PD-AAY-516
ISN 16536

BOTSWANA

BOTSZAM ROAD PAVING

SUPERVISION

JUNE, 1977

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT PAPER FACESHEET

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9. ESTIMATED DATE OF OBLIGATION: A. INITIAL FY 77; B. QUARTER 4 (Enter 1, 2, 3, or 4); C. FINAL FY 80

10. ESTIMATED COSTS ($000 OR EQUIVALENT $: –)

A. FUNDING SOURCE	FIRST FY 1977			LIFE OF PROJECT		
	B. FX	C. L/C	D. TOTAL	E. FX	F. L/C	G. TOTAL
AID APPROPRIATED TOTAL						
(GRANT)	(45)	(5)	(50)	(1365)	(135)	(1500)
(LOAN)	( )	( )	( )	( )	( )	( )
OTHER U.S. 1.						
OTHER U.S. 2.						
HOST COUNTRY					1400	1400
OTHER DONORS				9285	2315	11600
TOTALS	45	5	50	10650	3650	15000

11. PROPOSED BUDGET APPROPRIATED FUNDS ($000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	PRIMARY TECH. CODE		E. 1ST FY 77		H. 2ND FY		K. 3RD FY	
		C. GRANT	D. LOAN	F. GRANT	G. LOAN	I. GRANT	J. LOAN	L. GRANT	M. LOAN
(1) SA	910	821		1500					
(2)									
(3)									
(4)									
TOTALS				1500					

A. APPROPRIATION	N. 4TH FY		O. 5TH FY		LIFE OF PROJECT	
	O. GRANT	P. LOAN	R. GRANT	S. LOAN	T. GRANT	U. LOAN
(1)					1500	
(2)						
(3)						
(4)						
TOTALS					1500	

12. IN-DEPTH EVALUATION SCHEDULED: MM 03 YY 78

13. DATA CHANGE INDICATOR. WERE CHANGES MADE IN THE PID FACESHEET DATA, BLOCKS 12, 13, 14, OR 15 OR IN PRP FACESHEET DATA, BLOCK 12? IF YES, ATTACH CHANGED PID FACESHEET.

1 (1 = NO, 2 = YES)

14. ORIGINATING OFFICE CLEARANCE

SIGNATURE: Louis A. Cohen

TITLE: Louis A. Cohen, Director, REDSO/EA

DATE SIGNED: MM 6 DD 16 YY 77

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BOTSWANA PAVING DESIGN AND SUPERVISION

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Summary and Recommendation

A. Face Sheet (see above)

B. Recommendation

Grant: $1,500,000.00

C. Description

Over the proposed four-year project life, the Agency for International Development (AID), in cooperation with the Government of Botswana (GOB) and the European Community (EC), will provide capital assistance designed to increase Botswana's transport self reliance. The project consists of the design and construction of a bituminous surface treatment of the 300-km BotZam Road, see Annex B-6.

AID's proposed grant will finance the costs of an engineering consulting firm to provide engineering design of the construction plans, specifications, cost estimates and contract documents (one year). as well as supervision during the two year construction and one year maintenance periods.

The EC, through the European Development Fund (EDF), is providing $11.6 million grant and the GOB will provide the estimated balance of $1.4 million to finance paving of the BotZam Road.

The combination of inputs proposed to finance the cost of paving of the BotZam Road will result in an alternative transport link between Botswana and Zambia.

D. Summary Findings

Botswana's network of roads is at an early stage of development. Of the estimated 7000 km of roads which comprise the basic road network, less than five percent are paved. The principal road from an economic (and increasingly, a political) perspective is the north-south axis (approximately 1000 km), along which much of the country's road traffic is concentrated. The GOB is concentrating its efforts on upgrading the road to bituminous standards and has requested the assistance of several international donors to assist in financing sections of the road.

This road is an essential element in linking Botswana with Black Africa in an effort to develop political and economic independence from neighboring minority ruled countries.

The proposed grant will finance a consulting firm to provide design and supervision for bituminous surfaced treatment of the BotZam Road. The project is economically viable and it is in accordance with the UN Security Council resolution of January 14, 1977.

Tippetts-Abbett-McCarthy-Stratton (TAMS) has prepared a study of the feasibility of upgrading the BotZam Road. The proposed AID financed design and construction supervision, along with the EC and Government of Botswana inputs for actual construction, are sufficient to implement the project. The key factor of the paving project will be the reduced maintenance costs. The GOB has been prepared to maintain the gravel roadway so maintenance of the paved highway will not be a constraint (see section on maintenance). On the basis of the analyses provided in the TAMS feasibility study and analyses contained in this paper, OSARAC and REDSO/EA conclude that the project is technically, economically and financially sound and recommend that the AID portion of the project be authorized at a level of $1.5 million.

The project meets all applicable statutory criteria (see Annex D-1). The Director of REDSO/EA has certified that the Republic of Botswana has the capability to effectively maintain and utilize project financed activities (Annex D-3).

E. Issues

None.

PART II

Description and Background of Project

A. Project Background

The Government of Botswana has recognized the importance of highways in their development plans in recent years. The National Development Plans 1973-1978 states "In respect of roads, the Government will concentrate on improving rural roads, upgrading the existing main roads (especially the north-south road of which the northern 300-km is known as the BotZam Road) and providing a reliable access road to the northern part of the country, to provide a direct link with Botswana's northern neighbors". The Government has been implementing this plan, particularly with regard to the North-South Road (BotZam). Between the South African border and Nata, the road is either paved or in the design or construction stages as a paved road (see Annex B-6).

In 1967, the Ministry of Commerce, Industry and Foreign Trade of the Republic of Zambia retained a consulting firm to undertake a feasibility study of an improved route connecting Francistown, Nata and Kazangula with southern Zambia, with particular emphasis on the section between Nata and Kazangula. Their report 1/ recommended the construction of a class 2 gravel road from Nata to Kazangula with an improved ferry crossing at Kazangula and the upgrading of the Nata-Francistown section from class 2 to class 1 (bituminous surface).

1/ Report on the Nata-Kazangula Road, Botswana, Brian Colquhoun and Partners (Zambia) 1967

Another study was undertaken in 1969 and 1970 by the URS Research Company under contract to the US Agency for International Development 1/. The objectives of that study were to identify the economic feasibility of alternative road alignments and improvements between Francistown, Botswana and Livingstone, Zambia, with particular emphasis on the Nata-Kazangula sections and to identify the least-cost alternative(s), if any, of any feasible transport mode to the present rail link through Rhodesia for transit traffic between South Africa and the copperbelt in Zambia. The study concluded that improvement of the main road to an all-weather, good-gravel standard was economically feasible.

In November of 1970, AID provided Botswana with a $850,000 grant to finance the engineering design of the section between Nata and Kazangula. The design contract was signed in June of 1971 between TAMS and the GOB Ministry of Works and Communications. Subsequently, an AID loan of $12.6 million was authorized on April 28, 1971, to finance the construction and engineering supervision of the road and the procurement of road maintenance equipment at an estimated cost of $130,000. Evaluation of the bids for construction led to AID providing an additional $4.0 million to the loan agreement with an amendment authorized June 13, 1973. The construction contract was awarded in June 1973 to Grove International Corporation by the Government of Botswana. Construction was completed in January of 1977.

Since the border between Rhodesia and Zambia closed in 1976, added emphasis has been given to this route as the main north-south supply link between Southern Africa and Zambia. The Government of Botswana believed that the additional traffic on the BotZam Road generated by the border closure might be sufficient to justify paving the road. The paving of the Nata-Kazangula section would fit with the overall highway improvement program in Botswana and provide a paved north-south road through the entire country.

The GOB requested grant funds from USAID to examine the feasibility of paving the BotZam Road. AID retained TAMS in October of 1976 to carry out a feasibility study. The objective of the BotZam Upgrading was to determine the feasibility of upgrading the BotZam Road between Nata and Kazangula from a soil aggregate to a bituminous surface.

TAMS' feasibility study of upgrading the BotZam Road dated May 1977 is based on a review of available traffic data in the vicinity of the road, origin-destination survey data collected by TAMS on the Kazangula ferry crossing, data compiled at the Rhodesia-Botswana border crossing at Kazangula, a review of development plans for various sectors of the economy, discussions with trucking companies and a review of other pertinent data.

1/ Botswana-Zambia Transportation Survey, URS Research Company, 1970

It was concluded that the opening year traffic on the improved BotZam Road (1980) would be about 55 vehicles per day. It is estimated that this would increase by an average of 9 percent per year to a total of 283 vehicles per day after 20 years (the Sua Pan Development Project, if implemented, would add about 10 vehicles per day to these estimates). Therefore, it was concluded by TAMS that the upgrading of the BotZam Road to a bituminous standard is economically feasible (see Annex B-5).

Actual traffic counts taken during the first six weeks of the road being open indicated a traffic volume of up to 200 vehicles a day which compared with the forecast prepared by TAMS for 1994 (see Annex B-5). Based on the findings of the feasibility study, the EC offered to grant-finance the paving of the road in March 1977. AID proposed to grant-finance a sum of $1.5 million for the design and construction supervision. The GOB is also prepared to finance any possible shortfall. Construction is planned to begin in August 1978.

1. Coordination with Other Donors

The GOB has received considerable financial assistance from other donors for the development of its infrastructure. Donors have been particularly forthcoming in helping the GOB to improve and develop its transportation sector. The IDA and Swedish SIDA are providing the necessary funds ($5.9 million) for paving the road between Lobatse and Gaborone. The UK is providing assistance for a bituminous surfaced road from the end of the paved road going north from Gaborone to Mahalapye. The IBRD is financing a similar type of paved road from Mahalapye to Serule. The German KFW is financing a paved road from Serule to Francistwon. The Canadian CIDA, Norwegian NORAD and Danes are financing a paved road from Francistown to Nata. AID will grant-finance design and construction supervision from Nata Kazangula and the EC, vide their telex 266/77 dated April 1, 1977, addressed to Mr Michael Stevens of the Ministry of Finance, has reserved a sum of 10 million units of account (approximately $11.6 million) for paving the BotZam road from Nata to Kazangula. Upon completion of all these projects, coordinated and financed by various donors, Botswana will have a paved North-South Road going from South Africa to the Zambia Border.

2. Priority and Relevance - Project Rationale

Botswana is politically and economically dependent on the neighboring white-ruled countries of Rhodesia and South Africa. The resulting pressures are greater than any other landlocked country would face since political agitation and insurrection are taking place in both of those countries. Botswana's main transport routes pass through those countries. Economic blockade, sabotage or political disruptions in either country could have significant, direct economic consequences for Botswana.

Hostorically, the majority of Botswana's international trade has transitted via the Republic of South Africa (RSA). In 1973, when the OPEC oil embargo was launched, an attempt was made to stop all oil shipments to the RSA. Since all of Botswana's petroleum imports come from RSA,

Botswana faced the threat of a cut-off in its oil supplies. While the OPEC oil embargo did not materially affect Botswana, it did drive home to the GOB its heavy dependence on trade and transit with South Africa

Starting in 1973/1974, Botswana realized that security of its transport routes was one of its most critical economic requirements. The need for alternative supply routes quickly became one of Botswana's top priorities. The GOB defined the situation as its "lifeline problem". Any political disruption in the RSA or UN economic embargo against the RSA would affect Botswana. In addition, the Rhodesian owned and controlled railroad carries roughly 800 000 tons a year of Botswana imports and exports. Any Rhodesian political or other disruption (war, sabotage, etc) could restrict or eliminate Botswana's use of the railroad. The need for an alternative "lifeline" to Black Africa became even more critical. From the Kazangula ferry an all-weather road connects through Livingstone to Lusaka and the highway and railway connection to Dar es Salaam. The BotZam gravel road provided access to Zambia, avoiding transit through both South Africa and Rhodesia. However, the road was designed before the current political changes started in Southern Africa. The gravel road was designed for only a minor amount of traffic in both numbers of vehicles and weight of vehicles. Any large-scale diversion of traffic to the gravel road would result in its rapid deterioration and high maintenance costs.

The GOB approached the US Government and nations for economic assistance to upgrade the road. The UN Security Council on January 14, 1977, "appealed to all states to respond positively in providing assistance to Botswana ...". This project is in response to that request. It will help provide Botswana with the "lifeline" to the north which it requires.

3. Relationship to Previous AID Activities

In November of 1970, AID provided Botswana with a $850,000 grant to finance the engineering design of a gravel surfaced road. The loan of $12.6 million was authorized on April 28, 1972, to finance the construction and engineering supervision for an improvement to about 360-km of roadway. In June of 1973, under amendment No 1, AID increased this loan by a further $4.0 million, bringing the total to $16 600,000. The construction of the road was completed in December 1976. The road was officially opened on January 20, 1977.

On September 30, 1976, AID signed a contract with TAMS for a feasibility study. Under a new contract to be signed between TAMS and GOB, TAMS will prepare the design and contract documentation, grant-financed by AID, for the paving of the road and EDF will grant-finance the construction costs.

4. Origin of Request for Assistance

On May 17, 1974, the GOB's Ministry of Finance and Development planning requested AID to consider the possibility of supplemental AID funds for bituminization of the BotZam Road. It also indicated that the GOB anticipated obtaining a substantial contribution to the project's costs from

other donors. However, the contributions from other donors did not materialize and the proposed project was deferred until a later date.

From May 20 through 23, 1977, EDF/OSARAC/GOB and REDSO met to coordinate support for the project. During this meeting the EC indicated it would proceed with preparation of project documents based on cost estimates provided in the TAMS Feasibility Study. REDSO agreed to proceed with the preparation of the Project Paper for support of design and supervision. GOB has agreed to provide a formal application for assistance which requests AID's financial contribution for engineering design and supervision costs. A revised request will be forwarded from Gaborone directly to AID/Washington.

B. Detailed Project Description

1. Project Goal and Purpose

The project goal is to improve the economic well-being of the general populace of Botswana, particularly those living along the eastern borders of the country where the major transport network is located. The purpose of the project is to support the GOB's efforts to increase its transport self-relience. The project will support these objectives by financing the design and bituminous paving of the northern link of the north-south road axis (BotZam). This will help to reduce the GOB's dependence on road transport from its southern neighbor, Republic of South Africa, and enhance the possibilities of increased trade and communication with Tanzania and other states of contral and eastern Black Africa. This project is in consonance with the Botswana National Development Plans (1973-1978 and 1976-1981) which placed considerable emphasis on upgrading the existing main roads, principally the North-South Road.

2. Project Outputs

The principal output of the project will be a bituminously surfaced 300-km road from Nata to Kazangula, the northern terminus of the North-South Road and the border crossing area to Zambia. This section of the road is hereafter known as the BotZam Road. The road was constructed with AID funds and is currently gravel surfaced. The AID-financed portion of the project will consist of: a) design of the road project, preparation of all contract documents and assistance to GOB in the selection of the contractor; and b) the supervision of paving during the estimated two-year construction period as well as supervision during the one-year maintenance warranty period.

3. Project Inputs

To complete the proposed project within the time frame proposed, the following inputs are required: a) a $1.5 million grant to finance the cost of an engineering consultant firm to provide engineering design of plans, specifications and cost estimates as well as carry out supervision during the proposed two-year construction and one-year maintenance periods; b) a $13.0 million equivalent input (comprised of $11.6 million equivalent grant from the EC and a contribution of $1.4 million equivalent from GOB) to finance the construction/paving and maintenance during an initial one-year period after completion of the construction.

The GOB has received assurance from the EDF that the proposed $11.6 million grant (10 million currency units) has been earmarked for the project. As a condition precedent to disbursement of AID funds for the design phase, the GOB will be required to provide evidence of EDF's intention to contribute to the project as well as a statement of GOB's willingness to meet any funding requirements for construction not covered by the EDF contribution. During the design phase of the project, the EDF will be expected to formalize and authorize its contribution. AID approval of disbursements for activities other than those associated with the design phase will be contingent upon GOB's providing AID with firm evidence that adequate funds are available to carry out the construction.

PART III

Project Analysis

A. Technical and Engineering Analysis

1. Introduction

The proposed regional project consists of upgrading the existing BotZam Road from a soil aggregate to bituminous surface road.

AID, under the proposed project, will provide grant funds in the sum of $1.5 million to cover the costs of engineering design, plans, specifications, preparation of construction documents, selection of lowest responsive bidders and provisions of services to supervise the construction. It is anticipated that the GOB/TAMS contract will be signed about early September 1977, immediately after authorization of funds from AID/Washington and signing of the project agreement with the GOB.

2. Road Alignment

The existing BotZam Road is a soil aggregate surfaced road stretching from Nata to Kazangula, a distance of about 300-km. This road provides a regional transport link between Zambia and the central part of Botswana. Ferry services are provided by Zambia across the Zambezi River at Kazangula.

3. Design Standards

The existing gravel road cross section used on the BotZam Road provides 0.15-meter base course and 0.15-meter soil aggregate surface course. The width of the roadway measured to the outer edge of the shoulders is 7.4 meters. The pavement cross slope is 4.0 percent and the side slopes are 1:4.

Four alternative cross sections were analyzed in the feasibility study prepared by TAMS' engineering:

Alternative I is the minimum design and provides for a paved width of 6.0 meters, shoulder width of 0.7 meters and a cross slope of 4.0 percent.

Alternative II also provides a paved width of 6.0 meters and shoulder width of 0.7 meters but the cross slope would be reduced to 2.5 percent.

Alternative III, the paved width is increased to 6.7 meters, shoulders are 0.35 meters and a 2.5 percent cross slope is used.

Alternative IV provides a paved width of 6.0 meters, shoulders of 0.7 meters and a cross slope of 3.0 percent.

The base course (presently the surface course) was proposed by TAMS to be treated with lime for a width of 6.3 meters in alternatives I, II and IV and for 7.0 meters in alternative III. The 6.7-meter paved width was tested by TAMS in their study as this criteria is the standard width on paved roads in Botswana and is the same width used in the section of the north-south highway south of Nata. The low traffic volume to be expected on this road, however, has allowed TAMS to reduce this width to 6.0 meters and still provide adequate capacity. Although the proposed cross sections all have shoulder widths less than what the Botswana standards specify, TAMS believe that shoulders are adequate for the forecasted traffic volume, especially with the almost unlimited sight distance on this road. The cross slope of 4.0 percent is fairly standard on gravel roads to permit surface water to run off fast before it soaks into the surface. It is considered high value, however, for a paved road where the surface water runoff is not a problem.

The economic analysis indicated that alternative I is the preferred design with alternative IV ranked second and alternative II ranked third. Alternative III is not economically feasible. Although this would normally mean that alternative I would be recommended, there is another factor - pavement cross slopes - which was considered but is difficult to build into an economic analysis. The rather high cross slope of four percent in alternative I can be a problem on heavily travelled roads since during a passing maneuver, vehicles must negotiate reversing cross slopes which tend to cause swaying in trucks with high body loads. To avoid any potential safety problems and to be consistent with Botswana's standard practices, TAMS has concluded that alternative IV should be recommended even though it provides slightly lower economic feasibility indices than alternative I. The recommended scheme will provide a 6.0-meter paved width with 0.7-meter unpaved shoulders and a three percent cross slope.

In a meeting held in Gaborone with EDF, OSARAC, Government of Botswana and REDSO/EA officials, Botswana representatives approved and accepted the TAMS Study Report and AID concurred with Botswana on the selection of alternative IV as best for basis of construction. EDF representatives were also agreeable to the adoption of alternative IV. Alternative I construction procedure was the second choice acceptable to all parties concerned.

4. Existing Maintenance Facilities

Maintenance operations in Botswana are the responsibility of the Road Branch of the Ministry of Works and Communications. The country is divided into three maintenance divisions - south, north and west - each with a roads engineer responsible for all maintenance activities in his division. Each division is further broken down into two or three districts, each with an inspector of works stationed at a road maintenance depot in charge of that district. Each district then contains a number of road camps from which routine maintenance activities are carried out.

Equipment used in maintenance activities is supplied by the Central Transport Organization (CTO) of the Ministry of Works and Communications. This organization is responsible for supplying, maintaining and equipping all vehicles used by government agencies in Botswana, not only for the Ministry of Works but for all ministries. Prior to April 1976, the CTO charged each agency for the use of the equipment on a price per liter of fuel. This price included not only fuel costs but depreciation, repair and all costs associated with operating the equipment. Since the start of the new fiscal year on April 1, 1976, however, these costs are part of the CTO budget and no billing is made to other agencies.

The Nata-Kazangula Road falls within the Nata District of the North Division. This district has a road depot at Nata and road camps at Mosetse, Zoroga and Kasane. This district is responsible for maintaining 642-km of roads. As part of the construction of the BotZam Road, three new maintenance camps have been built - at Nata, at kilometer 105 and at kilometer 256.

It is assumed that each of the camps responsible for the BotZam Road be self-sufficient - responsible for carrying out all maintenance work within the limits of their section, including grading, rolling, bushclearing, patching, etc. The three camps that would be responsible for maintaining the BotZam Road will be adequately staffed and equipped for maintaining a DBST road.

These camps will be able to provide a reasonable level of maintenance service. It is generally recognized by officials of the Ministry of Works and Communications that maintenance of roads in Botswana has been less than satisfactory. The biggest problem has been with equipment. Breakdowns and slow maintenance of equipment have resulted in an average down time of about 60 percent for graders and 40 percent for other equipment.

Equipment availability has been improving this past year, however, and it is expected that it will continue to improve. The Central Transport Organization is standardizing its equipment purchases which should result in faster repair of machinery. Ten new graders have recently peen purchased and these will be put in the field in the next few months.

The CTO expects to have one mechanic stationed at each road camp or depot to do first-line, routine maintenance of equipment. In addition, they have recently ordered two mobile workshops which will travel around the country, each staffed by a three-man crew to perform more complex maintenance tasks. The CTO anticipates that the down time can be reduced to about 20 percent in the near future. It therefore appears that there will be adequate facilities to maintain the road surface after it has been paved. The World Bank under a separate program is providing technical assistance and equipment to upgrade Botswana's road maintenance capabilities.

5. Project Costs

a) General

The estimated financial costs provided by TAMS for upgrading the BotZam Road with a double bituminous surface treatment (including escalation) is US $10,650,600 and Pula 3,178,870 for alternate IV 1/. The estimated investments required to implement the project is US $13,000,000 equivalent for construction and US $ 1,500,000 for design and supervision.

b) Estimating Basis

The estimates are based on an analysis of unit prices prepared by TAMS from recent contracts, engineering estimates for other highway projects in Botswana and neighboring countries, TAMS studies of upgrading the BotZam Road performed in 1974 and discussions with officials of the GOB and TAMS resident staff in Botswana. These unit prices have been escalated to December 1976 Botswana prices. The cost estimating factors used to develop the estimates are discussed below, and a detailed cost estimate provided by TAMS is provided in Annex B-3.

The estimates reflect importing major equipment, bitumen, lime and other material which are not locally available. Imported material and services are assumed to originate from the African, Caribbean, Pacific (ACP) and EC countries. Petroleum fuels, oils and lubricants are assumed to have their source in Botswana and origin from free world countries. The material costs include all applicable purchasing charges, freight, export packing duties and import taxes.

The construction labor is composed of a mixture of expatriate, third country nationals and locally hired labor. The locally hired labor consists primarily, of semi-skilled, unskilled labor and administrative support staff.

The estimate is based on a unit price contract obtained under competitive bidding. Inclusion of South African contractors and US contractors for construction may be requested of the EC by the GOB.

1/ 1.21 US Dollar equals 1 Pula.

Design engineering to be performed by a US firm consists of plans, specifications, engineering estimates, construction contract documents and bid reviews. It is anticipated that this function will be conducted in Africa by expatriate and third country national staff.

The project field engineering and supervision, also to be performed by the same US firm, consists of the final design, modifications in the field, administration of contracts, inspections and costs; housing, offices, laboratories and corresponding furnishings, utilities and supplies for the engineering staff and vehicles and fuel will be furnished by the contractor under the field construction contract.

c) Contingency

All elements of the project include a 10 percent contingency over and above the identifiable cost elements of the project. The major portion of the contingency provides for project changes that occur during project execution. The remainder provides for some variation in economic conditions and schedule, and other non-foreseeable costs to the extent that they have occurred on the average project. It is not the intent at this level of contingency to cover project scope/basis changes, currency re-valuation, extensive project delays, petroleum or material embargoes or exceptional petroleum price increases.

d) Currency Breakdown

Costs have been divided into pula and dollar components. In the engineering estimate, the pula component consists of salaries of locally hired technicains and administrative support personnel and living allowances for all field personnel. The dollar component consists of expatriate and third country national salaries, travel and moving expenses. For field construction, the cost for expatriate and third country national salaries, major equipment and materials, including bitumen, fuel and lime are included in the dollar component. Costs for locally obtained materials, services and locally hired semi-skilled and unskilled labor or included in the pula components.

B. Technical Feasibility

1. Appropriateness of Technology

The consultant's progress in developing the final design specifications, cost estimates and contract documents for the project will be closely monitored by AID, EDF and the GOB Department of Public Works staff. Particular attention will be given to the thoroughness of the consultant's approach to the soils investigation portion of the design. The work to date of the consultant's preparation of the feasibility study is based upon sound engineering principles.

The project's final design, cost estimates, specifications and contract documents will be completed by an American consulting engineering firm. The highway standards used for the road are in accordance with the AASHTO design criteria and GOB's minimum standards for a gravelled primary highway. Alternate methods of road construction, soil/cement and select material base, have been evaluated by the consultant and the lime stabilization method was selected for treating the base course and double surface treatment (DBST) was recommended by TAMS for surfacing.

The consulting engineers will be required to submit complete construction drawings 1/, specifications and bid documents to AID, EDF and GOB, for approval prior to inviting tenders for the project. No problems are anticipated for the construction phase of the project. A detailed review of the preliminary cost data provided by TAMS under the feasibility study, confirm that (i) planning is adequate to define the final project, and (ii) a reasonably firm estimate of the project costs under construction conditions in Botswana has been made. The project meets the requirements of section 611 (a) of the Foreign Assistance Act of 1961, as amended.

2. Environmental Assessment

An Initial Environmental Examination prepared for the BotZam Road paving project indicates that no significant problem areas exist or are likely to develop. Thus a negative determination was made. See Annex B-7.

C. Financial Analysis

1. Summary

The total cost of the project is anticipated to be $14.5 million, of which AID will provide $1.5 million (approximately 10 percent), the EC $11.6 million equivalent (80 percent) and the GOB $1.4 million equivalent (approximately 10 percent).

It is estimated that $3.85 million equivalent, or 27 percent of the total project cost, will be used for local currency expenditures. The remaining $10.65 million, or 73 percent of the total project costs, will be used for foreign exchange expenditures. Of the AID grant contribution, approximately 90 percent of the funds will be used for foreign exchange costs; the balance will be used for local currency expenditures. The following table provides a summary of the project costs:

1/ As built plans for the existing road and gravelled surface are available.

Table 1: Summary Project Costs ($000s)

Project Components	AID FX	AID LC	EC FX	EC LC	GOB FX	GOB LC	Total
1. Design and Supervision	1102	109	--	--	--	--	1211
Inflation (14%)	153	15	--	--	--	--	168
Contingency (10%)	110	11	--	--	--	--	121
2. Construction	--	--	6870	1640	--	990	9500
Inflation 1/	--	--	705	290	--	175	1170
Contingency (10%)	--	--	687	163	--	100	950
Regravelling 2/	--	--	1023	222	--	135	1380
TOTAL:	1365 (91%)	135 (9%)	9285	2315	--	1400	14500

The above cost estimates are based on a May 1977 report by TAMS, the "Study of the Feasibility of Upgrading the BotZam Road" (see Annex B-4). The data has been reviewed by REDSO/EA and found acceptable. One difference that should be noted by readers referring to the TAMS report is that the conversion rate used in this paper is US $1.21 = Pula 1, whereas the TAMS report used a rate of US $1.15 = Pula 1. Also the conversion rate used in calculating the projected EC contribution is US $1.16 = 1 currency unit (or 1 currency unit = US $.862).

2. Project Disbursement

The project will require an estimated four year disbursement period. A similar disbursement is proposed for the AID input. The following table presents the projected disbursement of project funds by source and activity:

1/ The inflation factor varies according to the assumed escalation rates for different project activities. See Annex C-3 for a discussion of inflation criteria.

2/ The regravelling component incorporates an inflation factor of 8.8 percent (through January 1978) as well as a contingency element of 10 percent.

Table 2: Source and Application of Funding (US $000)

a) Source 1/

	FY78	FY79	FY80	FY81	Total
AID	210	550	550	190	1500
EC	--	4200	5900	1500	11600
GOB	--	580	650	170	1400

b) Application

	FY78	FY79	FY80	FY81	Total
Design	210	--	--	--	210
Supervision	--	550	550	190	1290
Construction/Maintenance	--	4780	6550	1670	13000
TOTAL:	210	5330	7100	1860	14500

3. Implementing Agency Budget

The implementing agency for purposes of the project is the Ministry of Works and Communications (MOW) of the GOB. During the past eight years, the MOW has received approximately 27 percent of the total GOB development expenditure budget, ranging from 7.7 percent in 1972-1973 to 61.8 percent in 1968-1969. This is detailed in the following table:

Table 3: MOW Share of GOB Development Budget (Million Pula)

	1968 1969	1969 1970	1970 1971	1971 1972	1972 1973	1973 1974	1974 1975	1975 1976	Total
MOW	2.1	2.7	4.4	3.9	2.3	5.8	10.6	10.0	41.8
Percentage	(61.8)	(55.1)	(51.8)	(31.7)	(7.7)	(19.2)	(32.4)	(30.3)	(27.0)
GOB Development Expenditure	3.4	4.9	8.5	12.3	29.8	30.2	32.7	33.0	154.8

In the National Development Plan (1976-1981), the GOB development strategy places major emphasis on economic independence, particularly in matters relating to communication. This is reflected in the allocation guidelines for GOB development expenditures for the period 1976-1981. They assign fully 27 percent of the total GOB expenditures for roads, airfields

1/ Although AID, EC and GOB have different fiscal year periods, estimate of funds required is in accordance with AID fiscal year.

and railways. In addition, the ceiling for projected recurrent departmental expenditures provides for the highest annual increase among all government programs to be assigned to road activities (15 percent growth per annum). As regards stated official intent, the road building and maintenance activities are projected to receive very significant GOB financial support.

The National Development Plan projects the following recurrent expenditure to support maintenance of the AID-financed BotZam Road:

Table 4: MOW Allocations for Maintenance - BotZam Road (000 Pula)

	1976 1977	1977 1978	1978 1979	1979 1980	1980 1981
Total - All New Road Activities	2	208	709	678	1508
BotZam Road	-	40	440	440	440
(Percentage)	-	(19.2)	(62.1)	(64.9)	(29.2)

The TAMS report (Chapter IV-8 and Appendix C) discusses project maintenance costs. One of the largest benefits of the resurfacing project will be a significant reduction in ongoing maintenance expenditures. A comparison of the total life-of-the-project maintenance costs indicates that the gravelled surface would require $39 million and the bituminous surface would require $7.42 million between 1980 and 1999. The difference in costs ($31.58 million) is very considerable. Even assuming that the suggested gravel road maintenance plan will not be closely followed (regravelling in years 3, 6, 8, 12, 14, 16 17 and 19), and that the bituminous-surface road maintenance program is strictly adhered to (resurfacing in years 7 and 14), there are still very major benefits accruing to the MOW recurrent budget.

Given the fact that the estimated maintenance costs on the resurfaced BotZam Road will significantly reduce projected MOW recurrent expenditures already planned for the higher cost gravel road, OSARAC and REDSO/EA are in agreement that GOB support for maintenance appears adequate. In addition, the GOB has set aside $605,000 equivalent to procure road maintenance equipment in 1978-1980, and the World Bank will provide approximately $145,000 to finance road depots in support of the Roads Department's maintenance activities.

D. Social Analysis

1. Project Impact

The major social impact of upgrading the existing all-weather road will be felt by those living within the service area of the road. The road will directly serve an estimated 3800 persons: 600 in Nata, 475 in Pandamatenga (a settlement 200-km north of Nata), approximately 2300 in the Kasane-Kazangula area and an estimated 200 small farm and herding families living along the service area of the road. However, since the road already exists, the additional social changes likely to result from this project are minimal.

In the short term, during the construction/paving phase of the road, as many as 200-250 day laborers will be recruited. Some of these workers may come from the project area, although the majority are expected to be recruited from areas further south (Francistown and Gaborone). For laborers recruited locally there will be increased income opportunities as well as extensive contacts with workers from other parts of the country. However, since many of these local recruits will already have had previous experience during the first phase of the project, it is unlikely that there will be any major shift in local mores or customs. Furthermore, it is likely that many of the services developed to take advantage of the presence of a large influx of workers with disposable income will, in fact, already be familiar with the customs of new arrivals because of exposure during the first phase of the project. Given the limited services and facilities available in the area, the work camps will be, in all likelihood, rather self-contained. One very probable beneficial impact of the project, particularly for those recruited locally, is the learning of at least some skills which may be useful even after project completion. Lastly, the incomes directly and indirectly generated by workers employed on the project will at least partially be spent on more or better food, health services, education, housing and other creature comforts.

Over the long term, the improved road will contribute to the development of a tourist industry which may have negative consequences for the maintenance of local values and customs. The specific impact of the paving project on the overall changes to the area which may occur as a result of the development of the Chobe National Park, however, is extremely difficult to predict.

On the positive side, once the upgraded road is completed it should bring increased incomes to at least some of the families in the area, particularly to the traders and hotel/restaurant keepers in Nata and the Kasane-Kazangula area. These benefits will also extend to those providing food and services to support the latter activities.

While beef cattle are currently transported by rail to markets, a positive role of the paved road in future improvements to the local economy cannot be ruled out. Any changes which will occur, however, are expected to be no more than an extension of the trends set in motion by the gravelling of the road, which was completed only recently.

Further social benefits are expected to accrue to people living outside the immediate vicinity of the road. These range from the general (improved communications) to the specific (job creation). The possibilities for generating additional employment from enterprises which utilize theroad for transportation were created by the initial gravelling of the road. These will be only marginally enhanced by paving the road. Similarly, the social benefits associated with improved communications and flow of ideas and people will be only marginally, albeit positively, affected by the paving of the road.

2. Role of Women

This activity does not lend itself to the creation of any specific role for the women directly or indirectly affected by the project. While the traditional role of women in marketing activities in the region can be expected to be enhanced by the influx of workers during the construction phase, it is difficult to determine the extent to which this will continue after the project is completed. Thebenefits assumed by the project will be equally shared by both men and women.

E. Economic Analysis

1. Related Factors

At the outset, it should be recognized that the economic benefits of the project do not, of themselves, adequately convey the importance attached to this project by the GOB. An equally salient factor, and one which is not economically quantifiable, is that the project will upgrade an important link in the North-South Road, Botswana's "lifeline project" 1/ . The improved access this will provide to Zambia and other Black African states, and the reduced dependence on South African road transport this will afford, have a potential value which the GOB perceives as being equally relevant and important as the strict economic benefits resulting from the project.

2. Project Feasibility - Overview

The TAMS report provides the basis for the benefit-cost analysis. This report indicates that the project is economically feasible. With the use of shadow pricing, the internal rates of return for the four alternatives range from 11.1 to 15.7 percent, using two different rates for the overvaluation of the pula (see section 3 below). The alternative chosen is alternative IV, which has a lesser cross slope than alternative I and is therefore considered safer. Since this safety factor was not taken into account in the benefit-cost analysis, the IRR is slightly higher for alternative I than for alternative IV, which has an IRR of 14.8 percent.

As noted in AID Handbook Three, Chapter 6, "AID projects ought to have an economic rate of return of 15 percent or higher. In those cases where the analysis indicates this cannot be expected, special attention needs to be given to the significance and criticality of the non quantifiable benefits. The 15 percent standard should be looked upon as a warning signal and not as an absolute minimum below which AID cannot go".

Although the economic benefits of the project could stand alone, the political considerations, mentioned above, result in non quantifiable benefits which also suggest that the project should be considered for approval.

3. Economic Costs

In order to determine economic costs (the value of actual resources expended), transfer payments that ultimately result in revenue to the Botswana economy must be deducted and costs that do not represent true opportunity costs to the economy must be shadow priced. There are two types of transfer payments that accrue to the GOB from this project

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1/ As described in the recently released National Development Plan (1976-1981), "Under the 'lifeline project' ... this road provides a safeguard against an interruption of traffic through South Africa" (page 20).

- customs revenue and income taxes. Under the Southern African Customs Union (South Africa, Botswana, Swaziland and Lesotho are members), Botswana receives revenue from a common pool in direct proportion to the value of its imports. Since 1970, the GOB has received customs revenue equal to about 20 percent of the CIF value of its imports. Therefore, the value of all imported project commodities are reduced by 20 percent to reflect the transfer of taxes to GOB. Salary costs are reduced to reflect GOB income tax receipts resulting from the project (since they represent a cost to the project and not to the economy). Corporate income tax was estimated at 30 percent of corporate profits, expatriate income taxes at 25 percent, road construction workers at 10 percent and maintenance workers at 5 percent. The TAMS report applied shadow pricing on unskilled labor and foreign exchange. Shadow pricing is required when market costs do not accurately reflect the true scarcity cost of a resource to the economy. For unskilled labor the opportunity costs is assumed at 75 percent of the minimum wage. The assumption here is that unskilled labor has limited alternative employement (farming, cattle herding, etc). In a country with a great labor surplus, like Bangladesh, shadow pricing of unskilled labor is clearly required. In Botswana the case is less strong; therefore a lower rate has been applied. Since the unskilled labor component is relatively small and the shadow pricing factor is also relatively small, the net effect on the analysis is negligible.

The TAMS report also shadow prices foreign exchange. The case for doing so in Botswana is very weak. Botswana has almost no restrictions on trade or capital movements. Most items are available on the South African market for purchase by a Botswanan firm. However, the TAMS analysis uses a 50 percent factor for an over-valued pula. This is a subjective judgement, since very little analysis to support that assumption was carried out in the TAMS report. The 50 percent over valuation factor was based on Botswana's trade deficit in 1975, when imports of 157 million rand (equivalent to pula and equal to $1.15) exceeded exports by 52 million rand. Trade deficits of this magnitude are common in LDCs and easily made up by foreign aid, which amounted to $80 million for Botswana in 1975. Therefore, the case for over-valuing the pula is weak. REDSO/EA believes a case could be made for applying a 20 percent rate. By reducing the over valuation of the rand to 20 percent, the IRRs for the project would be increased (on the average) by about 1.6 percent. The final economic value is the residual or salvage value of the road in the year 1999. On the assumption that the road will be maintained during this period (1980-1999), the salvage value is assumed to be about half its original value.

4. Economic Benefits

Benefits include reduced vehicle operation costs, savings in road user time and reduced road maintenance costs. TAMS used vehicle consumption data from a World Bank Study and a report for Kenya. While these studies were not for Botswana, they appear reasonably accurate.

The costs of vehicles, fuel, tires, lubricants and wages for maintenance were taken from the local Botswana market. Representative per kilometer costs were then computed. The financial costs of imported items were then reduced by 20 percent to reflect the GOB's transfer receipts under the Customs Union. The value of vehicle occupant time-savings was determined at pula 0.5 per hour, based on prevailing wage rates.

Since the anticipated traffic volumes are the same for both the gravel and paved surface, the full difference in vehicle operating costs and passenger time-savings were taken as benefits for the road paving. The four alternative paving options do not result in any difference in vehicle speed or vehicle wear and tear. Therefore, the vehicle operating costs and passenger time-savings are the same for all four alternative paved road surfaces.

The main project benefit is reduced road maintenance costs. The periodic costs of regrading and replacing gravel are saved by paving the road. This represents the major cost-saving and the primary justification for upgrading the road to a paved surface. To determine benefits, maintenance savings of paved versus gravel roads have to be re-costed and shadow priced as described above. The financial benefits in the form of cost savings are included in the Financial Analysis, Part III C.

There are also some miscellaneous benefits which could not be costed. With regard to accidents, it appears that paving the road will not necessarily reduce the number of accidents or change the types of accidents. Although a paved surface should improve vehicle stability and handling, this may be offset by generally higher speed traffic. A reduction of travel time can be expected, although this appears to be a relatively minor benefit, given the long distance (Zambia to Southern Africa) involved.

There are differences in accident rates inherent among the alternative designs. The steeper cross slope of alternative I, for example, is more accident-prone at high speeds than the other alternative. These factors were not taken into account in the TAMS analysis, although they affect the final selection process.

5. Comparison of Rates of Return

Annex C-1, pp 1-4, summarize the shadow price economic costs and benefits for the four design alternatives. It should be noted that in each case, maintenance cost savings substantially exceed either vehicle operating cost savings or passenger time savings. Shadow pricing of foreign exchange at 1.5 and unskilled labor at 0.75 for both costs and benefits does not have a marked effect on overal project feasibility. The following table gives the internal rate of return (IRR) for the four alternatives - with shadow pricing the IRR is slightly improved:

	Alt I	Alt II	Alt III	Alt IV
1. IRR without Shadow Pricing	13.9 %	12.5 %	10.8 %	13.0 %
2. IRR with Shadow Pricing (FX overvalued by 50%)	14.1 %	12.8 %	11.1 %	13.2 %
3. IRR with Shadow Pricing (FX overvalued by 20%)	15.7 %	14.4 %	12.7 %	14.8 %

6. Sensitivity Analysis

Sensitivity analysis is a method whereby the strength of a benefit-cost analysis is assessed by testing the assumption on which the benefits and costs were imputed. The assumptions used in the TAMS analysis appear to be strongest on the construction costs estimates. There is only a 10 percent probability that costs will be exceeded by 20 percent and a 10 percent probability that costs will be less than 20 percent of the estimated value. Thus, keeping other variables constant, there is an 80 percent probability that construction costs will not vary more than plus or minus 20 percent.

The assumptions used for the base average daily traffic count (ADT), the yearly growth in traffic, and the opening of the Rhodesian-Zambia border are more open to question. The TAMS report gives only a 50 percent confidence factor to the ADT remaining within the range of 6-12 percent annual growth rate. That means that there is a 50 percent chance that traffic growth will be outside that range. If traffic growth were greater than 12 percent, then project benefits would be enhanced. If the growth in the ADT drops below 9 percent, the project becomes marginal, and at 6 percent ADT growth, it is barely viable.

Nonetheless, there is a probability that economic activity, such as tourism, livestock, salt mining and mineral extraction, will be promoted by the road. If so, these activities will contribute to the ADT count.

The assumption regarding the opening/closing of the Rhodesian and Zambian border is equally important. When the border opens some portion of the BotZam traffic may go via the Rhodesian routes. The actual number of vehicles going via Rhodesia would depend upon the specific vehicle origins and destinations involved, competition from the railroads, border crossing fees, political consideration and other factors that are impossible to estimate at this time. If all of this transit traffic (25 vehicles per day in the project's opening year) were to move through Rhodesia then the IRR would fall to only 7 percent. If all went via Botswana then the IRR would not change much from the basic project projection. However, it is also possible that normal trade between Botswana and Zambia will be promoted by the road, especially when the entire North-South Road is upgraded. The crucial variable determined by these two assumptions is the ADT count. Further preliminary evidence suggests that

the ADT may already have reached the level projected for the early 1990s.

Annex C-2 presents the range of IRRs under the four alternatives with all or none of the transit traffic going via the BotZam Road. The opening date of the border is a political question and traffic diversion is hard to estimate in any economic analysis. It would seem that during the 20-year project life the border will be opened. The consequences are impossible to estimate at this time.

7. Benefit Incidence

The analysis of benefits is structured on an aggregate or macro basis. The benefits are imputed to the national economy. The major beneficiaries will be shippers of goods and travellers in buses and small vehicles. Some of the benefits will accrue to shippers and truckers located outside of Botswana, though GOB tax policy could recover some of their gain. Individual beneficiaries cannot be identified with any degree of precision, i.e. tourists, travellers, truckers and shippers from one country to another, Botswana residents from one region to another, bus passengers, etc. While AID analysis usually tries to quantify such beneficiaries, this project does not lend itself to such micro analysis.

8. Conclusions of the Economic Analysis

Based upon the TAMS analysis and AID's review of the analysis the following conclusions can be made:

a) The paving of the BotZam Road between Nata and Kazangula would be feasible because of potential road user and maintenance cost savings;

b) While the project is feasible and does have a positive rate of return, the selected alternative is below the AID standard of a 15 percent IRR;

c) The possibility exists that construction costs may rise, that traffic volume may be less than expected, that the Rhodesian border may open and divert traffic or that political instability in an independent Zimbabwe may result in more traffic flowing on this road. Judging from very preliminary data, it is also quite possible that traffic volume may be more than anticipated;

d) Relatively low traffic volume is projected. Thus the difference between the four paving alternatives on road maintenance and vehicle operating costs are minimal; and

e) There is minimal difference in overall economic benefits between the four alternatives, except for a safety factor. It is mainly construction costs which differ between the four alternatives. Alternative I has the highest IRR and would be most attrative in a strictly economic

sense. The high cross slope in alternative I, however, is a factor which is difficult to incorporate in the economic analysis. This large cross slope would be hazardous to motorists and result in accident costs which would change the road use costs. Thus, while alternative I has the highest IRR, it is not the optimal solution and it is proposed to use alternative IV, the next highest rated alternative.

PART IV

Implementation Arrangements

A. Administrative Analysis

1. Grantee Implementation Responsibility

The key GOB agency for the implementation of this project is the MOW. Direct responsibility is assigned to the Chief Roads Engineer (CRE). The CRE has absolute authority on decisions relating to engineering and technical matters. The Ministry of Finance, working closely with the MOW, has authority to make decisions regarding major financial matters. The consulting engineering firm will work directly under the supervision of the CRE. In the first segment of their contract with GOB, the engineering firm will prepare final plans, specifications, cost estimates, contract documents and will follow through to prequalification of contractors, bid analysis and award. Under the second part of the contract, the firm will provide necessary staff to supervise the quality of the construction works and report directly to the CRE for major decisions. The contract will be executed between the GOB and the engineering firm with AID concurrence. REDSO/EA and OSARAC's past experience with the GOB-MOW on the BotZam Road indicates that the GOB has excellent capabilities for implementing contractual responsibilities.

2. AID Implementation Responsibility

The AID contribution provides for the financing of design and supervision services; EC grant funding supports the construction. At a meeting held in Gaborone, Botswana, between representatives of GOB, OSARAC, EDF and REDSO/EA, an agreement was reached to coordinate the design with all parties involved in order to provide a set of contract documents acceptable to all concerned. Additionally, GOB and EDF agreed that OSARAC and REDSO/EA will have free access to theconstruction site for the purpose of implementation and monitoring of AID interests, provided advance notice is given to MOW. The responsibility of issuing implementation letters and field engineering inspections rests with REDSO/EA. The AAO in Gaborone (OSARAC) will be the principal contact point for the engineering firm's field forces.

3. EDF Implementation Responsibility

The EDF has recently established an office in Gaborone. This office will be responsible for coordinating efforts requiring EC concurrence. The consultant will answer directly to the CRE of the Ministry of Works. The EC representative will monitor and coordinate all construction efforts from

their office in Gaborone. TAMS will prepare monthly, quarterly and annual reports for the EC and GOB. Copies of these reports will be provided to AID.

B. Construction Plan/Schedule

The consulting engineering firm of TAMS will carry out design services and prepare tender plans and specifications; plans and bid documents will be completed by March 1978.

It is anticipated that a firm from one of the fifty African-Caribbean-Pacific and EC countries will be awarded the contract. Prequalification of prospective tenderers will reduce the likelihood of an unqualified contractor obtaining the contract. Government of Botswana may request a relaxation of the EC rules to allow South African based and US contractors to participate.

The planned construction contract period is 24 months. The contract is scheduled to be let by July 1978, and contractor on site by August of 1978. The following schedule, prepared by GOB/EC, is intended for implementation:

1.	AID Authorization	August 1, 1977
2.	Grant Agreement Signed	August 15, 1977
3.	Engineering Contract Signed	September 10, 1977
4.	EC Grant Authorization	January 21, 1978
5.	Prequalification of Contractors	March 1, 1978
6.	Final Design Completion	March 1, 1978
7.	IFB Availability	March 15, 1978
8.	Bid Opening	May 24, 1978
9.	Engineer's Recommendation	June 10, 1978
10.	Bid Award	July 10, 1978
11.	Contract Signing	July 24, 1978
12.	Contractor on Site	August 24, 1978
13.	Construction Completion (TAMS estimate and contract for 24 months)	August 24, 1980
14.	End of Maintenance Period	August 24, 1981

C. Disbursement Procedure

The method of disbursement to be utilized under this project is the standard letter of commitment/letter of credit procedure. This procedure will be outlined to the borrower in the Project Agreement and explained in subsequent implementation letters. For local currency expenditures, procedures will be developed and explained in implementation letters.

D. Evaluation

An annual PAR and end-of-project evaluation will be prepared. If appropriate, AID will participate with the EC in special evaluations. Since AID is funding only the A & E design supervision, it would be inappropriate to plan for any larger AID evaluation effort.

E. Conditions, Covenants and Negotiating Status

It is not expected that the project agreement will be exceptional or that there will be special reasons for justifying a host country legal opinion on the validity of the project agreement as a condition precedent to disbursement. Conditions precedent to initial disbursement would include such standard concerns as the specification of GOB representatives and the provision of their specimen signatures and the submission of a satisfactory contract for design services. The agreement will also include a condition precedent to initial disbursement to the effect that the GOB must provide appropriate evidence of the arrangements made to finance the full cost of surfacing the road. An evaluation plan will be included in the project agreement obviating the need for a condition precedent requiring the submission of a plan.

It is anticipated that conditions precedent to disbursement for construction supervision services will include submission of plans, specifications, cost estimates and time schedules for the paving, a contract covering supervision, if not included as part of the overall engineering contract, and a contract for construction. GOB will also be required to submit appropriate evidence that the planned contributions of the EC and GOB are or will be available on a timely basis.

At present no special covenants are considered necessary, with the possible exception of a GOB undertaking in regard to vehicle weight limitations and road maintenance, if these matters are not otherwise covered, e.g. in the EC agreement.

The scope of the project, its feasibility and scheduling and the relationships among GOB, EC and AID have been fully discussed and agreed to in the planning phase by representatives of these three parties. The GOB Ministries of Works and Finance have gone over the financial, implementation and other plans, as well as the substance of proposed terms and conditions with REDSO/EA and EC representatives and no disagreements or significant issues have arisen. The GOB ministries, in their further planning, have demonstrated reliance on AID participation. A formal written request for AID assistance will be submitted as an annex to the PP.

AID 1020-29 (1-72)

Annex A-1

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

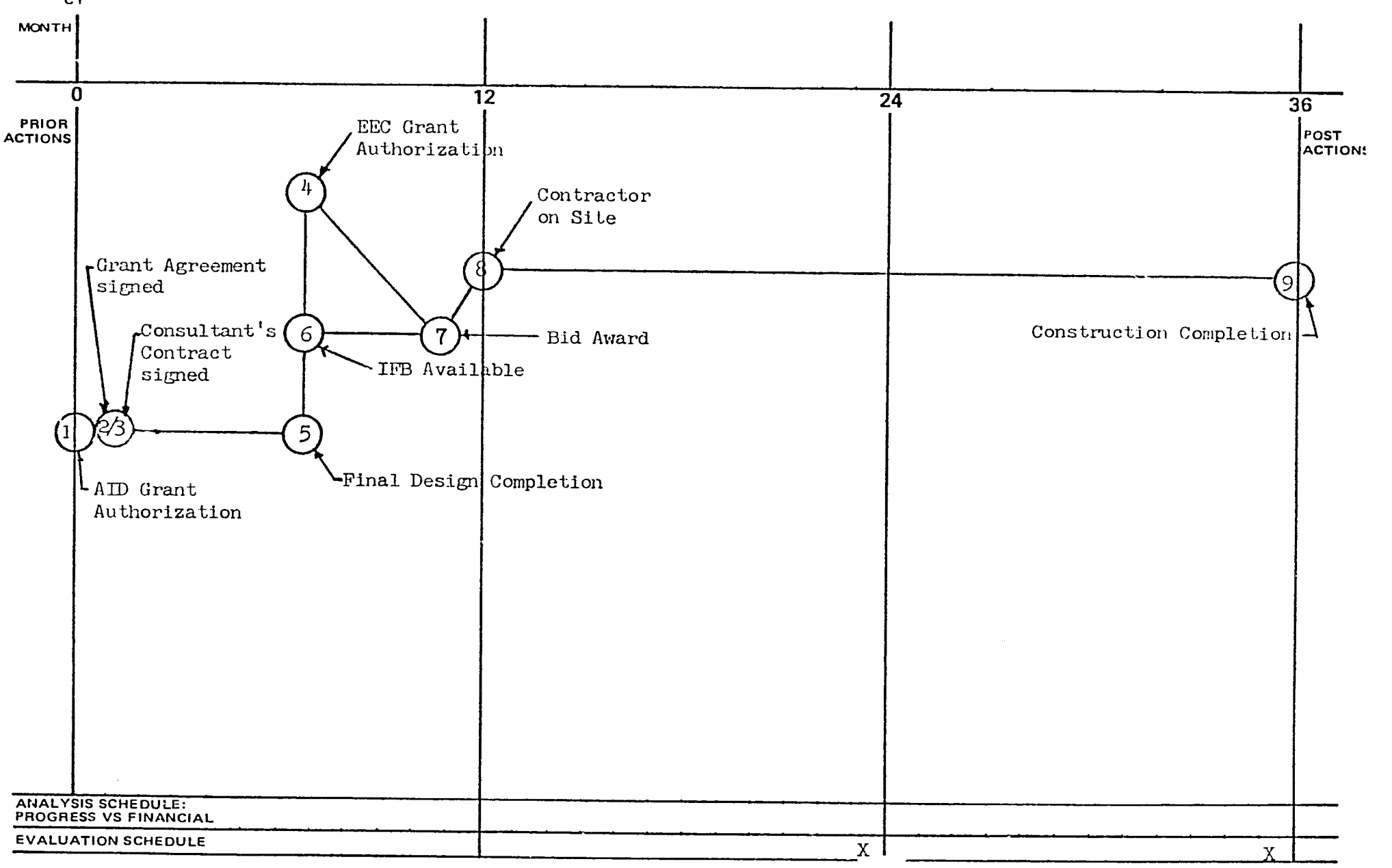
Life of Project:
From FY 1977 to 1981
Total U. S. Funding $ 500,000
Date Prepared: June 14, 1977

Project Title & Number: BOTZAM ROAD ROAD PAVING DESIGN AND SUPERVISION

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Program or Sector Goal: The broader objective to which this project contributes: Improve economic well-being of the general populace of Botswana	Measures of Goal Achievement: Increased trade, income and communications. Unification both within Botswana and externally between Botswana and Zambia.	Project Evaluations GOB Statistics and Report	Assumptions for achieving goal targets: Relationship with Zambia continues to be on friendly basis. Improved road will increase trade between Zambia and Botswana.
Project Purpose: Increase economic and communication self-reliance by improving transport link with Zambia	Conditions that will indicate purpose has been achieved: End of project status. Existence and use of an alternative transport link between Zambia and Botswana. Increased trade of goods between Botswana and Zambia Increased ADT from 55 in 1980 to to 283 in 1999	Reports on Improved Political and Economic Stability of Botswana Trade Statistics GOB Traffic Counts	Assumptions for achieving purpose: Improved surfaced road will encourage economic trade and communications between Botswana and Zambia
Outputs: Bituminously surfaced BotZam Road	Magnitude of Outputs: 300-km of bituminous surfaced road from Nata to Kazangula	GOB Reports and Statistics Reports prepared by EDF AID Evaluations Contractors Records and Consultants Reports	Assumptions for achieving outputs: Authorization of AID funds by August 1, 1977 AID grant agreement signed by August 15, 1977 GOB-TAMS contract signed by September 10, 1977 EDF funds of 11.6 million dollars available by April 1978 GOB funds of $1.4 million available during the upgrading.
Inputs: Grant financing for design, supervision for surfacing and maintenance period by AID Grant financing for surfacing and maintenance by EDF for initial year. GOB financing any shortfall	Implementation Target (Type and Quantity) Design, maintenance and surfacing supervision ($1,500,000) Bituminous surfacing and maintenance over a three year period - $11.6 million GOB input of about $1.4 million	AID Financial Records GOB and EC Financial Records and Reports	Assumptions for providing inputs:

Annex A-2

COUNTRY	PROJECT NO.	PROJECT TITLE	DATE		APPROVED
BOTSWANA		BOTZAM ROAD PAVING DESIGN & SUPERVISION	Jun 9, 1977	[X] ORIGINAL [ ] REVISION # ____	



AID 1020-35 (6-76)

CRITICAL PERFORMANCE INDICATOR (CPI) NETWORK

COUNTRY	PROJECT NO.	PROJECT TITLE	DATE		APPROVED
BOTSWANA		BOTZAM ROAD PAVING DESIGN AND SUPERVISION	Jun 9,1977	[X] ORIGINAL [ ] REVISION # ____	

PROJECT PURPOSE (FROM PRP FACESHEET)

CPI DESCRIPTION

1. AID Grant Authorization - August 1, 1977
2. Grant Agreement signed (GOB/AID) - August 15, 1977
3. Consultant Contract signed - September 10, 1977
4. EC Grant Authorization - April 1978
5. Final Design Completion - April 1978
6. IFB Available - April 1978
7. Bid Award - August 1978
8. Contractor on Site - September 1978
9. Construction Completion - September 1980

Design Criteria

1. Pavement Design Criteria

Several pavement design methods have recently been developed, especially for tropical climates, because the lack of frost and less rainfall have been observed to impose less severe conditions (1) (2) on pavement structures. The most significant design change has been the adoption, under certain conditions, of the design strength (CBR) obtained on unsoaked samples rather than the conventional soaked samples. The recommended design procedures pertaining to tropical soils have been adopted in the structural design of the pavement for this upgrading by TAMS (1).

2. Construction Methods/Procedures

The strength of the pavement layers determine the pavement thickness and type of surfacing needed to sustain a given traffic. The existing 300-km road pavement from Nata to Kazangula is composed basically of two layers, the surface course and the base course, overlying a compacted subgrade or embankment. The existing surface course would become the base course for the paved road and the existing base course would become the subbase after surfacing.

a) Existing SubGrade

The subgrade soil consists primarily of wind blown fine sand except for approximately 30-km of road for which the subgrade is a pan material consisting of clay. In the pan areas, special 1.0-meter thick embankments were constructed with plasticity and fineness control of materials. The subgrade and embankment soils were compacted to a minimum of 90 percent of modified AASHTO compaction. The mean relative compaction from sampling to 280 subgrade density tests taken by TAMS was 93.5 percent of the modified AASHTO density. By comparing the relative compaction of these samples versus the relative compaction at the time of the construction, it was found that the densification of the subgrade and embankment has occurred since the initial compaction and measurements of relative compaction (3).

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(1) Laterite and Lateritic Soils and Other Problem Soils of the Tropics, Lyons Associates and Road Research Institute of Brazil, 1974

(2) A Guide to the Structural Design of Bitumen-Surfaced Roads in Tropical and Subtropical Countries, Road Note 31, Roads Research Laboratory United Kingdom

(3) CBR and Density Tests, TAMS Feasibility Study, May 1977

b) Existing Base Course

The existing 15-cm thick base course is bank run or blended material for which the amounts of fines and plasticity were controlled. Sampling of 180 base course density tests indicates that the mean relative compaction directly after construction of the subgrade was 96 percent of the modified AASHTO maximum density. The design CBR of 35 is used by TAMS for the existing base course which will be subbase course after surfacing (1).

The samples were mixed with varying amounts of hydrated lime or cement and water was added to bring the water content to approximately two percent above the optimum moisture content. The samples were then compacted and moist cured until Atterberg limits were conducted (see TAMS Report, appendix A).

The analysis of the results shows that the lime is more effective than cement in reducing the plasticity of the existing surface course materials. The amount of lime required to reduce the plasticity index to less than 8 varied between 1 and 2 percent by weight.

In the final design of the road during construction, each utilized borrow pit will be investigated to determine the exact amount of lime stabilization required. In the final design, actual road stations will be shown along with the corresponding percentage of the required lime stabilization. Since the mixing, moisture control and curing will not be as uniform in the field as in the laboratory tests and to account for local variations, TAMS has recommended that not less than 2 percent lime by weight be added to the entire surface course. For estimating purposes, an average of 2 percent lime application was considered for the full length of the highway with the exception of the section containing material from pit 23A where TAMS has recommended that four percent lime should be added between stations 211+900 and 235+750.

c) Existing Surface Course

The existing 15-cm thick gravel surface course has a controlled gradation, plasticity and durability to obtain sufficient strength, to reduce ravelling to a minimum particularly during the dry season and to resist traffic wear. Surface course materials have been obtained by crushing and blending materials from 8 borrow pit areas and were compacted to a minimum of 98 percent of modified AASHTO (T-180) maximum dry density. The sampling of 112 surface course density tests by TAMS indicates that directly after construction of the surface course, the mean relative compaction was 100 percent of the modified AASHTO maximum density.

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(1) CBR and Density Tests, TAMS Feasibility Study, May 1977

The CBR values obtained on the surface course materials from roadway stations indicated a need for strengthening the base materials - see TAMS Study Report for details. The existing BotZam Road surface course, which will become the base course for the upgraded road, was designed with a plasticity index which ranges from 8 to 20 to reduce surface ravelling caused by traffic, particularly in the dry season. The measured plasticity indexes by the borrow pit areas range from 11 to 19.

d) Upgrading of Existing Surface Course

The design procedures pertaining to tropical soils with the anticipated traffic level indicates that strengthening of the base below the surfacing course will be required for a base CBR below 75 to utilize a double bituminous surface treatment. The test values provided by TAMS show that without modification, some road sections represented by the existing surface course samples will require strengthening when covered by a bituminous surfacing - see Figure 8 of the TAMS Study Report for details.

The Road Research Laboratory recommendsthat the maximum plasticity index be within the range of 6 to 12, depending on rainfall, in base courses beneath the surfacing. Samples of the existing BotZam Road surface course were therefore treated with lime and cement to determine the effect of these additives on the plasticity (see TAMS Feasibility Report). Samples representing five surface course borrow pits were obtained by TAMS from the roadway for testing with lime and cement. For alternative IV, additional surface material required to change the cross slope, will be obtained by extending the borrow pits. The existing surface course will be scarified, mixed with lime and water and recompacted to 98 percent of the modified AASHTO density. To cure the lime, a bituminous curing coat will be sprayed over the width of the lime treated base course following shaping and recompaction. The width of the lime treatment will be extended 0.15-meters beyond the surfacing to protect the edges of the surfacing. For the final design, during the construction stage, it will be necessary to test the content of salt in the gravel and to propose possible remedial solutions, if necessary. For the final design during construction, it may be necessary to measure the cross slope of the roadway to determine more accurately the quantities of gravel required, due to loss of gravel to meet the recommended cross slope. Excessive salt contents may require slope modifications.

e) Bituminous Surface Treatment

A double bituminous surface treatment was recommended by TAMS for the anticipated base course strength and for the projected traffic width. The tack coat plus the curing coat, sprayed on the road following lime treatment, will serve as the prime coat. The recommended rates of application suggested by TAMS for the bituminous materials utilizing a nominal size aggregate of 1 3/7-mm are shown on the following page:

Coat	Rate of Application, l/m^2
Coat	0.40 - 0.60
Tack	0.40 - 0.60
Seal No 1	0.80 - 1.00
Seal No 2	1.30 - 1.45

The materials for the cure and tack coat will consist of MC-70 cutback asphalt. The bituminous seals will be 120/150 penetration asphalt with approximately 40 percent of the total requirements being placed in the first seal and 60 percent in the second seal (1) (2).

f) Aggregate Source and Application

Exposed basalt rock exists in the borrow pits along the roadside. Limited tests and visual inspection performed by TAMS indicate that these sources have suitable and adequate aggregate rock. Two sizes of aggregate will be placed with the large 13-mm nominal size being placed after the first seal coat and the smaller 7-mm nominal size after the second seal. The rates of application recommended by TAMS are as follows:

Nominal Size, mm	Rate of Application, Kg/m^2
13	18 - 22
7	9 - 12

g) Construction Water

Construction water was obtained during the construction of the existing BotZam Road at 12 locations. The 15-cm diameter wells were drilled primarily to 30-100-meter depths and will be available for construction during the upgrading phase. The locations of the producing wells and the yield in gallons per hour are given on the next page:

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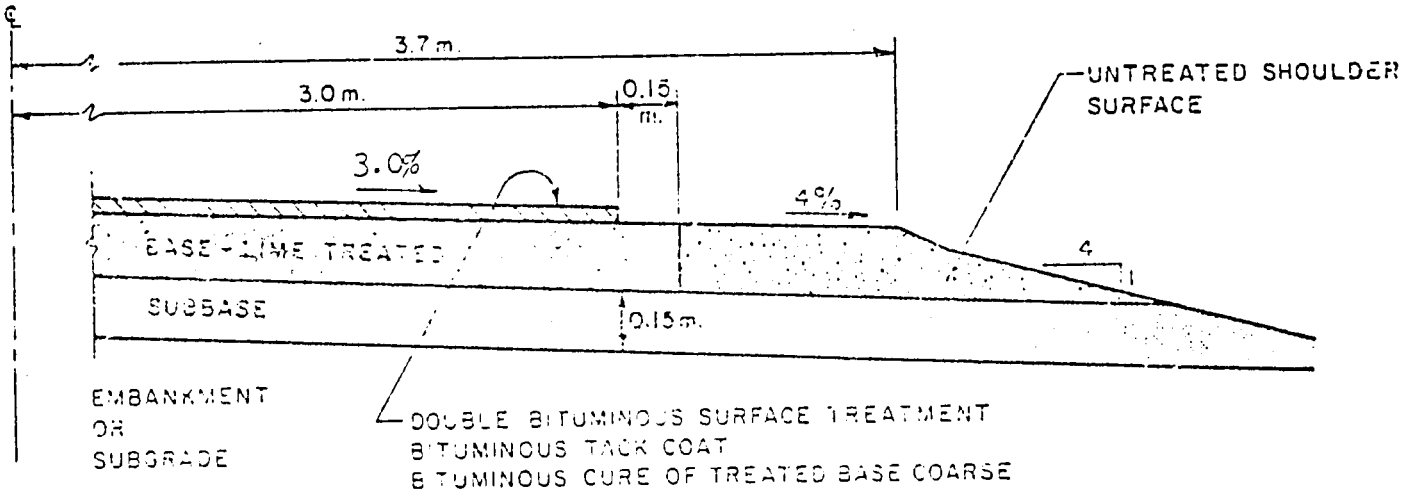
(1) Asphalt Surface Treatments, MS-13, The Asphalt Institute, 1969

(2) Bituminous Surface Treatments for Newly Constructed Rural Roads TRH 3, National Institute for Road Research, South Africa 1971.

Location, Km	Yield, gph
39	30
43 (sanded up)	-
63	1450
71	1500 +
104	2000
135, 500^{m} left	1000 +
171, 200^{m} left	1000 + (approx)
190	1000 + "
217	1000 + "
224	1000 + "
253	1000 + "
256	1000 + "

At the request of the GOB, the contractor is leaving the casings of the above wells in place.

TYPICAL CROSS SECTION



ALTERNATIVE IV

CONSTRUCTION COST ESTIMATE
ALTERNATIVE IV

Item	Unit	Estimated Quantity	Unit Price Pula[b]	Unit Price U.S.$	Amount[a] Pula[b]	Amount[a] U.S.$
Mobilization	LS				66,300	686,400
Base Course Material	m^3	40,680	4.60	10.60	187,130	431,210
Scarify, pulverize, mix lime, shape and compact base course	m^3	313,200	.20	2.20	62,640	689,040
Lime for stabilization	t	13,530	29.0	67.0	392,370	906,510
Prime (Cure & Tack)	l	2,103,000	0.06	0.32	126,180	672,960
Double Seal Surface Treatment	l	4,140,000	0.06	0.34	248,400	1,407,600
Chips, 13mm nominal	m^3	28,300	17.0	38.0	481,100	1,075,400
7mm nominal	m^3	14,100	17.0	40.0	239,700	564,000
Provide and maintain accommodations, office, labs, and vehicles for supervision staff	LS				368,000	437,000
Total					2,171,820	6,870,120

Notes:
(a) At location costs, December 1976
(b) Exchange rate 1.0 Pula = 1.21 U.S.$

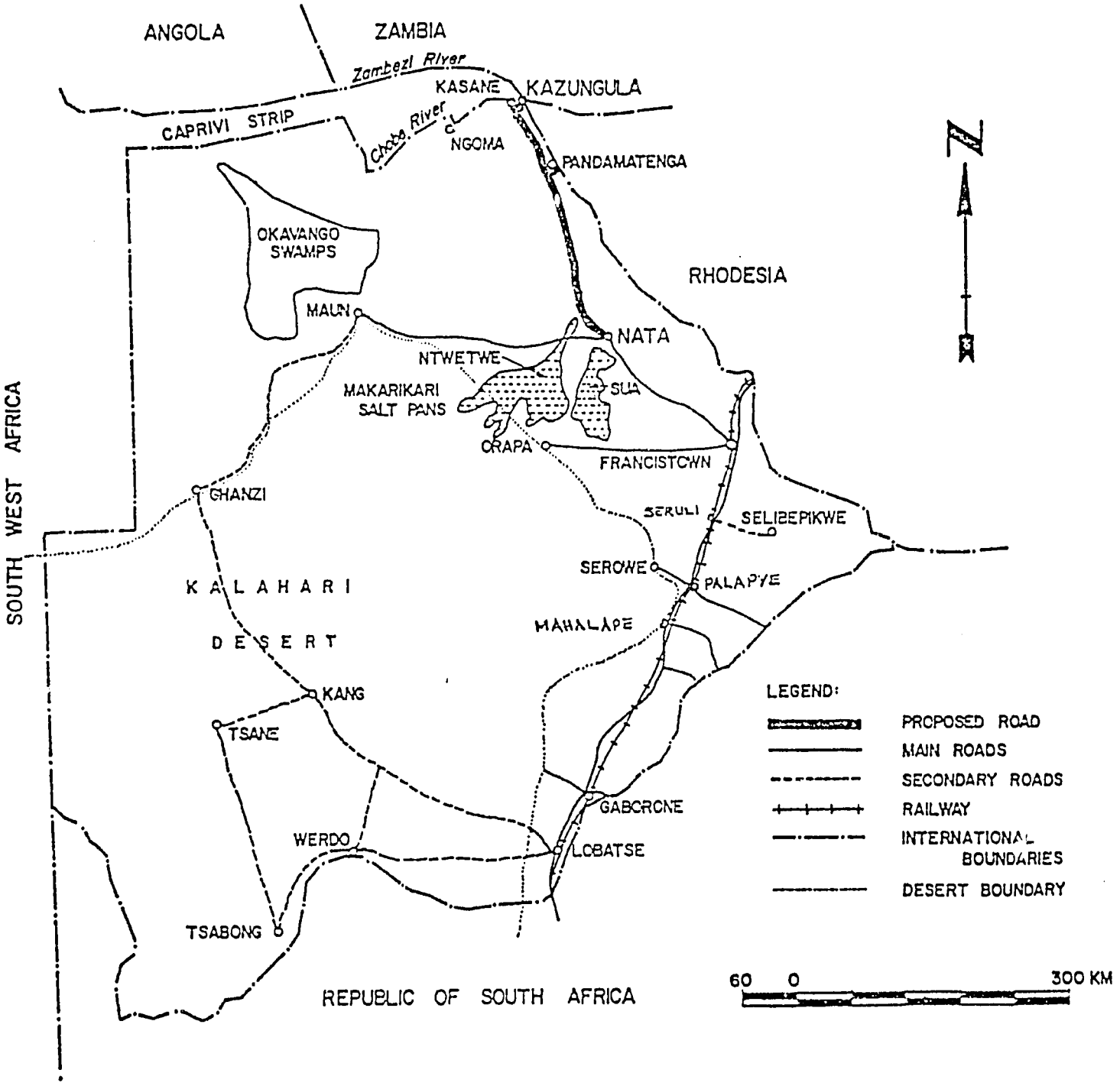
SUMMARY COST ESTIMATES

Alternative IV

	Pula	$ US
I. Engineering costs		
A. Design	13,440	165,330
B. Supervision	76,160	936,870
Subtotal	89,600	1,102,200
C. Inflation	13,010	152,560
D. Contingency	8,960	110,220
Total	111,570	1,365,000
II. Construction costs		
A.	2,171,820	6,870,120
B. Inflation	382,900	706,810
C. Contingency	217,180	687,010
D. Regravelling	295,870	1,021,000
Total	3,067,770	9,285,000
III. Grand Total	3,178,870	10,650,600

PROJECTED TRAFFIC VOLUMES
(Annual Average Daily Traffic)

Year	Passenger Car (4 Cyl)	Passenger Car (6 Cyl)	Pick-up (6 Cyl)	Truck (3.5 Ton)	Truck (15 Ton)	Total
1980	12	10	5	7	21	55
1981	13	11	5	8	23	60
1982	14	12	6	8	25	65
1983	16	13	6	9	27	71
1984	17	14	7	10	30	78
1985	18	15	8	11	42	94
1986	20	17	8	12	45	102
1987	22	18	9	13	48	110
1988	24	20	10	14	52	120
1989	26	22	11	15	56	130
1990	28	24	12	17	60	141
1991	31	26	13	18	64	152
1992	34	28	14	20	69	165
1993	37	31	15	21	74	178
1994	40	33	17	23	80	193
1995	44	36	18	25	86	209
1996	48	40	20	28	93	229
1997	52	43	22	30	101	248
1998	57	47	24	33	109	270
1999	62	51	26	36	118	293



BOTSWANA-ZAMBIA HIGHWAY

LOCATION MAP

INITIAL ENVIRONMENTAL EXAMINATION

Project Location	:	BOTSWANA
Project Title	:	BotZam Road Paving Design and Supervision
Funding for Design & Supervision	:	US $ 1.5 Million (grant)
Life of Project	:	Three Years
IEE Prepared By	:	Stafford H. Baker REDSO/EA-EDID
Date Prepared	:	June 6, 1977
Environmental Action Recommended	:	Negative Determination
Concurrence	:	
Date	:	
Assistant Administrator's Decision	:	
Date	:	

1. Description of the Project

The Nata-Kazangula Road is a 300-km section of the main north-south road connecting Gaborone, Francistown and Livingstone, Zambia. It serves transit traffic between Southern Africa and Zambia, tourist traffic to the Chobe Game Park and to a lesser extent, traffic supporting the Kasane region and traffic between Botswana and Zambia. The project will pave the existing all-weather gravel road. AID will grant-finance the cost of design and supervision of construction by a consulting firm - Tippetts-Abbett-McCarthy-Stratton; EEC and the Government of Botswana will grant-finance the paving costs. No change in road with, right-of-ways or drainage structures will be made.

Botswana is a landlocked country bordered by South Africa, Namibia, the Caprivi Strip, Zambia and Rhodesia. The country is generally flat with a mean elevation of about 1000-meters, rising to about 1200-meters in the eastern part of the country near Mahalapye and Palapye. Most of the country is covered with Kalahari sand which supports a low, savannah-type vegetation. The vegetation in the region of the BotZam Road varies from dry, dicidous forests in the north to tree savannah in the south with some aquatic grasslands in the pans located about at the mid-point of the roadway. Rainfall in Botswana varies from a low of about 250-mm per year in the southwest part of the country to about 650-mm in the northeast. The BotZam Road is in the area of maximum rainfall - between 550 and 650-mm per year.

The population of Botswana in 1971 was approximately 630,000 and has been growing at a rate of approximately 2 percent per year. The vast majority of the population lives along the eastern border of the country south of Nata. North of Nata, the population drops off to a very small level. The road directly serves a total population of about 3,500 persons.

Most of the people in the vicinity of the road make their livelihood either by raising crops or cattle, or are engaged in the tourist industry in Kasane. The Chobe Game Park attracts many tourists,

particularly from Rhodesia and South Africa and the area abounds in wild game. Cattle raising supports a sizeable segment of the rural population in Botswana but very few in the vicinity of the road. Most of the cattle raised in the area is shipped to an abattoir in Lobatse.

2. Discussion of Impacts

a) Land Use

Borrow pits that were used to provide material for construction of the existing gravel road are located along the route at distances varying from about 50 meters to 2 kilometers from the road. Some of these borrow pits will be marginally extended to provide aggregate for the new surface course. The construction contractor will grade any spoil banks to drain the pits and avoid unsightly appearances. Any impact on the aesthetics of the area will be minor.

The road width and right-of-way will not be changed. Upgrading the surface of the road will not have any other effects on land usage.

b) Water Quality

Existing drainage structures will be utilized without alterations, the project will have no effect on the water quality.

c) Atmosphere

Machinery used during the construction will temporarily contribute to dust, exhaust and noise pollution. Traffic volumes will not be significantly increased by the paving. The long term positive effect of the project will be to virtually eliminate dust pollution that traffic on a gravel road would produce.

d) Natural Resources

Upgrading the surface of the road will have no effect on natural resources.

e) Cultural

The project will have no effects on the cultural environment.

f) Socio-Economic

Socio-economic conditions will not be significantly affected by the project.

g) Health

Traffic patterns will not be changed by the road upgrading. There will be no environmental effects on health conditions.

h) General

The project will have no international, controversial or larger program impacts on the environment.

3. Recommendation for Environmental Action

Upgrading the surface of the road from all-weather gravel to pavement will result in a marginal expansion of borrow pits and long-term reduction in atmospheric pollution. The overall effect will be to improve the environment of the roadway area. It is recommended that a negative determination be made.

4. Impact Identification and Evaluation Form

Impact Areas and Sub Areas	Impact Identification and Evaluation 1/
A. Land Use	
1. Changing the Character of the Land through:	
a. Increasing the population	N
b. Extracting natural resources	N
c. Land clearing	N
d. Changing soil character	N
2. Altering Natural Defenses	N
3. Foreclosing Important Uses	N
4. Jeopardizing Man or his Works	N
5. Strip or Squatter Development along ROW	N
6. Borrow Pit Siting	L
B. Water Quality	
1. Physical State of Water	N
2. Chemical and Biological	N
3. Ecological Balance	N

C. Atmospheric Effects

1. Air Additives ---------- N
2. Air Pollution ---------- N
3. Noise Pollution ---------- N

D. Natural Resources

1. Diversion, Altered Use of Water ---------- N
2. Irreversible, Inefficient Commitments ---------- N

E. Cultural Effects

1. Altering Physical Symbols ---------- N
2. Dilution of Cultural Traditions ---------- N
3. Damage to Primitive Cultures ---------- N

F. SocioEconomic Effects

1. Changes in Economic/Employment Patterns ---------- N
2. Changes in Population ---------- N
3. Changes in Cultural Patterns ---------- N
4. Dislocation of Population by New or Widened ROW --- N

G. Health

1. Changing a Natural Environment ---------- N
2. Eliminating an Ecosystem Element ---------- N
3. New Patterns for Disease Vectors ---------- N

H. General

1. International Impacts ---------- N
2. Controversial Impacts ---------- N
3. Larger Program Impacts ---------- N

1/ Symbols: N - NO environmental impact
L - LITTLE environmental impact
M - MODERATE environmental impact
H - HIGH environmental impact
U - UNKNOWN environmental impact

SUMMARY OF ECONOMIC COSTS AND BENEFITS, SHADOW PRICED

Alternative I (1976 Pula)

Year	Investment Cost	Vehicle Operation Cost Savings	Occupant Time Savings	Maintenance Cost Savings	Total Benefits
1977	122,250	---	---	---	---
1978	4,140,684	---	---	---	---
1979	6,211,026	---	---	---	---
1980	---	308,850	26,708	83,225	418,783
1981	---	339,669	29,215	83,225	452,109
1982	---	365,181	31,583	83,225	479,989
1983	---	397,269	34,493	3,036,225	3,467,987
1984	---	440,282	37,946	83,225	561,453
1985	---	575,850	46,286	83,225	705,361
1986	---	619,958	50,166	2,498,525	3,169,649
1987	---	664,254	54,046	83,225	801,525
1988	---	720,570	58,896	83,225	862,691
1989	---	776,886	63,746	4,379,225	5,219,857
1990	---	840,419	69,139	83,225	992,783
1991	---	898,019	74,416	83,225	1,055,660
1992	---	973,119	80,779	4,379,225	5,433,123
1993	---	1,042,739	87,026	-1,797,475	- 667,710
1994	---	1,130,048	94,359	4,379,225	5,603,632
1995	---	1,218,452	102,119	83,225	1,403,796
1996	---	1,328,016	111,819	4,379,225	5,819,060
1997	---	1,438,913	121,092	4,379,225	5,939,230
1998	---	1,560,045	131,762	83,225	1,775,032
1999	-3,696,000	1,691,462	142,475	4,379,225	6,213,662

SUMMARY OF ECONOMIC COSTS AND BENEFITS, SHADOW PRICED

Alternative II (1976 Pula)

Year	Investment Cost	Vehicle Operation Cost Savings	Occupant Time Savings	Maintenance Cost Savings	Total Benefits
1977	137,400	---	---	---	---
1978	4,740,703	---	---	---	---
1979	7,111,055	---	---	---	---
1980	---	308,850	26,708	83,225	418,783
1981	---	339,669	29,215	83,225	452,109
1982	---	365,181	31,583	83,225	479,989
1983	---	397,269	34,493	3,036,225	3,467,987
1984	---	440,282	37,946	83,225	561,453
1985	---	575,850	46,286	83,225	705,361
1986	---	619,958	50,160	2,498,525	3,168,649
1987	---	664,254	54,046	83,225	801,525
1988	---	720,570	58,896	83,225	862,691
1989	---	776,886	63,746	4,379,225	5,219,857
1990	---	840,419	69,139	83,225	992,783
1991	---	898,019	74,416	93,225	1,055,660
1992	---	973,119	80,779	4,379,225	5,433,123
1993	---	1,042,739	87,926	-1,797,475	- 667,710
1994	---	1,130,048	94,359	4,379,225	5,603,632
1995	---	1,218,452	102,119	83,225	1,403,796
1996	---	1,328,016	111,819	4,379,225	5,819,060
1997	---	1,438,913	121,092	4,379,225	5,939,230
1998	---	1,560,045	131,762	83,225	1,775,032
1999	-5,911,000	1,691,462	142,475	4,379,225	6,213,662

SUMMARY OF ECONOMIC COSTS AND BENEFITS, SHADOW PRICED

Alternative III (1976 Pula)

Year	Investment Cost	Vehicle Operation Cost Savings	Occupant Time Savings	Maintenance Cost Savings	Total Benefits
1977	144,600	---	---	---	---
1978	5,577,761	---	---	---	---
1979	8,366,641	---	---	---	---
1980	---	308,850	26,708	83,225	418,783
1981	---	339,669	29,215	83,225	452,109
1982	---	365,181	31,583	83,225	479,989
1983	---	397,269	34,493	3,036,225	3,467,987
1984	---	440,282	37,946	83,225	561,453
1985	---	575,850	46,286	83,225	705,361
1986	---	619,958	50,166	2,242,975	2,913,099
1987	---	664,254	54,046	83,225	801,525
1988	---	720,570	58,896	83,225	862,691
1989	---	776,886	63,746	4,379,225	5,219,857
1990	---	840,419	69,139	83,225	992,783
1991	---	898,019	74,416	83,225	1,055,660
1992	---	973,119	80,779	4,379,225	5,433,123
1993	---	1,042,739	87,026	-2,053,025	- 923,260
1994	---	1,130,048	94,359	4,379,225	5,603,632
1995	---	1,218,452	102,119	83,225	1,403,796
1996	---	1,328,016	111,819	4,379,225	5,819,060
1997	---	1,438,913	121,092	4,379,225	5,939,230
1998	---	1,560,045	131,762	83,225	1,775,032
1999	-6,428,000	1,691,462	142,475	4,379,225	6,213,662

SUMMARY OF ECONOMIC COSTS AND BENEFITS, SHADOW PRICED

Alternative IV (1976 Pula)

Year	Investment Cost	Vehicle Operation Cost Savings	Occupant Time Savings	Maintenance Cost Savings	Total Benefits
1977	134,400				
1978	4,835,574				
1979	6,803,361				
1980	---	308,850	26,708	83,225	418,783
1981	---	339,669	29,215	83,225	452,109
1982	---	365,181	31,583	83,225	479,989
1983	---	397,269	34,493	3,036,225	3,467,987
1984	---	440,282	37,946	83,225	561,453
1985	---	575,850	46,286	83,225	705,361
1986	---	619,958	50,166	2,498,525	3,168,649
1987	---	664,254	54,046	83,225	801,525
1988	---	720,570	58,896	83,225	862,691
1989	---	776,886	63,746	4,379,225	5,219,857
1990	---	840,419	69,139	83,225	992,783
1991	---	898,019	74,416	83,225	1,055,660
1992	---	973,119	80,779	4,379,225	5,433,123
1993	---	1,042,739	87,026	-1,797,475	- 667,710
1994	---	1,130,048	94,359	4,379,225	5,603,632
1995	--	1,218,452	102,119	83,225	1,403,796
1996	---	1,328,016	111,819	4,379,225	5,819,060
1997	---	1,438,913	121,092	4,379,225	5,939,230
1998	---	1,560,045	131,762	83,225	1,775,032
1999	-5,173,025	1,691,462	142,475	4,379,225	6,213,662

SUMMARY OF SENSITIVITY TESTS
FOR PROJECT FEASIBILITY (IRR, B/C) - PREPARED BY TAMS

	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Feasibility Indices, No Shadow Pricing, Opening Year ADT of 55, 9% Annual Growth	13.9%, 1.20	12.5%, 1.06	10.8%, 0.89	13.0%, 1.11
12% Annual Growth	15.5%, 1.46	14.3%, 1.29	12.6¢, 1.08	14.7%, 1.34
6% Annual Growth	11.9%, 1.00	10.8%, 0.88	9.2%, 0.74	11.1%, 0.92
9% Annual Growth, No Occupant Time Value	13.4%, 1.15	12.1%, 1.02	10.4%, 0.85	12.5%, 1.06
Construction Cost + 20%	12%, 1.00	10.8%, 0.88	9.2%, 0.74	11.2%, 0.92
Construction Cost - 20%	16.4%, 1.50	14.9%, 1.33	13.0%, 1.11	15.4%, 1.33
Benefits + 20%	15.9%, 1.44	14.4%, 1.27	12.6%, 1.07	14.9%, 1.33
Benefits - 20%	11.6%, 0.96	10.4%, 0.85	8.9%, 0.71	10.8%, 0.88
Rhodesian-Zambian Border Opening*	7.4 - 13.9% 0.57 - 1.20	6.7 - 12.5% 0.50 - 1.06	5.2 - 10.8% 0.42 - 0.89	6.9 - 13.0% 0.53 - 1.01

* a range of values is indicated inasmuch as the acutal values that depend upon the split of transit between Botswana and Rhodesia.

Inflation Criteria

Escalation for the past few years and for the next two years was estimated utilizing the following rates for the various estimated components:

	Escalation, %/Year
Labor and Salary (US $)	6.0
Equipment (US $)	10.0
Materials (US $)	5.0
Engineering (US $)	5.0
Materials and Labor (Pula)	14.0

The rates of escalation for the US dollar costs are based on the published Bureau of Labor Statisitics, Engineering News Record and Civil Engineering Surveys for the last two years. The rate of escalation for the local cost component is an average derived from changes in the cost of living indexes 1/ in Botswana.

Escalation and regravelling total for alternative IV are broken down as follows:

	Pula	US $
Escalation	383,380	707,200
Regravelling	296,070	1,021,420

The above escalation figures for for construction costs only.

1/ Statistical Abstract, Government of Botswana

Escalation for design and supervision is based on a 5 percent per year increase in engineering costs. An approximate disbursement schedule is:

FY 1978	15 percent for design
FY 1978	35 percent for supervision of construction
FY 1980	35 percent for supervision of contruction
FY 1981	15 percent for supervision of maintenance

Composite inflation is:

	15 percent x 1.05	=	.16
+	35 percent x 1.05 x 1.05	=	.39
+	35 percent x 1.05 x 1.05 x 1.05	=	.41
+	15 percent x 1.05 x 1.05 x. 1.05 x 1.05	=	.18
	Composite Inflation (14 percent)		1.14

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6C(1) - COUNTRY CHECKLIST

Listed below are, first, statutory criteria applicable generally to FAA funds, and then criteria applicable to individual fund sources: Development Assistance and Security Supporting Assistance funds.

A. GENERAL CRITERIA FOR COUNTRY

1. FAA Sec. 116. Can it be demonstrated that contemplated assistance will directly benefit the needy? If not, has the Department of State determined that this government has engaged in consistent pattern of gross violations of internationally recognized human rights?	No such determination
2. FAA Sec. 481. Has it been determined that the government of recipient country has failed to take adequate steps to prevent narcotics drugs and other controlled substances (as defined by the Comprehensive Drug Abuse Prevention and Control Act of 1970) produced or processed, in whole or in part, in such country, or transported through such country, from being sold illegally within the jurisdiction of such country to U.S. Government personnel or their dependents, or from entering the U.S. unlawfully?	No such determination
3. FAA Sec. 620(a). Does recipient country furnish assistance to Cuba or fail to take appropriate steps to prevent ships or aircraft under its flag from carrying cargoes to or from Cuba?	No
4. FAA Sec. 620(b). If assistance is to a government, has the Secretary of State determined that it is not controlled by the international Communist movement?	Yes
5. FAA Sec. 620(c). If assistance is to government, is the government liable as debtor or unconditional guarantor on any debt to a U.S. citizen for goods or services furnished or ordered where (a) such citizen has exhausted available legal remedies and (b) debt is not denied or contested by such government?	No
6. FAA Sec. 620(e) (1). If assistance is to a government, has it (including government agencies or subdivisions) taken any action which has the effect of nationalizing, expropriating, or otherwise seizing ownership or control of property of U.S. citizens or entities beneficially owned by them without taking steps to discharge its obligations toward such citizens or entities?	No

A

7. FAA Sec. 620(f); App. Sec. 108. Is recipient country a Communist country? Will assistance be provided to the Democratic Republic of Vietnam (North Vietnam), South Vietnam, Cambodia or Laos? — No

8. FAA Sec. 620(i). Is recipient country in any way involved in (a) subversion of, or military aggression against, the United States or any country receiving U.S. assistance, or (b) the planning of such subversion or aggression? — No knowledge of such activities.

9. FAA Sec. 620(j). Has the country permitted, or failed to take adequate measures to prevent, the damage or destruction, by mob action, of U.S. property? — Security and protection measures appear to be adequate and reasonable.

10. FAA Sec. 620(l). If the country has failed to institute the investment guaranty program for the specific risks of expropriation, inconvertibility or confiscation, has the AID Administrator within the past year considered denying assistance to such government for this reason? — No

11. FAA Sec. 620(o); Fishermen's Protective Act, Sec. 5. If country has seized, or imposed any penalty or sanction against, any U.S. fishing activities in international waters,

a. has any deduction required by Fisherman's Protective Act been made? — —

b. has complete renewal of assistance been considered by AID Administrator? — No such actions

12. FAA Sec. 620(q); App. Sec. 504. (a) Is the government of the recipient country in default on interest or principal of any AID loan to the country? (b) Is country in default exceeding one year on interest or principal on U.S. loan under program for which App. Act appropriates funds, unless debt was earlier disputed, or appropriate steps taken to cure default? — No

13. FAA Sec. 620(s). What percentage of country budget is for military expenditures? — under 10%
How much of foreign exchange resources spent on military equipment? — Under 5%
How much spent for the purchase of sophisticated weapons systems? (Consideration of these points is to be coordinated with the Bureau for Program and Policy Coordination, Regional Coordinators and Military Assistance Staff (PPC/RC).) — None

A

14. FAA Sec. 620(t). Has the country severed diplomatic relations with the United States? If so, have they been resumed and have new bilateral assistance agreements been negotiated and entered into since such resumption? — No severance

15. FAA Sec. 620(u). What is the current status of the country's U.N. obligations? If the country is in arrears, were such arrearages taken into account by the AID Administrator in determining the current AID Operational Year Budget? — No knowledge of arrears

16. FAA Sec. 620A. Has the country granted sanctuary from prosecution to any individual or group which has committed an act of international terrorism? — No knowledge of granting such sanctuary.

17. FAA Sec. 666. Does the country object, on basis of race, religion, national origin or sex, to the presence of any officer or employee of the U.S. there to carry out economic development program under FAA? — No

18. FAA Sec. 669. Has the country delivered or received nuclear reprocessing or enrichment equipment, materials or technology, without specified arrangements on safeguards, etc.? — No knowledge of such delivery or receipt.

19. FAA Sec. 901. Has the country denied its citizens the right or opportunity to emigrate? — No knowledge of such denials

B. FUNDING CRITERIA FOR COUNTRY

2. Security Supporting Assistance Country Criteria

a. FAA Sec. 502B. Has the country engaged in a consistent pattern of gross violations of internationally recognized human rights? Is program in accordance with policy of this Section? — No / Yes

b. FAA Sec. 531. Is the Assistance to be furnished to a friendly country, organization, or body eligible to receive assistance? — Yes

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? — No commodities to be granted.

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6C(2) - PROJECT CHECKLIST

Listed below are, first, statutory criteria applicable generally to projects with FAA funds, and then project criteria applicable to individual fund sources: Development Assistance (with a sub-category for criteria applicable only to loans); and Security Supporting Assistance funds.

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

A. GENERAL CRITERIA FOR PROJECT.

1. App. Unnumbered; FAA Sec. 653(b)

(a) Describe how Committees on Appropriations of Senate and House have been or will be notified concerning the project;	AID/W will notify
(b) is assistance within (Operational Year Budget) country or international organization allocation reported to Congress (or not more than $1 million over that figure plus 10%)?	Yes

2. FAA Sec. 611(a)(1). Prior to obligation in excess of $100,000, will there be (a) engineering, financial, and 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 — applies to supervision of contr.

3. FAA Sec. 611(a)(2). If further legislative action is required within recipient country, what is basis for reasonable expectation that such action will be completed in time to permit orderly accomplishment of purpose of the assistance? — AOO/Gaborone indicates no legislative action required for Grant.

4. FAA Sec. 611(b); App. Sec. 101. If for water or water-related land resource construction, has project met the standards and criteria as per Memorandum of the President dated Sept. 5, 1973 (replaces Memorandum of May 15, 1962; see Fed. Register, Vol 38, No. 174, Part III, Sept. 10, 1973)? — Not water or related project.

5. FAA Sec. 611(e). If project is capital assistance (e.g., construction), and all U.S. assistance for it will exceed $1 million, has Mission Director certified the country's capability effectively to maintain and utilize the project? — Yes

A.

6. FAA Sec. 209, 619. Is project susceptible of 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. If assistance is for newly independent country, is it furnished through multilateral organizations or plans to the maximum extent appropriate?	Will be implemented as regional and multilateral project.
7. FAA Sec. 601(a); (and Sec. 201(f) for development loans). Information and conclusions whether project 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.	Significant improvement of Bot-Zam Highway will facilitate and encourage international trade between and through Botswana and countries to the north.
8. FAA Sec. 601(b). Information and conclusion 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).	Aid will finance continued services of a U.S. engineering firm. This will also help to maintain U.S. engineering and, possibly construction, presence in Southern Africa.
9. FAA Sec. 612(b); Sec. 636(h). Describe steps taken to assure that, to the maximum extent feasible, 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 to meet the cost of contractual and other services.	GOB will contribute approximately 10% of cost of over-all multilateral Project.
10. FAA Sec. 612(d). Does the U.S. own excess foreign currency and, if so, what arrangements have been made for its release?	Not excess foreign currency country.

3. Project Criteria Solely for Security Supporting Assistance

FAA Sec. 531. How will this assistance support promote economic or political stability?

The improved road will facilitate Botswana's trade and contact with majority-ruled African nations which will help to provide the stabilizing effect of additional markets and sources of supply as a potential supplement or alternative to those offered by the minority-ruled nations. Accordingly, it will also help to permit some economic disengagement from the minority-ruled countries at a time when dislocation in the economies of those countries is predicted.

Draft Amplified Description of
Project for Project Agreement

A. The Project.

The Project will consist of the upgrading of the Nata-Kazangula soil-aggregate road ("Road") in Botswana by paving the Road with a bituminous surface. The construction and the construction supervision of the soil-aggregate road were financed under AID Loan No. 690-H-001, as amended.

Under the Grant A.I.D. will assist in financing the cost of the engineering design and construction supervision for upgrading the Road. The European Community ("EC") acting through the European Development Fund ("EDF") will assist in financing the construction or placement of the bituminous surface. The Grantee will finance, in accordance with Section 3.2, such costs of design, supervision and construction as are not met by A.I.D. or EDF and will finance or provide such miscellaneous inputs as administrative support, as may be needed for construction operations, and certain taxes and duties as may be specified in Project Implementation Letters. The Grantee's contribution, including a contingency for possible shortfall in donor funding, is estimated at approximately 10% of total Project costs and is further explained in the Estimated Financial Plan attached hereto.

B. Implementation Plan.

Except as A.I.D. may otherwise agree in writing, goods and services

financed under the Grant shall have their source and origin in areas included in A.I.D. Geographic Code 000 and the procurement of engineering services financed under the Grant shall be carried out in accordance with Chapter 1 of A.I.D. Handbook 11.

The Grantee shall enter into a contract for engineering services in approximately August 1977. It is anticipated that this contract will cover both the design and construction supervision phases, including services connected with the award of a construction contract, such as, preparation of prequalification questionnaires and invitation for bids ("IFB") and analysis of and recommendations on the responses thereto.

The engineering services contract or contracts shall be submitted to A.I.D. for comment and approval prior to execution in accordance with this Agreement. As will be further described in Project Implementation Letters, the effectiveness of contractual obligations in regard to construction supervision and other designated elements of the scope of work will be made conditional on the commitment or approval by the EDF, satisfactory to A.I.D., of funding for construction.

The Grantee will make every reasonable effort to assure that the IFB, as well as the design, plans and specifications, and the prequalification of prospective bidders are finally approved by the Grantee, EDF and A.I.D. by March 1978, that a construction contract is awarded by approximately July 1978 and that the construction contractor begins work by approximately September 1978.

C. Evaluation Plan.

The Grantee will participate with and assist A.I.D. in evaluating Project Implementation, the achievement of Project goals and the effectiveness of the Project and will submit or assist A.I.D. in preparation of annual Project appraisal reports and an end of Project evaluation report, as will be specified in Project Implementation Letters. The Grantee will keep A.I.D. informed of Project evaluation activities by the EDF or the Grantee and will provide A.I.D. with copies of such evaluation reports resulting therefrom, as A.I.D. may reasonably request. The Grantee will support, facilitate and cooperate in joint evaluation activities conducted by the EDF and A.I.D.

611(e) Certification

I, Louis A. Cohen, the principle officer of the Agency for International Development for capital projects in the East and Southern Africa Region (REDSO/EA), having taken into account, among other things, the maintenance and utilization of projects in Botswana previously financed or assisted by the United States, the staffing and regularly increasing budget of the Ministry of Works and Communications -- responsible for maintaining roads throughout Botswana, and previous and on-going assistance from other donors specifically directed to road construction and maintenance, do hereby certify that I believe that the Government of Botswana has both the financial capability and the human resources capability to effectively maintain and utilize the capital assistance project, the paving of the Botswana-Zambia Road.

Louis A. Cohen, Director, REDSO/EA

9 June 1977
Date

AGENCY FOR INTERNATIONAL DEVELOPMENT
PROJECT AUTHORIZATION AND REQUEST FOR ALLOTMENT OF FUNDS PART I

1. TRANSACTION CODE: [ ] A = ADD, C = CHANGE, D = DELETE

PAF

2. DOCUMENT CODE: 5

3. COUNTRY/ENTITY: BOTSWANA

4. DOCUMENT REVISION NUMBER: [ ]

5. PROJECT NUMBER (7 digits): [ ]

6. BUREAU/OFFICE: A. SYMBOL: AFR; B. CODE: 06

7. PROJECT TITLE (Maximum 40 characters): BOTZAM ROAD PAVING DESIGN & SUPERVISION

8. PROJECT APPROVAL DECISION — ACTION TAKEN: [ ] A = APPROVED, D = DISAPPROVED, DE = DEAUTHORIZED

9. EST. PERIOD OF IMPLEMENTATION: YRS. 04 QTRS. 16

10. APPROVED BUDGET AID APPROPRIATED FUNDS ($000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	PRIMARY TECH. CODE		E. 1ST FY 1977		H. 2ND FY 1978		K. 3RD FY 1979	
		C. GRANT	D. LOAN	F. GRANT	G. LOAN	I. GRANT	J. LOAN	L. GRANT	M. LOAN
(1) SA	910	821		1,500					
(2)									
(3)									
(4)									
TOTALS				$1,500					

A. APPROPRIATION	N. 4TH FY 1980		Q. 5TH FY 1981		LIFE OF PROJECT	
	O. GRANT	P. LOAN	R. GRANT	S. LOAN	T. GRANT	U. LOAN
(1) SA					1,500	
(2)						
(3)						
(4)						
TOTALS					$1,500	

11. PROJECT FUNDING AUTHORIZED (ENTER APPROPRIATE CODE(S)) 1 = LIFE OF PROJECT, 2 = INCREMENTAL LIFE OF PROJECT: A. GRANT 1; B. LOAN

C. PROJECT FUNDING AUTHORIZED THRU: FY 81

12. INITIAL PROJECT FUNDING ALLOTMENT REQUESTED ($000)

B. ALLOTMENT REQUEST NO. _____

A. APPROPRIATION	C. GRANT	D. LOAN
(1) SA	1,500	
(2)		
(3)		
(4)		
TOTALS	$ 1,500	

13. FUNDS RESERVED FOR ALLOTMENT

TYPED NAME (Chief, SER/FM/FSD)

SIGNATURE

DATE

14. SOURCE/ORIGIN OF GOODS AND SERVICES: [X] 000 [ ] 941 [ ] LOCAL [ ] OTHER _____

15. FOR AMENDMENTS, NATURE OF CHANGE PROPOSED

FOR PPC/PIAS USE ONLY	16. AUTHORIZING OFFICE SYMBOL	17. ACTION DATE (MM DD YY)	18. ACTION REFERENCE (Optional)	ACTION REFERENCE DATE (MM DD YY)

AID 1330-6 (7-78)

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DRAFT PROJECT AUTHORIZATION AND REQUEST FOR ALLOTMENT OF FUNDS - PART II

BOTSWANA - BOTZAM ROAD PAVING DESIGN AND SUPERVISION

Pursuant to Part II, Chapter 4, Section 53 of the Foreign Assistance Act of 1961, as amended, I hereby authorize a Grant to Botswana, the "Cooperating Country" of not to exceed one million five hundred thousand United States Dollars ($1,500,000) (the "Authorized Amount") to help in financing certain foreign exchange and local currency costs of goods and services required for engineering design and construction supervision for the project as described in the following paragraph.

The overall multilateral project to which AID is contributing as aforesaid consists of upgrading the existing soil-aggregate BotZam to a bituminous surfaced road (hereinafter referred to as the "Project). The entire amount of the AID financing herein authorized for the Project will be obligated when the Project Agreement is executed.

I hereby authorize the initiation of negotiation by the Director of REDSO/EA and execution of the Project Agreement by the officer to whom such authority has been delegated in accordance with AID regulations and Delegations of Authority, subject to the following essential terms and covenants and major conditions together with such other terms and conditions as AID may deem appropriate:

a) Source and Origin of Goods and Services

Goods and services financed by AID under the Grant shall have their source and origin in the United States, except as AID may otherwise agree in writing.

b) Prior to any disbursement or the issuance of any commitment documents under the Project Agreement, Grantee shall furnish in form and substance satisfactory to AID, an executed contract for engineering design services.

c) Prior to any disbursement or the issuance of any commitment documents under the Project Agreement to finance construction supervision, Grantee shall furnish in form and substance satisfactory to AID, executed contracts for construction and construction supervision and evidence that contributions needed for the Project from the Grantee and other donors will be available on a timely basis.

Signature: _____

_____

Typed Name of Authorizing Officer

_____

Office Symbol