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**UNCLASSIFIED**

UNITED STATES INTERNATIONAL DEVELOPMENT COOPERATION AGENCY  
AGENCY FOR INTERNATIONAL DEVELOPMENT  
Washington, D. C. 20523

CARIBBEAN REGIONAL

**PROJECT PAPER**

INFRASTRUCTURE EXPANSION AND  
MAINTENANCE SYSTEMS  
Amendment Number 7

AID/LAC/P-451  
CR P-284, 328, 356, 368  
P-385, 391, & 436

Project Number: 538-0138

**UNCLASSIFIED**

**PROJECT DATA SHEET**

1. TRANSACTION CODE

A = Add  
 C = Change  
 D = Delete

Amendment Number  
7

DOCUMENT CODE  
3

2. COUNTRY/ENTITY

Regional Development Office/Caribbean

3. PROJECT NUMBER

538-0138

4. BUREAU/OFFICE

LAC

05

5. PROJECT TITLE (maximum 40 characters)

Infrastructure Expansion and Maintenance Systems

6. PROJECT ASSISTANCE COMPLETION DATE (PACD)

MM DD YY  
09 30 94

7. ESTIMATED DATE OF OBLIGATION  
 (Under 'B.' below, enter 1, 2, 3, or 4)

A. Initial FY 86 B. Quarter 3 C. Final FY 90

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

A. FUNDING SOURCE	FIRST FY <u>86</u>			LIFE OF PROJECT		
	B. FX	C. L/C	D. Total	E. FX	F. L/C	G. Total
AID Appropriated Total						
(Grant)	( 1,100 )	( 100 )	( 1,200 )	( 15,500 )	( 4,000 )	( 19,500 )
(Loan)	( 1,800 )	( - )	( 1,800 )	( 14,500 )	( 6,000 )	( 20,500 )
Other U.S.						
1.						
2.						
Host Country				-0-	4,700	4,700
Other Donor(s)						
<b>TOTALS</b>	<b>2,900</b>	<b>100</b>	<b>3,000</b>	<b>30,000</b>	<b>14,700</b>	<b>44,700</b>

9. SCHEDULE OF AID FUNDING (\$000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH. CODE		D. OBLIGATIONS TO DATE		E. AMOUNT APPROVED THIS ACTION		F. LIFE OF PROJECT	
		1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan
(1) ESF	770	852	890	6,272	4,300	-0-	-0-	10,800	5,300
(2) DA	701	800	800	2,458	7,600	-0-	1,600	8,700	15,200
(3)									
(4)									
<b>TOTALS</b>				<b>8,730</b>	<b>11,900</b>	<b>-0-</b>	<b>1,600</b>	<b>19,500</b>	<b>20,500</b>

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

11. SECONDARY PURPOSE CODE

12. SPECIAL CONCERNS CODES (maximum 7 codes of 4 positions each)

A. Code

B. Amount

13. PROJECT PURPOSE (maximum 480 characters)

To create an infrastructure environment that will stimulate investment and productive activity in the Eastern Caribbean.

14. SCHEDULED EVALUATIONS

Interim MM YY MM YY Final MM YY  
09 88 | 03 93

15. SOURCE/ORIGIN OF GOODS AND SERVICES Participating Countries of the Eastern Caribbean

000  941  Local  Other (Specify) Caribbean

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

The purpose of this amendment is to add \$1.6 million in DA funds to the St. Kitts Southeast Peninsula Area Development Project #538-0138.01 and to amend the project authorization accordingly.

Approval of methods of implementation/finance.

*James Ahn*  
 James Ahn, Acting Controller

17. APPROVED BY

Signature

Title

*James S. Holtaway*  
 James S. Holtaway  
 Director

Date Signed

MM DD YY  
08 18 88

18. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION

MM DD YY

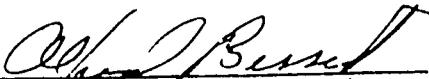
AUTHORIZATION

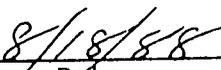
AMENDMENT NUMBER SEVEN

NAME OF COUNTRY: Caribbean Regional  
NAME OF PROJECT: Infrastructure Expansion and Maintenance Systems  
NUMBER OF PROJECT: 538-0138

1. Pursuant to Section 531 of the Foreign Assistance Act of 1961, as amended, the Infrastructure Expansion and Maintenance Systems Project for the Caribbean Region was authorized on May 6, 1986, and amended on September 16, 1986; February 26, 1987; June 23, 1987; August 28, 1987; September 28, 1987 and July 1, 1988.
2. That Authorization is hereby amended to authorize additional funds for the Southeast Peninsula Area Development Subproject (538-0138.01) and modify that Subproject description as follows:
  - (a) Paragraph 1 is deleted and the following new paragraph 1 inserted in lieu thereof: "Pursuant to Sections 531 and 106 of the Foreign Assistance Act of 1961, as amended, I hereby authorize the Infrastructure Expansion and Maintenance Systems Project for the Caribbean Region involving obligations of not to exceed Nineteen Million, Five Hundred Thousand United States dollars (U.S.\$19,500,000) in grant funds and Fourteen Million, Five Hundred Thousand United States dollars (\$14,500,000) in loan funds over a five year period from date of authorization, subject to the availability of funds in accordance with the USAID OYB/allotment process, to help in financing foreign exchange and local currency costs for the Project. Subject to future authorizations, the Project Authorization may be increased by an amount not to exceed Six Million United States Dollars (US\$6,000,000) in loan funds. The planned life of project is eight years from the date of initial obligation."
  - (b) Paragraph 2, subparagraph i is deleted and the following new subparagraph i inserted in lieu thereof:
    - (i) The St. Kitts Southeast Peninsula Area Development subproject which will consist of engineering services, construction services and related commodities and technical assistance to construct the Southeast Peninsula road, to install the associated water supply system and to support ancillary services such as environmental and land use management, investment packaging, fiscal recovery, and utility installation. The subproject also includes a revegetation/soil erosion control activity."

3. The authorization, except as previously and herein amended, remains in force and effect.

  
\_\_\_\_\_  
James S. Holtaway  
Director

  
\_\_\_\_\_  
Date

ST. KITTS  
SOUTHEAST PENINSULA AREA DEVELOPMENT SUBPROJECT  
AMENDMENT NO. 2. TO PROJECT PAPER SUPPLEMENT  
NO. 538-0138.01

to the

INFRASTRUCTURE EXPANSION AND MAINTENANCE SYSTEMS PROJECT  
No. 538-0138

TABLE OF CONTENTS

	<u>Page</u>
AMENDED PROJECT DATA SHEET	i
PROJECT AUTHORIZATION AMENDMENT	ii
TABLE OF CONTENTS	iii
I. RECOMMENDATION ON SUMMARY	1
II. BACKGROUND AND PROGRESS TO DATE	1
III. CIRCUMSTANCES RESULTING IN NEED FOR THIS AMENDMENT	3
IV. MODIFICATIONS TO PROJECT RATIONALE AND DESCRIPTION	5
V. TECHNICAL ANALYSIS (Design modification)	7
VI. REVISED FINANCIAL PLAN	10
A. Subproject Costs	10
B. Methods of Implementation and Financing	12
VII. REVISED IMPLEMENTATION PLAN/SCHEDULE	14
A. Road Construction	14
B. Revegetation/Soil Erosion Control Component	14
VIII. MODIFIED FINANCIAL/ECONOMIC ANALYSIS	17
A. Update of Financial Analysis	17
B. Update of Economic Analysis	17
IX. MODIFICATION TO OTHER ANALYSES	24
ATTACHMENTS:	
1. Revised Cross Sections	
2. Quantity Computations Side Hill Cuts	
3. Quantity Computations Modified Furrow Ditch	
4. Revegetation/Soil Erosion Control Component	
5. Revised Embankment/Pavement Design	
6. Summary Revised Quantity Computations, Clearing and Grubbing	
7. Summary Cost Estimates, Road Design Modifications	

ANNEXES:

- A. Initial Environmental Examination
- B. Environmental Assessment Amendment Approval
- C. Delegation of Authority to Approve PP Amendment
- D. Project Checklist
- E. Unattached: Amendment to the Environmental  
Assessment (112 pgs)  
- Official files, RDO/C and LAC/DR
- F. GOSKN Letter of Request

## I. RECOMMENDATION AND SUMMARY

RDO/C recommends authorization of an additional \$1,600,000 in loan funding to the Government of St. Christopher (St. Kitts) and Nevis to finance (a) additional construction costs (\$1,400,000) resulting from design changes of the St. Kitts Southeast Peninsula penetration road, and (b) a revegetation program (\$200,000) of areas contiguous to the road to reduce soil erosion and sedimentation and further stabilize cut and fill slopes. The terms of the additional \$1,600,000 loan will be the same as those under the original loan agreement, i.e., 25 year term, ten year grace period with interest rates at 2% per annum for the first five years, 3% per annum for the next five years and 5% per annum for the remaining fifteen year amortization period. The original agreement was signed on September 17, 1985 with a project assistance completion date of September 30, 1989.

## II. BACKGROUND & PROGRESS TO DATE

The Infrastructure Expansion and Maintenance System (IEMS) Project Authorization was amended on September 16, 1986, to provide \$7.9 million in loan funds and \$1.0 million in grant funds for the St. Kitts Southeast Peninsula Area Development Subproject. The Loan/Grant Agreement obligating \$1,800,000.00 in loan funds and \$700,000.00 in grant funds was executed on September 17, 1986. The Agreement stipulated that, subject to availability, additional incremental funding would be provided at a later date.

The project included the following components:

- (a) construction and construction supervision of an access road from Frigate Bay to Mayors Bay at the tip of the peninsula;
- (b) concurrent installation of a potable water transmission main to serve development anticipated on the peninsula;
- (c) installation of other utilities at a later date; and
- (d) technical assistance for land use and environmental management planning activities.

Subsequent to execution of the agreement, discussions between Canadian International Development Agency (CIDA), USAID and the Government of St. Kitts and Nevis (GOSKN) continued regarding the water supply component of the project. As a result of these discussions, CIDA agreed to provide the materials required for the water transmission main, including pipes, valves and fittings and to finance the remainder of the system. USAID agreed that the IEMS Core contractor, Louis Berger International Ind. (LBII), would prepare engineering plans for the transmission main, including technical specifications for the materials. USAID further agreed to finance installation costs of the CIDA-furnished materials under the

road construction contract. LBII revised the IFB to incorporate these changes, and the project agreement was formally amended on June 24, 1987, to reflect AID's intent to finance installation of the water transmission main and to obligate an additional \$90,000 in grant and \$8,100,000 in loan funds (a \$2.0 million increase resulting from the water works).

A contract in the amount of \$893,694 for construction supervision services was awarded to TAMS/ELMES Associates in August, 1987. A construction contract in the amount of \$8,863,000 was awarded to Redondo Construction Company in September, 1987. Through June, 1988, Redondo had completed approximately 50% of the work versus 60% scheduled. The contractor has not experienced any particular problems in prosecuting the work. On June 7th, 1988, the project agreement was amended a second time to obligate an additional \$200,000 in grant, thereby fully funding the project's grant component. CIDDA has commenced delivery of the ductile iron pipe to be installed under the construction contract. The contractor is also negotiating with the St. Kitts Electric Company to install a direct burial cable for power service and SKANTEL to install ducts for telephone service. Design of the electrical system is being undertaken by TAMS/ELMES under contract (non donor funded) to the GOSKN. Delivery of the electrical cable is expected to commence in July 1988. Coordination of utility installations with road construction activities will be the responsibility of the individual utilities. The grant funded land use and environmental management component is proceeding slightly behind schedule as a result of the change of Chief-of-Party midway through the contract with Tropical Research and Development.

### III. CIRCUMSTANCES RESULTING IN NEED FOR THIS AMENDMENT

The horizontal and vertical alignments, cut slope design, and embankment heights for the St. Kitts Southeast Peninsula Road were established by Roughton and Partners in a design report prepared in 1980. In early 1984, RDO/C employed a Barbadian consultant, David Lashley and Partners, to review the Roughton report, update the cost estimates and make further recommendations regarding alignment changes which would reduce the need for earth retaining structures, improve gradients and reduce maintenance costs. The Lashley report suggested more extensive cutting into the face of the hills to eliminate sliver fills, reduce the number of gabion structures and improve road stability.

Upon execution of the core contract in mid-1986, LBII was requested to resurvey the alignment proposed by Roughton, revise the bid documents to incorporate standard U.S. specifications and include mandatory AID clauses in the general terms and condition of contract. As a result of the resurvey, the consultant recognized that the first 1.3 kilometers of roadway which passed around the northern tip of Sir Timothy Hill would be unstable and likely create serious maintenance problems. LBII realigned this segment of the roadway to more closely follow the existing track, while maintaining a maximum 50 meter radius of curvature and 15% grade, design criteria adopted in the Roughton report and endorsed by the GOSKN. The realignment necessitated major cuts over the first 1.5 kilometers of roadway and a redesign of the cut slopes. Since only limited subsurface information was available from the Roughton report, Berger leased a D-7 dozer with a 3 shank ripper (the largest machine available on the island) and attempted to make periodic cuts along the alignment to obtain a clearer picture of in-situ conditions.

The information derived from this last effort was only of limited value. The Roughton report projected that 85% of the rock would have to be drilled and blasted during excavation, implying solid unweathered rock which would stand at a very steep slope. As a result, Roughton's cut slopes were designed at 1:6. Based on Roughton's data and the additional information gleaned from the field study, Berger recommended 1:4 cut slopes over the entire length of the project and designed the major cut through Sir Timothy Hill to incorporate 3 benches, including a 2- meter bench outside the ditch line to accommodate utility ducts. However, when earthwork quantities based on the revised design were recomputed, the increase in unclassified excavation was so great that costs far exceeded the amount available under the loan. As a result, Berger had to simplify the design to reduce costs.

Upon commencing excavation at Sir Timothy Hill and at other side hill cuts along the alignment, the contractor encountered rock varying from volcanic ash with embedded volcanic bombs to tuffs, conglomerates andesites, and basalts with discontinuities. All or several of these rock types frequently occurred in adjacent sections with layers of the same cut. Bedding planes at the rock joints were approximately parallel to the roadway centerline. As a result, numerous rockfalls and slides occurred during excavation.

Due to the orientation of the bedding planes, further slides can be anticipated after rainstorms and as a result of minor seismic activity. To provide increased cut slope stability, reduce maintenance costs and improve safety, the cut slopes were recently redesigned. To further stabilize both cut and fill slopes and to reduce erosion and sedimentation, a revegetation program has been recommended which was not envisioned at the time the project was authorized.

The pavement design for the Southeast Peninsula Road was based on a given number of repetitions of an 18,000 pound axial load. Subsequent to award of the construction contract, concern was expressed that, as a result of major developments planned between the Great Salt Pond and Majors Bay, loadings from heavy construction equipment far in excess of the design loading would substantially reduce the design life of the pavement. To eliminate this likelihood, the embankment and pavement structure between the Great Salt Pond and Majors Bay will be strengthened by adding additional select borrow material.

The funds to be provided in this amendment are intended to cover the costs of (1) increased quantities of unclassified excavation, embankment materials, and clearing and grubbing resulting from design changes and (2) the soil erosion control revegetation program.

#### IV. MODIFICATIONS TO PROJECT RATIONALE AND DESCRIPTION

The project rationale, goal and purpose as presented in the original Project Paper Supplement remain valid. The original project description as amended in the PP supplement amendment No. 1 is herein modified by (a) the increased cost resulting from the road design changes (see Section V. Technical Analysis) and (b) the addition of the new subproject component for revegetation/soil erosion control.

The additional \$1.4 million to be obligated for the road construction component of the project will be incorporated by amendment into the contract with Redondo Construction Company of Puerto Rico. Funds will be disbursed directly to the Contractor by the RDO/C Controller's Office upon receipt of documentation specified in the contract, including certifications by the supervisory engineer, TAMS/ELMES Associates, and the Government of St. Kitts that the work has been carried out in accordance with the plans and technical specifications. Invoices will be endorsed by the Project Officer prior to payment.

##### REVEGETATION/SOIL EROSION CONTROL

A revegetation program to control soil erosion (not included in the original P.P. supplement) will be undertaken to stabilize cut and fill slopes and reduce erosion and sedimentation in areas exposed during road construction. The nature of the materials encountered along the road alignment not only required the redesign of cut slopes but also require that they be stabilized with vegetation.

The redesign of the road also resulted in larger areas of exposed surfaces which need to be protected from sheet erosion. Pilot roads, tracks and other areas also require revegetation to reduce silting of reefs which are important in protecting the shores from full wave action. Protecting reefs is also important to the tourist and fishing industries. Both the revegetation of key areas as well as the redesign of the road will provide reduced road maintenance costs and improve safety.

The revegetation component will consist of the following. The Department of Agriculture will expand its tree nursery at the agriculture station at La Guerite to produce approximately 30,000 tree seedlings. AID loan funds will finance commodities, materials and operation and maintenance of the nursery and tree planting. In order to ensure that sufficient planting stock is available to

revegetate the targeted areas by the PACD, AID loan funds will be made available to the GOSKN for contracting with one or more private contractors to produce and plant an additional 20,000 seedlings. To maximize tree survival through the hot and dry periods, the project will finance the purchase of a drip irrigation system and the hauling of water until the water main, which is part of the road construction component, is activated. In areas with high clay content, guinea grass mulch will be used for seeding. Other areas along the roadway could be planted with Khus Khus grass. AID loan funding also provides for the contracting of a forestry technical advisor to assist in the implementation of this new project component.

AID loan funds amounting to \$200,000 are required for the revegetation component. The GOSKN will provide space for the development of the nursery, approximately five thousand square feet of area accessible by vehicle, five hundred square feet under roof for work space and a storage area for tools which can be made secure. The GOSKN will also detail a forester and a soil conservation specialist who together with the technical advisor will carry out the day-to-day implementation of the revegetation component.

The Minister of Agriculture, Lands, Housing and Development will be the chief representative and will have overall responsibility for this activity. The Director of Department of Agriculture will be responsible for managing all aspects of the revegetation program. The day-to-day implementation of the program will be carried out by the forester and soil conservation specialist from the Department of Agriculture. These last two individuals will be assisted by a Forester Peace Corp Volunteer responsible to the Director of the Department of Agriculture. The PCV Forester's assignment to St. Kitts ends in November 1988 and it is anticipated that the GOSKN will enter into a T.A. contract with this individual (or someone equally well qualified) for the duration of the project. The Southeast Peninsula Development and Conservation Board will, in keeping with its mandate, will be responsible for coordinating the revegetation activity into the overall development of the Southeast Peninsula.

## V. TECHNICAL ANALYSIS

### DESIGN MODIFICATIONS

The nature and classification of rock materials encountered along the road alignment has required the redesign of cut slopes to provide greater slope stability, reduce maintenance costs, and improve safety. Anticipated heavy axial loads resulting from construction equipment operating in the area between the Great Salt Pond and Majors Bay has necessitated a redesign of the pavement structure in that area. The Environmental Assessment (Island Resources Foundation February 1986) contemplated a road with much smaller cuts and fills and much less disturbance from pilot roads and other activities incidental to construction than that contained in the previous final design. The subproject now includes a revegetation/soil erosion activity to revegetate cut and embankment slopes, and reforest abandoned pilot roads, tracks and various other locations. Specific design changes are as follows:

(a) Through-Cut at Sir Timothy Hill (STA 0 + 825 - STA 1 + 050). The finished design roadway section will be maintained, but the overall width of the through-cut will be increased as a result of constructing additional benches in the cut face to reduce the vertical height separation between benches. The original design cross section required construction of one bench in the thirty meter cut face, or one bench at each fifteen meter vertical interval. The modified section provides for three to five benches, depending upon material encountered and induced drainage requirements, within the thirty meter cut face. The topmost bench will be constructed to a width of five meters with an inward slope of 10%. This bench will replace the furrow ditch included in the original plans. Remaining benches will be 2 meters wide. The height separation between benches will not exceed 8 to 10 meters. Revised roadway cross sections from station 8 + 825 to station 1 + 050 are shown in attachment 1.

(b) Side Hill Cuts Friars Bay to Great Salt Pond (STA 2+050 - STA 6+050). The roadway alignment between Friars Bay and the Great Salt Pond requires 13 sidehill cuts varying in length from 25 to 675 meters. Where basalt rock bedding planes are approximately parallel to the roadway centerline, rock slides have occurred during construction and will likely continue to occur. To provide a storage area for fallen rock prior to removal, a 3 meter wide flat bottom ditch will be used in lieu of the V - bottom ditch designated on the original plans. The modified ditch section will be constructed only in those areas where there is evidence that cut slopes will not stand at the 1:4 design slope. On the basis of side hill excavation completed to date, we estimate that the modified

ditch design will be required over 25% of the length of the exposed cuts. Details of the modified design, information on each of the 13 sidehill cuts between Friars Bay and the Great Salt Pond, and computations of the increased quantity of unclassified excavation resulting from this change are shown in attachment 2.

(c) Modified Furrow Ditch. As a result of site conditions (materials encountered), the furrow ditch (catchwater drain) designed to prevent stormwater runoff from reaching and eroding cut slopes would likely create further maintenance problems. Debris would have to be removed continuously to keep the drains open, and access would be difficult.

The catchwater drain, a 1 meter flat bottom ditch which was to be constructed at the top of cut slopes, will be replaced by a 5 meter wide bench sloping away from the roadway into the hillside. The bench will serve as an interceptor for stormwater runoff as well as a depository for falling debris. The revised furrow ditch will be constructed between Sta 0 + 200 and Sta 1 + 050, Sta 2 + 375 and sta 2 + 500, and sta 2 + 575 and sta 2 + 875. Computations of the increased quantities of unclassified excavation resulting from this change are shown in attachment 3.

(d) Revegetation/Erosion Control Component. The construction contract contained a provisional sum of \$50,000 to be used for carrying out erosion control measures as directed by the Engineer. Anticipated were such items as check dams, silt fences, sediment containment structures, diversion channels, earth berms and temporary slope drains and waterways. In light of materials encountered during excavation, a more extensive revegetation/soil erosion control program must be initiated to protect the roadway and prevent sediment from reaching and damaging nearshore coral reefs. The erosion control program will consist of revegetating cut and embankment slopes and reforestation of abandoned pilot roads, tracks and other areas. A total of about 32 hectares (80 acres) will be replanted. Where appropriate, Khus Khus grass will be used to reduce erosion and stabilize slopes. An estimated 220,000 sprigs (2 sprigs per square meter over 27 acres) will be used in the revegetation program. Approximately 25 acres of bare soil would be covered with mulch so as to protect it from sheet erosion.

In certain areas, tree species which are salt tolerant and can survive in the dry windy climate of the peninsula will be planted to augment the grass. Species under consideration include neem, casaurina, almond, white cedar, tamarind, and leucaena. Approximately 50,000 trees will be planted over the project area. A more detailed description of the revegetation/erosion control activity is contained in attachment 4.

(e) Pavement Design - Great Salt Pond - Majors Bay (STA 6+100 to STA 10+300). The pavement design for the Southeast Peninsula Road was based on a given number of repetitions of an 18,000 pound axial load. In the area between the Great Salt Pond and Majors Bay, in-situ soils consist of fine to coarse sandy silty clays and inorganic clays with CBR'S varying from 5 to 15 percent. These subgrade CBR'S would be adequate for the pavement structure proposed and the projected number of repetitions of an 18,000 pound axial load over the design life of the pavement. However, since concern has been expressed over the movement of heavy construction equipment over this section of the road as a result of developments planned in the area, the pavement structure will be strenghtened by adding selected borrow fill to raise the embankment and increase the subgrade CBR.

Two alternative design modifications were considered: raising the subgrade elevation by 0.3 meters and raising the elevation by 0.6 meters. The latter was ultimately adopted to improve drainage and reduce maintenance costs, in addition to strengthening the pavement structure. Details of the revised typical roadway section and computations of quantity increases are shown in attachment 5.

(f) Clearing and Grubbing. The design modifications described in paragraphs (a), (b), (c) and (e) above will also result in additional clearing and grubbing. Quantity increases corresponding to this activity are summarized in attachment 6.

## VI. REVISED FINANCIAL PLAN

### A. SUBPROJECT COSTS

Cost estimates for the modifications required under the redesigned specifications of the road amount to \$1,400,000. A cost breakdown of the individual road modifications is provided in attachment 7. Cost estimates for the revegetation component are included in attachment 4.

The revised estimated total cost of the USAID - financed portion of the project is \$11.49 million, consisting of \$10.50 million in loan funds and \$0.99 million in grant funds. Loan funds will be used to finance road construction, including installation of the water transmission main, construction supervision services and the revegetation/soil erosion control program. Grant funds are being used to finance technical assistance for land use and environmental management planning and a project evaluation. A summary of revised total project costs by component and source of funding is shown in table 1.

TABLE 1

SUMMARY OF REVISED SUBPROJECT COSTS BY COMPONENT AND SOURCE OF FUNDING  
(In \$000)

Subproject Component	Life of Subproject Funding		
	USAID	Grant	GOSKN
	Loan		
1. Road Construction			
a. Supervisory Engineering	900	-	-
b. Construction, including Installation of water main <sup>a/</sup>	10,400	-	2000
SUB-TOTAL	11,300	-	2000
2. Revegetation/Soil Erosion Control Program	200	-	-

Subproject Component	Life of Subproject Funding		
	USAID		GOSKN
	Loan	Grant	
3. Land Use and Environmental Management Program <u>c/</u>			
a. Technical Assistance	-	644	-
b. Training	-	50	-
c. Commodities	-	74	-
d. Other	-	198	100
SUB-TOTAL	-	966	100
4. Fiscal Recovery Program <u>b/</u>	-	<u>b/</u>	-
5. Evaluation & Financial Review	-	24	-
6. Other Utility Installations	-	-	2,000
TOTAL	11,500	990	4,100

a/ Materials to be supplied by CIDA. Installation of Materials by road construction contractor. GOSKN to finance well development and transmission mains from well to Morne Rogue Reservoir and thence to Sir Timothy Hill Reservoir.

b/ \$150,000 for the fiscal recovery program is being financed from USAID Project No. 538-0096, Public Management and Policy Planning.

c/ As indicated in the Project Agreement Amendment Number One, this item was decreased by \$10,000. Funding was provided directly by USAID for legal services of an environmental attorney who consulted on conservation legislation.

## B. METHODS OF IMPLEMENTATION AND FINANCING

The following provides information relating to the methods of implementation and financing for the funds to be obligated under this amendment.

<u>Activity</u>	<u>Method of Implemen- tation/Financing</u>	<u>Amount</u>
A. Construction	Host Country Fixed Unit Price Contract Amendment USAID Direct Payment	<u>1,400,000</u>
Subtotal A		1,400,000
B. Revegetation		
1. Commodities <sup>a/</sup>	Direct Reimbursement	28,500
2. Materials <sup>a/</sup>	Direct Reimbursement	2,900
3. GOSKN Nursery O&M <sup>a/</sup>	Direct Reimbursement	23,600
4. Planting (Private)	Host Country Contract, Fixed Unit Price. USAID Direct Payment	50,000
5. Private Nursery	Host Country Contract, Fixed Unit Price. USAID Direct Payment	50,000
6. Water Delivery (Private)	Host Country Contract, Fixed Unit Price. USAID Direct Payment	15,000
7. Technical Assis- tance <sup>a/</sup>	Host Country Contract, USAID Direct Payment	<u>30,000</u>
Subtotal B		<u>200,000</u>
TOTAL		<u>1,600,000</u>

<sup>a/</sup> The GOSKN may apply for advance of funds for these items.

AID guidelines suggest that the Host Country be charged with the procurement of goods and services, unless there are mitigating circumstances. USAID has had satisfactory experience with the Government of St. Kitts-Nevis ability to service advances and disburse funds for civil works under the Natural Resources Management Project (538-0108). Under this project amendment, 96.6% of all payments will go directly to the appropriate contractor and will not pass through the Central Treasury.

As indicated in the PP amendment cover sheet, the RDO/C Controller has reviewed and approved the methods of implementation and financing for the activities included in this amendment as summarized above.

## VII. REVISED IMPLEMENTATION PLAN/SCHEDULE

### A. ROAD CONSTRUCTION

The contract with Redondo Construction Company will be amended to reflect the additional work required by the design modifications described in the technical analysis. The estimated revised contract amount will be \$10,263,000, an increase of \$1,400,000. No additional time will be required to complete the road works. The implementation schedule for this component of the project is as follows:

December, 1987	Contractor commences construction
August, 1988	Contract amendment executed
March, 1989	Construction completed
May, 1989	Final disbursement, excluding retention
June, 1989	Completion of as-built drawings and final project report

### B. REVEGETATION/EROSION CONTROL COMPONENT

The project loan and grant agreement will be amended to reflect both the increased road construction costs and the revegetation program. The revegetation program administered by the GOSKN will be implemented by the Department of Agriculture with most of the work executed by private host country entities. The implementation schedule for activities to be accomplished by the GOSKN Department of Agriculture are as follows:

August, 1988	<ul style="list-style-type: none"> <li>- Set up MAG nursery, employ assistant, acquire vehicle.</li> <li>- Collect and germinate seeds of White Cedar, tamarind, tibet, casaurina and leucaena.</li> <li>- Collect germinated seedlings of yellow poui and others if available.</li> <li>- Gather potting soil.</li> <li>- Start 4000 seedlings in cups and bags.</li> <li>- Start rooting turpentine, sea grape and gliricidia.</li> <li>- Plant leucaena and tibet by direct seeding on Frigate bay side of Timothy Hill.</li> </ul>
September, 1988	<ul style="list-style-type: none"> <li>- Continue in nursery, start 6000 more plants.</li> <li>- Care for growing planting stock.</li> <li>- Collect and store seed for direct seeding.</li> <li>- Prepare specifications for bids from contractors.</li> </ul>

- October, 1988
- After funds are obligated, write bid requests, accept bids, draft contracts, work with contractors.
  - Develop water truck system (this is intended to be a Contractor operation).
  - Apply guinea grass mulch on lower portions of road on Frigate Bay side.
- November, 1988
- Apply mulch on portions of fill below the big cut in Friar's Bay.
  - Plant white cedar, tamarind and drought tolerant trees on both sides of Timothy Hill (K0.0 to 1.3).
  - Collect seed.
  - Start almond, clammy cherry in nursery as soon as permits.
- December, 1988
- Prepare for installation of first drip systems.
  - Plant khus khus at K1.5 to 2.0.
  - Plant clammy cherry, white cedar, loblolly and sea grape in K2.0 to 4.0.
  - Plant by direct seeding as needed and where accessible.
  - Plant white cedar and leucaena on South East side in Friars Bay.
- January, 1988
- Plant khus khus at K2.0 to 4.0.
  - Plant ornamentals on lower portions of big fill, casaurina and sea grape on dune.
- February, 1989
- Plant khus khus from K4.0 to 5.0.
  - Plant drought resistant trees along spine.
  - Plant white cedar, casaurina, sea grape, tamarind, yellow poui in Friars Bay upper slopes.
- March, 1989
- Install drip system as needed along spine to White House Bay.
  - Plant khus khus from K6.0 to 6.2 and 7.5 to 8.5.
  - Plant rooted turpentine, gliricidia and sea grape with a drip system near K7.5 to 8.5.
  - Plant ornamentals with drip systems to hide cuts and fills in Friars Bay.
  - Refill in Frigate Bay.

April 1989

- Maintain drip systems until October.
- Hand water as feasible and necessary during summer.
- Water pipe should be completed by this time.
- Project terminated by September 30, 1989.

### VIII. MODIFIED FINANCIAL/ECONOMIC ANALYSIS

#### A. UPDATE OF FINANCIAL ANALYSIS

Table 9 of the project paper contained the data used in the original financial analysis. For comparison, that table is reproduced here, with minor corrections, as Replicated Table 9. The updated calculations retain all of the assumptions used in the original project paper except that the present analysis includes interest on debt (but not principal payments) in costs. The results are presented in the accompanying tables.

The effect of the modified calculation of IRR can be seen by comparing Replicated Table 9 with Revision A of Table 9. It can be seen that with the original loan value of US \$11.4 million, the inclusion of interest payments as a cost reduces the IRR from 17.6% to 16.5% in the optimistic case and from 4.0% to 2.0% in the mid-range case.

Revision B of Table 9 shows the effect of increasing the loan from \$11.4 million to \$13.0 million. The "optimistic" IRR falls to 15.3%, while that for the mid-range assumptions decreases to 1.0%.

The US \$1.6 million increase in project cost therefore does not significantly alter the conclusions of the original analysis. Under the optimistic scenario, the capacity to service the loan is retained. The same is true under the Mid-Range scenario, but the "margin for error" is reduced. Cumulative revenues begin to exceed cumulative costs in year 7 under optimistic assumptions and in year 13 under mid-range assumptions.

As a test of sensitivity, a third scenario was examined, which assumes an increase in construction costs of US \$3.5 million (to \$14.9 million). The results are shown in Revision C of Table 9. Under optimistic assumptions, the financial viability of the project is again not seriously threatened. The IRR falls to 14.0%, and the period of cumulative negative cash flow still ends after year 6. However, in the Mid-Range scenario, the IRR falls to zero. Cost increases to levels beyond \$14.9 million would therefore raise questions regarding the adequacy of revenues to service the loan, except under optimistic assumptions.

#### B. UPDATE OF ECONOMIC ANALYSIS

The assumptions used in the original economic analysis were retained. For comparison, the data from the original economic analysis are reproduced in the Replication of Table 10. Revision A

of Table 10 shows the effect of adding US \$1.6 million in cost during year 2. The economic IRR is reduced from 35.3% to 33.2%. As a test of sensitivity, a scenario was analyzed which assumes that total construction costs increased by US \$3.5 million (to \$14.9 million) in year 2. This reduces the IRR to 31.0%, as can be seen in Revision B of Table 10.

The economic viability of the project is therefore not significantly weakened by cost increases of up to \$3.5 million if the original assumptions about the benefits of the project are retained.

REPLICATED TABLE 9  
 FINANCIAL ANALYSIS OF PUBLIC COSTS  
 IN PENINSULA DEVELOPMENT  
 (ALL VALUES IN THOUSAND EC DOLLARS)

	OPTIMISTIC IRR IS: 17.5%		MID-RANGE IRR IS: 4.0%		YEAR 0	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10	YEAR 11	YEAR 12	YEAR 13	YEAR 14	YEAR 15	YEAR 16	YEAR 17	YEAR 18	YEAR 19	YEAR 20	
LOAN US\$11.4 MILLION																										
LOAN PAYMENTS (ON US\$11.4 MILLION)																										
RECURRENT COSTS			616	616	616	616	616	616	616	923	923	923	923	923	923	2975	2975	2975	2975	2975	2975	2975	2975	2975	2975	2975
TOTAL COSTS			3616	3616	3616	3616	3616	3616	3616	3923	3923	3923	3923	3923	3923	4423	4423	4423	4423	4423	4423	4423	4423	4423	4423	4423
CUMULATIVE COSTS			3616	7231	10847	14462	18078	22001	25925	29848	33772	37695	41617	45540	49463	53386	57309	61232	65155	69078	73001	76924	80847	84770	88693	92616
FISCAL REVENUES (OPTIMISTIC)			700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	7500	8000	8500	9000	9500	10000	10500	11000	11500	12000
CUMULATIVE			700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	7500	8000	8500	9000	9500	10000	10500	11000	11500	12000
FISCAL REVENUES (MID-RANGE)			700	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
CUMULATIVE			700	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900
NET RETURNS (OPTIMISTIC)	-30750	-2300	-2700	-1500	-1500	5200	4800	5600	13100	12500	14000	15100	16600	18100	19600	21100	22600	24100	25600	27100	28600	30100	31600	33100	34600	36100
NET RETURNS (MID-RANGE)	-30750	-2300	-2800	-2000	-3000	-3000	-1500	3000	2200	3600	4400	4500	5100	5700	6300	6900	7500	8100	8700	9300	9900	10500	11100	11700	12300	12900

NOTE: MINOR ARITHMETIC ERRORS IN THE ORIGINAL TABLE 9 HAVE BEEN CORRECTED HERE

REVISION A OF TABLE 9  
 FINANCIAL ANALYSIS OF PUBLIC COSTS  
 IN PENINSULA DEVELOPMENT  
 (ALL VALUES IN THOUSAND EC DOLLARS)

	OPTIMISTIC IRR IS: 16.5%		MID-RANGE IRR IS: 2.0%		YEAR 0	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10	YEAR 11	YEAR 12	YEAR 13	YEAR 14	YEAR 15	YEAR 16	YEAR 17	YEAR 18	YEAR 19	YEAR 20	
LOAN US\$11.8 MILLION																										
LOAN PAYMENTS (ON US\$11.4 MILLION)																										
PRINCIPAL																										
INTEREST			616	616	616	616	616	616	616	923	923	923	923	923	923	2052	2052	2052	2052	2052	2052	2052	2052	2052	2052	2052
RECURRENT COSTS			3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500
TOTAL COSTS, INCLUDING PRINCIPAL REPAYMENTS			3616	3616	3616	3616	3616	3616	3616	3923	3923	3923	3923	3923	3923	4423	4423	4423	4423	4423	4423	4423	4423	4423	4423	4423
CUMULATIVE COSTS			3616	7231	10847	14462	18078	22001	25925	29848	33772	37695	41617	45540	49463	53386	57309	61232	65155	69078	73001	76924	80847	84770	88693	92616
FISCAL REVENUES (OPTIMISTIC)			700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	7500	8000	8500	9000	9500	10000	10500	11000	11500	12000
CUMULATIVE			700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000	7500	8000	8500	9000	9500	10000	10500	11000	11500	12000
FISCAL REVENUES (MID-RANGE)			700	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
CUMULATIVE			700	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900	900
NET RETURNS (OPTIMISTIC)	-30780	-2916	-3316	-2116	-2116	4584	3877	5677	12177	11577	13077	14177	15677	17177	18677	20177	21677	23177	24677	26177	27677	29177	30677	32177	33677	35177
NET RETURNS (MID-RANGE)	-30780	-2916	-3416	-3616	-3616	-3616	-2523	2377	1277	2677	3477	3877	4177	4777	5177	5777	6177	6777	7177	7777	8177	8777	9177	9777	10177	10777
CUM REV MINUS CUM COSTS (OPTIM)	-2915.6	-6231.2	-8346.8	-10462.4	-5878	-2001.4	3675.2	15851.8	27428.4	40505	54681.6	70358.2	82734.8	114811.4	137988	163464.6	190941.2	224617.8	258094.4	292671	327247.6	361824.2	396400.8	430977.4	465554	
CUM REV MINUS CUM COSTS (MID-RANGE)	-2915.6	-6331.2	-9946.8	-13562.4	-17178	-19701.4	-17324.8	-16048.2	-13371.6	-9895	-6018.4	-1841.8	2934.8	8011.4	13798.8	20664.6	26311.2	32117.8	38594.4	45771	52947.6	60124.2	67300.8	74477.4	81654	

NOTE: THIS DIFFERS FROM ORIGINAL FINANCIAL ANALYSIS BY INCLUDING INTEREST PAYMENTS IN COST TO CALCULATE "NET RETURNS" AND BY ADDING THE LAST TWO ROWS

28

REVISION B OF TABLE 9  
 FINANCIAL ANALYSIS OF PUBLIC COSTS  
 IN PENINSULA DEVELOPMENT  
 (ALL VALUES IN THOUSAND EC DOLLARS)

OPTIMISTIC IRR IS: 15.3%																					
MIDRANGE IRR IS: 1.0%																					
IN US\$13.0 MILLION	YEAR 0	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10	YEAR 11	YEAR 12	YEAR 13	YEAR 14	YEAR 15	YEAR 16	YEAR 17	YEAR 18	YEAR 19	YEAR 20
AN PAYMENTS (ON US\$13.0 MILLION)																					
PRINCIPAL																					
INTEREST															2340	2340	2340	2340	2340	2340	2340
CURRENT COSTS	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500
TOTAL COSTS, EXCLUDING PRINCIPAL REPAYMENTS	3702	3702	3702	3702	3702	3702	4053	4053	4053	4053	4053	4553	4553	4553	4553	4553	4553	4553	4553	4553	4553
CUMULATIVE COSTS	3702	7404	11106	14808	18510	22212	26616	30669	34722	38775	43328	47881	52434	56987	61540	66093	70646	75199	79752	84305	88858
SCAL REVENUES (OPTIMISTIC)	700	300	1500	1500	8200	7800	9600	16100	15500	17000	18600	20100	26800	26500	27600	29900	31900	38600	38400	39500	39500
CUMULATIVE	700	1000	2500	4000	12200	20000	29600	45700	61200	78200	96800	116900	143700	170200	197800	227700	259600	298200	336600	376100	376100
SCAL REVENUES (MID-RANGE)	700	200				1400	6300	5200	6600	7400	8300	8600	9200	9500	10200	10700	10700	10700	11400	12100	12100
CUMULATIVE	700	900	900	900	900	2300	8600	13800	20400	27800	36100	44700	53900	63400	73600	84300	95000	105700	117100	129200	129200
NET RETURNS (OPTIMISTIC)	-35100	-3402	-3402	-2202	-2202	4498	3747	5547	12047	11447	12947	14047	15547	22247	21947	23047	25347	27347	33547	33347	34447
NET RETURNS (MID-RANGE)	-35100	-3402	-3502	-3702	-3702	-3702	-2653	2247	1147	2547	3347	3747	4047	4647	4947	5647	6147	6147	5647	6347	7047
NET REV MINUS CUM COSTS (OPTIM)	-3002	-6404	-8606	-10808	-6310	-2563	2984	15031	26478	39425	53472	69019	91266	113213	136260	161607	188954	222501	255848	290295	290295
NET REV MINUS CUM COSTS (MID-RANGE)	-3002	-6504	-10206	-13908	-17610	-20263	-18015	-16869	-14322	-10975	-7228	-3181	1466	6413	12060	18207	24354	30001	36348	43395	43395

NOTE: THIS DIFFERS FROM ORIGINAL FINANCIAL ANALYSIS BY INCLUDING INTEREST PAYMENTS IN COST TO CALCULATE "NET RETURNS" AND BY ADDING THE LAST TWO ROWS

REVISION C OF TABLE 9  
 FINANCIAL ANALYSIS OF PUBLIC COSTS  
 IN PENINSULA DEVELOPMENT  
 (ALL VALUES IN THOUSAND EC DOLLARS)

OPTIMISTIC IRR IS: 14.0%																					
MIDRANGE IRR IS: 0.0%																					
IN US\$14.9 MILLION	YEAR 0	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10	YEAR 11	YEAR 12	YEAR 13	YEAR 14	YEAR 15	YEAR 16	YEAR 17	YEAR 18	YEAR 19	YEAR 20
AN PAYMENTS (ON US\$14.9 MILLION)																					
PRINCIPAL																					
INTEREST															2682	2682	2682	2682	2682	2682	2682
CURRENT COSTS	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500
TOTAL COSTS, EXCLUDING PRINCIPAL REPAYMENTS	3805	3805	3805	3805	3805	3805	4207	4207	4207	4207	4207	4707	4707	4707	4707	4707	4707	4707	4707	4707	4707
CUMULATIVE COSTS	3805	7609	11414	15218	19023	23230	27437	31644	35851	40058	44764	49471	54178	58885	63592	68299	73006	78213	83420	88627	88627
SCAL REVENUES (OPTIMISTIC)	700	300	1500	1500	8200	7800	9600	16100	15500	17000	18600	20100	26800	26500	27600	29900	31900	38600	38400	39500	39500
CUMULATIVE	700	1000	2500	4000	12200	20000	29600	45700	61200	78200	96800	116900	143700	170200	197800	227700	259600	298200	336600	376100	376100
SCAL REVENUES (MID-RANGE)	700	200				1400	6300	5200	6600	7400	8300	8600	9200	9500	10200	10700	10700	10700	11400	12100	12100
CUMULATIVE	700	900	900	900	900	2300	8600	13800	20400	27800	36100	44700	53900	63400	73600	84300	95000	105700	117100	129200	129200
NET RETURNS (OPTIMISTIC)	-40230	-3105	-3505	-2305	-2305	4395	3593	5393	11893	11293	12793	13893	15393	22093	21793	22893	25193	27193	33393	33193	34293
NET RETURNS (MID-RANGE)	-40230	-3105	-3605	-3805	-3805	-3805	-2807	2093	993	2393	3193	3593	3893	4493	4793	5493	5993	5993	5493	6193	6893
NET REV MINUS CUM COSTS (OPTIM)	-3104.6	-6609.2	-8913.8	-11218.4	-6823	-3229.9	2163.2	14056.3	25349.4	38142.5	52035.6	67428.7	85521.8	111314.9	134208	159401.1	186594.2	219987.3	253180.4	287473.5	287473.5
NET REV MINUS CUM COSTS (MID-RANGE)	-3104.6	-6709.2	-10513.8	-14318.4	-18123	-20929.9	-18836.8	-17843.7	-15450.6	-12257.5	-8664.4	-4771.3	-270.2	4514.9	10008	16901.1	21994.2	27487.3	33680.4	40573.5	40573.5

NOTE: THIS DIFFERS FROM ORIGINAL FINANCIAL ANALYSIS BY INCLUDING INTEREST PAYMENTS IN COST TO CALCULATE "NET RETURNS" AND BY ADDING THE LAST TWO ROWS

25

REPLICATION OF ORIGINAL TABLE 10  
 UPDATE OF S.E. PENINSULA ECONOMIC ANALYSIS  
 (ALL VALUES IN THOUSAND EC DOLLARS)

	TOTALS	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10
TOTAL COSTS	222103	36480	3000	5529	24900	16479	15150	37050	26100	28207.5	29207.5
IMPRASTRUCTURE	33480	33480									
TOURISM FACILITIES	53073			2529	21900	2529		21900		2107.5	2107.5
IMPRA OPERATING	30000	3000	3000	3000	3000	3000	3000	3000	3000	3000.0	3000.0
FACILITIES OPERATING	105550					10950	12150	12150	23100	23100.0	24100.0
(NOW PUB COSTS)	158623			2529	21900	13479	12150	34050	23100	25207.5	26207.5
TOTAL BENEFITS (DISP INCOME)	433658	4800	2300	11700	11658	47400	41700	54900	87800	81600.0	89800.0
NET BENEFITS		-31680	-700	6171	-13242	30921	26550	17850	61700	53392.5	60592.5

ECONOMIC RATE OF RETURN IS: 35.3%  
 IF OCCUPANCY RATE IS: 60%

NOTE: THIS REPLICATES TABLE 10 OF THE PROJECT PAPER, WITH CORRECTIONS OF ARITHMETIC ERROR  
 IN CALCULATING NET BENEFITS FOR YEARS 5 THROUGH 10 IN TABLE 10.

26

REVISION A OF TABLE 10  
 UPDATE OF S.E. PENINSULA ECONOMIC ANALYSIS  
 ADDITION OF US\$1.6 MILLION (KCS\$4.32 MILLION) TO CONSTRUCTION COST  
 (ALL VALUES IN THOUSAND BC DOLLARS)

	TOTALS	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10
TOTAL COSTS	226423	36480	7320	5529	24900	16479	15150	37050	26100	28207.5	29207.5
INFRASTRUCTURE	37800	33480	4320								
TOURISM FACILITIES	53073			2529	21900	2529		21900		2107.5	2107.5
INFRA OPERATING	30000	3000	3000	3000	3000	3000	3000	3000	3000	3000.0	3000.0
FACILITIES OPERATING (NON PUB COSTS)	105550					10550	12150	12150	23100	23100.0	24100.0
TOTAL BENEFITS (DISP INCOME)	433658	4800	2300	11700	11658	48400	41700	54900	87800	81600.0	89800.0
NET BENEFITS		-31680	-5020	6171	-13242	30921	26550	17850	61700	53392.5	60592.5

ECONOMIC RATE OF RETURN IS: 33.2%  
 IF OCCUPANCY RATE IS: 60%

NOTE: EXCEPT FOR ADDITIONAL COST, THIS ANALYSIS RETAINS THE SAME ASSUMPTIONS AS TABLE 10 OF THE PROJECT PAPER, WITH CORRECTIONS OF ARITHMETIC ERROR IN CALCULATING NET BENEFITS FOR YEARS 5 THROUGH 10 IN TABLE 10.

REVISION B OF TABLE 10  
 UPDATE OF S.B. PENINSULA ECONOMIC ANALYSIS  
 ADDITION OF US\$3.5 MILLION (EC\$9.45 MILLION) TO CONSTRUCTION COST  
 (ALL VALUES IN THOUSAND EC DOLLARS)

	TOTALS	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10
TOTAL COSTS	231553	36480	12450	5529	24900	16479	15150	37050	26100	28207.5	29207.5
INFRASTRUCTURE	42930	33480	9450								
TOURISM FACILITIES	53073			2529	21900	2529		21900		2107.5	2107.5
INFRA OPERATING	30000	3000	3000	3000	3000	3000	3000	3000	3000	3000.0	3000.0
FACILITIES OPERATING (NOW PUB COSTS)	105550					10950	12150	12150	23100	23100.0	24100.0
TOTAL BENEFITS (DISP INCOME)	433658	4800	2300	11700	11658	47400	41700	54900	87800	81600.0	89800.0
NET BENEFITS		-31680	-10150	6171	-13242	30921	26550	17850	61700	53392.5	60592.5

ECONOMIC RATE OF RETURN IS: 31.0%  
 IF OCCUPANCY RATE IS: 60%

NOTE: EXCEPT FOR ADDITIONAL COST, THIS ANALYSIS RETAINS THE SAME ASSUMPTIONS AS TABLE 10 OF THE PROJECT PAPER, WITH CORRECTIONS OF ARITHMETIC ERROR IN CALCULATING NET BENEFITS FOR YEARS 5 THROUGH 10 IN TABLE 10.

28

IX. MODIFICATION TO OTHER ANALYSES

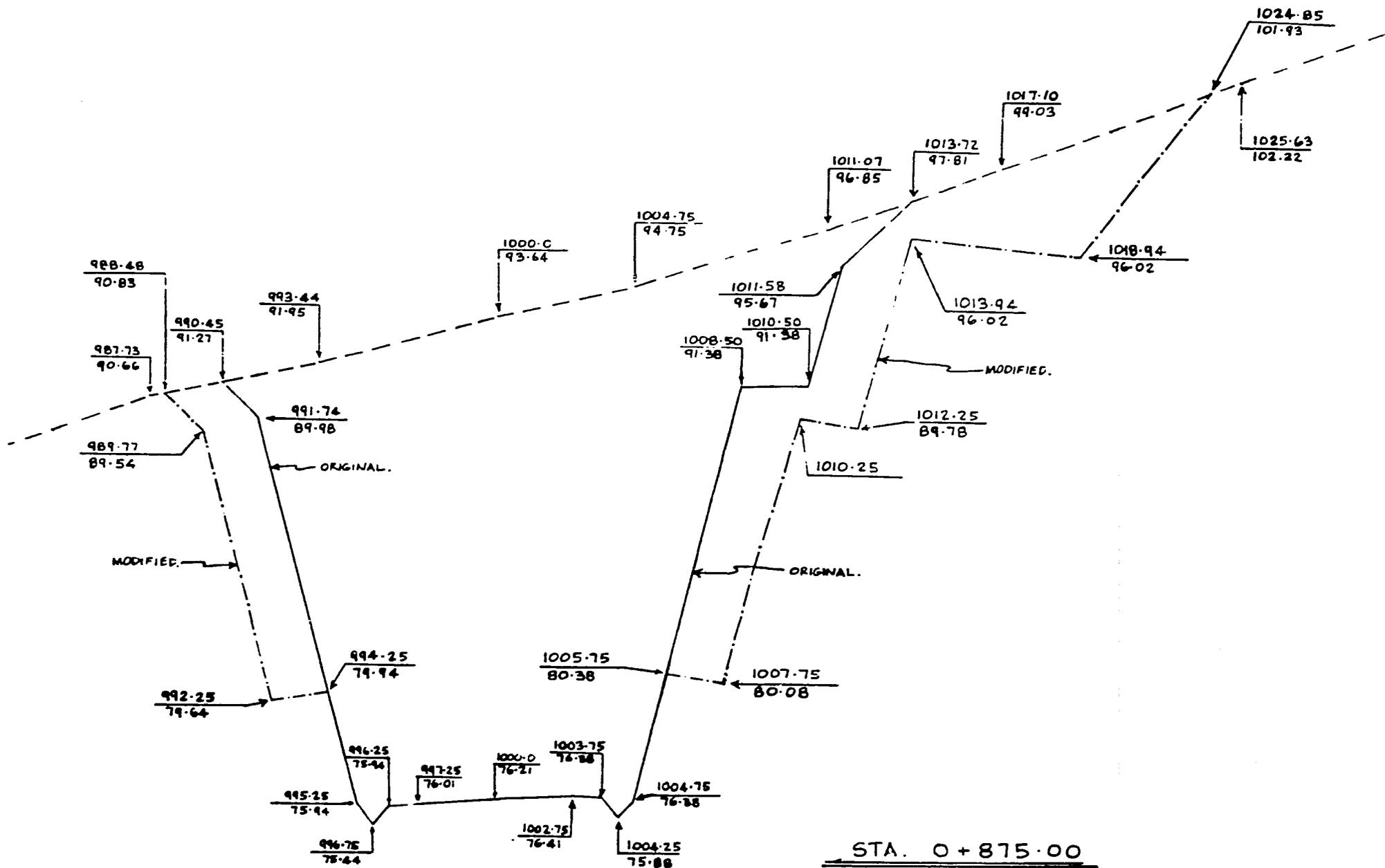
All other analyses as presented in the original Project Paper Supplement and Amendment No. 1 to the P.P. Supplement remain valid. As required by AID/W, the original Environmental Analysis was amended. As indicated in Annex B, the amended Environmental Analysis was approved by the LAC Chief Environmental Officer Subject to incorporation of the recommended mitigative actions into the P.P. amendment. This P.P. Supplement No. 2 incorporates those mitigative actions, i.e. the redesign of the road and the revegetation component.

ATTACHMENT 1

REVISED CROSS SECTIONS

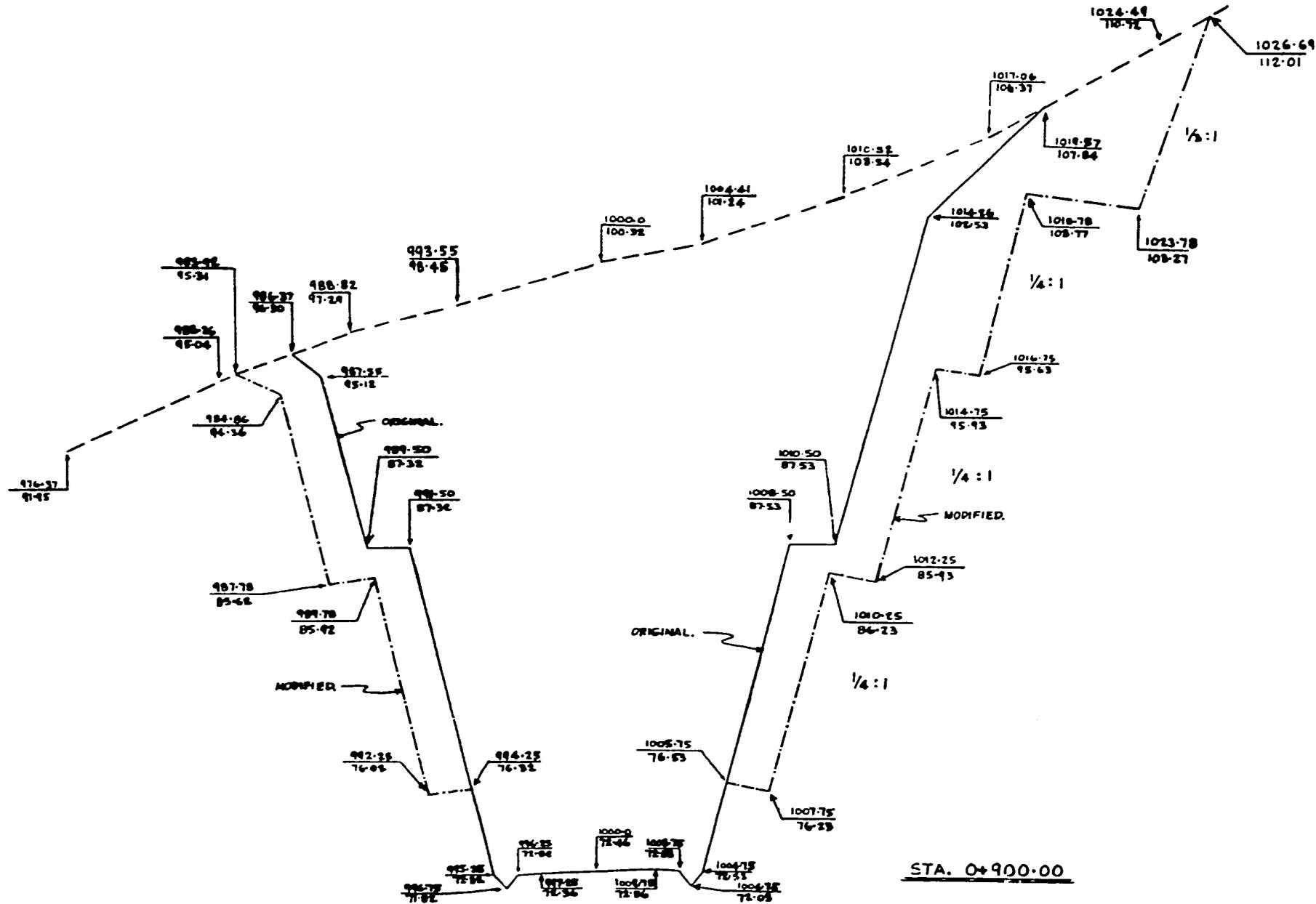
STA 0+850 TO STA 1+050



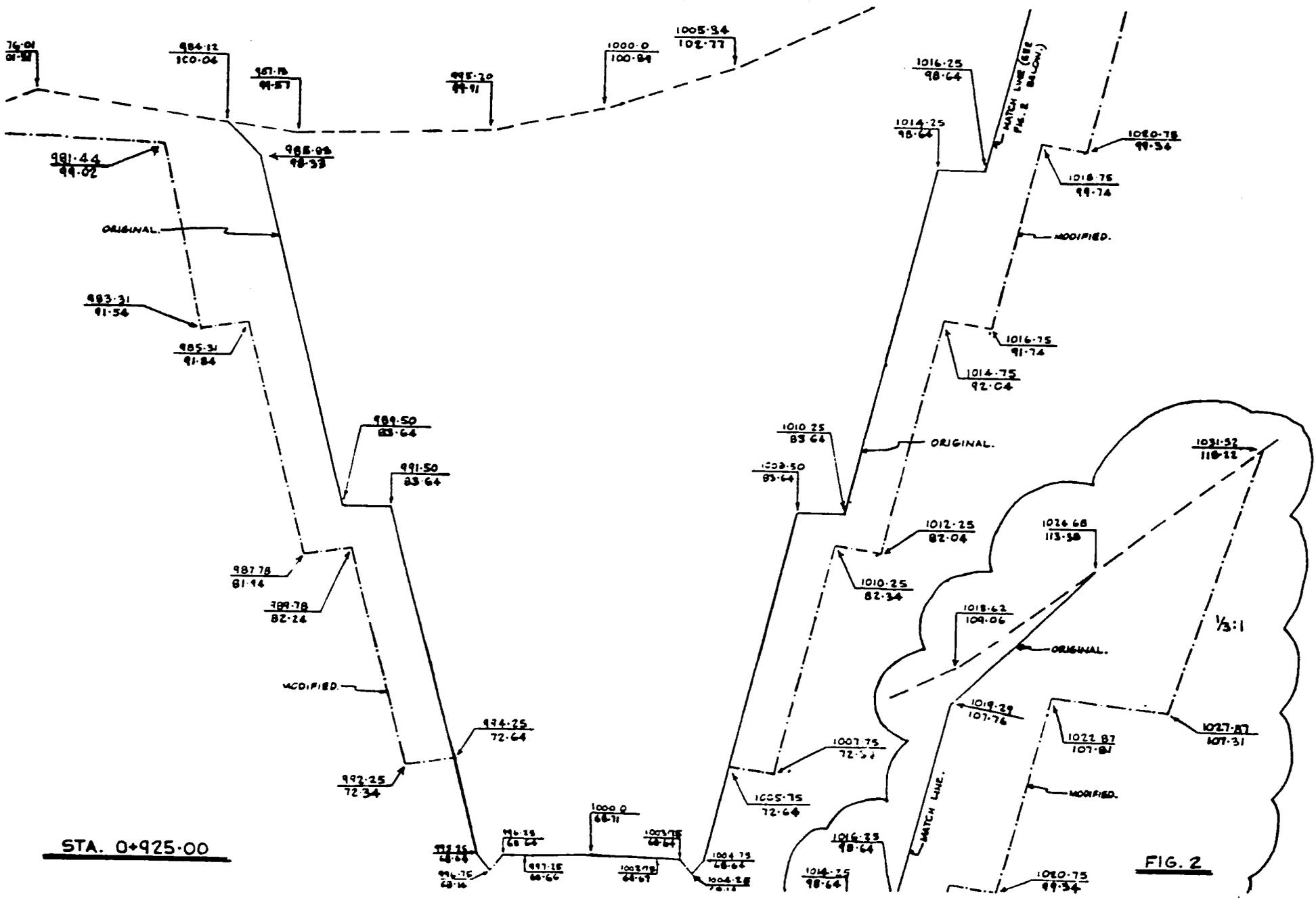


STA. 0+875.00

100



2-29



**FIG. 2**

AKZ

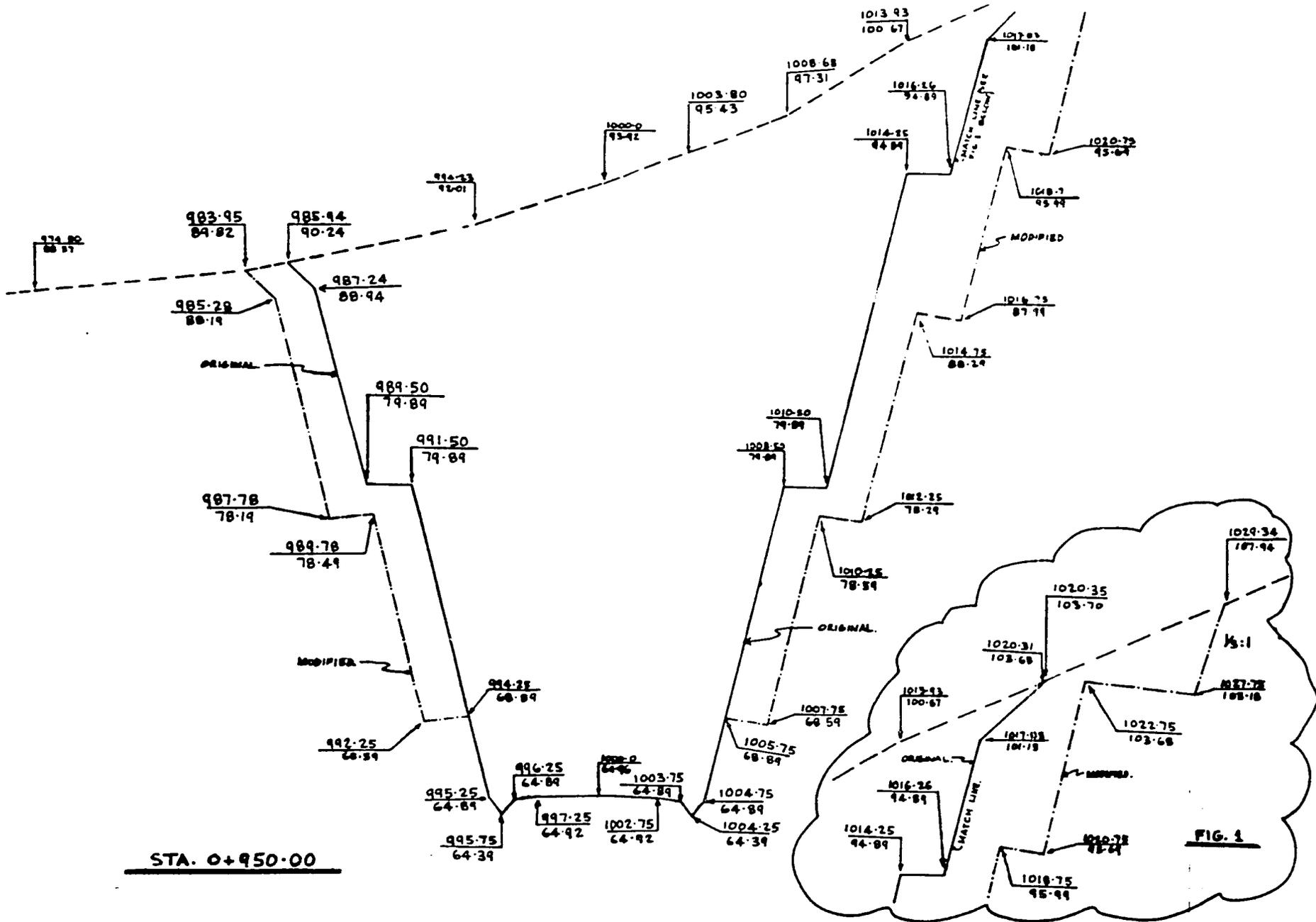
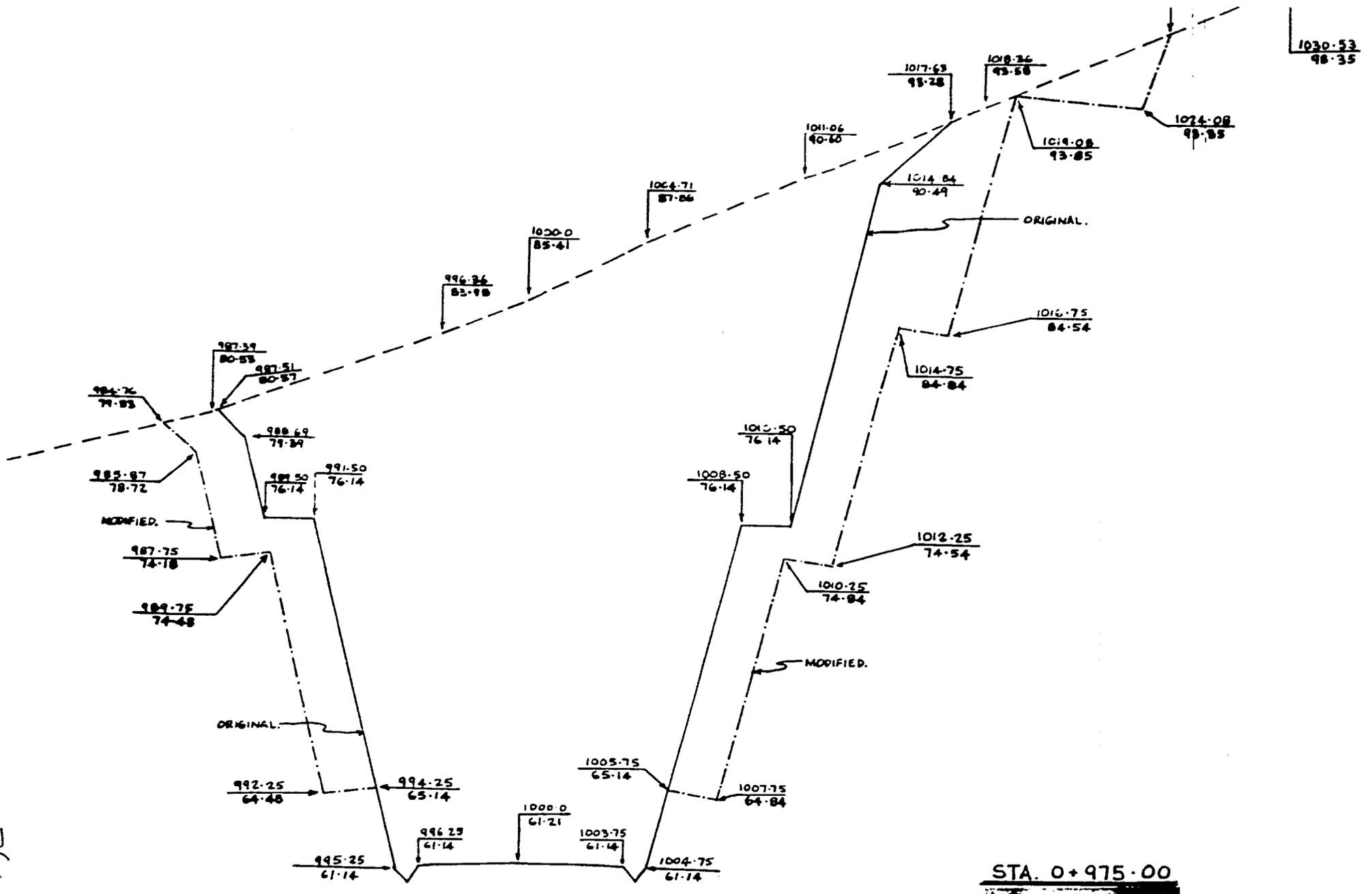
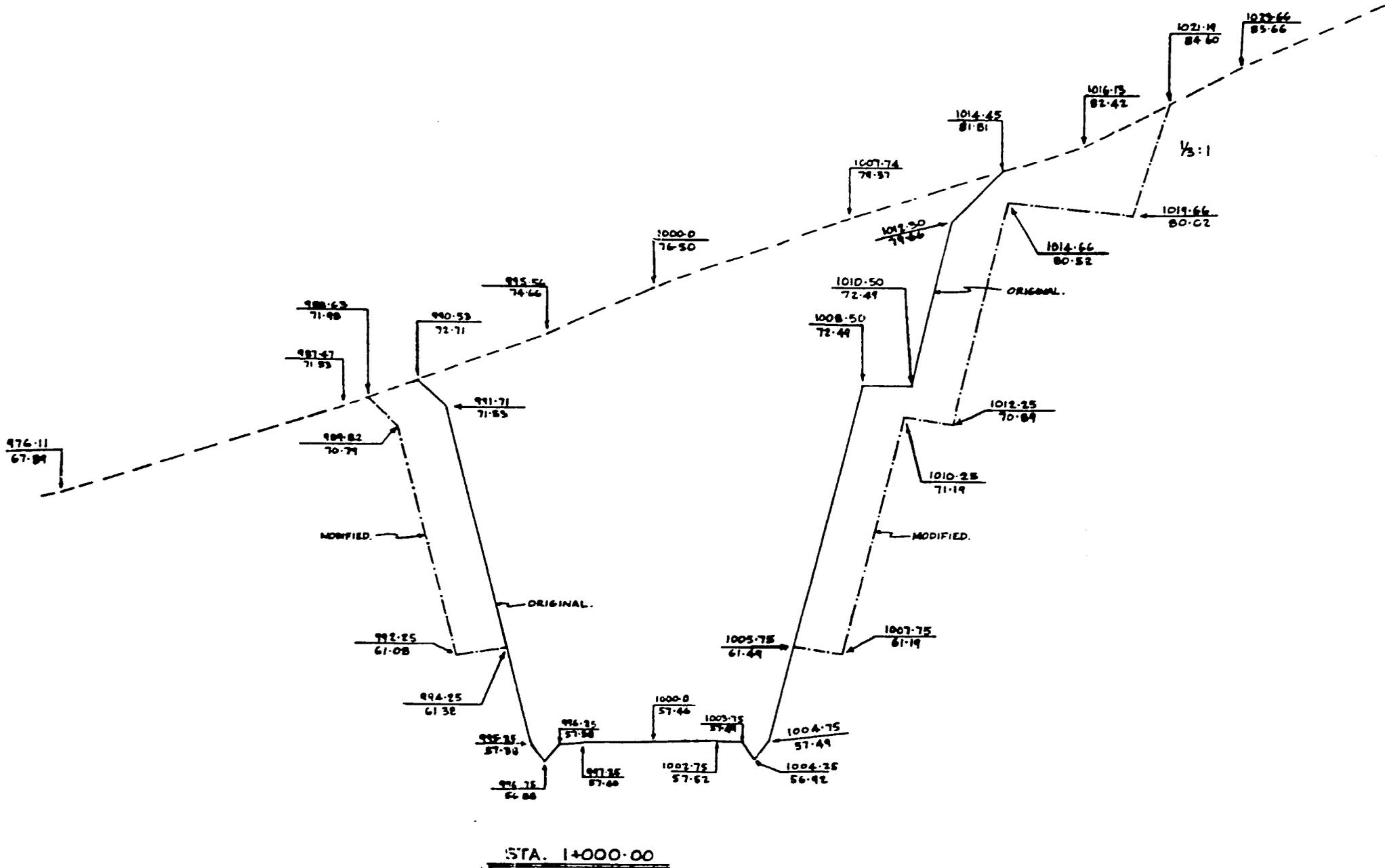


FIG. 1

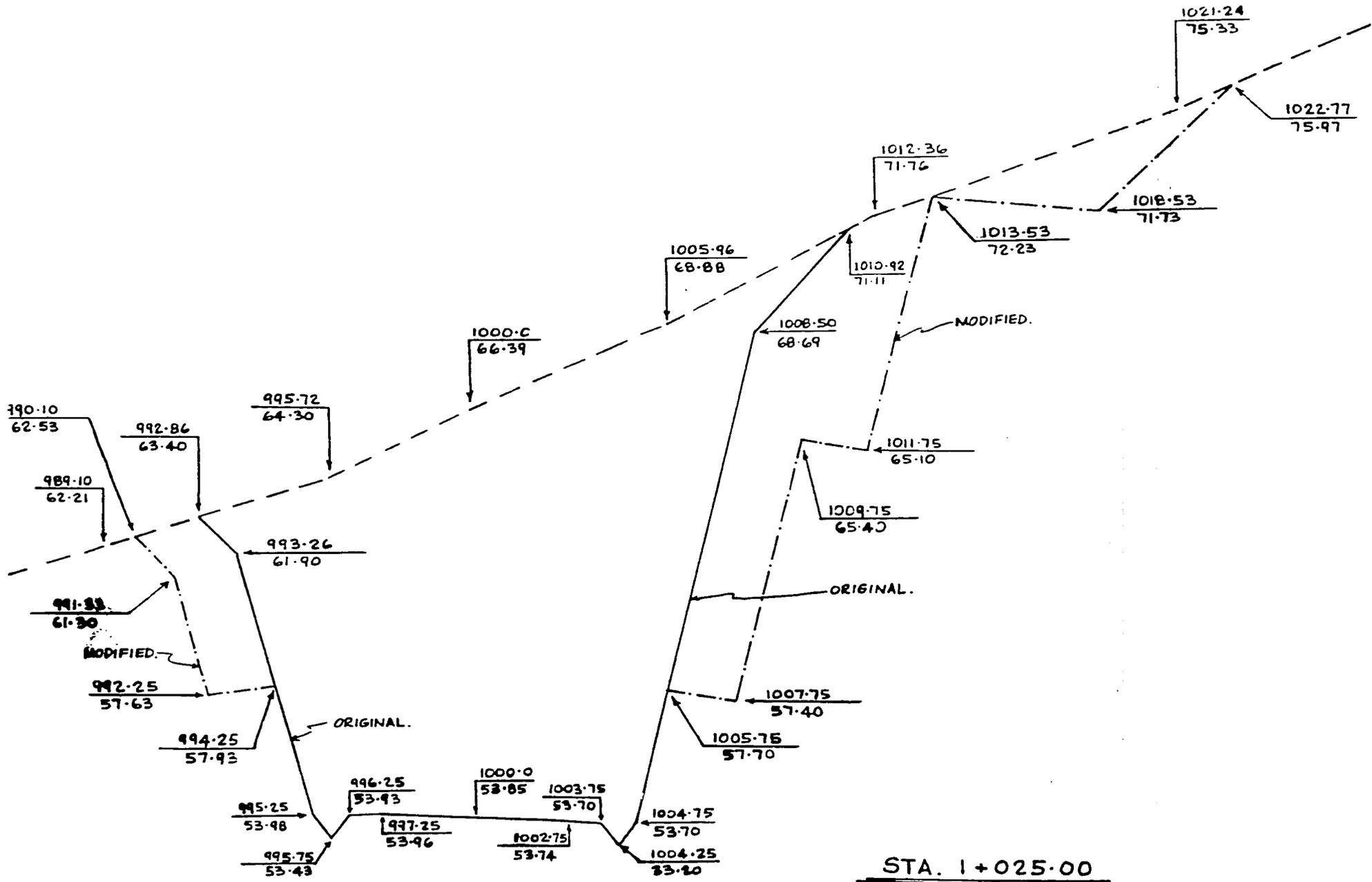
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36



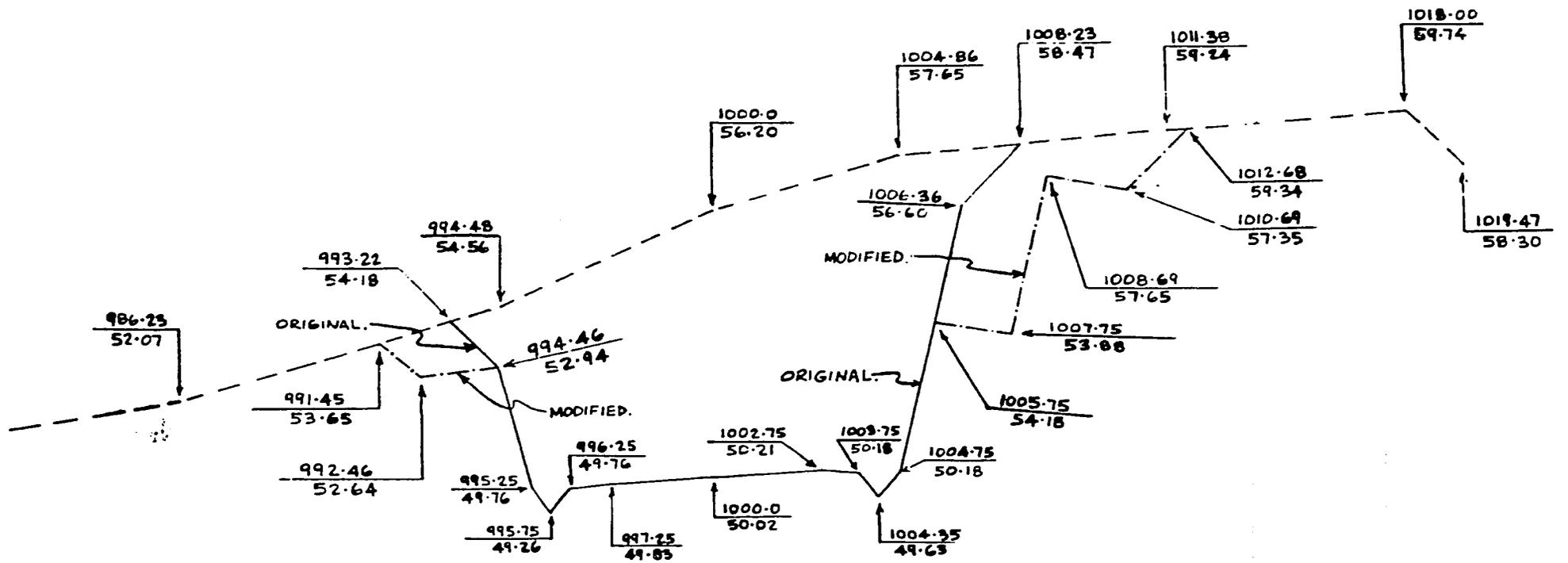


37



STA. 1+025.00

128



STA 1+050.00

i

152

SUMMARY OF QUANTITIES

SIR TIMOTHY HILL THROUGH CUT

(STA 0+850 TO STA 1+050)

Computed by determining cross sectional areas by planimeter and utilizing average end area method to determine volumes.

TOTAL ADDITIONAL UNCLASSIFIED EXCAVATION - 24,411 M<sup>3</sup>

ATTACHMENT 2

QUANTITY COMPUTATIONS

SIDE HILL CUTS (STA 2+050 TO STA 5+950)

. dl

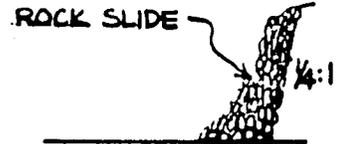
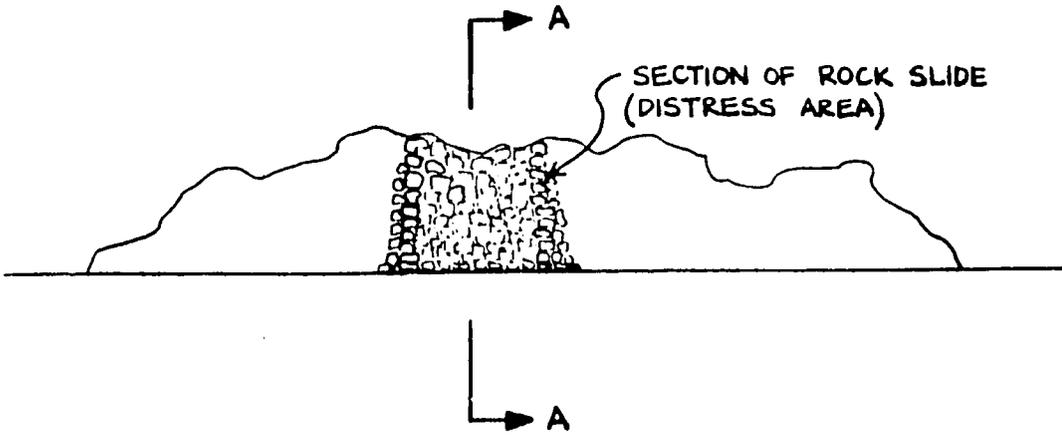
SUBJECT: SOUTH EAST PENINSULA ROAD.

DRAWN BY E.R.

CALC. BY

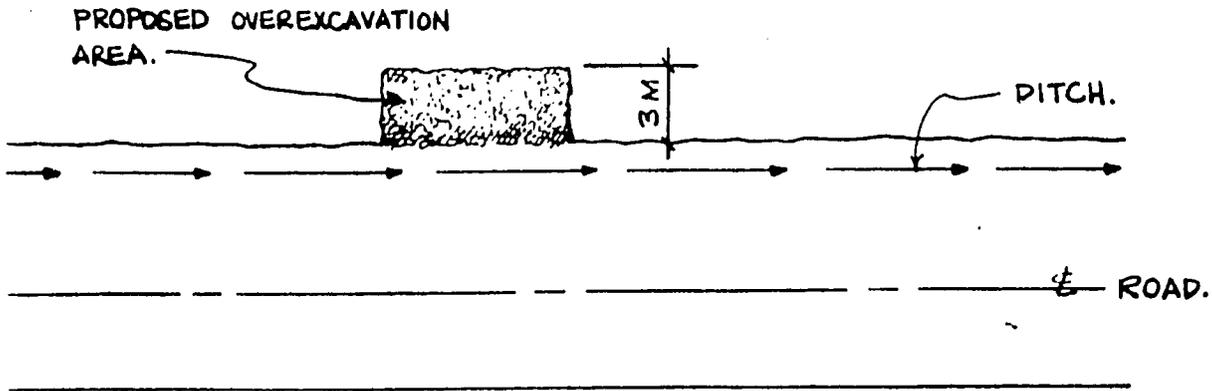
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DATE: 26:2:88.



SECTION A-A

SIDE ELEVATION



PLAN

SKETCH: SIDEHILL CUTS

42

**TABLE SHOWING AVERAGE CUT HEIGHTS**

CUT SECTIONS		AVE. CUT HEIGHT AND LENGTH	
Sidehill Cut	Cut Length	Right/Length	Left/Length
2+050-2+375	375	6/325	1/100
2+450-2+525	75	6/75	1/25
2+650-2+700	50	7/50	1/25
2+825-2+925	100	6/100	0/100
2+975-3+650	675	5/625	0/675
3+775-4+175	400	5/400	1/50
4+225-4+350	125	3/125	0/125
4+400-4+775	375	4/350	1/75
4+850-5+400	550	0/550	3/375
5+500-5+575	75	0/75	6/75
5+625-5+650	25	0/25	8/25
5+700-5+875	175	0/175	4/150
5+950-6+050	100	0/100	3/100

43

SOUTH-EAST PENINSULA ROAD  
PROJFCT

Cut Calculations  
(Average)

STATION	CUT HEIGHT		AVERAGE CUT HEIGHT			VOLUME COMPUTATION
	R	L	R	L		
2+050	3	0	6	1	Av. for section	Cut #1 Length of cut = 325m Average height of cut = 6m Length of unstable section = 25% of 325 m = 81.25m Depth of Excavation = 3m  Total Over-excavation = 81.25m x 6m x 3m = 1462.50m <sup>3</sup>
2+075	5	0				
2+100	9	2				
2+125	6	0				
2+150	9	2				
2+175	8	3				
2+200	8	3				
2+225	5	0				
2+250	6	0				
2+275	6	0				
2+300	5	0				
2+325	8	2				
2+350	7	0				
2+375	4	0				
<hr/>						
2+450	3	0	6	1	Av. for section	Cut #2 Length of Cut = 75m Ave. Height of Cut = 6m Length of unstable section = 25% of 75m = 18.75m Depth of Evaluation = 3m Total over-excavation = 18.75m x 6m x 3m = 337.50m <sup>3</sup>
2+475	9	4				
2+500	8	0				
2+525	3	0				
2+525	3	0				
<hr/>						
2+650	5	0	7	1	Av. for section	Cut #3 Length of cut = 50m Ave. Hgt. of cut = 7m Depth of Excavation = 3m Length of unstable section = 25% of 50m = 12.50m Total over-excavation = 12.50 m x 7m x 3m = 262.50m <sup>3</sup>
2+675	9	2				
2+700	6	0				
<hr/>						
2+825	7	0	6	0	Av. for section	Cut #4 Length of cut = 100m Ave. Hgt. of cut = 6m Depth of cut = 3m Length of Unstable section = 25% of 100m = 25m Total over-excavation = 25m x 6m x 3m = 450m <sup>3</sup>
2+850	8	0				
2+900	5	0				
2+925	4	0				

- 441

STATION	CUT HEIGHT		AVERAGE CUT HEIGHT			VOLUME COMPUTATION
	R	L	R	L		
2+975	4	0	5	0.4	Av. for section	Cut #5 Length of cut = 675m Average height of cut = 5m Length of unstable section = 25% of 675 = 168.7m Depth of excavatopm = 3m  Total over-excavation = 168.75m x 5m x 3m = 2,531.25m <sup>3</sup>
3+000	4	0				
3+025	6	0				
3+050	5	0				
3+075	4	0				
3+100	9	0				
3+125	7	0				
3+150	11	3				
3+175	9	2				
3+200	9	0				
3+225	6	0				
3+250	3	0				
3+275	2	0				
3+300	2	0				
3+325	3	0				
3+350	2	0				
3+375	1	0				
3+400	2	0				
3+425	3	0				
3+450	3	2				
3+475	2	2				
3+500	0	0				
3+525	0	0				
3+550	0	0				
3+575	2	2				
3+600	4	0				
3+625	9	2				
3+650	6	0				
<hr/>						
3+775	2	0	5	1	Av. for section	Cut #6 Length of cut = 400m Average height of cut = 5m Length of unstable section = 25% = 400m = 100m Depth of excavation = 3m  Total over-excavation = 100m x 5m x 3m = 1500m <sup>3</sup>
3+800	7	4				
3+825	9	5				
3+850	10	2				
3+875	7	0				
3+900	4	0				
3+925	3	0				
3+950	7	0				
3+975	3	0				
4+000	5	0				
4+025	4	0				

45'

STATION	CUT HEIGHT		AVERAGE CUT HEIGHT			VOLUME COMPUTATION
	R	L	R	L		
4+050	3	0				
4+075	3	0				
4+100	6	0				
4+125	7	0				
4+150	5	0				
4+175	3	0				
<hr/>						
4+225	3	0	3	0	Av. for section	Cut #7 Length of cut = 125m Average height of cut = 3m Length of unstable section = 25% of 125m = 31.25m Depth of excavation = 3m  Total overexcavation = 31.25m x 3m x 3m = 281.25m <sup>3</sup>
4+250	3	0				
4+275	4	0				
4+300	4	0				
4+325	2	0				
4+350	2	0				
<hr/>						
4+400	0	0	4	1	Av. for section	Cut #8 Length of cut = 375m Average height of cut = 4m Length of unstable section = 25% of 375 = 93.75m Depth of excavation = 3m  Total over-excavation = 93.75m x 4m x 3m = 1125m <sup>3</sup>
4+425	7	3				
4+450	5	5				
4+475	4	4				
4+500	3	1				
4+525	2	0				
4+550	2	0				
4+575	3	0				
4+600	4	0				
4+625	4	0				
4+650	2	0				
4+675	2	0				
4+700	3	0				
4+725	5	0				
4+750	8	0				
4+775	3	0				
<hr/>						
4+850	0	2	0	3	Av. for section	Cut #9 Length of cut = 550m Average height of cut = 3m Length of unstable section = 25% of 550m = 137.5m Depth of excavation = 3m  Total over-excavation = 137.5m x 3m x 3m = 1237.50 m <sup>3</sup>
4+875	0	5				
4+900	0	4				
4+925	0	3				
4+950	0	0				
4+975	0	0				
5+000	0	0				
5+025	0	0				
5+050	0	0				
5+075	0	0				

46

STATION	CUT HEIGHT		AVERAGE CUT HEIGHT			VOLUME COMPUTATION
	R	L	R	L		
5+100	2	0				
5+125	2	2				
5+150	2	3				
5+175	2	3				
5+200	0	5				
5+225	0	6				
5+250	0	5				
5+275	0	4				
5+300	0	4				
5+325	0	4				
5+350	0	2				
5+375	0	4				
5+400	0	7				
<hr/>						
5+500	0	4	0	6	Av. for section	Cut #10 Length of cut = 75m, Ave. Hgt. of cut = 6m, Depth of excavation = 3m Length of unstable section = 25% of 75m = 18.75m
5+525	0	4				
5+550	0	8				
5+575	0	6				Total over-excavation = 18.75 m x 6m x 3m = 337.50m <sup>3</sup>
<hr/>						
5+625	0	4	0	8	Av. for section	Cut #11 Total over-excavation = 6.25m x 8m x 3m = 150m <sup>3</sup>
5+650	0	12				
<hr/>						
5+700	0	0				Cut #12
5+725	0	5				
5+750	0	4				Length of cut = 175m
5+775	3	6				Average height of cut = 4m
5+800	0	3				Length of unstable section = 25% of 175m = 43.75m
5+825	0	4				Depth of excavation = 3m
5+850	0	4				
5+875	0	6				Total over-excavation = 43.75m x 4m x 3m = 525.00m <sup>3</sup>
<hr/>						
5+950	0	2				Cut #13
5+975	0	3				Length of cut = 100m
6+000	0	3				Average height of cut = 3m
6+025	0	3				Length of unstable section = 25% x 100m = 25m
6+050	0	4				Depth of excavation = 3m
						Total over-excavation = 25m x 3m x 3m = 225m <sup>3</sup>

SUMMARY OF QUANTITIES

SIDE HILL CUTS

<u>Cut #</u>	<u>Volume (M<sup>3</sup>)</u>
1	1,462.50
2	337.50
3	262.50
4	450.00
5	2,531.25
6	1,500.00
7	281.25
8	1,125.00
9	1,237.50
10	337.50
11	150.00
12	525.00
13	<u>225.00</u>
<u>TOTAL</u>	<u>10,425.00 M<sup>3</sup></u>

48'

ATTACHMENT 3  
QUANTITY COMPUTATIONS  
MODIFIED FURROW DITCH

COMPUTATIONS (Excavation Overrun - Revised Furrow Ditch)

Ditch Length

0+200 to 1+050 = 850m  
\* 1+150 to 1+450 = 300m (Deletion)  
2+375 to 2+500 = 125m  
2+575 to 2+875 = 300m  
Total Ditch Length = 1575m  
\*Less Deletion: 300m  
NET LENGTH = 1275m

Additional Volume

$$\text{Sectional area} = \frac{(5)(3.5)}{2} = 8.75 \text{ m}^2$$

$$\text{Additional Volume} = (8.75)(12.75) = 11,156 \text{ m}^3$$

ATTACHMENT 4  
REVEGETATION/SOIL  
EROSION CONTROL COMPONENT

REVEGETATION/SOIL EROSION CONTROL COMPONENT

1. Estimate of Exposed Surface Area From Road Construction

The Environmental Assessment (Island Resources Foundation February 1986) contemplated a road with much smaller cuts and fills and much less disturbance from pilot roads and other activities incidental to construction than that contained in the present final design.

Due to benching, fills that are exposed have a slope distance that are many times the fill heights shown on the profile grade of the engineering drawings. For example the fill for the 1st 300 meters goes almost from the 3.0 meter above mean sea level (AMSL) elevation (@ STA. 0+000) up to the 29.0 meter AMSL elevation (@ STA 0+300). In the first seven tenths of a kilometer (to STA 0+700) the average fill has about a 50 meters slope distance. The largest fill has a maximum slope distance of about 110 meters.

Therefore, the area exposed in the first 0.7 km equals:

$$\begin{aligned} (700 \text{ M})(50 \text{ M}) &= 35000\text{M}^2 \\ 700(3.28 \text{ ft/m}) & \\ \times 50(3.28 \text{ ft/m}) &= 376544 \text{ ft}^2 = 8.6 \\ &\text{acres} \\ &\text{of} \\ &\text{exposed} \\ &\text{surface} \end{aligned}$$

It is estimated that the first kilometer - will have about 12.2 acres of exposed surface.

In the second kilometer, the above figure can be expected to double, about 24.4 acres. The exposed soil in need of vegetation will be about equal to the first 0.7 km for each of the remaining 4km of road that have hillside cuts and fills, or a total of 4 (8.6) = 34.4 acres. An estimate of the total area of exposed soils is:

$$\begin{aligned} \text{a. Total} &= 12.2 + 24.4 + 34.4 = 70.8 \text{ acres} \\ \text{b. Secondary const. roads} & \\ &\text{for machinery, trails and} \\ &\text{other disturbed surfaces} &= 9 \text{ acres} \\ \text{Grand Total Exposed surface} &= \overline{79.8} \text{ acres} \end{aligned}$$

(Note: Rough estimate based on field calculations by Chief of Party, SEP Area Development Project).

52

Much of this exposed area is rubble rock mixed with some clay, and presents little threat except for increased rapid runoff. Some areas have considerable clay and present a very serious and definite erosion potential. It is a known fact that these areas will add considerable amounts of destructive sediments into the adjacent marine habitats if remedial measures are not taken. How much of this area will be clay and soil instead of rock cannot be calculated because it is still undisturbed. When the entire site is opened up the amount of rock versus soil will become apparent. As an example, Salt Pond Hill has considerable clay while the slopes above Turtle Bay are primarily rock with clay top soil of varying depth (a few inches to over a foot).

## 2. Possible Environmental Damage

Most anticipated environmental damage was adequately described in the Environmental Assessment (Island Resources Foundation February 1986).

Those areas which can be planted consist of clay or clay and sand topsoil, sand, muck, or crushed rock with a clay binder. Some are highly erodible by rain or wind, while others are stable. The vegetation cover on dunes has been disturbed in a few places. The sand is already moving.

Rainfall in the Peninsula is generally slight, but occasional storms (every few years) result in heavy runoff or flash floods. A few years ago a worker at Banana Bay almost had his car washed into the Great Salt Pond.

Erosion on the Peninsula in the past has not presented serious ecological and economical problems. The sea water is notably clear and the clean sandy beaches have high tourism potential. The coral reefs are also valuable to the tourism and fishing industries. Grass beds are feeding grounds for turtles and conch, and act as an important nursery area for juvenile conch, lobster and fish on the Caribbean side of the Southeast Peninsula. Silt and sediment in the water from road construction development could damage all of these important resources.

There is also the potential for a striking negative visual impact resulting from the bare disturbed areas if no mitigative actions are taken. This is extremely important in an area scheduled for tourism development.

91

The Government of St. Kitts has been counting on this tourism development on the Southeast Peninsula as a major economic boost and considers it a very high priority. This is the primary purpose for the road. The degree of potential negative visual impact could not have been anticipated by Island Resources E.A. because a different road design was considered.

It is not suggested that USAID should be responsible for landscaping. Landscaping should be the responsibility of the owners and developers. However, a negative visual impact of this magnitude does require mitigation. USAID is aware of the purpose of the road and is taking corrective measures through this revegetation program to assure that the integrity of the road is maintained as a tourist attraction.

3. Recommended Plants for Revegetation of the Southeast Peninsula Road

A summary of plants proposed for use in the revegetation of the Southeast Peninsula Road is contained in Table 1.

There are environmental considerations for practically each species being considered for planting. The project should be appropriately supervised (Figure 1).

The environmental assessment (Island Resources Foundation, February 1986) recommended use of mulch from guinea grass. This is a very good idea and should be used in certain places. Guinea grass mulch would be less likely to blow away like bagasse would on the windy slopes of the SEP. Guinea grass is naturalized around the Great Salt Pond, and was introduced by Campbell Evelyn as cattle feed for Charles Wilkin in the fifties. It is not yet common on the neck of the Peninsula from Friar's Bay to Canoe Bay. It is a fire hazard and by burning, extends its territory into the perimeter of the natural thorn brush cover. Aerial photographs taken in 1945 and 1968 compared to visual observation today show that the grassland has pushed into the brush and scrub forest areas. Guinea grass should be used, but it should be used carefully and sparingly. It may eventually spread along the road over the years, but the erosion control measures should use other plants where appropriate.

21

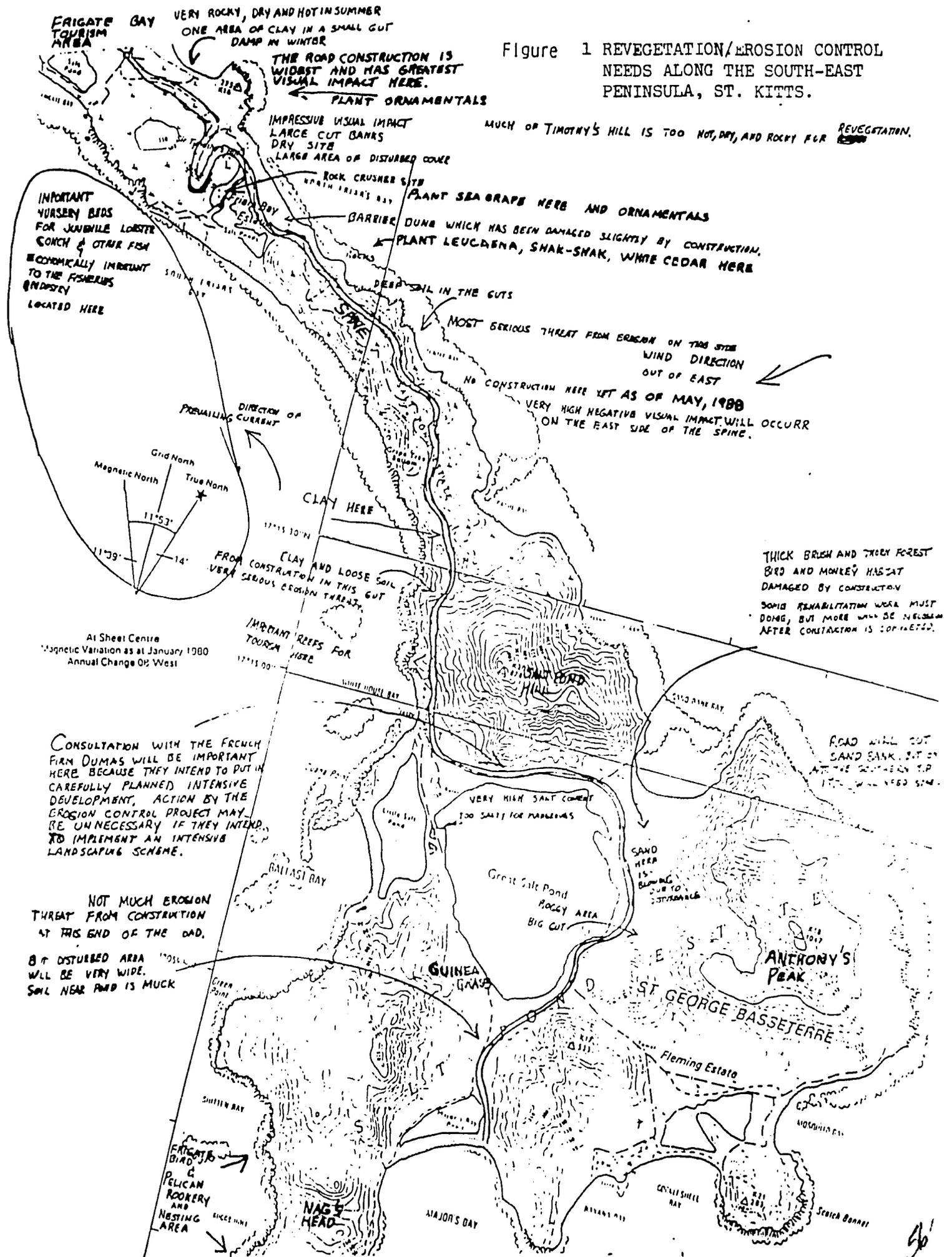
TABLE 1

AN ESTIMATION OF PLANTS NEEDED FOR REVEGETATION FOR THE  
PURPOSE OF EROSION CONTROL ALONG THE S.E. PENINSULA ROAD

<u>Vegetation</u>				
<u>Common Name</u>	<u>Scientific Name</u>	<u>Exotic*/Native</u>	<u>Preferred Habitat</u>	<u>Possible Area Of Planting</u>
Guinea grass	<u>Panicum maximum</u>	Exotic	invader	flats
Sour grass	<u>Andropogon intermedius</u>	Native	hot rocky dry hillside	ridge top
Khus khus grass	<u>Vetiveria zizanioides</u>	Exotic	deep soil	ridge top
White cedar	<u>Tabebuia heterophylla</u>	Native	hot hillsides	everyplace
Casaurina	<u>Casaurina equisetifolia</u>	Exotic	beach	sand dune
Tibet	<u>Albizia lebbek</u>	Exotic	deep soil	dry hillside
Leucaena	<u>Leucaena leucorephala</u>	Exotic	scrub hillside	dry hillside
Giant leucaena	<u>Leucaena leucorephala</u>	Exotic	good soil	dry hillside
Tamarind	<u>Tamarindus indicus</u>	Exotic	dry hillside	
Neem	<u>Azadirachta indica</u>	Exotic	deep soil	ridge
Acacia	<u>Acacia farnesiana</u>	Exotic	dry hillside - fire	dry hillside
Gumbo limbo	<u>Bursera simaruba</u>	Native	water - good soil	flat
Almond	<u>Terminalia catappa</u>	Exotic	coastal	coast
Sea grape	<u>Corroloba uvifera</u>	Native	coastal -dry hillside	coast & ridge
Clammy cherry flat	<u>Cordia nitida</u>	Native	wet, deep soil	fire resistant
Gliricidia	<u>Gliricidia sepium</u>	Exotic	wet, deep soil	flat
Loblolly	<u>Pisonia subcardata</u>	Native	dry hillside	ridge
African tulip	<u>Spathodea campanulata</u>	Exotic	deep soil	ridge & flat
Yellow poui	<u>Tabebuia glomerata</u>	Exotic	deep soil	ridge
Yellow flamboyant	<u>Peltophorum inerm</u>	Exotic	deep soil	flat
Red flamboyant	<u>Delonix regia</u>	Exotic	deep soil	flat
Golden shower	<u>Cassia fistula</u>	Exotic	deep soil	flat
Pride of India	<u>Melia azadarach</u>	Exotic	deep soil	flat
Sour lemon	<u>Citrus limos</u>	Exotic	dry hillside	ridge
West Indian pea tree	<u>Sesbania Grandiflora</u>	Exotic	deep soil	flat
Lime	<u>Citrus aurantifolia</u>	Exotic	good soil	flat

\* Note: Exotics have been introduced and on the island for many years.

Figure 1 REVEGETATION/EROSION CONTROL NEEDS ALONG THE SOUTH-EAST PENINSULA, ST. KITTS.



VERY ROCKY, DRY AND HOT IN SUMMER  
ONE AREA OF CLAY IN A SMALL GUT  
DAMP IN WINTER

THE ROAD CONSTRUCTION IS  
WIDEST AND HAS GREATEST  
VISUAL IMPACT HERE.

PLANT ORNAMENTALS

IMPRESSIVE VISUAL IMPACT  
LARGE CUT BANKS  
DRY SITE  
LARGE AREA OF DISTURBED COVER

ROCK CRUSHER SITE

PLANT SEA GRAPES HERE AND ORNAMENTALS

BARRIER

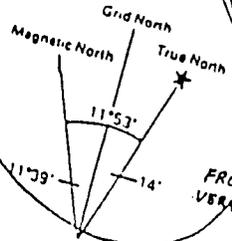
DUNE WHICH HAS BEEN DAMAGED SLIGHTLY BY CONSTRUCTION.  
PLANT LEUCODENA, SHAK-SHAK, WHITE CEDAR HERE

DEEP SOIL IN THE CUTS

MOST SERIOUS THREAT FROM EROSION ON THIS SIDE  
WIND DIRECTION  
OUT OF EAST

NO CONSTRUCTION HERE YET AS OF MAY, 1988  
VERY HIGH NEGATIVE VISUAL IMPACT WILL OCCUR  
ON THE EAST SIDE OF THE SPINE.

PREVAILING  
DIRECTION OF  
CURRENT



CLAY HERE

CLAY AND LOOSE SOIL  
FROM CONSTRUCTION IN THIS GUT  
VERY SERIOUS EROSION THREAT

IMPORTANT REEF FOR  
TOURISM  
HERE

THICK BRUSH AND TROPICAL FOREST  
BIRD AND MONKEY HAS BEEN  
DAMAGED BY CONSTRUCTION  
SOME REHABILITATION WORK MUST  
BE DONE, BUT MORE WILL BE NEEDED  
AFTER CONSTRUCTION IS COMPLETED.

At Sheet Centre  
Magnetic Variation as at January 1980  
Annual Change 0.8 West

CONSULTATION WITH THE FRENCH  
FIRM DUMAS WILL BE IMPORTANT  
HERE BECAUSE THEY INTEND TO PUT IN  
CAREFULLY PLANNED INTENSIVE  
DEVELOPMENT. ACTION BY THE  
EROSION CONTROL PROJECT MAY  
BE UNNECESSARY IF THEY INTEND  
TO IMPLEMENT AN INTENSIVE  
LANDSCAPING SCHEME.

NOT MUCH EROSION  
THREAT FROM CONSTRUCTION  
AT THIS END OF THE ROAD.

8 ft DISTURBED AREA  
WILL BE VERY WIDE.  
SOIL NEAR POND IS MUCK

VERY HIGH SALT CONTENT  
TOO SALTY FOR MARSHES

Great Salt Pond  
ROCKY AREA  
BIG CUT

SAND HEAP  
IS  
BLowing  
DUE TO  
DISTURBANCE

ROAD WILL CUT  
SAND BANK... AT THE SOUTHERN T.P.  
IT WILL NEED SOME...

ANTHONY'S  
PEAK

ST GEORGE BASSETTERRE

Fleming Estate

FRIGATE  
BIRD &  
PELICAN  
ROOKERY  
AND  
NESTING  
AREA

NAG'S  
HEAD

MAJOR'S BAY

GREEN SHELL  
BAY

SEALED BUNKER

Khus-khus grass, (factory grass) was introduced into St. Kitts and Nevis many years ago by USAID or FAO for erosion control. It was used by USAID on an erosion control project on the Green Hill sugar cane field service roads, and is called factory grass because the sugar factory uses it for erosion control in so many places. It is planted by sprigs and spreads vegetatively. It does not spread by seed and so does not escape to become a pest. It may be difficult to establish. It should be planted when it is actually raining, but it survives and grows well in the New River area of Nevis which like the Southeast Peninsula is also hot and fairly dry.

It will be extremely important to have exposed surfaces high in soil content (versus rocks) planted immediately in grasses to help bind soils, as trees may take a number of years before their root systems develop sufficiently to provide the soil holding capacity that is desirable.

Neem could become a problem near Major's Bay, but generally neem needs much more moisture than what is present on the Peninsula to take over a site. It grows rapidly and will very likely be used in appropriate places in the revegetation program. It will require water for the first five months as will Casaurina.

Casaurina has become a problem in Florida, but the species C. equisetifolia doesn't send up root suckers like other species. On Nevis a casaurina, probably C. glouca, has taken over a hillside with numerous sprouts to form an impenetrable thicket and may become a pest. C. equisetifolia does not spread from seed easily because ants eat the seeds. However, grass and other plants do not grow well under casaurina. Casaurina is an excellent windbreak and is very good for growing on sand dunes. The roots hold sand, particularly where people walk.

Tamarind is slow growing, but it stays green when most of the brush on a dry hillside turns brown and it may be more fire resistant.

Acacia has already become a pest, and would be worse if the charcoal cutters and fire weren't keeping it under control. With less cutting and less fire, acacia could become more of a problem. It has sharp spines and can form an impenetrable barrier, but when it gets large, twenty feet tall with a stem a foot in

diameter, it is a very handsome tree. Acacia should not be planted in areas where it is not already common. Perhaps it should not be planted at all, but it has the advantage of surviving on difficult dry sites unsuitable for most other available species.

The Peninsula supports cactus, dry scrub and other xerophytic vegetation, as well as larger trees in damper protected places such as drainages or small ghauts. Trees such as tamarind should be planted, but they are very slow growing. Tibet should grow fairly well, similar to scrub leucaena and giant leucaena. Mahogany, because of its slow growth, is not feasible. White cedar occurs naturally, along with sea grape. Clammy cherry and almond will do well if they are watered for a few months to get established.

Ornamentals such as African tulip, yellow poui, yellow flamboyant, red flamboyant, golden shower, pride of India and Bougainvillea will also need water to get established and will require water for several years in most places for good rapid growth. Ornamentals are out of place and do not appear to conform with "natural" vegetation in some places, such as higher elevations on Timothy Hill or along the spine. However, in other areas at lower elevation and near proposed development the use of ornamentals instead of sea grape is acceptable.

It would not cost any more to plant an African tulip instead of loblolly. The ornamental would fit in with the environment around the development and would hide or take attention away from some of the negative visual impact of the road. Ornamentals are more likely to be protected and maintained by the land owners, developers and operators of the tourism industry. Ornamentals should go in on land which used to be in agriculture and would not be encroaching on "natural" stands. In fact, "natural" planting of non-ornamental species would look artificial and out of place on the old agriculture land because the trees would be in comparatively small clumps in a thin strip along the road. There very likely would not be sufficient money to plant large enough areas to make it appear like a "natural" stand of forest.

The selection of natural or ornamental vegetation should be made in collaboration with the Government, developers and landowner. Either type has about the same value for erosion control in lower elevations on more gentle slopes.

In the extremely high erosion potential areas *Ieucaena*, Tibet, white cedar, loblolly, sea grape and clammy cherry should be used in conjunction with grasses.

The large number of species contemplated for use in the program makes failures less likely to be major, and refilling easier.

All plants which are being considered as candidates for inclusion in erosion control measures and visual impact mitigation are naturally occurring on the Peninsula or have already been introduced to the Peninsula or to the island of St. Kitts.

Experimental or test plots will be an integral part of production. It is expected that 50,000 trees will be planted, and even more if much refilling must be done. This would be planting at a rate of about a thousand per acre. One or two thousand per acre is appropriate for erosion control. High mortality is expected in certain locations. Revegetation of the road will require development of a long term program lasting a number of years. As a result, it is important that this project build long term capabilities in both the public and private sectors which will carry on revegetation activities after the project completion date.

4. Erosion Control Techniques Associated with Final Road Grading and Revegetation Which are Not Recommended

The placing of top soil over the rock on fill slopes may be creating a problem instead of solving one. Top soil added to a fill slope will be unstable and will be inclined to slump (if any is left) after sheet erosion from rainfall. Top soil will not be bound to the slope for several years if ever, because roots would probably stay in the soil instead of penetrating into the rocky material of the fill slope. The mass of root web, vegetation and soil could easily slump off or slide down the slope similar to the slides on Brimstone Hill last year. Ultimately, the potential damage from sediment reaching the marine habitat is more important than the loss in visual aesthetics which the rocky slopes present.

5. Environmental Constraints

The fill slopes have clay mixed in to act as a binder and in many instances there is sufficient soil

to support vegetation. In some cases growth will survive only on the toe of the slope where more moisture will be present. The desiccating effect of the wind will also be a problem on some exposed fill slopes, and surface temperatures on the slopes will be intense.

Deep rooted drought resistant plants should be used in these locations, although survival rates might still be very low. Occasionally a hole will have to be dug and filled with good soil to support a plant. Grass such as khus-khus would not be appropriate in these difficult spots.

The establishment of vegetation in such a hot, dry, windy, steep, salty and rocky place is not easy, and in some places is impossible. Rocky faces of cut banks on the Peninsula are bare now and thousands of years from now will have no more vegetation than the sides of the Great Pyramid at Giza. Other places, that have enough soil to be a source of destructive sediment pollution, can be vegetated.

Trees should be established as well as grasses because the grass is more susceptible to damage by fire and loses some of its effectiveness until the root wad resprouts. Although the root systems of grasses tend to become established more quickly, important for "short term" erosion control, tree roots eventually go deeper and sew the top soil to the hillside better than grasses to prevent slumping. Most importantly, trees can inhibit the spread of fire. A fire can be contained in a smaller area if control measures are taken.

At the present time wildfires on St. Kitts are allowed to burn themselves out unless they threaten sugar cane crops or homes. With the development of a thriving tourism industry on the Peninsula it is anticipated that wild fire suppression will be undertaken by the developers. It would be neither expensive nor difficult near the road. The usual ignition points have been in the area of the Great Salt Pond to make new growth for cattle feed, or escaping fires from charcoal burning near Anthony's Peak or Nag's Head. These sources should decline, but other sources will increase with development. As a whole fire occurrence should be less common and the area burned less extensively with development. Because of this, grazing of livestock on the Peninsula might be considered as a natural management tool to keep grasses cropped and thus reduce the risk of wild fires,

## 6. Component Description

The revegetation component will consist of the following. The Department of Agriculture will expand its tree nursery at the agriculture station at La Guerite to produce approximately 30,000 tree seedlings. AID loan funds will finance commodities, materials and operation and maintenance of the nursery and tree planting. In order to ensure that sufficient planting stock is available to revegetate the targeted areas by the PACD, AID loan funds will be made available to the GOSKN for contracting with one or more private contractors to produce and plant an additional 20,000 seedlings. To maximize tree survival through the hot and dry periods, the project will finance the purchase of a drip irrigation system and the hauling of water until the water main which is part of the road construction component is activated. In areas with high clay content, guinea grass mulch will be used to seed the areas. Other areas, along the roadway would be planted with Khus Khus grass. AID loan funding also provides for the contracting of a forestry technical advisor to assist in the implementation of this new project component.

The GOSKN will provide space for the development of the nursery, approximately five thousand square feet of area accessible by a vehicle, five hundred square feet under roof for work space and a storage area for tools which can be made secure. The GOSKN will also detail a forester and a soil conservation specialist who together with the technical advisor will carry out the day-to-day implementation of the revegetation component.

The La Guerite nursery should have 10,000 tree seedlings in containers ready for planting out in November and December. Most of these trees would be white cedar, but some ornamentals would also be produced. Direct planting from seed would also be done on the Frigate Bay side of Timothy Hill using leucaena, tibet and flamboyant. By February or March a new crop of 10,000 should be ready.

In September, October and November, 1988, contractors will be used to plant trees, plant khus khus and spread mulch. The contracts cannot be entered into before the funds are in hand, although preliminary negotiations may be conducted.

The tree planting work would be done, at that time in order to take advantage of the cool winter weather and shorter days which would increase survival of the trees. Planting 10,000 trees would require about 70 to 100 man days to work.

About 10,000 trees should be planted from November through May. The project should expect to pay about US \$0.75 to \$2.00 per healthy tree in a 1/2 gallon black plastic bag, and US \$0.50 to \$1.00 for a seedling in a 16oz. cup. Planting could be about \$0.25 to \$0.50 per tree.

A contract compliance inspection would be made of tree seedlings and plantings to ensure that proper species, adequate size, proper degree of hardening off, absence of root bound but well formed roots, and that planted trees have proper placement, (no "J" roots) and that roots are well spread and covered at appropriate depth, and that trees are properly spaced.

Tree species selected for planting in various locations would be selected on the basis of the environmental factors of the site, expected appearance of the growing tree, and availability of planting stock. Density of the planting, or number of trees per acre would vary with the species, the characteristics of the site would be planted at the rate of up to 2000 trees per acre, or spaced about 4 1/2 feet apart.

A planting on good soil at lower elevations for visual impact purposes or to stabilize the edge of a sand dune would have a spacing of about eight feet apart, or about 680 trees per acre.

The fill slope on the spine from kilometer 3 to kilometer 6 would need high density, from 1000 to 2000 trees per acre. Even with this close spacing, the planting of white cedar and tibet would be thickened by direct seeding with leucaena. The final amount of area needing treatment in the region from K3 to K6 is not known because construction has not started there yet, but it is expected to be about 25 acres. It could conceivably be twice that.

This area is windswept and is a difficult site even though soil should be available. Khus Khus grass would be planted in portions of the fill, but 20,000 trees would be established as well, at an expected cost of \$50,000. Planting in this area would be during January and February of 1989. A crew of ten men would be able to do the 200 man days of labour in 20 days.

#### a. The Drip Irrigation Scheme

In order to get survival of many trees through the hot and dry period a drip irrigation system will be utilized. It will cost about US \$1.80 per lineal foot for hose fittings, or about US \$15,000 for ten installations. Two drip irrigation set-ups would be made on the Frigate Bay side of Timothy Hill, two more on the Friars Bay side, one at the fill below the big cut, the other at the hill top. Six more would be utilized from Friars Bay to Salt Pond Hill. Drip system might not be needed past White House Bay. Drip system can be bought off the shelf at TDC in Basseterre, or ordered direct from the company. TDC is the largest hardware store in Basseterre and can deduct the duty cost from materials purchased there. Ten drums, fifty gallon size, would be situated to feed water into the drip hose. The 500 gallons should last a couple of days, and the plants could go another couple of days before the ground is dried out. So water should be replaced in the system every 3 or 4 days. Water delivery could cost US \$15,000 for a water truck and driver for a year. Two trucks might be necessary June to September 1989.

b. Guinea Grass Mulch

Mulch would be cut guinea grass spread so as to protect bare soil from sheet erosion. Heavy long lengths of guinea grass would be necessary to maintain the grass in place when the wind is up. Bagasse would be blown away, and so would chopped and blown mulch from a chipper or other device. Hand cutting and spreading would be cheapest. This method would be used on sites of high clay content.

Cutting guinea grass is more difficult than cutting cane. One man might cut less than one cane cart per day, or about five pickup loads. It would take about fifteen loads per acre. Guinea grass mulch would seed the area with guinea grass, and in some places this is undesirable. Therefore the area which would have mulch applied would only be about 25 acres. There would be about 80 man days involved in cutting, transporting, and spreading the mulch. This operation would cost US \$5,000, and would require, total time, about a month with two or three men working on it.

c. Khus-Khus Grass

The planting of khus-khus grass would be somewhat limited by the capability of the country to supply the sprigs. Most of the khus khus growing in St. Kitts is on Greenhill in an old USAID erosion control project. Clumps of khus khus can be taken from there and broken apart into sprigs, but it must be done carefully so as to not interfere with or damage the original project at Green Hill. Close association with Conrad Kelly or Mr. Joseph of the Agronomy section of SKSMC will be necessary.

Planting khus khus along the road would be made in the following approximate locations.

Kilometer	Area
0.5 to 0.7	1.5 hectare on clay
1.2 to 1.3	1 h on big fill
1.5 to 2.0	2 h both sides of fill and on portions of dune.
2.0 to 4.0	3.5 h on fill
4.0 to 5.0	2 h on fill
6.0 to 6.2	.5 h
7.5 to 8.5	.5 h on sand dune

Eleven hectares or about twenty-seven acres would require 220,000 sprigs if planted two sprigs per square meter. Three sprigs per meter would be preferable if there is sufficient supply. The clumps are difficult to dig out, a back hoe might be necessary, and the clumps must be broken up into individual sprigs. The preparation of sprigs is as difficult as planting.

Planting should be done when the ground is wet, or even during a rain. One man plant about 800 sprigs per day if the ground is not too rocky. If each hectare gets 20,000 sprigs it would require 25 man days, or about 5 days for a crew of 5 to plant a hectare.

Contract costs would be US \$700 per acre, or almost US \$20,000 for the khus khus. It would take 3 or 4 months to do the job. It would be fairly easy to inspect for contract compliance or satisfactory completion of the job.

The difficulty in planting khus-khus is coordinating availability of planting stock, accessibility to planting site, labour and weather.

d. Production of Tree Seedlings by Contractor

Bids to be accepted for:

Production of three months old or older seedling trees in 1/2 gallon black plastic bags. Bags shall be full or soil to within one inch of the top.

Soil shall be good quality, dug from a ghaut and containing 1/3 silt and 1/3 clay. Plants shall be well rooted, but not root bound. Plants shall be hardened off for three weeks before delivery, and be free from nematode and damping off injury.

Lot #1	500 white cedar	10" tall or more	delivery
	500 sea grape	well rooted	November 1
	500 tamarind	8" tall	
	500 tibet	10" tall or more	
Lot #2	500 golden shower	12" tall or more	November 15
	500 flamboyant	20" tall or more	
	500 yellow poui	12" tall or more	
	500 white cedar	12" tall or more	
Lot #3	500 casaurina	14" tall or more	March 1
	500 almond	10" tall or more	
	500 clammy cherry	12" tall or more	
	500 neem	12" tall or more	
Lot #4	500 yellow flamboyant	12" tall or more	March 15
	500 pride of India	12" tall or more	
	500 sour lemon	12" tall or more	
	500 African tulip	12" tall or more	

These lots total only 8,000 trees, so additional similar contracts would be entered into.

The lots are grouped according to drought resistance, salt tolerance, value as ornamentals, and location on SEP where planting of such species would be concentrated.

Lot #1, White cedar, sea grape, tamarind and tibet are drought resistant and salt tolerant, but relatively drab trees. It was originally intended to have contractors begin growing these trees in June for planting in October. However, now it appears that since a nursery will not be in operation at this time then the October planting date cannot be met. White cedar is the easiest tree to grow, and very drought tolerant, and can generally be started any time in the year.

Sea grape is rooted from cuttings, but these take time - a good strong rooted cutting in a 1/2 gallon bag should be about six months old. Tamarind seeds are available only in May to June, and Tibet is the same. Therefore, adequate production of suitable planting stock is doubtful for early winter planting.

e. Selection of Species for Location Along the Road

o to K.1      Need, casaurina, white cedar, leucaena in background, ornamentals golden shower, yellow poui, pink golden shower, flamboyant.

In clay area at K0.5, sea grape, gliricidia, clammy cherry, almond.

For cleared swath to top of Timothy Hill, acacia, a few neem, a few giant leucaena, many leucaena cunninghamia, other wild tamarind, a few clammy cherry, many tibet, white cedar.

K1 to K2      White cedar, casaurina, sea grape tamarind, yellow poui on upper slopes.

Flamboyant, golden shower, yellow flamboyant, pride of India, at lower elevations with pride of Barbados, sea grape, almond.

K2 to K5.5      White cedar, casaurina, some neem, giant leucaena, wild tamarind, almond, sea grape, loblolly, clammy cherry, tibet.

K5.5 to K6.5      Turpentine, white cedar, giant leucaena, acacia.

K6.5 to K7.5      Giant leucaena gliricidia.

K7.5 to K8.5      Sea grape, white cedar, turpentine, gliricidia, casaurina.

K8.5 to K10.3      Clammy cherry, pride of India, red flamboyant yellow flamboyant, gliricidia neem, (maybe) yellow poui, golden shower, for fire breakes - clammy cherry, giant leucaena, tamarind.

f. Planting by Contractor

Bids will also be accepted for planting trees meeting the qualifications and description of trees in the prescribed lots, at specified spacing (from 4 to 10 feet depending upon the location) in a hole dug by pick to a depth of 10". Roots shall be properly spread and covered by at least one inch of firmly packed soil. Trees shall be kept shaded until planted, and roots shall be kept moist at all times. Planting shall be completed at the specified date.

A random inspection will be made of the job after performance. If 15% of planted trees are not in compliance the payment will be reduced accordingly, and if 25% of planted trees are not in compliance the contractor shall be considered to be in default.

g. Illustrative Budget  
(U.S. Dollars)

Commodities

a. Vehicle	\$ 12,500
b. Equipment (Tools & drip irrigation)	16,000
c. Materials (Fertilizer, fungicide, lumber, concrete blocks, cups & plastic bags, pipe fittings)	<u>2,900</u>
Subtotal	\$ 31,400

Dept of Agriculture Nursery (La Guerite)

a. Operation and maintenance	16,100
b. Vehicle operating costs, including water trucks	5,000
c. Office clerical, telephone, mail, etc.	<u>2,500</u>
Subtotal	\$ 23,600

Technical Assistance

a. Forester (approx 1 yr.)	\$ 30,000
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Planting

a. Trees (from La Guerite)	15,000
b. Mulch	5,000
c. Khus Khus	20,000
d. Guinea Grass	5,000
e. Seed Collection & seeding	<u>5,000</u>
Subtotal	\$ 50,000

Private Contractor (Purchase & planting of trees) \$ 50,000

Watering of Vegetation \$ 15,000

TOTAL \$200,000

b6

ATTACHMENT 5

REVISED EMBANKMENT/PAVEMENT DESIGN

STA 6+100 TO STA 10+300

SUBJECT: SOUTH EAST PENINSULA ROAD

DRAWN BY E.R.  
 CALC. BY CE  
 CHKD. BY CE  
 DATE: 29:2:88.

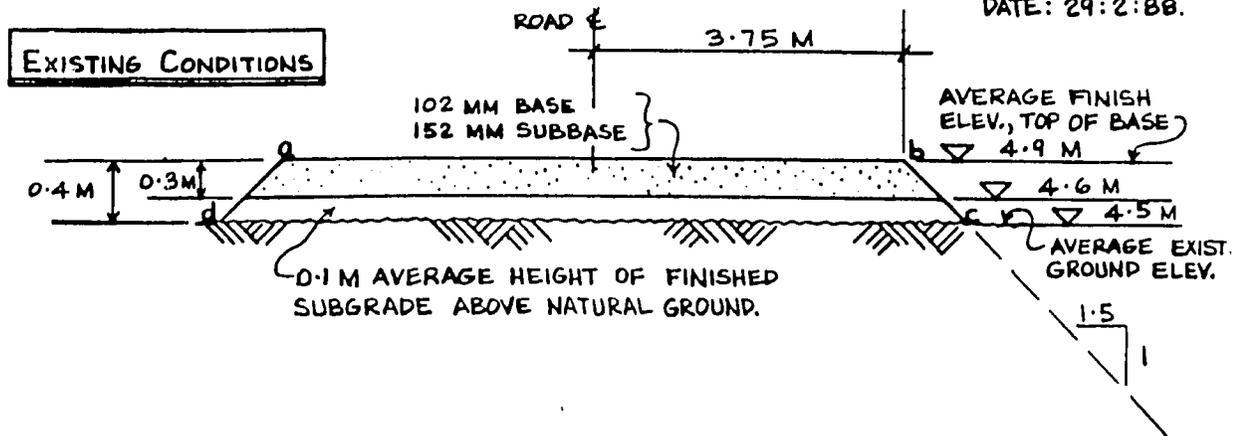


FIG. E - AVERAGE FINISHED ROADWAY EMBANKMENT SECTION - (STA. 6+100 TO STA. 10+376, PRESENT DESIGN)

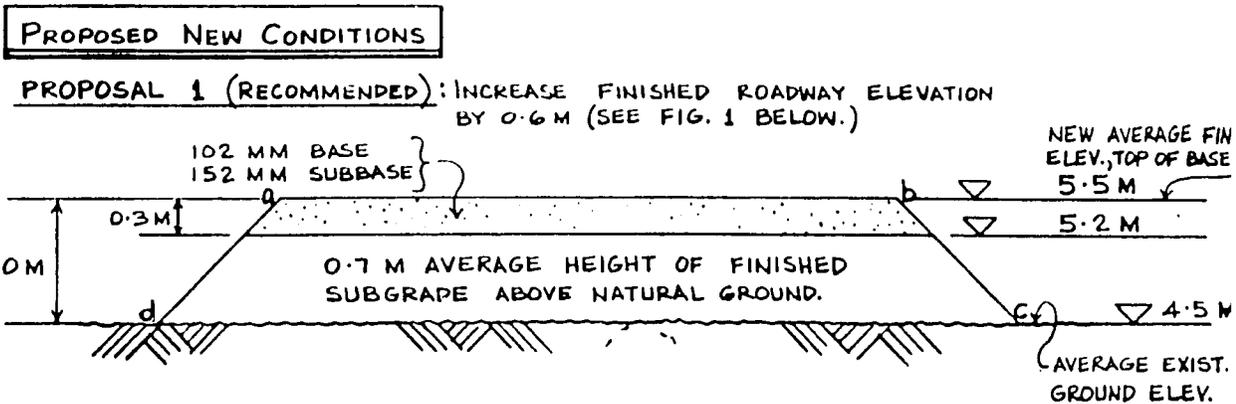


FIG. 1 - AVERAGE FINISHED ROADWAY EMBANKMENT - HEIGHT INCREASED BY 0.6 M.

PROPOSAL 2 : INCREASE FINISHED ROADWAY ELEVATION BY 0.3 M (SEE FIG. 2 BELOW.)

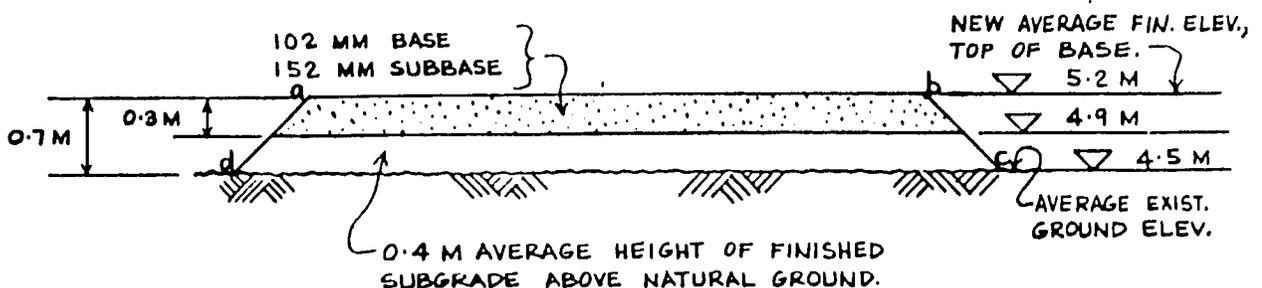


FIG. 2 - AVERAGE FINISHED ROADWAY EMBANKMENT - HEIGHT INCREASED BY 0.3 M.

68

# TAMS/Elmes

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CHKD. BY CF  
DATE: 29:2:88.

SUBJECT: SOUTH EAST PENINSULA ROAD

CALCULATION: ADDITIONAL EARTHWORK QUANTITIES  
ARISING FROM PROPOSALS 1 AND 2.

## TOTAL SECTIONAL AREAS:

$$\text{FIG. E} - A_E = \text{AREA } abcd = 2(3.75)(0.4) + (0.4)(1.5)(0.4) = 3.24 \text{ SM.}$$

$$\text{FIG. 1} - A_1 = \text{AREA } abcd = 2(3.75)(1.0) + (1.0)(1.5)(1.0) = 9.00 \text{ SM.}$$

$$\text{FIG. 2} - A_2 = \text{AREA } abcd = 2(3.75)(0.7) + (0.7)(1.5)(0.7) = 5.98 \text{ SM.}$$

## VOLUME INCREASES:

$$1. \text{ PROPOSAL 1 (FIG. 1)} - (A_1 - A_E) 4276 = (5.76)(4276) = 24,630 \text{ CM.}$$

$$2. \text{ PROPOSAL 2 (FIG. 2)} - (A_2 - A_E) 4276 = (2.74)(4276) = 11,716 \text{ CM.}$$

SUBJECT: SOUTH EAST PENINSULA ROAD.

PAGE OF  
 DRAWN BY E.R.  
 CALC. BY E.  
 CHKD. BY  
 DATE:

QUANTITIES: PROPOSED RAISING OF EMBANKMENT-  
(CH. 6+100 TO 10+376)

STATION (M)	ELEVATION (M)		EMBANKMENT HEIGHT (M) COL(1)-COL(2)	REMARKS
	FIN. TOP OF BASE	EXIST. GROUND		
6+100.00	10.42	10.1	+0.32	
6+200.50	4.41	5.6	-1.19	
6+300.80	3.26	3.6	-0.34	
6+400.00	6.46	6.7	-0.24	
6+500.00	8.97	7.9	+1.07	
6+600.00	7.36	7.0	+0.36	
6+700.50	5.60	5.7	-0.10	
6+800.00	7.06	7.5	-0.44	
6+900.00	6.66	6.5	+0.16	
7+000.00	5.21	4.9	+0.31	
7+100.50	7.06	7.5	-0.44	
7+200.50	8.69	7.2	+1.49	
7+300.00	8.06	6.4	+1.66	
7+400.00	5.56	3.8	+1.76	
7+500.50	2.09	1.2	+0.89	
7+600.50	1.81	1.2	+0.61	
7+700.00	2.06	1.3	+0.76	
7+800.50	2.31	0.5	+1.81	
7+900.00	3.15	1.8	+1.35	
8+000.00	6.68	7.6	-0.92	
8+100.00	5.56	5.6	-0.04	

TAMS/Elmes

SUBJECT: SOUTH EAST PENINSULA ROAD.

QUANTITIES: PROPOSED RAISING OF EMBANKMENT-  
(CH. 6+100 TO 10+376)

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CALC. BY E.F  
CHKD. BY :  
DATE: .....

STATION (M)	ELEVATION (M)		EMBANKMENT HEIGHT (M) COL(1)-COL(2)	REMARKS
	FIN. TOP OF BASE	EXIST. GROUND		
8+200.00	3.56	2.7	+0.86	
8+300.00	1.94	1.6	+0.34	
8+400.00	2.56	1.5	+1.06	
8+500.00	3.21	0.9	+2.31	
8+600.00	1.76	0.6	+1.16	
8+700.00	1.41	0.9	+0.51	
8+800.00	2.25	3.3	-1.05	
8+900.00	1.73	3.1	-1.37	
9+000.00	2.71	1.9	+0.81	
9+100.00	3.91	3.2	+0.71	
9+200.00	5.11	5.4	-0.29	
9+300.00	6.31	6.1	+0.21	
9+400.00	7.51	7.2	+0.31	
9+500.00	8.31	7.9	+0.41	
9+600.00	7.21	6.4	+0.81	
9+700.00	8.71	8.9	-0.19	
9+800.00	8.01	7.9	+0.11	
9+900.00	4.91	5.5	-0.59	
10+000.00	3.61	3.8	-0.19	
10+100.00	2.67	3.2	-0.53	



ATTACHMENT 6

SUMMARY

REVISED QUANTITY COMPUTATIONS

CLEARING AND GRUBBING

<u>LOCATION</u>	<u>AREA (Hectares)</u>
SIR TIMOTHY HILL THROUGH CUT	0.263
STA 2+275 TO STA 3+925	2.975
STA 5+300 TO 6+175	1.025
STA 6+175 TO STA 10+375	<u>4.000</u>
<u>TOTAL</u>	<u>8.263 Hectares</u>

ATTACHMENT 7  
SUMMARY COST ESTIMATE  
FOR ROAD DESIGN MODIFICATIONS

SUMMARY COST ESTIMATE  
ROAD DESIGN MODIFICATIONS

<u>LOCATION</u>	<u>ITEM</u>	<u>QUANTITY</u>	<u>UNIT PRICE</u>	<u>AMOUNT</u>
Sir Timothy Hill	Unclassified Excavation	24,411M <sup>3</sup>	\$16.40	\$ 400,340
Side Hill Cuts (STA 2+050 to STA 5+950)	Unclassified Excavation	10,425M <sup>3</sup>	\$16.40	\$ 170,970
Modified Forrow Ditch (STA 0+200 to STA 2+875)	Unclassified Excavation	11,156M <sup>3</sup>	\$16.40	\$ 182,958
Clearing & Grubbing (STA 0+000 to STA 10+300)	Clearing & Grubbing	8.263 HA	\$30,000	\$ 247,890
Revised Pavement Design (STA 6+100 to STA 10+300)	Embankment Material	24,630M <sup>3</sup>	\$16.40	\$ 403,932
			TOTAL	\$1,406,090

The above estimate is based on the assumption that unit prices contained in the original contract will apply to the additional work.

76

INITIAL ENVIRONMENTAL EXAMINATION

Project Location : St. Kitts, Southeast Peninsula,  
Eastern Caribbean

Project Title : St. Kitts Southeast Peninsula Area  
Development Project - 538-0138.01

Funding (LOP) : 1,000,000 (G); 11,500,000 (L)

Life of Project : Three years

IEE Prepared by : Paul Andres DeGeorges  
Paul Andres DeGeorges  
Regional Environmental Management  
Specialist, Caribbean

Date : May 20, 1988

Environmental Action : Positive Determination Requiring An  
Environmental Assessment Amendment

Concurrence : James S. Holtaway  
James S. Holtaway  
Director, USAID  
Regional Development  
Office/Caribbean

Date : 6/1/88

Clearances:

PDO:DChiriboga  
C/PDO:KFinan  
INFRA:BSelliah  
C/INFRA:JBaird  
ARD:RJNiec

RE  
WV  
QPS ) do not know the revegetation program is massive  
QSB  
RJNiec 5/27/88

Discussion:

In February 1986 an environmental assessment was funded by USAID to assess the impact on the natural and man made environments of a proposed road running the length of the Southeast Peninsula. At this time the routing and engineering design of the road were believed to have been finalized. This was followed by the preparation of a preliminary Land Use Management Plan.

USAID decided to fund the construction of this road, whose primary goal would be to stimulate the development of tourism on the Southeastern Peninsula, provide employment, and improve the economy of St. Kitts. As part of this project, a contract was let to develop a land use and environmental management program. This program among other things is to:

- 1) Establish the Southeast Peninsula Land Development and Conservation Board.
- 2) Develop an Environmental Education Program.
- 3) Develop Environmental Protection Strategies in:
  - Erosion Control
  - Wildlife/Endangered Species Management
  - Park and Recreation Management
  - Liquid and Solid Waste Disposal
  - Beach and Dune Management
  - Marine Resources Management
- 4) Aid in the Development of Environmental Legislation.
- 5) Provide Environmental Assessment Procedures.
- 6) Establish a Developers Handbook providing guidelines to developers evolving out of the above management plans.
- 7) Monitor the road construction supervisor to assure that the latter is ensuring environmental compliance by the road construction contractor.

For a number of reasons many of which have to do with the geological stability of the original road's routing the road was rerouted and redesigned. This was undertaken subsequently to the Environmental Assessment and Land Use Management Plan. This has resulted in additional costs to construct the road as well as a major increase in exposed surface and thus an increase for erosion potential. USAID will loan to the Government of St. Kitts (GOSK) an additional US\$200,000 to mitigate this erosion potential through a massive revegetation program. Approximately 1.4 million U.S. dollars, will be loaned to the GOSK for the completion of road construction. United States law, 22CFR, Part 216, requires an Environmental Examination (IEE) for substantive amendments of extensions of ongoing projects, programs, and activities.

-2-

The changes in the routing and design of the Southeast Peninsula road raise major concern, especially with the potential for erosion onto the fragile and erosion-sensitive nearshore grass beds and coral reefs, as well as the possibility to adversely affect critical habitat which the original Environmental Assessment recommended as being set aside for conservation. As a result a positive determination is reached which recommends that an environmental assessment be undertaken to determine what if any modifications to the ongoing project will be required to assure that long term sustainable development will take place in harmony with the natural beauty of the island's environment on which tourism depends so heavily such as coral reefs, grass beds, bird rookeries, beaches and clear blue water.

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B.O. 12356: N/A

TAGS:

SUBJECT: ENVIRONMENTAL ASSESSMENT (EA) AMENDMENT FOR ST. KITTS PENINSULA ROAD PROJECT

LAC CHIEF ENVIRONMENTAL OFFICER HEREBY APPROVES THE EA AMENDMENT FOR THE ST. KITTS SOUTHEAST PENINSULA AREA DEVELOPMENT PROJECT, SUBJECT TO INCORPORATION OF THE RECOMMENDED MITIGATIVE ACTIONS INTO THE PP AMENDMENT. WHITEHEAD

BT

#8465

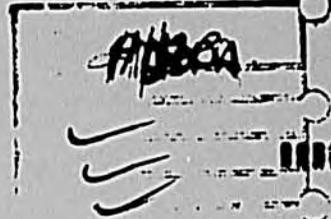
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*Handwritten signature: P. J. ...*

07/20/88

MAY 16 1988

ACTION MEMORANDUM FOR THE ASSISTANT ADMINISTRATOR, LAC

From: LAC/DR, Terrence J. Brown, B

Subject: RDO/C: Request for Delegation of Authority to Approve PP Amendment

Action Requested: The RDO/C Mission requests delegation of authority to approve an Amendment to the PP for the St. Kitts Southeast Peninsula Area Development Project (538-0138.01). The proposed amendment incorporates an additional \$1.6 million in SDA loan funds in order to cover the higher than expected costs of road construction and environmental safeguards.

Background: Based on subsurface soil information, the original cost estimates were predicated on cutting through rock. However, the contractor encountered boulders, slabs and conglomerates; all unstable roadbed materials. Additional benches, side hill cuts and erosion control and reforestation measures became necessary.

Because of the major change in roadbed construction, an amendment to the original environmental assessment is necessary. A scope of work for preparation of the environmental assessment amendment was approved by the LAC Environmental Officer. The amendment must be approved by the LAC Environmental Officer before funds covered by the proposed PP amendment may be authorized.

Discussion: The 1989/90 Action Plan review concluded with the recommendation that the Mission complete the St. Kitts Southeast Peninsula road construction, "subject to the availability of adequate ESF resources." Because of the lack of FY 1988 ESF, the Mission proposes to deobligate \$3.6 million in SDA loan funds from the Infrastructure for Productive Investment project (538-0088) and obligate \$1.6 million to complete construction of the Southeast Peninsula road. Of the \$1.6 million, \$200,000 is to be used for environmental safeguards and erosion control. The balance of \$1.4 million is to be used for road construction.

Because timely construction of the road is crucial to development of the Southeast Peninsula, the Mission requests the authority to approve an Amendment to the PP and to use SDA loan funds to finance the additional activities cited above. A Technical Notification will be prepared following approval.

81



PROJECT CHECKLIST

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

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

A. GENERAL CRITERIA FOR PROJECT

1. FY 1988 Continuing Resolution Sec. 523; FAA Sec. 634A. If money is sought to obligated for an activity not previously justified to Congress, or for an amount in excess of amount previously justified to Congress, has Congress been properly notified? Congressional Notification in process. No obligation will be incurred under the project until the waiting period expires.
2. FAA Sec. 611(a) (1). Prior to an obligation in excess of \$500,000, will there be (a) engineering, financial or other plans necessary to carry out the assistance, and (b) a reasonably firm estimate of the cost to the U.S. of the assistance? Yes
3. FAA Sec. 611(a) (2). If legislative action is required within recipient country, what is the basis for a reasonable expectation that such action will be completed in time to permit orderly accomplishment of the purpose of the assistance? No legislation is anticipated to be required.
4. FAA Sec. 611(b); FY 1988 Continuing Resolution Sec. 501. If project is for water or water-related land resource construction, have benefits and costs been computed to the extent practicable in accordance with the principles, standards, and procedures established pursuant to the Water Resources Planning Act (42 U.S.C. 1962, et seq.)? (See A.I.D. Handbook 3 for guidelines.) Not applicable (N/A).

- 97

-2-

5. FAA Sec. 611(e). If project is capital assistance (e.g., construction), and total U.S. assistance for it will exceed \$1 million, has Mission Director certified and Regional Assistant Administrator taken into consideration the country's capability to maintain and utilize the project effectively? Yes, the Mission Director has certified that St. Christopher and Nevis has the capacity to use and maintain the project.
6. FAA Sec. 209. Is project susceptible to execution as part of regional or multilateral project? If so, why is project not so executed? Information and conclusion whether assistance will encourage regional development programs. No.
7. FAA Sec. 601(a). Information and conclusions on whether projects will encourage efforts of the country to: (a) increase the flow of international trade; (b) foster private initiative and competition; (c) encourage development and use of cooperatives, credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture and commerce; and (f) strengthen free labor unions. The subproject provides the infrastructure base for foreign and local investment in private sector enterprises.
8. FAA Sec. 601(b). Information and conclusions on how project will encourage U.S. private trade and investment abroad and encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise). The subproject utilizes U.S. firms as construction supervisors, contractors, and land use management contractors.
9. FAA Secs. 612(b), 636(h). Describe steps taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services, and foreign currencies owned by the U.S. are utilized in lieu of dollars. N/A.
10. FAA Sec. 612(d). Does the U.S. own excess foreign currency of the country and, if so, what arrangements have No.

84

-3-

11. FY 1988 Continuing Resolution Sec. 521. If assistance is for the production of any commodity for export, is the commodity likely to be in surplus on world markets at the time the resulting productive capacity becomes operative, and is such assistance likely to cause substantial injury to U.S. producers of the same, similar or competing commodity? N/A.
12. FY 1988 Continuing Resolution Sec. 553. Will assistance (except for programs in Caribbean Basin Initiative countries under U.S. Tariff Schedule "Section 807," which allows reduced tariffs on articles assembled abroad from U.S.-made components) be used directly to procure feasibility studies, prefeasibility studies, or project profiles of potential investment in, or to assist the establishment of facilities specifically designed for, the manufacture for export to the United States or to third country markets in direct competition with U.S. exports, of textiles, apparel, footwear, handbags, flat goods (such as wallets or coin purses worn on the person), work gloves or leather wearing apparel? N/A.
13. FAA Sec. 119(g) (4)-(6). Will the assistance (a) support training and education efforts which improve the capacity of recipient countries to prevent loss of biological diversity; (b) be provided under a long-term agreement in which the recipient country agrees to protect ecosystems or other wildlife habitats; (c) support efforts to identify and survey ecosystems in recipient countries worthy of protection; or (d) by any direct or indirect means significantly degrade national parks or similar protected areas or introduce exotic plants or animals into such areas? Subproject design included a full environmental assessment. Subproject amendment includes an amended environmental assessment. Project implementation includes an AID financed environmental management program which supports environmental education efforts, ecosystem protection and survey, and national park protection.
14. FAA 121 (d). If a Sahel project, has a determination been made that the host government has an adequate system for accounting for and controlling N/A.

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-4-

receipt and expenditure of project funds (either dollars or local currency generated therefrom)?

15. FY 1988 Continuing Resolution. If assistance is to be made to a United States PVO (other than a cooperative development organization), does it obtain at least 20 percent of its total annual funding for international activities from sources other than the United States Government? N/A.
16. FY 1988 Continuing Resolution Sec. 541. If assistance is being made available to a PVO, has that organization provided upon timely request any document, file or record necessary to the auditing requirements of A.I.D., and is the PVO registered with A.I.D.? N/A.
17. FY 1988 Continuing Resolution Sec. 514. If funds are being obligated under an appropriation account to which they were not appropriated, has prior approval of the Appropriations Committees of Congress been obtained? N/A.
18. FY 1988 Continuing Resolution Sec. 515. If deob/reob authority is sought to be exercised in the provision of assistance, are the funds being obligated for the same general purpose, and for countries within the same general region as originally obligated, and have the Appropriations Committees of both Houses of Congress been properly notified? Yes. Congressional Notification in process and will be completed prior to obligation.
19. State Authorization Sec. 139 (as interpreted by conference report). Has confirmation of the date of signing of the project agreement, including the amount involved, been cabled to State L/T and A.I.D. Leg within 60 days of the agreement's entry into force with respect to the United States, and has the full text of the agreement been pouched to those same offices? (See Handbook 3, Appendix 6G for agreements covered by this provision). N/A.

26

-5-

B. FUNDING CRITERIA FOR PROJECT

1. Development Assistance Project Criteria

- a. FY 1988 Continuing Resolution Sec. 552 (as interpreted by conference report). If assistance is for agricultural development activities (specifically, any testing or breeding feasibility study, variety improvement or introduction, consultancy, publication, conference, or training), are such activities (a) specifically and principally designed to increase agricultural exports by the host country to a country other than the United States, where the export would lead to direct competition in that third country with exports of a similar commodity grown or produced in the United States, and can the activities reasonably be expected to cause substantial injury to U.S. exporters of a similar agricultural commodity; or (b) in support of research that is intended primarily to benefit U.S. producers? N/A.
- b. FAA Secs. 102(b), 111, 113, 281(a). Describe extent to which activity will (a) effectively involve the poor in development by extending access to economy at local level, increasing labor-intensive production and the use of appropriate technology, dispersing investment from cities to small towns and rural areas, and insuring wide participation of the poor in the benefits of development on a sustained basis, using appropriate U.S. institutions; (b) help develop cooperatives, especially by technical assistance, to assist rural and urban poor to help themselves toward a better life, and N/A.

87

-6-

otherwise encourage democratic private and local governmental institutions; (c) support the self-help efforts of developing countries; (d) promote the participation of women in the national economies of developing countries and the improvement of women's status; and (e) utilize and encourage regional cooperation by developing countries.

- c. FAA Secs. 103, 103A, 104, 105, 106, 120-21. Does the project fit the criteria for the source of funds (functional account) being used? Yes.
- d. FAA Sec. 107. Is emphasis placed on use of appropriate technology (relatively smaller, cost-saving, labor-using technologies that are generally most appropriate for the small farms, small businesses, and small incomes of the poor)? N/A.
- e. FAA Sec. 110, 124(d). Will the recipient country provide at least 25 percent of the costs of the program, project, or activity with respect to which the assistance is to be furnished (or is the latter cost-sharing requirement being waived for a "relatively least developed" country)? Yes, the recipient is providing 25% of the costs of the sub-project.
- f. FAA Sec. 128(b). If the activity attempts to increase the institutional capabilities of private organizations or the government of the country, or if it attempts to stimulate scientific and technological research, has it been designed and will it be monitored to ensure that the ultimate beneficiaries are the poor majority? N/A.



-7-

- g. FAA Sec. 281(b). Describe extent to which the project recognizes the particular needs, desires, and capacities of the people of the country; utilizes the country's intellectual resources to encourage institutional development; and supports civil education and training in skills required for effective participation in governmental processes essential to self-government. N/A.
- h. FY 1988 Continuing Resolution Sec. 538. Are any of the funds to be used for the performance of abortions as a method of family planning or to motivate or coerce any person to practice abortions? No.
- Are any of the funds to be used to pay for the performance of involuntary sterilization as a method of family planning or to coerce or provide any financial incentive to any person to undergo sterilizations? No.
- Are any of the funds to be used to pay for any biomedical research which relates, in whole or in part, to methods of, or the performance of, abortions or involuntary sterilization as a means of family planning? No.

-8-

- i. FY 1988 Continuing Resolution. No.  
Is the assistance being made available to any organization or program which has been determined to support or participate in the management of a program of coercive abortion or involuntary sterilization?
- If assistance is from the population functional account, are any of the funds to be made available to voluntary family planning projects which do not offer, either directly or through referral to or information about access to, a broad range of family planning methods and services? N/A.
- j. FAA Sec. 601(e). Will the project utilize competitive selection procedures for the awarding of contracts, except where applicable procurement rules allow otherwise? Yes.
- k. FY 1988 Continuing Resolution. A female headed consulting firm is implementing the Land Use and Environmental component of the project under a \$966,000 contract with AID.  
What portion of the funds will be available only for activities of economically and socially disadvantaged enterprises, historically black colleges and universities, colleges and universities having a student body in which more than 40 percent of the students are Hispanic Americans, and private and voluntary organizations which are controlled by individuals who are black Americans, Hispanic Americans, or Native Americans, or who are economically or socially disadvantaged (including women)?
- l. FAA Sec. 118(c). Does the assistance comply with the environmental procedures set forth in A.I.D. Regulation 16? Does the assistance place a Yes. The St. Kitts Southeast Peninsula has no remaining Tropical Forests.

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-9-

high priority on conservation and sustainable management of tropical forests? Specifically, does the assistance, to the fullest extent feasible: (a) stress the importance of covering and sustainably managing forest resources; (b) support activities which offer employment and income alternatives to those who otherwise would cause destruction and loss of forests, and help countries identify and implement alternatives to colonizing forested areas; (c) support training programs, educational efforts and the establishment or strengthening of institutions to improve forest management; (d) help end destructive slash-and-burn agriculture by supporting stable and productive farming practices; (e) help conserve forests which have not yet been degraded by helping to increase production on lands already cleared or degraded; (f) conserve forested watersheds and rehabilitate those which have been deforested; (g) support training, research, and other actions which lead to sustainable and more environmentally sound practices for timber harvesting, removal, and processing; (h) support research to expand knowledge of tropical forests and identify alternatives which will prevent forest destruction, loss, or degradation; (i) conserve biological diversity in forest areas by supporting efforts to identify, establish, and maintain a representative network of protected tropical forest ecosystems on a worldwide basis, by making the establishment of protected areas a condition of support for activities involving forest clearance or degradation, and by helping to identify

91

-10-

tropical forest ecosystems and species in need of protection and establish and maintain appropriate protected areas; (j) seek to increase the awareness of U.S. government agencies and other donors of the immediate and long-term value of tropical forests; and (k) utilize the resources and abilities of all relevant U.S. government agencies?

- m. FAA Sec. 118(c) (13). If the assistance will support a program or project significantly affecting tropical forests (including projects involving the planting of exotic plant species), will the program or project (a) be based upon careful analysis of the alternatives available to achieve the best sustainable use of the land, and (b) take full account of the environmental impacts of the proposed activities on biological diversity? N/A. The St. Kitts South East Peninsula has no remaining tropical forests.
- n. FAA Sec. 118(c) (14). Will assistance be used for (a) the procurement or use of logging equipment, unless an environmental assessment indicates that all timber harvesting operations involved will be conducted in an environmentally sound manner and that the proposed activity will produce positive economic benefits and sustainable forest management systems; or (b) actions which will significantly degrade national parks or similar protected areas which contain tropical forests, or introduce exotic plants or animals into such areas? N/A.
- o. FAA Sec. 118 (c) (15). Will assistance be used for (a) activities which would result in the conversion of forest lands to the rearing of livestock; (b) the

92

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construction, upgrading, or maintenance of roads (including temporary haul roads for logging or other extractive industries) which pass through relatively undegraded forest lands; (c) the colonization of forest lands; or (d) the construction of dams or other water control structures which flood relatively undegraded forest lands, unless with respect to each such activity an environmental assessment indicates that the activity an environmental assessment indicates that the activity will contribute significantly and directly to improving the livelihood of the rural poor and will be conducted in an environmentally sound manner which supports sustainable development?

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-12-

- p. FY 1988 Continuing Resolution. N/A.  
If assistance will come from the Sub-Saharan Africa DA account, is it (a) to be used to help the poor majority in Sub-Saharan Africa through a process of long-term development and economic growth that is equitable, participatory, environmentally sustainable, and self-reliant; (b) being provided in accordance with the policies contained in section 102 of the FAA; (c) being provided, when consistent with the objectives of such assistance, through Africa, United States and other PVOs that have demonstrated effectiveness in the promotion of local grassroots activities on behalf of long-term development, in Sub-Saharan Africa; (d) being used to help overcome shorter-term constraints to long-term development, to promote reform of sectoral economic policies, to support the critical sector priorities of agricultural production and natural resources, health, voluntary family planning services, education, and income generating opportunities, to bring about appropriate sectoral restructuring of the Sub-Saharan African economies, to support reform in public administration and finances and to establish a favorable environment for individual enterprise and self-sustaining development, and to take into account, in assisted policy reforms, the need to protect vulnerable groups; (e) being used to increase agricultural production in ways that protect and restore the natural resource base,

-13-

especially food production, to maintain and improve basic transportation and communication networks, to maintain and restore the natural resource base in ways that increase agricultural production, to improve health conditions with special emphasis on meeting the health needs of mothers and children, including the establishment of self-sustaining primary health care systems that give priority to preventive care, to provide increased access to voluntary family planning services, to improve basic literacy and mathematics especially to those outside the formal educational system and to improve primary education, and to develop income-generating opportunities for the unemployed and underemployed in urban and rural areas?

2. Development Assistance Project Criteria (Loans Only)

- |   |  |
|---|--|
| a. <u>FAA Sec. 122(b)</u> . Information and conclusion on capacity of the country to repay the loan at a reasonable rate of interest.   | RDO/C has concluded that the Government of St. Christopher and Nevis has the capacity to repay the loan. |
| b. <u>FAA Sec. 620(d)</u> . If assistance is for any productive enterprise which will compete with U.S. enterprises, is there an agreement by the recipient country to prevent export to the U.S. of more than 20 percent of the enterprise's annual production during the life of the loan, or has the requirement to enter into such an agreement been waived by the President because of a national security interest? | N/A.   |
| c. <u>FY 1988 Continuing Resolution</u> . If for a loan to a private sector institution from funds made available to carry out the provisions of FAA Sections 103   | N/A.   |

- 95 -

-14-

through 106, will loan be provided, to the maximum extent practicable, at or near the prevailing interest rate paid on Treasury obligations of similar maturity at the time of obligating such funds?

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

The purpose of the project is to provide infrastructure to the St. Kitts S.E. Peninsula in order to expand tourism and further diversify the economy traditionally dependent of sugar production for significant foreign exchange earnings and employment.

3. Economic Support Fund Project Criteria

- a. FAA Sec. 531(a). Will this assistance promote economic and political stability? To the maximum extent feasible, is this assistance consistent with the policy directions, purposes, and programs of Part I of the FAA?
- b. FAA Sec. 531(e). Will this assistance be used for military or paramilitary purposes?
- c. FAA Sec. 609. If commodities are to be granted so that sale proceeds will accrue to the recipient country, have Special Account (counterpart) arrangements been made?

Economic and political stability will be enhanced by diversifying the economy and making it less vulnerable to downward trends in sugar prices thereby safeguarding employment opportunities and foreign exchange earnings.

No.

N/A.

96

UNATTACHED:

AMENDMENT TO THE ENVIRONMENTAL ASSESSMENT (112 Pgs)

- Official Files, RDO/C and LAC/DR

PUBLIC WORKS DEPARTMENT

ANNEX F

ST. CHRISTOPHER AND NEVIS

INARA

TELEGRAMS: 'P. W. D. ST. KITTS'  
BOX No. 52

BASSETERRE,  
ST. KITTS, W. I.

OUR REF: SN/BA2.....

YOUR REF: .....

17th May, ..... 1988

*21 June 1988*

*cont -  
FWD Chubb*

USAID Barbados  
P.O. Box 302  
Bridgetown  
Barbados.

For the attention of Mr. James Baird

Dear Sirs,

SLP Road Project No. 538-0138.01

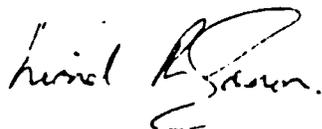
Request for additional funds for SLP Area development Project

*06/09/88  
NAN  
05/17/86  
JTB  
08/27/88*

The Government of St. Kitts-Nevis formally requests USAID to provide an additional \$1.0 million in loan funds to cover the cost of work resulting from design modifications described in the attachments to our letter of March 4, 1988, including the soil erosion control programme.

We intend to amend Redondos construction contract to incorporate the additional clearing and grubbing and unclassified execution resulting from the design changes. The soil erosion control programme will be carried out under local contracts with the SLP Land Development and Conservation Board

Yours faithfully



Lionel R. Gannon  
Superintendent Public Works

LRC/16

cc. Resident Engineer, Hans/Eines Associates  
Director Planning Unit

*qtd*