.75
51.95km - 52.15km	Reconstruct	.2
52.15km - 53.3 km	Overlay and Seal	1.15

Total (Reconstruct) = 9.85
Total (Overlay and Seal) =29.85
Total (Patch and Seal) = 9.7
49.4

* Not part of the project

Table 1(A)

Lusaka-Kafue Road - Condition of Drainage

CHAINAGE	DIAMETER OR SIZE	TYPE	HEAD WALLS L	HEAD WALLS R	WING WALLS L	WING WALLS R	TO BE REPLACED	SCOUR PROTECTION REQUIRED	COMMENTS
1.32	1 x 300	CONCRETE PIPE	BRICK	BRICK	NIL	NIL	NO	SMALL	LIMITED COVER BUT APPARENTLY IN REASONABLE CONDITION
2.4	1 x 600	CONCRETE PIPE	BRICK	BRICK	BRICK	BRICK	NO	NO	CONCRETE CHANNEL AT INLET AND OUTLET
4.55	1 x 800	STEEL PIPE	NIL	NIL	NIL	NIL	NO	YES	SOFFIT AT ROAD LEVEL
4.75	1 x 900	STEEL PIPE	NIL	BRICK	NIL	NIL	NO	YES	SOFFIT ABOUT 150MM BELOW ROAD LEVEL
5.45	600 x 600	CONCRETE BASE	CONCRETE	CONCRETE	NIL	NIL	YES	YES	CULVERT EQUALISING AND ALMOST SILTED UP
10.3	3 x 600	CONCRETE PIPES	CONCRETE	CONCRETE	NIL	NIL	NO	YES	OUTLET BLOCKED BY TRACTOR TRAFFIC CAUSING SWAMP AREA ON BOTH SIDES
12.5	3 x 900	CONCRETE PIPE	BRICK	BRICK	NIL	NIL	YES	YES	CULVERT TO BE LIFTED, ROAD TO BE RAISED OR MOVED
12.52	3 x 600	CONCRETE PIPE	CONCRETE	CONCRETE	NIL	NIL	NO	YES	APPEAR TO BE SUBSTITUTED BY 12.50
13.46	1 x 600	CONCRETE PIPE	MASONRY	MASONRY	NIL	NIL	YES	YES	ROAD TO BE RAISED
13.5	1 x 600	CONCRETE PIPE	MASONRY	MASONRY	NIL	NIL	YES	YES	ROAD TO BE RAISED
13.89	1 x 600	CONCRETE PIPE	CONCRETE	NIL	NIL	NIL	YES	YES	TO BE ABANDONED
13.9	1 x 600	CONCRETE PIPE	NIL	CONCRETE	NIL	NIL	YES	YES	ABOUT 60% SILTED
14.7	1 x 600	CONCRETE PIPE	CONCRETE	CONCRETE	NIL	NIL	YES	YES	CULVERT NEEDS TO BE RAISED BY 600 MM
15.09	2.7mx4.3m	CONCRETE BRIDGE	CONCRETE	CONCRETE	YES	YES	NO	NO	ROAD BRIDGE
15.4	1 x 600	CONCRETE PIPE	MASONRY	MASONRY	NIL	NIL	YES	YES	RAISE CULVERT BY 500MM

Source: Reference 1

Table 1(B)

Lusaka-Kafue Road - Condition of Existing Drainage

15.9	2 x 1.8m	CONCRETE ARCH	CONCRETE	CONCRETE	CONCRETE	CONCRETE	NO	YES	MASS CONCRETE ARCH 1.8M DIA ON 750 UP STAND
16.2	1 x 450	CONCRETE PIPE	CONCRETE	CONCRETE	NIL	NIL	YES	YES	TO BE LOWERED BY 300MM
16.5	1 x 450	CONCRETE PIPE	CONCRETE	CONCRETE	NIL	NIL	YES	YES	50 MM FRESH WATER PIPE PASSES DIRECT
17.2	2 x 1900	AMCO CONCRETE	CONCRETE	CONCRETE	YES	YES	YES	YES	WING WALLS NOT LONG ENOUGH. CULVERT NEEDS RAISING
17.6	1 x 600	CONCRETE PIPE	CONCRETE	CONCRETE	NIL	NIL	NO	NO	INTAKE PIPE 900MM DIA 3M DEEP PROVIDED ON LEFT SIDE
17.9	1 x 600	CONCRETE	CONC	CONC	NIL	NIL	NO	YES	SILTED SLIGHTLY @ PHS - SCOUR PROTECTION
18.2	1 x 1100	AMCO CONCRETE	CONCRETE	CONCRETE	NIL	NIL	NO	YES	ADEQUATE
18.7	1 x 600	CONCRETE PIPE	MASONRY	MASONRY	NIL	NIL	NO	YES	DRAIN TO BE SCOUR PROTECTED ON LHS
19.1	1 x 600	CONCRETE PIPE	MASONRE	MASONRY	NIL	NIL	NO	YES	RAISED ADEQUATELY
19.2	1 x 450	CONCRETE PIPE	MASONRY	MASONRY	NIL	NIL	NO	YES	DRAINS INTO PROPER FURROW
19.45	2 x 600	CONCRETE PIPE	MASONRY	MASONRY	YES	NIL	NO	YES	NEEDS WING WALL ON RIGHT SIDE
20.1	1x1.7mx1.7m	CONCRETE ARCH	CONCRETE	CONCRETE	YES	YES	NO	YES	DRAINS FROM PROPER LINED CHANNEL ON RIGHT - SCOURED ON LEFT
20.3	1. x 600	CONCRETE PIPE	MASONRY	MASONRY	NIL	NIL	NO	YES	TO BE PROTECTED AGAINST SCOUR ON LEFT SIDE
20.32	1 x 600	CONCRETE PIPE	MASONRY	MASONRY	NIL	NIL	NO	YES	PROTECTION REQUIRED BOTH SIDES
20.41	1 x 600	CONCRETE PIPE	MASONRY	MASONRY	NIL	NIL	YES	YES	SILTED SLIGHTLY
20.51	1 x 1.7 x 1.7	CONCRETE ARCH	CONC	CONC	NIL	NIL	NO	YES	PROTECTION ON LHS

Source: Reference 1

Table 1(C)

Lusaka-Kafue Road - Condition of Existing Drainage

21.4	1 x 600	CONCRETE PIPE	NIL	NIL	NIL	NIL	YES	YES	PIPE EXPOSED AT ENDS NO CONCRETE
21.6	1 x 600	CONCRETE PIPE	MASON RY	MASON RY	NIL	NIL	YES	YES	SILTED RIGHT AND LEFT ROAD TO BE RAISED
21.99	1 x 600	CONCRETE PIPE	MASON RY	MASON RY	NIL	NIL	YES	YES	SILTED RIGHT AND LEFT RAISE ROAD-NO OVER BURDEN
22.4	1 x 600	CONCRETE PIPE	MASON RY	MASON RY	NIL	NIL	YES	YES	SILTED LEFT AND RIGHT RAISE ROAD
22.6	1 x 600	CONCRETE PIPE	MASON RY	MASON RY	NIL	NIL	NO	YES	DRAINS PROPERLY
23.2	1 x 600	CONCRETE PIPE	MASON RY	MASON RY	NIL	NIL	YES	YES	SILTED RUNS OBLIQUE APPROX. 25M LONG
23.45	2 x 600	CONCRETE PIPE	MASON RY	MASON RY	NIL	NIL	NO	YES	SILTED ON RIGHT SIDE
23.7	2 x 600	CONCRETE PIPE	MASON RY	MASON RY	NIL	NIL	NO	YES	SILTED ON RIGHT SIDE
23.98	1 x 450	CONCRETE PIPE	MASON RY	MASON RY	NIL	NIL	YES	YES	SILTED ON RIGHT SIDE
24.5	1 x 600	CONCRETE PIPE	MASON RY	MASON RY	NIL	NIL	YES	YES	SILTED ON RIGHT SIDE
24.6	1 x 600	CONCRETE PIPE	MASON RY	MASON RY	NO		YES	NO	DRAINS WELL
24.9	2 x 600	CONCRETE PIPE	MASON RY	MASON RY	NIL	NIL	YES	NO	REQUIRES RAISING BY 250 MM ROAD IS LOW
25.4	1 x 600	CONCRETE PIPE	MASON RY	MASON RY	NIL	NIL	YES	NO	HEAVILY SILTED NEEDS RAISING - ROAD VERY LOW
26.4	1 x 450	CONCRETE PIPE	MASON RY	NIL	NIL	NIL	NO	NO	DRAINS PROPERLY
26.8	1 x 1700	CONCRETE ARCH	NIL	NIL	NIL	NIL	NO	NO	SILTATION ON RIGHT SIDE
28.2	1 x 600	CONCRETE PIPE	MASON RY	MASON RY	NIL	NIL	NO	YES	SILTATION ON RIGHT SIDE
28.75	1 x 600	CONCRETE PIPE	MASON RY	MASON RY	NIL	NIL	YES	YES	SILTED ON RIGHT SIDE

Source: Reference 1

Table 1(D)

Lusaka-Kafue Road - Condition of Existing Drainage

28.9	1 x 600	CONCRETE PIPE	MASON RY	MASON RY	NIL	NIL	YES	NO	SILTED ON RIGHT SIDE
29.85	1 x 600	CONCRETE PIPE	MASON RY	MASON RY	NIL	NIL	NO	NO	SILTED ON RIGHT SIDE
31.8	3 x 600	CONCRETE PIPE	NIL	MASON RY	NIL	NIL	YES	NO	BOTH SIDES SILTED ROAD LOW - LIFT ROAD
32.4	1 x 450	CONCRETE PIPE	MASON RY	MASON RY	NIL	NIL	YES	YES	BLOCKED COMPLETELY ON HILL
32.7	1 x 2.5m x 7.5m	CONCRETE BRIDGE	CONCRE TE	CONCRE TE	YES	YES	YES	YES	BRIDGE SILTED BOTTOM
34.7	1 x 2.5m x 1.75m	CONCRETE BRIDGE	CONCRE TE	CONCRE TE	YES	YES	NO	YES	FAIR CONDITION
35.25	1 x 1200	CONCRETE ARCH	NIL	NIL	NIL	NIL	YES	NO	SILTED ON BOTTOM
35.55	1 x 600	CONCRETE PIPE	MASON RY	MASON RY	NIL	NIL	YES	YES	FULLY SILTED CULVERT CAN BE RAISED BY 250MM
36.2	1 x 700	CONCRETE PIPE	CONCRE TE	CONCRE TE	NIL	NIL	NO	NO	RUNS OBLIQUE SILTED ON LEFT SIDE
36.55	1 x 3200	CONCRETE AMCO	CONCRE TE	CONCRE TE	NIL	NIL	NO	YES	UPSTREAM WING WALL NECESSARY, SILTED ON RIGHT SIDE
37	1 x 100	CONCRETE	CONCRE TE	CONCRE TE	NIL	NIL	YES	NO	HEAVILY SILTED
38.4	2 x 600	CONCRETE PIPE	MASON RY	MASON RY	NIL	NIL	YES	NO	SILTED, TO BE RAISED BY 300 MM
38.55	1 x 600	CONCRETE PIPE	MASON RY	MASON RY	NIL	NIL	YES	NO	FULLY SILTED
39.5	1 x 600	CONCRETE PIPE	MASON RY	CONCRE TE	MASON RY	NIL	NO	YES	SILTED 300 M BELOW ROAD LEVEL - AREA LOW-LYING, LIFT ROAD
39.7	1 x 600	CONCRETE PIPE	CONCRE TE	CONCRE TE	NIL	NIL	YES	NO	SILTED BOTH SIDES
39.8	1 x 3500	CONCRETE ARMCO	MASON RY	NIL	MASON RY	MASON RY	NO	YES	WING WALLS TO BE IMPROVED

Source: Reference 1

Table 1(E)

Lusaka-Kafue Road - Condition of Existing Drainage

39.9	2 x 600	CONCRETE PIPES	CONCRETE	CONCRETE	NIL	NIL	YES	NO	FULLY SILTED - AREA FLAT
40.1	2 x 600	CONCRETE PIPE	CONCRETE	CONCRETE	NIL	NIL	YES	NO	FULLY SILTED 100 MM AC PIPES FOR SIGNAL CABLES - LEVEL CROSSING
41.11	2 x 600	CONCRETE PIPE	CONCRETE	CONCRETE	NIL	NIL	YES	NO	FULLY SILTED - LEVEL CROSSING
40.12	2 x 600	CONCRETE PIPE	CONCRETE	CONCRETE	NIL	NIL	YES	NO	FULLY SILTED
40.8	1100 x 700	BOX CULVERT	CONCRETE	CONCRETE	YES	YES	NO	NO	IN GOOD CONDITION
41.1	1 x 600	CONCRETE PIPE	MASONRY	MASONRY	NIL	NIL	NO	NO	PARTLY SILTED
42.5	2 x 600	CONCRETE PIPE	BRICK	BRICK	NIL	NIL	YES	NO	FULLY SILTED, RAISE CULVERT - LIFT ROAD
42.9	2 x 600	CONCRETE PIPE	BRICK	BRICK	NIL	NIL	NO	NO	PARTLY SILTED
43.1	2 x 600	CONCRETE PIPE	CONC BLOCK	CONC BLOCK	NIL	NIL	NO	NO	PARTLY SILTED LEFT SIDE HEAD WALL BROKEN
43.12	1 x 600	CONCRETE PIPE	CONC	CONC	YES	YES	YES	NO	NEEDS RAISING SLIGHTLY
43.305	2 x 600	CONCRETE PIPE	CONC	CONC	NIL	NIL	YES	NO	SILTED - AREA LOW-LYING
43.31	2 x 600	CONCRETE PIPE	CONC	CONC	NIL	NIL	YES	NO	PARTLY SILTED
43.7	1 x 600	CONCRETE PIPE	CONC	CONC	NIL	NIL	NO	NO	PARTLY SILTED RIGHT WING WALL BROKEN
44.15	2 x 1.5 x 1	BOX CULVERTS	CONC	CONC	YES	YES	YES	NO	ONE COMPARTMENT FULLY SILTED OTHER PARTLY LIFT ROAD
44.25	2 x 600	CONCRETE PIPE	CONC	CONC	NIL	NIL	YES	NO	SILTED PARTLY - ROAD LOW LIFT ROAD
44.4	2 x 450	CONCRETE PIPE	CONC	CONC	NIL	NIL	YES	NO	FULLY SILTED NEEDS RAISING - LIFT ROAD

Source: Reference 1

Table 1(F)

Lusaka-Kafue Road - Condition of Existing Drainage

46.1	2 x 5.4 x 2	BOX CULVERT	CONC	CONC	YES	YES	NO	YES	WING WALL TO BE EXTENDED
47.98	2 x 600	CONCRETE PIPE	CONC	CONC	NIL	NIL	NO	YES	DRAINS PROPERLY - STONE PITCHED APRONS
48.4	1 x 2.5 x 2	BOX CULVERT	CONC	CONC	YES	YES	NO	YES	DRAINS PROPERLY - LARGE ENOUGH
48.9	2 x 600	CONCRETE PIPE	CONC	CONC	NIL	NIL	NO	YES	DRAINS PROPERLY
49.6	2 x 600	CONCRETE PIPE	CONC	CONC	NIL	NIL	YES	NO	FULLY SILTED - LIFT ROAD
49.8	1 x 600	CONCRETE	CONC	CONC	NIL	NIL	NO	NO	GOOD WORKING ORDER
50.12	2 x 600	CONCRETE	CONC	CONC	NIL	NIL	NO	YES	SCOUR PROTECTION ON RIGHT SIDE
50.4	2 x 600	CONCRETE	CONC	CONC	NIL	NIL	NO	YES	JUST REQUIRES CLEANING
50.88	1 x 600	CONCRETE	CONC	CONC	NIL	NIL	YES	YES	SILTED - LIFT ROAD
51.5	3.0mx2.5m	BOX CULVERT	CONC	CONC	YES	YES	NO	NO	
52.05	1 x 600	CONCRETE	CONC	CONC	NIL	NIL	YES	YES	FULLY SILTED - LOW LIFT ROAD

Source: Reference 1

Table 2

Km	Cumulative standard axles to 1989 MSA	Sound		Critical		Failed	
		Mean	SD	Mean	SD	Mean	SD
0 - 3.9	27.4	39	8.4	50	9.6	38	3.5
3.9 - 15.1	14.8	69	24	63	18	62	22

Note: SD = Standard Deviation (Ref to sect 2 .8D)
Mean = Mean Deflection
MSA = million standard axles

Table 2(A) Cumulative traffic up to 1989

Condition	Cracking Index m/sq.m
Sound	0
Critical	1 2
Failed	3 4 5

Table 2(B) Classification of pavement condition

	MODEL A			MODEL B			MODEL C		
	H (mm)	Mr (MN/m2)	V	H (mm)	Mr (MN/m2)	V	H (mm)	Mr (MN/m2)	V
Road base	155	varies	0.35	150	varies	0.35	110	varies	0.35
Sub-base	110	120	0.35	150	160	0.35	160	240	0.35
Subgrade	-	60	0.35	-	80	0.35	-	120	0.35
Subgrade CBR	8%			12%			20%		

Loading details: Contact pressure 590 kN/m2) Wheel load 31 kN
Radius of loaded area 130 mm)

Note: H = Layer thickness Mr = Resilient Modules V = Poisons Ratio

Table 2(C) Details of Analytical Pavement Models

Source: Reference 1

Table 3

Derivation of Overlay Design Chart B

		Layer	H (mm)	M (MN/m^2)	U
Overlay		1	Varies	2500	0.35
Existing	Roadbase	2	150	Mr_2	0.35
	Sub-base	3	150	160	0.35
	Subgrade	4	-	80	0.35

Loading details $p = 590$ kN/m^2 Wheel load 31 kN

$a = 130$ mm

$d_o = 60$ mm/100

$Mr_2 = 945$ MN/m^2

Overlay (mm)	40	70	100	140
d_1 (mm/100)	51	44	39	33
N (msa)	6.7	9.9	13.8	21.6

$d_o = 80$ mm/100

$Mr_2 = 402$ MN/m^2

Overlay (mm)	40	70	100	140
d_1 (mm/100)	65	54	46	38
N (msa)	3.5	5.7	8.8	14.8

$d_o = 100$ mm/100

$Mr_2 = 207$ MN/m^2

Overlay (mm)	40	70	100	140
d_1 (mm/100)	80	64	53	43
N (msa)	2.0	3.6	6.0	10.6

$d_o = 120$ mm/100

$Mr_2 = 121$ MN/m^2

Overlay (mm)	40	70	100	140
d_1 (mm/100)	97	73	59	46
N (msa)	1.2	2.5	4.5	8.8

d_o = deflection before [illegible]

d_1 = deflection after [illegible]

Mr_2 = Resilient Modulus [illegible] deduced [illegible]

H = LAYER THICKNESS

M = RESILIENT MODULUS

V = POISSONS RATIO

Source: Reference 1

Table 4

Predicted overlay requirements based on 1989 deflection levels

km	1989 Design Deflection (mm/100)	Design CBR %	Overlay (mm)		
			10 yrs	15 yrs	20 yrs
5.8 - 6.7	83	20	80	110	130
7.1 - 7.5	93	8	110	150	180
7.8 - 8.8	90	8	110	150	180
9.1 - 10.1	61	12	40	80	120
10.8 - 12.1	70	12	60	100	130
12.7 - 13.3	94	20	90	120	140
13.6 - 14.1	104	20	100	130	150
14.1 - 14.6	91	20	100	130	160
14.8 - 15.1	91	20	100	130	160
15.2 - 15.3	113	20	90	110	130
15.5 - 16.8	113	20	90	110	130
17.3 - 18.1	122	20	100	120	140
18.5 - 21.5	124	20	100	120	140
22.1 - 22.3	132	8	120	150	170
22.5 - 23.6	132	8	120	150	170
23.6 - 24.8	83	8	60	100	130
25.0 - 25.3	83	8	60	100	130
25.5 - 26.5	83	8	60	100	130
27.0 - 27.6	165	8	R	R	R
27.6 - 28.2	101	8	90	120	150
28.2 - 31.7	83	8	60	100	130
32.3 - 35.45	54	20	P+S	P+S	40
35.65- 39.4	54	20	P+S	P+S	40
39.6 - 42.4	54	20	P+S	P+S	40
42.6 - 44.05	87	20	70	100	120
44.5 - 49.5	110	20	70	90	110
49.7 - 50.0	110	20	70	90	110
50.2 - 51.95	110	20	70	90	110
52.15- 53.3	110	20	70	90	110

Design traffic (10 years / 15 years /20 years)

km 0 - 3.9	:	12.3/19.7/28.0 msa
3.9 - 15.1	:	06.6/10.6/15.1 msa
15.1 - 43.9	:	04.1/06.6/09.3 msa
43.9 - 53.3	:	03.3/05.3/07.6 msa

Note: R = Reconstruct P+S = Patch and Seal

Source: Reference 1

Table 5

Predicted overlay requirements based on 1991 deflection levels (used for project road)

km	1991 Design Deflection (mm/100)	Design CBR %	Overlay(mm) 10 yrs
5.8 - 6.7	95	20	90
7.1 - 7.5	106	8	R
7.8 - 8.8	103	8	R
9.1 - 10.1	70	12	70
10.8 - 12.1	80	12	80
12.7 - 13.3	107	20	R
13.6 - 14.1	119	20	R
14.1 - 14.6	104	20	100
14.8 - 15.1	104	20	100
15.2 - 15.3	129	20	100
15.5 - 16.8	129	20	100
17.3 - 18.1	139	20	R
18.5 - 21.5	141	20	R
22.1 - 22.3	150	8	R
22.5 - 23.6	150	8	R
23.6 - 24.8	100	8	90
25.0 - 25.3	100	8	90
25.5 - 26.5	100	8	90
27.0 - 27.6	200	8	R
27.6 - 28.2	122	8	110
28.2 - 31.7	100	8	90
32.3 - 35.45	59	20	P+S
35.65- 39.4	59	20	P+S
39.6 - 42.4	59	20	P+S
42.6 - 44.05	95	20	70
44.5 - 49.5	176	20	R
49.7 - 50.0	176	20	R
50.2 - 51.95	176	20	R
52.15 -53.3	176	20	R

Design traffic (10 years)

km 0 - 3.9	:	12.3 msa
3.9 - 15.1	:	6.6 msa
15.1 - 43.9	:	4.1 msa
43.9 - 53.3	:	3.3 msa

Note: R = Reconstruct when overlay exceeds 120 mm P+S = Patch and Seal

Source: Reference 1

Table 6

Table 6(A) Estimation of Cumulative Standard Axles (Lusaka Bound)

km	Section km - km	No. Standard axles 1989		cumulative million standard axles after		
		12 hr day	24 hr day	10 yrs	15 yrs	20 yrs
1.0	0 - 3.9	2402	3003	12.3	19.7	28.0
7.0	3.9 - 15.1	1298	1623	6.6	10.6	15.1
41.0	15.1 - 43.9	802	1002	4.1	6.6	9.3
53.0	43.9 - 53.3	650	813	3.3	5.3	7.6

Note: 24 hr day = 12 hr day x 1.25 (Standard axle count)

Table 6(B) Estimation of the total daily flow in the design year

km	Section km - km	All vehicles (2-way flow, 1989)					
		12 hour counted	12 hour average daily calculated	24 hour Average daily	24 hr flow after		
					10 yrs	15 yrs	20 yrs
1.0	0 - 3.9	14486	13228	16535	21200	24000	27100
7.0	3.9 - 15.1	4297	3852	4815	6200	7000	7900
41.0	15.3 - 43.9	-	1521	1905	2440	2760	3120
53.0	43.9 - 53.3	-	911	1139	1460	1650	1870

Note: 12 hour counted flow for table 4.2 and 12 hour average calculated as discussed in 4.5.2

Source: Reference 1

Table 7

Estimation of the number of standard axles (SA)/12 hr day
(one way towards Lusaka)

Location (Date)	Traffic Group	No of Commercial Vehicles in average 12 hr day	Standard Axles per Vehicle	SA/12 hr day	Total SA/12 hr day
km 1.0 Mon 29-5-89	2-3 Axle Rigid	662	1.5	993	
	2-3 Axle + Trailer	115	7.0	805	
	Articulated	44	8.5	374	
	Buses	191	1.2	230	2402
km 7.0 Tue 30-4-89	2-3 Axle Rigid	228	1.5	342	
	2-3 Axle + Trailer	26	7.0	182	
	Articulated	82	8.5	697	1298
	Buses	64	1.2	77	
km 10.0 Wed 31-5-89	2-3 Axle Rigid	250	1.5	375	
	2-3 Axle + Trailer	28	7.0	196	
	Articulated	66	8.5	561	1197
	Buses	54	1.2	65	
km 41.0 (Dec 1988)	Single Unit	123	1.5	185	782 (1988)
	Trailer/Semi trailer	71	7.8	554	802 (1989)
	Buses	36	1.2	43	
km 53,0 (April 1989)	Single unit	87	1.5	131	
	Trailer/Semi-trailer	65	7.8	507	650
	Buses	10	1.2	12	

Source: Reference 1

Table 8

Roughness Survey Results

km	Southbound BIv inches/km	Southbound BI mm/km	Northbound BIv inches/km	Northbound BI mm/km	Average BI mm/km
0-1	52	2131	56	2239	2185
1-2	53	2158	60	2345	2252
2-3	61	2371	59	2319	2345
3-4	63	2423	69	2575	2499
4-5	55	2212	60	2345	2279
5-6	38	1727	62	2397	2075
6-7	28	1107	38	1727	1571
7-8	31	1603	37	1696	1650
8-9	21	1161	46	1963	1587
9-10	25	1304	37	1696	1507
10-11	11	1905	59	2319	2117
11-12	24	1269	30	1474	1373
12-13	39	1757	49	2047	1905
13-14	25	1304	57	2268	1817
14-15	82	3891	99	3280	3088
15-16	34	1603	38	1727	1665
16-17	11	1817	40	1787	1802
17-18	87	3008	77	2772	2891
18-19	106	3434	111	3541	3488
19-20	36	1665	75	2723	2226
20-21	43	1876	72	2650	2279
21-22	66	2500	88	3031	2772
22-23	60	2345	82	2891	2625
23-24	14	1905	65	2474	2199
24-25	15	1931	64	2449	2199
25-26	36	1665	62	2397	2047
26-27	55	2212	71	2625	2423
27-28	58	2292	78	2796	2550
28-29	17	1991	57	2266	2131
29-30	55	2212	87	3008	2625
30-31	53	2158	67	2525	2345
31-32	59	2319	75	2723	2525
32-33	53	2158	69	2575	2371
33-34	12	1847	17	1991	1919
34-35	18	2019	50	2075	2047
35-36	50	2075	51	2103	2089
36-37	14	1905	57	2266	2089
37-38	12	1817	56	2239	2047
38-39	17	1991	51	2103	2047
39-40	11	1817	32	1539	1681
40-41	71	2625	79	2820	2723
41-42	44	1905	50	2075	1991
42-43	60	2345	62	2397	2371
43-44	58	2292	69	2575	2436
44-45	50	2075	60	2345	2212
45-46	39	1727	37	1696	1712
46-47	43	1876	53	2158	2019
47-48	11	1817	54	2185	2005
48-49	64	2449	71	2625	2538
49-50	78	2796	76	2747	2772
50-51	71	2625	66	2500	2563
51-52	17	1991	55	2212	2103
52-53	57	2266	52	2131	2199
53-53.3	67	2525	83	2915	2723

Source: Reference 1

Table 9

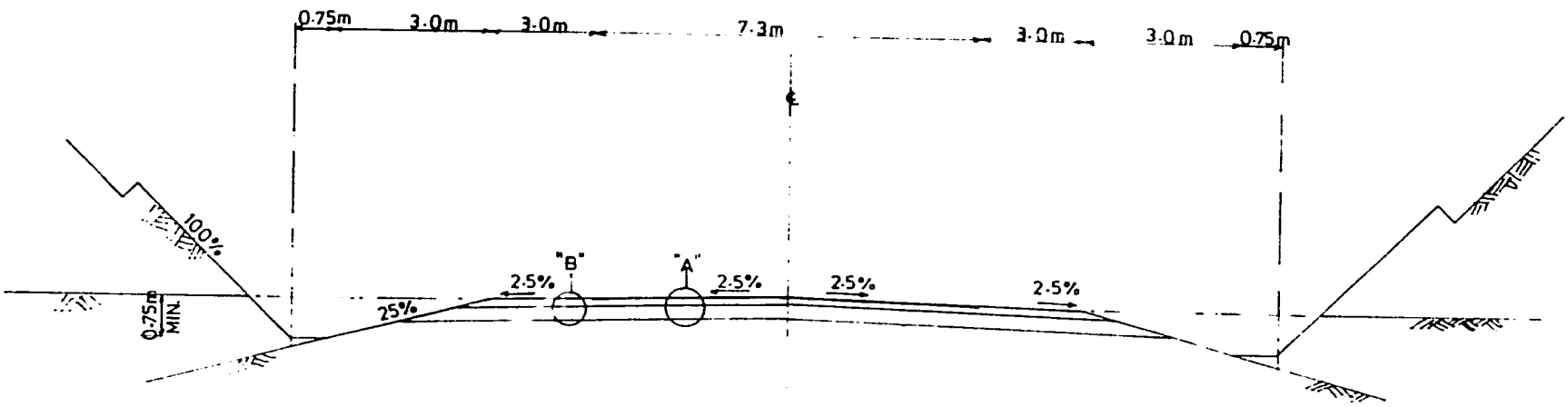
LENGTH OF ROADS MAINTAINED BY ROADS DEPARTMENT & PLGAD

Province	CLI	CLII	CLIII	UN/CL	TOTAL
Central	389.7	15.5	818.2	680.5	2103.9
Copperbelt	708.3	527.0	364.8	18.1	1618.2
Eastern	666.7	-	836.5	753.7	2256.9
Lusaka	970.3	339.0	731.8	546.4	2587.5
Luapula	174.9	113.8	1087.8	439.1	1815.6
Northern	992.2	210.9	1079.3	948.5	3230.9
N. Western	348.1	193.2	755.4	918.3	2215.0
Southern	809.3	574.4	222.5	1480.2	3087.4
Western	461.6	302.4	409.1	604.1	1867.2
Total	5721.1	2277.2	6395.4	6388.9	20782.6

CLASSIFICATION	CLI Bituminous	CLII Gravel	CLIII Gravel	EARTH UN/CL	TOTAL
Inter-territorial		-	-	100	3056
Main Roads	2956	-	-	-	-
Territorial		1214.2	-	216	4109.3
Main Roads	2067.1	-	612	-	-
District Roads	698	1063	5783.4	6072.9	13617.3
Total	5721.1	2277.2	6395.4	6388.9	20782.6

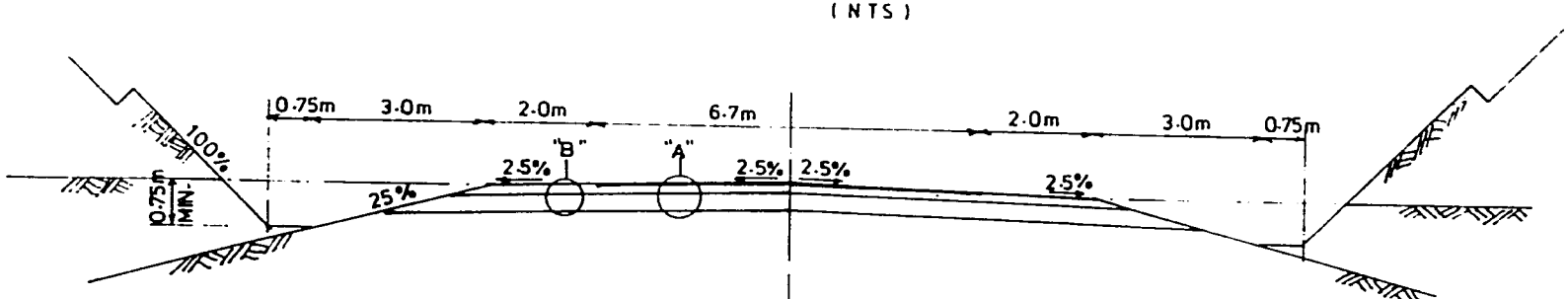
Note: All figures given in kilometers
CLI = Class 1, CLII = Class 2, CLIII = Class 3,
UN/CL = Unclassified

Source: GRZ/Roads Department



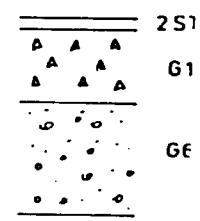
TYPICAL CROSS SECTION CLASS IA (RECONSTRUCTION)

(NTS)



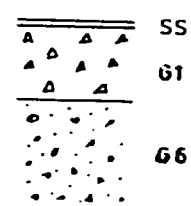
TYPICAL CROSS SECTION CLASS IB (RECONSTRUCTION)

(NTS)



DETAIL A

(N T S)



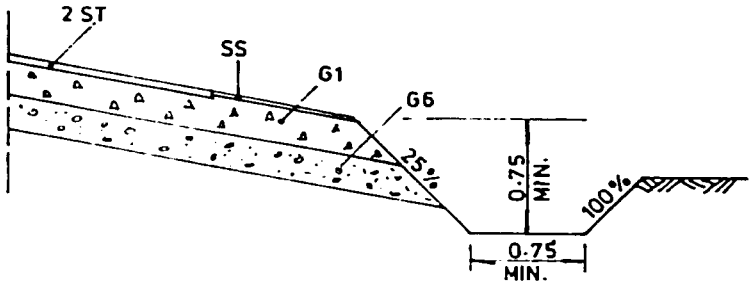
DETAIL B

(N T S)

John Burrow & Partners CONSULTING ENGINEERS	KAFUE LUSAKA ROAD FEASIBILITY STUDY/COST ANALYSIS	RECONSTRUCTION DETAILS SINGLE CARRIAGEWAY (Class IA and IB)	Fig. 1

Source: Reference 1

Source: Reference 1



CLASS IA AND I B SECTION (RECONSTRUCTION)

TYPICAL CROSS SECTION (NTS)

2ST - Double bituminous surface treatment
First seal 80/100 pen bitumen @ 1.5 l/m2 19mm chipping @ 70 m2/m3
Second seal 80/100 pen bitumen @ 1.3 l/m2 13.2mm chipping @ 80m2/m3

SS - Sand seal surface on shoulders
Seal 80/100 pen bitumen @ 1.0 l/m2
Crusher dust @ 120 m2/m3

G1 - Crushed stone road base and shoulder material PI>6 CBR<80

G6 - Selected gravel sub-base PI>12 CBR<25

Notes:

1 Design based on 10 (Class IA) and 5(Class IB) m.s.a.

2 Prime coat (where required) to be MC30 cutback @ 1.0 l/m2

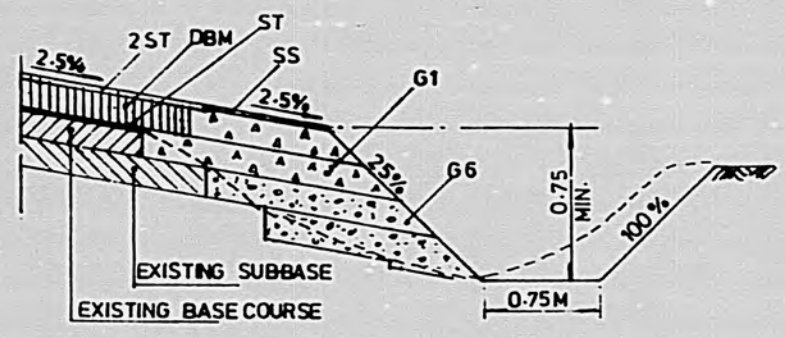
3 Tack coat (where required) to be KI-40 emulsion @ 0.6 l/m2

4 Cross section widths according to design standard.

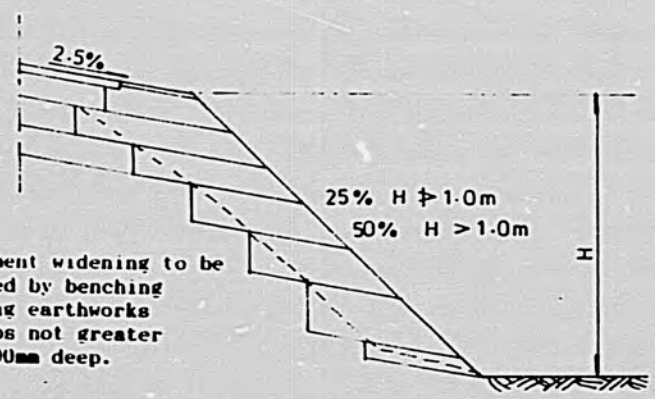
5 Existing base course material (after removal of bituminous surfacing may be incorporated into the sub-base layer where required to match levels.

db John Burrow & Partners CONSULTING ENGINEERS	KAFUE LUSAKA ROAD FEASIBILITY STUDY/COST ANALYSIS	RECONSTRUCTION DETAILS SINGLE CARRIAGEWAY (Class IA and IB)	Fig. 2

Source: Reference 1



CLASS IA AND IB SECTIONS (OVERLAYING WITH OR WITHOUT WIDENING)
(NTS)



Embankment widening to be achieved by benching existing earthworks in steps not greater than 300mm deep.

CLASS IA AND IB SECTIONS (EMBANKMENT WIDENING)
(NTS)

2ST - Double bituminous surface treatment
First seal 80/100 pen bitumen @ 1.5 l/m2 19mm chipping @ 70m2/m3
Second seal 80/100 pen bitumen @ 1.3l/m2 13.2mm chipping @ 80m2/m3

DBM - Dense bitumen macadam overlay in 2 layers Recipe mix (nom. size depending on thickness) to base course quality (approximately 4.4% binder content) using 80/100 pen bitumen.

ST - Existing surface patched and prepared by sealing cracks and applying a single bitumious surface treatment comprising 80/100 pen bitumen @ 1.3 l/m2 13 mm chipping @ 80m2/m3

SS - Sand seal surface on shoulders. Seal 80/100 pen bitumen @ 1.0 l/m2 Crusher dust @ 120m2/m3

G1 - Crushed stone road base and shoulder material PI≯6 CBR≮80

G - Selected gravel material PI≯12 CBR≮25

Notes

1 - Design based on 10 (Class IA) and 5 (Class IB) m.s.a

2 - Prime coat (where required) to be MC30 cutback @ 1.0 l/m2

3 - Tack coat (where required) to be K1-40 emulsion @ 0.6 l/m2

4 - Cross section widths according to design standard.

db John Burrow & Partners CONSULTING ENGINEERS	KAFUE LUSAKA ROAD FEASIBILITY STUDY/COST ANALYSIS	OVERLAY DETAILS / WIDENING DETAILS	Fig. 3

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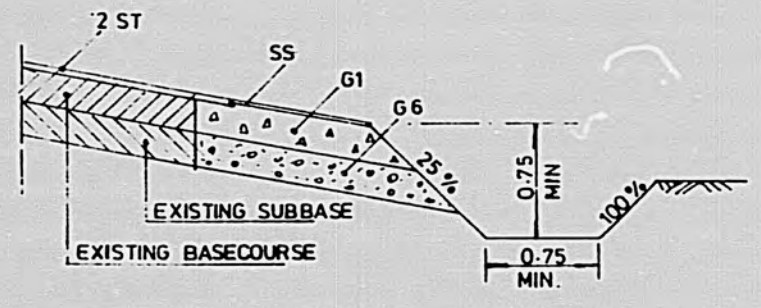
Source: Reference 1



CLASS IA AND IB SECTION (PATCH & RESEAL WITH OR WITHOUT WIDENING)

TYPICAL CROSS SECTION (NTS)

2ST - Existing surface patched and prepared by sealling cracks and applying a double bituminous surface treatment comprising: first seal 80/100 pen bitumen @ 1.5 l/m2 19mm chipping @ 70m2/m3 Second seal 80/100 pen bitumen @ 1.3 l/m2 13mm chipping @ 80m2/m3

SS - Sand seal on shoulders. Seal 80/100 pen bitumen @ 1.0 l/m2. Crusher dust @ 120m2/m3

G1 - Crushed stone road base and shoulder material PI $>$6 CBR $<$80

G6 - Selected gravel material PI $>$12 CBR $<$25

Note:

1 Only to be used where remaidual life exceeds 5(Class IA) and 2.5 (Class IB) m.s.a

2 Prime coat (where required) to be MC30 cutback @ 1.0 l/m2

3 Tack coat (where required) to be K1.40 emulsion @ 0.6l/m3

4 Cross section widths according to design standard

John Burrow & Partners
Consulting Engineers

KAFUE LUSAKA ROAD
FEASIBILITY STUDY/COST ANALYSIS

PREPARATION OF EXISTING SURFACE

Fig. 4

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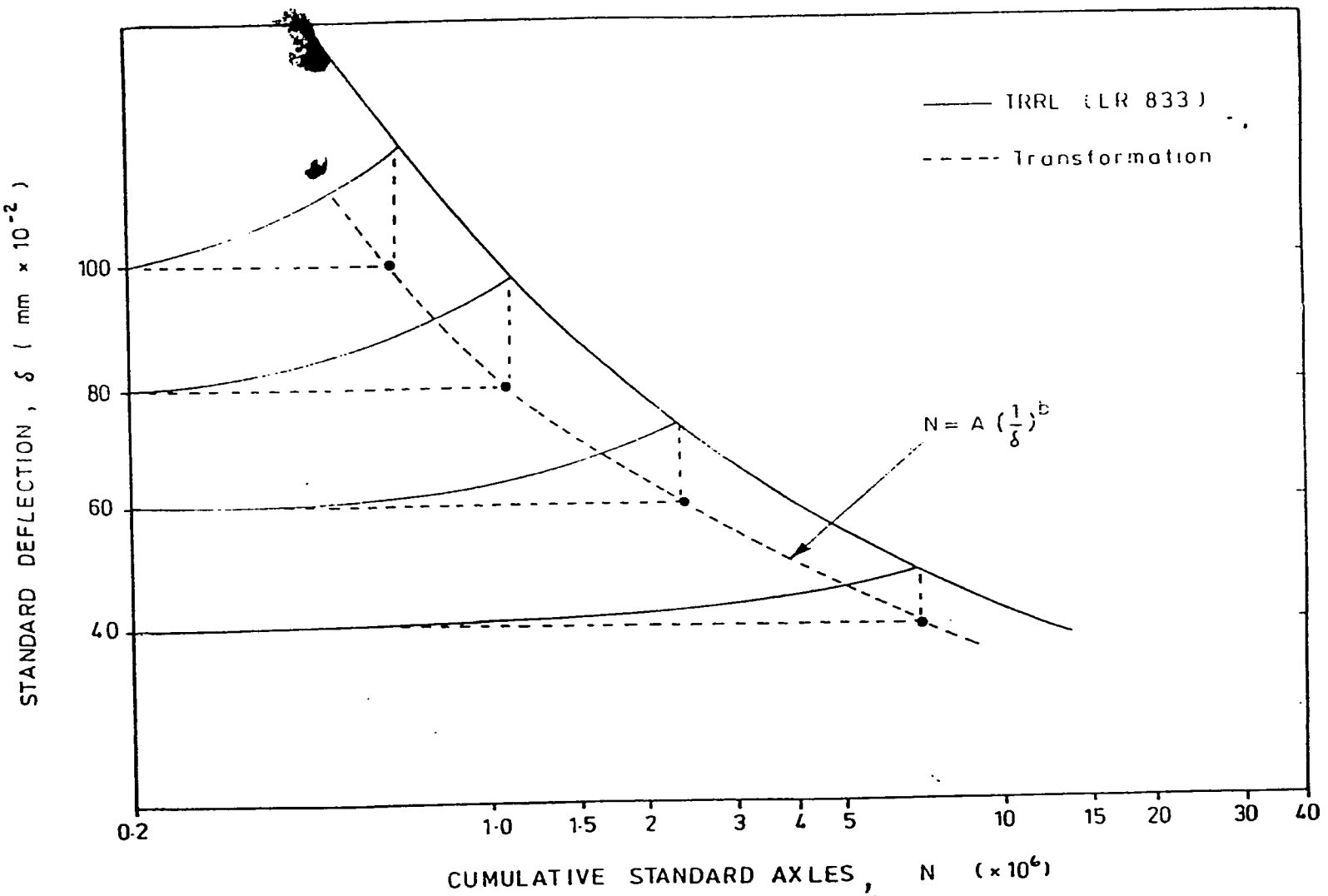
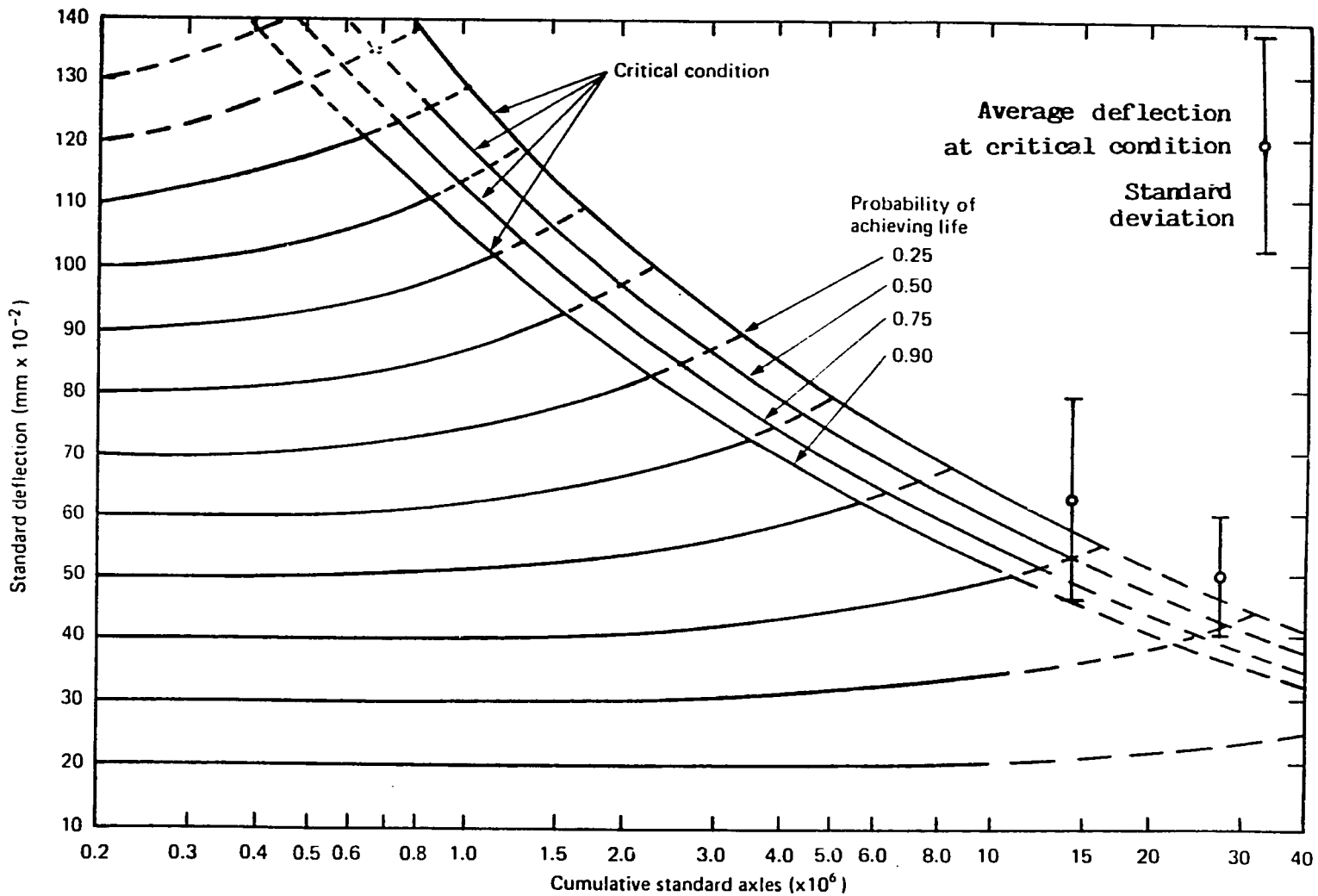


Figure 6 Transformation to give Deflection - Life Relationship

Source: Reference 1



RELATION BETWEEN STANDARD DEFLECTION AND LIFE FOR PAVEMENTS WITH NON-CEMENTING GRANULAR ROAD BASES

Figure 5 Typical TRRL Deflection - Performance Chart.

Source: Reference 1

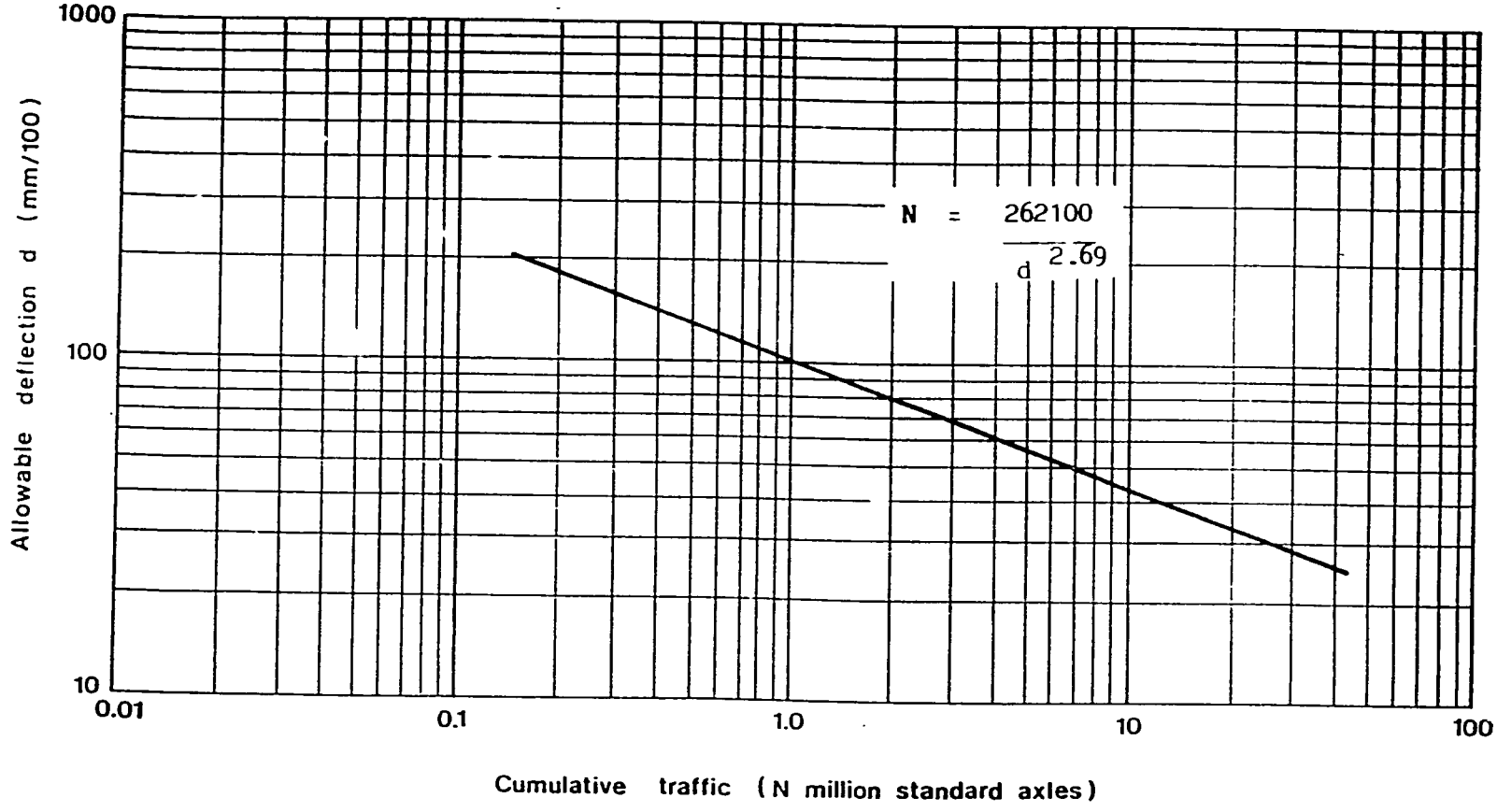
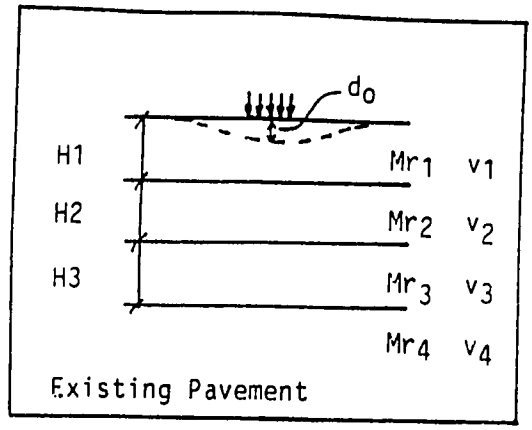


Figure 7 Deflection - Life Relationship

Source: Reference 1

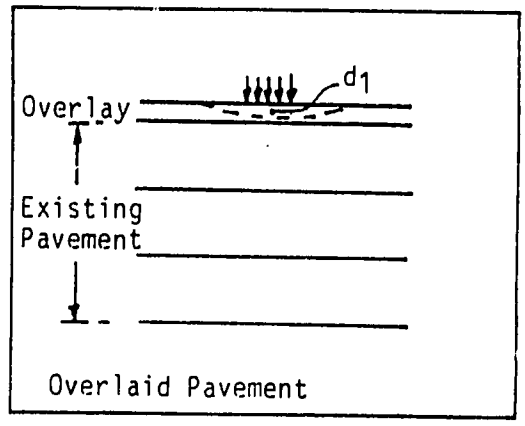
Define Pavement Model

Back Analyse to obtain Mr_1 based on deflection before overlaying (d_o)

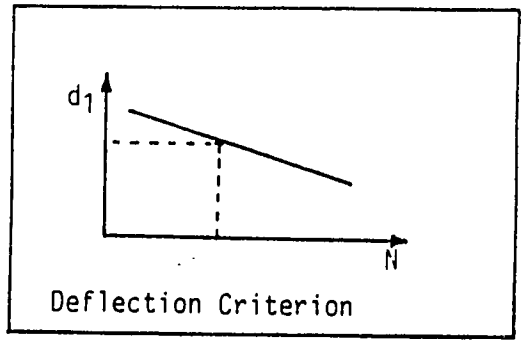


Apply overlay thickness as extra layer.

Analyse to obtain d_1 (new early life deflection) for different overlay thicknesses.



Predict Design Life N for different overlay thicknesses using deflection criterion.



Iterate for various values of d_o

Plot Overlay Thickness vs Design Life.

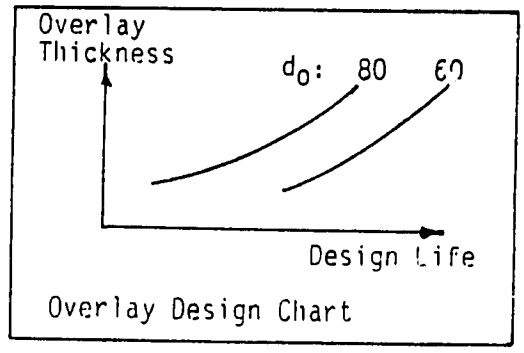
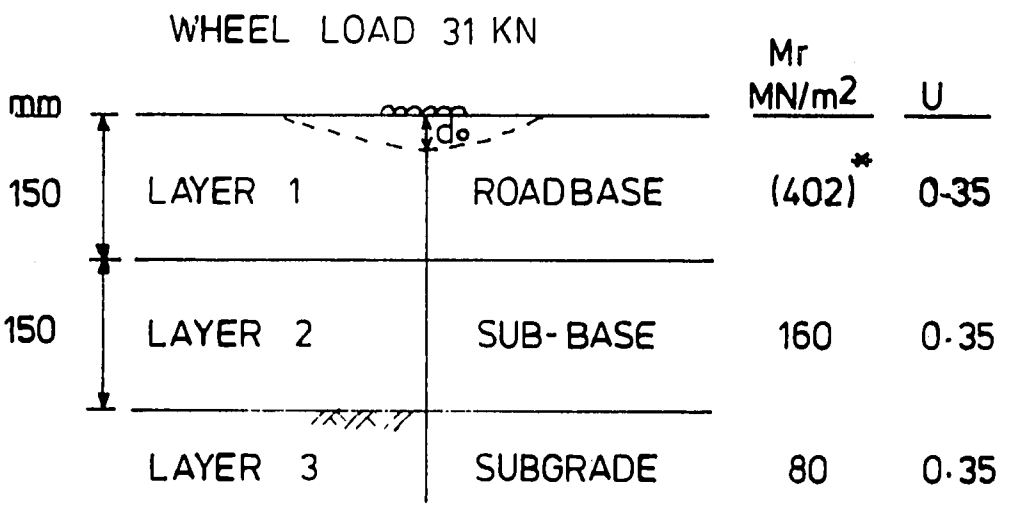


Figure 8 Design Methodology for Overlays

Source: Reference 1



d_o = 80 mm/100

FIGURE 9 EXISTING PAVEMENT CONSTRUCTION-MODEL B

Source: Reference 1

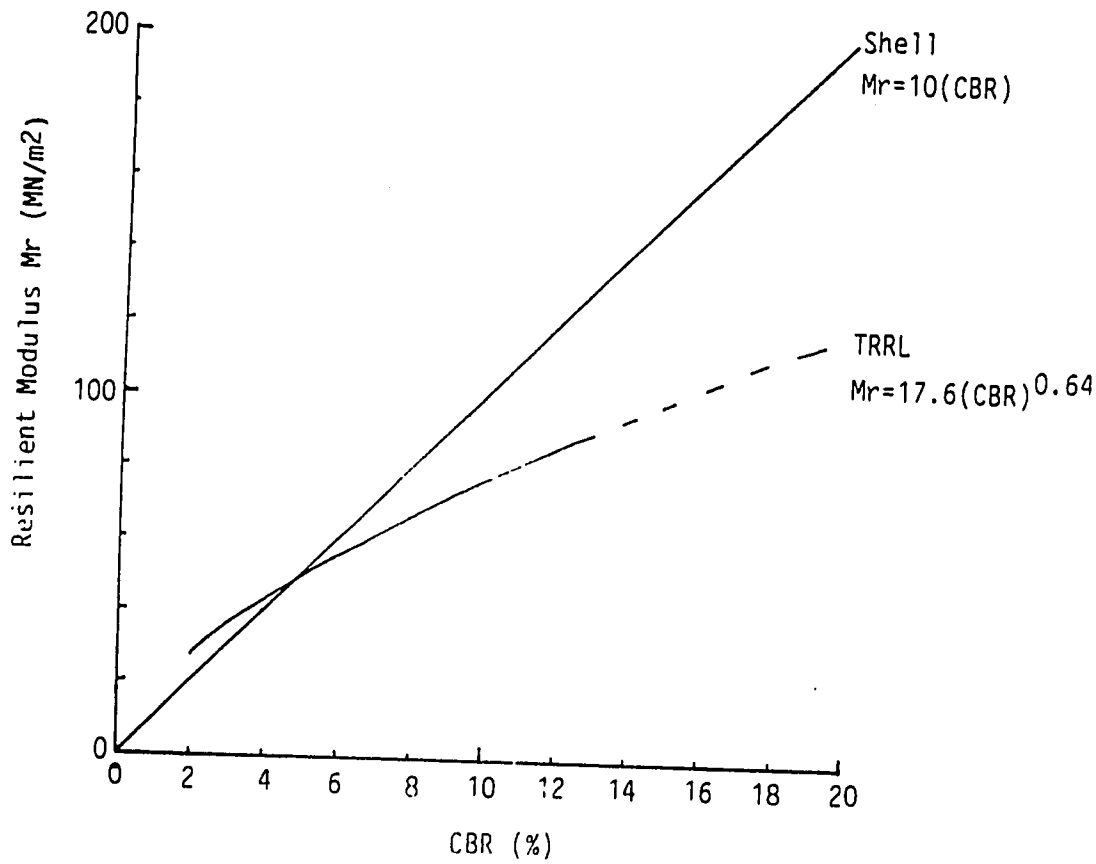


Figure 10 Resilient Modulus - CBR Relationships

Source: Reference 1

Source: Reference 1

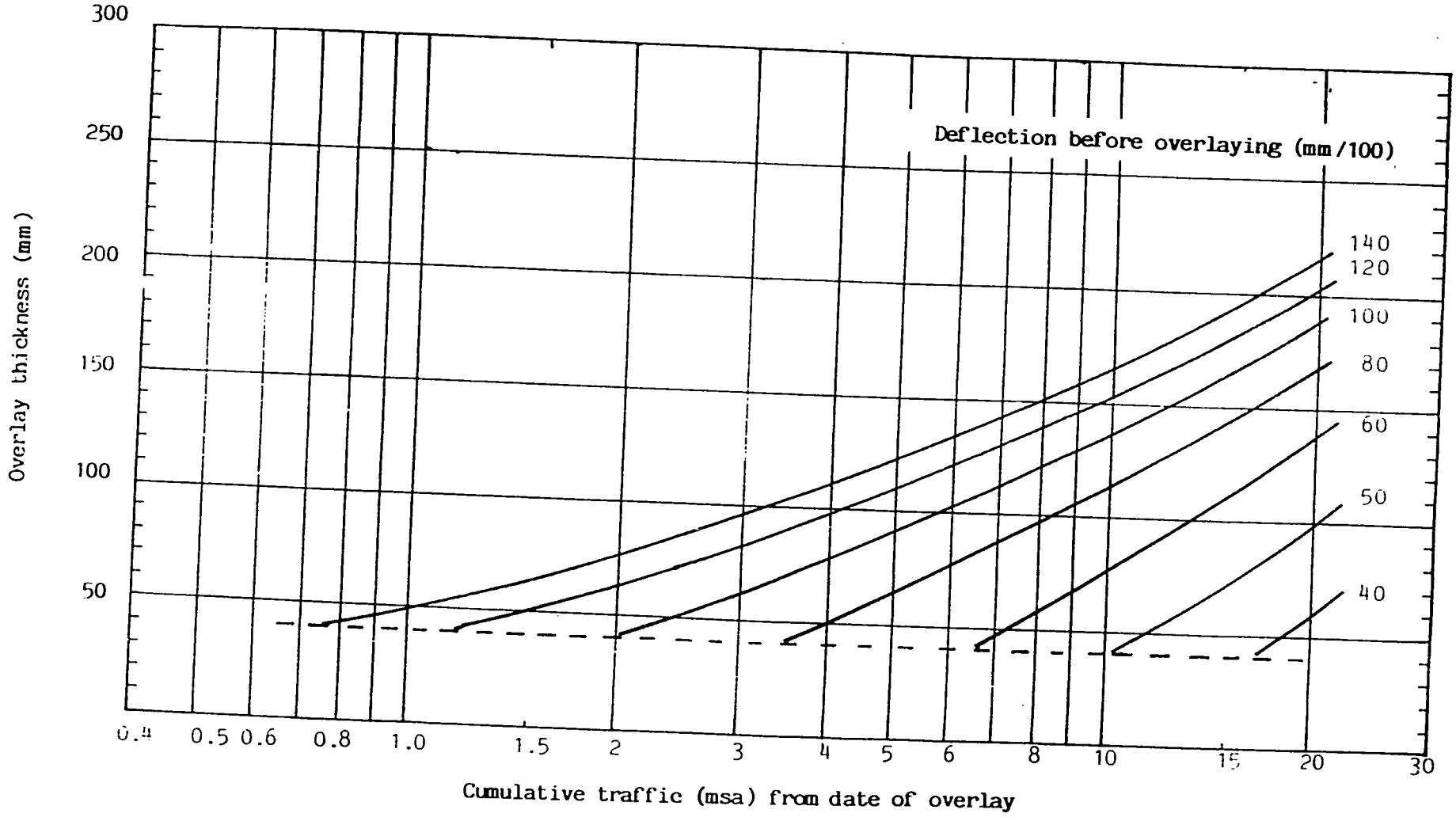


Fig 12 Overlay Design Chart B (Subgrade CBR 12%)

Source: Reference 1

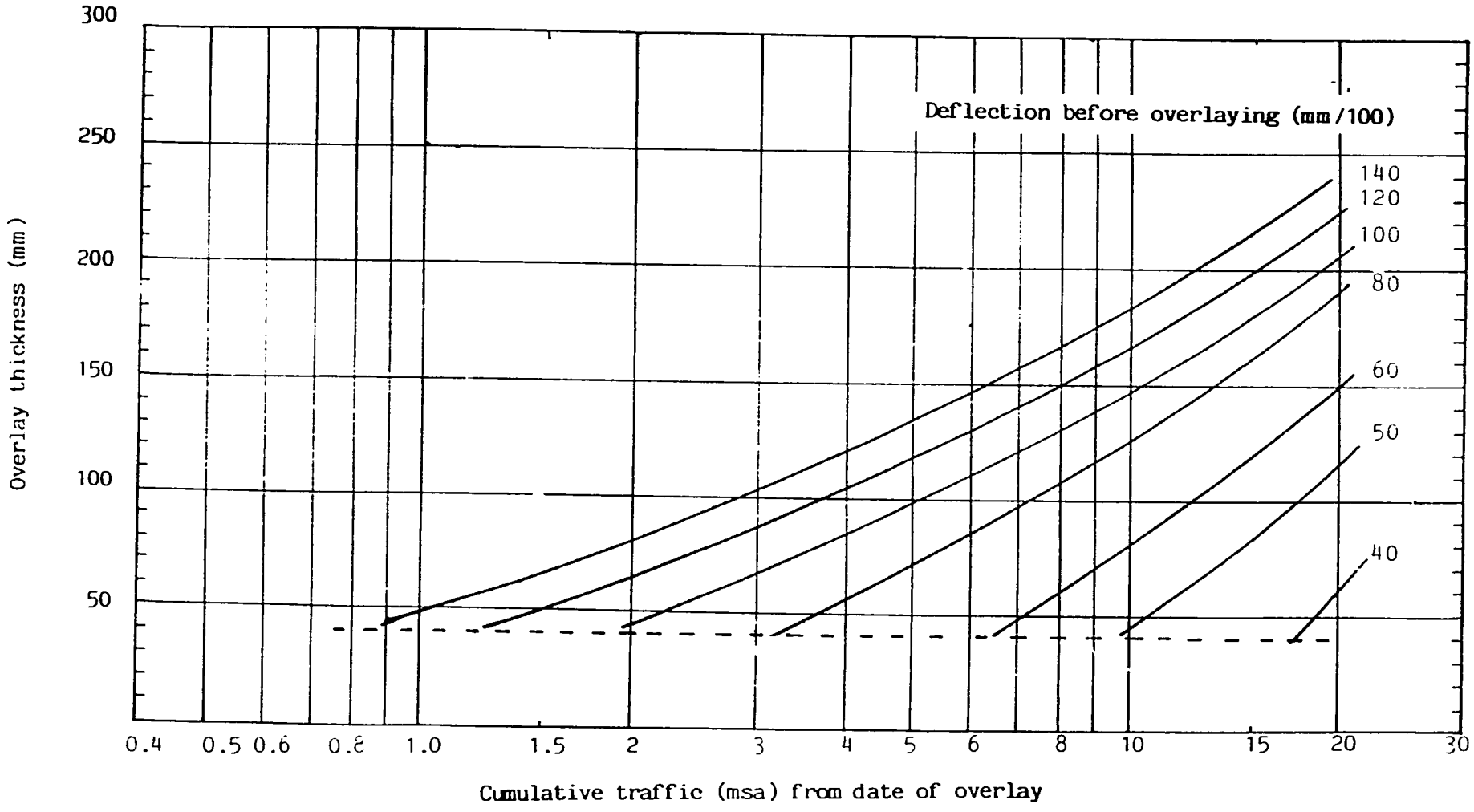


Fig 11 Overlay Design Chart A (Subgrade CBR 8%)

Source: Reference 1

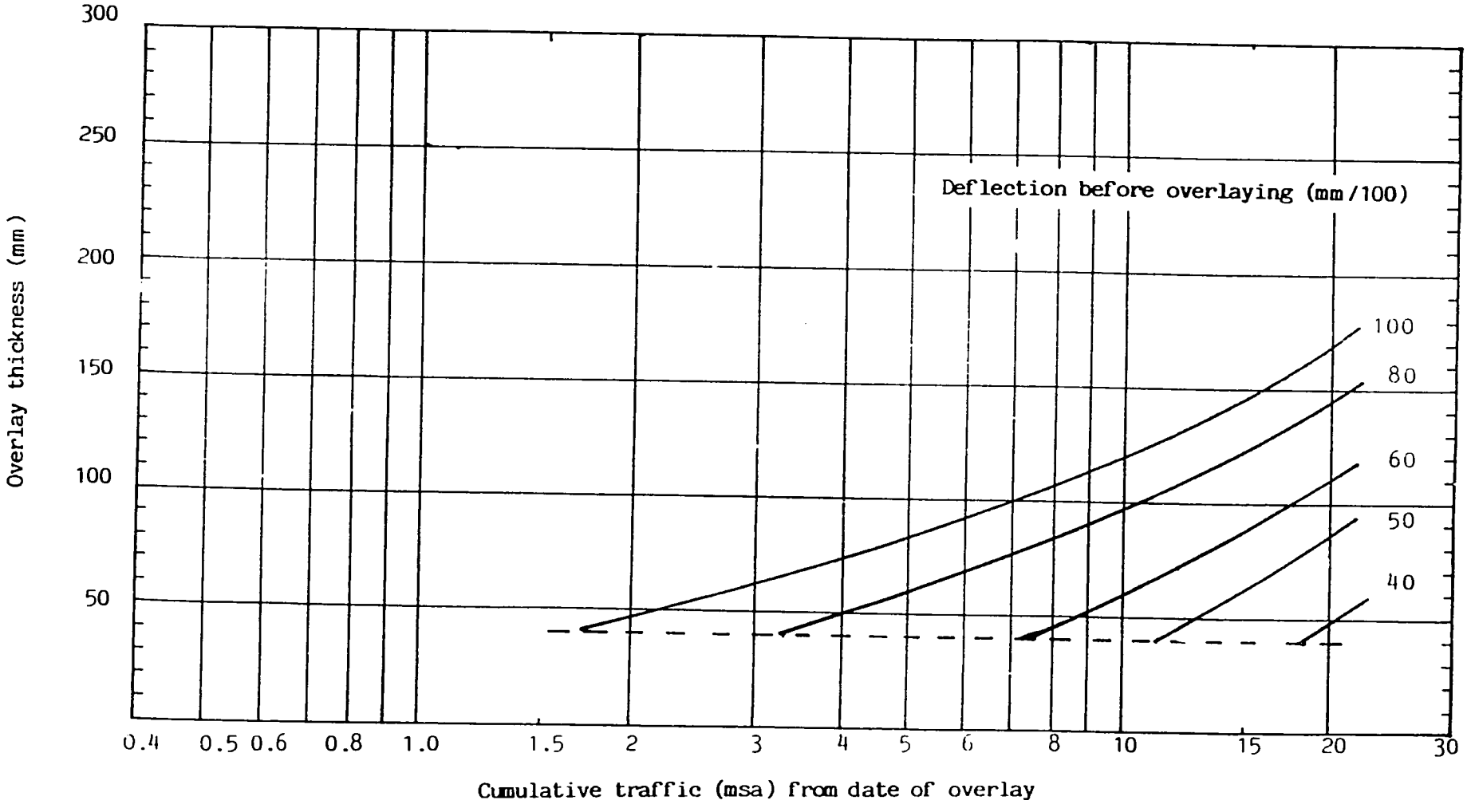
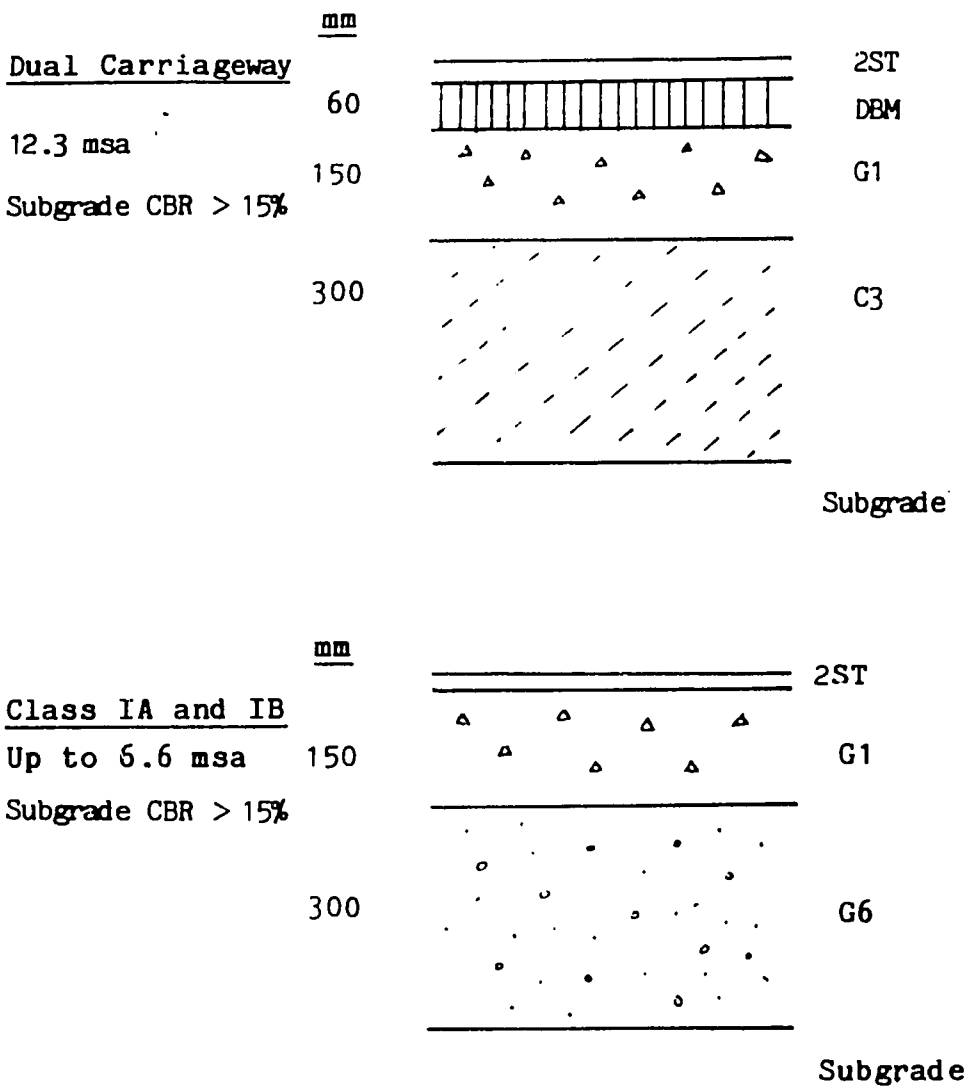


Fig 13 Overlay Design Chart C (Subgrade CBR 20%)



Legend

2 ST	Double Surface Treatment
DBM	Dense Bitumen Macadam
C3	Cemented Natural Gravel
G1	Graded Crushed Stone
G6	Natural Gravel

Figure 14 New Pavement Construction

Source: Reference 1

Economic Analysis

1. Introduction

1.1 General Background and Priority Context

As a result of the fact that a number of routes to the main SADCC ports are not fully operational, SADCC has, through its transport sector planning institution, SATCC, set about the task of preparing a comprehensive development plan for all the region's Port Transport System corridors. The Kafue-Lusaka Road is an integral part of the road section included in the Beira Port Transport System 10-Year Development Plan endorsed by SATCC in May 1986.

The major criteria for determining projects' inclusion in the SATCC program are as follows:

i) in keeping with overall SADCC objectives, projects should aim at the reduction of economic dependence of the member states, and/or the enhancement of genuine equitable regional integration;

ii) reflecting the regional character of SADCC, projects should be able to benefit more than one member state;

iii) to ensure consistence with national development objectives, and to assure government commitment, projects proposed for regional cooperation should also be part of the National Development Plans of the member states concerned;

iv) to ensure the comprehensiveness of the overall program, all projects of regional benefit should be included in the program, even if additional outside financing is not required;

v) in specific transport models, projects should generally aim at improvement of facilities and services defined as regional (e.g., regional ports, railways, trunk road networks, etc);

vi) minor transport elements of projects on other sectors should generally be dealt with as integral parts of the projects of those sectors, and thus not included in the SATCC program.

In keeping with the objectives of SADCC, AID has formulated a program that focuses on this crucial sector of transport. The strategic objective as enunciated in the RDSS is to "install capacity and improve efficiency in infrastructure that serves regional cooperation, provides a cess to regional and external markets and fosters economic growth".

AID has specifically identified the Harare-Lusaka corridor as an essential surface transportation link between Zimbabwe and Zambia that would facilitate the exchange of food and commercial consumer goods between the two nations and with other countries both inside and outside the region. So far, AID has financed (i) reconstruction, resealing and reshouldering of the 62 kilometers on the Zimbabwe side (Makuti-Chirundu), through a US$4.2 million concessional loan to the Government of Zimbabwe, and (ii) rehabilitation of 82 kilometers on the Zambia side (Chirundu-Kafue) through a US$13.1 million loan and US$990,000 grant to the Government of Zambia. The Kafue-Lusaka Road provides the final link on the Harare-Chirundu-Kafue-Lusaka Road Corridor. Of all options considered in the Kafue-Lusaka Road Project Feasibility Study, the 10-year design life rehabilitation option was favored in terms of being the least cost in financial, economic and foreign exchange terms. The life of project estimated costs are US$21.05 million in foreign cost and ZK53.5 million in local cost. The 10-year design option chosen covers widening of the road to class 1A and 1B standard (as appropriate) and strengthening to accommodate the 10-year design traffic with 90 mm overlays for the Makeni-Chilanga section and 80 mm overlays for the Chilanga-Kafue section and 50 mm thick overlays at 10 year intervals thereafter.

2. Project Context

2.1 Transport Constraint to the Import and Export Sector

As shown below, the project route contributes significantly to the alleviation of the transport constraint on the import and export sector, in terms of availability, distance and cost.

2.1.1 Route Availability

i) Rail

- Dar-es-Salaam Route: From Lusaka and the Copperbelt to Kapiri Mposhi by Zambia Railways, then via Mpika, Kasama and Tunduma to Dar-es-Salaam in Tanzania by TAZARA. (Although this route is the most important route for Zambia to the sea, Zambia does not totally rely on this route because of inefficient port operations at Dar-es-Salaam and capacity problems on the TAZARA railway line.)

- Southern Route: From Lusaka to Livingstone, thence Beira and Maputo in Mozambique and South African ports via Botswana or via Beit Bridge. (The Maputo route is currently not fully operational because of insurgency problems.)

- Northern Route: From Lusaka via Ndola to Lubumbashi (Zaire) and then through the Benguela railway (in Angola) to the port of Lobito. (Owing to political difficulties access to Lobito has been closed since 1975).

ii) Road

- Dar-es-Salaam Route: From Lusaka to Dar-es-Salaam via TANZAM Highway, which for most of the way runs parallel with TAZARA. (This road is tarred throughout but is in need of rehabilitation).

- Eastern Route: From Lusaka to Katete, thence either via Chipata to Mchinji and Malawi Railways to Nacala (Mozambique), or via Moatize (Mozambique) and the railway line to Beira. (Links to the Beira and Nacala ports in Mozambique are currently inaccessible because of insurgency problems while the railway line between Mchinji and Chipata is currently being extended.)

- Southern Route: From Lusaka to Livingstone, thence to Victoria Falls and on to Mozambique and South Africa, or to Kazungula Ferry and South Africa. (This route which the project road is part of, is fully operational).

- South Eastern Route: From Lusaka to Harare or the railhead at Lion's Den Northwest of Harare for Beira, and South African ports. (This route, which the project road is part of, and caters to substantial levels of import and export traffic between Zambia and Zimbabwe, if fully operational.)

2.1.2 Route distances.

As shown in Table 1 below, the Kafue-Lusaka road falls in between the shortest route:

TABLE 1: Distances to Ports (Km)

	Lusaka
Rail to Dar-es-Salaam	2,045
Road to Dar-es-Salaam	2,020
Road to Mchingi, thence rail to Nacala	1,705
Rail to Maputo	2,020
Rail to Beira	2,020
Road to Lion's Den, thence rail to Beira	1,115*
Rail to Durban via Botswana	2,751
Rail to Lobito	2,715

Source: Zambia Dry Port Study, 1989.

* Shortest route incorporating the project road.

2.1.3 Cost

A 1983 SATCC study compared user charges of various routes for some major commodities (see Table 2 below). This can be assumed to offer a valid comparative picture despite the change of tariffs and devaluation of the kwacha since then.

TABLE 2: User Charges per ton to or from Ports
(Zambia Kwacha at 1982 prices)

	Dar-es-Salaam		Nacala	Maputo	Beira*		Durban
	Rail	Road	Rail + Road	Rail	Road	Rail/Road	Rail
Exports							
Copper (Kitwe)	75**	130	210	130	130	125	145
Lead (Kabwe)	60**	115	125	90	105	90	130
Mixed General Cargo							
Container 15t (Lusaka)	205	270	275	185	185	180**	310
General Cargo (Lusaka)	195**	290	325	240	240	210	310
Imports							
Wheat (Lusaka)	105	145	160	85	90	70**	120
Fertilizer (Kafue)	105	160	155	90	90	70**	125
Machinery (Kitwe)	340**	405	510	410	420	395	520
Mixed General Cargo:							
Container 15t (Lusaka)	380	480	450	365	360**	440	485

Source: SATCC Technical Unit, July 1983

* Project road forms part of both the road and rail/road links on the Beira corridor.
** Lowest cost alternative

The Dar-es-Salaam and Beira rail/road corridors are the cheapest routes, with the Beira rail/road corridor providing the lowest cost alternative for containerized general cargo exports and wheat and fertilizer imports.

2.2 Investment Criteria for A.I.D.

In order to guide project design strategy, eight criteria were identified in the original PID and they have been addressed as far as they relate to this project as follows:

(i) Short-to medium-term importance of transport constraints (cost and availability) to the import/export sector of SADCC countries.

Because of operational, capacity and security problems, traffic distribution is not optimized according to ideal cost or availability criteria. For example, copper exports (6,000 tons per month) are being shipped via the project road to Beira because the normally cheaper Dar-es-Salaam route incurs costs related to traffic congestion and operational inefficiencies. Shipping via road to Beira is currently relieving this constraint, because negotiated competitive shipping rates can be obtained if certain shipping quantities can be guaranteed.

(ii) Relative priority within SADCC countries (as measured by, e.g., foreign exchange spent on transport as a percentage of foreign exchange earnings)

Zambia's heavy dependence on foreign trade and the great distance between it and its major trading partners, means that the country has a relatively high cost economy. The tenuous position of Zambia was evident in a 1982 UNDP comparative study of Zambia, Zimbabwe and Malawi where the freight costs as a percentage of the value of imports were estimated at 16.42%, 12.84% and 11.96%, respectively. Since a large component of freight costs are in foreign currency, by virtue of being on a relatively less costly route, the project road reduces foreign exchange expenditure.

(iii) Economic feasibility of the project as measured by the estimated rate of return

The choice proposed and found to be economically viable involves rehabilitation, and the internal rates of return obtained for the road segments were favorable, ranging from 25 to 30 percent (see Project Analysis).

(iv) Total system reliability within proposed project corridor, i.e., the status of other critical links in the transportation network

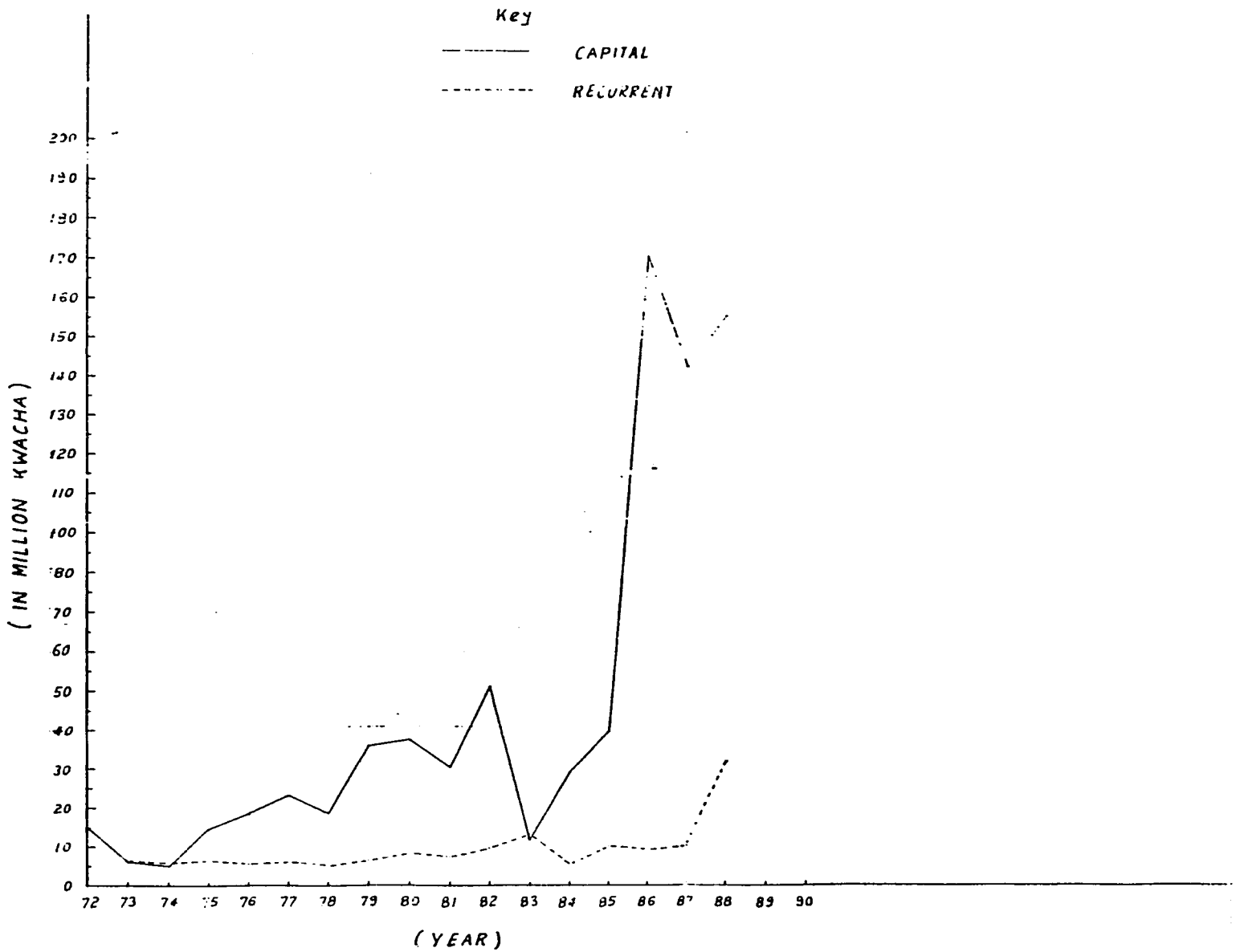
For consumption goods requiring speedy delivery, the project road offers a more reliable and quicker facility as compared to available alternative rail corridors. This route also provides a more reliable route for the very essential fertilizer and industrial goods imports.

(v) Capacity of host country to finance recurrent costs and maintain the project

The graphical presentation of the comparison of capital versus recurrent expenditure shows that the gap between capital and recurrent expenditure has in nominal terms increased substantially over the past five years. This substantial increase in capital expenditure has been matched by a relatively modest increase in recurrent expenditure. In real terms, the increases could be negative given the loss of value of the Kwacha over the same period. Amid the current economic crisis, the country is therefore faced with increased pressure to match the current major rehabilitation of trunk roads, with adequate recurrent expenditure.

In order to address the problem of recurrent expenditure, there would be a need to establish a revenue earning base for the road sector. This would necessitate the need for relating road user

COMPARISON OF CAPITAL VS RECURRENT EXPENDITURE



Source: Roads Department

tariffs to road damage. Most of the road damage is attributable to commercial heavy trucks, the number of which has been increasing over the years (see Demand Analysis). Current government policy allows for charging international commercial trucks US$60 per entry, irrespective of weight.

Specific approaches for addressing the problem of user tariffs are outside the realms of this project. However, the project will require enforcement of loading regulations through use of the A.I.D.-funded weighbridge at Kafue. This will be necessary in order to ensure less damage to the road. In addition, a proper maintenance plan will be provided by the GRZ prior to disbursement of project funds.

(vi) Medium- long-term impact of the transport system on economic growth in the region

This aspect is addressed within the project's aims of strengthening this corridor as a cost effective alternative to the South African routes, promoting increased exports to regional and overseas markets, providing regional food security and developing the human resources base and management effectiveness in the road transport sector.

(vii) Priority of the project within SADCC and SATCC Programs

The project road is a high priority in the SATCC's regional transport network development plan (see 1.1 General Background and Priority Context).

(viii) System security within proposed project corridor

The project road is in a location that has no security problems.

2.3 Investment Scope

2.3.1 Conceptual Framework for Project Analysis

The original Kafue-Chirundu-Makuti road project goal is to enhance the economic development of Southern Africa by facilitating the movement of key commodities (food grains and commercial goods) between Zambia and Zimbabwe, and with neighboring countries. As shown in Table 2 the road is on a least cost alternative corridor for containerized general cargo exports and wheat and fertilizer imports. In the new project (Kafu -Lusaka road), the original project goal and purpose is retained i.e. "to support the development of a stronger economic foundation for growth in Southern Africa", by strengthening and expanding the capacity and operational efficiency of the road system between Lusaka (Zambia) and Harare (Zimbabwe).

The implication for project analysis is that the benefit stream (mainly regional) accruing to proposed project activities is inextricably bound to those previous rehabilitation projects, since this 49 km segment forms the final road link connecting Lusaka with import, export and transit corridors to the south. In addition, original project economic analysis, in which internal rates of return ranged from 13% to 24% (reflecting measurable direct benefits of vehicle operating costs and road maintenance cost savings), assumed that work would proceed on the Kafue-Lusaka leg.

The 1987 mid-term evaluation of the Kafue-Chirundu road project determined that the project's goal and purpose remained valid and therefore was not to be changed. There are indications that, since the original project IRR was calculated, the benefits have not decreased. However, the Kafue-Lusaka road portion has already come to the end of its economic life and if allowed to deteriorate any further, the cost of restoration would be so high that it would inevitably eliminate anticipated benefits from the previous investment on the Kafue-Chirundu road. This is, in effect, tantamount to disinvestment. This is as a result of the fact that

since the project road lies on the same stretch as the Kafue-Chirundu road, vehicle operating cost savings estimated on the Kafue-Chirundu road project would inevitably be reduced by deteriorated road conditions on the project road.

The first phase of the economic analysis involves a least cost analysis of the road maintenance and rehabilitation alternatives. The alternatives are reviewed in this analysis in terms of how costs respond to deteriorating conditions on the road. The cost implications are then expressed in economic, financial and foreign exchange terms. Finally, a rate of return is calculated for the preferred option to show whether there are enough transport cost savings to justify the road expenditure.

2.3.2 Demand Analysis

(a) Regional Demand Setting

In June 1989, Coopers and Lybrand Associates were commissioned by USAID/Zambia to undertake an analysis of cross-border traffic movements at Chirundu, Kazungula and Victoria Falls for the year 1988. This was intended inter alia to provide insights on the regional usage of the Kafue-Lusaka road. Analysis was based on a sample count of approximately 30% of representative months' Bills of Entry (see Attachment for detailed analysis). In 1988, about 350,000 tons of regional traffic used the three border posts, through the project road. The distribution of the cargo traffic was roughly 10% exports, 30% imports and 60% transit. Exports, 80% of which went through Chirundu included copper and industrial goods and were mostly destined for overseas (copper), Zimbabwe, R.S.A. and Botswana. Chirundu also handles over 50% of imports comprising agricultural inputs, industrial goods and cereals, and were mostly from Zimbabwe, R.S.A., Swaziland, Botswana and overseas. Transit traffic (mainly petroleum products and industrial goods) mainly originated or was destined to Zimbabwe, Zaire, Mozambique and Malawi.

From the analysis of the regional trade flows, the road plays a major role in promoting intra-regional trade, since it connects with all major international road and rail links leading into and out of the country.

(b) Existing Traffic on Project Road

Based on a traffic survey done by the Roads Department and John Burrows, consultants, traffic flows were established at 1487 vehicles per day, made up as follows:

Light vehicles	826
4-wheel drive and minibus	203
Medium trucks	245
Heavy trucks	29
Articulated trucks	113
Buses	71
Total	1487

(c) Traffic Growth Trend

Partly due to the poor performance of the Zambian economy, and diversion of traffic to TAZARA, traffic on the project road, has declined by about 6% since 1975. However, traffic counts for one of the count stations near Kafue reveals that in overall terms traffic has remained static. (See Table below.)

TABLE 3: TRAFFIC GROWTH AT TRAFFIC COUNT STATION NEAR KAFUE (1983-1989)

Year	Light Vehicles	Buses	Single Trucks*	Articulated Trucks	Total
1983	554	27	295	57	933
1984	756	28	279	59	1122
1985	595	23	276	66	960
1986	635	38	282	60	1015
1987	507	29	159	100	795
1988	796	13	243	161	1203
1989**	632	19	173	129	911

Source: Roads Department

* Assumed to include all commercial vehicles other than single unit trucks and buses

**Not assessed as part of the annual traffic census.

As shown in the table below, while total truck traffic as a percentage of total traffic has remained static, articulated truck traffic has increased at the expense of single unit truck traffic.

TABLE 4: TRUCK TRAFFIC AS A PERCENTAGE OF TOTAL TRAFFIC AT KAFUE WEIGHBRIDGE (1983-1989)

Year	Single Unit Truck Traffic as % of Total Traffic	Articulated Truck Traffic as % of Total Traffic	Total Truck Traffic as % of Total Traffic
1983	31.6	6.1	37.7
1984	24.9	5.3	30.2
1985	28.8	6.9	35.7
1986	27.8	5.9	33.7
1987	20.0	12.7	32.7
1988	20.2	13.4	33.6
1989	19.0	14.2	33.2

Source: Roads Department

d) Future traffic growth on project road

Articulated truck traffic, with the highest pavement damaging factor, has been increasing over the five years (1983-1989) by about 15%. The following formula is used to estimate traffic growth rate:

Annual Traffic Growth Rate = a x b x 100

Where a = Percentage of articulated truck traffic as a component of the whole traffic

Where b = The growth rate of this component of traffic

Although this yields a traffic growth rate of 2.1%, the figure was rounded up to 2.5% to accommodate potential increase of corridor usage due to the local growth impact (e.g., Kafue developing as a national fertilizer distribution center) and regional economic and political developments (e.g., congestion of the Dar-es-Salaam corridor and political stability in Mozambique). This 2.5% growth factor has been used on the current traffic levels determined by traffic counts and data from the Roads Department. This in turn has been used to enable selection between pavement construction alternatives. (See Technical Analysis.)

3. Project Analysis

3.1 Evaluation Model - The World Bank HDM III

The World Bank Highway Design and Maintenance Standards Model (HDM 111) is a multiple link-alternative model which is capable of analysing several road links in one run - a link being a length of road carrying uniform traffic loading. The model reflects empirical research on statistically validated physical and economic relationships underlying road deterioration.

While the model is ideally suitable for analysing transport costs for a network of roads, its prime function as an investment appraisal model is to calculate the components of the transport costs in each year of an analysis period and conduct an economic comparison of different construction alternatives. These costs are then discounted at determined rates for the whole economic life to enable calculation of net present value and IRR.

3.2 Model Inputs and Assumptions

As detailed in Table 5, and based on existing road surveys and data obtained from Roads Department and suppliers in Lusaka, values were calculated using the following assumptions:

(i) Traffic

There would be no assumed generated traffic arising from improvements to the road.

(ii) Costing

To minimize the impact of the volatile national foreign exchange rate, the U.S. dollar is used as the denominator for all project costings.

(iii) Financial

The official exchange rate of US$1 = K10 was used though at a later stage (July 14, 1989), the currency was devalued by 60% to a new rate of US$1 = K16. The effect would only be in the absolute value of the results. For construction costs only an exchange rate of US$1=K30 has been used on the assumption that contractors will subsidise the kwacha element of the project to obtain dollars.

(iv) Economic (shadow pricing)

Given that the current parallel market rate is about US$1 = K60 and project components reflecting an estimated cost composition ratio of 80% foreign and 20% local, a shadow exchange rate of US$1 = K50 was considered reasonable. The economic costings exclude tax and duty elements but no further adjustments were made for opportunity cost of labor or or the effect of government subsidies other than through exchange rate valuation.

3.3 Evaluation Parameters

In order to estimate returns on investment capital, different design lives were compared with a 'minimum-intervention' base case. (See Technical Analysis for determination of pavement strength and design standards based on traffic level estimates). Because the road section between Lusaka and Makeni would require a dual carriageway which would not be significantly affected by the alternative proposed design periods, it was not analysed. The two sections Kafue-Chilanga and Chilanga-Kafue were evaluated separately on the basis of two one-kilometer sample homogeneous lengths representing conditions before and after improvements. The following six options were then considered for the analysis:

Option 1: Minimum-intervention - existing road and existing condition plus routine maintenance plus 100% pothole patching.

Option 2: Periodic Maintenance Option A - existing road and existing condition plus routine matinenance plus 100% pothole patching plus surface dressing whenever wide cracking exceeds 15% of pavement area.

Option 3: Periodic Maintenance B - existing road and existing condition plus routine maintenance plus 100% pothole patching plus surface dressing whenever wide cracking exceeds 15% of pavement area plus 50 mm overlay whenever roughness exceeds 2500 mm/km.

Option 4: 10 Year Design Option - road widened to class 1A and 1B standard (as appropriate) and strengthened to accommodate the 10-year design traffic with 90 mm overlays for the Makeni-Chilanga section and 0 mm overlays for the Chilanga-Kafue section and 50 mm thick overlays at 10 year intervals thereafter.

Option 5: <u>15 Year Design Option</u> - as above but strengthened to accommodate the 15 year design traffic with 120 mm overlays for the Makeni-Chilanga sections and 110 mm overlays for the Chilanga-Kafue section and 50 mm thick overlays at 15 year intervals thereafter.

Option 6: <u>20 Year Design Option</u> - as above but strengthened to accommodate the 20 year design traffic with 150 mm overlays for the Makeni-Chilanga section and 135 mm overlays for the Chilanga-Kafue section and 50 mm thick overlays at 20 year intervals thereafter.

3.4 Evaluation Output

The above options were examined, using a 30 year economic analysis period, as below:

Table 5: Average Road Cost (Million Zambia Kwacha) Per Year Per Kilometer For The Two Sections of Road

Option	Cost Category	Section A (Makeni - Chilanga)		Section B (Chilanga - Kafue)	
		Discount Rate* 0%	12%	Discount Rate* 0%	12%
1 do minimum	Financial	19.260	4.173	7.003	1.573
	Economic	47.017	10.117	17.170	3.823
	Foreign	11.997	2.673	4.357	1.000
2 periodic maintenance	Financial	17.343	3.827	6.330	1.400
	Economic	42.276	9.283	15.600	3.437
	Foreign	11.013	2.500	4.013	0.913
3 periodic maintenance	Financial	14.193	3.547	4.977	1.263
	Economic	34.277	8.557	12.110	3.060
	Foreign	9.450	2.360	3.357	0.850
4 rehabilitation 10 year design life	Financial	14.210	3.667	5.053	1.377
	Economic	34.213	8.783	12.230	3.287
	Foreign	9.470	2.430	3.403	0.913
5 rehabilitation 15 year design life	Financial	14.280	3.697	5.173	1.397
	Economic	34.400	8.840	12.290	3.327
	Foreign	9.503	2.447	3.410	0.923
6 rehabilitation 20 year design life	Financial	14.353	3.727	5.117	1.417
	Economic	34.557	8.893	12.387	3.370
	Foreign	9.540	2.463	3.433	0.933

Source: Kafue-Lusaka Project Feasibility Study/Cost Analysis, John Burrow & Partners, 1989

Option 3 offers the least cost in financial, economic and foreign exchange terms, followed by Option 4. To accommodate the possibility of lack of finance for full rehabilitation, the two low cost improvements were compared at 0% and 12% discount rates as follows:

Table 6: Comparison of Average Road Costs (Million Zambia Kwacha) Of The Periodic Maintenance Option 3 and the 10-Year Design Life Rehabilitation Option 4

	Section A Makeni - Chilanga			Section B Chilanga - Kafue		
	Financial Cost	Economic Cost	Foreign Currency Cost	Financial Cost	Economic Cost	Foreign Currency Cost
Periodic Maintenance (Option 3)	3.547	8.557	2.360	1.263	3.060	0.850
Rehabilitation (Option 4)	3.667	8.763	2.430	1.377	3.287	0.913
% Difference	3.38%	2.41%	2.97%	9.03%	7.42%	7.41%

Periodic maintenance Option 3 was found to be slightly less expensive. However, in Option 3, there is an inherent high maintenance requirement which, because of government problems of allocating adequate funds for recurrent maintenance expenditure, makes this option a high risk one. Besides, the transport costs inherent in the maintenance option are understated from what is likely to actually occur over the time span of the analysis. The next best option, the 10-year design Option 4, is preferred because it is only relatively less maintenance expensive and yet only slightly more expensive.

An internal rate of return was then calculated for Option 4 in order to determine whether this would produce enough transport cost savings. The minimum maintenance alternative (Option 1) was considered to represent the without-project case. That is, the analysis assumed that the Government of Zambia would carry aout the expenditures contained in the minimum alternative. The incremental benefits were assumed to be the reduction in transport costs resulting from the road improvement while the incremental costs were those associated with the higher costs required to raise the

standard of the road design. (For basic input data used in the HDM III model economic analysis, see Attachment B). Based on this approach, the IRRs for the two road segments were as follows:

	IRR
Section A: Makeni-Chilanga	29.9%
Section B: Chilanga-Kafue	24.6%

Sensitivity Test

These high IRRs were obtained using rather conservative values for costs and traffic flows. It would take unrealistic changes in the variables to reduce the IRR below 12%, the point at which we might begin to question the feasibility of the investment. For that reason, no sensitivity analysis was deemed necessary. Furthermore, no attempt has been made to quantify the benefits that are likely to occur as a result of a decrease in road accidents or to vehicle operating costs.

3.5 Conclusion

Based on the least cost and the internal rate of return analyses conducted for this project, the Mission is confident that the project will provide the rate of return in the range of 25%-30%.

Attachments

1989 Commodity Analysis of Coopers & Lybrand - June 1989 Survey
Carried out at Chirundu, Kazungula and Victoria Falls Border Posts

Chirundu

1A - Exports: Origin and Destination Analysis of Cargo Traffic

1B - Imports: Origin and Destination Analysis of Cargo Traffic

1C - Destination Analysis of Transit Cargo Traffic

1D - Origin Analysis of Transit Cargo Traffic

1E - Value to Weight Calculation of Total Cross Border Cargo Traffic

Victoria Falls

2A - Exports: Origin and Destination Analysis of Cargo Traffic

2B - Imports: Origin and Destination Analysis of Cargo Traffic

2C - Destination Analysis of Transit Cargo Traffic

2D - Origin Analysis of Transit Cargo Traffic

2E - Value to Weight Calculation of Total Cross Border Cargo Traffic.

Kazungula

3A - Exports: Origin and Destination Analysis of Cargo Traffic

3B - Imports: Origin and Destination Analysis of Cargo Traffic

3C - Destination Analysis of Transit Cargo Traffic

3D - Origin Analysis of Transit Cargo Traffic

3E - Value to Weight Calculation of Total Cross Border Cargo Traffic.

ATTACHMENT 1A

ORIGIN AND DESTINATION ANALYSIS OF Transit Cargo Traffic

Year: 1988

NAME: CHIRUNDU BORDER POST

EXPORTS

COMMODITY TYPE	Origin	DESTINATION (TONS) Overseas	Zimbabwe	Mozambique	RSA	Botswana	Lesotho	Swaziland	Other	Total
COPPER	Kafue									
	Lusaka									
	Other	24172								24172
	S/total	24172								24172
OTHER MINERALS	Kafue									
	Lusaka									
	Other									
	S/total									
PETROLEUM PRODUCTS	Kafue									
	Lusaka									
	Other		3405							3405
	S/total		3405							3405
OTHER INDUSTRIAL GOODS	Kafue									
	Lusaka									
	Other									
	S/total									
CEREALS/ OTHER AGRIC PRODUCTS	Kafue		1702							1702
	Lusaka									
	Other									
	S/total		1702							1702
AGRIC INPUTS	Kafue									
	Lusaka									
	Other									
	S/total									
OTHER CONSUMPTION GOODS	Kafue									
	Lusaka		3300		1200	266				4766
	Other									
	S/total		3300		1200	266				4766
PERSONAL EFFECTS	Kafue									
	Lusaka									
	Other									
	S/total									
TOTAL		24172	9407		1200	266				34045

NOTE:

Origin 'other' - Kitwe for Copper and Ndola for Petroleum Products, Kabwe, Livingstone, etc.

ORIGIN AND DESTINATION ANALYSIS OF Cargo Traffic

Year: 1988

NAME: CHIRUNDU BORDER POST

(IMPORTS)

COMMODITY TYPE	Destination	ORIGIN: Overseas	Zimbabwe	Mozambique	RSA	Botswana	Lesotho	Swaziland	Other	Total
COPPER	Kafue									
	Lusaka									
	Other									
	S/total									
OTHER MINERALS	Kafue									
	Lusaka									
	Other									
	S/total									
PETROLEUM PRODUCTS	Kafue									
	Lusaka					171				171
	Other									
	S/total					171				171
OTHER INDUSTRIAL GOODS	Kafue		13		9					22
	Lusaka	79	10094		10919	383		1179		22654
	Other	19	14812		12505	567		1910		29813
	S/total	98	24919		23433	950		3089		52489
CEREALS/ OTHER AGRIC PRODUCTS	Kafue									
	Lusaka									
	Other									
	S/total									
AGRIC INPUTS	Kafue									
	Lusaka	23	4395		224					4642
	Other									
	S/total	23	4395		224					4642
OTHER CONSUMPTION GOODS	Kafue									
	Lusaka		1952		8091	664				10707
	Other									
	S/total		1952		8091	664				10707
PERSONAL EFFECTS	Kafue									
	Lusaka		17		82					99
	Other									
	S/total		17		82					99
TOTAL		121	31283		31830	1715		3089		68168

NOTE: Destination 'other' - Mitwe, Ndola, Mabwe, etc.

Table 1: Staffing Levels

Designation	Salary Scale	Est 1987	Est 1988	Strength 1988 Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Director of Roads	GPS/3	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Dep. Director of Roads	GPS/5	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Senior Exec. Engineer	GPS/7	7	7	5	5	5	5	5	5	5	5	5	5	4	2
Exec. Engineer	GPS/9	18	18	4	4	4	4	4	4	4	4	4	4	4	6
Exec. Engineer Mechanical	GPS/9	4	4	1	1	1	1	1	1	1	1	1	1	1	1
Senior Exec Officer	S/11/10	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Personnel Officer	S/11/10	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Executive Officer	S/13/12	4	4	4	4	4	4	3	3	3	3	3	3	3	1
Asst. Personnel Officer	S/13/12	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Registry Supervisor	S/13	1	1	-	-	-	-	-	-	-	-	-	-	-	-
Asst. Executive Officer	S/14	2	2	2	2	2	2	1	1	1	1	1	1	1	2
Clerical Officer	S/15	10	10	10	10	10	10	7	9	9	9	9	9	9	9
Tel. Operator Grade 1	S/17	2	1	1	1	1	1	1	1	1	1	1	1	1	1
Asst. Clerical Officer	S/19/17	14	14	13	13	13	13	11	14	14	14	14	14	14	14
Head Orderly	S/19	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Laboratory Assistant	S/19/16	7	7	4	4	4	4	4	4	4	4	4	3	3	3
Computer Operator	S/12/11	1	1	-	-	-	-	-	-	-	-	-	-	-	-
Tel. Operator Grade II	S/19/18	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Senior Orderly	S/19	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Chief Engineering Asst.	TS/2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Chief Materials Officer	TS/2	1	1	-	-	-	-	-	-	-	-	-	-	-	-
Chief Road Inspector	TS/2	1	1	-	-	-	-	-	-	-	-	-	-	-	-
Chief Mech.Superintendant	TS/3	1	1	-	-	-	-	-	-	-	-	-	-	-	-
Senior Engineering Asst.	TS/3	3	3	1	1	1	1	-	-	-	-	-	-	-	-
Senior Materials Officer	TS/3	4	4	1	1	1	1	1	1	1	1	1	1	1	2
Senior Road Inspector	TS/3	8	8	6	6	6	4	4	3	3	3	3	3	3	3
Road Inspector	TS/4	9	9	9	9	9	9	9	8	8	8	8	8	8	4

Table 1: Staffing Levels

Designation	Salary Scale	Est 1987	Est 1988	Strength 1988 Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Road Superintendant	TS/5	29	29	20	20	20	20	14	16	16	16	16	16	16	14
Mech.Engineering Asst.	TS/5/4	4	4	-	-	-	-	-	-	-	-	-	-	-	-
Draughtsman	TS/6/14	3	3	2	2	2	2	2	2	2	2	2	2	2	2
Engineering Assistant	TS/6/4	16	16	11	11	11	11	10	10	10	10	10	10	10	12
Materials Officer	TS/6/4	4	4	3	3	3	3	4	3	3	3	3	3	3	3
Asst. Field Survey Officer	TS/6/5	6	6	1	1	1	1	1	1	1	1	1	1	1	1
Mechanic	TS/6/5	2	2	-	-	-	-	-	1	1	1	1	1	1	2
Road Foreman & Plant Oper.	TS/6/5	3	3	1	1	1	1	-	1	1	1	1	1	1	1
Learner Field Survey Offic.	TS/8/7	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Materials Assistant	TS/8/7	5	5	4	4	4	4	2	2	2	2	2	2	2	2
Sub-Road Foreman	TS/8/7	1	2	-	-	-	-	-	-	-	-	-	-	-	-
Tracer	TS/8/7	5	5	4	4	4	4	5	5	5	5	5	5	5	5
Transport & Mach.Overseer	TS/8/7	14	14	9	9	9	9	7	8	8	8	8	8	8	8
Learner Technician	TS/9	5	5	-	-	-	-	-	-	-	-	-	-	-	-
Stenographer	SS/2	2	2	1	1	1	1	1	1	1	1	1	1	1	2
Typist	SS/4	12	12	12	12	12	12	12	12	12	12	12	12	12	12

ATTACHMENT I C

Destination Analysis of Transit Cargo Traffic

TRANSIT

NAME: CHIRUNDU CUSTOMS POST

YEAR: 1988

COMMODITY TYPE	DESTINATION OF TRANSIT TRAFFIC														
	NORTHBOUND							SOUTHBOUND							
	Over-seas	Tanzania	Zaire	Malawi	Kenya	Uganda	Other	Over-seas	Zimbabwe	Mozambique	RSA	Botswana	Lesotho	Swaziland	Other
COPPER															
OTHER MINERALS															
PETROLEUM PRODUCTS			4564	32787											
OTHER INDUSTRIAL GOODS		51	11954	2049	3154	308	6333		1027						
CEREALS & AGRICUL GOODS			6278	41418	221		1201	6691	401		765				
AGRICULTURAL INPUTS			3933	8930	51										
OTHER CONSUMPTION GOODS			5680	517			928		254						
PERSONAL EFFECTS				968				120			40				
TOTAL		51	32409	86569	3426	308	8462	6811	1682		805				

NOTE

* NORTH BOUND

Destination 'other' - Burundi and Rwanda.

ATTACHMENT 1D

ORIGIN ANALYSIS OF TRANSIT CARGO TRAFFIC

YEAR 1988

NAME: CHIRUNDU CUSTOMS POST

TRANSIT

COMMODITY TYPE	ORIGIN OF TRANSIT TRAFFIC (IN TONS)														
	SOUTHBOUND							NORTHBOUND							
	Over-seas	Tanza-nia	Zaire	Malawi	Kenya	Uganda	Other	Over-seas	Zimbabwe	Mozamb-que	RSA	Botswa-na	Lesotho	Swazi-land	Other
COPPER															
PETROLEUM PRODUCTS									34691	1835	825				
OTHER INDUSTRIAL GOODS	410	206			411			423	13773		7930			1718	
CEREALS & AGRIC GOODS				7857					49015		103				
AGRICUL-TURAL INPUTS									8526		4388				
OTHER CONSUMP-TION GOODS	102	52			100				6198		927				
PERSONAL EFFECTS				160					968						
TOTAL	512	258		8017	511			423	113071	1835	14173			1718	

ATTACHMENT 1 E

VALUE TO WEIGHT CALCULATION OF TOTAL

CROSS BORDER CARGO TRAFFIC

YEAR: 1988

NAME: CHIRUNDU CUSTOMS POST

COMMODITY TYPE	CALCULATION OF WEIGHT TO VALUE RELATIONSHIP					
	NORTHBOUND			SOUTHBOUND		
	Total Tonnage	Total Value (US. Dollars in '000)	Value per Ton (US. Dollars in '000)	Total Tonnage	Total Value (US. Dollars in '000)	Value per Ton (US. Dollars in '000)
COPPER				24172	33670	1.39
OTHER MINERALS						
PETROLEUM PRODUCTS	37522	9641	0.257	3405	328	0.1
OTHER INDUSTRIAL GOODS	76338	80594	1.056	1027	534	0.52
CEREALS AGRIC	49118	8401	0.171	9559	17423	1.82
AGRICULTURAL INPUTS	17556	5214	0.297			
OTHER CONSUMPTION GOODS	17832	13739	0.770	5020	3263	0.65
PERSONAL EFFECTS	967	2578	2.666	160	386	2.41
TOTAL	199333	120167	0.603	43343	55604	1.28

Note: Z$ 1 = US$1

ATTACHMENT 2 A

ORIGIN AND DESTINATION ANALYSIS OF CARGO TRAFFIC

Year: 1988

NAME: VICTORIA FALLS BORDER POST

EXPORTS

COMMODITY TYPE	Origin	DESTINATION (TONS) Overseas	Zimbabwe	Mozambique	RSA	Botswana	Lesotho	Swaziland	Other	Total
COPPER	Kafue									
	Lusaka									
	Other									
	S/total									
OTHER MINERALS	Kafue									
	Lusaka		16							16
	Other		26							26
	S/total		42							42
PETROLEUM PRODUCTS	Kafue									
	Lusaka									
	Other									
	S/total									
OTHER INDUSTRIAL GOODS	Kafue									
	Lusaka		20		2	90				112
	Other				137	20				157
	S/total		20		139	110				269
CEREALS/ OTHER AGRIC PRODUCTS	Kafue									
	Lusaka									
	Other									
	S/total									
AGRIC INPUTS	Kafue									
	Lusaka									
	Other									
	S/total									
OTHER CONSUMPTION GOODS	Kafue									
	Lusaka					7				7
	Other									
	S/total					7				7
PERSONAL EFFECTS	Kafue									
	Lusaka		1							1
	Other		4							4
	S/total		5							5
TOTAL			67		139	117				323

NOTE: Origin 'other' - Gwe, Mdola, Livingstone, Choma, Mazabuka, Luisa, etc.

ATTACHMENT 2 B

ORIGIN AND DESTINATION ANALYSIS OF CARGO TRAFFIC (TONS)

NAME: VICTORIA FALLS BORDER POST

(IMPORTS)

COMMODITY TYPE	Destination	ORIGIN: Overseas	Zimbabwe	Mozambique	RSA	Botswana	Lesotho	Swaziland	Other	Total
COPPER	Kafue									
	Lusaka									
	Other									
	S/total									
OTHER MINERALS	Kafue									
	Lusaka									
	Other									
	S/total									
PETROLEUM PRODUCTS	Kafue									
	Lusaka									
	Other									
	S/total									
OTHER INDUSTRIAL GOODS	Kafue		10		7					17
	Lusaka		205		88	7				300
	Other	1	215		288					504
	S/total	1	430		383	7				821
CEREALS/ OTHER AGRIC PRODUCTS	Kafue									
	Lusaka					2				2
	Other									
	S/total					2				2
AGRIC INPUTS	Kafue		1							1
	Lusaka		16							16
	Other		18							18
	S/total		35							35
OTHER CONSUMPTION GOODS	Kafue		1							1
	Lusaka		1		25	8				34
	Other		9		3					12
	S/total		11		28	8				47
PERSONAL EFFECTS	Kafue									
	Lusaka		1							1
	Other		5		1					6
	S/total		6		1					7
TOTAL		1	482		412	17				912

NOTE: Destination 'other' - Kitwe, Ndola, Livingstone, Chipata, Salomo, Mongu, etc.

DESTINATION ANALYSIS OF TRANSIT CARGO TRAFFIC

ATTACHMENT 2 C

YEAR: 1988

NAME: VICTORIA FALLS CUSTOMS POST

TRANSIT

COMMODITY TYPE	DESTINATION OF TRANSIT TRAFFIC (IN TONS)													
	NORTHBOUND							SOUTHBOUND						
	Over-seas	Tanza-nia	Zaire	Malawi	Kenya	Uganda	Other	Over-seas	Zimbabwe	Mozambi-que	RSA	Botswa-na	Lesotho	Swazi-land	Other
COPPER															
OTHER MINERALS															
PETROLEUM PRODUCTS			8												
OTHER INDUST-TRIAL GOODS			1260	411			10								
CEREALS															
AGRICUL-TURAL INPUTS			27	48											
OTHER CONSUMP-TION GOODS			132	60			21								
PERSONAL EFFECTS				41											
TOTAL			1427	560			31								

ORIGIN ANALYSIS OF TRANSIT CARGO TRAFFIC

ATTACHMENT 2 D

YEAR: 1988

TRANSIT NAME: VICTORIA FALLS CUSTOMS POST

COMMODITY TYPE	ORIGIN OF TRANSIT TRAFFIC (IN TONS)														
	SOUTHBOUND							NORTHBOUND							
	Over-seas	Tanzania	Zaire	Malawi	Kenya	Uganda	Other	Over-seas	Zimbabwe	Mozambique	RSA	Botswana	Lesotho	Swaziland	Other
COPPER															
OTHER MINERALS															
PETROLEUM PRODUCTS											8				
OTHER INDUSTRIAL GOODS								30	514		1102		35		
CEREALS															
AGRICULTURAL INPUTS									25		50				
OTHER CONSUMPTION GOODS									113		84	16			
PERSONAL EFFECTS									22		19				
TOTAL								30	674		1263	16	35		

NOTE:

* [illegible]

Destination 'other' - Burundi

ATTACHMENT 2 E

VALUE TO WEIGHT CALCULATION OF TOTAL

CROSS BORDER CARGO TRAFFIC

YEAR: 1988

NAME: VICTORIA FALLS CUSTOMS POST

COMMODITY TYPE	CALCULATION OF WEIGHT TO VALUE RELATIONSHIP					
	NORTHBOUND			SOUTHBOUND		
	Total Tonnage	Total Value (US. Dollars in '000)	Value per ton (US. Dollars in '000)	Total Tonnage	Total Value (US. Dollars in '000)	Value per Ton (US. Dollars in '000)
COPPER						
OTHER MINERALS				42	55.65	1.325
PETROLEUM PRODUCTS	8	7.552	0.944			
OTHER INDUST-TRIAL GOODS	2502	2507.504	1.002	269	72.63	0.27
CEREALS	2	1.1	0.55			
AGRICUL-TURAL INPUTS	110	95.48	0.868			
OTHER CONSUMP-TION GOODS	260	234.78	0.903	7	52.829	7.547
PERSONAL EFFECTS	48	34.272	0.715	5	1.7	0.14
TOTAL	2930	2880.688	0.983	323	181.309	9.282

ZK 8 = US$1

ORIGIN AND DESTINATION ANALYSIS OF CARGO TRAFFIC

NAME: KAZUNGULA BORDER POST

EXPORTS

COMMODITY TYPE	Origin	DESTINATION (TONS) Overseas	Zimbabwe	Mozambi	RSA	Botswana	Lesotho	Swazi-	Other	Total
COPPER	Kafue				110					110
	Lusaka									
	Other									
	S/total				110					110
OTHER MINERALS	Kafue									
	Lusaka									
	Other									
	S/total									
PETROLEUM PRODUCTS	Kafue									
	Lusaka									
	Other									
	S/total									
OTHER INDUSTRIAL GOODS	Kafue									
	Lusaka									
	Other									
	S/total									
CEREALS/ OTHER AGRIC PRODUCTS	Kafue									
	Lusaka									
	Other									
	S/total									
AGRIC INPUTS	Kafue									
	Lusaka									
	Other									
	S/total									
OTHER CONSUMPTION GOODS	Kafue									
	Lusaka		210			7500				7710
	Other					228				228
	S/total		210			7728				7938
PERSONAL EFFECTS	Kafue									
	Lusaka									
	Other									
	S/total									
TOTAL			210		110	7728				8048

NOTE: 'Origin 'other': - Kitwe, Ndola, Kabwe, Kalomo, Li[illegible]stone, etc.

ORIGIN AND DESTINATION ANALYSIS OF CARGO TRAFFIC

(IMPORTS) NAME: KAZUNGULA BORDER POST YEAR 1988

COMMODITY TYPE	Destination	ORIGIN: Overseas	Zimbabwe	Mozambi	RSA	Botswana	Lesotho	Swazi-	Other	Total
COPPER	Kafue									
	Lusaka									
	Other									
	S/total									
OTHER MINERALS	Kafue									
	Lusaka									
	Other									
	S/total									
PETROLEUM PRODUCTS	Kafue									
	Lusaka									
	Other									
	S/total									
OTHER INDUSTRIAL GOODS	Kafue	2			316	28				346
	Lusaka	68			17750	1344		20		19182
	Other	39			10413	779		12		11243
	S/total	109			28479	2151		32		30771
CEREALS/ OTHER AGRIC PRODUCTS	Kafue									
	Lusaka									
	Other									
	S/total									
AGRIC INPUTS	Kafue									
	Lusaka				580	51				631
	Other									
	S/total				580	51				631
OTHER CONSUMPTION GOODS	Kafue									
	Lusaka	55			3482	1161				4698
	Other									
	S/total	55			3482	1161				4698
PERSONAL EFFECTS	Kafue									
	Lusaka									
	Other									
	S/total									
TOTALS	Kafue	2			316	28				346
	Lusaka	123			21812	2556		20		24511
	Other	39			10413	779		12		11243
	TOTAL	164			32541	3363		32		36100

NOTE: * Destination 'other': Kitwe, Ndola, Kabwe, Livingstone, Siloma, Mazabuka, etc.

ATTACHMENT 3 C

DESTINATION ANALYSIS OF TRANSIT CARGO TRAFFIC

YEAR: 1988

NAME: KAZUNGULA CUSTOMS POST

TRANSIT

COMMODITY TYPE	DESTINATION OF TRANSIT TRAFFIC														
	NORTHBOUND							SOUTHBOUND							
	Over-seas	Tanzania	Zaire	Malawi	Kenya	Uganda	Other	Over-seas	Zimbabwe	Mozambique	RSA	Botswana	Lesotho	Swaziland	Other
COPPER															
OTHER MINERALS															
PETROLEUM PRODUCTS				2952											
OTHER INDUSTRIAL GOODS			12177	8367											
CEREALS				103				17143			3026				
AGRICULTURAL INPUTS			824	7080											
OTHER CONSUMPTION GOODS			8179	3177											
PERSONAL EFFECTS				1751											
TOTAL			21180	23430				1714[illegible]			3026				

ATTACHMENT 3 D

ORIGIN ANALYSIS OF TRANSIT CARGO TRAFFIC

NAME: KAZUNGULA CUSTOMS POST

YEAR: 1988

TRANSIT

COMMODITY TYPE	ORIGIN OF TRANSIT TRAFFIC (IN TONS)														
	SOUTHBOUND							NORTHBOUND							
	Over-seas	Tanza-nia	Zaire	Malawi	Kenya	Uganda	Other	Over-seas	Zimbabwe	Mozambi-que	RSA	Botswa-na	Lesotho	Swazi-land	Other
COPPER															
PETROLEUM PRODUCTS											2952				
OTHER INDUSTRIAL GOODS								658			19521			365	
CEREALS				20172							103				
AGRICUL-TURAL INPUTS											7904				
OTHER CONSUMP-TION GOODS								2511			8845				
PERSONAL EFFECTS											1751				
TOTAL				20172				3169			41076			365	

ATTACHMENT 3 E

VALUE TO WEIGHT CALCULATION OF TOTAL
CROSS BORDER CARGO TRAFFIC

YEAR: 1988

NAME: KAZUNGULA CUSTOMS POST

COMMODITY TYPE	CALCULATION OF WEIGHT TO VALUE RELATIONSHIP					
	NORTHBOUND			SOUTHBOUND		
	Total Tonnage	Total Value (US. Dollars in '000)	Value per ton (US. Dollars in '000)	Total Tonnage	Total Value (US. Dollars in '000)	Value per Kg (US. Dollars in '000)
COPPER				110	205	1.86
OTHER MINERALS						
PETROLEUM PRODUCTS	2952	1057	0.358			
OTHER INDUSTRIAL GOODS	51336	87442	1.703			
CEREALS & AGRIC PRODS	103	45	0.437	20172	41518	2.06
AGRICULTURAL INPUTS	8535	5062	0.593			
OTHER CONSUMPTION GOODS	16054	12216	0.761	7938	5500	0.69
PERSONAL EFFECTS	1751	1544	0.882			
TOTAL	80731	107266	1.33	28220	[illegible] 323	1.67

ZF [illegible] USSI

Table 7 : Basic Input Data Used In The HDM3 Economic Analysis (Costs in Kwacha)

	Private and light	4 Wheel and Min Bus	2/3 axle Rigid Truck	Rigid Trucks Plus Draw-Bar Trailer	Articulated Truck	Bus
HDM3 Veh Type	1	4	8	9	10	5
No of Tyres	4	4	6	14	14	6
Gross Veh. Wght	-	-	9.0	30.0	39 0	5.68
E S A	0.001	0.001	1.5	7.0	8.5	1.2
Average Axles	2	2	2	5	5	2
Financial Costs						
Vehicle	302500	298400	850000	1420000	1130000	477000
Tyres	510	900	3370	3370	4080	2660
Maint. Labr/Hr	90	150	150	150	150	150
Crew Cost/Hr	0	6.25	6.25	12.5	12.5	6.25
Interest Rate	25%	25%	25%	25%	25%	25%
Fuel:	Petrol =	5.16/lt	Diesel =	3.10/lt	Lubricants =	19.17/lt
Economic Costs						
Vehicle	692000	994700	3001000	5066000	4021000	1428200
Tyres	1100	1940	7390	7390	8940	5840
Maint. Labr/Hr	90	150	150	150	150	150
Crew Cost/Hr	0	6.25	6.25	12.5	12.5	6.25
Interest	25%	25%	25%	25%	25%	25%
Fuel	Petrol =	5.42/lt	Diesel =	3.26/lt	Lubricants =	20.15/lt

Attachment B

Table 7 Continued

Foreign Exchange Costs

Vehicle	133100	191000	569000	943800	757000	277000
Tyres	150	270	1040	1040	1260	820
Maint. Labr/Hr	0	0	0	0	0	0
Crew Cost/Hr	0	0	0	0		
Interest	25%	25%	25%	25%	25%	25%
Fuel	Petrol	4.74/lt	Diesel	2.85/lt	Lubricants	17.64/lt
Km Driven/Yr	2000	45000	50000	90000	90000	90000

Note: ESA = Equivalent Standard Axle

Source: Kafue-Lusaka Project Feasibility Study/Cost Analysis, John Burrow and Partners, 1989

SOCIAL SOUNDNESS ANALYSIS
KAFUE-LUSAKA ROAD REHABILITATION (690-0254)

I. Sociocultural and Socioeconomic Context

A. Intraregional Context of the Road

1. User Countries

The Kafue - Lusaka road directly contributes to the intraregional flow of commodities in southern Africa. This is especially true for Zimbabwe, Zambia, Malawi, Botswana and eastern Zaire which utilize the road for imports and exports. While most of the commodities originate from and are destined for countries within the region, a small proportion of the traffic consists of international trade outside the region. The road also facilitates the movement of passengers from one country to the next.

Zimbabwe is connected with the Kafue-Lusaka road through three border crossings: Chirundu, Kariba and Victoria Falls. Botswana is linked to the road through the border post of Kazangula. From Lusaka a road leads to Malawi through Chipata. The main route proceeding north from Lusaka branches approximately 150 km. from the city, with a road going northwesternly through the Copperbelt that links with the Zairean town of Lubumbashi. The second branch proceeds northeast and again branches to either to Mpulungu on Lake Tanganyika from which cargo is sent by ship to Rwanda and Burundi or Nakonde on the border with Tanzania and onward to Dar es Salaam.

Information on traffic crossing the Chirundu, Kazungula and Victoria Falls border posts indicates the importance of the Kafue - Lusaka road in intraregional trade. Out of a total of 354,859 tons of cargo which passed through the three posts in 1988, 58 percent

was transit cargo, that is not from or for Zambia. Most of the transit cargo (86%) was northbound. The main transit user was Malawi and secondarily Zaire. Together they accounted for 93 percent of the northbound cargo tonnage and 86 percent of the southbound tonnage. Kenya, Swaziland, Rwanda, Burundi and Mozambique traffic accounts for a very small proportion of the total tonnage.

The extent to which a particular country uses a route which includes the Kafue - Lusaka road section relates to factors influencing the viability of alternative routes and extraordinary circumstances in that country. For example, landlocked Malawi which normally produces enough maize for its population, experienced a maize scarcity in 1988 due to refugees, floods and drought, and therefore had to import a large amount of maize. Maize was hauled from Zimbabwe via the project road.

Use of alternative routes is influenced by factors internal and external to their operations. This is particularly significant since charges are less for transporting heavy, bulk items by rail rather than road. The railroads, however, are unable to meet the demand and tend to be a more inefficient means of transport (due to several reasons which are currently being addressed through SATCC). Also, political unrest hinders use of specific routes. For example, insurgents in Mozambique have caused stoppage of the rail traffic to Nacala, thus cutting Malawi off from its nearest seaport.

The major importance of all SADCC transport routes is to lessen the countries' dependency on routes through the Republic of South Africa (RSA) and to strengthen trade between the SADCC nations.

2. Sociocultural and Demographic Patterns

The population in the four SADCC countries and eastern Zaire which depends on the Kafue - Lusaka road totals some 30 million. There are significant similarities among the countries in terms of patterns of development and differences in indicators of general welfare. As indicated in Table 1, all the countries except Malawi have a relatively high rate of urbanization and most have a significant industrial and manufacturing base which is mainly centered on mining activities. However, indicators of general welfare, i.e. infant mortality rates and GNP per capita, show a wide range of difference. Malawi has the highest mortality rate and together with Zaire the lowest GNP per capita, while Botswana has the lowest mortality rate and highest GNP per capita.

Table 1: Socioeconomic and Demographic Indicators*

	Zambia	Zimbabwe	Malawi	Botswana	Zaire
Population (millions 85)	6.7	8.4	7	1.1	30.6
Urbanization %pop 1985	48	27	..	20	39
Infant mortality rate 1985	84	77	156	71	102
GNP per cap US$ 1985	390	680	170	840	170
%GNP Industry & Manuf 1985	61	72	19	57	35

* 1985 statistics have been used since they are the only ones accessible on all of the countries and use of the same base year permits a more accurate analysis of similarities and differences.

Source: World Development Report 1987, World Bank.

The five countries specifically affected by the Kafue - Lusaka road exhibit sociocultural differences in terms of ethnicity and languages. However, there is one overreaching unifying force among the people in the four SADCC countries: that is their common problematic history and experience vis a vis the RSA apartheid system. Recognition of this common problem takes precedence over sociocultural differences among the four SADCC countries.

B. Kafue - Lusaka Area and he National Context

1. The Immediate Impact Zone

The immediate impact zone is from the Lusaka suburb of Makeni to the Kafue river bridge, approximately 50 kms. Kafue was developed in the 1960s as a model industrial complex and is located 41 kms. from Lusaka. Kafue town currently has a population of some 21,000 people. The largest employers are Kafue Textiles and Nitrogen Chemicals of Zambia. The town also contains the Bata Tannery, Zambia Concrete, a brewery of chibuku (maize based) beer, boat builders, a company manufacturing nets, twines and ropes, and a bakery. There are several medium to large size wholesale and retail shops, service stations with repair facilities, retail and open air markets, and various social service facilities.

Chilanga, 14 km. from Lusaka, is the only town between Kafue and Lusaka. It is the site of Chilanga Cement Ltd, an agricultural research station, a botanic garden, arboretum, zoo, shops and normal social facilities.

Several businesses are adjacent to the road for about 8 kms. south of the Kafue roundabout in Lusaka. These include a soybean oil processing plant, a stone quarry, engineering firms of various types and medium size manufacturers. In addition, there are a

couple of low income housing areas. In regard to microenterprise activities, some 15 sellers of crushed stone line the road in front of the quarry and a few people sell handicraft items and food.

Lusaka town contains some 600,000 people, with a slightly higher proportion of males to females. About 55 percent of the labor force living in the greater Lusaka area are economically active in the formal and informal sectors. (The labor force is defined as those 12 years or older that are either employed or unemployed or looking for work and are available for work.) According to the Lusaka Urban Labor Force Survey of 1985 which included informal sector activities, 73 percent of the men were active on the labor market compared to 36 percent of the women. Sales work is the most common job for women (48%), whereas among the men almost half (45%) work as transport and equipment operators and laborers.

2. National Context

Kafue - Lusaka is part of the major road route which connects southern and northern Zambia. This section of road will effectively be an extension of the recently completed Regional Transport and Storage Development Project - Phase II (the Kafue-Chirundu road rehabilitation) and will complete an unbroken stretch of high standard trunk road between Lusaka and Harare. It plays a role in imports and exports as well as domestic traffic.

Road traffic accounted for 13 percent of the total volume of Zambia's external trade in 1987, while rail accounted for 86 percent. Two main road routes for Zambia are to Tanzania and to Zimbabwe via Chirundu. In absolute terms the volume carried by road to Zimbabwe decreased between 1983 and 1987 because formerly more imports and exports went through the RSA. However, in early 1988 Zambia lessened its restrictions on trade with and through the RSA so the overall proportion of road traffic may have increased since then. Furthermore, the increased focus on promotion of trade

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within SADCC and the PTA is expected to result in an increase of road traffic on the project road.

An Analysis of Cross Border Traffic Movements at Chirundu, Kazungula and Victoria Falls for the Year 1988 reveals that 147,536 tons of Zambia's external trade passed through the three border posts. Sixty-one percent of the volume of imports were destined for locations other than Kafue or Lusaka and 66 percent of the export tonnage originated in locations other than Lusaka and Kafue. Most of the other imports were destined for the Copperbelt and a significantly large proportion of the other exports originated in this area. Virtually all of the traffic used the project road.

Beside this traffic, some Zambia northbound exports traverse the project road. In particular, cement from Chilanga is exported to Malawi, Rwanda and Burundi and sugar from Nakambala (located on the road from Livingstone which connects with the project road) is exported to Zaire, Rwanda and Burundi. The commodities destined for Rwanda and Burundi are taken by road to Mpulungu from where they are forwarded by ship.

In addition to the external trade traffic on the road, the Kafue - Lusaka road also plays a major role in domestic marketing of agricultural commodities. Commercial farmers in Southern Province and the sections of Central Province within the road catchment area produce cash crops and rely on commercial agricultural inputs such as fertilizer.

Commercial farmers are classified into three categories: large scale, small scale and emergent. A significant proportion of each category lives within Southern Province and within Central Province, which includes the road catchment area. About 40 percent of the large scale commercial farmers reside in Southern Province and most of the rest live in Central Province. These farmers market

hybrid maize, tobacco, sunflower seed, cotton, soybeans, wheat, horticultural products, beef cattle, hogs, poultry and dairy products. Also some Commercial Farmers in the project catchment area produce seed maize, seed potatoes and seed wheat which is delivered to the Zambia Seed Company in Lusaka.

In comparison the small scale and emergent commercial farmers primarily market hybrid and traditional maize, sunflower seed, cotton, beans and horticultural products. Forty - three percent of the 19,300 small scale commercial farmers and 57 percent of the 101,700 emergent commercial farmers reside in Southern Province.

Factors related to the efficiency of the marketing system are particularly critical since nearly 50 percent of Zambia's population is urban based, and hence purchasers of food. Overwhelmingly the main crop marketed in Zambia is maize, which normally accounts for some 80 percent of all the crops marketed. Seed cotton and wheat have vied closely for second position over the past 3 to 4 years and soya beans is becoming a healthy fourth. Zambia produces enough oil seeds to meet about half of its edible oil requirements.

Almost all commercial farmers use fertilizer. Currently 65 to 75 percent of the fertilizer use occurs in Southern, Central and Eastern Provinces, which reflects the distribution of commercial farms.

Nitrogen Chemicals of Zambia (NCZ), located at Kafue, currently meets about 30 percent of the demand for fertilizer but is expected to supply about 70 percent of the market when improvements in the plant are completed. Presently the NCZ delivers directly to NAMBOARD in Lusaka and in Masabuka which is responsible for distribution of the fertilizer. Ninety percent of the cargo is carried by rail. However, a proposal which has been accepted in principle by the GRZ would transfer the distribution function to NCZ which would be responsible for delivery of fertilizer to 10 regional depots. It is expected that most will be hauled by road.

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II. Beneficiaries

A. Direct

1. Road Construction Workers and Supervisors

An estimated 500 jobs will be created to implement the project. Some 95 percent of the positions will be for general laborers and 5 percent for tradesmen (e.g. carpenters, steel fixers, and mechanics) and supervisors of work teams. In addition to the basic pay which is the set government rate, the workers will have the opportunity to earn overtime pay for more than 45 hours of work a week. The construction firm may also use a bonus system as did the second construction contractor on the Chirundu road, whereby extra income can be earned when a set task is completed within a given time frame. Besides earning income, the tradesmen are expected to benefit from on the job training which will upgrade their skill level.

Twenty percent of the new jobs created by the road work financed by USAID will be targeted for women. The construction firm will be required to hire women to work on the road and in the camps. This has been determined to be feasible, as explained in part IV A.

Many of the locally registered construction firms do not use Zambians or other Africans as foremen, and hire expatriates. If this occurs then the project construction firm will be expected to provide on the job training for two to three Zambians in positions as assistants to the foremen. It is anticipated that these people will already be on the firm's staff.

2. Commercial Transporters

Commercial transporters involved in intraregional and

domestic trade will benefit from rehabilitation of the Kafue - Lusaka road. The benefits should be in terms of a) fewer accidents due to improvements, b) a reduction in hauling time due to the elimination of potholes, expansion of road shoulders, improved laybys, and better flow of traffic, and c) a reduction in operating costs. The commercial transporters are registered companies which are individually or jointly owned. Ownership is primarily if not completely by men.

An analysis of vehicles crossing the three southern border posts reveals that 47 percent of the vehicles are registered in Zambia (Table 2). However, Table 2 needs to be interpreted with care since trucks with Zambian license plates are not necessarily Zambian owned. A study of the trucking sector in Zambia carried out in late 1983 showed that a significant proportion of the trucks registered by the private sector were owned by resident non-Zambian firms and by firms from neighboring countries. It does not appear that the composition of the private sector trucking fleet in Zambian has changed much since 1983.

TABLE 2: Origin Profile of Crossborder Truck Traffic
Chirundu, Kazungula and Victoria Falls 1988

Vehicle Type	Origin and Number of Vehicles				
	Zambia	Zimbabwe	Republic SA	Botswana	Other
Trucks	11,517	4,536	7,116	600	692
% of Total	47	19	29	2	3
			(GRAND TOTAL	24,461)	

Source: Derived from Tables 13, Coopers & Lybrand Associates, An Analysis of Cross Border Traffic Movements at Chirundu, Kazungula and Victoria Falls for the Year 1988, June 1989.

The 1983 study, by P. Moeller on behalf of the National Commission for Development Planning and IBRD and published March 1984, found that there were 140 private sector trucking firms in Zambia with an average of 10 trucks. Fifty-three percent of the

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firms were owned by Zambians. Almost half of the firms were located in Lusaka and another 20 percent were located in either Kitwe or Ndola. About 27 percent of the total number of trucking firms were owned by resident non-Zambian firms, and comprised eleven nationalities, but with Yugoslavian, Italian and Zimbabwean firms accounting for half of these. Twenty-eight percent of the firms were registered foreign private firms operating from outside of Zambia. This consisted of Zimbabwean (11), Botswanan (9) and South African (8) firms.

No information was available on the age of the private sector fleet in 1983. Most likely the average number of vehicles owned by the three categories of firms has changed. Availability of spare parts and new vehicles as well as their cost have hindered growth of the commercial transport fleet. Moreover, the initial cost of procuring equipment has barred entry by newcomers. Currently a commercial truck costs an equivalent of over U.S. $60,000 and tires cost over $500 each.

The Zambian public sector commercial transport fleet is under Contract Haulage Limited (CHL) which has a fleet of 220 vehicles of which about 170 are operational at any given time. It provides service for general and liquid cargo throughout Zambia, the SADCC and PTA countries. The largest volume of cargo is carried on behalf of parastatal organizations like Zambia Consolidated Copper Mines, Chilanga Cement, Indeco Milling and farming cooperatives.

The Zambia trucking fleet that handles intraregional cargo also plays a significant role in domestic cargo. CHL for example hauls more domestic than international traffic in terms of tonnage. And, although precise statistics are not available on the private sector trucking fleet, it is estimated that some 60 percent of their cargo is domestic traffic. In fact because of the relatively small size of the fleet in relation to demand, it is common for the GRZ to declare the borders closed to Zambian transporters during the agricultural season to haul fertilizer and maize domestically.

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3. Other Commercial Users

Besides the commercial transporters, numerous other types of companies use the Kafue - Lusaka road with their own vehicles. This traffic is domestic rather than intraregional and involves commercial farmers, wholesale traders, and manufacturers. For example, a number of the commercial farmers along the Kafue - Lusaka route produce vegetables, fruits and flowers for the export market; these commodities are transported by road to the Lusaka airport.

For those who use the road on a daily or near daily basis, there should be a significant reduction in operating costs. Because of other economic factors, however, it is extremely doubtful if the savings will be passed on to consumers. The users are also expected to benefit in terms of fewer accidents and increased convenience.

4. Passengers

There are three types of passengers: those in private passenger cars, those on buses and those having obtained a ride in trucks. The latter primarily involves domestic travelers. Both domestic and intraregional passengers will benefit from the road improvements. People living within the immediate impact area shall benefit from better bus stops. All passengers shall benefit from an improved flow of traffic due to better road surface and improved shoulders and laybys which should lessen the amount of travel time.

There is a daily bus service between Lusaka and Kafue, beginning at 4 am in the morning and with at least 7 trips a day. Also, there is a regular bus service between Lusaka and Siavonga, and between Livingstone and Lusaka.

At least a hundred people commute daily between Kafue and Lusaka in their personal cars. Other frequent users are residents

and visitors to the Entomology Center of the National Council for Scientific Research and the Mt. Makulu Agricultural Research Station, and staff and trainees of the Zambian Industrial and Mining Corporation Limited (ZIMCO) Institute of Management, located near the project road between Chilanga and Lusaka.

In regard to intraregional passengers, there is a bus departing Lusaka and one departing Harare virtually every day. In 1988 there were an average of 65 people on each of the 681 buses that passed through Chirundu. Only 40 buses, presumably tourist buses, passed through Victoria Falls in 1988 and they averaged 40 people. Since January 1989 a regular bus service operates between Francistown, in Botswana, and Lusaka via Kazungula.

The analysis of cross border traffic combines passenger cars with other light vehicles such as vans. The number of light vehicles passing Chirundu and Victoria Falls did not vary significantly, (12,712 and 12,212 respectively), whereas Kazungula had much less traffic (6,709). The light vehicles passing Chirundu in 1988 averaged 3.5 passengers. In contrast, the average number of passengers in the light vehicles going through Victoria Falls and Kazungula was 2.5 and 2 respectively.

An analysis of light vehicle and bus passengers reveals that the former carried two-thirds of the passenger traffic. While no information exists on the purpose of these trips it may be assumed that most of the passengers in light vehicles were traveling in regards to tourism or holidays, and the second most common purpose was probably business. Except for tourist buses, bus passengers were probably traveling on business and to visit relatives or friends and of a lower socioeconomic class than were those riding in light vehicles.

While no statistics are available, observations of passenger traffic reveal that at least two-thirds of the passengers in light vehicles are male and about 50 to 60 percent of the bus passengers are male.

5. Pedestrians

No statistics exist on the pedestrian traffic along the project road. However, it appears that some 60 percent of the pedestrians are male.

Currently the road shoulder is often less than a meter wide. Under the project the shoulder shall be two meters wide, except for a stretch of some 7 kms in the Chilanga area which will be three meters wide. The extension of the shoulders will make walking along this major highway much safer for pedestrians.

Accidents occur in front of the Chilanga Primary School which has an enrollment of 2,000 students. The school lies adjacent to the road which curves downwards at this site. The official speed limit in town is 50 km. and there are warning signs on the approach to the school. However, neither of these factors result in most of the traffic slowing down; it is common for the vehicles to be moving at over 80 km per hour around the school. Because this is an international highway, ways of controlling the speed of vehicular traffic is limited by law. The project engineers will investigate technical options for slowing the traffic at this point.

B. Indirect Beneficiaries

1. Malawi, Zaire and Zimbabwe

Of the total volume of transit cargo passing through the three southern border posts in 1988, 96 percent of the southbound cargo was from Malawi and 62 percent of the northbound cargo was destined for Malawi. The northbound cargo consisted mainly of

cereals and other agricultural goods (48%) and petroleum products (38%). Fifteen percent of the tonnes were agricultural inputs, predominately fertilizer. The southbound cargo consisted almost exclusively of agricultural products, in particular tobacco, sugar, tea and groundnuts.

Thus it can be surmised that all socioeconomic classes in Malawi will indirectly benefit from the rehabilitated road facilitating external trade. The poor shall benefit when food is imported such as in 1988 and from the availability of kerosene for lighting. Owners of medium and large scale farming operations will acquire imported fertilizer and should be able to export their cash crops more efficiently. Vehicles owners may have better access to petrol and diesel fuel.

The inhabitants of eastern Zaire, especially those living in Lubumbashi, depend on receiving commodities imported over the road. In 1988 31 percent of the volume of all transit imports were destined for Zaire. Of the total volume passing into Zaire, 46 percent were industrial products such as steel bars and rods, chemicals, machines and spare parts. Cereals and agricultural products accounted for 11 percent of the volume imported and other consumption goods comprised 25 percent.

Only a small volume of Zairean exports are transported over the project road and this consists mainly of industrial products such as copper sheets, cobalt and zinc slabs.

Information on the type of cargo carried indicates that owners of Lubumbashi industries and people in medium and high level positions will be the main indirect beneficiaries in Zaire.

Zimbabwe will be another indirect beneficiary, largely by the project enabling greater efficiency in transportation of exports. From the 1988 traffic data it is difficult to know precisely if the cargo stated as originating in Zimbabwe had its origin elsewhere but Zimbabwe is either the source or transit

point. However, certain types of commodities unquestionably originated in Zimbabwe.

In 1988 113,071 tons of the traffic passing through the three southern border posts and transiting Zambia are listed as having originated in Zimbabwe. Virtually all of this cargo passed through Chirundu and over the project road. Cereal products and petroleum products accounted for almost three-fourths of the total volume. In addition 31,765 tons of traffic originating in Zimbabwe were imported to Zambia. Most of this cargo (80%) consisted of industrial goods, such as steel bars and rods, chemicals, machinery and spare parts. Agricultural inputs, especially seed maize and irrigation equipment, accounted for 14 percent of the cargo.

Zambian exports to Zimbabwe are primarily of an industrial nature, such as copper rods and billets, zinc sheets, bitumen, and telephone cables. It also sells molasses to Zimbabwe.

2. Zambian Companies

The main Zambian company utilizing the project road is Zambia Consolidated Copper Mines Ltd. (ZCCM), located in the Copperbelt. The Government of Zambia through Zambia Industrial and Mining Corporation Ltd. (ZIMCO) owns 60 percent of the shares. ZCI Holdings, a subsidiary of Anglo-American, owns 27 percent of the shares and 7 percent is held by RST International, which is part of the Sardanis group of companies. Five percent of the ordinary shares are held by the public and of these shares 76 percent are held by a company on behalf of Morgan Guaranty Trust Company of New York, the depositary of American Depositary Receipts.

Besides its direct operations, ZCCM also has subsidiaries which largely provide supplies and services to it. ZCCM employes some 54,130 people, of whom 2 percent are expatriates. An additional 7,861 people are employed by its subsidiaries in Zambia. Given that total formal sector employment in 1987 was some 356,500, ZCCM and its subsidiaries account for some 17 percent of employment

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in the formal sector. In addition, it has forward and backward linkages with other industries and hence affects employment and production in various realms.

While ZCCM relies mainly on the port of Dar es Salaam for its exports, some pass on the Kafue - Lusaka road to Zimbabwe, Botswana and the Republic of South Africa. Moreover, a large proportion of the imports transported on the project road are directly or indirectly for ZCCM and its subsidiaries.

Practically all of Zambia's exports and hence foreign exchange are attributable to ZCCM. Thus, the amount of foreign exchange earned, the amount of taxes collected and the earnings per share accrued by ZIMCO all relate to the economic well-being of ZCCM.

Many of the other Zambian indirect users of the project road are principal subsidiaries and associate companies of ZIMCO, the main GRZ parastatal. ZIMCO principal subsidiaries consist of 94 companies, most of which are in mining and industry including ZCCM and its subsidiaries. ZIMCO percentage of equity ranges from 51 to 100 percent. In regard to the 7 associate companies the percentage of equity ranges from 23 to 50 percent.

As of March 1988 employment in ZIMCO companies totalled 140,408 including those discussed above under ZCCM . Thus ZIMCO accounts for some 38 percent of formal sector employment.

3. Zambian Consumers

Virtually thousands of rural and urban consumers may indirectly benefit from the project through improved efficiency in marketing. These are people who purchase goods transported on the road. For example, virtually every Zambian household purchases sugar on a regular basis and a significant proportion of the country's sugar output in transported over the project road. In addition, as mentioned in part I B, if the plans for reorganization

of the fertilizer marketing system are implemented thousands of commercial farmers who purchase fertilizer will indirectly benefit from the project.

The other types of consumer products transported over the road are too numerous to detail. However, the previous sections provide the reader with a notion of these.

4. Republic of South Africa

While the project does not intend that RSA be a beneficiary, it is inevitable. The RSA sells and purchases commodities which are transported on the Kafue - Lusaka road. Industrial products especially steel and chemicals, vehicles and associated spare parts, and consumer goods such as food and fridges are exported. And it receives primarily metal products from the SADCC countries.

III. Participation

SATCC has classified the Harare to Lusaka road route as a priority. Kafue to Lusaka is the only portion of the Harare to Lusaka route which has not been rehabilitated to a first class standard. The GRZ also considers the proposed road work as a priority and has been involved in making decisions about the contents and design of the project. The GRZ has already financed a local engineering firm to provide engineering surveys for use in the design of this project.

Road users have not and will not participate directly in the decision making process for project design or implementation. However, numerous road users were consulted during the design of the project. These users were very pleased with the objective of the project.

IV. Sociocultural Feasibility

A. Female Road Workers

A target of 20 percent has been set for employment of women on the road work. This has been deemed feasible based on conversations with a representative of the second construction firm on the Chirundu road project, and rural men and women along the road.

Zambian women have seldom been employed on road construction work. The second USAID construction contractor on the Kafue-Chirundu road, however, did seek out women workers during the last few months when the men were not doing a specific task properly. He found that they were quite good and reliable workers. In this case, it appears that wives or other family members of the men already employed were brought onto the labor crews.

Between Lusaka and Kafue there are numerous single female parents and unmarried women without children. Conversations with some of them and with fathers did not reveal any prejudices against women doing road work. Married women usually require the permission of their husbands to work. Since almost all of the work will be done during the dry season, the jobs should not conflict with the main agricultural tasks with which women are normally engaged.

Recent assessments of females working on labor intensive road maintenance and construction in Kenya reveal the following. First, information dissemination about job opportunities often occurs through channels which do not reach women and unless those responsible for recruitment specify that women are to be employed then it is assumed that the jobs are only available to men. Second, although men often claim that women cannot do the heavy tasks, women were found carrying out virtually all types of work. However, it varied greatly by site depending on the attitude of the men involved in recruitment and assignment of work. Third, male supervisors often reported that the women were more reliable and better workers than the men. Fourth, in some cases it appeared that the immediate

male supervisor and male workers exploited women's ability and earnestness about their work.

Because construction firms normally use their own staff or experienced people as "boss boys" or leaders of work teams, it is not expected that women will be hired for this position. Furthermore, it is questionable at this stage if women would be able to obtain the respect and approval needed from male workers to successfully carry out the job responsiblities.

The extent to which the recruitment and employment of women will succeed on the Lusaka - Kafue road will be influenced by the attitude and behavior of the project construction firm. The construction industry is dominated by men, most of whom either do not believe in sexual equality or cannot be bothered with addressing equity issues when carrying out their job responsibilities. Unless the supervisor and foremen support the effort and recognize the economic payoff to their work, the effort is unlikely to succeed.

2. Other Issues

The following sections on disruption and displacement include discussions on compensation for loss of building structures It should be noted that men are normally considered the head of household and hence representatives of construction firms negotiate with them. However, if money is not used for the purpose for which it was intended then other family members suffer. Because of this it is recommended that the loss of building structures be compensated by in-kind payments to the extent possible, for example, providing poles, mud bricks and a builder.

In the few cases where land will be acquired the person handling the negotiations should be aware of intrahousehold dynamics and make the amount of payment known to male and female adult members. This information will permit them to seek compensation from the recipient.

B. Disruption and Displacement

1. Introduction

Major work on an international highway such as the project road can cause disruption and physical displacement of people in the following ways. First, deviation routes have to be identified: either existing adjacent low volume roads or creation of temporary roads. In the former the increased volume of traffic may be harzardous to those living near the road. If paths are created they may be within the road access corridor, ie. 60 metres, but cause a safety risk to those who dwell immediately adjacent to the path. In most cases the engineers try to avoid having to negotiate to obtain private land on which to build the deviation road because of the time involved.

Second, people who are living, cropping or trading within the road access corridor are displaced. Third, an office and a road camp are usually constructed along the route, with access to water an important factor. Land is normally obtained from the government or by payment to the legal owner.

2. Those in the Road Corridor

The Lusaka - Kafue road corridor is legally 60 meters wide. Any structures (e.g. houses, graneries, trading stalls, and walls), crops being grown or fruit trees planted in this corridor are not protected by law.

Between Lusaka and the Kafue bridge there are some 12 trading stalls of semi-permanent and permanent materials, most of which are selling fruits and vegetables to people in passing vehicles, which are in the road corridor. About 7 fruit stands made of unpressed clay bricks with tin roofs are located at Chimamanga (km. 30). The traders have paid for the building materials and

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erection of these. Here women sell fruit and vegetables which they have purchased from the large commercial Fresh Fruit Farm and to a lesser extent local producers. Except for some five isolated stands (three of permanent materials) this is the main road side produce marketing spot along the project road.

In addition there are approximately 30 family compounds, with houses, graneries and other buildings within the corridor. These are found primarily between Chilanga and Kafue town (between kms. 35-41). Many are located between the railway line and road in front of a GRZ quarry. The people here sometimes work as casual laborers at the quarry but are otherwise involved with trade, hence the reason they settled close to the road. Here the men make crude wooden frame chairs woven with raffia, wood animal carvings, pestals and morters (for pounding maize). The families have been living here for over five years and a couple houses show a substantial amount of investment.

Closer to Kafue, between the old Kafue road leading to Chilanga and the current main road, numerous families have settled with permission of the Kafue Urban Council. Families here include carpenters, metal workers, shoe makers and wood carvers. It appears that only some five structures are on or over the boundary of the road corridor. In addition there are a few farming compounds scattered along the road with the houses probably within the road corridor.

Legally these people with houses and other structures within the road corridor do not have to be compensated and can be ordered to depart. However, construction contractors have found that this approach can be very costly because of delays and disputes which halt work on the road. Hence, many negoiate with those who are within the road corridor, offering to compensate the people for the

structures which have to be abandoned and sometimes offering casual employment for a family member. Since the total cost of compensation is estimated to be under $20,000 payable in kwacha, the GRZ is expected to support this approach and provide the funds.

In some locations people are growing maize within the road corridor. This is particularly evident between the road and the commercial farms. Laborers on the farms are usually the people who have planted the crops. The project contractor will make public announcements in newspapers and on radio stating when road work will begin and warning growers that their crop will be in jeopardy if not harvested immediately after the rains. (The practice is to allow the maize to dry in the field.) It might be assumed that after work has been completed on the road, the former growers will recommence planting of maize and will not have lost any land to the improved road since no maize is now being grown within 3 meters of the road.

3. Those Effected by Diversion of Traffic

Between Chilanga and Kafue town the possible options for diversion of traffic include use of the Chilanga quarry road, the pipeline road and old Kafue road. From Kafue town to Kafue bridge and from Chilanga to Lusaka city a path may be made parallel to the existing road and within the road corridor. Especially in these cases, the construction engineers will need to be aware of the disruption and risk imposed on households with compounds are near the diversion road. In particular there are about seven sites where the deviation road could readily pose a threat to the inhabitants. These are in a township immediately within the border of Lusaka Urban Area (around km 11), in Chilanga and Kafue towns, and a few rural sites.

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The publicity and uproar over a serious collision of vehicles or child being hit by a vehicle on a deviation road could hinder work on the road and provide negative publicity on USAID and the construction firm. Hence, the selection of the deviation road will include attention to the number of families which might be at risk. Furthermore, when residential buildings are within some 25 meters of the deviation road, the families will be compensated to build houses further from the flow of traffic.

4. Those Effected by Road Realignments

Two realignments will occur near Lusaka to eliminate dangerous blind spots. The realignments will involve securing land lying on the inside of the now dangerous curves in the road. In one case land will be obtained from the owner of a large commercial farm. The second realignment cuts through the fields of three to four smallscale farmers. Particularly in this case the construction supervisor will be made aware of intrahousehold dynamics and make the amount of compensation known to all adult family members, not just the male head.

INSTITUTIONAL ANALYSIS

1.0 Overview of Roads Department

The Roads Department of the Ministry of Power, Transport and Communication (MOPTC) is responsible for the construction and maintenance of primary and secondary roads which comprise approximately 21,000 km or 54% of the roads gazetted in Zambia. These responsibilities entail administering all roads designated as International Main (T) and Main (M), which form a major portion of the primary system linking provincial capitals with one another and other SADCC countries. In addition, the Roads Department has administrative responsibilities for secondary District (D) roads which link the primary network with district headquarters and economic centers. The Roads Department is responsible for implementing policy, budgeting and administering the nine provincial organizations in the country. The Department is comprised of a Headquarters in Lusaka, responsible for coordination, planning and centralized provision of services, and nine provincial divisions which carry out the organization's primary task of road maintenance .

2.0 Organization of the Roads Department

2.1 Headquarters

The headquarters in Lusaka is comprised of the Offices of the Director and Deputy Director, four functional sections, the Mumbwa Workshop, the Materials Laboratory, and a Training School. Each of these units is headed by a Senior Executive or Executive Engineer (see organizational chart in Annex IID). The four functional sections are Planning and Design, Maintenance, Administration and Contracts.

The Planning and Design Section is subdivided into the Survey and Drawing Office and the Planning and Design Office. The Survey and Drawing Office has very limited capabilities because 60% of the personnel slots are vacant. However, their services will not be required for this project because a complete Schedule of Cross Section Data has been compiled by John Burrow & Partners as part of the Feasibility Study/Cost Analysis provided as input to the project design. It will therefore be a relatively easy task for the Final Design contractor to complete longitudinal (horizontal and vertical) and cross sectional drawings, drainage structure and miscellaneous drawings, and perform soil analysis testings.

Also located at the headquarters is the Traffic Statistics Office which supports both the Planning and Design Office and the Maintenance Section. The Traffic Statistics Office is responsible for data collection and traffic analysis and maintains detailed records of traffic counts taken over a period of years at various locations throughout the country. Although the Statistics Office does a creditable job in carrying out its mandate to collect data on country-wide traffic flows, it is not envisaged that they will be the primary data collection unit for project evaluations. Under Local Currency Counterpart Funds Project No. 2.68, Kafue-Lusaka Road Rehabilitation Administrative Support, kwacha has been earmarked for data collection services procured through A.I.D. Direct Contacts (i.e. purchase orders) from local consulting firms. The contract method of data collection has proven to be reasonably economical, flexible and easiest to tailor to the exact needs of project evaluations.

The Administration Section has primary responsibilities for personnel management functions such as hiring, firing, creation of new staff positions, salaries, administration of leave time, and other tasks related to staffing. Since the project cannot address the primary personnel issue related to pay structures and a sufficiently attractive benefit package to hire and retain management personnel, no further analysis will be made of this section. Problems emanating from the salary/benefits package offered by the section will be discussed below under staffing.

The Maintenance Section, administered by a Senior Engineer provided by NORAD, has a central role in policy making and the identification, prioritization, coordination and monitoring of maintenance activities carried out by the Provincial Road Engineers. This section also plays a central role in the allocation of funding to the provinces. Maintenance will be further discussed below under the Operations heading in the Analysis of Institutional and Management Capability.

The Contracts Department will play a critical role in the success of the project at two stages of implementation. First, the Executive Engineer for Contracts will have the primary GRZ responsibility for the development of advertisements, host country solicitation/contract documents, the review of bids/recommendation of awards, follow-on contract administration, and coordination with A.I.D. to ensure that all documents and Departmental procedures conform to HB 11 rules. Due to his previous experience with A.I.D. regulations on the Kafue-Chirundu Road Project, it is anticipated that the Executive Engineer will not encounter any significant problems with preparation of documents, contract award and administration, and securing required A.I.D. approvals. The staff of the Roads Department has a good working relationship with USAID/Zambia, so close coordination will be easy to achieve. The second important function of Contracts will be the review and certification of invoices for payment. Invoices from the construction contractor will first be reviewed by the construction supervision contractor and then re-checked by the Executive Engineer who will pass them to the Director of Roads for certification. Invoices of the construction supervision contractor will be be verified for accuracy by the Executive Engineer and passed to the Director of Roads for certification. All dollar payments will subsequently be made by A.I.D. and kwacha payments will be made by the accounts section of the MOPTC. Payment problems are not anticipated because USAID/Zambia did not experience problems with either the timeliness or the accuracy of the Department's payment approval process under the Kafue-Chirundu Project. Further, a July 1989 RIG audit report found that financial controls over disbursements were adequate for the recently completed Kafue-Chirundu Project.

The Mumbwa Workshop is located approximately 20 km west of Lusaka on the Old Mumbwa Road and provides maintenance/overhaul services for engines, plant and vehicles owned by the Department and serves the provincial organizations as a central spares distribution facility. The workshop, established under the World Bank Third Highway Project, was originally administered for Roads by the Mechanical Services Department (MSD) but is now administered by an Egyptian expatriate hired under a local contract. While the workshop provides a centralized service to all provinces in theory, the facility has never fully achieved this objective due to insufficient funding and a lack of staff with sufficient mechanical expertise. While the facility is well stocked with spares, there have been bureaucratic delays in transferring responsibilities for distribution of spares from the MSD to Roads.

The materials lab has the capability to do basic soils testing. However, it is not anticipated that their services will be required to any great extent for this project. During the Feasibility Study/Cost Analysis completed prior to project design, John Burrow and Partners implemented a thorough program of testing which has been fully documented in their report to A.I.D. Since this report will be available for the engineering firm contracted to complete the final design, it is not anticipated that any significant additional testing will be needed prior to the commencement of construction. If any additional testing is required it will be performed by the engineering consultant responsible for the design/construction supervision. Lab equipment required by the construction supervision contractor to monitor the quality of construction will be procured as a provisional sum item under the construction contract and be set up in an on-site facility at the construction camp.

The Training School, established in 1985, provides both theoretical and practical training for road foremen termed "gangers". To date, only 60 gangers have received training in labor intensive road maintenance techniques due to initial problems in hiring an adequate staff. However, this problem has now been solved and the Training School is an ongoing and integral part of operations. The training program consists of a sequence of 6 months theory, 6 months on-the-job and 6 months theory. An additional 30 gangers will graduate in September 1989, making a total of 90 trained maintenance crew supervisors available for duty in the provinces. This program appears to have been effective in improving the level of performance among road maintenance crews due to increased knowledge of techniques and effectiveness of supervision by road gangers. It is conceivable that the effectiveness of the program may be largely attributed to the relatively low level of turnover at the technician level of the Department (approximately 5 % annually). If Roads continues to retain technicians at current levels, it is probable that this training will continue to produce positive results as the number of graduates grows over time.

There is a definite training void in the area equipment maintenance. This problem has arisen because of a GRZ reorganization of the MSD. Formerly, the MSD had Government wide responsibilities for the maintenance of equipment and vehicles, and thus, the Department was mandated to use their maintenance services for all plant and equipment. The MSD has recently been reorganized under a profit-making parastatal charter so the Department has the flexibility to shop around for the most advantageous contract maintenance service, or alternatively, develop its own capability. The project will address this opportunity to strengthen the Roads Department's capability to maintain equipment by providing short term training in equipment maintenance. Details of this program are included in the Training Plan.

2.2 Provincial Organization

Each provincial organization is headed by a Provincial Roads Engineer (PRE) who is responsible for the maintenance of the class T, M and D roads within the province. Each provincial organization, with headquarters in the provincial capital, is divided into maintenance zones. Each of the zones,

which total 127 country wide, has offices and living facilities for the workforce and their families. Road Foremen (gangers) and the workforce are usually provided with transport and basic equipment. Each zone has been provided with a tractor, trailer and mower. A water tanker and tipper truck are generally provided for every 4 or 5 zones. The zone establishment carries out routine and recurrent maintenance work such as pot hole patching, grading, drainage, clearing, grass cutting, painting of center lines, and other routine tasks.

A number of District Offices are located throughout the country. Each district, comprised of several zones, is headed by a Road Superintendent. Responsibilities of the District Office are more extensive than those of the zones, and include extensive work to repair failures on paved roads and replacement of damaged culverts in addition to activities carried out at the zone level.

Periodic maintenance (overlaying and sealing) and regravelling is carried out by the Department and by contract, subject to available GRZ funding and the availability of Departmental resources. All major in-house Departmental works are implemented by augmenting existing District Office resources in relation to the size of the given job. For instance, a major maintenance activity could require the movement of several pieces of equipment and reassignment of additional manpower. However, major works are supervised and controlled by the Provincial Roads Engineer even if District level resources are utilized to do the work. In-house works are inevitably constrained by a severe lack of equipment and adequately trained supervisory personnel so major maintenance works must generally be contracted out.

Road construction and major rehabilitation such as the Kafue-Lusaka Road Rehabilitation Project are carried out by contract, awarded and controlled by the Roads Department Headquarters in Lusaka. A consultant is generally engaged to supervise the works.

3.0 Analysis of Institutional and Management Capability

3.1 Staffing

The Roads Department has experienced very serious problems in the hiring and retention of qualified staff, particularly at managerial and professional levels. At the level of Executive or Senior Executive Engineer (i.e. Department Head or Provincial Roads Engineer level) only 10 of 27 existing positions were occupied as of December, 1988. The problem of vacancies continues down through the organizational hierarchy in practically all functional areas, including laboratory staff, mechanical and materials personnel, and on-site line supervisory personnel. For instance, as of December 1988 (see 1988 Staffing Levels in Table 1 below) only 14 of 29 critical Road Superintendent positions were filled. The Superintendent positions also indicated a negative trend in which vacant slots increased from 9 at the beginning of the year to 15 at the end. Obviously, this situation seriously constrains the Department's ability to adequately manage the scarce human, physical and financial resources necessary to maintain the 21,000 km of roads under its charge.

The problem of retention of adequate staff is most critical at the management and professional levels where the lack of pay and benefit packages offered by the Department pushes qualified staff into the private/parastatal sector which provides more attractive remuneration. Even if the Department is able to hire qualified engineering/technical graduates from Zambian institutions, it is highly unlikely they will be retained long enough to be developed into senior management (current annual salary is less than $1500). This is evidenced at the provincial level where only 2 of 9 PRE's are native Zambians. Remaining PRE slots are filled by 3 British OSAS managers (2 of which are being terminated by ODA) and 3 expatriates under local contracts. This is further evidenced at the Headquarters where expatriates under foreign assistance programs fill key slots on a long term basis. The Deputy Director and Executive Engineer for contracts have been provided under the British OSAS Program and the Senior Executive Engineer for Maintenance by NORAD. While the use of expatriates may not be optimal from the point of view of utilizing Zambian human resources, it is probably the only way the Department could efficiently operate at the present. Yet, this arrangement for the provision of key management personnel leaves the Department at the mercy of the foreign assistance programs which may or may not be there with needed technical assistance. For instance, the OSAS program provided 6 Executive or Senior Executive engineers at Headquarters in 1985, whereas for reasons outside the control of the Department, only two are currently being provided. In 1985, there were 12 OSAS engineers at the Department, a figure which will be reduced to 3 shortly.

FINNIDA is currently providing six engineers on a long-term basis. Three road maintenance engineers are working in the Lusaka Province under a pilot project which is scheduled to run through 1993 and may be expanded to other provinces. Three engineers have also been provided to establish a stone crushing facility at Kafue. Their services are scheduled to end in 1990.

It is because of this seemingly irreversible trend in hiring and retaining Zambian management/professional level staff that the Department has concentrated efforts on a bottom-up personnel development program centered around the training school for road foremen (gangers). Personnel at the technician level have tended to stay with the Department on a long term basis so it has been possible to realize the benefits of in-house training.

In summary, the Roads Department has the same problems with hiring and retaining competent staff which are faced by all GRZ Ministries. Until the Government modifies the salary/benefits package which the Department may offer, competent management/professional personnel will continue to flock to the private and parastatal organizations. In the near future, the Department will have to rely on its own training program for road foremen, and assistance from donors for senior level management staff and appropriate training. Given the turnover pattern experienced by the Department, it may be most effective to direct as much training as possible toward the technician level (such as training for mechanics already on the staff who have shown potential) because artisans and technicians have demonstrated the most longevity and loyalty within the organization.

3.2 Operations

The Department's two main areas of responsibility are construction and maintenance of International Main (T), Main (M) and District (D) Roads. All construction and major maintenance such as rehabilitation are contracted out so Departmental actions in that regard are confined to contract administration and monitoring construction. The primary operations of the Department are therefore focussed on maintenance activities such as patching, cleaning and repairing drainage ditches, and periodic resealing of of road surfaces to prolong their useful lives. It is because of the relative importance within the organization and the critical nature of the activity in general that the following discussion focuses on the organizational process of how the Department carries out maintenance.

3.2.1 Goals: Goals are initiated by each Provincial Roads Engineer (PRE), reviewed by the Roads Department Headquarters in Lusaka and forwarded to the Ministry of Finance to be programmed in relation to Government-wide requirements and available funds. For instance relevant information for decision making purposes regarding paved roads would include necessary resealing, vegetation control, ditch digging, drainage structure clean-up and pothole patching. On gravel roads the resealing task would be replaced by regravelling.

3.2.2. Planning vs. Implementation Both tasks are initiated by the PRE. Levels of implementation are always less than those planned due to funding constraints, and the availability of equipment and labor. At the end of the year the Headquarters in Lusaka does a comparison study on planned vs. actual work implemented and makes appropriate adjustments in requests for funding, deployment of equipment and personnel, and other actions.

3.2.3 Accountability The responsibility for both financial and technical issues lies with the PRE's. They report to the Director of the Roads Department who reviews technical matters and renders decisions. However, on financial issues the Director must consult with the Ministry of Finance and Ministry of Power, Transport and Communication. On administrative matters only, the PRE's are responsible to the Provincial Permanent Secretaries who coordinate and monitor all government activities within the province.

3.2.4 Level-of-Service Standards There are three classes of paved roads. They are Class 1A: 7.3 meters-wide carriageway with 3 meter shoulders (only one road of this type exists in Zambia), Class 1B: 6.7 meters-wide carriageway with 2 meter shoulders (only a few of this type of road exist in Zambia; and Class 1C - 6.1 meter wide carriageway (most paved roads in Zambia are of this class). Current Roads Department practice calls for a double seal surface dressing, and for every road to be resealed at least once every seven years. This is defined as periodic maintenance.

3.2.5 Training Training is an extremely important element to maintain an effective level of service. The Director of Roads stated that his philosophy is to strengthen the base of the organization by concentrating on improving the efficiency of road maintenance crews. As previously described, maintenance repair gang leaders will be for a training course given in Lusaka. Roads Department feels it is more important to provide short-term training for its road technicians and maintenance gang leaders than it is to provide long-term training for the engineers. The road technicians and maintenance gang leaders tend to remain with the Roads Department long-term versus the engineers who work only for short durations before going to better-paid jobs. Current managerial courses for Road Provincial engineers are of 4 weeks duration.

The Director of Roads believes that more short-term intensive training is needed especially in the area of mechanical services because the Department is taking over responsibilities for equipment maintenance from the Government's Central MSD. Roads is also getting 3 new road maintenance equipment units which will need proper maintenance (one unit is being provided by the current A.I.D.-funded Kafue-Chirundu Road Project).

3.3 Organizational Framework (Maintenance Section)

3.3.1 Decentralization The Road Maintenance Section is mainly decentralized. The entire Zambian Roads Department consists of 127 Road Maintenance Zones. Each zone has approximately 150 km of primary/secondary paved/gravelled roads. Each PRE is responsible on average for 12 maintenance zones. Each zone crew is comprised of 10-15 people including the road gang leader. General laborers are hired as needed for specific jobs on a casual basis. In each province there are usually Urban City Councils who are responsible for road maintenance of urban roads. Only planning control (i.e., for new capital projects) and budgeting are performed on a centralized basis by the Roads Department Headquarters in Lusaka. As stated above, maintenance plans are initiated by the PRE's.

3.3.2 Organizational Relationships Provincial Roads Engineers are responsible to the Permanent Secretary of their Province (administratively only). However, for technical and financial support they report to the Director of Roads. The PRE is responsible for the maintenance crews working in each zone.

3.3.3 Personnel and Equipment Distribution Roads Department Headquarters hires all engineers and road technicians and deploys them wherever services are needed. The PRE is responsible for hiring all maintenance crew personnel (drivers, laborers, gang leaders, etc.) The Roads Department Headquarters procures and distributes equipment.

3.3.4 Equipment Availability and Utilization This is the responsibility of the PRE, however the task is closely monitored by the Roads Department Headquarters which deploys equipment to provinces based on local requirements.

3.3.5 Road Maintenance Budget and Expenditure PRE's are responsible for submitting a budget for their province on a quarterly basis to the Roads Department Headquarters. Work preparation for the annual budget is usually started by the PRE's in August. The Roads Department Headquarters authorizes the request, then sends the request (with revisions) to the Ministry of Power, Transport and Communication which in turn submits the request to the Ministry of Finance for final review. In November the Ministry of Finance submits the request (which has been reviewed by the Cabinet Office) to Parliament for approval. Parliament approves the budget in December for the next fiscal year which starts January 1. Expenditures are analyzed by the Roads Department at the end of the year after the budget has been spent. The Roads Department has flexibility to move funds from one line item to another to implement programs. A supplementary appropriation may be requested by the Roads Department for additional maintenance.

3.3.6 Work Programs or Plans These actions are initiated by the PRE's and approved by the Roads Department Headquarters. Special capital programs (large new construction projects) are initiated by the Ministry of Power, Transport and Communication and approved by the National Commission for Development Planning and the Ministry of Finance.

3.3.7 Private Sector Contracting Capacity and Utilization There are 5 approved contractors available in the country for construction jobs consisting of a value of K41,000,000.00 ($2,562,500.00) or more. It is envisaged that only one of these firms is actually Zambian owned, and therefore it will be necessary to solicit bids from other contractors in the SADCC region or the U.S.

4.0 Equipment

Equipment is deployed by the Director of Roads to the provinces on an as needed basis (see Table 2 for a breakdown of the Roads Department Plant/Vehicles/Equipment Inventory). While the Department owns a sizable amount of equipment, the upkeep and ongoing maintenance of these units has been a problem for a number of reasons. Stocking of adequate spares has been a problem which the Department has attempted to resolve by standardizing on certain brands of trucks such as Mercedes and Mitsubishi. Another problem has been attributed to inadequate service from the MSD. However, the Roads Department is no longer mandated to use their services and is attempting to do more repair/maintenance work in-house. In addition to the Mumbwa Workshop, each provincial headquarters has a workshop and a staff of mechanics.

Table 2: Plant/Vehicle/Equipment (Working)

	Lusaka	Central	Copperbelt	Northern	North Western	Luapula	Western	Southern	Eastern	Total	Procurement (Pending)
Flat Truck	2	4	3	3	2	2	2	3	4	25	-
Tipper	12	7	8	8	6	7	5	4	12	69	40
Water Tanker	3	3	4	?	3	3	3	-	3	25	04
Front end Loader	2	4	2	3	4	2	1	-	3	21	02
Bitumen Distributor	2	-	1	-	-	-	-	1	-	4	02
Roller (Tire)	4	2	2	3	2	4	2	3	2	24	02
Bull Dozer	2	1	-	2	1	1	1	2	1	11	04
Motor Grader	4	5	2	5	5	4	1	3	3	32	04
Low Loader	-	1	-	1	1	1	1	-	1	6	-
Jumbo Breaker	-	-	-	-	-	-	-	-	-	-	02
Dozer Shovel	-	-	-	-	-	-	-	-	-	-	02
Roller (Steel)	2	1	2	1	1	-	-	-	8	8	04
Vanette	5	3	3	4	3	4	1	2	3	28	06
Chip Spreader	2	-	-	-	1	-	-	-	2	5	06
Asphalt Kettle	-	-	-	-	-	-	-	-	-	-	02
Crusher (plant)	1	-	1	-	-	-	-	1	-	3	02
Compressor	-	1	1	-	1	1	1	-	2	7	02
Farm Tractor	12	6	8	13	10	11	7	9	7	83	-
Mobile Workshop	3	-	-	-	-	-	-	-	-	3	-
Dumper (small)	-	-	-	2	-	-	-	-	2	4	-
Bitumen Storage Tank	1	-	-	-	-	-	-	-	1	2	-

June 1989

Methods of Financing

1.0 Responsibilities for Implementation

This project will be obligated under a bilateral grant agreement with the Government of the Republic of Zambia (GRZ). USAID/Zimbabwe will be the authorized accounting station for the project and will be responsible for dollar disbursements and financial accountability.

Local currency will be provided under a standard counterpart funds agreement signed by USAID/Zambia and the GRZ. Accountability for these funds will remain with USAID/Zambia.

Local currency payments will be made from the project working account established under the authority of the USAID/GRZ counterpart funds agreement. The counterpart funds agreement must be signed and the working account established prior to the signing of the construction contract to minimize delays in paying contractors/suppliers. Payments from the working account will be made to the construction contractor, the local training institution and to suppliers of locally produced equipment. The Director of Roads will authorize payments from this working account in accordance with the applicable provisions of the counterpart funds agreement. All kwacha payments for construction supervision services, locally manufactured equipment and local training will be approved by the Director of Roads or his designee as specified in the USAID/GRZ counterpart fund agreement for the project. These kwacha payments will be made by the Accounts Department of the Ministry of Power, Transport and Communication.

All payments from the USAID grant will be certified by USAID/Zimbabwe. Administrative approval will be given in Zambia for dollar payments to the final design/construction supervision contractor, the construction services contractor, equipment suppliers and the institution providing overseas training.

Host country contracting mechanisms detailed in HB 11 will be utilized to procure services for both final design/construction supervision and construction. Additionally, road maintenance equipment and in-country training will be procured under host country contracting procedures. Imported maintenance equipment will be purchased using HB 11 procedures while locally produced fuel and bitumen tanks will be purchased using standard GRZ competitive procedures and funded from the project working account. In-country training will also be procured under standard GRZ procedures and funded in kwacha from the project working account.

Host country contracting was successfully utilized to procure nearly identical goods and services under the recently completed Kafue-Chirundu Road Rehabilitation Project. The contracting capability of the GRZ was found to be satisfactory under that activity so there is every reason to believe the situation will continue under the current activity.

Evaluations will be carried out primarily by the REDSO/ESA staff. USAID/Zambia will utilize PSCs or IQCs to support REDSO/ESA in areas where direct hires are not available during required time frames. A non-federal audit will also be contracted with an individual or firm under an A.I.D. direct contract if RIG/A/N staff from Nairobi are not available.

2.0 Recurrent Costs Financing

The Department of Roads has budgeted 275 million kwacha for recurrent road maintenance and capital expenditures. Historic budget allocations are shown as follows:

1989	275.62 million kwacha
1988	248.59
1987	214.37
1986	256.23
1985	72.26
1984	50.58

Recurrent maintenance of the project road can be divided into two discrete categories: periodic maintenance and routine maintenance. A schedule of periodic maintenance requirements is provided in the Technical Analysis. On an annualized basis, it is estimated that periodic maintenance costs for the project road will amount to ZK 1,093,857 in 1989 kwacha. Routine maintenance is estimated at ZK 50,000/km or 2,470,000 for the project road, also expressed in 1989 kwacha. The total of these two categories of maintenance costs is ZK 3,563,857; roughly 1.2% of the 1989 budget allocation of the GRZ Department of Roads.

The ability of the GRZ to meet future recurrent costs associated with the Kafue-Lusaka road is addressed through three Covenants:

1. The GRZ covenants to include adequate resources for the maintenance of the project road in the Ministry of Power, Transport and Communications budget request to Parliament;

2. The GRZ covenants to give maximum consideration to the dedication of payments received as penalties for overweight assesments to provide supplemental funding for the national road maintenance program; and

3. The GRZ covenants to initiate a study to assess the feasibility of levying road user fees to ensure that transporters bear a greater proportion of recurrent road maintenance costs.

Other project interventions directed towards improving the capability of the Department of Roads to provide recurrent maintenance on a cost-effective basis include the provision of training for roads engineers and mechanics and the procurement of road maintenance equipment. These inputs are described in greater detail in the Project Paper.

Other donors are also actively involved in building institutional maintenance capability at the Department of Roads. FINNIDA, NORAD and British ODA are each contributing technical assistance and budget support to the Department on a long-term basis. Future road rehabilitation projects such as the proposed

AfDB Great East Road Rehabilitation will include resources dedicated to improving the road maintenance capability of the GRZ. The EEC has also indicated their intention to provide budgetary support for the Department of Roads as part of the Lusaka-Copperbelt road rehabilitation project.

2.1 Financing Methods

Financing methods for the various elements of the project are included in Methods of Financing and Implementation tables below. Table 1 relates to dollar disbursements and Table 2 relates to kwacha disbursements.

Obligations by fiscal year are detailed in Table 3. Accrued expenditures are detailed in Table 4 for dollars and in Table 5 for kwacha. A cost build-up for the PSC engineer is detailed in Table 6.

Table 1: Methods of Financing and Implementation
U.S. $ Costs (000)

Element	Method of Implementation	Method of Financing	Total
Final Design	Host Country Contract, competitively procured in accordance with HB 11, Ch 1 procedures	Direct Letter of Commitment	$390.00
Construction Supervision	Host Country Contract, competitively procured in accordance with HB 11, Ch 1 procedures (same contract as final design	Direct Letter of Commitment	$1,000.00
Construction Services	Host Country Contract, competitively procured in accordance with HB 11, Ch 2 procedures	Direct Letter of Commitment	$15,100.00
Maintenance Equipment	Host Country Contract, competitively procured in accordance with HB 11, Ch 3 procedures	Direct Letters of Commitment	$860.00
Training	Direct Contract or PO with Training Institutions	Direct Payment	$20.00
PSC Engineer	Direct Contract with individual	Direct Payment	$820.00
Evaluations, Audits	Direct contract with individuals or work order IQC NFA	Direct Payment	$100.00

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Table 2: Methods of Financing and Implementation
Kwacha Costs (000)

Element	Method of Implementation	Method of Financing	Total Amount (k)
Construction Services	Host Country Contract, competitively procured in accordance with HB 11, Ch 2 procedures and USAID/GRZ counterpart funds agreement.	Direct payment by Accts Dept of MOPTC from working acct at Lusaka commercial bank.	40000.00
Maintenance Equipment (a)	Host Country Contract, in accordance with GRZ procurement procedures and USAID/GRZ counterpart funds agreement.	Direct payment by Accts Dept of MOPTC from working acct at Lusaka commercial bank.	400.00
Training (in-country) (b)	Host Country Contract, in accordance with GRZ procurement procedures and USAID/GRZ counterpart funds agreement.	Direct payment by Accts Dept of MOPTC from working acct at Lusaka commercial bank.	750.00

Note:

(a) Maintenance equipment is comprised of one bitumen storage tank estimated at Kwacha 300,000 and one mobile fuel tank estimated at Kwacha 100,000.
(b) Based on cost s provided by the International Training Center in Lusaka.
(b) Costs for 1990 are for 10 participants @ 900 K/week X 8 weeks (two 4-week sessions) = k 72,000 plus 400 lunches X k45 =k 18,000. Total 1990 = k 90,000. Applying a cost escalator of 50 % per year, estimated costs over time are: k 135,000 (1991), k 202,500 (1992), and k 303750 (1993).

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Table 3: A.I.D. Obligations Schedule
By Fiscal Year
($ 000)

Activity	FY 90	FY 91	Total
Final Design	390.00	0.00	390.00
Construction Supervision	500.00	500.00	1000.00
Construction Services	10000.00	5100.00	15100.00
PSC Engineer	420.00	400.00	820.00
Training	20.00	0.00	20.00
Maintenance Equipment	0.00	860.00	860.00
Evaluations, Audits	0.00	100.00	100.00
Contingency/Inflation (15 %)	1699.50	1044.00	2743.50
TOTAL	13029.50	8004.00	21033.50
TOTAL (ROUNDED)	13050.00	8000.00	21050.00

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Table 4: A.I.D. Projected Accrued Expenditures
By Fiscal Year
($ 000)

Activity	FY 90	FY 91	FY 92	FY 93	FY 94	Total
Final Design	0.00	390.00	0.00	0.00	0.00	390.00
Construction Supervision	0.00	0.00	500.00	500.00	0.00	1000.00
Construction Services	0.00	0.00	7500.00	7600.00	0.00	15100.00
PSC Engineer	120.00	220.00	220.00	260.00	0.00	820.00
Training	3.00	4.40	5.50	7.10	0.00	20.00
Maintenence Equipment	0.00	0.00	0.00	300.00	560.00	860.00
Evaluations, Audits	0.00	0.00	30.00	0.00	70.00	100.00
Contingency/Inflation (15 %)	18.45	92.16	1238.33	1300.07	94.50	2743.50
TOTAL	141.45	706.56	9493.83	9967.17	724.50	21033.50
TOTAL (ROUNDED)	140.00	710.00	9500.00	9970.00	730.00	21050.00

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Table 5: Local Currency Expenditures
By Fiscal Year

(Kwacha 000)

Activity	FY 90	FY 91	FY 92	FY 93	FY 94	Total
Construction Services	0.00	20000.00	20000.00	0.00	0.00	40000.00
Maintenance Equipment	0.00	0.00	0.00	0.00	400.00	400.00
Training	90.00	135.00	202.00	323.00	0.00	750.00
Contingency/Inflation	27.00	6040.50	6060.60	96.90	120.00	12345.00
TOTAL	117.00	26175.50	26262.60	419.90	520.00	53495.00
TOTAL (ROUNDED)	120.00	26180.00	26260.00	420.00	520.00	53500.00

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Table 6: Estimated Cost For Personal Services Contractor
Engineering Services For Kafue-Lusaka Road Project

Tour of Duty:	3 1/2 yrs
Compensation:	$70,000 /yr (a)
Dependents:	Spouse and 2 children (assumed)

ALLOWABLE COSTS

A. Personal Compensation	1st Year ($)	2nd Year ($)	3rd Year ($)	4th Year ($)	Total ($)
1. Basic Pay (a)	70,000	72,100	74,263	38,245	254,608
2. Post Differential	10,500	10,815	11,139	5,737	38,191
3. COLA	2,800	2,884	2,971	1,530	10,184
B. Personal Benefits (5% annaual inflation)					
1. Education Allowance (b)	45,700	47,985	50,384	26,452	170,521
C. Travel and Transportation					
1. International Travel	7,000	0	0	7,875	14,875
2. Excess Baggage	1,000	0	0	1,125	2,125
3. Per Diem (post assign/ return)	800	0	0	900	1,700
4. Unaccompanied Baggage	7,000	0	0	7,875	14,875
5. Household Effects	25,000	0	0	28,125	53,125
6. POV	4,000	0	0	4,500	8,500
7. Storage	4,000	4,200	4,410	4,631	17,241
8. R and R	0	14,000	14,700	0	28,700
9. Emergency Med. Travel	2,000	2,100	2,205	2,315	8,620
10. Medical/ Minbank	500	525	551	579	2,155
D. Rent & Utilities					
1. Residential Rent	24,000	24,000	24,000	12,000	84,000
2. Utilities	18,000	18,000	18,000	9,000	63,000
3. Furnishings	20,000	0	0	0	20,000
4. Appliances	9,000	0	0	0	9,000
5. Maintenance to Res.	2,400	2,400	2,400	2,400	9,600
E. Other Direct Costs					
1. Physical Exams	375	0	0	375	750
2. Miscellaneous	2,000	2,000	2,000	1,000	7,000
TOTAL ($)	256,075	201,009	207,023	154,663	818,771
AVERAGE COST/MONTH	$19,495				

Note:
(a) Assumes starting salary of $70,000, with annual increases of 3 %.

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