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PROJECT ASSISTANCE COMPLETION REPORT

FOR THE

ENERGY SECTOR ASSISTANCE PROJECT
WATER COMPONENT

JUNE 1989

PROJECT NO.: 532-0065
LOAN NO.: 532-W-016A

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Project Assistance Completion Report

Project No. 532-0065; Loan No. 532-W-016A

PROAG No. 532-W-016 & 016A

I. BACKGROUND

The Energy Sector Assistance Project (ESAP), initiated in September 1981, was directed toward reducing Jamaica's dependence on imported energy. At the time, Jamaica's oil imports accounted for about one third of its import costs. The Project consisted of "strengthening the institutional capacity of the Government of Jamaica to plan and manage energy programs, expand and improve its energy conservation program and institute programs in alternative energy."

The Project consisted of two phases: Phase I was directed toward the Public Sector while Phase II was directed toward the Private Sector. Phase II consisted of an Energy Credit Fund (ECF) which provided loans administered through local commercial banks for private sector entities to improve their energy efficiencies. The ECF was less than a full success due to ECF loans carrying a substantially lower interest rate than regular commercial loans favored by the banks. As a result, by the end of the 5 year project, less than 10% of the ECF had been committed.

II. MODIFIED PROJECT

In September 1986, the Project was modified to direct the remaining funds toward energy-related water supply and sewerage subprojects that could qualify under the original authorization of funds. Energy auditing under the Project had indicated a high potential for future energy savings by introducing efficiencies to existing water supply schemes and by extension, energy efficiencies could be introduced to planned improvements and expansions of water supply and sewerage systems. This concept for use of the remaining funds thus became the basis for the Modified Project. The subprojects that were developed under the Modified Project were initiated under Fixed Amount Reimbursement Agreement (FARA) arrangements as follows:

<u>Subproject No.</u>	<u>Title</u>	<u>Implementing Agency *</u>	<u>Total Cost (US\$)</u>
FARA 87-1	Eastern St. Thomas	NWC	1,651,000
FARA 87-2	Tulloch Springs	NWC	380,600
FARA 87-3	Lucea-Negril	NWC	1,069,160
FARA 88-1	Negril-Logwood	CECL	83,487
FARA 88-2	Negril Sewerage	NWC	116,139
FARA 88-3	Ocho Rios Sewerage	NWC	81,818
FARA 88-4	Ocho Rios Water	PCJ Engr.	641,804
FARA 88-5	Bulk Flow Meters	NWC	<u>110,000</u>
			4,134,008

A detailed account of the financial status is presented in Section III.

* NWC = National Water Commission; CECL = Carib Engineering Corporation; PCJ Engr. = Petroleum Corporation of Jamaica Engineering

The 3-party FAR Agreements were signed among the Implementing Agencies indicated above, the Ministry of Mining, Energy and Tourism (MMET) and the United States Agency for International Development (USAID).

These projects would save an estimated US\$733,350 per year in energy costs indicating an average payback period of less than 4 years. They also represented 23.28 million gallons per day of new water capacity or enhanced delivery of existing capacity.

A. FARA 87-1

FARA 87-1 was signed on October 1, 1987 initiating the Eastern St. Thomas Water Supply Project. Completion date for this activity was originally set for February 29, 1988 but was further revised to December 12, 1988.

(i) Description:

The work involved improvement to the existing Eastern St. Thomas water supply system. Three contracts were negotiated to perform the tasks which included the supply of Pipes and Fittings Schedule 100 - 12" Diameter DI Pipes.

Contract C1 - 12" Dia D.I. main, Source Development and Pumping Station inclusive of contract drawings

Contract C2 - 8" & 6" Water Main together with the contract drawings.

Contract C3 - Supply and erect 0.5 mg Reservoir together with drawings.

- (a) Acquisition of the existing spring source at Bachelor's Hall with improvement work to protect against pollution, installation of duty and standby pumping equipment including switchgear and gas chlorination equipment.
- (b) Installation of approximately 17,100 ft. of 12" dia. rising trunk transmission main from the spring to the Pleasant Hill Reservoir.
- (c) Construction of a 0.5 million imperial gallon reservoir at Pleasant Hill at approximate elevation 265 ft. amsl.
- (d) Installation of approximately 7,700 ft. of 8" dia. trunk main from the reservoir to Golden Grove to connect to the existing 4" dia. AC main leading to Duckenfield.
- (e) Installation of approximately 7,300 ft. of 6" dia. trunk main from the 12" rising main to Airy Mount to connect into existing 6" dia./4" dia. line to Bowden Wharf.

- (f) The incorporation of the existing Phillipsfield well into the existing Old Pera/Barking Lodge and Springfield systems using approximately 9,000 ft. of 2" dia. pipework.

(ii) Details of Improvement:

Batchelor's Hall Source Works: The existing source works currently used for irrigation purposes was upgraded by the installation of two (2) identical duty and standby pump and motor units with an operational duty point of 630 gpm at a total delivery head of 245 ft. The pumps can now supply water directly to the storage reservoir through some 17,100 ft. of 12" nominal diameter rising main.

The installation of electrical switchgear consisting of a motor control center for the two pump motors and the installation of cylinder mounted gas chlorination equipment were also included in these improvements.

Trunk Transmission Mains: The transmission main from the spring source pumping station was a 12" nominal diameter ductile iron pipe laid generally at a 30" minimum cover below ground to the proposed Pleasant Hill reservoir.

From the reservoir an 8" dia. trunk main was installed to Golden Grove to interconnect to the existing 4" dia. AC main leading to Duckenfield.

A 6" dia. trunk main was laid from the 12" dia. rising main at Pleasant Hill to Airy Mount to interconnect with the existing 6" dia./4" dia. raw water main to Bowden Wharf.

Reservoir: The reservoir is a factory galvanized bolted steel tank complying with AWWA D103-80. It is erected on a bitumen stabilised sand bed and anchored to a reinforced concrete ring beam.

The 500,000 imperial gallon tank is approximately 66 ft. in diameter and 24 ft. high and is equipped with an 8" double acting altitude valve controlled inlet/outlet, a 12" dia. weir controlled "overflow" (and washout).

Construction under this FARA was proceeding as planned until the passage of the hurricane. The transmission pipeline constructed under Contract #C1 suffered major damages as the Plantain Garden River shifted its course some 150 ft. west dislodging in the process a section of the pipeline.

This section had to be rebuilt as soon as the river flows subsided sufficiently to permit work to commence. Also, much of the temporary reinstatement of this line suffered severe scouring necessitating a repeat of the backfill and compaction of the pipetrench along sections of the pipeline. Completion of the source and the control building was also affected as a tributary of the river broke its banks demolishing the incomplete structures and depositing silt and debris over the site.

The completion date had to be further extended to December 12, 1988 to accommodate remedial works to be done.

(iii) Results:

Reservoir site at Pleasant Hill - A 0.5 million Imperial gallon reservoir was constructed. The reservoir was filled with water and tested. Upon inspection, it was found to be totally devoid of leaks and all the pipework associated with the bolted steel tank was in place.

The spring source/pumping station, along the route traversed by the 12" 0 transmission main: No visible leaks were detected along the route and all valve chambers were completed. All works as specified were in place and fully functional.

Piped water supply was now available to people who were only partially served by trucked water supplies or not served at all - in addition to improved supply to those previously served.

B. FARA 87-2

FARA 87-2 was signed on October 1, 1987 initiating the Tulloch Springs Water Supply Improvement Project. Completion date for this activity was set for January 31, 1988 but was further revised to December 12, 1988.

(i) Description:

The proposed works consisted of improvements to the Rio Cobre Pipeline Water Supply System to enable pumping from the augmentation wells directly into the trunk main. The previous facilities in use supplied 7-8 MGD to the Corporate area, although the system was designed for a maximum flow of 13.5 MGD. The activities involved:

- (a) Upgrading the four upper Rio Cobre basin augmentation wells by replacing the existing deep well pump sets with units sized to match the expected pressure heads.

- (b) Tying the augmentation well line directly into the Tulloch Springs discharge line to preclude double pumping.
- (c) Upgrading the Tulloch Springs pump station by installing 2 fixed speed motors, replacing a motor control center and doing minor maintenance repairs.
- (d) Replacing all inoperable metering devices so that flows can be determined to optimize the operation of the system.
- (e) Interchanging pumps E and H.

(ii) Details of Improvement:

- (a) Augmentation Wells Upgrading The existing four augmentation wells 1, 2, 3 and 4 had their pumps and motors upgraded.

Augmentation Well # 1 The pump and motor unit installed has an operational duty point of 850 USgpm at a total delivery head of 180 ft. The motor was a 50 HP 1460 rpm for outdoor 415 volts 50 hertz operation. Replacement of missing electrical components from its motor control centre has been accomplished.

Augmentation Well # 2 and # 4 Installation of two (2) pump and motor units replaced the previously existing units. The new system now has an operational duty point of 2500 USgpm at a total delivery head of 160 ft. The motors were 125 HP each 1460 rpm for outdoor 415 volts 50 hertz operation.

Augmentation Well # 3 The new pump and motor unit installed consists of a pump with an operational duty point of 1250 USgpm at a total delivery head of 210 ft. The motor is a 100 HP 1460 rpm unit for outdoor 415 volts 50 hertz operation. A new motor control center and circuit breaker has been installed.

- (b) Tie-In of Augmentation Line

This involved the connection of the 600 mm ductile iron augmentation line directly to the existing 24' dia. Tulloch Spring discharge line. The augmentation well line is now isolated from the Tulloch Spring sump by the installation of a 24" dia. mechanical joint butterfly valve. To prevent back pressure into the well line when Tulloch Springs is running and the well pumps are idle, a 24" dia. flanged check valve

was installed. The supply and installation of fittings to implement the works constituted the remainder of the tie-in of the augmentation line.

(c) Upgrade Tulloch Springs Pump Station

The Tulloch Springs pumping station upgrading work consisted of replacing the two (2) variable speed motors with two fixed speed 200 hp motors. Installation of 2 sump pumps, one to deliver 3 gpm at 30 TDH at the Tulloch Spring pump station and the other of 1.5 gmp at 15 TDH in the primary measuring chamber was carried out. The remainder of the works consisted of re-anchoring the upper support for the pump shafts and pillow-block bearing and the installation of a new motor control center and gauges.

(d) Replacement of Inoperable Metering Devices

Due to the prior unavailability of accurate flow data from the existing system at Tulloch Springs and the wells, the flow rates are now monitored by the installation of propeller meters, electronic pulse signal transmitter, analog flow rate indicator and totaliser for remote application.

(e) Interchange Well E and H

This work consisted of interchanging the existing pumps E and H at the lower source works in order to get the correct pumping units in the right location. This was later deleted from the project as not cost-effective. The securing of the existing facilities was done by the installation of grill work and padlocks on all windows and doors at the well installations.

(iii) Results:

(a) Augmentation Well #1 The pump and motor unit were installed and the existing motor control center upgraded.

Augmentation Well #3 The new pump, motor unit, motor control center and circuit breaker were all installed and fully functioning.

Augmentation Well Nos. 2 and 4 The installation of two (2) pumps and motor units was completed.

(b) Tie-In of Augmentation Line

The tie-in has been effected in the valve chamber constructed for the purpose. The installation of the 600 mm ductile iron augmentation line was also completed.

(c) Upgrade Tulloch Spring Pump Station

Extent of Upgrading

- i) Installation of three fixed speed 200HP motors
- ii) Installation of two sump pumps
- iii) Replacement of three sets of shafting
- iv) Replacement of support system for the shafts and walkways
- v) Replacement of motor control center and gauges

The upgrading works which consisted of replacing the existing pumps (3 No.), installation of 2 sump pumps and the re-anchoring of the upper support for the pump and the Pillow-Block Bearing were all completed.

(d) Replacement of Inoperable Metering Devices

Meters at all stations i.e., Tulloch Spring, the four augmentation Wells and the headworks wells were all replaced.

The propeller meters at Tulloch Springs and the various well sites were all installed and functioning. The analog flow rate indicator and totaliser were installed.

(e) Interchange Well E & H

This aspect of the FAR Agreement was not carried out because there was no pump nor switchgear at Well E. In fact the pump at Well E has been removed and the switchgear has been vandalized. It would have been to the disadvantage of the system to interrupt the service of a productive well and to leave both wells inoperative.

All stations have been secured with:

- a) steel doors
- b) grills on windows and doors
- c) padlocks
- d) chainlink fencing.

The work as outlined in the FARA except for the deleted interchange was done. This has resulted in improved water supply to the section of the urban areas of Kingston and Portmore served by the Rio Cobre system and significant improvement on the original energy consumption.

C. FARA 87-3

FARA 87-3 was signed on December 4, 1987 initiating the Lucea-Negril Water Supply Transmission Main. Completion date for this Project was March 31, 1988.

(i) Description:

This project represented the second stage of an overall development program undertaken by Carib Engineering Corporation Ltd for the GOJ to improve the water supply to the general Lucea-Negril area in Western Jamaica, one of the major tourist destinations on the island. This FARA was to help finance the cost of the 18" diameter pipeline from the Logwood Treatment Plant to Orange Bay and the pumping systems for raw water and treated water. The pumps are the primary basis for the projected energy savings.

The Lucea-Negril Water Supply Phase II Improvement Project comprised the supply of materials and construction complete of an 18" nominal diameter trunk transmission main in ductile iron pipe and fittings, from the Logwood Treatment Plant to the existing 12" nominal diameter trunk distribution mains at Orange Bay over a distance of some 11,000 feet.

This FARA was amended to include the installation of new pressure filters. This resulted in an increase in the funding from US\$354,600 to US\$553,760.

Included in the upgrading is the installation of a parallel distribution line from the plant to the Negril-Green Island main road at Orange Bay. The supply source had enough water to provide the additional volume; however, to ensure that this remains that way, two wells were drilled in the vicinity of the source to stave depletion.

(ii) Details of Improvement:

Activities involved improvement to the Lucea-Negril water supply system as follows:

- (a) Expansion of the Logwood Treatment Plant increasing its capacity by one million imperial gallons per day.
- (b) Installation of approximately 11,000 linear feet of 18" diameter ductile iron pipe and fittings to connect the Logwood Treatment Plant to the existing distribution main at Orange Bay.

(iii) Results:

Installation of approximately 11,000 linear feet of 18" diameter ductile iron pipe and fittings to connect the Logwood Treatment Plant to the existing distribution main at Orange Bay was completed and commissioned in July 1988. This resulted in the provision of an additional 1 mgd to the designated areas in particular the tourist area of Negril.

D. FARA 88-1

FARA 88-1 was signed on May 13, 1988 initiating the Preliminary Engineering & Feasibility Study for the Negril-Logwood Water Treatment Plant. This study was to be submitted by June 30, 1988, but was extended to July 15, 1988.

(i) Description:

The study would serve as a reference for an energy related project for the Negril Water Supply Scheme to upgrade the Logwood Water Treatment Plant, the Distribution System and institute a Water Loss Management Programme. The detailed Terms of Reference addressed the design and implementation of upgrading to the Logwood Water Treatment Plant and Negril Distribution System. It also addressed the design and implementation of a Water Loss Management Programme for the Negril Service Area.

The engineering study involved the preparation of preliminary designs and cost estimates for improvements to the Logwood Water Treatment Plant and the Negril Water Distribution System, and the definition of a system of water loss management. It included:

- (a) Preparation of preliminary designs and cost estimates for upgrading the Logwood Water Treatment Plant to improve product quantity and quality and to reduce energy related operating costs;
- (b) Preparation of preliminary designs and cost estimates for improvements to the Negril Water Distribution System; and
- (c) Preparation of preliminary designs and cost estimates for a Water Loss Management Programme in the Lucea-Negril service area.

Earle & Associates, a local Consulting Engineering firm, was awarded the contract to work on behalf of CECL. Camp Dresser & McKee International Inc. was a subcontractor of E&A who performed consulting services on the Negril Water Supply project.

(ii) Details of Improvement:

1. Logwood Water Treatment Plant

- (a) Intake Works: Evaluate and prepare preliminary engineering designs and cost estimates for a suitable intake facility to abstract the established yield of the Patterson Blue Hole and provide a supply of the best quality of raw water available to the treatment works. The facility should be protected against flooding and inundation known to occur in the area.
- (b) Clarification: Evaluate the existing facility at the Logwood Water Treatment Plant for clarification of raw water, evaluate the need for specific clarification process on the basis of assessed raw water quality parameters and, as appropriate, develop preliminary designs based on least cost energy efficient solutions for renovating the existing equipment or providing new clarification facilities for the plant. The assessment should include inspection and recommendations with regard to the chemical dosing equipment for alum and chlorine.
- The clarification process proposed should be consistent with the technical capability of the available operating staff. In general, a unit process with limited amounts of mechanical moving parts is preferred.
- (c) Filtration: Evaluate the existing facility at the Logwood Water Treatment Plant for filtration of clarified water, and develop preliminary designs and cost estimates based on least cost energy efficient solutions for rehabilitating and/or expanding the capacity of the existing filter facilities. The proposed filtration system should be simple to operate and monitor and should have a low maintenance requirement within the capacity of the available work force.
- (d) Disinfection: Review the existing provision at the plant for disinfection including the available treated water storage and prepare preliminary designs and cost estimates to ensure that adequate equipment for chlorination is identified and plant storage of treated water provides the necessary chlorine contact time prior to distribution.
- (e) High Lift Pumping: Evaluate the existing high lift pumping equipment at the Logwood Water Treatment Plant to determine:
- the optimum pumping requirements;
 - the efficiency of the units;
 - the serviceability of the units; and
 - the opportunity cost in replacing the units with more efficient pumps and motors.

2. The Distribution System

- (a) Definition of Lucea-Negril Supply Area: Define the Lucea-Negril Water Supply Area on a map at a minimum scale of 1:50000, demarking urban and rural districts with the closest available contour intervals.
- (b) System Mapping: Develop distribution schematic drawings based on the largest scale available for the area, updated to reflect current information.
- (c) Source and Distribution System Assessment: Review data collected from existing installed source meters and determine equipment necessary for assessing unmetered sources based on characteristic curves, instantaneous flow measurements and pressure readings.

Carry out simultaneous pressure and flow assessment of major distribution pipes to establish pipe characteristics. In collaboration with the NWC, carry out inspections, coordinate the NWC's construction of test holes and tapings necessary to facilitate the data collection exercise. If and where necessary, carry out leakage and pressure tests on water mains in the study area to determine pipe integrity and facilitate the estimation of net water loss and loss due to leakage.

- (d) Demand Estimation and Projections: Develop current and projected demands over a study period to the year 2007 (with, however, particular reference to the year 1997) based on collated information on population, development plans, metering data and general water consumption estimates considered appropriate for the area based on the above and experience from elsewhere.
- (e) Hydraulic Distribution System Model: Develop a distribution system model and its coarse calibration based on information collected and collated.
- (f) Design Study: Prepare preliminary design of a future system based on simulations of the projected demands imposed on various upgradings to the existing distribution network.

3. Water Loss Management Program

- (a) Existing Data: Update and evaluate existing data on sources, distribution system details, water sold or accounted for, estimates for water loss in the system and unit production costs for the various sources.

- (b) Procurement of Equipment: Advise on the procurement of equipment for determining production levels and water loss at leaks, the location of leaks and materials for repairs.
- (c) Methodology: Define a general programme and methodology appropriate (for implementation under a future assignment) to complete detailed system mapping, to locate leaks, plan and supervise repairs and assess benefits in terms of reduced water loss, leak detection program costs and energy savings.

(iii) Results:

The scope of work was performed and the report was submitted by CECL. This report has provided the preliminary technical data required for the proposed expansion of the existing water supply system in the Lucea/Negril area.

E. FARA 88-2

FARA 88-2 was signed on May 19, 1988 initiating the Preliminary Engineering & Feasibility Study (Negril Sewerage) in the Negril area. This study was to be submitted by June 30, 1988, but was extended to December 12, 1988.

(i) Description:

The study involved the investigations pursuant to feasibility determinations and preliminary designs and cost estimates to design and construct a sewage scheme in the Negril area. It covered:

- (a) the review, evaluation and updating of existing data and pre-design parameters;
- (b) the initiation and supervision of limited field investigations necessary to assist in establishing the feasibility of the Project and for providing information needed for design;
- (c) preliminary engineering design;
- (d) economic and financial analysis; and
- (e) preliminary engineering and feasibility report.

(ii) Results:

The first edition of the Preliminary Engineering and Feasibility Study Report of Primary Study Outputs was submitted prior to November 10, 1988, followed by the Final Edition. The Final Report submitted by James M. Montgomery and Association on January 30, 1989 has been reviewed and found acceptable.

The Report serves the purpose of supporting an application to lending agencies for funds to finance final design and construction.

F. FARA 88-3

FARA 88-3 was signed on May 19, 1988 initiating the Preliminary Engineering & Feasibility Study (Ocho Rios Sewerage) in the Ocho Rios area. This study was due June 30, 1988, but was extended to December 12, 1988.

(i) Description:

This engineering study, carried out by Wallace Evans & Partners, a local Consulting Engineering firm for the NWC, involved the preparation of preliminary designs and cost estimates for wastewater collection, treatment and disposal in the Ocho Rios Area.

(ii) Scope of Work:

1. The Scope of Work involved complete engineering analysis of existing facilities and future requirements, including population projections through the year 2008 for the study area. Soils investigations and aerial photography were a part of the scope of work.
2. Preliminary designs and equipment outline specifications were based on energy efficient criteria for both system characteristics and operation.
3. Preliminary designs made compatible with sound environmental principles pursuant to minimizing any significant potential adverse impacts both during construction and operational life of the project.

(iii) Results:

Scope of work was performed and the Report was submitted by NWC.

G. FARA 88-4

FARA 88-4 was signed on June 27, 1988 initiating the Ocho Rios/St. Ann's Bay Water Supply Scheme. Completion date for this was September 30, 1988.

(i) Description:

The main objective of the project was to provide a reliable and safe water supply to the Ocho Rios/St. Ann's Bay area through the next ten years. It was also to provide water to the surrounding regions of St. Mary Parish and Discovery Bay.

Implementing agency for this study was the Petroleum Corporation of Jamaica Engineering subsidiary (PCJ Engr.). The engineering study involved the investigations, analyses and preparation of engineering designs, cost estimates and tender documents for a two-phased improvement scheme that would expand the service, by the addition of approximately 12 million gallons per day of treated water supply, and to integrate the existing water supply, treatment and distribution systems serving Ocho Rios, St. Ann's Bay and their environs. Phase I covered facilities to expand the service to Ocho Rios and Phase II further expanded the service to the balance of the Project service area.

(ii) Scope of Work:

1. The work included surveys, geotechnical and hydrological investigations, aerial photography, architectural work and all other activities associated with it.
2. Design and choice of project facilities, specifications for pumps and other equipment, and proposed operations of completed works were based on energy efficiency criteria pursuant to minimizing recurrent costs while maintaining optimal operational characteristics of the system as a whole.
3. Designs made compatible with sound environmental principles pursuant to minimizing any significant potential adverse impacts both during construction and the operational life of the project.

4. A report containing the preliminary design of the proposed improvements, including outline specifications and cost estimates of the two phases as separate construction undertakings, were submitted. Data for Phase II is to be in sufficient detail to support an application for funding from an international lending agency. A final report including final designs and tender documents were to be submitted by September 30, 1988.

(iii) Results:

The scope of work was performed and the Report was submitted by PCJ Engineering. All design decisions in the proposal were based on energy efficiency as a necessary criteria. Choice of treatment plant process and site were heavily weighted in favor of gravity systems in carrying out feasibility studies of alternative designs.

H. FARA 88-5

FARA 88-5 was signed on July 25, 1988 providing funding for purchase of Bulk Flow Meters for the water supply systems in Jamaica. Completion date for purchase and contract awards for installation of these meters was September 30, 1988.

(i) Description:

The activities covered by this FARA involved procurement and contracting for installation of Bulk Flow Measuring devices and related instrumentation at 22 locations of existing water supply systems throughout Jamaica, pursuant to improving energy efficiency in operation of the systems. The imported materials and equipment were procured and delivered to the NWC warehouse and three signed contract documents for the installation of the measuring devices were presented to USAID.

(ii) Scope of Work:

1. Procurement of imported materials and equipment as follows:
 - a) 1 Portable flow measuring instrument;
 - b) 24 mechanical flow meters ranging in nominal size from 6" to 14";
 - c) 10 secondary flowmetering devices for indicating, recording and totalizing;
 - d) 1 lot of accessory pipe and fittings;
2. Award of construction contracts for the installation of metering equipment financed hereunder.

(iii) Results:

The meters were supplied and installed to provide accurate flow rates and amount of water supplied by the respective facilities. They were supplied by Rockwell International.

III. FINANCIAL STATEMENT

A. FARA 87-1

Fixed Amount: \$1,485,900 (USAID contribution)
GOJ Contribution: 165,100
Total Amount: \$1,651,000

25% of Amt. payable in U.S. dollars
to buy materials through L/Coms.: \$ 371,475.00

Disbursements:

U.S. Pipe & Foundry	L/COM 016A-J-15	239,419.20
Industrial & Municipal Supplies Inc.	-J-14	26,952.67
Peabody TecTank, Inc.	-J-16	<u>105,000.00</u>
		\$ 371,371.87

Reimbursed to NWC upon completion \$1,114,528.13

B. FARA 87-2

Fixed Amount: \$342,500 (USAID contribution)
GOJ Contribution: 38,100
Total Amount: \$380,600

25% of Amt. payable in U.S. dollars
to buy materials through L/Coms.: \$ 80,574.90

Disbursements:

Layne & Bowler Inc.	L/COM 016C-J-17	80,514.90
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Reimbursed to NWC upon completion \$ 261,985.10

C. FARA 87-3

Fixed Amount: \$ 553,760 (USAID contribution)
GOJ Contribution: 515,400
Total Amount: \$1,069,160

25% of Amt. payable in U.S. dollars
to buy materials through L/Coms.: \$ 329,339.31

Disbursements: (Ductile Iron Pipe & Fittings)

U.S. Pipe & Foundry Co.	L/COM 016-J-12	312,194.12
Industrial & Municipal Supplies Inc.	-J-13	<u>17,145.19</u>
		329,339.31

Reimbursed to NWC 224,420.69

<u>Subproject</u>	<u>Title</u>	<u>Implementing Agency</u>			<u>Total Cost (US\$)</u>
			<u>USAID</u>	<u>GOJ</u>	
FARA 87-1	Eastern St. Thomas	NWC	1,485,900	165,100	1,651,000
FARA 87-2	Tulloch Springs	NWC	342,500	38,100	380,600
FARA 87-3	Lucea-Negril	NWC	553,760	515,400	1,069,160
FARA 88-1	Negril-Logwood	CECL	78,000	5,487	83,487
FARA 88-2	Negril Sewerage	NWC	106,000	10,139	116,139
FARA 88-3	Ocho Rios Sewerage	NWC	75,000	6,818	81,818
FARA 88-4	Ocho Rios Water	PCJ Engr.	250,000	391,804	641,804
FARA 88-5	Bulk Flow Meters	NWC	54,000	56,000	110,000
			<u>2,945,160</u>	<u>1,188,848</u>	<u>4,134,008</u>

IV. CONCLUSIONS

A. Modification of the Project to accommodate an appropriate use of residual funds was an efficacious furtherance of the original objectives of the Project which provided the additional benefit of over 23 million gallons per day of new capacity or enhanced delivery of existing capacity.

B. Handbooks 1B Chapter 20 and Handbook 3, Appendix 3J which contain the policy and guidance respectively on the use of the Fixed Amount Reimbursement method of financing allow some flexibility in the use of the FAR method. The innovations used in application of the FAR method for this project enabled expeditious and relatively trouble free implementation of the FAR subprojects.

C. The Modified Project represents a continuation of a pioneering use of the FAR method for this Mission which has subsequently been used where appropriate and serves as an example of the possibilities for future use.