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INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

TECHNICAL REPORT

ON

EL SALVADOR COASTAL HIGHWAY PROJECT

FILE COPY

October 5, 1954

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EL SALVADOR COASTAL HIGHWAY PROJECT

I. SUMMARY

1. The Government of El Salvador is planning to complete the construction of an all-weather highway along the country's Pacific Coast and has requested a Bank loan to finance the foreign exchange costs of the work.
2. Out of an aggregate planned length of 306 km., contiguous sections totalling 40 km. are completed and open to traffic. This leaves a balance of 266 km. which the Government proposes to build or improve to all-weather standards in 1954-58 (See Schematic Map).
3. The loan request includes all the sections, totalling 238 km., for which construction contracts have not yet been awarded but excludes a 28 km. section which is committed to construction under an existing contract.
4. The Coastal Highway is intended to develop a region with large agricultural resources which are under-utilized at present because of inadequate roads. In particular, the Government wishes to stimulate crop cultivation, livestock raising, and dairy farming in the coastal plains extending East-West from the Gulf of Fonseca to the Guatemala border.
5. The proposed route promises to bring about increases in agricultural production and income on a scale which would amply justify its cost. Fuller utilization of the Coastal Zone's resources would help to improve the present balance between El Salvador's food requirements and food production and would also provide an outlet for settlement from over-populated areas.
6. The project is technically feasible, has been planned to suitable standards, and is a justifiable extension of the existing highway system to the only important region lacking adequate all-weather roads. It should take about four years to complete, including at least 12 months of design work and at least 30 months of actual construction. All the preliminary engineering necessary to locate the route has been carried out, and provisional cost estimates based on approximate quantities of materials have been prepared.
7. The Government is engaging competent consulting engineers to prepare detailed plans, designs and specifications for the sections comprising the loan request; to advise on the award of contracts, and to supervise construction. Furthermore, the Government intends to have the actual construction of these sections done by pre-qualified contractors chosen through international competitive bidding on the basis of unit-price contracts.
8. The Highway Department, which would be responsible for the ultimate upkeep of the new route, is well-organized and well-administered but needs additional trained technical personnel. The existing main roads are maintained in a satisfactory state of repair although maintenance of local roads could be improved.

9. Based on the engineers' preliminary estimates, the construction and improvement of the 238 km. comprising the loan request should cost about 440 million (\$16 million equivalent). Approximately \$11.1 million equivalent would be foreign exchange expenditure to be financed out of the loan proceeds and 12.2 million (\$4.9 million equivalent) would be local currency expenditure to be financed out of budget appropriations.

10. The construction and improvement of the 28 km. outside the loan request is provisionally estimated to cost about 45 million, thus increasing the total outlay for completion of the Coastal Highway to 45 million (\$18 million equivalent).

11. Feeder roads extending the Coastal Highway will eventually have to be built and some existing all-weather roads which connect the Coastal Zone with the Central Plateau may eventually have to be improved at a roughly estimated cost of \$3 - \$4 million equivalent. The ultimate outlay on the project may thus reach \$21 - \$22 million equivalent, or twice the amount of the proposed loan.

12. The Government is prepared to budget sufficient appropriations for Highway Department purposes (a) to cover the balance of the project costs beyond the Bank-financed portion; (b) to improve and expand the road network as needed outside the coastal plains; and (c) to provide adequate maintenance of the entire system of main and local roads. These appropriations could be made available without overstraining the public budget or delaying other essential public works.

13. The Government is prepared to meet all the necessary conditions for ensuring the successful execution of the project including (a) suitable procedures for effectuating the construction of the entire Coastal Highway; (b) satisfactory assurances regarding the construction of feeder roads and the improvement of branch roads; (c) an adequate program to strengthen the Highway Department's road maintenance facilities, methods, and staff; and (d) the provision of an extraordinary budget for 1955-1958, voted in advance, to cover the Government's portion of the Coastal Highway's cost.

14. The proposed route appears to be a suitable project for Bank financing to the amount of the loan request, \$11.1 million equivalent.

15. Based on comparable recent loans and with allowance for the required construction period, the appropriate terms might be 12 years with a 4-year period of grace.

II. BACKGROUND

Introduction

16. Construction of the Coastal Highway started several years ago on the basis of provisional plans and specifications prepared by the Highway Department, and has proceeded intermittently up to the present. The sections constructed to date have been built partly by local contractors and partly by the Department's forces.

17. With only a small portion of the route built or under contract, the Government decided about a year ago to request a Bank loan for financing the foreign exchange costs of the work still to be done. At this time, field surveys had not been completed on a substantial portion of the route mileage, including the most difficult sections of mountainous terrain, and incomplete determinations had been made of the required large structures over most of the route.

18. The project in its incomplete state was examined in the field in late 1953 by a Bank mission which included highway engineers and an agricultural expert. They found the proposed highway to be technically feasible and economically sound and recommended prompt execution of the work.

19. A preliminary assessment of the project (TO-49, February 17, 1954) concluded that the Coastal Highway promised to shape into a suitable project for Bank financing but that loan discussions should be deferred pending further engineering studies to develop firmer cost estimates. Shortly thereafter, the Government engaged Knappen-Tippetts-Abbett-McCarthy to carry out the required studies, an assignment which took about three months. After study of the engineers' report, dated August 24, 1954, the Bank invited the Government to initiate loan discussions.

20. If the loan is granted, Knappen-Tippetts-Abbett-McCarthy will act as consulting engineers for the planning, design, and execution of the 238 km. comprising the loan request. A contract to this end which will become effective upon ratification by the National Assembly, has recently been negotiated. The Government also intends to make supplementary arrangements with the consulting engineers to have them participate in supervising construction on 28 km. outside the loan request.

Agricultural Background of Project

21. El Salvador is an agricultural country with limited possibilities of industrialization whose main economic problem is the pressure of population against developed resources. Population density is high (98 persons per square km.) and population growth is rapid (2.5 - 3% per annum).

22. The land in agricultural use includes 392,000 hectares under cultivation, 154,000 in tree crops (mainly coffee), and 685,000 in pasture. The acreage devoted to crops is small for El Salvador's area (21,000 square km.) and population (1.9 million), while the pastures have low feeding value because of the climate. Most of the arable land, moreover, particularly in the Central Plateau and the Northern Hills, has already been brought under intensive cultivation.

23. The coastal plains--three plains of unequal size, separated by hilly stretches--are the only area where sizeable amounts of fertile land are still available for settlement. Furthermore, the rich, flat lands

along the coast can yield larger returns under proper cultivation methods than the poorer, hilly lands of the North. The Coastal Zone is thus El Salvador's last major land reserve for improving the present balance between food production and food requirements.

24. Although the Coastal Zone is, on the whole, underdeveloped and sparsely populated, exploitation of its resources is already under way, particularly in the Central Plain. The developed resources include 86,000 hectares under cultivation, 22,000 in tree crops, and 173,000 in pasture. Much of the forest cover has been cleared; there are large pastures interspersed by farms all along the coast; and the Central Plain is a wide expanse of cotton fields.

25. Most of the exploited land is in large haciendas up to several thousand hectares which produce cotton and other cash crops such as sesame by extensive farming methods or which maintain large herds of cattle, mainly for beef. The rest is in small holdings, predominantly subsistence farms, which produce maize, sorghum, rice, and other staple foods and a limited output of cash crops. The small-owner cultivators also keep some cattle, pigs, and poultry.

26. About 70% of El Salvador's cotton production and 60% of its sesame output comes from the Coastal Zone. It also produces 20 - 30% of the country's maize, rice, and sorghum and has about a third of the cattle. Coffee production, aggregating only 9 - 10% of the national total, is a minor factor.

27. The region's potential resources are under-utilized at present despite substantial progress in the Central Plain. First, the cultivated acreage could be doubled by bringing into production some 80,000 hectares, conservatively estimated, of good arable land not now in use. This would increase the national crop acreage about 20%, apart from larger yields per acre because of better soil and terrain. Second, the coastal pastures are producing a fraction of the beef and milk that could be obtained with more intensive methods of livestock raising and pasture management. Third, the existing small farms could greatly expand their production of food crops if favorable conditions were created for the replacement of subsistence farming by market-oriented agriculture.

28. The development of the coastal plains began 10 - 15 years ago with cotton cultivation. Progress to date traces largely to the construction of a few penetration roads and to the application of health measures for bringing malaria under control. Although malaria is no longer a deterrent to settlement, only the cotton-growing districts of the Central Plain have all-weather roads at present. Elsewhere, there are oxcart trails.

29. Owing to inadequate roads, transport costs are high in most of the region, access to markets is difficult, and prices at the farm are low. Considerable waste arises from the slow haulage of crops, the movement of livestock on the hoof, and the stoppage of transport during the rainy season.

As a result, the hacienda owners concentrate on producing a few cash crops of sufficient value to support expensive transport while the owner-cultivators find it difficult to advance beyond subsistence farming.

30. An adequate road system is an essential condition for developing full use of the region's resources. Such a system should include: (a) an East-West trunk route traversing the entire area--i.e., the planned new highway; (b) an eventual network of short access roads feeding into the arterial route; and (c) all-weather roads, which already exist, connecting the coastal plains with the Central Plateau.

Potential Benefits from Adequate Roads

31. With good roads, providing year-round access to widened markets at lower transport costs, agricultural production in the Coastal Zone might be expected to increase by a minimum of \$10 million equivalent per annum. Increased output of maize, rice, and other food crops because of additional cultivated acreage and more commercialized farming practices should yield at least \$6 million a year. Increased output of beef and milk because of more intensive methods of livestock raising and pasture management should yield an additional \$3 million a year. Income from the sale of the present crops ought to expand at least \$1 million a year due to better prices at the farm made possible by cheaper transport and year-round marketing. There would be additional large earnings, which cannot be definitely assessed, because of curtailed wastage in crop and livestock marketing.

32. Even more important are certain benefits which cannot be measured financially. Denser settlement of the Coastal Zone would help to relieve population pressure elsewhere in El Salvador and thus promote sounder land use in the country as a whole. Fuller utilization of the region's capabilities for producing food crops, meat, and milk would contribute materially to meeting the food requirements of El Salvador's growing population. A larger volume of crops sold for better prices at the farm would create favorable conditions for the gradual emergence of small owner-cultivators practising commercial agriculture instead of subsistence farming.

33. The benefits described above cannot, of course, be expected to materialize fully from road construction alone. The Government will have to continue its present efforts to improve health conditions in the coastal plains; to promote better land use, soil conservation, and production methods through enlarged agricultural extension services; and to facilitate the establishment of more adequate processing, storage, and credit facilities. The Government is aware of the necessity of such action and is preparing to take appropriate steps.

34. An East-West highway across the Coastal Zone would thus be a sound investment from the viewpoint of El Salvador's agricultural needs and possibilities. Furthermore, the measurable benefits (at least \$10 million a year, as calculated above) would comprise an ample return on the project costs (about \$21 - \$22 million, as shown later).

Existing Highways and Traffic

35. For its size, El Salvador has the largest and most complete system of all-weather roads in Central America. It totals about 1,640 km. including 580 km. of paved roads built to the general standards of the Inter-American Highway, and 1,060 km. of all-weather gravel roads built to lower standards.

36. The existing system is a well-planned network which, extended by the planned arterial route along the coast, would penetrate and connect all the main productive areas (see Schematic Map). Its backbone is the paved Inter-American Highway, extending 273 km. across the Central Plateau from the Guatemala border to the Honduras border. This route joins Santa Ana, San Vicente, San Miguel, and other population centers with San Salvador, the capital. Branching out from it are paved and gravel roads which lead to the producing regions and the ports.

37. The bulk of El Salvador's internal trade is road-hauled despite the existence of some railway lines which carry export-import goods between the market centers and the ocean ports. Maize, rice, beans, cotton, and coffee are the main commodities on the all-weather roads; harvest workers to and from the coffee districts, the main form of passenger transport. Goods traffic is highly concentrated in the dry season while passenger traffic increases considerably before and after the coffee harvest.

38. Motor vehicles are the principal means of transport on the all-weather roads. As of early 1953, about 6,300 automobiles and jeeps, 1,900 buses, and 3,100 trucks were operating, and the fleet has since increased. Even on the best roads, however, including the Inter-American Highway, oxcarts are used extensively and large numbers of cattle are driven to market on the hoof.

39. Motor vehicle traffic on the improved highways is dense by Central American standards in all parts of the country. The maximum densities, ranging from 1,000 to 2,000 vehicles a day, are reached on certain sections of the Inter-American Highway near San Salvador. Traffic volumes elsewhere vary between 150 and 400 vehicles a day.

40. Except in the immediate vicinity of the large towns, the traffic is predominantly commercial in the ratio of three trucks and buses to each automobile. Truck haulage charges are in line with those in other tropical countries at a comparable stage of development, averaging about 6 - 7 US cents a ton-mile on the all-weather routes. They are only a fraction of the prevailing costs of oxcart transport which have been estimated as roughly 30 cents a ton-mile.

Existing Highway Organization

41. Responsibility for the maintenance, improvement, and construction of the road system is centralized in a Highway Department which is part of the Ministry of Public Works. This Department is headed by a Director General to whom report 13 functional division chiefs. It includes a headquarters staff of about 200 men and a field organization, divided into six

zones, totalling several thousand men of whom 2,300 are employed in road maintenance. There are three shops for the repair of equipment, a main shop at San Salvador and branch shops at Santa Tecla and San Miguel.

42. From 1947 through 1953, the Highway Department expended about \$43 million (\$17 million equivalent) for various road purposes. Approximately \$26 million went for the construction of new roads other than the Inter-American Highway and \$14 million for the maintenance and improvement of the entire road system. The Inter-American Highway, largely completed before 1947, has taken only \$3 million for new construction since then.

43. The Highway Department's financial resources are provided by annual budget appropriations. Although gasoline, lubricants, and motor vehicles are taxed, none of the proceeds is earmarked for the Department's use, earmarking of taxes being prohibited by the Constitution. The Department's annual expenditures in recent years have increased from an actual \$6.6 million in 1951 to an expected \$9.1 million in 1954, and are provisionally budgeted at \$9.3 million for 1955 as follows:

<u>Item</u>	<u>\$ 000</u>
Administration and studies	600
Maintenance except shops and stores	1,800
Shops and stores	1,300
Construction and improvement	2,600
Coastal Highway	<u>3,000</u>
	<u>9,300</u>

44. Part of the Department's construction work is let to contractors, entirely local contractors at present, and part is accomplished by its own forces. All of the road and equipment maintenance is done by the Department itself. As a normal policy, the Department concentrates its personnel on maintenance and uses contractors for the bulk of the road-building.

45. The Department's basic organizational structure is sound and in accordance with generally accepted principles of highway administration. Within the limitations imposed by a lack of sufficient technical personnel, the existing staff is competent and its work is well-administered. The main weakness is a shortage of experienced engineers which hampers co-ordinated programming of the road system, clear-cut project planning, and the formulation of firm administrative policies.

46. The planning, supervision, and construction of an arterial highway across the coastal plains would seem to be beyond the unaided technical and administrative capabilities of the Highway Department and the local contracting industry. The employment of consulting engineers from abroad and the use of some foreign contractors appear to be necessary.

47. Although the Department is maintaining the main roads in a satisfactory state of repair, most of the secondary and local roads are poorly maintained. This is partly due to the use for road improvement work, of some of the funds nominally allotted to routine maintenance. Other contributory factors are under-staffing with technical personnel and lack of sufficient shops and equipment.

III. DESCRIPTION OF PROJECT

Route and Standards

48. The immediate project is completing the construction of an all-weather highway to extend 306 km. along the Pacific Coast from the Guatemalan border to near the port of La Union on the Gulf of Fonseca. Sections totalling 40 km. have been built and are open to traffic, leaving a balance of 266 km. for future construction. Of this, a 28 km. section is committed to construction under an existing contract, leaving a balance of 238 km. for which contracts have to be awarded.

49. Eventually, the project will also include: (a) the construction of some 250 km. of short feeder roads along the route of the Coastal Highway and (b) the improvement of existing all-weather roads which connect the coastal plains with the Central Plateau. Part of this work, some of which is already under way, will be carried out concurrently with the construction of the Coastal Highway, and the remainder will be carried out as soon as practicable thereafter.

50. The proposed route is well-located and adequately designed for its basic purpose--promoting the agricultural development of the coastal plains. It could also serve as an eventual alternate to the Inter-American Highway for the carriage of international through-traffic between Guatemala and Honduras, but its use for this purpose would require supplementary road building in Guatemala.

51. The projected road runs roughly parallel to the Inter-American Highway 20-30 km. to the North. It is separated from the latter by a mountain range which would make it extremely costly to try to develop the Coastal Zone by building a large number of additional North-South arteries.

52. Beginning at La Hachadura on the Guatemala border, the proposed highway runs near the coast or close inland for a distance of 252 km. to El Delirio, crossing the Rio Lempa en route by a recently-completed bridge. From El Delirio it makes a wide loop for the remaining distance of 54 km. to La Union. Over most of its length, the route traverses flat or gently rolling land with abundant resources pointing toward a high traffic potential. A few short sections, however, particularly a 26 km. stretch between Rio Mizata and Rio El Zonte, traverse mountainous terrain, while the El Delirio - La Union section crosses an area of limited resources. Allowance has been made for these factors by designing the Rio Mizata - Rio El Zonte stretch to lower standards of width, curves, and grades than the rest of the route and the El Delirio - La Union section as a crushed rock rather than an asphalt road.

53. All the preliminary engineering has been completed including provisional estimates of quantities of materials. The entire route has been located, including a recommended alignment for 26 km. of mountainous terrain where the heaviest and costliest construction would be encountered. Field surveys have been made over the total length but the recommended Rio Mizata - Rio El Zonte alignment varies from the line of the actual field survey in this area.

54. Design standards have been chosen (Annex A) which generally conform as regards grades and curves, with the specifications for secondary roads set forth by the American Association of State Highway Officials and which slightly exceed, as regards roadway and roadbed, the specifications to which most sections of the Inter-American Highway have been built. Broadly, the Coastal Highway has been designed as a two-lane, all-weather road with moderate curves and grades throughout and with a light bituminous surface treatment except where traffic is expected to be exceptionally dense (asphaltic concrete surface) or exceptionally light (crushed rock surface).

55. The standards chosen seem well-suited to the terrain, the traffic density, and the types of vehicles. They call for a somewhat better road than the Inter-American Highway but do so with good cause, considering probable traffic growth with further development of the region, the recognized need of widening and strengthening the more heavily travelled sections of the Inter-American Highway, and the fact that widening the roadway and reinforcing the pavement support later on would be much more costly than original construction to adequate standards. Finally, the initial use of a light bituminous surface treatment instead of a thick pavement is a desirable form of stage-construction since the pavement can gradually be built up as needed to a depth consistent with traffic requirements.

Estimated Costs and Timing of Expenditure

56. According to the engineers' preliminary estimates (Annexes B, C, and D), the construction of 238 km. comprising the loan request should cost about 40 million (\$16 million equivalent). This includes \$11.1 million equivalent in foreign exchange costs (foreign component of payments to construction contractors and consulting engineers) and 12.2 million in local currency costs (colon component of such payments plus administrative expenses incurred by the Highway Department). The required currencies for the foreign exchange costs cannot be determined until construction contracts are awarded, but most of the requirement is expected to be in dollars.

57. The construction of 28 km. outside the loan request may cost an additional 5 million, based on provisional estimates, while the future network of feeder and branch roads may require an outlay of the order of 8-10 million. The costs of the Coastal Highway alone thus total 45 million (\$18 million equivalent) while the eventual costs of the entire project may reach \$21 - \$22 million equivalent.

58. The cost estimates for the sections comprising the loan request are provisional in the absence of actual bids. They, nevertheless, seem realistic because: (a) they are the result of actual field surveys by competent technicians, (b) reflect clear-cut specifications giving rise to definite quantities of materials, (c) give appropriate weight to the various factors involved in formulating unit-price bids, and (d) include adequate allowances for ocean freight, spare parts, and construction contingencies.

59. The foreign exchange component appears to be a conservative estimate. It has been computed e.g. on the extreme assumptions that: (a) the contractors will quote unit prices calculated to amortize the full value, bought new, of all the equipment they bring to the job; and (b) all of the work will be let to foreign contractors requiring foreign exchange to pay for overhead, profit margins, and supervisory personnel.

60. Interest during construction to the approximate amount of \$1 million on the loan request is excluded from the cost estimates: first, because the project is not of a self-liquidating nature, and second, because no question of capitalizing such interest has been raised by the Government.

61. Based on the engineers' preliminary estimates, the timing of expenditures on the sections comprising the loan request might be expected to approximate the following pattern:

<u>Year</u>	<u>Foreign Exchange, \$ Million</u>	<u>Local Currency, £ Million</u>
- 1954	0.2	0.6
- 1955	1.3	2.1
- 1956	2.4	2.2
- 1957	3.9	3.8
- 1958	<u>3.4</u>	<u>3.5</u>
Total	<u>11.1</u>	<u>12.2</u>

62. The Government wishes to borrow the foreign exchange costs - about \$11.1 million - from the Bank and proposes to cover the local currency costs - about £12.2 million - out of appropriations. Additionally, the Government would provide £5.2 million--half from previous appropriations and half from new appropriations--to complete the section outside the loan request. An extraordinary budget covering the total costs of completing the Coastal Highway and specifying the annual amounts to be appropriated from 1955 through 1958 would be set up simultaneously with ratification of the loan.

63. The Government appears to have sufficient means, without curtailing expenditure on other essential public works, to finance its portion of the Coastal Highway costs; to provide adequate sums for proper maintenance of the entire system of main and local roads; to pay for high-priority road construction and improvement outside the Coastal Zone; and to build feeder roads and improve branch roads serving the Coastal Highway as needed.

64. The Government is prepared to appropriate the required sums for a balanced program of Highway Department work and has prepared, toward this end, budget estimates envisaging 1955-1958 appropriations to the amount of \$40 million, or \$10 million a year (Annex E). This includes \$11.8 million as an extraordinary budget item for the Coastal Highway and \$25.2 million as ordinary budget items for all other purposes.

Proposed Construction Procedures

65. The Government intends to have the Coastal Highway built in accordance with the procedures described below.

66. Consulting engineers satisfactory to the Bank will be employed to plan, supervise, and inspect the work on the Bank-financed sections. Specifically, as provided in the Government's contract with Knappen-Tippetts-Abbott-McCarthy, the consultants will conduct surveys; prepare detailed plans, design, and specifications in suitable form for the submission of unit-price bids; advise on the qualifications of contractors and on the award of contracts; and supervise actual construction with the aid of Highway Department personnel.

67. Pre-qualified contractors satisfactory to the Bank and chosen through international competitive bidding, will be employed to do the actual construction of the Bank-financed sections. Local as well as foreign contractors meeting suitable qualifications will be invited to bid. The primary contractors will be free to sub-contract individual portions of the work to sub-contractors meeting suitable qualifications subject to the Bank's approval of sub-contracts exceeding a stated minimum.

68. The work will be split into several sections large enough to interest foreign contractors but small enough to permit participation by local contractors as well. It will be offered for bidding on a composite contract basis allowing the contractor to bid on any single section, all of the sections, or any combination of several sections. The awards will be made so as to obtain the lowest aggregate cost.

69. The section outside the loan request will be redesigned to higher specifications comparable with those of the Bank-financed sections. Its construction will be supervised and inspected by appropriate arrangements to be worked out between the consulting engineers and the Highway Department.

70. These appear to be suitable procedures for the efficient execution of the work.

Strengthening of Highway Department

71. The Highway Department intends to strengthen the staff, facilities, and methods of its maintenance organization by action along the lines described below.

72. Appropriate arrangements will be made with the foreign consulting engineers and construction contractors to utilize local staff to the greatest practicable extent and to do vocational training on-the-job.

73. The Department will engage experts recruited abroad to collaborate with its local staff in devising improved methods of road maintenance and to train its equipment operators and shop mechanics in the proper use and repair of their machines.

74. The annual appropriations for routine maintenance will (a) be increased sufficiently to permit good upkeep of secondary and local roads as well as main highways; and (b) be separated from the appropriations for road improvement instead of being lumped in a single sum as at present.

75. The Department will re-equip the Santa Tecla and San Miguel field shops, set up three additional fields shops, and train additional mechanics to man the additional facilities. Worn-out trucks and graders now in use for road maintenance purposes will be replaced and some additional equipment will be bought.

IV. CONCLUSIONS AND RECOMMENDATIONS

76. The Coastal Highway is an economically desirable project; it would stimulate agricultural output in an underdeveloped area and thus promote a better balance between El Salvador's food production and food requirements.

77. For the full realization of these benefits, the Government should continue its present efforts to improve health conditions and expand agricultural extension services in the Coastal Zone; the Government intends to do so.

78. The project is technically sound; its preliminary engineering is adequate, and proper provision for detailed engineering has been made. The proposed route extends the national highway system to the last major land reserve at El Salvador's disposal and would be executed by suitable procedures including the employment of competent consulting engineers and contractors.

79. The Highway Department is competent and efficient within the limitations imposed by a shortage of trained engineers and intends to take the necessary action to improve its technical capabilities.

80. The present main highways are maintained in a satisfactory state of repair but maintenance of secondary and local roads could be improved; the Department intends to put an appropriate program into effect concurrently with the construction of the Coastal Highway.

81. If the loan request is granted, the Government has sufficient means to finance the balance of the project costs without delaying other essential public works or curtailing other essential activities of the Highway Department.

82. The Government is prepared to meet all the necessary conditions (See attached List) for ensuring the success of the project.

83. For the reasons stated above, the Coastal Highway seems to be a suitable project for Bank financing. In view of the estimated foreign exchange costs, the amount of the loan might appropriately be \$11.1 million equivalent. In view of comparable recent loans and the length of the construction period, the terms might appropriately be 12 years with a 4-year period of grace.

V. LIST OF CONDITIONS

The Government has expressed its willingness to meet all of the conditions specified below.

Construction of Coastal Highway

1. Experienced consulting engineers will be employed to plan, supervise, and inspect the work on the sections comprising the loan request.^{a/}
2. These sections will be constructed by pre-qualified contractors chosen through international competitive bidding under unit-price contracts.
3. No contracts will be awarded for particular sections until the consulting engineers have prepared detailed plans and specifications with estimates of quantities.
4. The section committed to construction outside the loan request will be redesigned to the same standards as the Bank-financed sections, and its construction will be supervised and inspected by appropriate arrangements between the Highway Department and the consulting engineers.

Construction of Feeder and Branch Roads

5. The Highway Department will prepare a detailed program for building an adequate network of feeder roads to extend the Coastal Highway and for improving to adequate standards the present all-weather roads which connect the coastal plains with the Inter-American Highway.
6. Part of this program will be carried out concurrently with the construction of the Coastal Highway and the remainder as soon as practicable thereafter.

Maintenance of Main and Local Roads

7. The Highway Department will prepare a detailed program for modernizing and expanding its field shops, replacing over-age trucks and graders, and procuring additional equipment.
8. This program will be carried out concurrently with the construction of the Coastal Highway.
9. The Department will employ qualified experts to help improve its present methods and practices of road maintenance.
10. The Department's appropriations for routine maintenance will be increased to allow better upkeep of local roads, and will be separated from its appropriations for road improvement.

^{a/} The government is taking steps to engage Knappen-Tippetts-Abbett-McCarthy for this purpose.

Financial and Budgetary

11. The Government will appropriate adequate amounts over the life of the loan to cover the Government's portion of the project costs, to improve and expand the Highway Department's maintenance facilities as planned, and to keep the entire road system in a good state of repair.

12. The necessary funds to complete the Coastal Highway will be appropriated as an extraordinary budget item covering the entire work in advance.

General

13. The Government will continue its present efforts to improve health conditions and expand agricultural extension services in the coastal zone.

Annex A. Recommended Design Standards for Coastal Highway

<u>Item</u>	<u>Flat or gently rolling terrain</u>	<u>Hilly or mountainous terrain</u>
<u>Width</u>		
Pavement	7.3 m	6.2 - 7.3 m
Base	7.3	6.2 - 7.3
Berms	1.7	1.0 - 1.7
Sub-base	9.0	7.2 - 9.0
Highway (total)	12.0	10.0 - 12.0
Right-of-way (minimum)	30.0	30.0
<u>Surface Type</u>		
Medium traffic density	Asphalt surface treatment, (a) single application (b) double application	Asphalt surface treatment, single application
Heavy traffic	Asphaltic concrete	Asphalt surface, single treatment
Light traffic	Crushed rock	Crushed rock
<u>Composition</u>		
Base	15 cm. compacted granular material	15 cm. compacted granular material
Sub-base	20 cm. selected material	20 cm. selected material
Treatment of berms	Stabilized	Stabilized
Side slope of fills	1½ : 1	1½ : 1
Design speed	100 km/hr.	45 km/hr.
Maximum grade	6%	6% - 8%
Minimum radius of curvature	10° metric = 115 m.	20° metric = 57 m.
Minimum distance between curves, opposite direction	60 m.	30 m.
Minimum distance between curves, same direction	150 m.	150 m.
Design load - bridges	H-15, S-12	H-15, S-12
<u>Width of bridges</u>		
Less than 25 m. long	Pavement width plus 0.6 m; 7.9 m. minimum	Pavement width plus 0.6 m; 7.9 m. minimum
More than 25 m. long	Pavement width plus 1.2 m; 8.5 m. minimum	Pavement width plus 1.2 m; 8.5 m. minimum

Source: Knappen-Tippetts-Abbott-McCarthy, and Ministry of Public Works.

Annex B. Estimated Construction Costs of Coastal Highway
by Class of Work

<u>Class</u>	<u>Foreign exchange \$ 000</u>	<u>Local currency Ø 000</u>	<u>Total, Ø 000 Equivalent</u>
Roadway	4,835	4,452	16,540
Drainage	720	656	2,456
Structures	1,457	1,316	4,959
Pavement	2,417	2,207	8,249
Miscellaneous	<u>58</u>	<u>65</u>	<u>210</u>
Sub-total	9,487	8,696	32,414
Contingencies	<u>949</u>	<u>870</u>	<u>3,242</u>
Construction proper <u>a/</u>	<u>10,436</u>	<u>9,566</u>	<u>35,656</u>
Consulting Engineers	678	615	2,310
Local Administration <u>b/</u>	-	1,875	1,875
Right-of-way	<u>-</u>	<u>100</u>	<u>100</u>
Total	11,114	12,156	39,941 <u>c/</u>

a/ Represents payments to construction contractors; assumes 100% use of foreign contractors.

b/ Represents Highway Department expenses for survey and inspection work including some equipment purchases.

c/ Rounded in final estimate to Ø40 million.

Source: Preliminary engineers' estimates by
Knappen-Tippett-Abbett-McCarthy.

Annex C. Estimated Construction Costs of Coastal Highway
by Class of Expenditure

<u>Class</u>	<u>Foreign exchange</u> \$ 000	<u>Local currency</u> ₱ 000	<u>Total, ₱ 000 equivalent</u>
Construction equipment ^{a/}	5,100	-	12,750
Construction materials	2,027 ^{b/}	2,500 ^{c/}	7,568
Fuel and lubricants	1,050	-	2,625
Labor (construction work)	840 ^{d/}	6,000	8,100
Contractors' profit	1,419 ^{d/}	-	3,547
Consulting engineers	678	615	2,310
Housing and food	-	975	975
Office costs	-	150	150
Right-of-way	-	100	100
Local administration	-	1,875 ^{e/}	1,875
Total	11,114	12,215	40,000

a/ Cost of contractors' equipment on assumption it is bought new and is fully amortized.

b/ Cost of imported dynamite, reinforcing steel, structural steel, cement, fencing, points and compounds, asphalt and miscellaneous metals.

c/ Cost of local sand, gravel, water, lumber and of locally-manufactured pipe.

d/ Assumes 100% use of foreign contractors.

e/ Expenses incurred by Highway Department in survey and inspection work.

Source: Preliminary engineers' estimates by Knappen-Tippetts-Abbott-McCarthy.

Annex D. Estimated Construction Costs of Coastal Highway
by Section of Route

<u>Section</u>	<u>Total Costs / mil.</u>	<u>Length km.</u>	<u>Type of Terrain</u>	<u>Type of Surface</u>	<u>Work to be done</u>	<u>Remarks</u>
La Hochadura- Acajutla	6.7	43	A	I-a	Grading through surfacing.	.
Acajutla- Rio Mizata	3.6	27	A	I-a	Grading through surfacing.	6 km. partially built.
Rio Mizata- Rio El Zonte	9.1	26	B	I-a	Grading through surfacing.	Circuitous alignment.
Rio El Zonte- La Libertad	3.2	19	C	I-a	Grading through surfacing.	(Committed to con- struction by exist- ing contract out- side loan request
La Libertad - Comalapa	(5.2)	23	D	II	Grading through surfacing.	
Comalapa- El Playon	-	40	.	.	None; completed and open to traffic.	Built to satisfac- tory standards.
El Playon- Usulután	1.9	33	E	I-b	Base and paving only.	.
Usulután- El Delirio	3.2	32	F	I-b	Grading through surfacing.	5 km. partially built.
El Delirio- Intipuca	2.1	22	G	III	Grading through surfacing.	.
Intipuca- La Unión	<u>2.5</u>	<u>32</u>	<u>E</u>	<u>III</u>	<u>Grading through surfacing.</u>	.
Sub-total	32.2	306	.	.	.	.
Miscellaneous unassigned	<u>0.2</u>	<u>.</u>	.	.	.	.
Construction proper	32.4	.	.	.	.	.
Construction contingencies	<u>3.2</u>	.	.	.	.	.
Construction & contingencies	35.7	.	.	.	.	.
Consulting engineers	2.3	.	.	.	.	.
Local adminis- tration	1.9	.	.	.	.	.
<u>Right-of-way</u>	<u>0.1</u>	.	.	.	.	.
Total: Sections compris- ing loan request	40.0					
: Section outside loan request	<u>5.2</u>					
Grand Total	45.2					<u>rough estimate.</u>

Type of Terrain: A - Flood plain area; flat, some rolling country; many rivers.
B - Rough mountainous region; finger cliffs; narrow valleys.
C - Mountainous and hilly to rolling and flat.
D - Rolling to hilly; some flat stretches
E - Flat.
F - Flat to gently rolling.
G - Flat to rolling and mountainous.

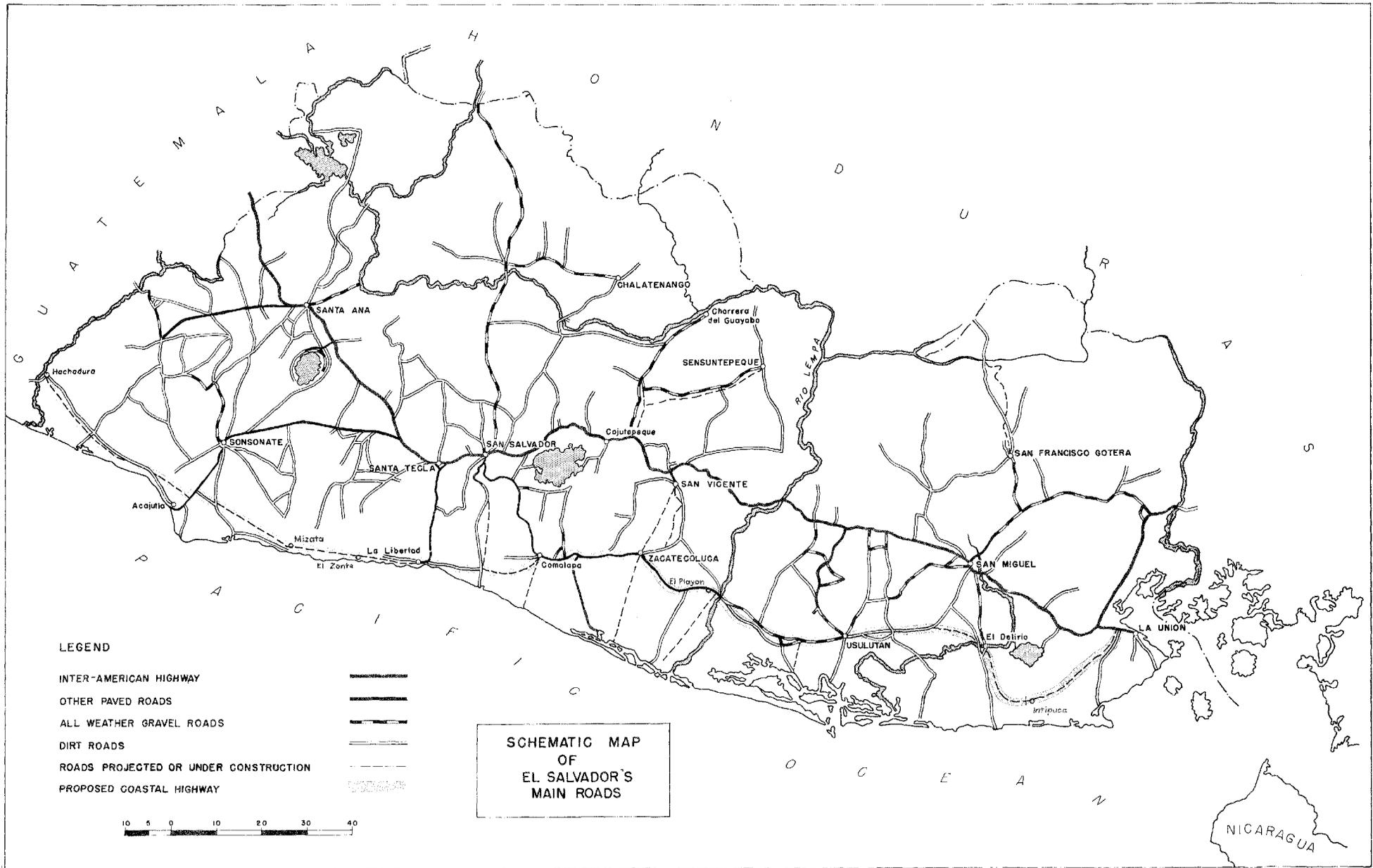
Type of Surface: I-a - Light bituminous treatment; single application.
I-b - Light bituminous treatment; double application.
II - Asphaltic concrete.
III - Crushed rock.

Source: Preliminary engineers estimates by Knappen-Tippetts-Abbett-McCarthy.

Annex E. Proposed Program and Budgeting of Highway Department Work,
1955 - 1958

<u>Class</u>	<u>£ million</u>
<u>Construction of Coastal Highway</u>	
1. Local currency costs of Bank-financed sections	12.2
2. Total costs of section outside loan request	<u>5.2</u>
	17.4
3. Available for (2) from previous appropriation Extraordinary budget	<u>2.6</u> 14.8
<u>Other Highway Department Work</u>	
Road Maintenance (£ 2 million/p.a.)	8.0
Feeder and branch roads for Coastal Highway (25% of eventual required network)	2.5
Administration and studies (apart from costs charged to Coastal Highway)	2.4
Shops and stores (normal expenditure)	5.2
Improvement and expansion of field shops; additional maintenance equipment (developmental expenditure)	1.3
Paving of North Highway (work in progress)	1.0
Completion of Airport Boulevard (work in progress)	1.5
Improvement of Inter-American Highway (work in progress)	0.2
Improvement of other roads (routine projects)	<u>0.8</u> 22.9
Contingencies	<u>2.3</u>
Ordinary budget	25.2
<hr/>	
<u>Total</u>	<u>40.0</u>
1955	9.3
1956	9.5
1957	10.5
1958	10.7

Source: Official estimates by Ministry of Public Works.



**SCHEMATIC MAP
OF
EL SALVADOR'S
MAIN ROADS**



NICARAGUA