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DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

MINISTRY OF LANDS, IRRIGATION AND MAHAWELI DEVELOPMENT

END OF TOUR REPORT

C.F. LEONHARDT
OPERATIONS & MAINTENANCE ENGINEER
POLONNARUWA RANGE
15 AUGUST 1987 – 17 FEBRUARY 1991

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END OF TOUR REPORT
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16 AUGUST 1987 TO 17 FEBRUARY 1991

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CHAPTER I

SCOPE OF WORK ASSIGNMENT

The work to be accomplished by the Operation and Maintenance Engineer under the ISMP is divided into three major tasks, as coutlined in the Project Paper, namely:

A. REHABILITATION OF THE IRRIGATION SYSTEMS

This involves assisting the Irrigation Department in survey, mapping design and construction / rehabilitation of the four irrigation systems in the Polonnaruwa District and the Gal Oya Right Bank systems in Ampara District. Providing guidance in monitoring construction to assure quality, determine appropriate site changes and certify completion of project rehabilitation work.

B. DEVELOPMENT OF A PREVENTATIVE MAINTENANCE PROGRAM

This involves assistance in the development and implementation of annual maintenance plans and the preparation of a preventive maintenance program for the irrigation osystems in the Polonnaruwa District and the Gal Oya Right Bank system of the Ampara District; also preparation of a Preventive Maintenance Program for the Gal Oya Left Bank System of the Ampara District.

C. IMPROVEMENTS TO IRRIGATION SYSTEM OPERATION

This involves assistance in the training of Irrigation Department staff in the development of a water management program which will enable the staff of all the Schemes within the ISMP area to carry out operations plans and programs in Polonnaruwa, Kurunegala and Ampara Ranges.

The details of each of the above three tasks as outlined in the Project Paper, is presented under Exhibit I-1.

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SCOPE OF WORK

OPERATIONS AND MAINTENANCE ENGINEER

1. REHABILITATION OF THE IRRIGATION SYSTEM

- Assist the Irrigation Department in survey, mapping, design and construction of the rehabilitation of the four irrigation systems in the Polonnaruwa District and the Gal Oya Right Bank Systems.

  - Recommend additional mapping requirements,if any, necessary for the rehabilitation.

  - Based on the information collected in the Diagnostic Analysis studies, other Baseline data collection activities, past rehabilitation experience in Sri Lanka and Irrigation Department data, work with ID to determine appropriate modifications to the main system design, sizing of canals, suitable locations of appropriate measuring structures, checks, drops, drains, etc.

  - Periodically review cost data and forecast costs of the Essential Structural Improvements (ESI) rehabilitation program for the four irrigation systems in the Polonnaruwa District and of the Pragmatic Rehabilitation (PR) program for the Gal Oya Right Bank.

  - Recommend appropriate system modifications at the field channel level, including design of measuring structures, farm outlets, extension of canal network to include de facto water users, drainage reuse areas, etc.

  - Oversee and develop a reporting format to report progress on designs. Review and recommend for approval all design drawings and documents and all as-built drawings.

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Provide guidance and monitor construction work to assure quality, determine appropriate site changes, and certify completion of project rehabilitation work.

- Ensure that construction is completed according to approved designs and specifications

- Develop in association with ID, methods of progress monitoring.

- Develop in association with the ID methods of monitoring for cost control.

- Develop and work with training staff to present courses for construction supervision and quality control personnel.

- Assist in identifying sub projects for fixed amount reimbursement.

- Recommend completed sub projects for USAID reimbursement.

- Recommend and promote efficient utilization of equipment. assist in planning the equipment utilization, operation and maintenance.

- Prepare and periodically revise construction progress charts.

2. DEVELOPMENT OF A PREVENTATIVE MAINTENANCE PROGRAM

- Assist with the development and implementation of annual Maintenance Plans and the preparation of a Preventive maintenance program for sustained renewal in the four Polonnaruwa District Systems, the Gal Oya Right Bank system, (or other system to be identified) and the Ridi Bendi Ela system.

  - Examine present maintenance procedures and identify Weaknesses and propose appropriate changes. Recommend staffing levels, schedules, procedures, equipment, etc., necessary for carrying out maintenance surveys and maintenance plans based on priority maintenance needs.

  - Develop and work with training staff to present courses on maintenance.

  - Review existing O&M manuals and prepare and updated maintenance manual specifically for use in the implementation of the preventive maintenance program for each of the schemes.

  - Prepare a report which summarizes the experience of the Maintenance Program, analyzes the progress under the program and makes recommendations for implementing the Preventive Maintenance program in each scheme.

- Assist with the development and implementation of and Annual Preventive Maintenance programs in the Gal Oya Left Bank system or other system to be identified.

  - Examine present maintenance procedures and identify weaknesses and propose appropriate changes. Recommend staff levels. schedules of maintenance, procedures, equipment, etc., necessary for carrying out the Preventive Maintenance Program.

  - Develop and implement refinements to the GSL annual budgeting procedures for the Irrigation Department and procedures which utilize supplemental GSL and USAID maintenance funds.

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- Prepare a Preventive Maintenance Manual and work with training staff to train field staff on the implementation of the Preventive Maintenance Program. Refine and update the manual as appropriate.

- Prepare a report which summarizes the experience of the Preventive Maintenance Program, analyzes the progress under the program and makes recommendations for implementing the Preventive Maintenance Program on a wider basis.

3. IMPROVEMENTS TO IRRIGATION SYSTEMS OPERATION

- Assist with and train staff in the development of a Water Management Improvement Program in the Gal Oya Right bank system, (or other system to be identified) the four Polonnaruwa District systems and the Ridi Bendi Ela system. Develop training programs, materials, etc., which enable staff to effectively carry out the program.

  - Assist with the development of discharge ratings and calibration for control and measurement structures.

  - Assist with the measurement of losses in the conveyance, distribution and on-farm systems.

  - Conduct on-farm studies to determine water requirements and appropriate irrigation practices for paddy and other crops.

  - Analyze the data, make recommendations for improvements in operating procedures and on-farm practices, and prepare a report which includes the findings and recommendations.

  - Assist in the preparation of seasonal reports on water issues.

- Develop and assist in the implementation of a computerized weekly operations model for the Gal Oya Right Bank, (or other system to be identified), the four Polonnaruwa District systems and the Ridi Bendi Ela system.

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- Develop a computer model for scheduling and recording water releases for each system which takes into account soil properties, cropping patterns, system losses, rainfall, etc. Prepare a document which describes and explains the usage of the computer model.

- Work with training staff to train personnel to utilize the model for operations and prepare seasonal water usage reports.

- Develop and assist in the implementation of a computerized daily operations model for the Gal Oya Left Bank system, (or other system to be identified), which takes into account soil properties, cropping patterns, system losses, rainfall, hydraulic transients, etc.

  - Develop and prepare documentation for the model.

  - Work with training staff to train personnel to use the model and prepare seasonal water usage reports.

CHAPTER II

STATUS OF O&M COMPONENTS AS OF 16 AUGUST 1987

FOREWORD

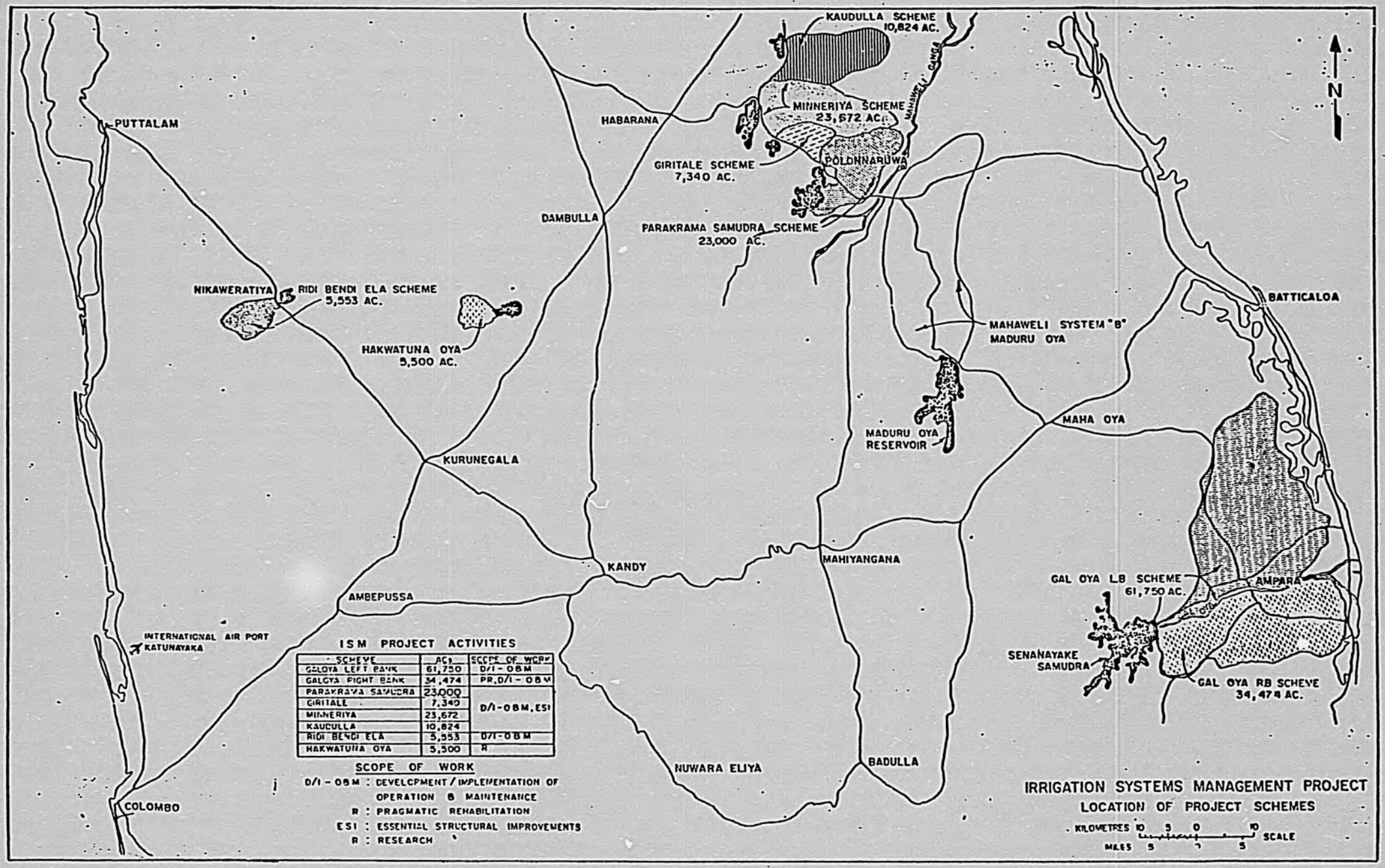
Irrigation Systems Management Project (ISMP) constitutes the second phase of USAID assistance for improving water management in Sri Lanka. The first phase of this program was completed with the Gal Oya Water Management Project which was implemented from 1979 - 1985.

The basic rationale for ISMP is that improvements in Water Management and in the Operation and Maintenance (O&M) of existing irrigation systems are essential for achieving increased agricultural production and thereby increased farmer incomes for overall upliftment of the rural agricultural sector in the Country.

The project sites for the implementation of ISMP consist of Parakrama Samudra, Giritale, Minneriya and Kaudulla Schemes in Polonnaruwa District, Right Bank and Left Bank of Gal Oya in Ampara District, and the Ridi Bendi Ela Scheme in the Kurunegala District. The total extent covered including additional encroachment acreage will be approximately 174,550 acres. The map showing the location of the above Irrigation Schemes in the Project are given as Exhibit II-1-1

ISMP originally consisted of Seven Major Project Components namely; (1) Farmer Organization Development; (2) O&M Improvements; (3) Financial Management Improvements; (4) Monitoring, Evaluation and FeedBack; (5) Training Capacity Enhancement (6) Research and (7)Commodity Procurement. After the Project was under way, another Component was added, namely Crop Diversification.

When the O&M Engineer arrived in Sri lanka on 16 August 1987, the Project was well underway in the Polonnaruwa Range. Originally it was planned for the Technical Assistance Team (TA) to arrive on April 15, 1987 or four months earlier than actually occurred. By the time the TA Team arrived, the surveys, planning and designs for the Main and Branch Canals, planned for rehabilitation in the 1987 construction season (August to October), had already been completed. This work was done between late 1986 and early 1987 by the Irrigation Engineers and their Technical Assistant Staff of the Parakrama Samudra, Minneriya, Giritale and Kaudulla Schemes. Contracts had already been awarded and in some cases construction works had already commenced.



SCHEME	ACS	SCOPE OF WORK
GALOYA LEFT BANK	61,750	D/I - O&M
GALOYA RIGHT BANK	34,474	PR, D/I - O&M
PARAKRAMA SAMUDRA	23,000	D/I - O&M, ESI
GIRITALE	7,340	
MINNERIYA	23,672	
KAUDULLA	10,824	
RIDI BENDI ELA	5,553	D/I - O&M
HAKWATUNA OYA	5,500	R

Because of the troubles in the Ampara Range the survey, planning and design for the Pragmatic Rehabilitation (PR) Works on the Gal Oya Right Bank and the Preventative Maintenance (PM) work on the Gal Oya Left Bank had not been completed. Discussions had already undertaken and a decision made made by USAID and IMD/ID to delay the start-up of work in the Ampara Range pending improvement of the situation in the area since little or no field activities could be undertaken at that time. Based upon that decision, no Sheladia Staff were assigned to the Ampara Range at the beginning of the Project.

In the Kurunegala Range, for the Ridi Bendi Ela Scheme in Nikaweratiya Division it was originally planned under the Project Paper only to improve the Irrigation System's Operations by constructing new water measurement structures and to develop a Preventative Maintenance Program for the Scheme. As of 16 August 1987 , when the O&M Engineer arrived, no work had yet been started on the planning and design for improvement to the irrigation systems operations or Preventative Maintenance Program on the Ridi Bendi Ela Scheme.

2.1 REHABILITATION OF THE IRRIGATION SYSTEMS

When the O&M Engineer arrived, the Irrigation Department in the Polonnaruwa Range had already planned and programmed the rehabilitation of the four Schemes in the Range based upon allocations of funds to be assigned to the Range for the rehabilitation works. Table II-2-1 presents the Original LOP ESI Work Program for the Polonnaruwa Range including the Annual Budget allocation. At the time of the preparation of this rehabilitation program, drains had not yet been included.

During the first year of the Project (1987) a total of 53.2 kilometers of Main and Branch Canals were planned for rehabilitation in the four Schemes of the Polonnaruwa Range and a budget of Rs. 22,530,000 was allocated for that work. Table II-2-2, that follows, presents the Rehabilitation Work Program for 1987 in the Polonnaruwa Range.

TABLE II-1-1

ISMP POLONNARUWA RANGE
ORIGINAL LOP REHABILITATION WORK PROGRAM

TYPE OF CANAL	1987 LENGTH (KM)	1987 COST Rsx106	1988 LENGTH (KM)	1988 COST Rsx106	1989 LENGTH (KM)	1989 COST Rsx106	1990 LENGTH (KM)	1990 COST Rsx106	1991 LENGTH (KM)	1991 COST Rsx106	TOTAL LENGTH (KM)	TOTAL COST Rs.x106	COST Rs. PER ACRE
PSS (24,000Ac)													
MAIN	15.24	7.16	2.50	1.18	2.00	0.94	--	--	--	--	19.74	9.28	
BRANCH	5.66	1.98	11.48	5.40	2.96	1.39	--	--	--	--	20.10	8.77	
DISTRIBUTARY	--	--	5.08	1.45	42.00	11.97	46.00	13.11	44.44	12.66	137.52	39.19	
FIELD	--	--	3.62	0.31	70.00	5.95	95.00	8.07	87.95	7.48	256.57	21.81	
SUB TOTAL	20.90	9.14	22.68	8.34	116.96	20.25	141.00	21.18	132.39	20.14	433.93	79.05	3294
GIRITALE (7500Ac)													
MAIN	--	--	1.60	0.62	--	--	--	--	--	--	1.60	0.62	
BRANCH	6.00	2.10	4.70	1.64	--	--	--	--	--	--	10.70	3.74	
DISTRIBUTARY	--	--	1.90	0.53	9.00	2.52	10.00	2.80	9.00	2.52	29.90	8.37	
FIELD	--	--	9.11	0.73	40.00	3.20	40.00	3.20	40.72	3.26	129.83	10.39	
SUB TOTAL	6.00	2.10	17.31	3.52	49.00	5.72	50.00	6.00	49.72	5.78	172.03	23.12	3083
MINNERIYA (22050Ac)													
MAIN	15.00	7.05	--	--	--	--	--	--	--	--	15.00	7.05	
BRANCH	--	--	3.00	1.56	7.00	3.64	7.35	3.82	--	--	17.35	9.02	
DISTRIBUTARY	--	--	10.64	2.66	26.00	6.50	27.00	6.75	26.55	6.64	90.19	22.55	
FIELD	--	--	27.34	1.37	81.00	4.05	82.00	4.10	78.01	3.90	268.35	13.42	
SUB TOTAL	15.00	7.05	40.98	5.59	114.00	14.19	116.35	14.67	104.56	10.54	390.89	52.04	2360
KAUDULLA(12000Ac)													
MAIN	6.37	2.61	0.80	0.33	--	--	--	--	--	--	7.17	2.94	
BRANCH	5.00	1.63	6.13	2.30	8.32	3.11	--	--	--	--	19.45	7.04	
DISTRIBUTARY	--	--	8.26	1.49	16.00	2.88	22.00	3.96	17.30	3.11	63.56	11.44	
FIELD	--	--	27.58	0.69	98.00	2.45	102.00	2.55	89.99	2.25	317.57	7.94	
SUB TOTAL	11.37	4.24	42.77	4.81	122.32	8.44	124.00	6.51	107.29	5.36	407.75	29.36	2447
GRAND TOTAL	53.27	22.53	123.74	22.26	402.28	48.60	431.35	48.36	393.96	41.82	1404.60	183.57	2800

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TABLE II-1-2
1987 REHABILITATION WORK PROGRAM POLONNARUWA RANGE.

SCHEME SUB-PROJECT NO.	DESCRIPTION OF WORK	TOTAL APPROVED COST PIL NO. 5 (Rs.)
PARAKRAMA SAMUDRA		
2	D-1 Main (Km 1+0-5+7)	2,186,194
3	D-1 North (Km 0+0-3+0)	1,410,448
5	D-1 North (Km 4+0-8+0)	1,880,597
7	D-1 East (Km 0+0-3+59)	1,687,836
8	D-1 Main (Km 0+0-4+25)	1,493,843
9	D-1 East (Km 0+59-5+0)	495,672
	Sub-Total Parakrama Samudra	9,154,590
MINNERIYA		
1	Yoda Ela (Km 0+0-5+0)	2,350,746
2	Yoda Ela (Km 5+0-10+0)	2,350,746
3	Yoda Ela (Km 10+0-15+0)	2,350,746
	Sub-Total Minneriya	7,052,238
GIRITALE		
1	RBMC Below Dambalawewa (Km 0+0-6+0)	2,108,955
	Sub-Total Giritale	2,108,955
KAUDULLA		
1	HLMC (Km 0+0-6+55)	2,616,640
2	LLMC (Km 0+0-5+0)	1,626,866
	Sub-Total Kaudulla	4,243,470
	TOTAL POLONNARUWA RANGE	RS. 22,559,253

2.3 DEVELOPMENT OF A PREVENTATIVE MAINTENANCE PROGRAM

Under the ISMP, one of the major aspects of the O&M Component is the development of a Preventative Maintenance Program for the seven Schemes of the Project so that the irrigation systems of those Schemes can be sustained without further need for future major rehabilitation after the Project.

At the beginning of the Project, the maintenance of the irrigation systems were not at the level that the systems. The four Schemes in the Polonnaruwa Range and the Gal Oya Right Bank System in the Ampara Range had deteriorated to the point where they were in a need of rehabilitation. In 1987 one of the major reasons for the state of these Systems was lack of an adequate O&M Budget to maintain the Systems. The 1987 O&M Budget allocation in the Polonnaruwa Range was around Rs. 88 per acre of which about 27% was allocated for Operations, leaving only about Rs. 64/acre for Maintenance. This amount was available for implementation of the Annual Maintenance needs of both the Main System (Headworks, Main and Branch Canals) and the Distributary System (D-Canals only). Based upon average Annual Maintenance Costs developed over the LOP for both Main (Rs. 145)and Distributary System (Rs. 64, with Rs. 146 for F Canals not included) it can be seen that the 1987 Budget Allocation was only 30% of what is needed to sustain and fully maintain a Major Irrigation System in Sri Lanka. The result of this lack of budget was the deterioration of the Systems over a period of time. Because of this situation, the development of a Preventative Maintenance Program was included under the ISMP as a major part of the O&M Component.

The process that was outlined in the Project Paper for developing and then implementing this Preventative Maintenance Program is presented in the following sequence and is internally tied in the rehabilitation program of each Scheme.

- Conduct a Walk-Through Maintenance Survey.
- Develop Annual Priority Rehabilitation Work Plan.
- Implement Annual Priority Rehabilitation Work Plan.
- Develop Annual Maintenance Plans for Completed Priority Rehabilitation Work.
- Develop Annual Maintenance Cost and Budget.
- Develop Preventative Maintenance Program and Implement.

The above sequence of work was to be accomplished each year of the Project on the rehabilitation work schedule for that program year so that by the end of the Project; all rehabilitation works would be have been completed; annual maintenance plans and cost developed for those works; and the Preventative Maintenance Program designed during the LOP would be ready for implementation thereafter.

2.4 IMPROVEMENTS TO IRRIGATION SYSTEMS OPERATIONS

In addition to the Rehabilitation of the Systems and the Development of a Preventative Maintenance Program, the third major effort under the O&M Component is the Improvement to Irrigation Systems Operations.

Improving Systems Operations of the Schemes under the ISMP was envisioned in the Project Paper, because in all of the Systems, with the exception of the Gal Oya Left Bank, no water measurement facilities or programs were being implemented. Therefore, the equitable distribution of water to the Systems and especially to the F-Canals and farmers served by those canals could not be realized.

At the beginning of the Project, in August 1987, no water measurement facilities were available in the four Polonnaruwa Schemes or in the Right Bank of the Gal Oya Scheme. In the Ridi Bendi Ela Scheme in the Kurunegala Range some water measurement structures had been installed during the rehabilitation program under that Scheme from 1978 - 1982. However, only about 25% of the facilities needed were installed at that time and no measurements were being taken on the existing structures in August 1987. Basically, there was no way of accurately determining the amount of water being issued from the sluice structure as the rating curves for these structures were very old and the accuracy in discharge could only be estimated within about 15%. In addition, no measurements were taken along the Main and Branch Canals or of the discharge into each Distributary Canal within the System. Therefore, equitable distribution of irrigation water within these Systems, was not possible at the beginning of the Project. Only in the Gal Oya Left Bank System, which was rehabilitated under the USAID Water Management Project from 1979 to 1984, was a Systems Operation Program being implemented.

On the Gal Oya Left Bank System, water measurement structures and devices were constructed and installed along the Main, Branch and at the offtakes to the D-Canals. Gauges had been installed and discharge rating curves established for each water measurement structure. A Water Management Computer Model had been was developed for the Left Bank System under the Water Management Project and at the time of the beginning of the ISMP in August

1987, data was being collected in the field and fed into the Computer Model. Results from the model initiated adjustments to the gates in the field to meet Water Management Indexes for the equitable distribution of water to the D-Canals. This Program was working satisfactorily on the Gal Oya Left Bank System at the beginning of the ISMP. As envisioned in the Project Paper, the following is the sequence of steps in the development of the Systems Improvement Operations.

- Conduct a Walk-Thru Operations Survey.
- Develop a Plan for Flow Control and Water Measurement.
- Construct the Control and Water Measurement Structure.
- Develop Discharge Rating Curves.
- Collect Water Measurement and Channel Losses Data
- Develop Operation Plan.
- Implement Improvement in Water Delivery Schedule.
- Develop Computer Model for Implementing Operation Plan.
- Collect Water Measurement, Channel Losses, and Irrigation Application Efficiency Data for Refining Computer Model.
- Refine Computer Model.
- Implement Refined Water Delivery Schedule.
- Develop Irrigation Scheme Improvement Plan

CHAPTER III
ACCOMPLISHMENTS DURING ASSIGNMENT

3.1 REHABILITATION OF THE IRRIGATION SYSTEMS

The rehabilitation of the Irrigation Schemes under the ISMP was actually implemented in three Phases.

Phase I Rehabilitation of the Polonnaruwa Schemes from January 1987

Phase II Rehabilitation of the Ampara Range Systems from January 1989

Phase III Rehabilitation of the Kurunegala Range Ridi Bendi Ela Scheme also from January 1989.

Each of these Phases is described in turn below:

3.1.1 PHASE I - POLONNARUWA RANGE SCHEMES

The original Rehabilitation Program for the Polonnaruwa Range was presented under Table II-1-1 of Chapter II. However, this Program was modified several times during the Life-of-Project. The actual Work Programs for 1987 and those based upon the Annual Work Plans for 1988, 1989, 1990 and 1991 along with the work actually accomplished during these years are presented on Tables III-1-1 to III-1-4 that follow along with the narrative of each year of rehabilitation activities.

3.3.1.1 REHABILITATION PROGRAM - 1987

The surveys and designs for the work planned for the 1987 Rehabilitation Program were initiated in 1986 and completed by May 1987 so that contracts could be awarded by July 1987. A total of 53.27 Km of Main and Branch Canals were programmed for 1987 with a budget allocation of Rs. 22,530,000. The amount of work completed by 31 December 1987 was 37.81 Km or approximately 71% of the planned work and about 2.5% of the overall Rehabilitation Program of the Range. The expenditure of the Rehabilitation of the 1987 work in the Polonnaruwa Range amounted to Rs. 16,141,133. Table III-1-1 presents the work programmed for 1987; the work completed; the work planned for 1988 and the work remaining for LOP.

Overall, the rehabilitation work accomplished in the first year of the Project was very satisfactory in the Polonnaruwa Range. This was because there were no major disturbances in 1987 to disrupt the work.

3.1.1.2 REHABILITATION PROGRAM - 1988

In 1988, 110.95 Km were planned for rehabilitation and 110.58 Km actually completed or approximately 100%. As of 31 December 1988, approximately 9.6% of the total rehabilitation work in the Polonnaruwa Range had been completed. Out of the 1988 budget allocation of Rs. 22,260,000 approximately Rs. 22,000,000 were expended on the rehabilitation work in the Polonnaruwa Range in 1988.

Based upon the planned work for 1987 and 1988, 53.27 and 110.58 Km respectively the total planned percent complete was 10.6% compared to 9.6% actual or a short fall of only 1.0%. Therefore, as of the end of 1988 the rehabilitation work in the Polonnaruwa Range was only a little behind schedule. Table III-1-2 presents the work completed in 1988; the program for 1989; and the works remaining for LOP.

3.1.1.3 REHABILITATION PROGRAM - 1989

During 1989 a total of 556.84 Km were planned to be rehabilitated under a budget allocation of Rs. 48,600,000. However, due to major disruption in the construction because of JVP and other terrorist activities, the actual progress achieved was only 99.74 Km or 17.91% of the targeted program for 1989.

This was a major set-back in the rehabilitation program in the Polonnaruwa Range as after three years of work the planned percent complete was 45.8%, however, the actual percent complete was only 15.8% or a major shortfall of 30%. This shortfall was a direct result of the troubled conditions in the Polonnaruwa District which severely affected the progress of the rehabilitation works.

Out of the Rs. 48,600,000 budget allocated for 1989, only Rs. 33,352,000 was expended on the rehabilitation work.

Table III-1-3 presents the work completed in 1989; the program for 1990; and the work remaining over the LOP.

3.1.1.4 REHABILITATION PROGRAM - 1990

During 1990 the planned program for rehabilitation in the four Schemes in the Polonnaruwa Range was 349 Km of Canals, most of which were D-Canals (110.4 Km) and F-Canals (231.0 Km). Progress during 1990 improved considerably over 1989 as the situation in the Polonnaruwa District improved so the work could proceed. A total of 242 Km were rehabilitated during 1990 or about 70% of the planned target for the year. As of the end of 1990, a total of 490 Km of Main, Branch, D-Canals and F-Canals had been rehabilitated out of the total planned for the four Schemes in

the Polonnaruwa Range of 592 Km or approximately 31% accomplishement compared to 1070 Km or 67% as planned or a short fall in the overall rehabilitation program of some 36%. The actual expenditure in rehabilitation work in the Polonnaruwa Range for 1990 was only Rs. 15,935,000.

Table III-1-4 presents the rehabilitation works completed in 1990; the program for 1991; and the amount remaining over the LOP.

3.1.1.5 SUMMARY REHABILITATION PROGRAM POLONNARUWA RANGE 1987 - 31 DECEMBER 1990

A summary of the implementation of the Rehabilitation Program from August 1987 until 31 December 1990 can most easily be presented graphically. Exhibit III-1-1 shows the Planned Rehabilitation Program verses the actual progress. In addition the curve also shows the adjusted program each year reflecting the actual work completed the year before.

O&M Engineer C.F. Leonhardt monitored the progress of rehabilitation from 16 August 1987 to 17 February 1991 and Mr. T.A. Cerdan monitored it from 17 February 1991 to 30 June 1992 (PACD End of Project). Exhibit III-1-1 also shows the planned programs for 1991 and 1992 and the actual progress of rehabilitation upto 30 June 1992.

The Status of Rehabilitation from 17 February 1991 to 30 June 1992 is discussed in Mr. T.A. Cerdan's End of Tour Report under Chapter III.

3.1.2 PHASE II - AMPARA RANGE SYSTEMS

The ISMP started in 1987 in the Polonnaruwa Range, however the program for implementing the Pragmatic Rehabilitation (PR) on the Gal Oya Right Bank and the Preventative Maintenance (PM) Program for the Gal Oya Left Bank could not be started due to ethnic unrest in the Ampara District. Therefore, no Technical Assistance (TA) team members were sent to Ampara at the start of the ISMP in August of 1987.

It wasn't until early 1989 that conditions in the Ampara District improved to the point that would allow USAID and Sheladia personnel to travel to Ampara to evaluate the situation in the Project Area. Exhibit III-1-2 presents a Field Trip Report of that first visit to Ampara District on 22 May 1989.

Based upon the recommendations made in that Field Trip Report by the Sheladia O&M Engineer, USAID agreed to initiate ISMP work in the Ampara District.

IRRIGATION SYSTEMS MANAGEMENT PROJECT - POLONNARUWA RANGE
MONITORING SURVEY, DESIGN AND CONSTRUCTION
PARAKRAMA SAMUDRA, MINNERIYA, GIRITALE, KAUDULLA,
BAKAMUWA, ATTARAGALLEWA SCHEMES - AS OF 31 DECEMBER 1987

TABLE III-1-1

TYPE OF CANAL		TOTAL LENGTH (Km)	PROGRAM FOR 1987			COMLETED AS OF 31 DECEMBER 1987			PRORGRAM FOR 1988			REMAINING FOR LIFE OF PROJECT		
			SURVEY	DESIGN	CONST.	SURVEY	DESIGN	CONST.	SURVEY	DESIGN	CONST.	SURVEY	DESIGN	CONST.
	PSS	19.74	19.74	19.74	15.24	19.74	17.74	9.45		1.00	2.50			4.50
	MIN	15.00	15.00	15.00	15.00	15.00	15.00	10.50						
M.C	GIR	1.60	1.60	1.60		1.60	1.60				1.60			
	KAU	7.17	7.17	7.17	6.37	7.17	7.17	6.37			0.80			
	TOTAL	43.51	43.51	43.51	36.61	43.51	41.51	26.32	0.00	1.00	4.90	0.00	0.00	4.50
	PSS	18.43	17.34	17.34	5.66	17.34	17.34	1.19	1.09	1.09	11.68			5.56
	MIN	17.06	8.00	8.00		8.00	8.00		7.00	7.00	13.81		2.06	3.25
B.C	GIR	10.50	10.50	10.50	6.00	10.50	10.50	5.30			5.20			
	KAU	18.04	18.04	18.04	5.00	18.04	18.04	5.00			13.04			
	TOTAL	64.03	53.88	53.88	16.66	53.88	53.88	11.49	8.09	8.09	43.73	0.00	2.06	8.81
	PSS	134.20	28.61	8.28		28.61	8.28		35.00	36.16	23.44	70.59	89.76	110.76
	MIN	90.19	24.00	5.00		24.00	5.00		20.00	33.46	28.46	46.19	51.73	61.73
D.C	GIR	29.90	8.00	5.00		8.00	5.00		5.00	5.00	3.38	16.90	19.90	26.52
	KAU	63.56	18.66			18.66			30.00	31.07	3.66	14.90	32.49	59.90
	ATA													
	TOTAL	317.85	79.27	18.28	0.00	79.27	18.28	0.00	90.00	105.69	58.94	148.58	193.88	258.91
	PSS	266.34	18.60	1.76		18.60	1.76		60.00	45.68	2.44	187.74	218.90	263.90
	MIN	268.35	70.00	5.00		70.00	5.00		25.00	30.00	0.94	173.35	233.35	267.41
P.C	GIR	129.90	17.00	4.00		17.00	4.00		20.00	10.00		92.90	115.90	129.90
	KAU	317.53	88.00			88.00			50.00	50.00		179.53	267.53	317.53
	ATA													
		982.12	193.60	10.76	0.00	193.60	10.76	0.00	155.00	135.68	3.38	633.52	835.68	978.74
	PSS	45.00										45.00	45.00	45.00
	MIN	65.00										65.00	65.00	65.00
DRN	GIR													
	KAU	35.00										35.00	35.00	35.00
	ATA													
	TOTAL	145.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	145.00	145.00	145.00
	PSS	483.71	84.29	45.12	20.90	84.29	45.12	10.64	96.09	83.93	40.06	303.33	354.66	433.01
	MIN	455.60	117.00	33.00	15.00	117.00	33.00	10.50	54.06	70.46	43.21	284.54	352.14	401.89
TOTAL	GIR	171.90	37.10	21.10	6.00	37.10	21.10	5.30	25.00	15.00	10.18	109.80	135.80	156.42
	KAU	441.30	131.87	25.21	11.37	131.87	25.21	11.37	80.00	81.07	17.50	229.43	335.02	412.43
	ATA													
	TOTAL	1552.51	370.26	124.43	53.27	370.26	124.43	37.81	255.15	250.46	110.95	927.10	1177.62	1403.75

III-1-1.WK1

IRRIGATION SYSTEMS MANAGEMENT PROJECT - POLONNARUWA RANGE — TABLE III-1-2

MONITORING SURVEY, DESIGN AND CONSTRUCTION

PARAKRAMA SAMUDRA, MINNERIYA, GIRITALE, KAUDULLA,

BAKAMUNA, ATTARAGALLEWA SCHEMES - AS OF 31 DECEMBER 19889

TYPE OF CANAL		TOTAL LENGTH (Km)	COMPLETED AS OF 31 DECEMBER 1988			PRRGRAM FOR 1989			REMAINING FOR LIFE OF PROJECT		
			SURVEY	DESIGN	CONST.	SURVEY	DESIGN	CONST.	SURVEY	DESIGN	CONST.
M.C	PSS	19.74	19.74	17.74	15.79		2.00	3.95			
	MIN	15.00	15.00	15.00	15.00						
	GIR	1.60	1.60	1.60	1.60						
	KAU	7.17	7.17	7.17	7.17						
	TOTAL	43.51	43.51	41.51	39.56	0.00	2.00	3.95	0.00	0.00	0.00
B.C	PSS	18.43	18.43	18.43	14.93			3.50			15.46
	MIN	17.06	13.00	8	5.00	4.06	9.06	6.60			
	GIR*	10.70	10.70	10.7	10.70						
	KAU	18.04	18.04	18.04	16.25			1.79			
	TOTAL*	64.23	60.17	55.17	46.88	4.06	9.06	11.89	0.00	0.00	15.46
D.C	PSS*	137.52	55.00	34.40	19.20	48.13	55.00	62.00	34.39	48.12	56.32
	MIN	90.19	39.70	29.75	27.00	25.00	33.00	33.50	25.49	27.44	29.69
	GIR	29.90	13.00	10.00	4.75	16.90	14.00	15.00		5.90	10.15
	KAU	63.56	54.50	21.50	7.00	9.06	42.06	48.00			8.56
	ATA										
	TOTAL*	321.17	162.20	95.65	57.95	99.09	144.06	158.50	59.88	81.46	104.72
F.C	PSS	256.57	46.20	5.00	1.00	30.80	19.00	19.50	179.57	232.57	236.07
	MIN	268.35	45.00	24.00	3.00	123.00	142.00	145.00	100.35	102.35	120.35
	GIR	129.90	36.00	13.00		40.00	56.00	66.00	53.90	60.90	63.90
	KAU	314.53	111.00	51.00		149.00	149.00	152.00	54.53	114.53	162.53
	ATA										
	TOTAL*	969.35	238.20	93.00	4.00	342.80	366.00	382.50	388.35	510.35	582.85
DRN	PSS	45.00							45.00	45.00	45.00
	MIN	65.00							65.00	65.00	65.00
	GIR										
	KAU	35.00							35.00	35.00	35.00
	ATA										
	TOTAL	145.00	0.00	0.00	0.00	0.00	0.00	0.00	145.00	145.00	145.00
TOTAL	PSS	477.26	139.37	75.57	50.92	78.93	76.00	88.95	258.96	325.69	337.39
	MIN	455.60	112.70	76.75	50.00	156.06	184.06	185.10	190.84	194.79	220.50
	GIR	172.10	61.30	35.30	17.05	56.90	70.00	81.00	53.90	66.80	74.05
	KAU	436.30	190.71	97.91	30.42	158.06	191.06	201.79	89.53	149.53	206.09
	ATA										
	TOTAL*	1543.26	504.08	285.53	148.39	449.95	521.12	556.84	593.23	736.81	836.03

III-1-1.WK1 * Change in length of canals from 1987

IRRIGATION SYSTEMS MANAGEMENT PROJECT - POLONNARUWA RANGE — TABLE III-1-3
MONITORING SURVEY, DESIGN AND CONSTRUCTION
PARAKRAMA SAMUDRA, MINNERIYA, GIRITALE, KAUDULLA,
BAKAMUNA, ATTARAGALLEWA SCHEMES - AS OF 31 DECEMBER 1989

TYPE OF CANAL		TOTAL LENGTH (Km)	PROGRAM FOR 1989 SURVEY	PROGRAM FOR 1989 DESIGN	PROGRAM FOR 1989 CONST.	PRRGRAM FOR 1990 SURVEY	PRRGRAM FOR 1990 DESIGN	PRRGRAM FOR 1990 CONST.	REMAINING FOR LIFE OF PROJECT SURVEY	REMAINING FOR LIFE OF PROJECT DESIGN	REMAINING FOR LIFE OF PROJECT CONST.
	PSS*	27.74	19.74	18.50	18.10	8.00	9.24	1.64			8.00
	MIN	15.00	15.00	15.00	15.00						
M.C	GIR	1.60	1.60	1.60	1.60						
	KAU	7.17	7.17	7.17	7.17						
	TOTAL*	51.51	43.51	42.27	41.87	8.00	9.24	1.64	0.00	0.00	8.00
	PSS*	19.89	19.89	19.89	18.80			1.09			
	MIN	17.06	15.80	15.80	9.04	1.26	1.26	4.86			3.16
B.C	GIR	10.70	10.70	10.70	10.70						
	KAU*	19.45	19.45	19.45	19.45						
	TOTAL*	67.10	65.84	65.84	57.99	1.26	1.26	5.95	0.00	0.00	3.16
	PSS*	144.66	101.00	87.23	30.93	38.23	38.23	44.00	5.43	19.20	69.73
	MIN	90.19	66.44	66.44	29.55	23.75	23.75	24.00			36.64
D.C	GIR	29.90	24.00	21.25	7.10	5.90	8.65	14.00			8.80
	KAU	63.56	63.56	45.06	22.00		18.50	18.40			23.16
	ATA										
	TOTAL*	328.31	255.00	219.98	89.59	67.88	89.13	100.40	5.43	19.20	136.33
	PSS*	266.34	80.00	40.00	6.89	116.10	41.00	70.24	110.24	218.45	
	MIN	268.35	144.22	144.00	13.02	75.00	90.00	24.13	49.13	165.33	
F.C	GIR	129.90	60.00	55.18	1.10	47.00	40.00	9.90	27.72	88.80	
	KAU*	317.53	175.00	125.00	37.68	100.00	60.00	35.00	92.53	219.85	
	ATA										
	TOTAL*	982.12	459.22	364.18	58.69	338.10	231.00	139.27	279.62	692.43	0.00
	PSS	45.00				27.00	20.00	10.00	18.00	25.00	35.00
	MIN	65.00				30.00	20.00		35.00	45.00	65.00
DRN	GIR										
	KAU	35.00				10.00	10.00		25.00	25.00	35.00
	ATA										
	TOTAL	145.00	0.00	0.00	0.00	67.00	50.00	10.00	78.00	95.00	135.00
	PSS	503.63	220.63	165.62	74.72	189.33	183.57	97.73	93.67	154.44	331.18
	MIN	455.60	241.46	241.46	66.61	155.01	120.01	118.86	59.13	94.13	270.13
TOTAL	GIR	172.10	96.30	88.73	20.50	65.90	55.65	54.00	9.90	27.72	97.60
	KAU	442.71	265.18	196.68	86.30	117.53	128.50	78.40	60.00	117.53	278.01
	ATA										
	TOTAL*	1574.04	823.57	692.49	248.13	527.77	487.73	346.99	222.70	393.82	976.92

III-1-1.WK1

IRRIGATION SYSTEMS MANAGEMENT PROJECT - POLONNARUWA RANGE TABLE III-1-4
MONITORING SURVEYS, DESIGNS AND CONSTRUCTION
OF
PARAKRAMA SAMUDRA, MINNERIYA, GIRITALE, KAUDULLA, BAKAMUNA -
ATTARAGALLEWA SCHEMES - AS OF 31 DECEMBER 1990

CANAL		TOTAL LENGTH (Km)	COMPLETED AS OF 31 DECEMBER 1990			PROGRAM FOR 1991			REMAINING FOR LIFE OF PROJECT		
			SURVEY	DESIGN	CONST.	SURVEY	DESIGN	CONST.	SURVEY	DESIGN	CONST.
	PSS	27.7	24.7	19.7	19.7	3.0	8.0	8.0	--	--	--
	MIN	15.0	15.0	15.0	15.0	--	--	--	--	--	--
M.C	GIR	5.6	1.6	1.6	1.6	4.0	4.0	4.0	--	--	--
	KAU	7.2	7.2	7.2	7.2	--	--	--	--	--	--
	TOTAL	55.5	48.5	43.5	43.5	7.0	12.0	12.0	--	--	--
	PSS	19.9	19.9	19.9	19.9	--	1.3	--	--	--	--
	MIN	17.1	17.1	15.8	14.2	--	--	2.8	--	--	--
B.C	GIR	10.7	10.7	10.7	10.7	--	--	--	--	--	--
	KAU	19.4	19.4	19.4	19.5	--	--	--	--	--	--
	TOTAL	67.1	67.1	65.8	64.3	--	1.3	2.8	--	--	--
	PSS	158.0	139.0	104.3	63.9	18.8	53.7	25.0	--	--	69.1
	MIN	90.2	90.2	69.4	56.0	--	20.7	25.0	--	--	9.2
D.C	GIR	29.9	29.9	21.0	16.9	--	8.1	3.8	--	--	9.2
	KAU	73.3	63.8	53.5	38.8	9.7	19.9	24.4	--	--	10.1
	ATA	7.6	--	--	--	7.6	7.6	5.7	--	--	1.9
	TOTAL	359.0	322.9	249.0	175.6	36.1	110.0	83.9	--	--	99.5
	PSS	266.3	116.0	106.8	9.4	150.3	80.0	40.0	--	79.5	216.9
	MIN	268.4	229.5	154.6	74.3	38.9	113.8	84.0	--	--	110.1
FC	GIR	129.9	108.0	61.0	20.8	21.9	68.9	37.0	--	--	72.1
	KAU	312.5	234.4	158.7	89.1	78.1	153.8	90.0	--	--	133.4
	ATA	26.6	--	--	--	6.6	6.6	3.3	20.0	20.0	23.3
	TOTAL	1003.7	687.9	481.1	193.6	295.8	423.1	254.3	20.0	99.5	555.8
	PSS	45.0	--	--	--	27.0	27.0	10.0	18.0	18.0	35.0
	MIN	65.0	--	--	--	65.0	65.0	--	--	--	65.0
DRN	GIR	--	--	--	--	--	--	--	--	--	--
	KAU	35.0	--	--	--	15.0	15.0	15.0	20.0	20.0	20.0
	ATA	1.5	--	--	--	1.5	1.5	1.5	--		--
	TOTAL	146.5	--	--	--	108.5	108.5	26.5	38.0	38.0	120.0
	PSS	516.9	299.6	250.7	112.9	199.1	170.0	83.0	18.0	97.5	321.0
	MIN	455.7	351.8	254.8	159.5	103.9	199.5	111.8	0.0	0.0	184.3
TOTAL	GIR	176.1	150.2	95.1	50.0	25.9	81.0	44.8	--	--	81.3
	KAU	447.4	324.8	238.8	154.6	102.8	188.7	129.4	20.0	20.0	163.5
	ATA	35.7	--	--	--	15.7	15.7	10.5	20.0	20.0	25.2
	TOTAL	1631.8	1126.4	839.4	477.0	447.4	654.9	379.5	58.0	137.5	775.3

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Although no work had been approved prior to the initial field trip, a considerable amount of survey and design works had been completed for the Right Bank Main Canal prior to that trip. During that Field Trip the O&M Engineer reviewed the surveys and designs for the work proposed on the RBMC for the 1989 construction season. With the exception of minor modifications the O&M Engineer approved the 1989 PR Work Program on the RBMC. Design and drawings were later submitted for signature or approval to the O&M Engineer so that when approval by USAID was given to initiate work on the Gal Oya Project, contracts could immediately be initiated.

Approval to proceed with the ISMP in the Ampara District was given by USAID in June 1989 and preparation work commenced immediately thereafter on the first 12 kilometers of the RBMC. Cost estimates for Sub-Project Nos. 1-5 (Km 0.0 to Km 12.0) were submitted to USAID on 4 September 1989 for approval and the establishement of a PIL.

3.1.2.1 PRAGMATIC REHABILITATION AND PREVENTATIVE MAINTENANCE PROGRAM 1989

The work program for 1989 in the Gal Oya RBMC is presented on Table III-2-1 which shows the planned program for 1989; works completed in 1989; and the program from 1990.

As shown on this table, work on survey and design was ahead of the rehabilitation work, however, the work fell behind schedule due to adverse conditions in the field. Only 14.0 Km of Main Canal were completed against a scheduled 21 km meaning that 67% of the target was achieved.

Although one-third of the planned work for 1989 was not accomplished, the progress was considered exceptional under the conditions, in the Ampara District.

At the same time that the Pragmatic Rehabilitation Work was being undertaken in the Gal Oya Right Bank, work on Preventative Maintenance Program on the Left Bank Main Canal had started. Two Sub-Projects were initiated, Sub-Project No 1 LBMC Km 2-5 and LBMC Km 24 - 34.2 and Sub-Project No. 2 Uhana BC Km 0-15; Madura BC Km 0-8.67 and Madura BC Km 8.67-15.5. However as of the end of 1989, very little work on the Preventative Maintenance Program had been implemented as contracts were begun being awarded for the work which was planned to start in early 1990.

IRRIGATION SYSTEMS MANAGEMENT PROJECT - POLONNARUWA RANGE
MONITORING SURVEYS, DESIGNS AND CONSTRUCTION
OF
GAL OYA RIGHT BANK SYSTEM
AMPARA RANGE AS OF 31 DECEMBER 1989

EXHIBIT III-2-1

CANAL	TOTAL LENGTH (km)	PROGRAM FOR 1989			COMPLETED AS OF 31 DECEMBER 1989			PROGRAM FOR 1990			REMAINING FOR LIFE OF PROJECT		
		SURVEY	DESIGN	CONST.	SURVEY	DESIGN	CONST.	SURVEY	DESIGN	CONST.	SURVEY	DESIGN	CONST.
M.C	35.20	35.20	30.20	21.00	35.20	28.50	14.00		6.70	21.20			
B.C	83.10	30.00	10.00		76.90	17.60		6.20	65.50	41.00			42.10
D.C	175.00				12.20			162.80	140.00	2.20		35.00	172.80
F.C	227.40							20.00	5.00	0.40	207.40	222.40	227.00
DRN	100.00										100.00	100.00	100.00
TOTAL	620.70	65.20	40.20	21.00	124.30	46.10	14.00	189.00	217.20	64.80	307.40	357.40	541.90

MSDC.WK1

3.1.2.2 PRAGMATIC REHABILITATION AND PREVENTATIVE MAINTENANCE PROGRAM - 1990

During early 1990 Sheladia assigned a Senior O&M Engineer, Mr. S. Balasingam to work in the Ampara Range to assist the ID in implementing the PR and PM work on the RBMC and LBMC respectively. Table III-2-2 presents the Pragmatic Rehabilitation works completed during 1990; and the Work Program for 1991. As of the end of 1989 only 14.0 Km of the RBMC had been completed. During 1990 it was planned to complete all 35.2 Km of the RBMC, however, due to a major outbreak of hostilities in the Ampara District from June 1990 the work was considerably curtailed and only 15.0 Km were completed in 1990. Therefore the total completed on the RBMC as of 31 December 1990 was 29.0 Km or a short fall of 6.2 km. On the Branch Canals of the RBMC 41.0 Km were planned for rehabilitation in 1990, however, only 5.0 Km were completed. This was primarily due to the trouble in the area as all the Branch Canals planned for rehabilitation were located in troubled areas where work could not be effectively accomplished. Therefore, during 1990 only 34.0 km of Canals out of the 64.8 Km planned for rehabilitation was completed. This represented a level of accomplishment of about 52%.

In first half of 1990, before fighting disrupted work in the area, considerable progress on the Preventative Maintenance Program was achieved. Sub-project No. 1 was approximately 75% complete and Sub-Project No. 2 was 56% complete as of 1 June 1990. Thereafter little progress was made during the remainder of the year on the Preventative Maintenance Program.

Mr. S. Balasingam, Senior O&M Engineer and Mr. K. Vallipuram, Sheladia Engineering Assistant were required to leave the Ampara office in early June 1990 because of the hostilities in the area. Therefore, monitoring of the work from 1 June to 31 December 1990 was accomplished by written reports furnished by the IE (Irrigation Engineer) of Ampara.

Exhibit III-1-3 presents the Gal Oya RBMC planned Pragmatic Rehabilitation Program as compared to the actual progress of Rehabilitation up through the first quarter of 1992.

As of the end of 1991, only 31% of the work planned had been completed.

Based upon the present rate of progress, only about 75 km out of the 621 km planned under the Gal Oya RBMC or 12% will have been completed by 30 June 1992 after a period of three years of work. If conditions in the Ampara District continue, without improvement, the rehabilitation work will extend for many years to come.

IRRIGATION SYSTEMS MANAGEMENT PROJECT - POLONNARUWA RANGE
MONITORING SURVEYS, DESIGNS AND CONSTRUCTION
OF
GAL OYA RIGHT BANK SYSTEM
AMPARA RANGE AS OF 31 DECEMBER 1990

EXHIBIT III-2-2

CANAL	TOTAL LENGTH (km)	COMPLETED AS OF 31 DECEMBER 1990			PROGRAM FOR 1991			REMAINING FOR LIFE OF PROJECT		
		SURVEY	DESIGN	CONST.	SURVEY	DESIGN	CONST.	SURVEY	DESIGN	CONST.
M.C	35.20	35.20	35.20	29.00			6.20			
B.C	84.00	84.00	58.30	5.00		25.70	79.00			
D.C	175.00	105.00	5.40		70.00	169.60				175.00
F.C	227.40				227.40	180.00			47.40	227.40
DRN	100.00				50.00			50.00	100.00	100.00
TOTAL	621.60	224.20	98.90	34.00	347.40	375.30	85.20	50.00	147.40	502.40

MSDC.WK1

Mr. T.A. Cerdan who took over as O&M Engineer in February 1991 will present the accomplishments on the Gal Oya RBMC and LBMC from 1 January 1991 to 30 June 1992 in Chapter III of his End of Tour Report.

3.1.3 PHASE III - KURUNEGALA RANGE SCHEME

Under the ISMP the only works planned for the Ridi Bendi Ela (RBE) Scheme were (1) Improvements to Systems Operations and (2) Preparation of Preventative Maintenance Program.

Under the Improvements to Systems Operations component, one of the requirements was to construct Water Level Control and Measurement Structures within the RBE Scheme. The program for implementing these Water Measurement Structures was initiated in early 1988 under a Pilot Project for the Left Bank Main Canal of the RBE Scheme. The Status Report on the progress of Water Measurement work on the Pilot Project area is attached as Exhibit III-1-4. The Status report indicates that by the end of 1988 about 90% of the Water Measurement Structure had been completed in the Pilot Area (LBMC). The design and cost estimates for the remaining Water Measurement Structures for the Center Canal, Inlet Canal and Right Bank Main Canal (RBMC) were essentially completed by 31 December 1988 for implementation during 1989.

It was in early 1989 when Sheladia's O&M Engineer, after review of the RBE Systems, made a recommendation to IMD/ID and to USAID that there were priority rehabilitation work requirements on the system that needed to be implemented if the Preventative Maintenance Program could be effectively carried out after ISMP was completed. Even though RBE Scheme had been rehabilitated in 1978 - 1982 under a World Bank Program, many of the structures within the LBMC, RBMC, Center Canal and Inlet Canal required repairs and rehabilitation. This was essentially the same situation that was planned to be carried out under the Preventative Maintenance Program planned for the Gal Oya Left Bank System which had also been rehabilitated under the USAID Water Management Project from 1980-1985.

The Project Paper's concept of providing Preventative Maintenance funds for the Gal Oya Left Bank was to ensure that the Left Bank System would be at the same level of condition as the Right Bank System after the Pragmatic Rehabilitation Program was completed under ISMP so that the long-term Preventative Maintenance Program for both systems could effectively be carried out at the same level.

Because of the similarity of the state of conditions of the RBE System and that of the Gal Oya LBMC System, the Sheladia O&M Engineer initiated a plan for a Priority Rehabilitation Program for RBE Scheme which was eventually approved by IMD/ID and USAID. This approval was given in late 1988 and the program was planned for implementing this priority rehabilitation work in the construction season of 1989.

All of the surveys, plans and designs for the 1989 Priority Rehabilitation Program for RBE were completed but no Contracts were awarded as the construction season was almost over before the contract documents were ready. Therefore, the 1989 Priority Rehabilitation Program was deferred to 1990 for implementation.

The progress of the Construction of Water Management Structures and Priority Rehabilitation Work on the RBE Scheme up to 31 March 1991 is presented on Table III-3-1 that follows:

TABLE III-3-1
PRIORITY REHABILITATION AND WATER MEASUREMENT PROGRAM
RIDI BENDI ELA SCHEME
PROGRESS UPTO 31 MARCH 1991

CANAL SYSTEM	ESTM. COST (RS.)	COST ALLOC. (RS.)	% COMPLETE
A. LBMC System (Sub-Proj. No.1)	337,795	287,464	85.1
B. RBMC Center Systems (Sub-Proj. No.2)	1,107,002	842,429	76.1
C. Inlet Canal Systems (Sub-Proj. No. 3)	302,135	241,708	80.0
Total as of 31/3/91	1,746,932	1,371,601	78.5

The status of Water Measurement and Priority Rehabilitation Works after 31 March 1991, for the above three Sub-Projects will be reported in T.A. Cerdan's End of Tour Report. In addition, the major Priority Rehabilitation Work on the Inlet Canal which only started in early 1991 under Sub-Project Nos 4 - 11 and Sub-project Nos 12 - 17 on the 1991 Priority Rehabilitation Work of the RBMC will also be reported in Mr. Cerdan's End of Tour Report.

3.2 DEVELOPMENT OF PREVENTATIVE MAINTENANCE PROGRAM

3.2.1 INTRODUCTION

The development of a Preventative Maintenance Program was initiated in mid - 1988 after the Sheladia's O&M Engineer had been on the Project for 10 months. After a thorough review of the Project Paper to determine the Scope of Work and extent of the Maintenance Program for the ISMP, the O&M Engineer submitted to the Sheladia Chief of Party an outline of the anticipated requirements to implement the Maintenance Program over the Life-of-Project. This paper was forwarded to Mr. G.T. Jayawardena, ISMP Project Director for his review and approval on 12 July 1988. Exhibit III-2-1 presents the letter to Mr. Jayawardena outlining the program for implementing the Maintenance Plan under the ISMP. As a result of this letter the Preventative Maintenance Program for the Schemes under the ISMP was developed and it involved the implementation of the following maintenance activities during the LOP.

- Conduct Walk-Through Maintenance Survey for ESI/PR Improvements.
- Implement ESI/PR Rehabilitation/Improvements.
- Conduct Walk-Through Maintenance Surveys for Priority Rehabilitation Works (Main System Only).

- Implement Priority Rehabilitation Works (Main System Only).
- Conduct Walk-Through Maintenance Survey for Main System Annual Maintenance Plan.
- Develop Annual Maintenance Plan and Cost Estimates.
- Implement Preventative Maintenance Program based on Annual Maintenance Plan.
- Conduct Walk-Through Maintenance Completion Survey and Submit Annual Maintenance Completion Report.
- Revise Annual Maintenance Plan.
- Improve Preventative Maintenance Program and report the process.

A Schematic Diagram showing the Preventative Maintenance Programs for the Main System and Distributary System is shown on Exhibit III-2-1A.

The Plan outlined under Exhibit III-2-1 was subsequently approved by IMD/ID on 1 August 1988, and various letters of correspondence followed to initiate the Program. These letters are presented in this Report as Exhibits to document the initial activities in the implementation of the Maintenance Program: these Exhibits are:

Exhibit III-2-2	Priority Maintenance Plan - To S. Piyadasa (29/9/88)
Exhibit III-2-3	Annual Maintenance Plan RBE Scheme - To S. Balasingam (30/9/88)
Exhibit III-2-4	Minutes of Meeting on RBE Maintenance Plan - To Mr. G.T. Jayawardena (16/11/88)
Exhibit III-2-5	ISMP Annual Maintenance Plan - To Mr. D. Jenkins (22/3/89)
Exhibit III-2-6	Annual Maintenance Plan ISMP - To S. Piyadasa (17/4/89)
Exhibit III-2-7	Annual Maintenance Plan - To Dr. L.E. Haley (9/5/89)
Exhibit III-2-8	Annual Maintenance Plan - To S. Balasingam (2/10/89)
Exhibit III-2-9	Annual Maintenance Plan - To S. Balasingam (22/1/90)
Exhibit III-2-10	Annual Maintenance Plan - To S. Senthinathan (31/1/90)
Exhibit III-2-11	Annual Maintenance Plan - To S. Pyadasa (23/4/90)

Exhibits III-2-2 to III-2-11 provide key correspondence information on the progress and development of the Preventative Maintenance Program up to the end of December 1990. These Exhibits were found to be instrumental in helping to start and achieve the Maintenance Program in Polonnaruwa, Ampara and Kurunegala Ranges.

The following summarizes the accomplishments in the Preventative Maintenance Program up to 31 December 1990. Mr. T.A. Cerdan will present the Maintenance Program accomplishments in his End of Tour Report from 1 January 1991 to 30 June 1992.

3.2.2 ANNUAL MAINTENANCE PLANS - POLONNARUWA RANGE

The preparation of the Annual Maintenance Plan was first initiated in the Polonnaruwa Range in early 1989. The sheladia O&M Engineer first developed the basic format and criteria for the Maintenance Plan and submitted it to the Deputy Director of Irrigation, Polonnaruwa Range, for approval. The format and the Maintenance Plan estimating criteria were tentatively approved by the DDI in a meeting on 19/5/89 (See Exhibits III-2-7 and III-2-11). In order to accelerate the preparation of the Annual Maintenance Plan for the four Schemes in the Polonnaruwa Range it was decided to first make the Plan for the Main System of each Scheme. It was decided to initiate the Annual Maintenance Plan on the Main System for rehabilitation work that were completed in 1987. In order to assist the ID in this process, the O&M Engineer would prepare the Annual Maintenance Plan for the Main System of the Giritale Scheme as an example for the other three Schemes. Since the Main System of Giritale Scheme had been rehabilitated in its entirety during 1987 and 1988, it was convenient to select Giritale as the Scheme for making the sample Annual Maintenance Plan.

Using the Main System estimating criteria as shown on Exhibit III-2-12 the O&M Engineer conducted the Walk-Through Maintenance Survey for the Giritale Headworks, Main Canal and Branch Canals. This survey took about four days as it involved 4.7 Kilometers of Inlet Canal; Giritale Tank, Sluice and Spillway; RBMC above Dambala Wewa 5.9 Kilometers; Dambala Wewa Tank, Sluice and Spillway; RBMC below Dambala Wewa 9.0 Kilometers; Chandana Pokuna Tank;Sluice and Spillway; D-6 Canal to Kadawala Wewa 3.3 Kilometers; and Kadawala Wewa Tank, Sluice and Spillway.

After the Walk-Through Survey was completed, quantities and cost estimates were developed. Exhibit III-2-13 (9 sheets) presents the quantity estimates for the Annual Maintenance Plan of the Giritale Main System.

Annual Costs were then estimated using data developed by the ID in 1982 for Operation and Maintenance Costs and up-dated to 1988 prices (see Exhibit III-2-14). Of the total Maintenance Cost, 33% was allocated to Indirect Costs such supervision, drivers/operators, travel/bata, fuel/repairs, administration, departmental overheads and depreciation of vehicles and equipment. Therefore 67% of the maintenance was taken as the direct cost; 7.23% was added for contingencies to the direct cost and 33% of the total direct cost was added as administrative / OH and indirect costs.

Exhibit III-2-15 presents the Summary Annual Maintenance Cost for the Giritale Main System and Exhibit III-2-16 (4 sheets) presents the detailed Cost Analysis to arrive at the Total Annual Cost.

The Annual Maintenance Plan for the Giritale Main System is presented on Exhibit III-2-17 and includes the following:

- Component or reach of the scheme to be maintained.
- Item number / quantity of work.
- Length of bund / canal / number of structures, etc.
- Description of works to be maintained.
- Quantity of maintenance.
- Schedule of time to perform the maintenance.
- Technical Assistant / Work Supervisor and or Field Unit responsible for the maintenance.
- Estimated labor requirement to perform the maintenance in person-days.

The Annual Maintenance Plan for the Giritale Main System has been developed for use in the Preventative Maintenance Program after the ISMP is completed. The Plan will only change if new features and structures are added to the system. However, the Plan should be reviewed periodically to ensure that the work planned for the Preventative Maintenance Program is adequate and is achieving the goal of sustaining the system without further need for major rehabilitation. If that goal is not being accomplished more intensive maintenance may be required and the Plan should be modified accordingly.

Based upon the Estimating Criteria, Annual Costs and Annual Maintenance Plan developed by Sheladia's O&M Engineer each IE in the Polonnaruwa Range was given a sample for preparation of the Annual Maintenance Plans for Parakrama Samudra, Minneriya and Kaudulla Schemes for the Main System Works completion in 1987. By the end of 1990 the Main System Maintenance Plan and Estimated Costs for ESI Works were completed for Parakrama Samudra, Minneriya and Kaudulla Schemes. For Giritale Scheme all of the requirements had been completed for the Main System.

A copy of the report for the Giritale Main System Annual Maintenance Plan is available with the IE Hingurakgoda for reference.

3.2.3 ANNUAL MAINTENANCE PLANS - KURUNEGALA RANGE

Under Exhibit III-2-9 the Deputy Director Irrigation Kurunegala Range was provided a sample Annual Maintenance Plan Format prepared for the Polonnaruwa Range. The format was provided in order that The Annual Maintenance Plan could be prepared for the Main System of The RBE Scheme. The Main System of the RBE Scheme includes the Anicut and Inlet Canal: Maggalla Tank, Bund and Headworks: LBMC and RBMC. During early 1990 the draft of the

Main System Annual Maintenance Plan was prepared and submitted to Sheladia for review. After review and comments a revised draft of the Main System Annual Maintenance Plan for the RBE Scheme including cost estimates were completed and submitted by 31 December 1990.

3.2.4 ANNUAL MAINTENANCE PLANS - AMPARA RANGE

Since Pragmatic Rehabilitation Work didn't start until 1989, it wasn't until early 1990 that any efforts were initiated to develop the Annual Maintenance Plan for the Gal Oya Right Bank System. Under a letter dated 31 January 1989 to the Deputy Director of Irrigation Ampara Range (See Exhibit III-2-10) it was requested that the Annual Maintenance Plan for the first 21 kilometers of the RBMC be prepared using the format developed for the Polonnaruwa Range. However, because of the conditions in the field no Walk-Through Maintenance Surveys could be accomplished during 1990 and therefore no progress on the Annual Maintenance Plan for the Gal Oya Right Bank System was achieved up to 31 December 1990. Planning for the Annual Maintenance Plan for the Gal Oya Right Bank System was scheduled in the 1991 Annual Work Plan to be accomplished from January to June 1991.

3.3 IMPROVEMENTS TO IRRIGATION SYSTEMS OPERATIONS

An Action Plan setup to improve the Systems Operations under ISMP was originally outlined in a letter from Sheladia Associates to W.N.M. Botejue, Project Director ISMP on 18 March 1988. A copy of the letter is presented as Exhibit III-3-1 and includes the following twelve major activities that were to be implemented to improve the System Operations of the Schemes.

1. Identification and establishment of Field Operation Units and Sub-Units and the development of Water Management Organizations and the establishment of job-descriptions for that Organization.

2. Establishment of two way-communications between Operation Centers and Field Operation Units.

3. Up-dating of Issues Trees and preparation of Schematic Water Distributary Diagrams.

4. Installation of a Rain Gauge Network.

5. Establishment of Control and Measuring Devices in Main and Branch Canals.

6. Establishment of Control and Measuring Devices at boundaries of DCFOs.

7. Establishment of Control and Measuring Devices at D-Canals Offtakes.

8. Establishment of Control and Measuring Devices in F-Canals.

9. Assessment of Canal Losses, Seepage and Percolation in the Systems.

10. Establishment of a Meteorological Station in Polonnaruwa.

11. Development of Three Computer Models:

- Reservoir Operation Model
- Systems Operations Model
- Seasonal Water Report Model

12. Refinement of System Operation Model

From the time the Action Plan was approved in April 1988 until December 31, 1990, considerable progress was achieved by the Sheladia O&M Engineer and Mr. D.S.A. Kulasekera, Sheladia Irrigation / Systems Operation Engineer on this Plan. There were four major efforts achieved during the period: they were (1) Conducting the Walk-Through Operations Survey; (2) Setting-up the Systems Operations Plan; (3) Training in Water Measurements; and (4) Development of a Systems Operations Computer Model.

Details of what was accomplished on the development of the Systems Operations Plan from 1988 to end of 1990 are presented in Mr. D.S.A. kulasekera's End of Tour Report dated December 1990.

A summary of the four major accomplishments during the period are as follows:

3.3.1 CONDUCT WALK-THROUGH OPERATIONS SURVEY

One of the major efforts accomplished during the period that was instrumental in getting the Operations Plan implemented was the Walk-Through Operations Survey that was conducted on the Main, Branch and Distributary Canals of five of the seven Schemes in the Project, namely, Parakrama Samudra, Minneriya, Giritale, Kaudulla and Ridi
Bendi Ela Schemes. This was a major effort and hundreds of kilometers of canal were walked and surveyed for determining the location and type of water level control and for measuring devices required to implement the Systems Operation Plans. Samples of the notes taken on the Walk-Through Operations Survey are shown on Exhibit III-3-2.

Based upon this survey, requirements for the number and size of gauges to be installed; repairs to existing water measurement structurea or drop structures; and the addition of new water measurement structures and devices were identified and programmed under the ESI Rehabilitation Program in the Polonnaruwa Range and for the Water Measurement and Priority Rehabilitation Program in the Kurunegala Range.

One of the most important requirements of the Survey was to determine the number and size of the various gauges required for all seven Schemes in the Project. Estimates of the number and size of gauges were provided to the DDI Polonnaruwa Range. Over 700 plastic gages were procured for all Schemes in the Project during this period.

3.3.2 SET-UP SYSTEMS OPERATIONS PLAN

The development of a System Operation Plan for the five Polonnaruwa Schemes was initiated with the location of Field Operation Units and Sub-Units in each Scheme; the location of Scheme Operation Computer Centers and a Range Operation Computer Center; location of rain gauges; location of meteorological stations; establishment of a communication network; and the designation of existing or new buildings for Field Operation Units. A Schematic Diagram showing the Giritale Operation Plan is presented on Exhibit III-3-3 and the locations of Field Operations Units and rain gauges are presented on Exhibit III-3-4.

3.3.3 TRAINING IN WATER MEASUREMENT

One of the most important activities conducted in 1990 under the ISMP was the nine week training course provided to over 60 TA's from all Schemes in the Project on the " Hydraulic Operations of Irrigation Delivery Systems ". This course was conducted by SAI Consultant, Professor Gaylord V. Skogerboe, of Utah State University. This course was a combination of class room exercises followed up by extensive field exercises in all phases of establishing flow measurement and discharge rating of structure and in establishing canal conveyance, seepage and percolation losses. This training program was an essential element in establishing the information and data necessary for implementation of the Computer Assisted Water Management Model. Some of the major water Measurement topics discussed and the Manuals presented during this nine week training course are summarized below:

- The Irrigation Maintenance and Operation (M&O) Learning Process (See Exhibit III-3-5).
- Field Calibration of Irrigation Structures for Discharge Measurement.

- Use of Current Meters for Determining Discharge Rates.
- Measuring Irrigation Canal Losses by the Inflow-Outflow Method.
- Measuring Seepage in Irrigation Channels by the Ponding Method.

All of the Manuals listed above are available at the IE's office in each Scheme of the Project. The training of the 60 TA's was considered a major success and has prepared them for implementing the program for improving Systems Operations under the ISMP.

3.3.4 DEVELOPMENT OF A COMPUTER ASSISTED WATER MANAGEMENT MODEL

During 1988 and 1989 two computer models were developed by the Consultants Systems Operations Engineer and field tested under the ISMP. The first model was a Reservoir Operation Model which allowed for pre-season planning and for establishing a rule curve for operating the reservoir during the season as a basis for the most efficient utilization of available water. The second model developed was the Seasonal Water Report Model which recorded seasonal data and for evaluating the performance of the irrigation scheme as a whole. Description and printouts of the results of these two models are presented in the End of tour Report of Systems Operations Engineer, D.S.A. Kulasekera, dated December 1990.

The development of the third model, the Systems Operation Model, required assistance from a Computer Model Specialist. The Model is primarily for scheduling of canal deliveries, taken into consideration, such factors, as extent actually cultivated, crops grown, crop staggers, stage of crop growth, soil properties, rainfall, canal losses, drainage inflows, etc. This Model will also provide the managers of the irrigation scheme with a tool to evaluate the performance of the delivery system at each monitoring point on a daily, weekly or periodic basis, as required.

Preliminary development of the Model was initiated by SAI Consultant, D.S.A. Kulasekera and Computer Specialist, Asok Athureliya, in 1988 and 1989. In order to finalize the System Operation Model it was decided first to send six ID Engineers to Utah State University for computer training in the basics of computer applications and water management models. The training provided these ID Engineers was delivered by Dr. Garry P. Merkley. Upon completion of the training course, Dr. Merkley came to Sri Lanka for a period of ten weeks to assist the Sheladia and ID staff in the development of the Systems Operation Model for the seven Schemes in the ISMP. During the period of

his assignment he held several training courses for the ID staff in computer application relative to water management modeling.

The model developed for the Scheme in the ISMP was especially adapted to the criteria established by Sheladia System Operation Engineer and the Irrigation Department so that the model that was developed was simple to operate; suited specifically to the scheme requirements; and provided the information and output that is required to fully monitor the distribution of water throughout the system and to assist in making the necessary adjustments to the system for the equitable distribution of water to all the farmers.

In May 1990, Dr. Merkley prepared a "Users Manual" for the Systems Operation Water Management Model and by the end of 1990 the Model had been tested out on the Giritale Scheme and was found to operate well. On 10 May 1990 Dr. Merkley gave a presentation to USAID staff on the capabilities of the Model before his departure from Sri Lanka. Copies of the "Users Manual" for the Systems Operation Computer Model are in the DDI's Office at each Range and the IE's at each Scheme.

During the remaining period of 1990, the Model was installed into the Computers at Minneriya, Kaudulla, Parakrama Samudra and Ridi Bendi Ela Scheme and data was collected for each of these Schemes to insert into the Model. However, only Giritale Scheme had the Model in operation as of 31 December 1990.

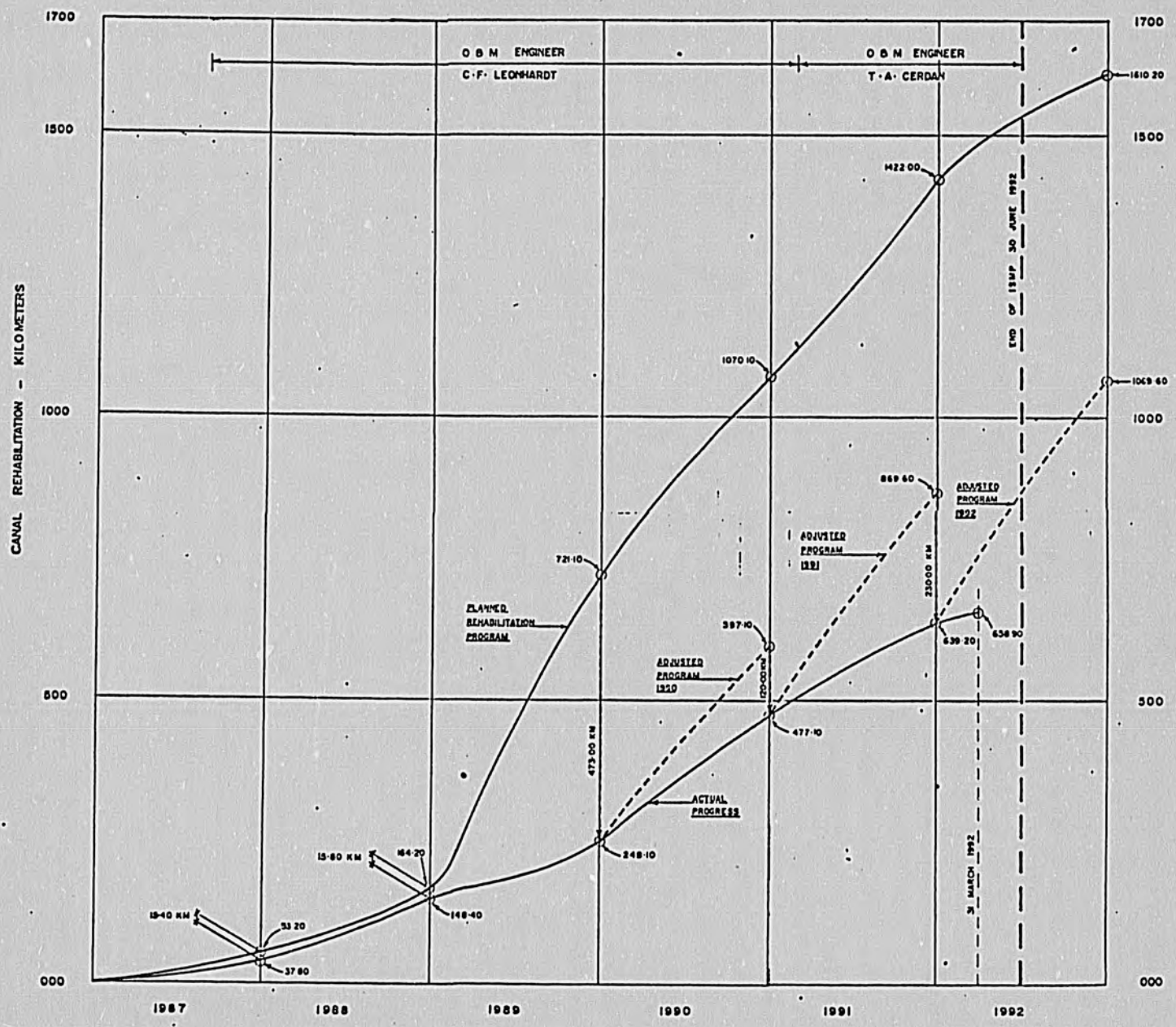
EXHIBIT III-1-1

IRRIGATION SYSTEMS MANAGEMENT PROJECT

POLONNARUWA RANGE

REHABILITATION WORK PROGRAM 1987 – 1992

SCHEDULED AND ACTUAL PROGRESS



44

SHELADIA Associates, Inc.
Consulting Engineers Irrigation Systems Management Project
Riverdale
Colombo
Polonnaruwa
35/7 Gregory's Road, Colombo 7. P. O. Box 1874, Colombo. Tel: 596034

30 May 1989
Our File 0.40

Mr. Dan Jenkins
Project Officer
USAID
Galle Road
Colombo 3

Subject: Irrigation Systems Management Project
Trip report to Gal Oya - C. F. Leonhardt

Dear Sir:

We are enclosing a copy of Mr. Leonhardt's trip report to the Gal Oya Irrigation Project at Ampara. We hope that you find this report interesting and of value.

Sincerely,

Louis E. Haley
Chief of Party

Enclosure: a/s

cc. w/cy encl : Mr. G. T. Jayawardena
Mr. L. T. Wijesuriya

cc. w/o encl : C. F. Leonhardt.

TRPRPTGO.2LH

MEMORANDUM

Date : 26 May 1989

To: L.E. Haley

Our File No : 9.0

Location: Colombo

From : C. F. Leonhardt

Location: Polonnaruwa

Subject: Field Trip Report to
Gal Oya Project, Ampara

A four day field trip was made to Ampara Range to review the status of the Gal Oya Project and to evaluate the possibility of initiating the ISMP on that Project. Mr. Pinney, Chief of Water Resources(USAID); Mr. Jenkins, ISMP Project Officer(USAID); and Mr. P. Ganawetta, Farmer Organization Specialist(SAI) were in attendance on this trip and arrived from Colombo while I arrived from Polonnaruwa.

Mr. Ganawetta was accompanied in Ampara by the Project Manager, Mr. K.M.M. Sheriff and they spent most of their time on the collection of data relative to the Farmer Organization status of the Right and Left Bank Main Canals of the Gal Oya Project. A separate trip report relative to the FO status of the Gal Oya Project will be submitted to you by Mr. Ganawetta.

I spent almost all of my time in the accompany of Mr. Pinney and Mr. Jenkins as their objective was primarily to evaluate the status of the Project relative to the rehabilitation and O & M aspects and to establish if the conditions existing in the Project Area were conducive for implementing the ISMP during 1989.

A summary of the meetings and field inspection trips taken during this four day trip from 22 May to 25 May 1989 follows:

May 22, 1989

I traveled from Polonnaruwa to Ampara through Mahaweli Systems B and C. The most appropriate and safe route for this trip from Polonnaruwa to Ampara is marked on the attached map for future reference and travel. The trip takes approximately 4.5 hours.

Upon arrival at Ampara I met with the DDI Ampara Range, Mr. S. Senathinathan and the IE Gal Oya Project, Mr. I.E. Wijedasa. Since Mr. Pinney and Mr. Jenkins had not arrived as yet we set up a time for a meeting at 1800 hours that evening.

Mr. Pinney, Jenkins and Ganawetta arrived around 1530 hours and a general discussion regarding the objectives of the trip were held.

The DDI and IE Gal Oya arrived at 1800 hours and a brief status report on the Project and the proposed 1989 rehabilitation works on the Right Bank Main Canal (RBMC) was presented by the DDI to the group. The schedule of work for the next three days was agreed upon by the DDI and the group as follows:

Tuesday Morning	- Meet the GA
Tuesday Morning	- Review 1989 RBMC Program and Drawings
Tuesday Morning	- Site visit to the Senanayake Samudra Reservoir, Gal Oya Dam, Spillway, Powerhouse and RBMC and LBMC Irrigation Headworks.
Tuesday Afternoon	- Site visit to inspect the 1989 planned RBMC rehabilitation works.
Wednesday Morning	- Review detail designs and plans of the 1989 rehabilitation works and give comments and general approval.
Wednesday Afternoon	- Review Systems Operation /Water Management Computer Program for LBMC.
Wednesday Afternoon	- Site inspection of Water Measurement Structures along LBMC.
Thursday Morning	- Jenkins and Pinney return to Colombo and Leonhardt, Ganawetta and PM Sheriff attend a meeting of the RBMC Farmer Reps.
Thursday Afternoon	- Leonhardt and Ganawetta return to Polonnaruwa.

May 23,1989

- The DDI, IE, USAID representatives and myself met with the Government Agent of Ampara District, Mr. Nandisena. The DDI explained the ISMP concept and objectives and the general program relative to the RBMC and LBMC Rehabilitation Works, Systems Operation, Maintenance, Farmer Organization Development, Financial Management and MEF Programs. The GA expressed his interest in the Project and said he would support the Project to his fullest extent and hoped that the Project would be initiated in 1989.

- A meeting was held in the DDI'S Office to review the general layouts of the RBMC and LBMC. A map of the two systems was given to the Consultant and USAID. A brief description of the planned 1989 rehabilitation program was presented. Since only Rs. 10 Million has been allocated for 1989 the DDI said that only the first 20 kilometers of the RBMC would be implemented.

Presently there is a shortage of water near the tail end of the system and the distributaries in that area do not receive adequate supply either due to lack of water or inadequate conveyance capacity.

To increase the water supply capability of the system the 1989 rehabilitation program plans to increase the discharge capacity of the RBMC System from 650 to 1000 CFS. This would entail increasing the control and regulator structure capacity along the canal in the first 20 kilometers. The major works proposed for 1989 are:

- Increase capacity of the RBMC Headgate Regulator
- Raise the concrete lining of the first 400 meters of the RBMC
- Add one barrel to the existing syphon across Padagada Ela
- Provide Dry Rubble Packing (DRP) along the RBMC bends where banks are damaged and roadway erosion is taking place
- Increase capacity of the RBMC regulator gates as necessary to provide for the increased discharge

A field inspection trip was taken in the morning to the Gal Oya Project to see the Senanayake Samudra Reservoir, Dam, Spillway, Powerhouse and the RBMC and LBMC headgate regulators. Although the Project was built over forty years ago it was found to be in good condition and in a good state of maintenance.

A visit to the tailrace of the Powerhouse was made and an inspection of the headgate regulator structures for the LBMC, RBMC and the River Diversion was conducted. The powerhouse controls the tail water level and sofar has not been agreeable to increase the existing maximum tail water level to allow the ID to increase the discharge capacity of the existing headgate regulators. Therefore, the proposal of the DDI is to remove the existing radial gate, lower the sill elevation and install a new rectangular slide gate to provide for the increased capacity from 650 to 1000 CFS. The proposal for raising the existing lining of the first 400 meters of the downstream canal section was reviewed in the field and the existing lining inspected.

Another field trip was taken in the afternoon to inspect the RBMC for the first 20 kilometer reach that is proposed for rehabilitation during 1989. Several reaches along the canal, where dry rubble packing is proposed, were inspected. Existing turnout structures to D Canals were found to be in good condition and the intake gates well maintained.

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Measuring devices in the outlet structures were not functioning or were in a damaged condition and will require rehabilitation. An inspection of the existing two barrel syphon (2.1m x 2.1m) over Padagada Ela was made.

Presently there is a problem of trash collection and disposal and it is planned to design a new trashrack when the third syphon barrel is added to increase the canal capacity from 650 to 1000 CFS. The new syphon barrel will be parallel and adjacent to the existing syphon, however, it will not be designed integrally. It is proposed that the construction of the new syphon could be done partly during the irrigation season and completed at the intake and outlet structures during the close season.

The inspection continued along the canal up to the 20 km reach where several regulators will have to be slightly modified for the added discharge capacity. The condition of the existing regulators and drop structures were found to be in a good state of repair and maintenance.

In the evening another meeting was held with the DDI, IE and USAID representatives at the ID Circuit Bungalow. The status of the Farmer Organization Programs on the Left and Right Banks were presented and proposals for implementing the RBMC Farmer Organization Program during 1988 was discussed. The DDI said that he would have to go to Colombo for a meeting the next day so requested the IE to continue the inspection tour program for the group on the 24 th May.

May 24, 1989

A meeting was held in the DDI'S Office to review in detail the proposed 1989 Work Program. The Design Engineer, Md. Aliyar, presented the program in detail to the group. In general, the planned program for 1989 was agreed upon as the designs were considered acceptable and approved with the exception of the following:

1. The modifications to the RBMC headgate regulator for increased capacity should be deferred until a decision is reached between the ID and the Power Station on increasing the tail water level. Also it was recommended that the radial gate be opened as wide as possible to increase the discharge from orifice flow to free flow which would increase the discharge through the regulator from 650 CFS to approximately 875 CFS.

2. The proposal for raising the first 400 meters of the existing downstream lined canal section was reviewed.

It is proposed that a 0.50 meter high vertical reinforced concrete wall be added above the existing lining to provide for adequate freeboard when the canal capacity is increased to 1000 CFS. It was recommended that an alternative of dry rubble packing be considered instead of the RCC wall.
Mr. Aliyar said he would prepare a cost estimate of the two alternatives for comparison purposes before submitting the final recommended design for this work.

3. The syphon design was reviewed and accepted in principal. The design of the trashrack arrangement would be made considering the possible location of the rack upstream. Alternative trashrack designs from Mahaweli System B Kuda Oya and Railroad Syphon Crossings would be reviewed before final design. The Consultants O & M Engineer agreed to send copies of drawings of those Mahaweli syphons to the DDI'S Office for review.

It was agreed that the detailed plans and cost estimates would be finalized and submitted for approval to the DDI as soon as possible so as not to delay the work when the Project is approved to start.

In the afternoon a meeting was held in the IE'S Office to review the status of the computer systems operation program for the LBMC. The IE explained that the systems operation/water management program has been successfully implemented for the last four years. The program was developed during the Water Management Project and basically involves the following procedures for improving the equity and distribution of water:

1. Measurement devices are located at all major junction/bifurcation points along the LBMC. Measurement devices are provided at all major D-Canal outlets taking off of the Main and or Branch Canals.

2. Eight rain gages are located in the LBMC Service Area to monitor rainfall and to establish effective rainfall to apply into the computer program for determining water requirements.

3. TA'S are permanently assigned to read the DC measuring gages to determine discharges based upon calibrated curves for each DC turnout. The TA'S travel by bicycle from the tail end to intermediate stations where they communicate by phone relaying the gage readings and discharges to the IE'S Office each morning and afternoon of the week.

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4. The IE'S Office inserts the information on rainfall and discharge into the water management computer program and the computer determines the proper discharge requirements and or gate openings at each DC turnout.

   This information is phoned to the TA'S who respond accordingly by adjusting the DC gate openings and discharge. This procedure is done twice a day, once in the morning and once in the afternoon.

A brief description of the inputs and out puts of the water management computer program was presented by the IE and print-outs of the program and the Seasonal Water Reports were reviewed. The IE offered to send samples of the computer print-outs of the program and the Yala and Maha Seasonal Water Reports to the SAI Office for review.

A presentation of how the computer program works was given by Senior TA Mr. L.G.P.Samarawickrama. He is responsible for operating the water management program under the IE'S supervision. An explanation of how the program runs was presented and it was recommended that the SAI Systems Operation Engineer D.S.A. Kulasekera and Computer Programmer N.A.D.S. Athuraliya come to Ampara to spend one week to inspect the LBMC and RBMC and to review the computer program presently operating effectively for the LBMC. A modified and simplified program for the RBMC has been developed and is presently being refined.

- In the afternoon a field inspection of the LBMC and the Uhana Branch Canal was made to see the work that was rehabilitated during the Water Management Project five years ago. In general the conditions of the canal and structures were very good. Dry rubble packing (DRP) placed on the Main and Branch Canals was generally in a very good condition and maintenance requirements after five years was considered minimal. It was estimated that only 5 % of the length of the DRP required some repairs. The areas that required repairs were those areas where people come down the slope for bathing and or washing. Consideration to providing more bathing steps in future rehabilitation programs may reduce this maintenance requirement.

The turnout structures original designed some forty years ago are very strong and are still in excellent shape. The gates are massive and are still in good state of repair. In general water measurement facilities constructed during this WMP five years ago are in good state of repair and are functioning in most cases effectively. Broad creasted weirs have been placed in the larger DC and are functioning well. Triangular weirs have been constructed at most smaller DC turnouts and are generally effective; only about 10 % of these structure have insufficient head to be effective for water measurement.

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Regulators, drop structures, bridges, etc. along the canals are all functioning well. In general the LBMC and Uhana Branch Canals are functioning very well.

Approximately eight D-canals have been turned completely over to the Farmer Organizations. Approximately 50 % of those D Canals are being operated by the FO's effectively. The FO are responsible for the equitable distribution of water below this D Canal turnout which is supplied by the ID with the adequate amount of water. The FO maintain the DC and FC below this point and receives O&M Funds in accordance with the unit rate provided for the Project.

A study by the SAI FO Specialists of the success and or failure of the FO to take over these DC's should be made to evaluate the advantages and disadvantages of this program relative to other ISMP Schemes.

May 25, 1989

The SAI O&M Engineers and FO Specialists along with Project Manager Sheriff attended a meeting of the RBMC Farmer Representatives (20 nos.) of the first 20 km of the canal. In attendance at the meeting was the Agrarian Services Division Officer (Daman) Mr. S. Deshabandu, the Agricultural Instructor Mr. D. M. Heenbanda and the Senior TA from the ID Mr. Kanapathipillai.

The PM and SAI FO Specialists explained to the Farmer Representatives the purpose of ISMP and how the F.O. program plays a major part in the Project. The SAI O&M Engineer explained the purpose of the rehabilitation, system operation and maintenance aspects of the project. Since the meeting was held in the Sinhalese language details of the meeting presentation will be covered in Mr. Ganewatte's Trip Report.

After meeting the SAI team departure for Polonnaruwa at 1130 hrs. and arrived at 1530 hrs.

Conclusions and Recommendations of the Trip

The following conclusions and recommendations were developed by the SAI O&M Engineer as a result of this four day trip to the Gal Oya Project in the Ampare Range.

A. Conclusions

1. The conditions in the Project Area are considered secure and it is safe enough to start the ISMP. Although the area near the tail end of the RBMC is under some ethic disturbances the planned works in the areas upstream can be initiate during 1989 and 1990.

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The down stream area can be implemented later when the situation improves.

2. The technical staff of the DDI Ampara Range is considered very experienced and are capable of implementing the ISMP; they are awaiting to initiate the Project.

3. The RBMC system is a very good system which has an immediate need for rehabilitation, improvement to systems operations, development of preventative maintenance program, development of farmer organization and the initiation of FM and MEF programs.

endations

It is recommended by the SAI O&M Engineer that the ISMP start immediately on the RBMC of the Gal Oya Project during 1989.

2. It is recommended that the SAI System Operation Engineer D. S. A. Kulasekera and the SAI Computer Programmer NADS Aturaliya visit the Gal Oya Project in the near future to evaluate the system operation/water management program which is successfully being implemented on the LBMC.

3. It is recommended that the SAI Crop Diversification Specialists visit the Gal Oya Project in the near future to review the on-going crop diversification program in that Project.

4. It is recommended that IE Gal Oya and Design Engineers from the Ampara DDI's office visit the Polonnaruwa Range to inspect and review ESI works that has been carried out during 1987 and 1988 on the Parakrama Samudra, Giritale, Minneriya and Kaudulla Schemes.

5. It is recommended that the SAI FM and MEF Specialists visit the Gal Oya Project in the near future to evaluate the status of FM/MEF programs currently being implemented in the Ampara Range.

6. It is recommended that the SAI O&M Engineer again visit Ampara in the near future to collect details on the project data, maps, schedules, plans, etc., and to approve the 1989 work plan for early submittal to USAID for approval.

7. The monitoring of construction and quality control by the Consultant can be done from Polonnaruwa with trips

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scheduled for a duration of one week every month.

It is recommended the SAI F.O Specialists prepare a Master Plan for F.O. Development on the RBMC for submittal to IMD.

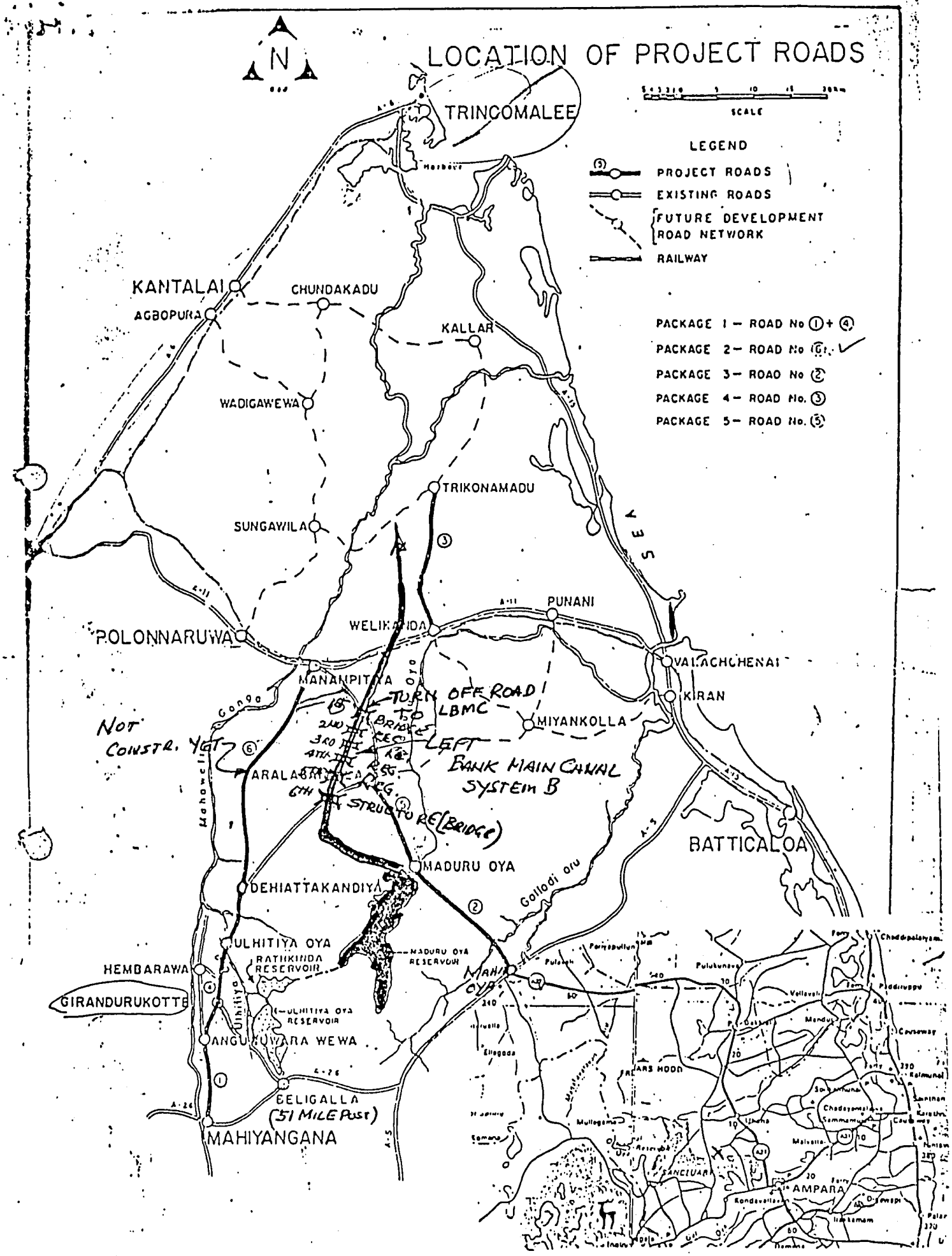
The distribution of the above field trip report can be determined by you, as appropriate.

C. F. Leonhardt

Encl: Map of travel route from Polonnaruwa to ampara.

FLDTRPGO.2CL

64


LOCATION OF PROJECT ROADS
N
SCALE
LEGEND
PROJECT ROADS
EXISTING ROADS
FUTURE DEVELOPMENT ROAD NETWORK
RAILWAY
PACKAGE 1 — ROAD No ① + ④
PACKAGE 2 — ROAD No ⑥
PACKAGE 3 — ROAD No ②
PACKAGE 4 — ROAD No. ③
PACKAGE 5 — ROAD No. ⑤
TRINCOMALEE
KANTALAI
AGBOPURA
CHUNDAKADU
KALLAR
WADIGAWEWA
TRIKONAMADU
SUNGAWILA
PUNANI
POLONNARUWA
WELIKANDA
VALACHCHENAI
MANANPITIYA
KIRAN
MIYANKOLLA
NOT CONSTR. YET
TURN OFF ROAD TO LBMC
LEFT BANK MAIN CANAL SYSTEM B
STRUCTURE (BRIDGE)
BATTICALOA
MADURU OYA
DEHIATTAKANDIYA
ULHITIYA OYA
RATHKINDA RESERVOIR
MADURU OYA RESERVOIR
HEMBARAWA
GIRANDURUKOTTE
ULHITIYA OYA RESERVOIR
ANGUNUWARA WEWA
BELIGALLA (51 MILE POST)
MAHIYANGANA
Galladi aru
Mahaweli
Ganga
AMPARA

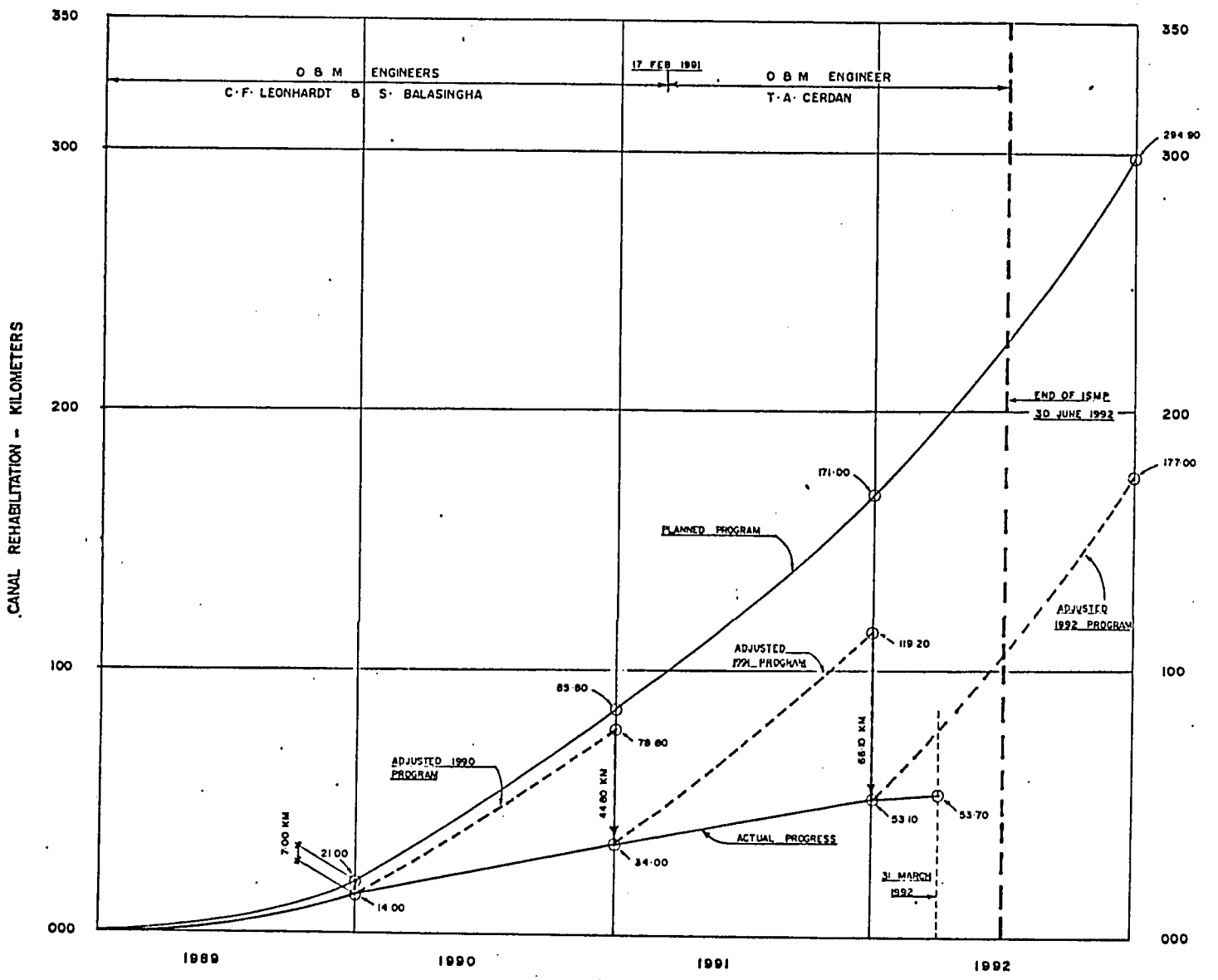
IRRIGATION SYSTEMS MANAGEMENT PROJECT

AMPARA RANGE

PRAGMATIC REHABILITATION WORKS GAL OYA RBMC

1989 TO 1992

PLANNED PROGRAM & ACTUAL PROGRESS



SHELADIA Associates, Inc.
Consulting Engineers Irrigation Systems Management Project
35/7 Gregory's Road, Colombo 7. P. O. Box 1874, Colombo. Tel: 596034
Riverdale
Colombo
Polonnaruwa

12 July 1988

Mr.G.T.Jayawardena
Project Director
Irrigation Systems Management Project
Irrigation Department
Bullers Road
Colombo 7

Dear Sir:

Subject: Maintenance Plan for ISMP

A Maintenance Plan for the ISMP must be developed for submittal to ID/IMD/USAID. The Consultant's O&M Engineers have studied the Project Paper regarding this requirement and we have attempted to interpret the meaning in the Project Paper with respect to the Maintenance Plan. In addition they have consulted with Mr. Piyadasa regarding the scope of this requirement and came to the following understanding of what the Maintenance Plan should contain during the LOP and what will be the Preventative Maintenance requirement after the Project ends.

Our understanding of these requirements follows:

1. MAINTENANCE PLAN- A Maintenance Plan will be prepared for each irrigation scheme under the ISMP for each year of the LOP. The Maintenance Plan will include the following:

   a. Identification of ESI works for the scheme and related costs for the year. This is currently being carried out by the ID and the designs and cost estimates are then submitted to IMD/USAID for approval of construction around May/June of each year.

   b. Inventory of normal maintenance needs for the scheme and related costs for the year. This is the maintenance that is required periodically (annually, semi - annually ; bi-annually; etc.) during each year to maintain the scheme after ESI is completed up to the end of the Project. A standard form will be filled out each year by the Division IE giving the component of the scheme; the location of the component; the maintenance work description; quantity of work; frequency of maintenance; schedule of maintenance performance; names of supervisory staff;labor requirements; etc. These normal maintenance work needs will follow after completion of ESI work during the following year up to LOP.

The Division IE will develop the cost of this work and it will be funded out of normal ID O&M funds. If these normal funds are found to be insufficient over the LOP a request for addition funds must be made at the end of the Project in order to satisfy the long term preventative maintenance program which is required to sustain the project without recourse to major rehabilitation.

c. Priority Maintenance needs for the scheme and related costs for the year. These maintenance needs are priority needs that are required to be maintained on a one time basis after completion of the ESI works. Priority Maintenance needs will be determined during a survey after completion of ESI work in any part of the scheme. These needs will be identified by the Division IE and his staff along with the Consultant and the related cost estimated and submitted for approval to IMD/USAID for funding under ISMP. Each year of the project a Priority Work Plan will be prepared listing the priority maintenance needs and related costs; they will be submitted for approval independent of the ESI work.

d. Maintenance equipment requirements for the scheme and related costs for the year. During the first two years of the Project most of the maintenance equipment will be procured,however, thereafter and up to the end of the Project, maintenance equipment requirements will be evaluated and procurement initiated as needed for the long term preventative maintenance program after the Project ends. Cost for the equipment and the costs to operate and maintain that equipment will be established. At the end of the Project annual O&M cost of the maintenance equipment will be developed for approval and funding.

e. Maintenance manpower requirement for the scheme and related costs for the year. The annual maintenance manpower required to maintain the scheme will be developed based upon normal annual maintenance and priority maintenance requirements during the LOP.The cost of this manpower will be estimated each year.

f. Identification of the type of maintenance contract. For each scheme the type of maintenance contract will be determined, i.e.; force account maintenance contract; private contractor maintenance contract; and SPC maintenance contract. The number and type of contracts will be identified and progress on each contract will be closely monitored and compared.

g. Annual Maintenance Report. At the end of each year the Division IE for each scheme will prepare a report that lists each maintenance item corrected and its actual cost; this procedure will continue through the LOP.

2. PREVENTATIVE MAINTENANCE PLAN- A Preventative Maintenance Plan is required to be prepared during the last year of the ISMP in order to plan for continued maintenance after completion of the Project. The Preventative Maintenance Plan will outline the periodic maintenance requirements that were identified during the LOP. The plan will discuss the physical causes and the extent of the maintenance problems and how they are best resolved at the least cost. Under the plan an annual preventative maintenance schedule will be developed listing the components of the scheme; the location of the components; the maintenance work description; quantity of work, frequency of maintenance, schedule of maintenance performance of the year; identification of supervisory staff; labor requirements; etc. This preventative maintenance schedule will be developed by the Division IE for each scheme with the help of his TA and WS staff. The Preventative Maintenance Plan will include maintenance equipment and manpower requirements and estimated annual maintenance cost to implement the Plan. The Preventative Maintenance Plan will be submitted annually for approval and funding.

The revised LOP schedule for conducting the Maintenance Plan, Priority Maintenance Work Plans, Preventative Maintenance Plan and other related maintenance tasks is presented in Table I, attached.

We would appreciate receiving your approval at the earliest practicable date so that we can proceed to implement the plan accordingly.

Sincerely,

Louis.E.Haley
Chief-of-Party

Enclosure: Table I - Maintenance program schedule

Mr.S.Ranatunga, DD IMD
Mr.L.Wijesuriya, Addl.Dir.ISMP/ID
Mr.S.Piyadasa, DDI Polonnaruwa
Mr.D.Jenkins, USAID
Mr.C.F.Leonhardt
Mr.D.Bradbury

TASK 2 - OPERATION AND MAINTENANCE

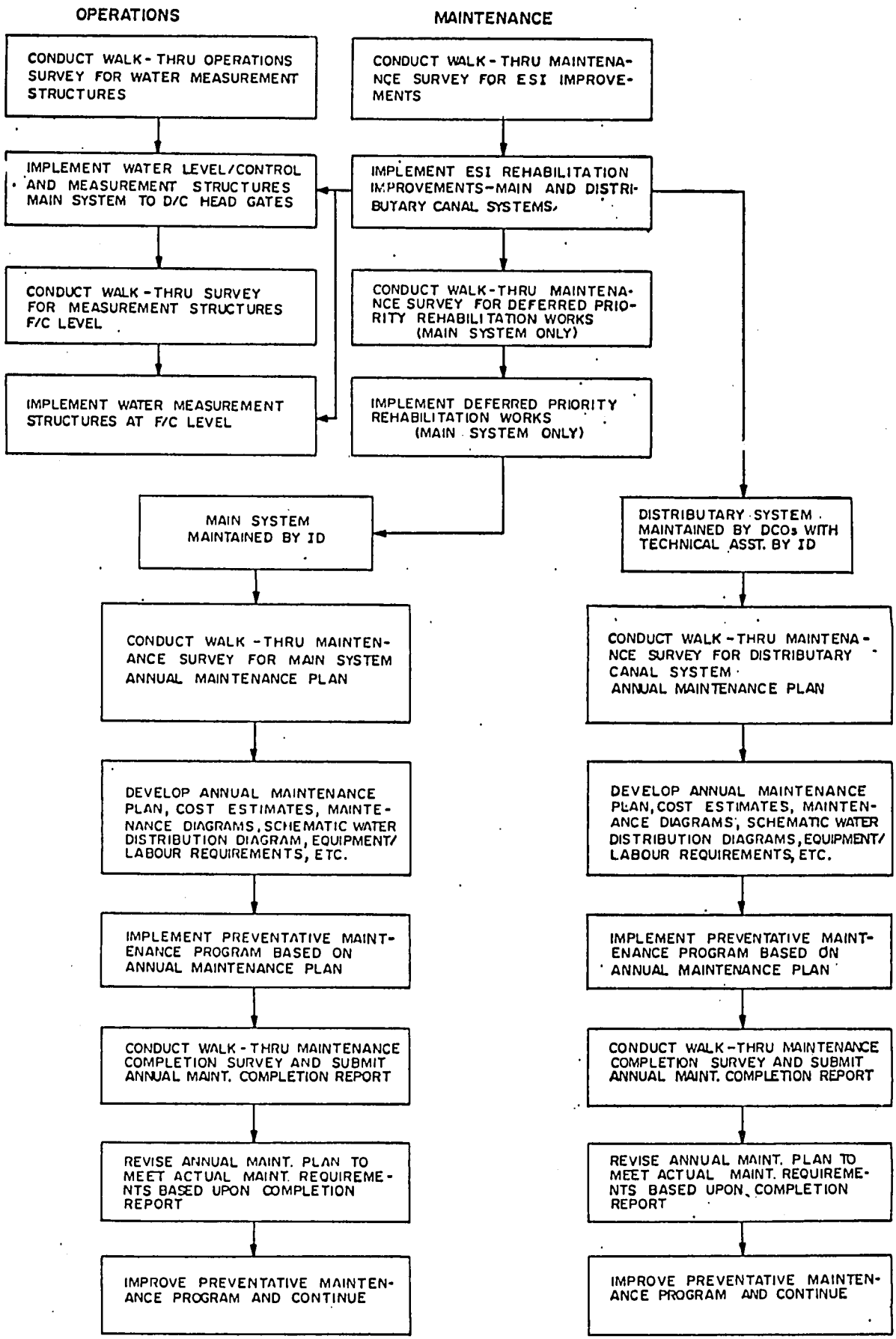
TABLE I
IRRIGATION SYSTEMS MANAGEMENT PROJECT
LIFE OF PROJECT WORK PLAN
MAINTENANCE PROGRAMME SCHEDULE

LEGEND

Planned	------	Date Due	●
Actual	xxxxxx	Date Submitted	0
Extension	======	Sched. Review	++++++
Percent Scheduled	----------25-------		
Percent Completed	xxxxxxxxxxxxxxxxxxx68xxx		

NO.	SUB-TASKS	RESP ORG'N/ PERSO	NUMBER OR AMOUNT	LOCATION OR AREA	OTHER FACTORS	CY-87 1ST QTR	CY-87 2ND QTR	CY-87 3RD QTR	CY-87 4TH QTR	CY-88 1ST QTR	CY-88 2ND QTR	CY-88 3RD QTR	CY-88 4TH QTR	CY-89 1ST QTR	CY-89 2ND QTR	CY-89 3RD QTR	CY-89 4TH QTR	CY-90 1ST QTR	CY-90 2ND QTR	CY-90 3RD QTR	CY-90 4TH QTR	CY-91 1ST QTR	CY-91 2ND QTR	CY-91 3RD QTR	CY-91 4TH QTR	CY-92 1ST QTR	CY-92 2ND QTR	CY-92 3RD QTR	CY-92 4TH QTR
	MAINTENANCE PROGRAMME																												
2.5.1	Conduct Maintenance Survey	ID/SAI																											
2.5.2	Develop Maintenance Plan	ID/IHD SAI																											
2.5.3	Annual Priority Maintenance Work Plan	ID/IHD SAI																											
2.5.4	Train Staff in Maintenance	ID/SAI																											
2.5.5	Implement Annual Priority Maintenance Plan	ID/SAI																											
2.5.6	Prepare Annual Priority Maint. Completion Report	ID/SAI																											
2.5.7	Revise Maintenance Plan	ID/SAI																											
2.5.8	Develop Preventive Maint. Plan	ID/IHD SAI																											
2.5.9	Develop O&M and Preventive Maintenance Manual	ID/SAI																											
2.5.10	Refine GSL Budgeting Procedure	ID/IHD SAI/US AID																											
2.5.11	Refine Preventive Maint. Manual	ID/SAI																											
2.5.12	Report on Project Experience and Recom. for Implementation of Preventive Maintenance Program	ID/IHD SAI																											
2.5.13	End of Tour Report																												

IRRIGATION SYSTEMS MANAGEMENT PROJECT
PREVENTATIVE MAINTENANCE PROGRAM
SCHEMATIC DIAGRAM



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Polonnaruwa

September 29, 1988

S.Piyadasa
Dy.Director of Irrigation
Polonnaruwa Range

Subject : Priority Maintenance Plan

Reference : Letter to G.T.Jayawardena regarding Maintenance Plan for ISMP dated 12 July 1988.

Dear Mr. Piyadasa,

The Maintenance Plan for ISMP was approved during the IMD/ID meeting in Colombo on 1 August 1988. Therefore, it is appropriate to initiate the Maintenance Plan during 1988. One of the requirements under the Maintenance Plan is the preparation of a Priority Maintenance Plan that must be prepared annually during the life of the Project for each scheme. This Priority Maintenance Plan will identify the priority maintenance needs that are required to be maintained on a one time basis after completion of the ESI works. Priority maintenance needs will be determined during a survey after completion of ESI work in any part of the scheme. These needs will be identified by the Division IE and his staff along with the Consultant and the related cost estimated and submitted for approval to IMD/USAID for funding under ISMP. Each year of the project a Priority Work Plan will be prepared listing the priority maintenance needs and related costs; they will be submitted for approval independent of the ESI work.

Inorder to initiate the Priority Maintenance Plan the Consultant has made a sample survey of the priority maintenance needs of the Parakrama Samudra Scheme on the D-1 Main Canal from kilometre one to the bifurcation structure. This reach of the D-1 Main Canal had ESI work completed during the 1987 work programme, therefore, priority maintenance needs for that reach of the canal can be identified in 1988 and implemented during the close seasor of April 1989.

A copy of the sample survey notes for priority maintenance needs of the D-1 Main Canal from kilometre one to the bifurcation structure is attached for your information and review. It is recommended that each Divisional IE conduct a similar survey on ESI works completed during 1987 so that the annual Priority Work Plan for each scheme can be submitted to IMD/USAID for approval and funding for implementation.

Head Office: 5711 Sarvis Avenue, Riverdale, Maryland 20737 U.S.A. Tele: (301) 779 - 4313

SHELADIA Associates, Inc.

The Consultant will assist the IE and his staff in this survey as needed. It is recommended that the survey be done when the water is out of the canal for better inspection purposes. Cost estimates and the necessary drawings and plans can then be prepared, approved and submitted to IMD/USAID by the end of 1988 with approval in early 1989 and implementation thereafter.

Please initiate this Priority Maintenance Plan at your earliest convenience.

Sincerely,

C.F.Leohardt
Dy.Chief of party
Sheladia Associates Inc.

Encl. Priority maintenance survey of PSS D-1
Main Canal (5 sheets)

cc. G.T.Jayawardena
L.T.Wijesooriya
D.Jenkins
R.A.V.S.Imbulana IE PSS
S.Senarathna IE Hingurakgoda
H.A.Karunasena IE Kaudulla
L.E.Haley
D.S.A.Kulasekera
File

SHELADIA Associates, Inc.
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Mandalay Colombo Polonnaruwa
35/7 Gregory's Road, Colombo 7. P. O. Box 1874, Colombo. Tel: 590034

Sheet 1 of 1

Project IRRIGATION SYSTEMS MANAGEMENT PROJECT — Contract No. 908 — File No.
Feature PRIORITY MAINTENANCE SURVEY — Designed CFL — Date 27/9/88
Item PSS- D-1MC Km 1 TO BIFURCATION STRUC — Checked — Date

SAMPLE PRIORITY MAINTENANCE PLAN SURVEY - PSS D-1MC.

A. FC-2 (URANGALA) 86AC. @ STA 1+324±

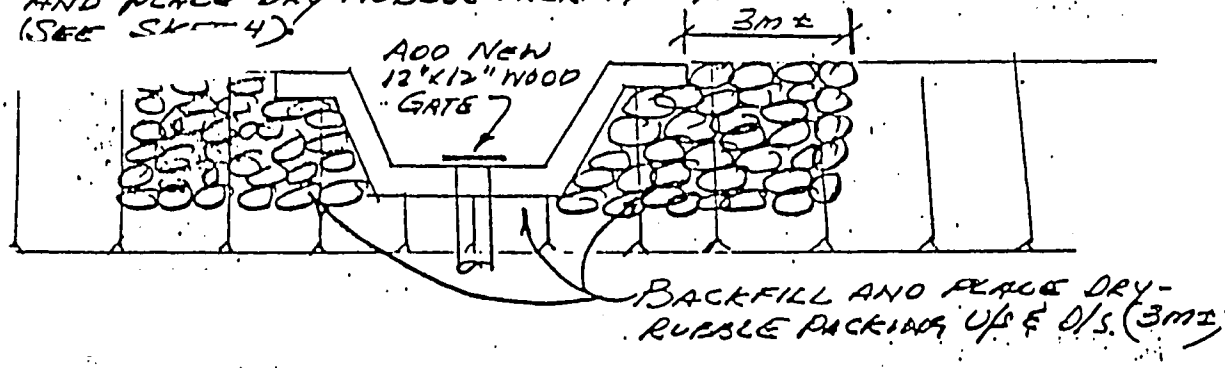
1. 12"x12" WOODEN GATE AND LIFTING STEM - TO BE REPLACE

B. EXISTING RETAINING WALLS LB AND RB DOWNSTREAM OF FC-2 - WALLS TO BE INSPECTED AT FOUNDATION LEVEL TO ENSURE STABILITY. IF REQUIRED, REPAIRS SHOULD BE MADE TO FOUNDATION UNDER PRIORITY MAINTENANCE WORK.

C. FC-3 @ STA 1+460±

1. NO GATE - INSTALL 6"x6" WOODEN GATE AND LIFTING STEM

2. EROSION BEHIND INTAKE STRUCTURE HEADWALL - BACKFILL AND PLACE DRY RUBBLE PACKING U/S AND D/S OF STRUCTURE (SEE SKT-4).

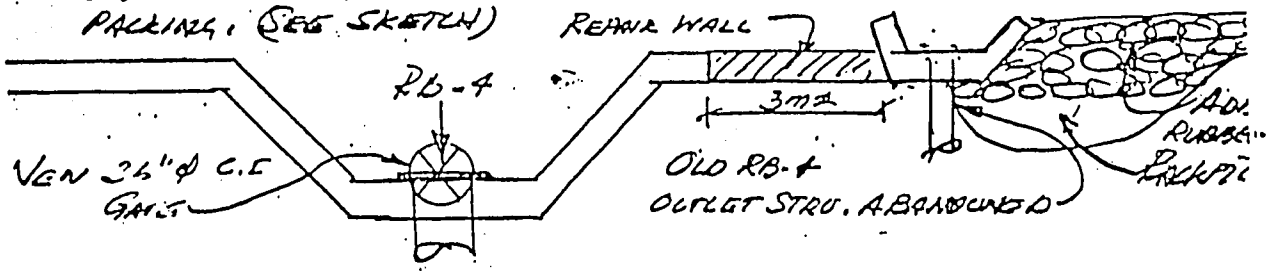


F.C-4 (84AC) AND FISH DEVELOPMENT OUTLET @ STA 1+600±

1. EXISTING INTAKE WITH NO GATE 18"φ PIPE. - INSTALL NEW 18"φ C.I SLIDE GATE WITH STEM AND WHEEL.

RB-4 (610AC) NEW 36"φ C.I. GATE WITH STEM @ STA 1+625±

1. WALL D/S OF INTAKE STRUCTURE DAMAGED AND BANK EROSION. REPAIR WALL BACKFILL HOLE AND ADD RUBBLE-PACKING. (SEE SKETCH)



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Project IRRIGATION SYSTEMS MANAGEMENT PROJECT
Feature PRIORITY MAINTENANCE SURVEY
Item

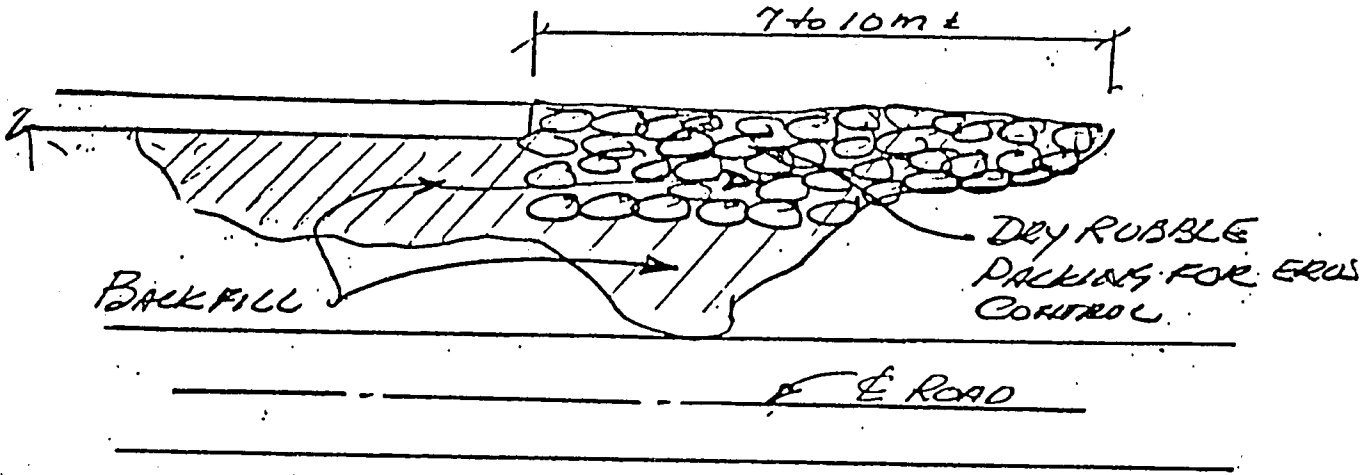
Contract No. 908
Designed CFL
Checked

Sheet 2 of 5
File No.
Date 27/9/88
Date

SAMPLE PRIORITY MAINTENANCE PLAN SURVEY - DSS D-1MC (CONT.)

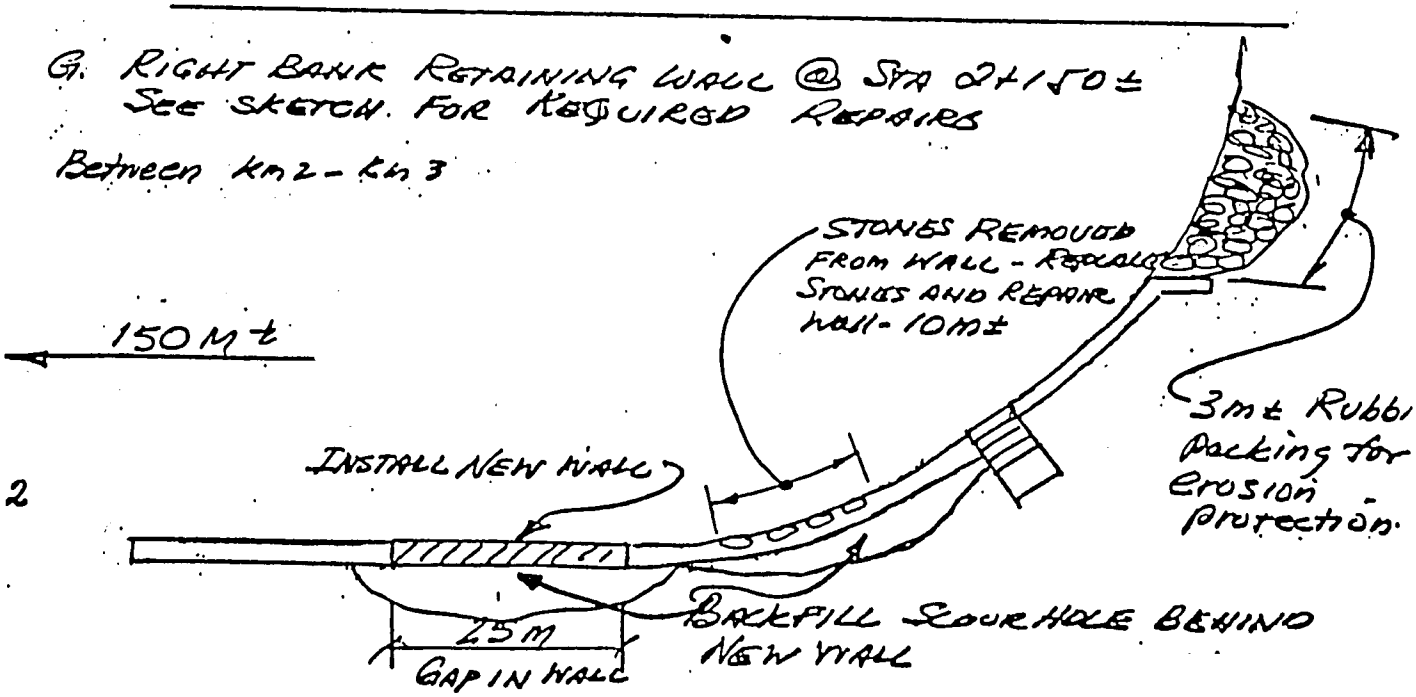
F. EXISTING RETAINING WALL ON RIGHT BANK 100 METERS ± BELOW D-1MC REGULATOR STRUCTURE @ STA. 1+750 ±.

1. NO BACKFILL BEHIND WALL AND EROSION HOLE 7-10 METERS D/S OF END OF WALL. – BACKFILL BEHIND WALL AND D/S HOLE ADD DRY RUBBLE PACKING FOR SLOPE PROTECTION (SEE SKETCH)



G. RIGHT BANK RETAINING WALL @ STA 2+150 ± SEE SKETCH. FOR REQUIRED REPAIRS

Between Km 2 – Km 3



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Consulting Engineers Irrigation Systems Management Project
35/7 Gregory's Road, Colombo 7. P. O. Box 1874, Colombo. Tel: 596034

Project: IRRIGATION SYSTEMS MANAGEMENT PROJECT — Contract No. 908 — Sheet 3 of 5
Feature: PRIORITY MAINT. SURVEY — Designed: CFL — File No. — Date: 29/9/88
Item: PSS - D-1MC KM1 TO BIFURCATION — Checked: — Date:

SAMPLE PRIORITY MAINTENANCE PLAN SURVEY - PSS D-1MC (Cont)

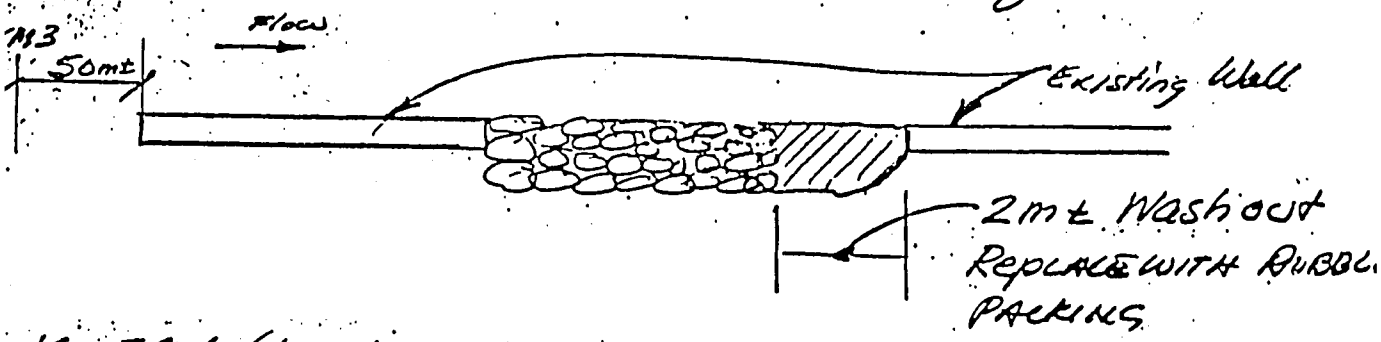
H. FC-5 (101 Ac) @ 2+770 ±

1. Gate lief missing - must be replaced; Gate stem in place but 15% of gate removal.

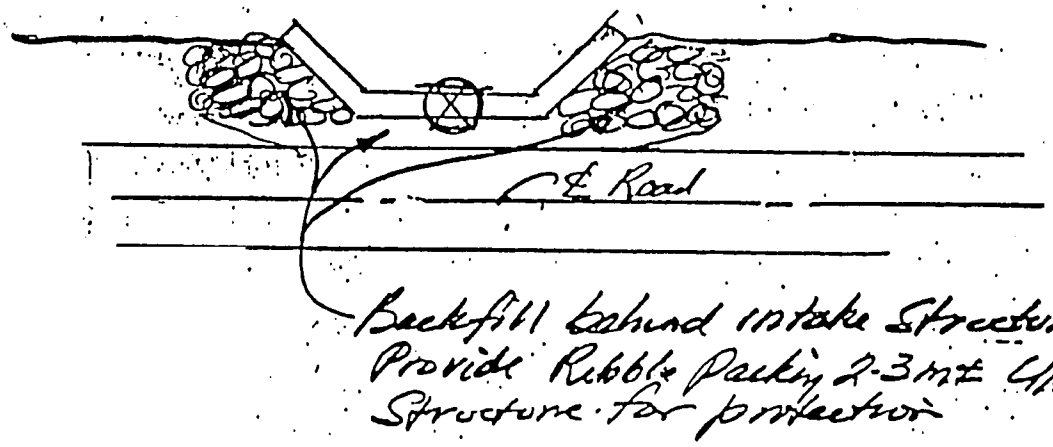
2. Backfill around intake structure and protect with Dry Rubble packing both U/S and d/s of structure - 3m

I. All washouts and erosion holes which are encroaching on the paved road should be filled and rubble packing placed to protect roadway.

J. RIGHT BANK RETAINING WALL 50m d/s of km3



K. FC-6 (61 Ac.) @ Stc. 3+800 ±



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Colombo
Polonnaruwa

Project IRRIGATION SYSTEMS MANAGEMENT PROJECT
Feature PRIORITY MAINT. SURVEY
Item PSS-01 MC Km 1 TO BIFURCATION

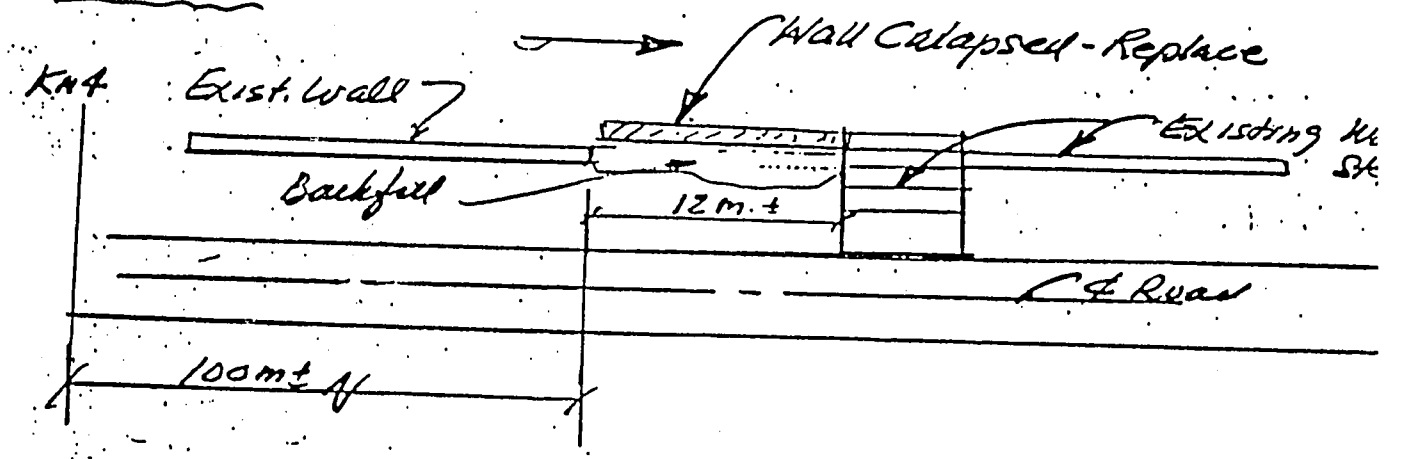
Contract No. 908
Designed CFL
Checked

Sheet 4 OF 5
File No.
Date 29/9/88
Date

SAMPLE PRIORITY MAINTENANCE PLAN SURVEY - PSS D-1 MC (CONT.)

L. EXISTING RETAINING WALL @ STA 4+100 ±

Km 4 to km 5



M. FC-7 (84AC) @ STA 4+360 ±

INTAKE STRUCTURE IN GOOD CONDITION - NO PRIORITY MAINT. REQ'D.

N. WALL DOWNSTREAM OF FC-7 ON RIGHT BANK NO BACKFILL
IF POSSIBLE BACKFILL SHOULD BE PLACED

EXHIBIT III - 2 - 2

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56/7 Gregory's Road, Colombo 7. P. O. Box 1874, Colombo. Tel: 596034

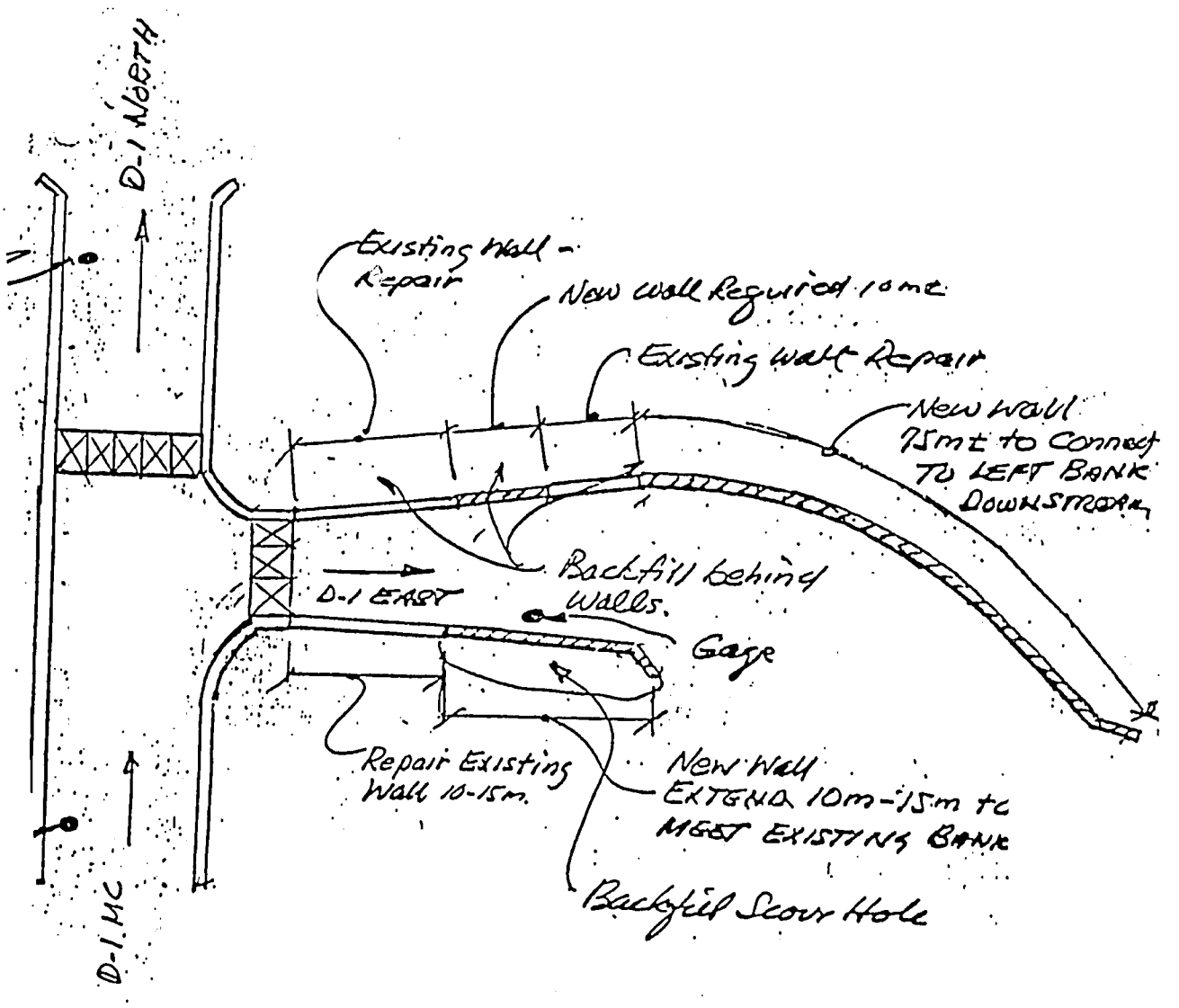
IRRIGATION SYSTEMS MANAGEMENT PROJECT
Project: PRIORITY MAINT SURVEY
Section: PSS-D-1MC EXT 1 TO BIFURCATION

Contract No. 908
Designed CPL
Checked

Sheet 5 of 5
File No.
Date 29/5/81
Date

SAMPLE PRIORITY MAINTENANCE PLAN SURVEY – PSS D-1MC (CONT)

D-1 EAST BIFURCATION STRUCTURE



SHELADIA Associates, Inc.
Consulting Engineers Irrigation Systems Management Project
35/7 Gregory's Road, Colombo 7. P. O. Box 1874, Colombo. Tel: 596034
Riverdale
Colombo
Polonnaruwa

September 30, 1988

Mr.S.Balasingham,
Dy. Director of Irrigation,
Kurunegala Range.

Dear Mr Balasingham

Subject: Annual Maintenance Plan for Redi Bendi Ela Scheme

Reference: Letter to Project Director regarding Maintenance Plan for ISMP dated 11 July 88. (Copy enclosed)

The Maintenance Plan for ISMP was approved during the IMD/ID meeting in Colombo on 1 Aug.1988.

One of the requirements of the Maintenance Plan for the ISMP is the preparation of the Annual Maintenance Plan for each scheme.

In order to initiate the Annual Maintenance Plan the Consultant has prepared a draft format in respect of the Parakrama Samudra Scheme in the Polonnaruwa Range . Headworks and all other items to be maintained by ID are to be included in the Plan for each respective year. This Plan is to be used in conjunction with the ID Maintenance Diagram of the scheme.

In the proposed format we have attempted to :

a) Identify each item requiring maintenance,

b) Indicate its relevant major dimensions,

c) Describe the maintenance work required,

d) Quantify the maintenance work whereever possible

e) Indicate the suggested frequency of maintenance

f) Schedule the maintenance work taking cognisance of water issues, rainy periods, low river conditions, etc.

g) Identify the field unit responsible for the work, and

h) Estimate the labour requirements

Head Office: 5711 Sarvis Avenue, Riverdale, Maryland 20737 U.S.A. Tele: (301) 779 - 4313

SHELADIA Associates, Inc.

We should be grateful if you would review the enclosed draft format with the IE Nikaweratiya and arrange a joint meeting with the IE and Consultant inorder to finalise the Annual Maintenance Plan for the Redi Bendi Ela Scheme.

Sincerely,

C.F. Leonhardt

C.F Leonhardt
Dy.Chief of Party
Sheladia Associates Inc.

Encl: Annual Maintenance Plan-Draft Format
Letter to Project Director regarding Maintenance Plan dated 11 July 88.

cc. G.T.Jayawardhana
L.T.Wijesooriya
D.Jenkins
Ratnayake I.E. Nikaweratiya
L.E.Haley
D.S.A.Kulasekera
File

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SHELADIA Associates, Inc.
Consulting Engineers Irrigation Systems Management Project
35/7 Gregory's Road, Colombo 7. P. O. Box 1874, Colombo. Tel: 596034

Riverdale
Colombo
Polonnaruwa

16 November 1988

Notey Copy 3/1/89

Mr. G. T. Jayawardena
Project Director
Irrigation Systems Management Project
Irrigation Management Division
Irrigation Department Building
Baudddhaloka Mawatha
Colombo 7

Subject: Irrigation Systems Management Project

Dear Mr. Jayawardena:

We are enclosing the notes for the minutes for the meeting on the Maintenance plan for the Kurunegala Range for your perusal. We hope that you find these notes of interest and useful to ISMP.

Sincerely,

Louis

Louis E. Haley
Chief of Party

Enclosure: a/s

cc w/cy encl: Mr. D. G. Premachandra, Dir/IMD
Mr. S. Balasingham, DDI, Kurunegala Range
Mr. Ratnayake, IE, Nikaweratiya, Kurunegala
Mr. L. Wijesuriya, Addl. Dir. ISMP, ID
Mr. D. Jenkins, USAID
Mr. C. F. Leonhardt
Mr. DSA Kulasekera
Mr. D. Bradbury

RBEMAINT.2LH

72

INTER-OFFICE CORRESPONDENCE

TO: L.E. HALEY
LOCATION: COLOMBO

DATE: 10 November 1988
FROM: C.F. LEONHARDT
LOCATION: POLONNARUWA

SUBJECT: MINUTES OF MEETING ON MAINTENANCE PLAN FOR KURUNEGALA RANGE

A meeting was held in the DDI's office Kurunegala Range on 4 November 1988 to discuss the Maintenance Plan for the Ridi Bendi Ela Scheme and other schemes in the Kurunegala Range. The people in attendance at the meeting were:

Mr. S. Balasingham	DDI Kurunegala Range
Mr. C.F. Leonhardt	Deputy Chief of Party SAI
Mr. D.S.A. Kulasekera	Irrigation Engineer SAI
IE's Kurunegala Range	
TA's Kurunegala Range	

The purpose of the meeting was to review the proposed Maintenance Plan format submitted by SAI and then determine the 1989 Maintenance Plan Program for the Ridi Bendi Ela Scheme and for other schemes in the Kurunegala Range.

Mr. Balasingham stated that he had reviewed the proposed SAI Maintenance Plan format and schedule and said his maintenance program coincided closely with that proposed by SAI and that his maintenance plan would overlap with the SAI plan and maintenance schedule. The maintenance Plan for the Kurunegala Range will be implemented during 1989.

For his Range the Maintenance Plan will be implemented section by section along the canal with each TA assigning sections, i.e, 2-3 KM of main, branch & D-Canals to a casual laborer who will be paid according to his output. The farmer will continue to maintain the F canals.

The DDI requested his TA's to initiate the 1989 Maintenance Plan under the following schedule:

Initiate Maintenance Survey	-	November-December 1988
Submit the Maintenance Survey result by	-	15 December 1988
Develop Detailed Cost Estimates	-	15 Dec.88 to 31 Jan. 89
Allocation for Maintenance Funds	-	February - March 1989
Implement Maintenance Plan Work	-	April - March 1989

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The Maintenance Survey results to be submitted by 15 December, as indicated above, will include the sections of work to be done; the man-power required to conduct the work; the quantity of work to be done; the equipment requirements; and the time and schedule for completion of the work. The TA's will be responsible to perform surveys and cross-sections in order to be able to prepare detailed cost estimates.

After the allocation has been established by the ID for the 1989 Maintenance Plan the DDI will prioritize the work estimated to meet the allocation. However the estimates must include all the work required in order to establish actual maintenance cost for the Range so that future allocations can be requested to meet the Range requirements.

The DDI stated that even though the Ridi Bendi Ela Scheme is in a good state of repair, that there are priority maintenance requirements that cannot be performed under the present maintenance allocation of Rs. 80/acre. It was suggested by the SAI staff that these priority maintenance requirements may be able to be funded under the ISMP, similar to the priority maintenance funds applicable to the Polonnaruwa Range Schemes. SAI staff told the DDI that they would request ID/IMD to initiate a proposal to USAID to provide priority maintenance funds for the Ridi Bendi Ela Scheme in order that these priority maintenance needs could be accomplished during the life of the ISMP.

cc: G.T. Jayawardena
L.T. Wijesooriya
S. Blasingham
Ratnayake, IE Nikaweratiya
D. Jenkins
D.S.A. Kulasekera

INTOFF.CFL

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35/7 Gregory's Road, Colombo 7. P. O. Box 1874, Colombo. Tel: 596034

Riverdale
Colombo
Polonnaruwa

PLEASE REPLY TO:
SHELADIA ASSOCIATES INC.
C/o Dy. Director of Irrigation
Polonnaruwa.
March 22, 1989
Our File: 2.42

Mr. Dan Jenkins
Project Officer/ISMP
Office of Engineering
USAID
Galle Road
Colombo 3

Subject: Irrigation Systems Management Project
Annual Maintenance Plan

Dear Mr. Jenkins:

We are enclosing a copy of a memorandum from Mr. C. F. Leonhardt, subject above, which is self explanatory. It is highly desirable, in fact essential, that a meeting between all concerned parties be held. Because of the urgency and time factor we suggest that this meeting take place, if possible, before the end of March 1989.

We would appreciate receiving your comments and suggestions.

Sincerely

Louis E. Haley
Chief of Party

Enclosure: a/s

cc/w/cy encl: Mr. G. T. Jayawardena
Mr. L. T. Wijesuriya
Mr. S. Piyadasa
Mr. C. F. Leonhardt

AMPDAN.LEH

Inter-Office-Correspondence

To: L. E. Haley

Date: 20 March 1989

Location: Colombo

From: C. E. Leonhardt

Subject: Annual Maintenance Plan

Location: Polonnaruwa

Reference: Letter to G. T. Jayawardena dated 12 July 1988 and to S. Piyadasa dated 30 Sept. 1988, reguarding Annual Maintenance Plan.

In regards to the above referenced letters; Mr. Piyadasa has approved, in general, the Annual Maintenance Plan. However, recently we have had a discussion with him regarding the implementation of the Annual Maintenance Plan for each of the four Schemes in his Range. Although he agrees with the Plan's format he indicated that the survey needed to initiate the Plan would required considerable time and man power from his staff in order to develop the annual maintenance cost requirement for each scheme. After developing the detailed annual maintenance costs for each scheme he would have to forward these estimates to appropriate authority for approval and budget. However, he indicated that under current ID practice, each Range receives only the standard annual maintenance allowance of approximately Rs. 80/Acre. Only that amount would be forth-coming even if the estimated actual cost of the annual maintenance was 3-4 times greater.

Considering the amount of work involved in performing these annual maintenance surveys and in developing the respective maintenance costs, it is recommended that a meeting be held with Mr. Jenkins and Mr. Piyadasa to discuss this matter at a very early date.

The Project Paper specifically sets out the Annual Maintenance requirements as indicated in your letter to Mr. Jayawardena of 12 uly 1988. In that letter, fund requirements for annual maintenance costs developed over the LOP will be submitted and funded out of normal ID maintenance funds. However, if these normal funds are found to be insufficient over the LOP a request for addition funds must be made at the end of the Project in order to satisfy the long term preventative maintenance program which is required to sustain the project without recourse to major rehabilitation.

At this meeting with USAID and the DDI it should be pointed out that there will most probably be a big shortage of annual maintenance funds to satisfy the Project Paper's goal of "sustained renewal without recourse to major rehabilitation."

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Therefore , a solution to where those additional funds must come from should be studied now.

In the mean time, we still need to get an estimate of the annual maintenance cost for at least one scheme so that we know what were talking about with respect to the financial requirement. I suggest we have the DDI do the annual maintenance survey for the Giritale Scheme and develop the respective annual maintenance cost.

Please set up the meeting with Mr. Jenkins and the DDI at your earliest convenience regarding this important annual maintenance task, as required in the Project Paper.

Sincerely,

C. F. Leonhardt

Encl: Letters to G. T. Jayawardena and S. Piyadasa On Annual Maintenance Plan

cc. DSA Kulasekera
CF Leonhardt
File

ANLMNPLN.CFL

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Consulting Engineers Irrigation Systems Management Project
35/7 Gregory's Road, Colombo 7. P. O. Box 1874, Colombo. Tel: 596034

Riverdale
Colombo
Polonnaruwa

17 April 1989

Mr. S. Piyadasa
Deputy Director
Irrigation Department
Polonnaruwa Range.

Subject : Annual Maintenance Plan for Sustained Renewal of Polonnaruwa Range Scheme under ISMP.

Reference : Meeting in your office with D. Jenkins, Louis Haley and C. F. Leonhardt on 30 March 1989 and ISMP Workshop April 6-10, 1989

Dear Mr. Piyadasa

During the above referenced meeting, discussions on the development of annual maintenance costs of the four Polonnaruwa Schemes were held. Subsequently, at the ISMP Workshop, further discussions and decisions were made to develop a program which would lead to the sustained renewal of the Polonnaruwa Range Schemes after ESI work has been completed and the ISMP is over.

The guidelines and discussions made at the meeting in Polonnaruwa and at the ISMP Workshop, relative to this important project requirement, are summarized below:

- To provide for sustained renewal of the Systems after ISMP, it is necessary to develop the annual maintenance costs of the schemes. This cost must be born by the GOSL for the Main (MC) and Branch (BC) Canals and by the Farmer Organization for the Distributary (DC) and Field (FC) Canals. The cost of this annual maintenance for sustained renewal of the schemes has yet to be developed .

- The annual maintenance cost of the schemes after completion of ESI work must be determined during the LOP. Since the ESI work is spread out over a five year period the annual maintenance cost of the whole scheme can only be developed at the end of the Project.

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- The general sequence of ESI work is for the MC, BC, DC and FC to be implemented in that order resulting in the ESI work for DC and FC being implemented during the latter part of the Project or during years three, four and five.

- Since the Farmer Organisation will eventually take over the DC and FC it will be necessary to develop annual maintenance costs of the MC and BC independently of the costs for DC and FC. Eventually the goal will be for the ID or GOSL to sustain the MC and BC and the FO to sustain the DC and FC's.

- A standard format has been developed by the Consultant to facilitate the survey and estimation of the annual maintenance cost for each scheme . This format has been accepted, in principle, by your office.

- Inorder to develop this annual maintenance cost for each scheme it will be necessary to make a maintenance survey of ESI works, already completed in 1987 and 1988, during 1989 and for ESI works to be completed in 1989 the maintenance survey should be carried out in 1990 and subsequently thereafter until all ESI work under each scheme has been surveyed and the annual cost developed over the LOP.

- The annual maintenance survey of completed ESI works should be assigned to one or two TA's in each scheme. The Consultants O&M Engineers will assist the TA's, as necessary, during the field surveys and in the development of the cost of each type of canal i.e.; MC; BC; DC; and FC. The annual maintenance cost of the head works and transfer canals should be done independently for each scheme.

- It is recommended that the Giritale Scheme be the first scheme surveyed for annual maintenance as the ESI works on that scheme are almost complete and the time to make the survey will be less.

- Please note that the annual maintenance cost after ESI should not include the priority maintenance needs which will be financed separately under ISMP.

Every one is aware that the annual maintenance cost for sustained renewal of the schemes under the ISMP will most probably be considerably more than what is presently allocated by the GOSL for annual maintenance budget for Major Irrigation Schemes throughout Sri Lanka. Therefore, it is necessary for ISMP to develop the actual cost required for this sustained renewal of each scheme inorder to present the requirements to GOSL for an adequate budget committment after ISMP.

SHELADIA Associates, Inc.

USAID has agreed to write the GOSL in this regard to emphasize the need and to gain a commitment for providing the adequate funds for sustained renewal maintenance after the ISMP. Therefore, ID, with the assistance of the Consultant, must develop the annual maintenance cost requirement so that it can be provided to the GOSL at the completion of the Project.

The Consultant will be ready to assist your staff in the annual maintenance survey and cost estimates whenever you initiate the program.

Sincerely,

L. E. Haley
Chief of Party

cc. G. T. Jayawardena
L.T. Wijesuriya
D. Jenkins USAID
SAI Polonnaruwa File.

INTER OFFICE CORRESPONDENCE

To: L. E. Haley

Date : May 19, 1989

Location : Colombo

From : C. F. Leonhardt

Subject : Annual Maintenance Plan for Sustained Renewal of four Polonnaruwa Range Schemes.

A meeting was held with the DDI and his staff of IE's and TA's to discuss the Implementation of the Annual Maintenance Plan for the four schems in the Polonnaruwa Range. The Plan was approved previously, however, details of how to implement the plan was the major topic of the discussion.

The Deputy Director told his staff the importance of implementing the Plan with respect to the long-term longevity of the Schemes after the ESI works are completed and ISMP is over. Mr. Kulasekera and myself explained the basic procedures for implementing the annual maintenance survey utilizing the format developed by the Consultant and approved by the DDI. It was emphasised that the objective of the survey was to establish the annual maintenance cost inorder to sustain the life of the irrigation systems after ISMP. The importance of developing an accurate cost of this annual maintenance requirement during the LOP was stressed to his staff inorder that future budget allocation after ISMP could be requested from GOSL for maintenance.

The major decisions made at this meeting for implementing the Annual Maintenance Plan are summarized below:

1. The ESI work constructed and completed in 1987 would be surveyed and the annual maintenances costs developed.

2. The Technical Assistants assigned to The annual maintenance survey and cost estimate would prepare the details of each Main and Branch Canal rehabilitated during 1987 and place all the relevant information on the approved Maintenance Plan Format before starting the field survey.

3. After the format has been completed the TA's will carry out the field survey to determine the maintenance requirements for the head works , transfer canal, M/C, B/C, D/C, and F/C. The Consultants O&M Engineers will assist the TA's during the field survey to help establish the maintenance requirements of each component of the system. ie. desilting canal, clearing canal, repairing damaged embankments, repairs to structures (bridges, turnouts, spills, drops, under crossings, regulators, retaining walls, dry rubble packing, etc.)

4. After the field survey the TA's will develop the annual maintenance cost for the canals completed under ESI in 1987. The Consultants will assist as necessary in this cost estimation.

5. The annual maintenance cost for 1987 ESI works in all four schemes will be completed before the end of June 1989.

6. The annual maintenance plan and cost estimates developed for 1987 ESI works will be submitted to ID/IMD/USAID in July 1989 for review, comments and or modifications as necessary for subsequent Annual Maintenance Plans.

7. After approval of the 1987 ESI annual maintenance cost the procedure will be again initiated for ESI works completed in 1988 and so on thereafter until all the works are completed down to F/C and are surveyed and annual costs estimated during the LOP.

Please pass on copies of this memo to ID/IMD and USAID in Colombo for their information on this important Project matter.

C. F. Leonhardt

cc. S. Piyadasa
D. Jenkins
DSA .Kulasekera
G. T. Jayawardena
S. S. Ranatunga
L. T. Wijesuriya

ANLMNPLN

SHELADIA Associates, Inc.
Consulting Engineers Irrigation Systems Management Project
Riverdale
Colombo
Polonnaruwa
35/7 Gregory's Road, Colombo 7. P. O. Box 1874, Colombo. Tel: 596034

02, Oct. 1989

S. Balasingham
Dy. Director of Irrigation
Kurunegala Range
Kurunegala.

Dear Mr. Balasingham,

Mr. Leonhardt, SAI O&M Engineer, visited the IE Nikaweratiya, Mr. W. A. P. Wijesooriya, on 28 September 1989 to discuss several ISMP work requirement for the Ridi Bendi Ela Scheme. The work requirements discussed and the recommended action to be taken are listed as follows:

1. Priority Maintenance Estimates should be forwarded to ISM Project Director for immediate sanction and for preparation of a PIL to USAID. This work should be carried out this close season.

2. Water Measurement Structure Estimates for RBMC, Center Canal and Inlet Canal should be finalized and sent to you for approval for forward transmittal to Project Director for sanction and for preparation of a PIL to USAID. The PIL for Priority Maintenance Work and for Water Measurement Structures can be combined. The implementation of the water measurement structures should be carried out this close season.

3. Annual Maintenance Plan and Cost Estimates for RBE Scheme for 1989 should be finalized utilizing the format prepared by SAI. An Annual Maintenance Plan format for Parakrama Samudra Scheme in the Polonnaruwa Range is enclosed for assistance to Mr. Wijesooriya in preparation of the Plan. Prints of blank copies of the format are transmitted for use by the IE.

4. The ISM Project Director has instructed SAI to send the computer formally used for MEF/FM in the SAI office directly to the IE's office in Nikaweratiya. This computer will be despatched within a weeks time and the MEF and FM program installed in the computer at the time of delivery. Instructions on the application of the MEF/FM programs will be given by Mr. P. Periyasamy and Mr. Faizal Mansoor, Computer Programmer. The IE and the Project Manager should be in attendance when the instructions are given. After installing the computer in the IE's office Mr. D. S. A. Kulasekera and Mr. N. A. D. S. Athuraliya will come to Nikaweratiya and install the Reservoir Operation Model; the Water Management Model; and the Seasonal Water Report Model in that computer. Instruction to the IE on how to use these models will be given to him and his staff after the models are inserted into the computers.

5. Final certification of completion of the 1988 Water Measurement Structures for the LBMC can be done by Mr. Leonhardt when the gages have been installed on the structures. Data on the location and installation of gages for cut-throat flumes are enclosed for assistance on the installation of the gages and calibration of the structure. Reimbursement for this work is pending the PIL (as indicated in 1 and 2 above) which must be prepared by the Project Director and sent to USAID.

Please take the necessary action to expedite the above requirements so that the Priority Maintenance and Water Measurement Structure works can be completed this close season.

Very truly yours,

for W. J. Leatham
Chief-of-Party
Sheladia Associates Inc.

Encl. As Stated.

cc. G. T. Jayawardena Project Director IMd w/o encl
L. T. Wijesooriya Addl. Pro. Dir. ID w/o encl
W. A. P. Wijesooriya IE. Nikaweratiya w/encl
Rathnayake IE Kurunegala w/o encl
D. Jenkins w/o encl
D. S. A. Kulasekera/N. A. D. S. Athuraliya
P. Periyasamy/F. Mansoor

VST-NK.WJL

SHELADIA Associates, Inc.
Consulting Engineers Irrigation Systems Management Project
Riverdale
Colombo
Polonnaruwa
35/7 Gregory's Road, Colombo 7. P. O. Box 1874, Colombo. Tel: 596034

January 22, 1990

Eng. S. Balasingham
Dy. Director of Irrigation
Kurunegala Range
Kurunegala

Subjects: (1) Annual Maintenance Plan
(2) Priority Maintenance Plan
(3) Water Measurement Program
For Ridi Bendi Ela Scheme

Dear Mr. Balasingham,

It is essential under the ISMP that the above three plans and programs be implemented during 1990. The following is a summary of the status of three plans and programs and the requirements needed to implement them:

1. Annual Maintenance Plan - A separate format for developing the Annual Maintenance Plan for the Ridi Bendi Ela Scheme has been given to the IE Nikaweratiya. The sample format develops the number of labour days necessary to carry out the Annual Maintenance Plan for Parakrama Samudra Scheme in the Polonnaruwa Range for the Headwork, Transfer Canal and Main Canals that were rehabilitated during 1987. Cost of the estimated labour requirements has been made and is attached to the Annual Maintenance Plan. In addition to labour, departmental overhead, as well as, materials, equipment, fuel, etc. should be added to develop the actual total Annual Maintenance Cost of the Ridi Bendi Ela Scheme needed to sustain the entire project (Headwork, Transfer Canal, Reservoir, Main Canals, Branch Canals, D-Canals, F-Canals and Drains.) without further need for rehabilitation in the future. Please note that the annual maintenance cost of D-Canals and F-Canals should be separated out as those cost will eventually be bourn by the DCOs. After this Annual Maintenance Plan and cost has been prepared by your staff it should be forwarded to the Consultant by 15 February 1990 for review and comments. After finalizing the plan and cost it will be submitted to IMD for approval and for sanction of the adequate GOSL funds need to implement the preventative maintenance program thereafter for the Ridi Bendi Ela Scheme.

2. Priority Maintenance Plan - Priority Maintenance Plans have been developed by your staff for all canals in the Ridi Bendi Ela Scheme and have been review and approved by the Consultant for implementation.

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It is understood from the IE that unit rates originally established for this work have increased and therefore it will be necessary to modify the cost estimates for the Priority Maintenance Work before submitted to IMD/USAID.

To expedite the implementation of this important Priority Maintenance work for the Ridi Bendi Ela Scheme it is recommended that the cost estimates be revised immediately and sent to IMD/USAID by 15 February 1990 so that a PIL can be set-up and the plan implemented during the next close season.

3. Water Measurement Program _ The water measurement structures constructed during 1988-89 on the LBMC were initially inspected by the Consultant on 31 March 1989 and partial reimbursement recommended at that time (see letter dated May 8, 1989). Since no PIL had been set-up for this work USAID could not reimburse the IMD/ID for the work. It is understood that the cost estimates for the remaining water measurement structures of the Project (Transfer Canal, RBMC and Center Canal) have been completed and are presently at your office. It is recommended that you submit these estimates along with LBMC estimates to IMD/USAID so that they can all be approved and a PIL set up for implementation of the remaining water measurement structures for the Project.

On 18 January 1990 Mr. Leonhardt inspected the Water Measurement Structures constructed in 1988-89 and found the following work remaining to be accomplished before final certification and reimbursement can be made from USAID.

A. LBMC

1. Broad Crested Weir Place DRP U/S and D/S of structure on each side 3 meters long for protection against scour (Add this additional cost to Weir estimate prior to submittal to USAID for reimbursement).

2. Turnout Structure No. 2. (LB) - Existing Cut Throat Flume (CTF) with new U/S & D/S lining - Gages to be installed.

3. Turnout Structure No. 3 (LB) - Existing CTF with new U/S & D/S lining Gages to be installed.

4. Turnout Structure No. 5 (LB) New CTF with new U/S & D/S lining - Gages to be installed.

5. Turnout Structure No. 7 (LB) - Existing CTF with new U/S & D/S lining Gages to be installed.

6. Turnout Structure No. 8 (LB) - Existing CTF with new U/S & D/S lining lining damaged to be repaired and gages to be installed.

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7. Turnout No. 15 (LB) - New CTF with new U/S & D/S lining - Gages to be installed.

8. Turnout No. 17 (LB) - New Division Box under construction; complete construction and connect to U/S headwall.

9. Turnout No. 18 (LB) - Last outlet to left, new rectangular suppressed weir - Gage required.

B. LB off LBMC

1. Turnout No. 3 (LB) - Existing CTF - install U/S & D/S lining and install gages.

2. Turnout No. 4 (RB) - New CTF with new U/S & D/S lining - Gages to be installed.

3. Turnout No. 6 (RB) - New CTF with new U/S & D/S lining - Gages to be installed.

4. Turnout No. 8 (LB) - Division box, downstream lining damaged/repair.

5. Turnout No. 10 (RB) - New CTF with new U/S/ & D/S lining - Gages to be installed.

6. Turnout No. 12 (RB) - New CTF originally complete but broken by farmers - Repair damage and install gages .

7. Turnout No. 13 (LB) - Existing CTF with new U/S & D/S lining - New lining requires repair and gages to be installed.

8. Turnout No. 15 (RB) - New CTF with new U/S & D/S lining - Gages to be installed.

The installation of the gages and repairs are required before reimbursement. The TA's sent to Polonnaruwa for water measurement training on 22 January 1990 will be instructed on the installation and measurement of CTF by Professor Skogerboe. Literature and instruction on the location and measurement of the gages will also be given to them.

Additional information on the design and measurement of cut throat flumes is attached herewith for help in the placement of gages on the existing cut throat flumes and on the installation of the CTF's yet to be constructed.

Please take the necessary action to expedite the three programs listed above prior to your new assignment and departure from the Project.

Very truly yours,

For: W. J. Leatham
Chief-of-Party
SHELADIA ASSOCIATES INC.

Encl: as stated.

cc. G. T. Jayawardena
IE Nikaweratiya
DA Nikaweratiya
TA Cruze Nikaweratiya
D Jenkins

plansrbe.WJL

SHELADIA Associates, Inc.
Consulting Engineers Irrigation Systems Management Project
Riverdale
Colombo
Polonnaruwa
35/7 Gregory's Road, Colombo 7. P. O. Box 1874, Colombo. Tel: 596034

31 Jan, 1990

Eng. S. Senthinathan
Dy, Director of Irrigation
Ampara Range
Ampara.

Subject: Annual Maintenance Plan for 1989 Pragmatic Rehabilitation works on RBMC.

Dear Mr, Senthinathan,

Under the ISMP an Annual Maintenance Plan and Cost Estimate must be prepared for the RBMC. In order to develop the Plan and Cost over the LOP it is proposed to prepare the plan for the works completed during the previous construction season, i.e. 0 km - km RBMC.

A sample Annual Maintenance Plan for the Parakrama Samudra Scheme in the Polonnaruwa Range covering the headworks and main canals completed in 1987 is enclosed for your review and assistance in preparing the plan and cost for the RBMC, km 0-km 21. In addition to the annual maintenance labour costs you should add the departmental overheads and costs for equipment, materials fuel, transport, etc. to obtain the total annual cost for maintaining the works that were completed the previous construction season. Therefore, by the end of the project the total Annual Maintenance Plan and Cost for the entire scheme, i.e. Headworks, MC, BC, DC, FC and Drains will have been developed and will be the basis of the Preventative Maintenance Program that will carry on after the LOP.

Please note that the Annual Maintenance Plan and Costs for DC and FC should be separated from the MC and BC as those canals will eventually be maintained by the DCO's after they are turned over to those organizations.

An original tracing along with prints of the Annual Maintenance Plan format is enclosed herewith for your use in preparing the plan and cost estimates.

Head Office: 5711 Sarvis Avenue, Riverdale, Maryland 20737 U.S.A. Tele: (301) 779 - 4313

Please have your IE and TA's assigned to the RBMC initiate the preparation of the Maintenance Plan and Cost for the first 21 kilometers of the RBMC. Mr. Leonhardt will review the plan and costs after it has been completed and before finalization.

Your cooperation in this important ISMP effort will be greatly appreciated.

Very truly yours,

W J Leatham

W. J. Leatham
CHIEF-OF-PARTY/SAI

Encl. (1) Sample Maint. Plan and Cost PSS
(2) Original Tracing and prints of Annual Maintenance Plan format for
Gal Oya RBMC

cc. G. T. Jayawardena w/incl.
D. Jenkins w/incl.
IE Gal Oya w/incl
C. F. Leonhardt w/o incl.
File w/o incl.

AMPRBMC9.WJL

SHELADIA Associates, Inc.
Consulting Engineers Irrigation Systems Management Project
Colombo 7. P. O. Box 1874, Colombo. Tel: 596034

Riverdale
Colombo
Polonnaruwa

April 23, 1990

Eng. S Piyadasa
Dy. Director of Irrigation
Polonnaruwa Range
Polonnaruwa

Subject: 1) Annual Maintenance Plan 1987 ESI Work
2) Priority Deferred Rehabilitation 1987 ESI Works

Dear Mr. Piyadasa,

During the Annual Maintenance Plan meeting on 14 February 1990 criteria for finalizing the Annual Maintenance Plan and Costs were established and the criteria was presented under your letter dated 16 February 1990. Based upon the criteria established, the Division IE's were to finalize the plan and respective cost estimates for the canals rehabilitated during 1987 and submit them to you by end of March 1990.

It is important that the plan and cost estimates for each scheme be now submitted to the Consultant for review so that they can be forwarded to ID, IMD and USAID for formal approval. Please have your IE's submit the plans and cost estimates for review as soon as possible.

In regards to the Priority Deferred Rehabilitation program for ESI works conducted in 1987 on each scheme, the following may be considered.

During 1989 your Division IE's and TA staff conducted a priority rehabilitation survey of the canals that were rehabilitated during 1987 in each scheme. The survey identified ESI works that were either deferred or left out of the 1987 ESI program. Your TAs prepared plans and cost estimates for this Priority Deferred Rehabilitation Program and have submitted them through the Division IE's for your approval. It is important that this Priority Deferred Rehabilitation Program be implemented during 1990; therefore it is recommended that you set-up one sub-project for each scheme for this work and submit it for approval for implementation in 1990. USAID has already approved the Priority Deferred Rehabilitation Program and therefore we should proceed with out delay.

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At the 1990 Annual Work Plan Workshop budget for this Priority Deferred Rehabilitation Program was to be funded out of surplus building funds; this should be confirmed, otherwise these works will have to come out of the 45 million 1990 ESI budget.

Thank you for your cooperation in these two important ISMP matters.

Very truly yours,

W J Leatham

W J Leatham
CHIEF-OF-PARTY/SAI

cc. G T. Jayawardena
L T Wijesooriya
D W R M Weerakoon
D Jenkins
IE Polonnaruwa Division
IE Hingurakgoda Division
IE Kaudulla Division

amp87esi.cfl

My No. D./P/4/234
Office of the DDI,
Polonnaruwa,
16th Feb. 1990

E. Hingurakgoda,
Kaudulla,
Polonnaruwa,

Sub: ANNUAL MAINTENANCE PLAN.

At the meeting held on 14.02.1990 at this office, the following norms have been arrived for the preparation of the Annual Maintenance Plan.

1. Weeding twice a year.
2. Desilting once in two years.
3. Earth work on main tank bunds - 30 M^3/Km/year.
4. Bund earthwork in main and branch channels 15 M^3/Km/year.
5. Replacement of rubber beddings in gated structures once in every 5 years.
6. Lubrication, four times a year.
7. Replacement of planks - once in 4 years.
8. Repairs to Dry Rubble Packing - Rs.6/= per M^2, once in two years.
9. Painting once a year.
10. Repairs to retaining walls - Rs.5/= per metre once a year.
11. Gravelling of roads - 25 M^3/Km , once a year.
12. Repairs to structures - Lump-Sum.

Please revise the Maintenance Plan prepared by you using the above norms for the uniformity of it amongst the schemes.

The revised Maintenance Plan for the EGI works completed in 1987 plus the Head works should be furnished to me before the end of March 1990.

Copy to, 1. Mr. C.R. Leonardt (SDI)
2. Mr. D.S.B. Kulasekera (SDI) c/c

Eng. S. Piyadasa
DDI, Polonnaruwa Range.

ANNUAL MAINTENANCE PLAN MAIN SYSTEM ESTIMATING CRITERIA
HEADWORKS

	Type of Maintenance	Frequency of Maint.	Unit Rate	Estimating Criteria
	TANK BUND/ANICUT STRC/INLET CANAL			
1	Weeding Tank Bund, Inlet Canal and Access Road	Twice a year	Ha	Actual Area
2	Earth Work on Tank Bund/slope	Once a year	km	30 m^3/km
3	Removal of Ant Hills	Once a year	km	3 Nos/km
4	Gravelling Bund Road	Once a year	km	30 m^3/km
5	Desilting along Inlet Canal	Once in 4 yrs	m^3	50% length;depth 3"
6	Repairs to paved Surface	Once a year	km	5% Area
7	Removal of Water Plants along Inlet Canal	Once a year	m^2	20% Area along Canal
8	Painting & Marking Historical Data and other Sign Boards	Once a year	m^2	50% Area
9	Repairs to U/S Rip Rap Protection	Once a year	m^3	3m^3/km
10	Repairs to Toe Filter and Drains	Once in 2 yrs	m^2	Actual Area
11	Repairs to Bathing Steps(1:3:6 Conc)	Once in 5 yrs	m^3	0.1m^3/yr
12	Repairs to R/Walls/Toe walls	Once in 5 yrs	Lm	Rs. 10/Lm
13	Repairs to Inlet Regulator (1:3:6 Conc.)	Once in 5 yrs	m^3	10m^3
	SLUICE STRUCTURE/GATES/LIFTING MECHNISM			
14	Repairs to Struc with 1:3:6 concrete	Once in 5 yrs	m^3	0.2m^3/yr
15	Lubrication of Sluice Gates	Once a year	kg	2kg/gate
16	Cleaning Gate Grooves Guides and Painting with Anti-corrosive paint	Once a year	Lts	2 Lts/gate
17	Painting/White washing Sluice Struct. (2 coats)	Once a year	m^2	Actual Area
18	Painting Sluice Gates/Trash Rack with Anti-Corrosive Paint	Once a year	Lts	3 Lts/Gate
19	Painting Staff Gage on Sluice	Once a year	EA	All faces
	SPILL STRUCTURES/GATES/LIFTING MECHANICM/TAIL CHANNEL			
20	Repairs to Struc with 1:3:6 Conc.	Once in 5 yrs	m^3	0.4m^3/yr
22	Cleaning & Painting Metal Surfaces	Once a year	Lts	10 Lts/gate
23	Lubrication of Lifting Mechanisms/ Bearings & Cables	4 x a year	Kg	2kg/gate
24	Repair/Replacement of Spill Gates Rubber Beadings/Seals	Once in 5 yrs	Lm	-----
25	Replace Stop Logs on Spills	Once in 3.yrs	Set	-----
26	Repairs to Natural Spillway Crest/Road with 1:3:6 Concrete	Once a year	m^3	0.5m^3
27	Clearing Natural Spillway/tail and Approach Channel of Obstructions	Once a year	Lm	1.0 m^3/Lm width

ANNUAL MAINTENANCE PLAN MAIN SYSTEM ESTIMATING CRITERIA
MAIN AND BRANCH CANALS

	Type of Maintenance	Frequency of Maint.	Unit Rate	Estimating Criteria
1	Weeding alog Canal Bund	twice a year	Ha	-----
2	Desilting along Canal Bund (Heavy)	once in 2 yrs	m^3	50% length 3" depth
	Desilting along Canal Bund (Light)	once in 2 yrs		33% length 3" depth
3	Earth work on MC/BC	once a year	km	15m^3/km
4	Lubricating Regulator Gate	1 x year	kg.	2kg/gate
5	Lubricating of T.O gate	4 x year	kg	1/2 kg/gate
6	Replace Stop Log Planks	once in 4 yrs	sest	-----
7	Repairs to Dry Rubble Packing	once in 2 yrs	m^2	Rs. 6/m^2
8	Paint Gates w/Anti-crossive Paint Large/Small	once a year	Lts	2 Lts/gate
9	Painting Number & Station on Struc.	once a year	Lts	0.1 Lt/Struc.
10	Repairing Retaining Walls	once a year	Lm	Rs.5/Lm
11	Gravelling Roads	once a year	km	25m^3/km
12	Removing Water Plants	once a year	m^2	20% Area along chl
13	Removal of Ant Hills From Chl Bunds	once a year	km	2 Nos/km
13	Repairs to Rubble Pitching	once a year	m^2	10% of area
14	Repairs to Structures w/1:3:6 Conc.	varies	m^3	-----
	Bridges	once in 5 yrs	m^3	0.2m^3/yr
	Regulators	once in 5 yrs	m^3	0.4m^3/yr
	TO Structures	once in 2 yrs	m^3	0.375m^3/yr
	Chl. Profiles	once in 5 yrs	m^3	0.10m^3/yr
	Drops	once in 2 yrs	m^3	0.5m^3/yr
	Bath Steps	once in 5 yrs	m^3	0.05m^3/yr
	Spills/Drain Crossings	once in 5 yrs	m^3	0.2m^3/yr
	Check Structures	once in 5 yrs	m^3	0.1m^3/yr
15	Clean/Desilt Canal Spill Chl	once a year	m^3	1m^3/Lm width

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ANNUAL MAINTENANCE PLAN - GIRITALE MAIN SYSTEM
QUANTITY ESTIMATE

EXHIBIT III-2-13
Sheet 1 of 9

A.INLET CANAL TO GIRITALE TANK

1. CLEANING/WEEDING LB BUND AND BANK (twice a year)
   L= 4.7km A= 4,700m x 15m wide/10,000 m^2/ha = 7.0ha x 2=14.0ha

2. GRAVELING ACCESS ROAD (once a year)
   L= 4.7km V= 4.7km x 25m^3/km = 117.5m^3 Say 120m^3

3. REPAIR TO CANAL BUND WITH EARTH FILLING (Once a year)
   V=4.7km x 15m^3/km = 70.5m^3 Say 75m^3/yr

4. REMOVAL OF WATER PLANTS/OBSTRUCTIONS FROM CANAL (once a year)
   Width = 20M
   Assume 20% of area along canal.
   A= 4.7km x 1000m/km x 0.20 x 20 = 18,800m^2/yr

5. REMOVAL OF ANT HILLS ALONG CANAL (once a year)
   3 hills/km x 4.7km = 14.1 Say 15 Ant Hills/yr

6. DESILTING ALONG CANAL (once in 4 years for Inlet canal)
   Assume width = 15m
   Depth = 0.075 - Heavy Silt Load
   Length = 4700m x 50% = 2350m
   V= 2,350 x 15m x 0.075 = 2644
   2644/4=660m^3 Say 660m^3/yr

7. REGULATOR INLET STRUCTURE (once in 5 years)
   Repairs: 10m^3 1:3:6 conc. every 5 years V= 2m^3/yr

8. REPAIRS TO RUBBLE PITCHING (once a year)
   A= 6 x 20m x 2m wide = 240m^2 Assume 10% of
   Area requires repairs; A= 240 x 0.10 = 24m^2

9. REPAIRS TO RETAINING WALLS (once a year)
   L= 20+15+20+10+5+50+2x30=180m Say 200m

10. REPAIRS TO BRIDGES (once in 5 years)
    V=1.0m^3/5yr x 2 Bridge = 0.40m^3/yr Say 0.5m^3/yr

11. REPAIRS TO T.O. STRUCTURES 1:3:6 Con. (once in two years)
    No. Structure 5 EA (6 Gates)
    V=0.75m^3/2 x 5 = 1.875 Say 2.0m^3/yr

12. LUBRICATION OF REGULATOR GATE (4 x a year)
    Wt= 2kg/gate x 4 x 3 gates = 24kg/yr

13. LUBRICATION OF T.O GATES (4 x a year)
    Wt= 1/2kg/gate x 6 gates x 4 = 12kg/yr

14. ANTI-CROSSION PAINT ON REG. AND T.O. STRUC.
    3 gates @ 2 Lt/gate + 6 gates @ 1/2Lt = 9 Lts Say 10 Lts/yr

15. STOP LOGS FOR DIV. WEIR (3 sets) (every 4 years)
    or 0.75 set/yr Say 1.0 set/yr

16. REPAIRS TO DIVERSION. weir. 1:3.6 Conc. (every 5 yr)
    V = 5m^3/5 = 1.0m^3/yr

17. Painting,Number and Station on Structures(Once a year)
    17 Structures x 0.1 Lt/Struct = 1.7 Lts./Yr. Say 2.0 Lts

ANNUAL MAINTENANCE PLAN - GIRITALE MAIN SYSTEM
QUANTITY ESTIMATE

B.GIRITALE TANK/SLUICE/SPILLWAY

1. WEEDING AND CLEANING GIRITALE TANK BUND (twice a year)
   L=550m
   Width = 45m D/S+20m U/S = 65m
   A= 65m x 550m/10,000 m^2/ha = 3.575 x 2 x/year = 7.15 ha/yr

2. REPAIRS TO RIP RAP PROTECTION (once a year)
   L=550m; @ 3m^3 /km/Yr =1.65m^3 /Yr.

3. EARTH EXCAV/BORROW &/E.F. SCOURED SECTIONS (once a year)
   L=550m V = 0.55km x 30m^3/km = 16.5m^3/Yr.

4. REMOVAL OF ANT HILLS ALONG BUND (once a year)
   @ 3 HILL/KM = 3 X 0.55 = 1.65 Say 2 Nos.

5. LUBRICATION OF SLUICE GATES (4 x a year)
   2. GATES 4'-0' x 2-8"
      2 GATES x 2kg/gate x 4 = 16kg/yr

6. CLEANING GATE GROOVER/PAINTING GATES/GUIDE/ (once a year)
   WITH ANTI-CORROSION PAINT(Once a Year)
   2 Gates x 2 Lts/gate = 4 Lts/yr

7. PAINTING SLUICE STRUCTURE WHITE WASH(2 Coats) (once a year)
   Area = H2m x W3m = 6m^2 x 4 x 2 = 48m^2 Wash coats

8. PAINTING STAFF GAGE ON SLUICE WALLS (once ayear)
   1 No.

9. UNGATED SPILLWAY - CLEANING U/S & D/S
   APPROACH AND TAIL CHANNELS (once a year)
   L= 40m V= 40m^3/yr

10. REPAIRS TO SPILLWAY STRUCTURES WITH 1:3:6 CONC. (once in 5 years)
    2.0 m^3/5 Yrs/Struc =0.4 m^3/Yr/Struc.Say =0.50 m^3/Yr.
    V = 50/5yrs = 10m^3/yr

11. REPLACEMENT OF SPILL STOP LOGS (once in 3 years)
    3 BAYS x 0.5m x 1.25m = 1.875 Say 2m^2/3yr.
    Low Level Spill 0.67m^2/yr or 1 Set/yr

12. PAINTING, NUMBER AND STATION OF STRUCTURES
    3 Nos x 0.1 LTS/STRUCT = 0.30 Lts. Say 0.50 Lts/Yr.

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ANNUAL MAINTENANCE PLAN - GIRITALE
QUANTITY ESTIMATE

EXHIBIT III-2-13
Sheet 3 of 9

C.RBMC (ABOVE DAMBALA WEWA)
STA. 0+000 TO STA. 5+922

1. WEEDING/CLEARING ALONG CANAL BUND (twice a year)
   L= 5,922m. Say 5.9km
   Area = 5.922km x 1000 x 10m wide/10,000m^2x2 = 11.8 Say 12ha/

2. REPAIRING CANAL BUND W/EARTH FILLING (ONCE A YEAR)
   V = 5.9km x 15m^3/km = 88.5m^3 Say 90m^3

3. DESILTING ALONG CANAL (once in two years)
   Assume heavy desilting required.
   Ave. depth = 0.075m
   Ave. width = 6.0m Assume 50% length
   V = 5,900m x 0.50 x 0.075m x 6.0m = 1327.5m^3 Say 1330m^3/2yr
   V = 665m^3/year

4. GRAVELLING UNPAVED ROADS (once a year)
   L = 5.9km V = 5.9km x 25m^3/km = 147.5m^3 Say 150m^3

5. REMOVAL OF WATER PLANTS ALONG CANAL (once a year)
   Ave. width = 6.0m
   Assume 20% of length
   5.9km x 1000m/km x 0.20 x 6.0m = 7080m^2/yr Say 7100m^2/yr

6. REMOVAL OF ANT HILLS FORM CANAL BUND (once a year)
   No. = 3 Ant Hills/km x 5.9km = 17.7 Say 18/year

7. REPAIRS TO RETAINING WALLS/LINING = (once a year)
   Length of retaining walls/lining = 1568m Say 1575m

8. REPAIRS TO DRY RUBBLE PACKING (once in two years)
   L = 20m Width = 2.0m
   Area = 20 x 2.0 = 40.0m^2/2 yrs = 20m^2/yr

9. REPAIRS TO STRUCTURES (Sequence varies) 1:3:6 Concrete

Type	No.	Repair Freq.	Vol./yr(m^3)
Drops	2	Every 2 yrs.	2x1.0m^3/2 = 1.00
Bath Steps	5	Every 5 yrs	5x0.25/5 = 0.25
Bridges	4	Every 5 yrs	4x1.0/5 = 0.90
Spills	4	Every 5 yrs	4x1.0/5 = 0.90
T.O. Struc.	8	Every 2 yrs	8x0.75/2 = 3.00
Regulators	1	Every 5 yrs	1x2.0/5 = 0.40
	24	Total All Struc.	6.45m^3/yr
			Say 6.5m^3/yr

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C RBMC ABOVE DAMBALA WEWA
STA. 0+000 TO 5+922 (Cont.)

10. REPAIRS TO RUBBLE PITCHING 1:3mix (once a year)
L = 5+10 = 15m
Area = 15m x 2m = 30m^2
Assume 10% Require repairs
A = 30 x .10 = 3.0m^2

11. LUBRICATION OF T.O. STRU. GATES (4 x A YEAR)
No of gates 12 each

12 Gates x 1/2kg/gate x 4 times/year = 24kg/year

12. APPLICATION OF ANTI-CORROSION PAINT
ON GATES/GATE STRUCTURES (ONCE A YEAR)
12 GATES x 1/2LT/GATES = 6LTS.

13. REPLACEMENT OF WOODEN PLANKS AT SPILLS (Once in 4 yrs)

4 spills = 1 set/year

14. CLEANING APPROACH/TAIL CHANNEL OF SPILLS (ONCE A YEAR)

4 SPILLS @ 25m^3/Str. = 100m^3

15. PAINTING, NUMBER AND STATION ON STRUCTURES.
24 Nos x 0.1 Lts/STRUCT = 2.4 Lts. Say = 2.5 Lts/Yr.

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ANNUAL MAINTENANCE PLAN - GIRITALE MAIN SYSTEM
QUANTITY ESTIMATE

D DAMBALA WEWA TANK/SLUICE/SPILLWAY

1. WEEDING AND CLEARING DAMBALA TANK BUND (Twice a year)

   L = 770m
   Width 40 D/S+10m U/S = 50m
   Area = 50x770m/10,000 = 3.85hax2 = 7.7ha/yr

2. REPAIRS TO RIP-RAP SLOPE PROTECTION (ONCE A YEAR)
   L = 770m ;@ 3 m^3/km =0.77 x3 =2.31 m^3/Yr .Say 2.5 m^3/Yr.

3. EARTH EXCAV/BORROW W/EARTH FILLING SCOUR SECTIONS OF BUND(ONCE A YEA
   L = 770 Vol = 0.77x30m^3/km = 23.1m^3

4. REMOVAL OF ANT HILLS ALONG BUND (ONCE A YEAR)
   @ 3 Hills/km = 3x0.77 = 2.31 Say 3 Nos.

5. LUBRICATION OF SLUICE GATE (4xYEAR)
   1-GATE 4'-0"x2'-8" 1 GATE x 2kg/GATE x 4 = 8kg/Yr.

6. CLEANING GATE GROOVES/PAINTING GATES/GUIDES W/ANTI CORROSSION PAINT (ONCE AYEAR)
   1 GATE @ 2-LTR/GATE = 2LTS/YR

7. PAINTING/WHITE WASHING SLUICE STRUCTURES (2 COATS)(ONCE A YEAR)
   AREA = 2x2x4x2 COATS = 32m^2

8. PAINTING STAFF GATE ON SLUICE WALLS (ONCE A YEAR)
   1 No.

9. REPAIRS TO SPILL STRUCTURE (ONCE IN 5 YEARS)
   1:3:6 (Concrete) 80 Meters long
   2.0m^3/5Yrs = 0.4m^3/yR Say 0.5M^3/YR

10. REPAIRS TO SPILL STOP LOGS (ONCE IN 3 YEARS)
    6 SETS 2 SETS/YEAR

11. REMOVE OF DEBRIS D/S OF SPILL CHANNEL (ONCE A YEAR)
    L = 80m @ 1.0m^3/m = 80m^3/Year

12. GRAVELLING ON UNPAVED SECTION OF BUND (ONCE A YEAR)
    L = 300m = 0.30km x 30m^3/km = 9.0 m^3/Yr

13. PAINTING, NUMBER AND STATION ON STRUCTURES.
    2 Nos x 0.1 Lts/STRUCT = 0.2 Lts/Yr.

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ANNUAL MAINTENANCE PLAN - GIRITALE MAIN SYSTEM
QUANTITY ESTIMATE

E.RBMC-BELOW DAMBALAWEWA - STA.6+500 to 15+460@ ENTRANCE TO CHANDANA POKUN

1. WEEDING/CLEARING ALONG CANAL BUND (Twice a year)
   L = 8.960kg Say 9.0 km
   Area = 9.0kg x 1000 x 7.5m/10,000 = 6.75x2=13.5 Say 13.5ha/yr

2. REPAIRS TO CANAL BUND W/EARTH FILL (ONCE A YEAR).
   V = 9.0km x 15m^3/km/Yr = 135m^3 Say 135m^3/Yr

3. DESILTING ALONG CANAL (ONCE IN TWO YEARS)
   Assume 33% of canal length Light desilting reqd.
   D = 0.075m width 3.0
   V = 9,000m x 0.33 x 0.075 x 3.0 = 670m^3/2Yr = 335m^3/Yr

4. REMOVAL OF WATER PLANTS ALONG CANAL (ONCE A YEAR)
   Avg. Width = 6.0m
   Assume 20% of length needs removal
   A = 9.000m x 0.20 x 6.0m = 10,800m^2

5. REMOVAL OF ANT HILLS FROM BUND (ONCE A YEAR)
   @ 3 Hills/km x 9.0 = 27.0 Say 27 Hills/Yr

6. REPAIRS TO RETAINING WALLS (ONCE A YEAR)
   L = 722m

7. REPAIRS TO RUBBLE PITCHING (ONCE A YEAR) 1:3 mix
   L = 347m Area = 347x2.0 = 694m^2 Assume 10% of gross area require repairs A= 694m^2x.10 = 69.4 Say 70.0m^2

8. REPAIRS TO DRY RUBBLE PACKING (ONCE IN TWO YEARS)
   L = 929m Avg. width = 2.0m
   A = 929x2 = 1858m^2/2Yrs = 929 Say 930m^2/Yr

9. REPAIRS TO STRUCTURES (SEQUENCE OF REPAIRS VARIES) 1:3:6 Concrete

Type struc.	No.	Repair Frequency	Vol./Yr (m^3)	
Drop	14	Every 2 Years	14x1.0m^3/strx1/2=7.0m^3/yr	
Bath steps	9	Every 5 Years	9x0.25/5	= 0.45m^3/yr
Regulators	1	Every 5 Years	1x2.0m^3/5	= 0.40m^3/yr
Bridges	14	Every 5 Years	14x1.0/5	= 2.8m^3/yr
Spills(C.P)	1	Every 5 Years	1.0x1.0/5	= 0.25m^3/yr
T.O. Struc.	20	Every 2 Years	20x0.75/2	= 7.50m^3yr
Check Struc.	4	Every 5 Years	4x0.5/5	= 0.30m^3
Chl. Profile	2	Every 5 Years	2x0.5/5	= 0.20m^3

	65	Total	Say 19.0m^3	18.9m^3/yr

10. LUBRICATION OF TURNOUT STRUCTURE GATES REGULATOR(4x A YEAR)
    No. Gates = 3+22 = 25 Gates x 1/2kg/Gates x 4 = 50kg/Yr.

11. APPLICATION OF ANTI-CORROSION PAINT
    To Gates/Gate Structures (once a year)
    25 Gates x 1/2Ltr./Gate = 12.5 Say 13.Lts.
12. PAINTING, NUMBER AND STATION ON STRUCTURES.
    65 Nos x 0.10 Lts/STRUCT = 6.5 Lts /Yr.

ANNUAL MAINTENANCE PLAN - GIRITALE MAIN SYSTEM
QUANTITY ESTIMATE

F.CHANDANA POKUNA TANK/SLUICE/SPILLWAY

1. CLEARING/WEEDING NEED (twice a year)
   L = 500m x 10m = 5000m^2/10,000m^2/ha = 0.5hax2 = 1.0ha/yr

2. REPAIRS TO RIP-RAP PROTECTION (ONCE A YEAR)
   Length=0.50km ; @ 3.0 m^3/km ; V =0.5 x 3m^3/Yr. =1.5 m^3/Yr.

3. EARTH EXCAVATION/BORROW W/E.F. (ONCE A YEAR)
   0.50km x 30m^3/yr/km = 15m^3/yr

4. Removal of Ant Hills
   3 Ant Hills/km x 0.5 = 1.5 Ant Hills/yr Say 2.0 Ant Hills/yr

5. GRAVELLING UNPAVED BUND ROAD (ONCE A YEAR)
   0.50km @ 30m^3/km = 15.0 m^/Yr.

6. REMOVAL OF DEBRIS D/S OF SPILL CHANNEL (ONCE A YEAR)
   1.0m^3/L.M Spill = 1.0 x 10 = 10m^3

G.D-6 CANAL TO KADAWALA WEWA AND KADAWALA TANK/SLUICE/SPILLWAY

1. Clearing/Weeding Canal Bund (Twice a year)
   L = 3.26km
   W = 7.5m Area = 7.50x3260m/10,000 = 2.445hax2 = 4.89ha Say 5.0ha

2. REPAIR CANAL BUND W/EF (ONCE A YEAR)
   L = 3.26km V = 3.26km x 25m^3/km = 81.5m^3 Say 85m^3

3. DESILTING ALONG CANAL (ONCE IN 2 YEARS)
   L = 3.260m (Heavy desilting reqd.)
   W = 2.0m V = 2.0x3260x0.075x0.50=245m^3
   50% of length Say 250m^3/2yr = 125m^3/yr

4. GRAVELLING ACCESS ROAD ALONG CANAL BUND (once a year)
   L = 3.26km V = 3.26kmx25m^3/km = 81.5m^3 Say 85m^3

5. REMOVAL OF WATER PLANTS ALONG CANAL (ONCE A YEAR) 20% OF LENGTH
   A = 3,260x4x.20=2608m^2 Say 2600m^2

6. REMOVAL OF ANT HILLS ALONG CANAL BUND (ONCE A YEAR)
   3 Hills/km x 3.26 = 9.78 Say 10 Ant Hills

7. REPAIRS TO RETAINING WALLS (ONCE A YEAR)
   Length = 20+20+5+5+5+3+14+22+17=111m Say 115m

8. REPAIRS TO RUBBLE PITCHING IN 1:3 CT.MTR Mix.(once a year)
   L = 5m A = 2mx5m = 10m^2x.10 = 1.0m^2 Net
   Assume 10% of Gross Area Requires repairs.

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G.D-6 CANAL TO KADAWALA WEWA AND KADAWALA TANK/SLUICE/SPILLWAY (Cont.)

9. Repairs to Structure 1:3:6 Conc.

Type	No.	Repair Freq.	Volume/Yr		
Bath step	1	Every 5 yrs.	1x0.25x5	=	0.05
Bridges	3	Every 5 yrs.	3x1.0/5	=	0.60
Spills(Minor)	2	Every 5 yrs.	2x0.25/5	=	0.10
Spills(Major)	1	Every 5 yrs.	1x1.0/5	=	0.20
Regulators	1	Every 5 yrs.	1x2.0/5	=	0.40
T.O. Struc.	7	Every 2 yrs	7x0.75/2	=	2.63
	15	Total		=	3.98m^3
				Say	4.0m^3/yr

10. LUBRICATION TO GATES (4 x A YEAR)

No. Gates = 7 x 1/2kg/Gate x 4 = 14kg/yr

11. APPLICATION OF ANTI-CROSSION PAINT FOR GATE/GATE STRUC.(ONCE A YEAR)

7 GATES x 1/2 LTS/GATE = 3.5LTS Say 4 Lts/yr

12. REPLACE WOOD PLANKS ON SPILLS/REGULATORS (ONCE IN 4 YRS.)

Spill = 4 sets
Regulators = 2 Sets
---
6 Sets/4 = 1.5 Sets/Yr

13. KADAWALA BUND CLEARING/ WEEDING (TWICE A YEAR)
L=1150m x20m =23,000m^3/10,000 =2.3 ha x 2 =4.6 ha/Yr.

14. CLEANING D/S SPILL CHANNELS (ONCE A YEAR)
L = 20+20+10 =50 LM x 1.0m^3/m =50m^3 /Yr.

15. REPAIRS TO TANK BUND W/EARTH FILLING (ONCE A YEAR)
30m^3 x 1.15km = 34.5m^3 Say 35m^3/yr.

16. GRAVELLING TANK BUND (ONCE A YEAR)
L = 1.15KM x 30m^3/km = 34.5m^3 . Say 35m^3/yr

17. REMOVE ANT HILLS ALONG TANK BUND (ONCE A YEAR)
3 Hill/km x 1.15km = 3.45 Say 4 Ant Hills/yr

18. CLEANING GATE GROVES/PAINT GATES/GUIDES(ONCE A YEAR)
W/Anti-Crossion paint
2 Gates x 3 Lts/Gate = 6 Lts/yr

19. PAINTING/WHITE WASHING SLUICE STRUCTURE (2 COATS) (ONCE A YEAR)
A = 2m x 2m = 4m^2x3x2 coats = 24 m^2

G.D-6 CANAL TO KADAWALA WEWA AND KADAWALA TANK/SLUICE/SPILLWAY (Cont.)

20. PAINTING STAFF GAGE ON SLUICE (ONCE A YEAR)
    1 No.

21. LUBRICATION TO SLUICE GATES (4 x A YEAR)

    2 Gates x 2kg/gate x 4 = 16 kg/yr

22. UNGATED SPILLWAY - CLEANING U/S & D/S CHANNELS (ONCE A YEAR)

    L = 90m x 1.0m^3/1m = 90m^3

23. REPAIRS TO SPILLWAY (ONCE IN FIVE YEARS)
    V = 5.0m^3/5yrs = 1.0m^3/yr

24. PAINTING, NUMBER AND STATION ON STRUCTURES.
    15 Nos x 0.1 Ltr/STRUCT = 1.50 Lts/Yr.

AMPGTLQE

PAST O&M COSTS ON MAJOR IRRIGATION SYSTEM IN SRI LANKA

	(1) 1982 cost	(2) Percen-tage	(3) 1988 Cost	(4) Percen-tage	(5) Oper-ation	(6) Percen-tage	(7) Naint-enance	(8) Percen-tage
Maintenance Labour	92.54	46.27	185.11	48.08	51.86	49.24	133.25	47.64
Supervision	5.04	2.52	11.45	2.97	3.47	3.29	7.98	2.85
Drivers & Operators	5.55	2.78	8.23	2.14	2.54	2.41	5.69	2.03
Travelling & Com. allow.	2.68	1.34	3.63	0.94	1.60	1.52	2.03	0.73
Fuel & Repairs to Vehicles	10.85	5.43	15.36	3.99	3.72	3.53	11.64	4.16
Purchase of Materials & Tools	32.98	16.49	37.07	9.63	3.70	3.51	33.37	11.93
Physical Contingencies	7.48	3.74	24.15	6.27	3.94	3.74	20.21	7.23
Administration & Overheads	18.50	9.25	40.00	10.39	13.50	12.82	26.50	9.48
Depreciation of Vehicles & Equip.	24.38	12.18	60.00	15.58	21.00	19.94	39.00	13.95
	200.00	100.00	385.00	99.99	105.33	100.00	279.67	100.00

Source - Based upon analysis and data provided by Irrigation Department of 1981 performance in 16 selected Major Irrigation Schemes at one per range and up datged to 1988 prices.

PERCENTAGE OF ANNUAL MAINTENANCE INDIRECT COSTS

D&MCOSTL

Type Of Maintenance Cost		% Of Annual Maintenance
(2)	Supervision	2·85
(3)	Drivers / Operators	2·03
(4)	Travel / Bata allowance	0·73
(5)	Fuel / Repairs	4·16
(8)	Admin / Dept OH	9·48
(9)	Depreciation Vehicle / Equipment	13·95
		33·20 % Say 33 %

SUMMARY ANNUAL MAINTENANCE COSTS GIRITALE SCHEME MAIN SYSTEM

WORK AREAS	TOTAL ANNUAL COST (RS.)
A. Inlet Canal	154,202.75
B. Giritale Tank/Sluice/Spillway	32,846.78
C. RBMC-Above Dambalawewa (km 0+000 - km 5+922)	146,212.00
D. Dambalawewa Tank/Sluice/Spillway	40,938.05
E. RBMC-Below Dambalawewa (km 6+560-km 15+460)	162,504.75
F. Chandana Pokuna Tank/Sluice/Spillway	8,103.25
G. D-6 Canal to Kadawalawewa and Kadawala Tank/Sluice/Spillway	97,634.90
Sub-total Direct cost	642,442.48
Contingencies @ 7.23%	46,448.59
Total Direct Cost (67%)	688,891.07
ID Admin./O.H/Indirect Cost(33%)	339,304.56
Total Annual Maint.Cost(100%) Rs.	1,028,195.60

Say Rs.1,028,200/=

Using the Annual Maintenance cost of Rs. 1,028,200/=, above the Annual Maintenance cost for the Giritale Main System per acre would be approximately Rs. 1,028,200/7,340 = 140/Ac.

Say Rs. 140/Ac

GIRITALE SCHEME

EXHIBIT III-2-16

ESTIMATE OF THE EXPENSE NECESSARY TO BE INCURRED FOR : ANNUAL MAINTENANCE PLAN
INLET CANAL/SLUICE/TANKS/SPILLWAY, MAIN AND BRANCH CANALS

Sheet 1 of 4

SPECIFICATION	SUB ITEMS	ANUAL MAINT. QUANTITIES	UNITS	DESCRIPTION OF WORK ITEMS	COST OF EACH ITEM OF WORK: UNIT RATE Rs. Cts	TOTAL ITEM COST Rs.Cts.
				A. INLET SUPPLY CANAL		
	1	14.00	HA	Weeding/cleaning bund/bank (Twice a year 7 ha)	3,079.00	43,106.0
	2	120.00	M^3	Gravelling access road (once a year)	125.50	15,060.0
	3	75.00	M^3	Repairs to canal bund W/EF (once a year)	99.45	7,458.7
	4	18800.00	M^2	Removal of water plants from canal (once a year)	1.50	28,200.0
	5	15.00	Nos	Removal of ant hills along canal (once a year)	200.00	3,000.0
	6	660.00	M^3	Desilting along canal (once in 4 years-2640M^3)	50.50	33,330.0
	7	2.00	M^3	Repairs to inlet regulator (once in 5 years-10m^3)	2,000.00	4,000.0
	8	24.00	M^2	Repairs tc rubble pitching (once a year)	202.00	4,848.0
	9	200.00	M	Repairs to retaining walls (once a year)	5.00	1,000.0
	10	0.50	M^3	Repairs to bridges (once in 5 years-2.5m^3)	2,000.00	1,000.0
	11	2.00	M^3	Repair to TO Struc. (once in 2 years-4 m^3)	2,000.00	4,000.0
	12	24.00	Kg	Lubrication of Regulator Gates (4 x a year-6kg)	100.00	2,400.0
	13	12.00	Kg	Lubrication of T.O Gates (4 x a year-3kg)	100.00	1,200.0
	14	10.00	LTS	Anti-corrosion paint on gates (once a year)	130.00	1,300.0
	15	1.00	Set	Stop logs for Div. Weir (once in 4 years - 4 sets)	2,000.00	2,000.0
	16	1.00	M^3	Repairs to Div. Weir (once in 5 years-5m^3)	2,000.00	2,000.0
	17	2.00	LTS	Painting,Number and Station on structures(once a year)	150.00	300.0
				Sub total A		154,202.7
				B. GIRITALE TANK/SLUICE/SPILLWAY		
	1	7.15	HA.	Weeding/Clearing Giritale Tank Bund (Twice A Year - 3.575 HA)	3,079.00	22,014.8
	2	1.65	M^3	Repair to Rip Rap Protection (Once A Year)	400.00	660.0
	3	16.50	M^3	Earth Excavation/Burrow W/E.F (Once A Year)	99.45	1,640.9
	4	2.00	Nos.	Removed of Ant Hills (Once A Year)	200.00	400.0
	5	16.00	KG.	Lubrication of Sluce Gates (4 x year - 4 Kg)	100.00	1,600.0
	6	4.00	LTS.	Cleaning Gate Grooves/Paint Gates/Guide (Once A Year)	130.00	520.0
	7	48.00	M2	Paint Sluice Struc. White Wash (Once A Year)	7.00	336.0
	8	1.00	No.	Painting Staff Gage on Sluice (Once A Year)	500.00	500.0
	9	40.00	M^3	Clearing U/S & D/S Spilling Chl. (Once A Year)	65.00	2,600.0
	10	0.50	M^3	Repairs to Spillway Structure with 1:3:6 conc.(Once in 5 Yrs.)	2,000.00	1,000.0
	11	1.00	Set	Replacement to Spill Stoplogs (Once in 3 Years - 3 Sets)	1,500.00	1,500.0
	12	0.50	Lts	Painting,Number and Station on structures (once a year)	150.00	75.0
				SUB TOTAL B		32,846.78
				Total Sheet 1		187,049.53

ESTIMATE.WK1

GIRITALE SCHEME

EXHIBIT III - 2-16

ESTIMATE OF THE EXPENSE NECESSARY TO BE INCURRED FOR : ANNUAL MAINTENANCE PLAN
INLET CANAL/SLUICE/TANK/SPILLWAY AND MAIN AND BRANCH CANALS

Sheet 2 of 4

SPECIFICATION	SUB ITE	ANNUAL MAINT. QUAN-TITIES	UNITS	DESCRIPTION OF WORK ITEMS	COST OF EACH ITEM OF WORK: UNIT RATE Rs. Cts	TOTAL ITEM COST Rs.Cts.
				C. RBMC - ABOVE DAMBALA WEWA (KM 0+000-KM 5+922)		
	1	12.00	HA	Weeding/Clearing along Canl Bund (Twice A Year - 6.0 HA)	3,079.00	36,948.00
	2	90.00	M3	Repairing Canal Bund W/Earth Fil (Once A Year)	99.45	8,950.50
	3	665.00	M3	Desilting along Canal (Once in Two Years - 1330 M3)	50.50	33,582.50
	4	150.00	M3	Gravelling Unpaved Roads (Once A Year)	125.50	18,825.00
	5	7100.00	M2	Removal of Water Plants along Canal (Once A Year)	1.50	10,650.00
	6	18.00	Nos.	Removal of Ant Hills along Canal (Once A Year)	200.00	3,600.00
	7	1575.00	M	Repairs to Retaining Walls (Once A Year)	5.00	7,875.00
	8	20.00	M2	Repairs to Dry Rubble Packing (Once Every 2 Years - 40 M2)	6.00	120.00
	9	6.50	M3	Repairs to Strs. along Canal 1:3:6 Conc.24 Nos(Sequence Varies)	2,000.00	13,000.00
	10	3.00	M2	Repairs to Rubbble Pitching 1:3 M2 (Once a Year)	202.00	606.00
	11	24.00	KG	Lubrication T.O Struc. Gates (4 x A Year - 3Kg)	100.00	2,400.00
	12	6.00	LTS.	Apply Anti-Corrosion Paint to Gate/gate Struc. (Once A Year)	130.00	780.00
	13	1.00	SET	Replace Wooden Stop Log Planks (Once in 4 Years - 4 Sets)	2,000.00	2,000.00
	14	100.00	M3	Cleaning Approach/Tail Channels of Spill (Once A Year)	65.00	6,500.00
	15	2.50	Lts	Painting,Number and Station on structures (once a year)	150.00	375.00
					SUB TOTAL C	146,212.00
				D. DAMBALA WEWA TANK.SLUICE/SPILLWAY		
	1	7.70	HA.	Weeding/Clearing Dambala Tank Bund (Twice A Year - 3.85 HA)	3,079.00	23,708.30
	2	2.50	M^3	Repair to Rip Rap Slope Protection (Once A Year)	400.00	1,000.00
	3	25.00	M3	Earth Excavation/Burrow W/Earth Filling Canal Bund(Once A Year)	99.45	2,486.25
	4	3.00	Nos.	Removal of Ant Hills from Canal Bund (Once A Year)	200.00	600.00
	5	8.00	KG.	Lubricate Sluce Gate (4 x year - 2 Kg)	100.00	800.00
	6	2.00	LTS.	Cleaning Gate Grooves/Paint Gates/Guide (Once A Year)	130.00	260.00
	7	32.00	M2	Paint Sluice Structure (Once A Year)	7.00	224.00
	8	1.00	Nos.	Painting Staff Gage on Sluice Structure (Once A Year)	500.00	500.00
	9	0.50	M3	Repairs to Spill Structure (Once in 5 Years - 2.5m^3)	2,000.00	1,000.00
	10	2.00	SETS	Repairs to Spill Stoplogs (Once in 3 Years - o Sets)	2,000.00	4,000.00
	11	80.00	M3	Removal of Debris D/S of Spill Channel (Once A Year)	65.00	5,200.00
	12	9.00	M3	Gravelling Unpaved Section of Bund (Once A Year)	125.50	1,129.50
	13	0.20	Lts	Painting,Number and Station on structures (once a year)	150.00	30.00
					SUB TOTAL D	40,938.05
					Total sheet 2	187,150.05

STIMATE.WK1

GIRITALE SCHEME

EXHIBIT III-2-16

Sheet 3 of 4

ESTIMATE OF THE EXPENSE NECESSARY TO BE INCURRED FOR : ANNUAL MAINTENANCE PLAN
INLET CANAL/SLUICE/TANK/SPILLWAY AND MAIN AND BRANCH CANALS

SPECIFICATION	SUB ITE	ANNUAL MAINT. QUAN-TITIES	UNITS	DESCRIPTION OF WORK ITEMS	COST OF EACH ITEM OF WORK: UNIT RATE Rs. Cts.	TOTAL ITEM COST Rs. Cts.
				E. RBMC BELOW DAMBALA WEWA TO CHANDANA POKUNA (6+500 - 15+460)		
	1	13.50	HA	Weeding/Clearing Canal Bund (Twice A Year 6.75 HA)	3,079.00	41,566.5
	2	135.00	M3	Repairing Canal Bund W/Earth Fil (Once A Year)	99.45	13,425.7
	3	335.00	M3	Desilting along Canal (Once in Two Years - 670 M3)	50.50	16,917.5
	4	10800.00	M2	Removal of Water Plants along Canal (Once A Year)	1.50	16,200.0
	5	27.00	Nos.	Removal of Ant Hills along Canal (Once A Year)	200.00	5,400.0
	6	722.00	M	Repairs to Retaining Walls (Once A Year)	5.00	3,610.0
	7	70.00	M2	Repairs to Rubbble Pitching (Once A Year)	202.00	14,140.0
	8	930.00	M2	Repairs to Dry Rubble Packing (Once Every 2 Years - 1860 M2)	6.00	5,580.0
	9	19.00	M3	Repairs to Structures (65 Nos) (Sequence Varies)	2,000.00	38,000.0
	10	50.00	KG	Lubrication T.O Structure Gates (4 x A Year 6.25 Kg)	100.00	5,000.0
	11	13.00	LTS.	Apply Anti-Corrosion Paint to Gate Structure (Once A Year)	130.00	1,690.0
	12	6.50	Lts	Painting,Number and Station on structures (once a year)	150.00	975.0
					SUB TOTAL E	162,504.7
				F. CHANDANA POKUNA TANK/SLUICE/SPILLWAY		
	1	1.00	HA	Weeding/Clearing Tank Bund(Twice a Year-0.5ha)	3,079.00	3,079.0
	2	1.50	M^3	Repair to Rip Rap protection (Once a Year)	400.00	600.0
	3	15.00	M^3	Earth/Excav/Borrow & Earth filling Bund (Once a Year)	99.45	1,491.7
	4	2.00	Nos	Removal of Ant Hills from Bund (Once a Year)	200.00	400.0
	5	15.00	M^3	Graveling unpaved Bund Road (Once a Year)	125.50	1,882.5
	6	10.00	M^3	Removal of debris D/S Spill Channel (Once a Year)	65.00	650.0
					SUB TOTAL F	8,103.2
					Total Sheet 3	170,608.0

ESTIMATE.WK1

GIRITALE SCHEME

ESTIMATE OF THE EXPENSE NECESSARY TO BE INCURRED FOR : ANNUAL MAINTENANCE PLAN
INLET CANAL/SLUICE/TANK/SPILLWAY AND MAIN AND BRANCH CANALS

EXHIBIT III-2-16

Sheet 4 of 4

SPECIFICATION	SUB ITE	ANNUAL MAINT. QUAN-TITIES	UNITS	DESCRIPTION OF WORK ITEMS	COST OF EACH ITEM OF WORK: UNIT RATE Rs. Cts.	TOTAL ITEM COST Rs. Cts.
				6. D-6 CANAL TO KADAWALA WEWA AND KADAWALA TANK SLUICE/SPILLWA		
	1	5.00	HA	Clearing/Weeding canal bund (twice a year - 2.5ha)	3,079.00	15,395.00
	2	85.00	M^3	Repairs to canal bund W/EF (once a year)	99.45	8,453.25
	3	125.00	M^3	Desilting along canal (once in two years -250m^3)	50.50	6,312.50
	4	85.00	M^3	Gravelling access road along canal (once a year)	125.50	10,667.50
	5	2600.00	M^2	Removal of water plants along canal (once a year)	1.50	3,900.00
	6	10.00	Nos	Removal of ant hills along canal (once a year)	200.00	2,000.00
	7	115.00	M	Repairs to retaining walls (once a year)	5.00	575.00
	8	1.00	M^2	Repairs to rubble pitching (once a year)	202.00	202.00
	9	4.00	M^3	Repairs to struc (15EA) 1:3:6 conc (sequence varies)	2,000.00	8,000.00
	10	14.00	KG	Lubrications to gates (4 x A year - 1.75 kg)	100.00	1,400.00
	11	4.00	LTS	Apply anti crossive paint to gates (once a year)	130.00	520.00
	12	1.50	Sets	Replace wood planks on spills/Reg. (once 1 x 4 years - 6 sets)	2,000.00	3,000.00
	13	4.60	HA	Kadawala bund cleaning weed (twice a year - 2.3 ha)	3,079.00	14,163.40
	14	50.00	M^3	Cleaning D/s spill channels (once a year)	65.00	3,250.00
	15	35.00	M^3	Repairs to tank bund W/EF (once a year)	99.45	3,480.75
	16	35.00	M^3	Graveling tank bund road (once a year)	125.50	4,392.50
	17	4.00	Nos	Remove ant hills on bund (once a year)	200.00	800.00
	18	6.00	LTS	Clean gate grooves/Paint gate (once a year)	130.00	780.00
	19	24.00	M^2	Painting sluice struc (once a year)	7.00	168.00
	20	1.00	EA	Painting staff gage on sluice (once year)	500.00	500.00
	21	16.00	KG	Lubricate sluice gates (4 x a year - 4 kg)	100.00	1,600.00
	22	90.00	M^3	Cleaning U/s D/s spillway chl (once a year)	65.00	5,850.00
	23	1.00	M^3	Repairs to spillway (once every 5 year - 5m^3)	2,000.00	2,000.00
	23	1.50	Lts	Painting,Number and Station on structures (once a year)	150.00	225.00
					TOTAL G	97,634.90
					TOTAL SHEET 4	97,634.90
					TOTAL SHEET I	187,049.53
					TOTAL SHEET 2	187,150.05
					TOTAL SHEET 3	170,608.00
					SUB TOTAL SHEET 1+2+3+4	642,442.48
					Contingencies @ 7.23%	46,448.59
					SUB TOTAL(67%)	688,891.07
					Dept. O/H(33%)	339,304.56
					TOTAL (100%)	1,028,195.60
				Annual Cost/Ac= Rs. 1028195.60/7340		

% Admin./Dept. O/H (from ID/IMD)	
Supervision of constr.	2.85%
Driver & Equip. Operation	2.03%
Travel & Bata Allowance	0.73%
Vehicle O&M Cost	4.16%
Admin./Overheads	9.48%
Depreciation Veh/Equip.	13.95%
Total	33.26%
Say	33%

SHELADIA Associates, Inc.
Consulting Engineers Irrigation Systems Management Project
35/7 Gregory's Road, Colombo 7. P. O. Box 1874, Colombo. Tel: 596034
Riverdale
Colombo
Polonnaruwa

18 March 1988

Mr. W.N.M. Botejue
Project Director
Irrigation Management Division
Bullers Road
Colombo 7

Subject : ISMP Operations

Dear Sir :

Thanks to the assistance cooperation received from the Deputy Director of Irrigation, Polonnaruwa Range and his staff we are able to present to IMD/ID for their review and evaluation of the outline of procedures for a preliminary action plan for the four Polonnaruwa ISMP schemes. One of the main objectives of ISMP is improved system operations. This preliminary action plan has been prepared after a study of present operating procedures, existing infrastructural facilities, availability of personnel, transport facilities, communications, and availability of data and flow of information.

The main activities are :

1. Identification and Establishment of Field Operation Units and Sub-Units

2. Establishment of two-way Communications between Operations Centers and Field Operation Units

3. Updating of Issue Trees and Preparation of Schematic Water Distribution Diagrams.

4. Installation of Rain Gauge network

5. Establishing Control and Measuring Devices in Main and Branch Canals

6. Establishing Control and Measuring devices in Pilot Areas

7 Establishing Control and Measuring Devices in other D-Channels

8. Assessment of Canal Losses, Seepage and Percolation in fields

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Establishment of a Meteorological Station at Polonnaruwa

0. Development of Computer Model

1. Establishing Control and Measuring Devices in F canals (other than Pilot Areas)

12. Refinement of System Operations

A brief description of the above 12 activities are as follows :

Item No. 1. Identification and Establishment of Field Operation Units and Sub-Units

It is envisaged that water management operations will be carried out through a network of Field Operation Units and Sub-Units. Technical Assistants will be in charge of Field Operation Units which will cover about 2000 ha of command area and will be assisted by Work Supervisors who will be in charge of Sub-Units covering about 100 ha, which are in accordance with Irrigation Department Circular NO. RW/GEN, dated 28 November 1980.

Proposed Water Management Operations Plan for Kaudulla Scheme (typical for all schemes) is presented as a schematic diagram on Exhibit I. The schematic diagram illustrates new information, instructions, and feedback will flow through the control network.

The locations of the Field Operations Units have been identified in consultation with Division I.E.'s taking into consideration the existing ID buildings, spatial distribution, access, proximity to Post Office/Sub-Post Office, and townships. Although most of these units are in ID premises, improvement to existing facilities and or construction of new offices or quarters may be necessary. Cost estimates are now under operation. Locations of the Field Operation Units are presented on Exhibit II, Operation Data and Control Net -k Plan.

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Item No. 2. Establishment of two-way Communications between Operation Centers and Field Operation Units

This is the most important item which by itself could make an immediate impact not only on water management operations but also on other day to day activities of the Division.

It is presently envisioned that telephones will be located at Field Operation Units with the possibility of extension lines from existing Sub-Post Offices. Alternatives will be studied in consultation with Telecommunication Department and an estimate of cost will be presented in due course.

Item No. 3. Updating of "Issue Trees" and Preparation of a Schematic Water Distribution Diagrams

The "Issue Trees" need to be updated to reflect changes in the distributory system as well as the total cultivated area. This could best be carried out with the aid of the Final Colony Plans (4 chains to an inch) and Final Colony Supplementary Tenement Lists prepared by the Survey Department. A request to initiate action was addressed to DDI-Polonnaruwa on 2 March 1988.

The Schematic Water Distribution Diagram, which is a bulk water "Issue Tree" showing water distribution up to D-Canal off takes will facilitate computation of required issues to the D-Canals. The Schematic Water Distribution Diagram for Giritale Scheme is presently under preparation and the irrigated areas will be amended after completion of the updating of the "Issue Tree" for that scheme.

Item NO. 4. Installation of a Rain Gauge network

Availability of daily rainfall data at the Operation Centers will enable better utilization of effective rainfall thereby conserving water in the reservoirs. Most of this benefit could be derived prior to development of Computer Models and is dependent only on the proposed two-way communication system. Some thirteen locations for rain gauges have been identified and are shown on the Operation Data and Control Network Plan, Exhibit II. Cost estimates for these rain gauges will be forwarded to you by separate letter.

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Item No. 5. Establishing Control and Measuring Devices in Main and Branch Canals

Identification of control and measuring points and the selection of the type of measuring device is to be carried out during the Operation Survey. Reservoir sluice and canal cross regulators are to be used as controls and are included in ESI. In most cases, existing structures are to be used for measurement and entails installation of gauges and rating of discharges by means of current meters, for completion in October 1988.

Item No. 6 Establishing Control and Measuring Devices in Pilot Areas.

Identification of control and measuring points and the selection of the type of measuring device is been carried out during the survey and design stage of the Pilot Area. Cost of the measuring devices are included in the Pilot Area cost estimates which are expected to be completed by 15 April 1988. If approved, the construction can commence in September 1988 and calibration in early 1989.

Item No. 7 Establishing Control and Measuring Devices in other D-Canals

Cast iron screw type lifting gates are to be installed or replaced, where necessary, and measuring devices will be installed at each D-Canal offtake during rehabilitation of the D-Canal. This work will continue throughout the project period.

Item No. 8 Assessment of Canal Losses, Seepage and Percolation in Fields (other than Pilot Areas)

Canal losses are to be ascertained after installation and calibration of measuring devices.

Indicative schedules for establishing canal losses are as follows

Main and Branch canals - 1st quarter 1989

Pilot Areas - 2nd Quarter 1989

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D & F Canals in other areas - to be continued to the end of the Project.

Studies to assess canal losses have been conducted by the Irrigation Water Management Study at Kaudulla by Hydraulics Research - wellingford 1978-85. Values for Maha and Yala are given separately for Stage I and Stage II areas under canal categories (A) Main and Branch (B) Distributory and Field.

Several other studies have been conducted in Polonnaruwa District to assess seepage and percolation losses in the field and information from those studies will be utilized, where applicable, for ISMP.

These studies are :

1985 - Diagnostic Analysis - W.M.S. Project

1986 - A study of Seepage and Percolation Rates in Rice Cultivation in the Polonnaruwa District of Sri Lanka. 1986. S.B. Smolnik and M.B. Riley, C.S.U.

1978-83 Irrigation Water Management Study at Kaudulla- Hydraulics Research - Wallingford, England

Additional studies in areas likely to exhibit unusual seepage and percolation losses could be carried out during operation of the Computer Model.

Item No. 9. Establishment of a Meteorological Station at Polonnaruwa

Presently there are two meteorological stations at Kaudulla established under the Irrigation Water Management Study and another at Aralanganwila in Mahaweli System B (about 30 km South East of Polonnaruwa) . In order to obtain reliable data for operation of the P.S.S and Giritale schemes it is proposed to establish a meteorological station at Polonnaruwa, location of which is shown in the annexed Operation Data and Control Network Plan (Exhibit I). The cost estimate for setting up this station will be intimated to you by a separate letter.

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Item No. 10. Development of Computer Model

Weekly operation model is to be based on Gal Oya L.B. Model which was developed in 1985-86. Since most of the data required for development of a model available for Kaudulla Scheme and it is proposed that the Kaudulla Model be given priority.

With the introduction of computers, reservoir operation model can be developed using historical data which will greatly assist in deciding on cultivation extends during the Yala Season.

Item No. 11. Setting up of control measuring devices in Field Canals (other than in Pilot Areas)

Location of control and measuring devices and the selection of types is to be carried out during survey and design stage of these canals and the construction of the devices will continue throughout the project period. However, preliminary estimates in the Pilot Areas indicate that the USAID agreed rates of reimbursement are insufficient to replicate the water measurement facilities as proposed in the Pilot Areas to the remainder of the 65,000 acres in the Polonnaruwa Range.

Item No. 12. Refinement of System Operations

With the introduction of control and measuring devices in the D and F-Canals and availability of better data on water requirements, effective rainfall, canal losses, seepage and percolation losses and experience gained in operation of the computer model the system operations will be refined during the Life-of-Project.

The above twelve items are considered to be the major and essential items required in order to implement the improved water management and operations for the ISMP. Other requirements will be introduced during the course of the Life-of-Project as required to improve and refine the operations. A schedule of conducting these twelve major work items is presented on Exhibit III.

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It would be appreciated if IMD/ID would review this preliminary action plan and provide us your comments as rapidly as possible in order that this work can proceed in a timely and efficient manner.

Sincerely,

Louis E Haley
Chief-of-Party

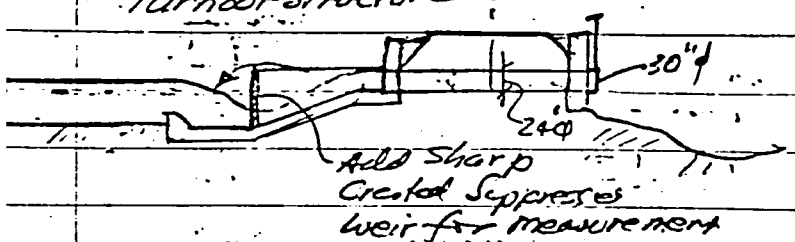
Enclosure : a/s

cc w/cy encl :

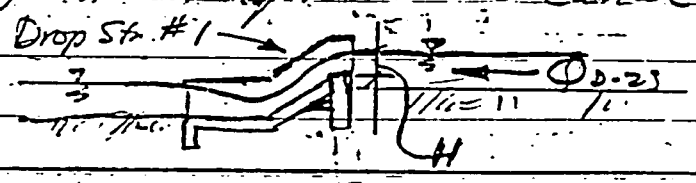
Mr. S Piyadasa, DDI-Polonnaruwa
Mr. L.T. Wijesuriya, ADD ISMP/ID
Mr S. Ranatunga, DD O&M/IMD
Mr. Dan Jenkins, USAID
Mr Dan Bradbury, SAI

GIRITALE PILOT AREA

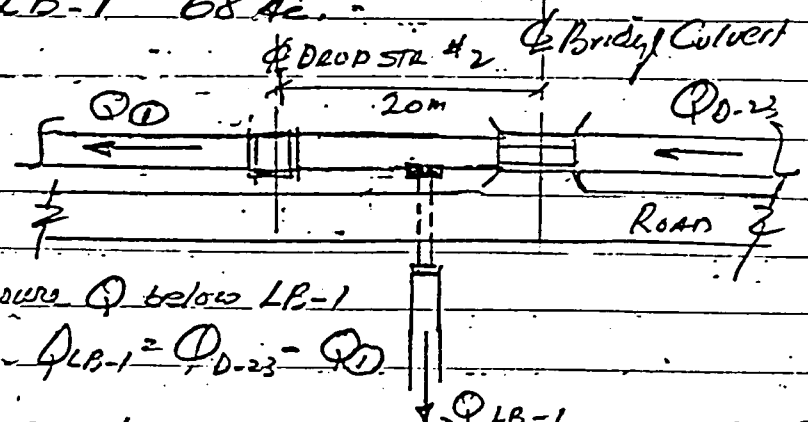
① RB-23 Turnout Structure ℄ ROAD



② Alternate Measurement at existing Drop Structure 280 m d/s of RB-23 offtake. Drop structure has been by-passed. Needs repairs and then calibrate plate for discharge to D-23 Canal



③ LB-1 68 Ac.

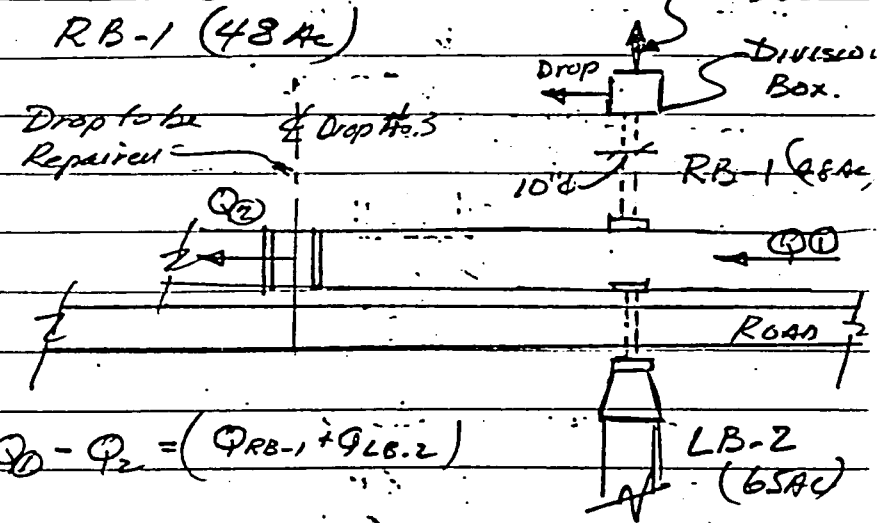


Measure Q below LB-1

Then $Q_{LB-1} = Q_{D-23} - Q_1$

#2 Drop Structure to be repaired & rated for Q

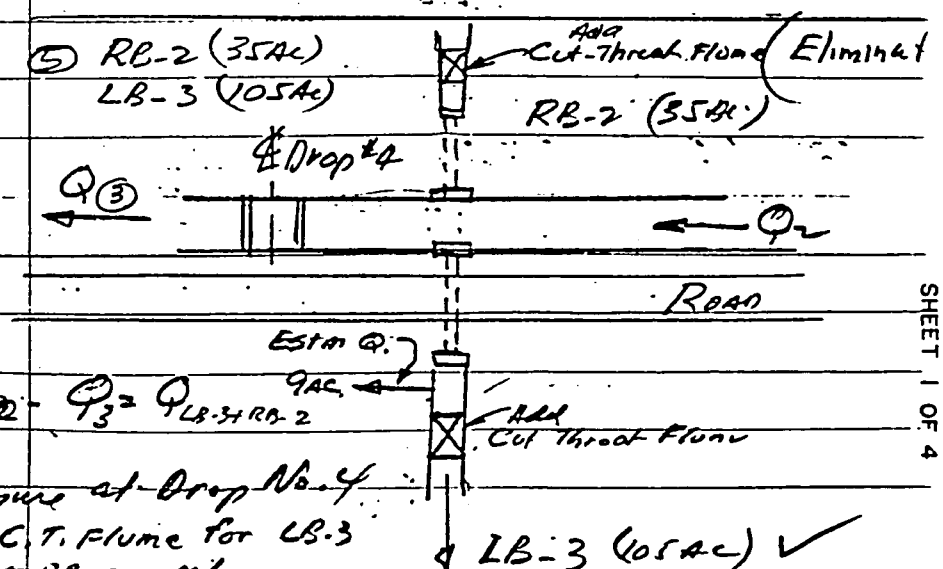
④ LB-2 (65 Ac)
RB-1 (48 Ac)



$Q_1 - Q_2 = (Q_{RB-1} + Q_{LB-2})$

Measure @ Drop #3 and a RB-1 Division Box drop to left. Difference = Q_{LB-2}

⑤ RB-2 (35 Ac)
LB-3 (105 Ac)



$Q_2 - Q_3 = Q_{LB-3+RB-2}$

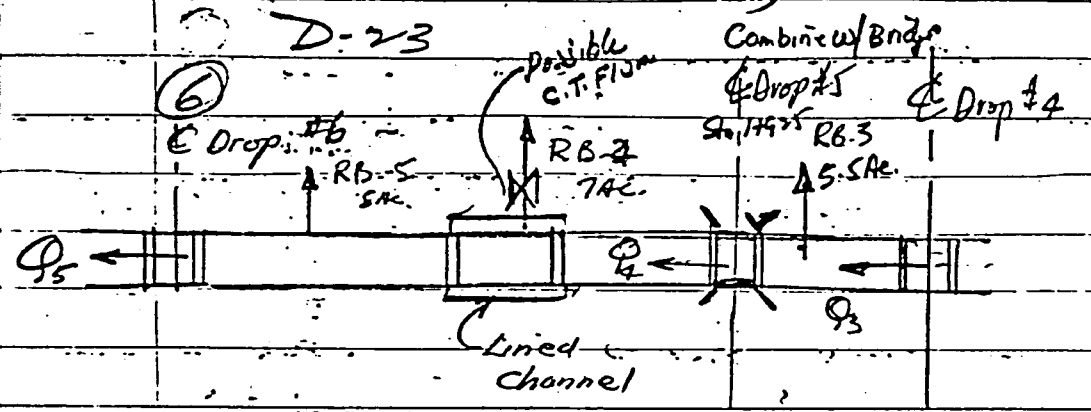
Measure at Drop No. 4
Add C.T. Flume for LB-3
~~Add RB-2~~ ok

EXHIBIT III-3-2
SHEET 1 OF 4

Giritale Pilot Area (Cont)

D-23

(6)



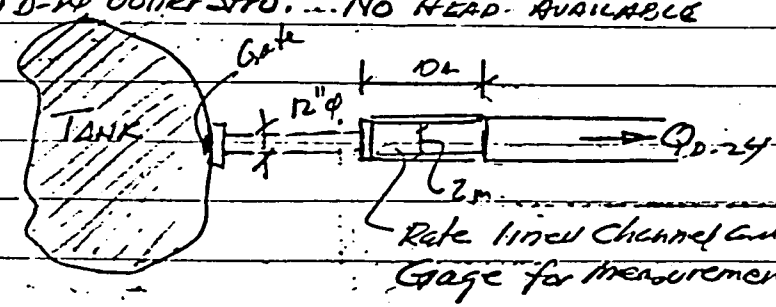
Measure Q @ Drops #5 AND #6

$Q_4 = Q_3 - Q_{RB3}$

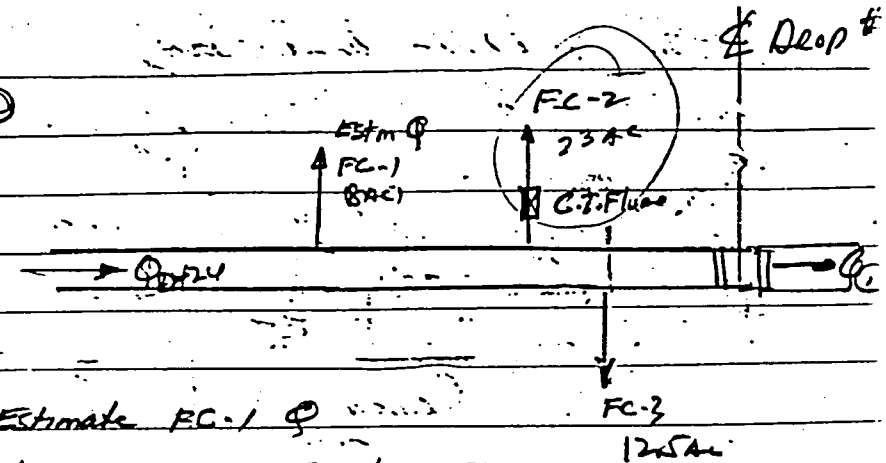
$Q_5 = Q_4 - (Q_{RB-3} + RB4)$

D-24

(1) D-24 Outlet Stru. ... NO HEAD AVAILABLE



(2)



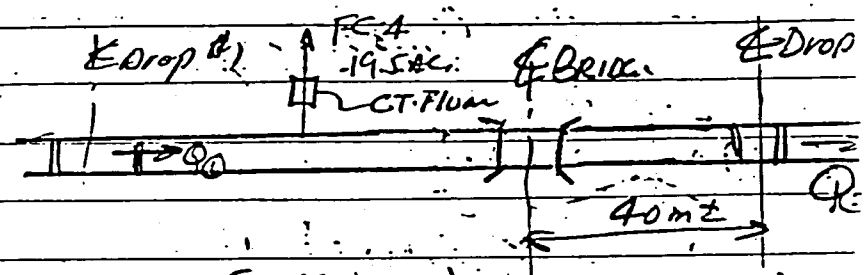
Estimate FC-1 Q

Measure FC-2 Q w/ C.T. Flume

Measure Q @ Drop #1 By Rating

$Q_{FC-3} = Q_{D-24} - (Q_{FC-1} + FC-2 + Q_{(1)})$

(3)



$Q_{FC-4} = (Q_{(1)} - Q_2)$

Measure @ Drop (2) Check FC-4 Q by C.T. Flume.

SHEET 2 OF 2

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KADULLA PILOT AREA FIELD TRIP 11/3/88

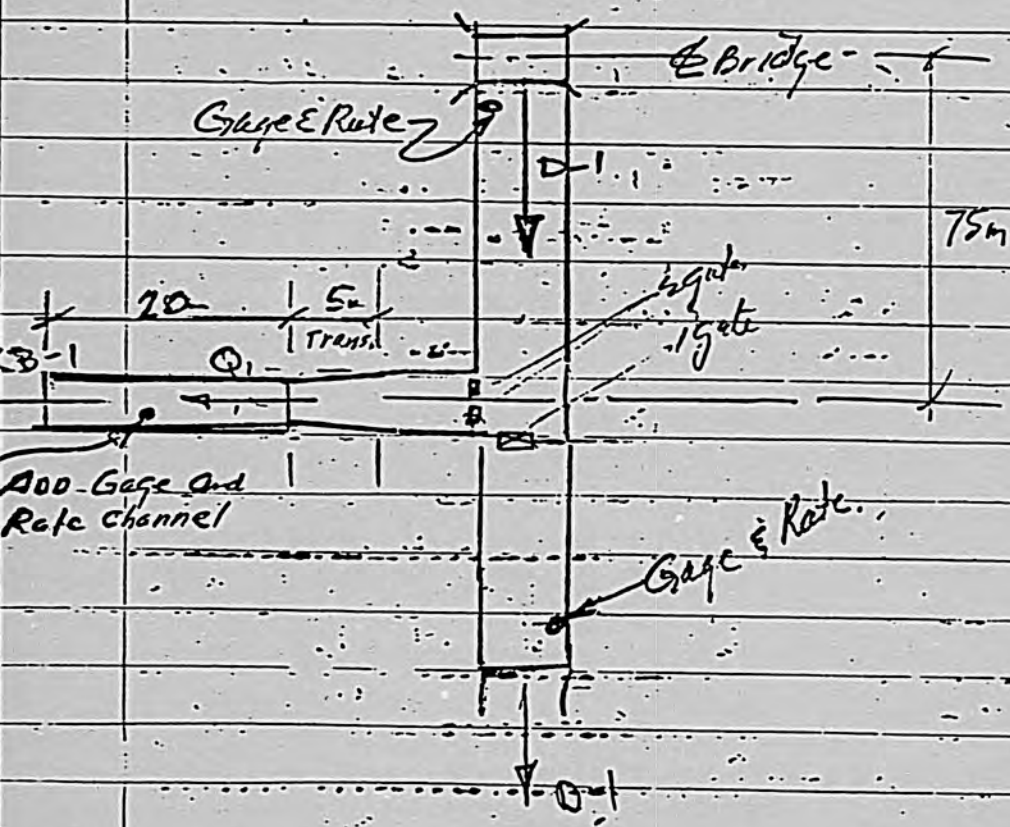
L. HALEY, DSAE, CPL, CSE, IE KAUMMA (DESIGN) TA

STATUS OF DESIGN.

- 9 FC Complete
- 45 FC Remaining
- 5.5 km of RB-1 Complete

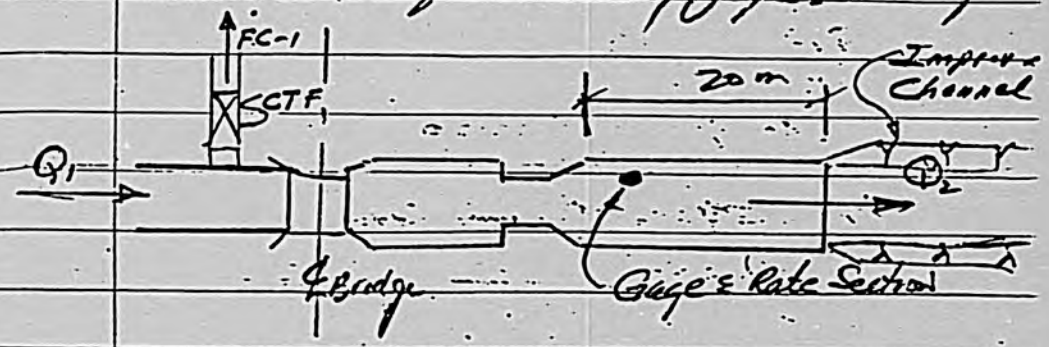
RB1 OFF D-1 MAIN CANAL

Az 1086 Ac. Q_{max} = 30 cfs ±

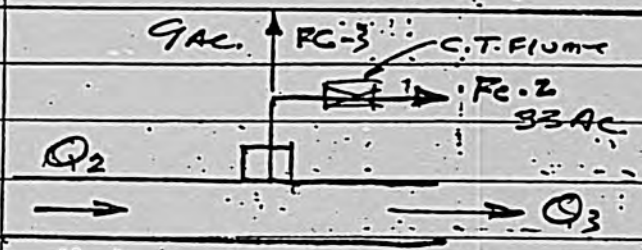


FC-1 Measure with Cut Throat Flume

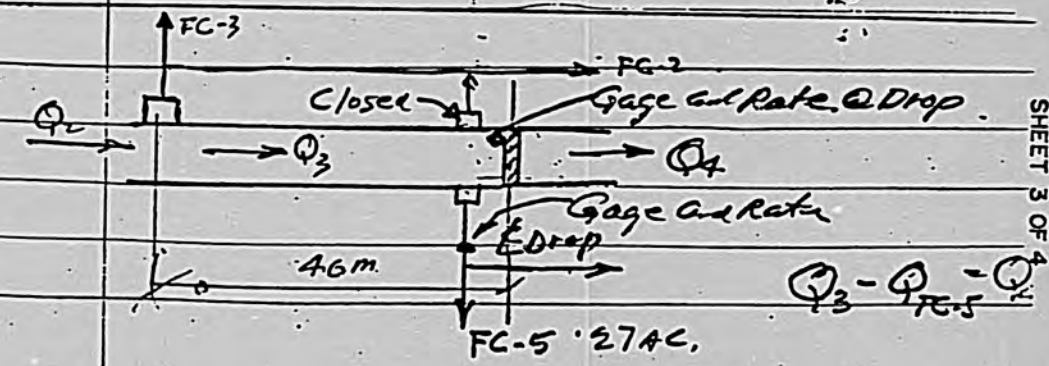
Measure d/s of FC-1 by gage & rating



$Q_1 - Q_{FC-1} = Q_2$ check by rating.



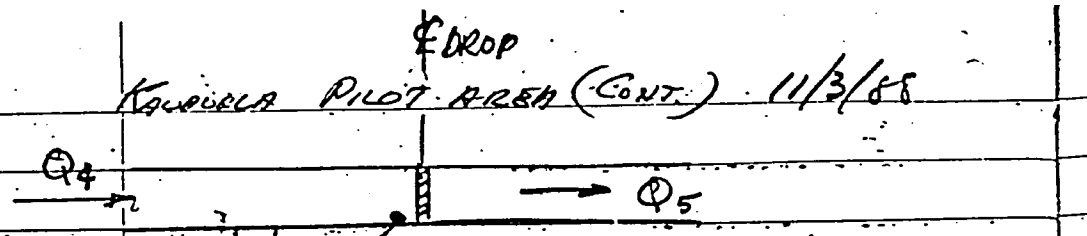
$Q_3 = Q_2 - (FC-2 + FC-3)$



$Q_3 - Q_{FC-5} = Q_4$

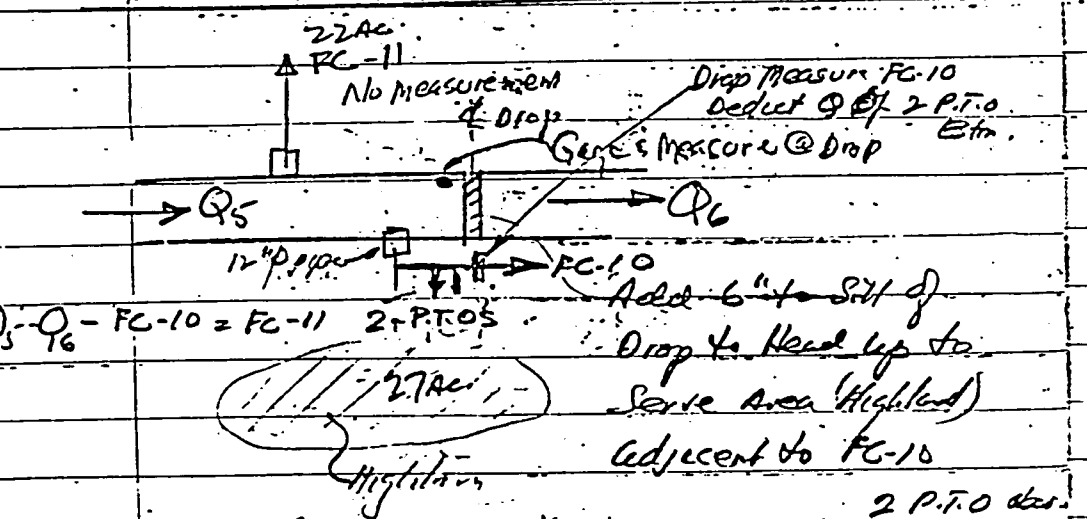
EXHIBIT W-3-2 SHEET 3 OF 4

KAUDULUA PILOT AREA (CONT.) 11/3/88



$Q_4 - Q_5 = FC\text{-}9$

Note:
OLD FC-10 Shifted d/s of FC-11

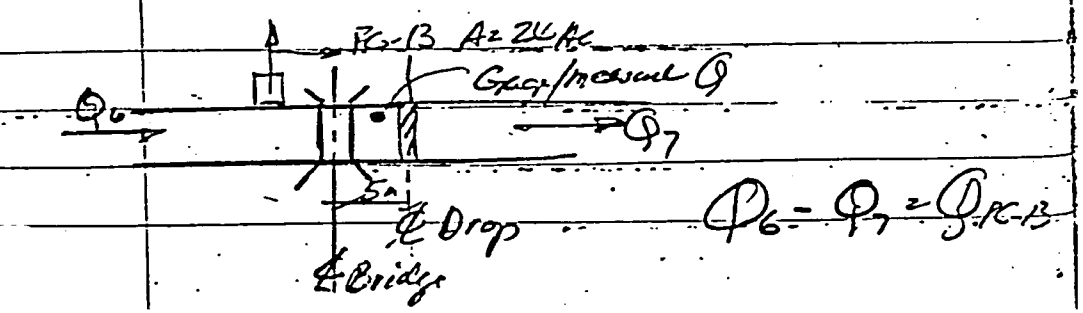


$Q_5 - Q_6 - FC\text{-}10 = FC\text{-}11$

~~Add 6" to Sill of~~
Drop to Head up to
Serve Area (Highland)
adjacent to FC-10

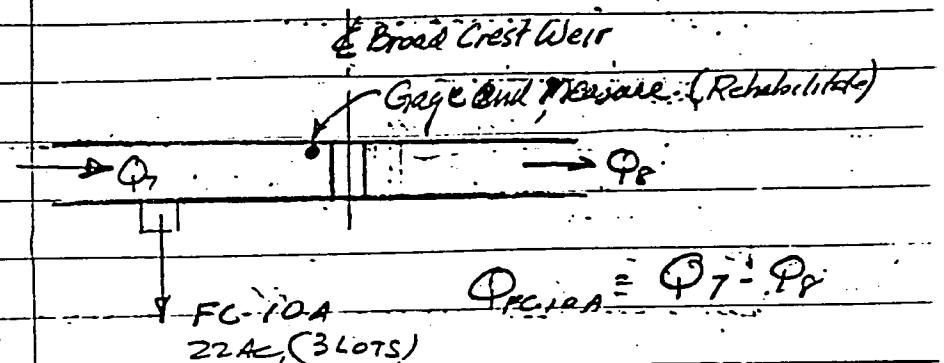
$Q_5 - (FC\text{-}11 + FC\text{-}10) = Q_6$ — Estm.

2 P.T.O deds.
~~FC-11 = 10~~
FC-10

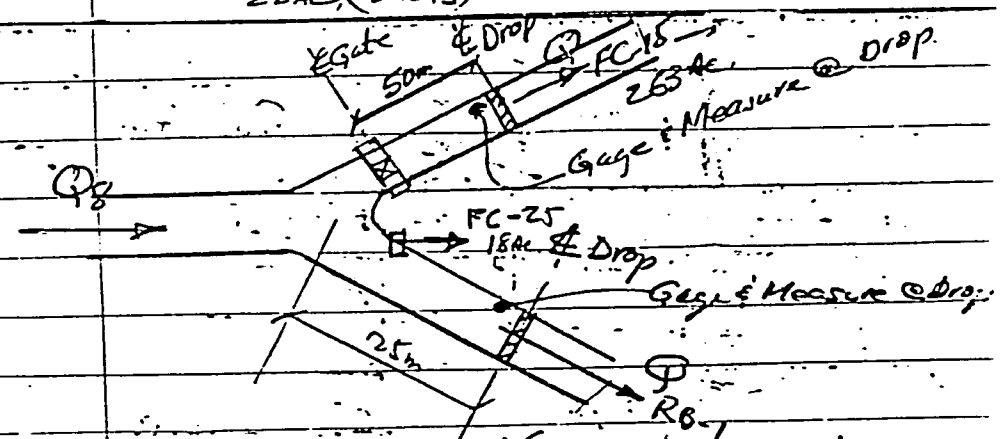


$Q_6 - Q_7 = Q_{FC\text{-}13}$

KAUDULUA PILOT AREA (CONT.) 11/3/88



$Q_{FC\text{-}10A} = Q_7 - Q_8$



$Q_{FC\text{-}25} = Q_8 - (Q_{FC\text{-}15} + Q_{RB\text{-}1})$
(Q_9)

SHEET 4 OF 4

GIRITALE SCHEME WATER MANAGEMENT OPERATIONS

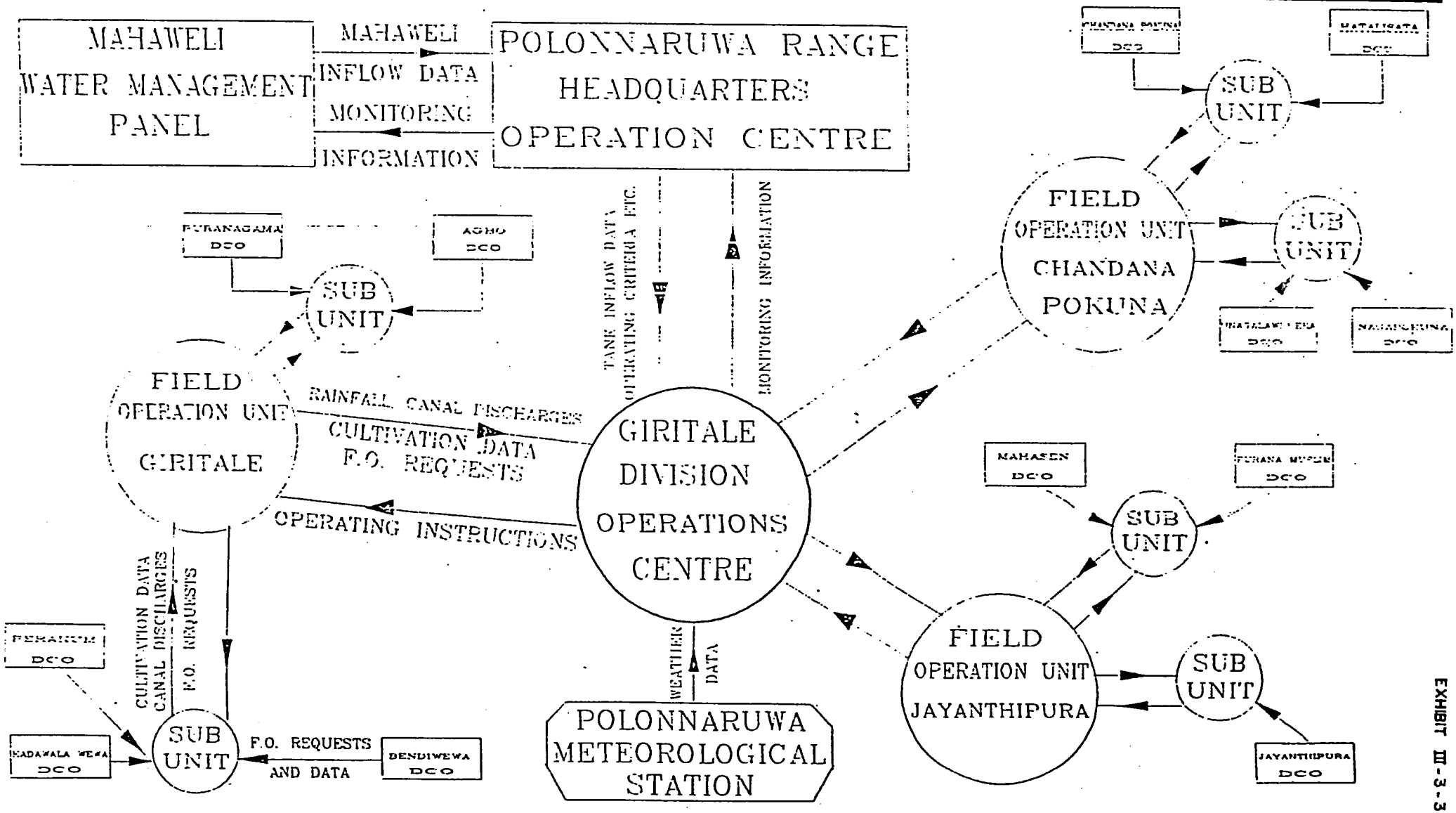
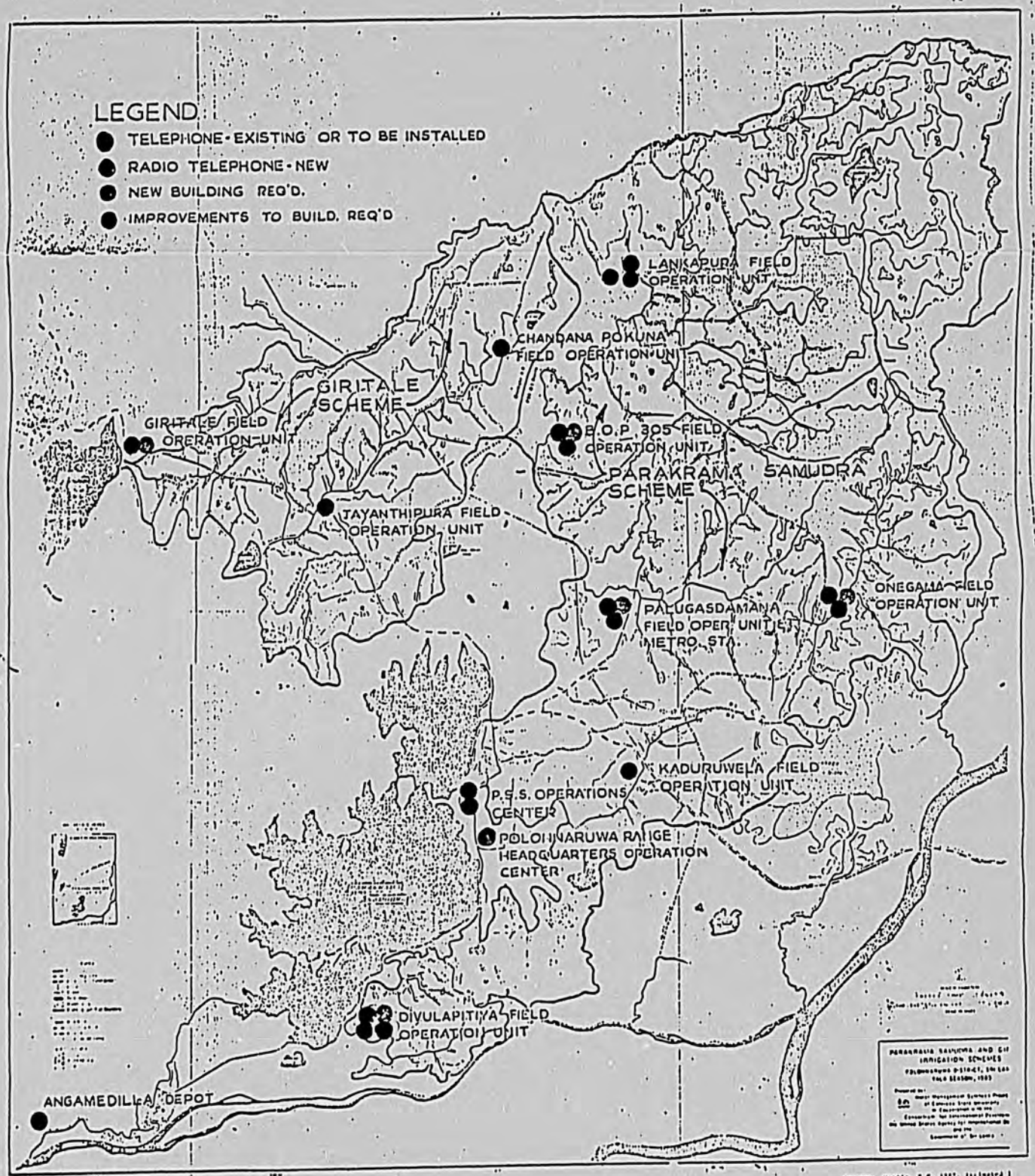


EXHIBIT III-3-3


LEGEND
TELEPHONE-EXISTING OR TO BE INSTALLED
RADIO TELEPHONE-NEW
NEW BUILDING REQ'D.
IMPROVEMENTS TO BUILD. REQ'D
LANKAPURA FIELD OPERATION UNIT
CHANDANA POKUNA FIELD OPERATION UNIT
GIRITALE SCHEME
GIRITALE FIELD OPERATION UNIT
B.O.P. 305 FIELD OPERATION UNIT
PARAKRAMA SAMUDRA SCHEME
JAYANTHIPURA FIELD OPERATION UNIT
ONEGALLA FIELD OPERATION UNIT
PALUGASDAMANA FIELD OPER. UNIT (METRO. ST.)
KADURUWELA FIELD OPERATION UNIT
P.S.S. OPERATIONS CENTER
POLONNARUWA RANGE HEADQUARTERS OPERATION CENTER
DIVULAPITIYA FIELD OPERATION UNIT
ANGAMEDILLA DEPOT

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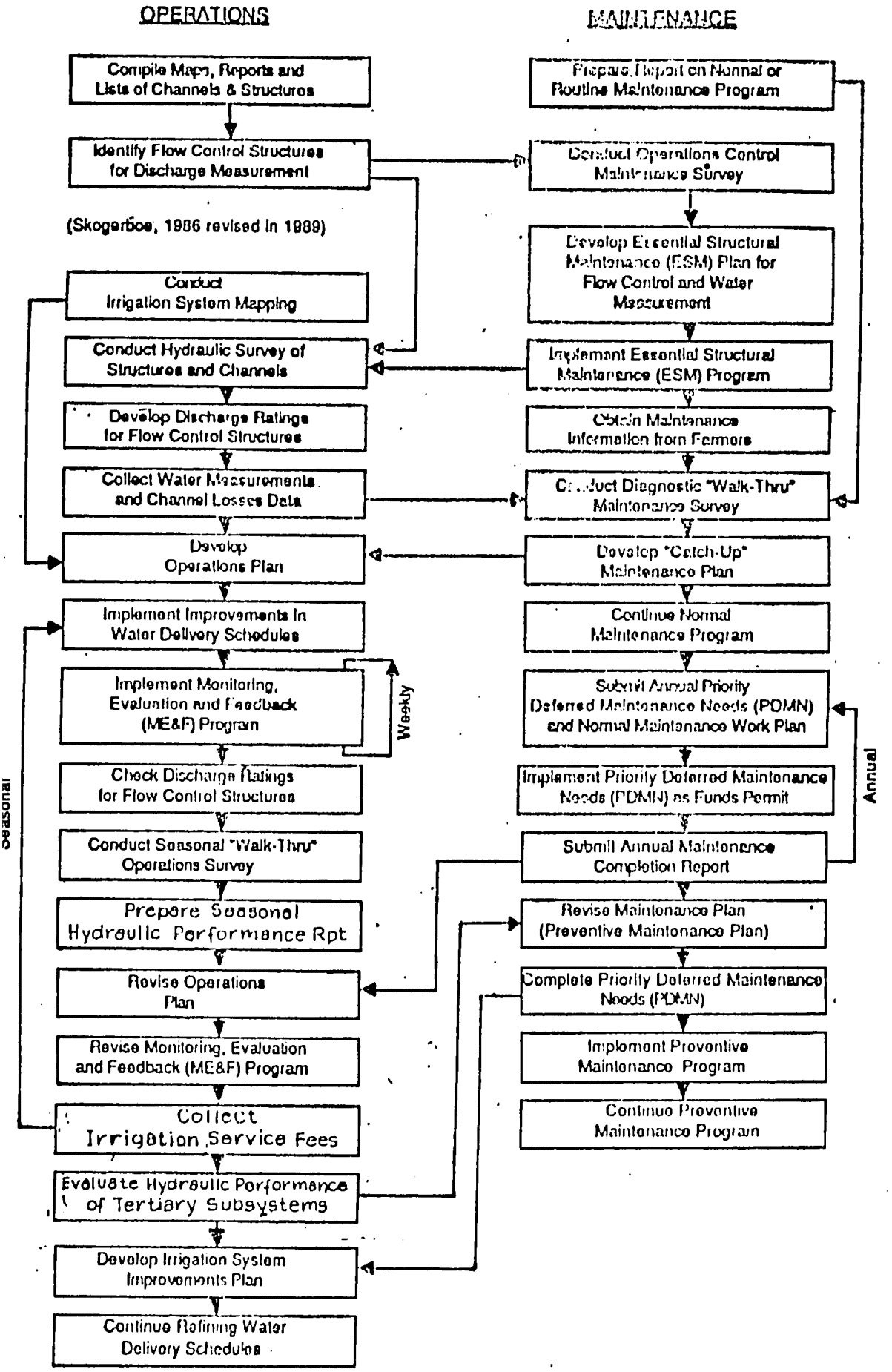
IRRIGATION M & O LEARNING PROCESS



CHAPTER IV

STATUS OF O&M COMPONENT AS OF 17 FEBRUARY 1991

4.1 REHABILITATION OF THE IRRIGATION SYSTEMS

Mr. C.F. Leonnardt Sheladia's O&M Engineer from 16 August 1987, officially turned over responsibilities of the O&M component to Mr. T.A. Cerdan, on 17 February 1991.

the Status of Rehabilitation Works in the seven Schemes as of the Project as of 17 February 1991 was essentially the same as reported in Sheladia's Quarterly Report No. 14 dated 25 January 1991 to 17 February 1991. Therefore, the status of Survey, Design, and Construction of each of the five Schemes in the Polonnaruwa range, including Bakamuna - Attaragallewa Scheme, is presented on Table IV-1-1; the status of Water Measurement and Priority Rehabilitation work on the Ridi Bendi Ela Scheme in Kurunegala Range is presented on Table IV-1-2; and the status of the Pragmatic Rehabilitation on the Gal Oya RB and Preventative Maintenance on the Gal Oya LB in the Ampara Range is presented on Tables IV-1-3 and IV-1-4 respectively.

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IRRIGATION SYSTEMS MANAGEMENT PROJECT - POLONNARUWA RANGE — TABLE IV-1-1

MONITORING SURVEYS, DESIGNS AND CONSTRUCTION

OF

PARAKRAMA SAMUDRA, MINNERIYA, GIRITALE, KAUDULLA, RAKAMUNA -

ATTARAGALLEWA SCHEMES - AS OF 31 DECEMBER 1990

CANAL		TOTAL LENGTH (Km)	COMPLETED AS OF 31 DECEMBER 1990			PROGRAM FOR 1991			REMAINING FOR LIFE OF PROJECT		
			SURVEY	DESIGN	CONST.	SURVEY	DESIGN	CONST.	SURVEY	DESIGN	CONST.
M.C	PSS	27.7	24.7	19.7	19.7	3.0	8.0	8.0	--	--	--
	MIN	15.0	15.0	15.0	15.0	--	--	--	--	--	--
	GIR	5.6	1.6	1.6	1.6	4.0	4.0	4.0	--	--	--
	KAU	7.2	7.2	7.2	7.2	--	--	--	--	--	--
	TOTAL	55.5	48.5	43.5	43.5	7.0	12.0	12.0	--	--	--
B.C	PSS	19.9	19.9	19.9	19.9	--	1.3	--	--	--	--
	MIN	17.1	17.1	15.8	14.2	--	--	2.8	--	--	--
	GIR	10.7	10.7	10.7	10.7	--	--	--	--	--	--
	KAU	19.4	19.4	19.4	19.5	--	--	--	--	--	--
	TOTAL	67.1	67.1	65.8	64.3	--	1.3	2.8	--	--	--
D.C	PSS	158.0	139.0	104.3	63.9	18.8	53.7	25.0	--	--	69.1
	MIN	90.2	90.2	69.4	56.0	--	20.7	25.0	--	--	9.2
	GIR	29.9	29.9	21.8	16.9	--	8.1	3.8	--	--	9.2
	KAU	73.3	63.8	53.5	38.8	9.7	19.9	24.4	--	--	10.1
	ATA	7.6	--	--	--	7.6	7.6	5.7	--	--	1.9
	TOTAL	359.0	322.9	249.0	175.6	36.1	110.0	83.9	--	--	99.5
FC	PSS	266.3	116.0	105.8	9.4	150.3	80.0	40.0	--	79.5	216.9
	MIN	268.4	229.5	154.6	74.3	38.9	113.8	84.0	--	--	110.1
	GIR	129.9	108.0	61.0	20.8	21.9	68.9	37.0	--	--	72.1
	KAU	312.5	234.4	158.7	89.1	78.1	153.8	90.0	--	--	133.4
	ATA	26.6	--	--	--	6.6	6.6	3.3	20.0	20.0	23.3
	TOTAL	1003.7	687.9	481.1	193.6	295.8	423.1	254.3	20.0	99.5	555.8
DRN	PSS	45.0	--	--	--	27.0	27.0	10.0	18.0	18.0	35.0
	MIN	65.0	--	--	--	65.0	65.0	--	--	--	65.0
	GIR	--	--	--	--	--	--	--	--	--	--
	KAU	35.0	--	--	--	15.0	15.0	15.0	20.0	20.0	20.0
	ATA	1.5	--	--	--	1.5	1.5	1.5	--		--
	TOTAL	146.5	--	--	--	108.5	108.5	26.5	38.0	38.0	120.0
TOTAL	PSS	516.9	299.6	250.7	112.9	199.1	170.0	83.0	18.0	97.5	321.0
	MIN	455.7	351.8	254.8	159.5	103.9	199.5	111.8	0.0	0.0	184.3
	GIR	176.1	150.2	95.1	50.0	25.9	81.0	44.8	--	--	81.3
	KAU	447.4	324.8	238.8	154.6	102.8	188.7	129.4	20.0	20.0	163.5
	ATA	35.7	--	--	--	15.7	15.7	10.5	20.0	20.0	25.2
	TOTAL	1631.8	1126.4	839.4	477.0	447.4	654.9	379.5	58.0	137.5	775.3

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TABLE IV-1-2

REHABILITATION OF RBE SYSTEM UNDER ISMP
WATER MEASUREMENT STRUCTURES, PRIORITY REHABILITATION AND REHAB. INLET CANAL
PHYSICAL STATUS REPORT AS OF 31-12-1990

NATURE OF WORK	PERCENTAGE COMPLETED UPTO 31-12-90			PERCENTAGE REMAINING FOR LOP		
	SURVEYING	DESIGN	CONSTRUCTION	SURVEYING	DESIGN	CONSTRUCTION
WATER MEASUREMENT STRUCTURES	80	80	43	20	20	57
PRIORITY REHABILITATION	75	45	21	25	55	79
REHABILITATION OF INLET CANAL	100	40	0	0	60	100

OREHABRB

REHABILITATION OF RBE SYSTEM UNDER ISMP
WATER MEASUREMENT STRUCTURES, PRIORITY REHABILITATION AND REHAB. INLET CANAL
FINANCIAL STATUS REPORT AS OF 31-12-1990

NATURE OF WORK	1 SUB-PROJECT No. 1	2 SUB-PROJECT No. 2	3 SUB-PROJECT No. 3	4 APPROXIMATE EXP. UPTO 31-12-91	5 (1+2+3)-4 BALANCE CARRYOVER	6 NEW ALLOCATION FOR 1991	7 (5)+(6) TOTAL ALLOCATION FOR 1991
WATER MEASUREMENT STRUCTURES	74,530.85	175,729.44	37,815.35	252,586.00	35,489.64	200,000.00	235,489.64
PRIORITY REHAB. WORKS	263,264.43	931,308.44	264,319.29	1,190,000.00	268,892.16	3,000,000.00	3,268,892.16
REHAB. OF INLET CANAL	---	---	---		---	9,200,000.00	9,200,000.00
TOTALS	337,795.28	1,107,037.88	302,134.64	1,442,586.00	304,381.80	12,400,000.00	12,704,381.80

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IRRIGATION SYSTEMS MANAGEMENT PROJECT - AMPARA RANGE

TABLE IV-1-3

MONITORING SURVEYS, DESIGNS AND CONSTRUCTION
OF PRAGMATIC REHABILITATION WORKS
GAL OYA RIGHT BANK SYSTEM
AS OF 31 DECEMBER 1990

CANAL	TOTAL LENGTH (Km)	COMPLETED AS OF 31 DECEMBER 1990			PROGRAM FOR 1991			REMAINING FOR LIFE OF PROJECT		
		SURVEY	DESIGN	CONST.	SURVEY	DESIGN	CONST.	SURVEY	DESIGN	CONST.
M.C	35.2	35.2	35.2	29.0	--	--	6.2	--	--	--
B.C	84.0	84.0	58.3	5.0	--	25.7	79.0	--	--	--
D.C	175.0	105.0	5.4	--	70.0	169.6	--	--	--	175.0
F.C	227.4	--	--	--	227.4	180.0	--	--	47.4	227.4
DRN	100.0	--	--	--	50.0	--	--	50.0	100.0	100.0
TOTAL	621.6	224.2	98.9	34.0	347.4	375.3	85.2	50.0	147.4	502.4

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IRRIGATION SYSTEMS MANAGEMENT PROJECT - AMPARA RANGE TABLE IV-1-4

MONITORING CONSTRUCTION OF PREVENTATIVE MAINTENANCE WORKS

GAL OYA LEFT BANK SYSTEM

AS OF 31 DECEMBER 1990

CANAL	TOTAL LENGTH (Km)	COMPLETED AS OF 31 DECEMBER 1990			PROPOSED 1991 PROGRAM			REMAINING FOR LIFE OF PROJECT		
		SURVEY	DESIGN	CONST.	SURVEY	DESIGN	CONST.	SURVEY	DESIGN	CONST.
M.C	70.5	--	--	52.5	--	--	18.0	--	--	--
B.C	36.5	--	--	--	--	--	36.5	--	--	--
D.C	281.2	--	--	34.0	--	--	247.2	--	--	--
F.C	362.4	--	--	41.0	--	--	321.4	--	--	--
DRN	---	--	--	--	--	--	--	--	--	--
TOTAL	750.6	--	--	127.5	--	--	623.1	--	--	--

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4.2 DEVELOPMENT OF A PREVENTATIVE MAINTENANCE PROGRAM

The Preventative Maintenance Program, for implementation for the Schemes under the ISMP is planned after Project completion on 30 June 1992, involved the prpreparation of the following six major maintenance activities during the LOP:

1. Conduct Walk-Through maintenance Survey.
2. Prepare Annual Maintenance Plan.
3. Prepare Annual Maintenance Costs.
4. Prepare Maintenance Diagrams.
5. Prepare Schematic Water Distribution Diagrams.
6. Prepare Annual Maintenance Report.

Under the ISMP the above Preventative Maintenance activities are to be prepared for 1) the Main System (headworks, Main/Branch Canals) of each of the seven Schemes of the Project and for 2) the 201 DCOs (Parakrama Samudra 28, Minneriya 20, Giritale 12, Kaudulla 22, BE 11, GORB 36, and GOLB 72) that will have been formed under those seven Schemes. The Preventative Maintenance Program for the Main System of the seven Schemes will be implemented by the Irrigation Department while the Preventative Maintenance Program for the 201 DCOs in those seven Schemes will be implemented by each of those respective Farmer Organizations.

As of 31 December 1990, on the Preventative Maintenance Program was confined primarily to the Main System of the four Schems in the Polonnaruwa Range and the Main System of the Ridi Bendi Ela Scheme in the Kurunegala Range. In the Polonnaruwa Range, the Annual Maintenance Plan was prepared for the Main System facilities that were rehabilitated during 1987 for each of the four Schems. Table IV-2-1 below presents the accomplishments on the 1987 ESI Works for the main Systems of the four Schemes in the Polonnaruwa Range as of 31 December 1990.

TABLE IV-2-1
ANNUAL MAINTENANCE PLAN - POLONNARUWA RANGE
FOR 1987 ESI WORKS AS OF 31 DECEMBER 1990

Maintenance Activities	Scheme - % Complete			
	PSS	Giritale	Minneriya	Kaudulla
1. walk-Thru Maint. Svy	100	100	100	100
2. Annl. Maint. Plan	100	100	100	100
3. Anl. Maint. Cost	100	100	100	100
4. Maint. Diagram	0	100	0	0
5. Sch. Wtr. Dist. Diag.	0	100	0	0
6. Report	0	100	0	0

For the Main System of the Ridi Bendi Ela Scheme in the Kurunegala Range the Walk-Through Maintenance Survey, the Annual Maintenance iPlan and the Annual Maintenance Cost Estimate was completed in draft form during 1990 and submitted to the Consultant for review. The completion of all six Maintenance activities in the RBE Scheme was scheduled for early 1991.

The Program planned for 1991 on the Walk-Through Maintenance Survey for the Main System (Headworks / Main / Branch Canals) of six of the seven Schemes in the Project is presnted on Table IV-2-2.

During 1990, the Walk-Through Maintenance Survey, Annual Maintenance Plans, Annual Maintenance Cost Estimates, Maintenance Diagrams, Schematic Water Distribution Diagrams and draft Reports were completed for the following DCOs in Giritale Scheme by the Consultant:

DCFO No	1	Puranagama	Completed June 1990
DCFO No	2	Agbopura	Completed July 1990
DCFO No	3	Mahasen	Completed August 1990
DCFo No	5	Kauduluwewa	Completed August 1990
DCFO No	10	Bendiwewa	Completed November 1990

The Program planned for 1991 on the Walk-through Maintenance Survey for the Distributary Canal Systems of Parakrama Samudra, Minneriya, Giritale , Kaudulla, RBe and Gal Oya LB and RB Schemes is presented on Table IV-2-3 to IV-2-9 respectively.

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TABLE IV-2-2
WALK THROUGH MAINTENANCE SURVEY
MAIN SYSTEM (HEAD WORKS/MAIN/BRANCH CANALS)

SCHEME	CANAL	TYPE	REACH (KM)	SCHEDULE OF SURVEY
PARAKRAMA SAMUDRA	D-1 NORTH	M/C	8.0-10.5	JANUARY 1991
	D-1 NORTH	B/C	10.5-11.69	FEBRUARY 1991
	D-1 EAST	B/C	5.0-9.2	MARCH 1991
	D-2 MAIN	B/C	4.25-5.9	MAY 1991
	RB21/D1 NORTH	B/C	0.0-4.81	MAY 1991
	RB18/D1 NORTH	B/C	0.0-1.09	JUNE 1991
	INLET CANAL/ HEAD WORKS	B/C	0.0-8.0	NOV/DEC 1991
	D-1 NORTH	M/C	2.86-4.10	NOV/DEC 1991
GIRITALE	RBMC	M/C	0.0-1.6	APRIL 1991
	RBMC	B/C	0.6-6.3	MAY 1991
MINNERIYA	YODA ELA (MYE)	B/C	15.18	MARCH 1991
	D-28/MYE	B/C	0.0-4.6	APRIL 1991
	D-21/MYE	B/C	0.0-6.0	MAY 1991
KAUDULLA	D-1/LLMC	B/C	0.0-1.447	JANUARY 1991
	LLMC	B/C	5.0-11.3	MAY 1991
	HLBC	M/C	0.0-0.80	FEBRUARY 1991
	HLBC	B/C	0.80-7.50	APRIL 1991
RIDI BENDI ELA	RBMC/LBMC/INLET CANAL	M/C-B/C	----	COMPLETED IN 1990
GAL OYA	RBMC	M/C	0.0-3.0	JAN. - FEB. 1991
	RBMC	M/C	6.0-7.0	FEBRUARY 1991
	RBMC	M/C	8.0-9.0	FEBRUARY 1991
	RBMC	M/C	11.0-12.0	MARCH 1991
	RBMC	M/C	17.0-18.0	MARCH 1991
	RBMC	M/C	18.0-19.0	MARCH 1991
	RBMC	M/C	22.0-23.0	APRIL 1991
	RBMC	M/C	24.0-27.0	APRIL 1991
	RBMC	M/C	28.0-35.0	MAY - JUNE 1991

Note: Gal Oya LBMC not planned for as of 31/12/90

AWWMSMS

TABLE IV-2-3
SCHEDULE FOR W[illegible] TH MAINTENANCE SURVEY OF DCFOs
[illegible]KRAMA SAMUDRA SCHEME

No	NAME OF DCFO	NAME OF TA/WS	SCHEDULE
1	AMBANGANGA	SOMARATNA/PERERA	JANUARY
2	ALUTHWEWA	ARIYAPALA/LOKUSURIYA	JANUARY
3	WEERA PEDESA	ARIYAPALA/LOKUSURIYA	JANUARY
4	2 CHL/WEERAPARAKRAMA	do	FEBRUARY
5	D - 4 CHL	do	FEBRUARY
6	MANIKKAMPATTIYA	ARIYAPALA/LOKUSURIYA	JUNE
7	GALTHAMBARAWA	CHANDRASEKERA/	JANUARY
8	VIJAYARAJAPURA	ATHUKORALA/PIYATILAKE	JANUARY
9	SINHARAJAPURA	do	FEBRUARY
10	PAHALAKALINGAELA	do	MARCH
11	MONARATENNA	dc	JUNE
12	DAMANA GEMUNUPURA	CHANDRASEKERA/AMARATUNGA	JULY
13	PALUGASDAMANA	do	FEBRUARY
14	SEWAGAMA	do	JANUARY
15	LAXAUYANA	RAJAPAKSHA/CYRIL	JANUARY
16	VIJAYABAPURA	ATHUKORALA/PIYATILAKE	FEBRUARY
17	SINHAPURA	RAJAPKSHA/CYRIL	JUNE
18	TALPOTHA	RAJAPAKSHA/CYRIL	JULY
19	LANKAPURA	MARASINGHE/SARANELIS	FEBRUARY
20	WEERAPURA	MARASINGHE/SARANELIS	JANUARY
21	THAMBALA(ALHILALPURA)	MARASINGHE/SARANELIS	MARCH
22	GEMUNUPURA	GUNASIRI/KARIYAWASAM	JANUARY
23	MAHASEN	GUNASIRI/KARIYAWASAM	FEBRUARY
24	KEGALUGAMA	do	JUNE
25	SOMAWATHIYA	DE SILVA/PIYADASA	FEBRUARY
26	SUNGAWILA/MOHIDEEN	SILVA/PIYADASA	MARCH
27	PULASTIGAMA	do	JANUARY
28	KALAHAGALA	SOMARATNA/PERERA	FEBRUARY

The Annual Maintenance Plans and preparation of Cost Estimates to be started from February 1991 and be completed by November 1991.

TABLE IV-2-4
SCHEDULE FOR WALK THROUGH MAINTENANCE SURVEY OF DCFOs
MINNERIYA SCHEME

DCFO No.	NAME OF DCFO	NAME OF TA/WS	SCHEDULE
1	RAJA ELA	D.M.G.B. DISSANAYAKE/ R.H. RAJAPAKSHA	FEBRUARY 1991
2	KOTALAWELA	N.D.W. PALLIYAGURU N.P. KRUNARATHNA	FEBRUARY
3	ULPATHWEWA	D.M.G.B. DISSANAYAKE R.H. RAJAPAKSHA	MARCH
4	HATHAMUNA	K.A.S.K. PERERA A.B.F. RANASINGHE	MARCH
5	HINGURAKA	EJMTB. JAYASUNDARA A.D.N. AMARASINGHE	MARCH
6	HINGURAKDAMANA	K. DISSANAYAKE K. JAYATUNGA	MARCH
7	KOTIGAHAPITIYA	----- -----	-----
8	KUMARAGAMA	H.N.C. RANASINGHE H.D.J. PERERA	FEBRUARY
9	GOVT. FARM	--------	MAY
10	YODA ELA	R.M.J.K. MUWANWELLA S. SOMAPALA	FEBRUARY
11	YATIGALPOTHANA	K.H.B. NANDIMITRA	MARCH
12	KAUDULLA	R.A.J. PERERA H. RATNAYAKE	JANUARY
13	SANSUNGAMA	K. WIJETUNGA D.T. SOMAPALA	FEBRUARY
14	KUSUMPOKUNA	B.L. ARIYASIGHE P.B. AMARASENA	FEBRUARY
15	KUSUMPOKUNA MAHASEN	B.L. ARIYASINGHE P.B. AMARASENA	JANUARY
16	DIVULANKADAWELA	M.L.R. FERNANDO P.R. TILAKARATNA	MARCH
17	VIHARAMAWATHA	B.L. ARIYASINGHE P.B. AMARASSENA	MARCH
18	GALAMUNA GEMUNU	------	
19	GALAMUNA PERAKUM	K.G.WIMALASENA I.A. PREMARATNA	FEBRUARY
20	GALAMUNA WIJAYA	K. G. WIMALASENA I. A. PREMARATNA	MARCH
21	NISSANKA	--------	

TABLE IV-2-5
SCHEDULE FOR WALK THROUGH MAINTENANCE SURVEY OF DCFOs
GIRITALE - SCHEME

No.	NAME OF DCFO	NAME OF TA/WS	SCHEDULE
1	PURANAGAMA	W.M. DAYARATNA	COMPLETED JUN 1990
2	AGBOPURA	W.M. DAYARATNA	COMPLETED JUL 1990
3	PARAKUM	B.A.L. De SILVA	JANUARY 1991
4	KADAWALA WEWA	B.A.L. De SILVA	COMPLETED AUG 1990
5	BENDIWEWA	B.A.L. De SILVA	NOVEMBER 1990
6	JAYANTHIPURA	B.A.L. De SILVA	DECEMBER 1990
7	MAHASEN	W.S.C. EKANAYAKE	COMPLETED AUG 1990
8	PURANA MUSLIM	W.S.C. EKANAYAKE	COMPLETED AUG 1990
9	NAGAPOKUNA (PULASTI)	W.S.C. EKANAYAKE	FEBRUARY 1991
10	UNAGALAWEHERA	R.J. GUNAWARDENA	DECEMBER 1990
11	CHANDANAPOKUNA	R.J. GUNAWARDENA	JANUARY 1991
12	HATASISATA	R.J. GUNAWARDENA	FEBRUARY 1991

Note: All twelve DCFO Annual Maintenance Plans and Cost Estimates will be completed for Giritale Scheme in March 1991.

TABLE IV-2-6
SCHEDULE FOR WALK THROUGH MAINTENANCE SURVEY OF DCFOs
KAUDULLA SCHEME - STAGE I

DCFO No	NAME OF DCFO	NAME OF TA/WS	SCHEDULE
1	EKSATH	BANDULA/WICKRAMARATNA	JANUARY 1991
2	C.P PURA PERAKUM	do	MARCH
3	KALINGA ELA	do	FEBRUARY
4	MANDALAGIRI	BANDULA/WICKRAMARATNA	MAY
5	SUHADA EKSATH	WANNINAYAKA/SIRIWARDENA	JANUARY
6	SRI NAGA	do	FEBRUARY
7	VIJITHA	WANNINAYAKE/SIRIWARDENA	MAY
8	VIJAYAPURA VIJAYA	do	MARCH
9	SAMAGI	do	JUNE
10	MENIK HOROWWA	AMUNUGAMA/UKKUBANDA	JANUARY
11	SAMA	do	FEBRUARY
12	GOVISETHA	do	MARCH
13	MAHAWELI	do	JULY
14	MAHINDAPURA	AMUNUGAMA/UKKUBANDA	MAY
15	PRAGATHI	AMUNUGAMA/UKKUBANDA	JUNE
16	PUBUDU	AMUNUGAMA/UKKUBANDA	AUGUST
17	D.S. SENANAYAKE	KODITUWAKKU/VANSES	JANUARY
18	NAGARAPURA SAHANA	do	JULY
19	WEERA KEPPETIPOLA	do	JUNE
20	SRI VIJAYA	do	FEBRUARY
21	EKSATHGOVI	do	MAY
22	MAHASEN	do	MARCH

Annual Maintenance Plans and preparation of Cost Estimates will commence from January - 1991 and will be completed by November 1991.

TABLE IV-2-7
SCHEDULE FOR WALK THROUGH MAINTENANCE SURVEY OF DCFOs
RIDI BENDI ELA SCHEME

No.	NAME OF DCFO	NAME OF TA/WS	SCHEDULE
1	KATAGAMUWA (INLET CANAL)	MUWANWELLA	JANUARY 1991
2	MAGALLEGAMA	W. B. GUNADASA	FEBRUARY
3	CENTRAL CANAL	do	MARCH
4	DANDUWAWA	do	APRIL
5	THARANAGOLLA	do	JANUARY
6	DANGAHAWELAYAYA	W. I. T. CROOS	FEBRUARY
7	HEELOGAMA	K.A.T.NANAYAKKARA	MARCH
8	DIVULLEWA	do	APRIL
9	BUDUMUTTAWA	W.I.T. CROOS	JANUARY
10	BALANGOLLAGAMA	W. B. GUNADASA	MAY
11	IBBAWELA	do	JUNE

TABLE IV-2-8
SCHEDULE FOR WALK THROUGH MAINTENANCE SURVEY OF DCFOs
GAL OYA LBMC

No	NAME OF DCFO	NAME OF TA/WS	SCHEDULE
1	LB 1A BATAHIRA DUNGALA	AMC FERNANDE/V IMPARAJAH	JANUARY
2	LB 1,2,& 3 ALIGALE	do	JANUARY
3	LB 4 - SANGVIDANAYA	do	FEBRUARY
4	LB 6 - SANGVIDANAYA	do	FEBRUARY
5	LB 7 - IHALA KOTTASAYA	do	MARCH
6	LB 7 PAHALA KOTTASAYA	do	MARCH
7	LB 7 - SANVIDHANAYA	do	MARCH
8	LB 10 - SANVIDHANAYA	AMARASEKERA/DHARMADASA	JANUARY
9	LB 11 - SANVIDHANAYA	do	JANUARY
10	LB 11A &B SANVIDHANAYA	do	JANUARY
11	LB 12 - SANGVIDHANAYA	do	JANUARY
12	LB14 - EKAMUTU	do	JANUARY
13	LB 15 - EKSATH	do	JANUARY
14	LB 16 - WALAGAMBA	do	JANUARY
15	UB 1 - GALATITIYAGODA	do	FEBRUARY
16	UB 2 SAMAGI UDARIGAMA	do	FEBRUARY
17	UB 5 -DEMATAMALPELASSA	do	FEBRUARY
18	UB 7 - UDAYA	do	FEBRUARY
19	UB 8-UHANA TISSAPURA EKSATH	do	FEBRUARY
20	UB 9&10 EKABADDAEKSATH	do	MARCH
21	UB 11-TISSAPURA	do	MARCH
22	UB 12-KUMARIGAMA	do	MARCH
23	UB 13-SAGVIDHANAYA	do	MARCH
24	KIRIPATTIYA	AMARASEKERA/JAYAWARDENA	JANUARY
25	UB 17- SANGVIDANAYA	do	JANUARY
26	M 1 SAGVIDHANAYA	do	JANUARY
27	M2, ,,	do	JANUARY
28	M 5 ,,	do	FEBRUARY
29	M 5.2 ,,	do	FEBRUARY
30	M 5.4 ,,	do	FEBRUARY
31	M6.7 ,,	do	FEBRUARY
32	M 8 ,,	do	FEBRUARY
33	M 9.11 - GEMUNU	do	MARCH
34	M 12 SANGVIDHANAYA	do	MARCH
35	M 16 ,,	do	MARCH
36	M 13 ,,	do	MARCH
37	G2&LB27 SANGVIDHANAYA	RA MAITHRIPALA	JANUARY
38	G4 SANGVIDHANAYA	do	JANUARY
39	G4 SANGVIDHANAYA	do	JANUARY
40	G5 SANGVIDHANAYA	do	JANUARY
41	G6 KITHSIRI	do	JANUARY
42	G9&12 SANGVIDHANAYA	do	FEBRUARY
43	G10 IHALA KOTASA	do	FEBRUARY
44	G10 PAHALAKOTASA	do	FEBRUARY
45	G 13 PERAKUM	do	FEBRUARY
46	LB19&20 SANGVIDHANAYA	do	MARCH
47	LB22 SANGVIDHANAYA	do	MARCH
48	LB23,24,&25 SANGVIDHANAYA	do	MARCH
49	LB 29-G1 SANGVIDHANAYA	do	MARCH

Note: Canals where there is no Farmer Org. are not included.

TABLE IV-2-9
SCHEDULE FOR WALK THROUGH MAINTENANCE SURVEY OF DCFOs
GAL OYA RBMC

No	NAME OF DCFO	NAME OF TA/WS	SCHEDULE
1	VILLAGE 23 A	NO PROGRAM PLANNED	NO PROGRAM PLANNED
2	MORAGAPALAMA		
3	GALMADU BC		
4	MAHENGALA		
5	VILLAGE 5		
6	DAMANA		
7	RB 20		
8	IRRAKKAMA		
9	5A COLONY		
10	SIRUNEETHAI		
11	AMBALATHARU		
12	IDA COLONY		
13	ILLUKKUCHENAI D/S		
14	NEETHAI		
15	ILLUKKUCHENAI		
16	WIPIRIYA		
17	NEDONTHUDDAM		
18	PAVANKAI		
19	NIRICHOLAI		
20	THILLAIARU		
21	RB 36		
22	A1 & 5		
23	AK 6		
24	AK 9		
25	AK 10		
26	VILLANKADU MEL		
27	VILLANKADU LILAL		
28	VR 6		
29	VR 7		
30	KL 6		
31	KLI/RB25		
32	DEEGAWAPI		
33	KL 20		
34	KL 24		
35	PERIYAVELIPIDDY		
36	MODAYAVELI		

Note: Establishment of DCFOs on RBMC area of Gal Oya not finalized.
The Walk-Through-Maintenance Survey is planned after DCFO Boundaries established and DCFOs officially formed.

4.3 IMPROVEMENTS TO IRRIGATION SYSTEMS OPERATIONS

The ISMP Action Plan that was set-up to improve the Systems Operations was originally outlined in a letter from Sheladia to W.N.M. Botejue, Project Director ISMP, on 18 March 1988, and involved 12 major activities as indicated below:

1. Identification and establishment of Field Operation Units and Sub-Units and the development of Water Management Organizations and job descriptions for each organization.

2. Establishment of two-way communications between Operation Centres and Field Operation Units.

3. Up-dating of Issue Trees and preparation of Schematic Water Distributary Diagrams.

4. Installation of Rain Gauge Network.

5. Establishment of Control and Measuring Devices in Main and Branch Canals.

6. Establishment of Control and Measuring Devices at Boundaries of DCFOs.

7. Establishment of Control and Measuring Devices in D-Canals.

8. Establishment of Control and Measuring Devices in F-Canals.

9. Assessment of Canal Losses, Seepage and Percolation in the Systems.

10. Establishment of a Meteorological Station in Polonnaruwa.

11. Development of Three Computer Models.

    - Reservoir Operation Model
    - Systems Operations Model
    - Seasonal Water Report Model

12. Refinement of the Systems Operation Model.

The status of work on the above twelve activities under the Systems Operation Action Plan as of 31 December 1990 is presented as follows:

Most of the activities identified in the Action Plan could not be fully achieved due to the very low priority given to the water management improvements program at the early stage of its development. The accomplishments as of 31 December 1990 are outlined below according to the twelve major activities identified under the Action Plan:

1. Identification and establi8shment of Field Operation Units and Sub-Units and the development of Water Management Organizations, and Staff Job Descriptions for each organization.

   Status: Field Operation adn Sub-Units established for all Schemes. Development of Water Management Organizations and Job Descriptions for each Scheme not yet started.

2. Establishement of two-way communications between Operation Centres and Field Operation Units.

   Status: Two way Radio (Walky-Talkie) communication could not be implemented due to the conditions in the Country and restrictions by the Military on use of short wave radios. However, transmittla of Water Management data was initiated by use bicycles travelling between Field Operation Units and Sub-Units and the Division Operation Centers in the Giritale Scheme.

3. Up-dating of Issue Trees and preparation of Schematic Water Distributary Diagrams.

   Status: The up-dating of the Issue Trees for Giritale Scheme was the only one completed as of 31 December 1990. However, Control and Issue Diagrams (Schematic Water Distribution Diagrams with locations of control and monitoring points) were prepared for Giritale, PSS, Minneriya, Kaudulla and RBE.

4. Installation of Rain Gauge Network

   Status: Rain gauges have been installed in the four Polonnaruwa Schemes as envisaged in the Action Plan. Gauges remain to be installed in RBE and Gal Oya Schemes.

5. Establishement of Control and Measuring Devices in Main and Branch Canals.

   Status: As a result of operation osurveys carried out in RBe Scheme and in the four Polonnaruwa Schemes, locations and types of control and measuring devices considered adquate for effective control and monitoring of canala deliveries were identified on the main System of those Schemes. In the Gal Oya RB Scheme, the measuring devices in the main and Branch Canals and their off-takes were idnetified and proposals incorporated into the pragmatic rehabilitation estimates.

6. Establishement of Control and Measuring Devices at Boundaries of DCFOs.

Status: This has yet to be accomplished as the Computer Model was not programmed for this at the time of development. Adjustments to the program will be up-dated in 1991-92 to accomodate this improtant monitoring effort.

7. Establishment of Control and Measuring devices in D-Canals.

Status: Planned to be accomplished in 1991-92.

8. Establishment of Control and Measuring Devices in F-Canals.

Status: Planned to be accomplished in 1992, 1993 and 1994.

9. Calibration of Measuring Devices and the assessment of Canal Losses, Seepage and Percolation in the Systems.

Status: Technical Assistants have been trained on-the-job in the measurement of canal deliveries and procedures for calibration of measuring devices have been established. In addition they were well trained in determination of canal losses, seepage and percolation.

10. Establishment of a Meterological Station in Polonnaruwa

Status: A Meterological Station was set up in Polonnaruwa for monitoring rainfall, sunshine, temperature, wind, humidity, etc.

11. Development of Three Computer Models.

Status: Computers have been installed at the DDIs Headquarter Office in Polonnaruwa and at the IEs office at Polonnaruwa, Hingurakgoda, Kaudulla Divisions in the Polonnaruwa Range and at Nikaweratiya in the Kurunegala Range.

The following Computer Models have been developed and field tested:

- Reservoir Operatons Model - For pre-season planning and for establishing a rule curve for operatiing the reservoir during the season.

- System Operation Model - For scheduling of canal deliveries taking into consideration osuch factors as extents actually cultivated, crops grown, crop staggers, stage of crop growth, soil properties, raiintall, canal losses, drainage inflows etc.

The model also provides management with a tool for evaluating the performance of the delivery system at each monitores point on a daily, weekly or periodic basis as required.

- Seasonal Water Report - for recording seasonal data and for evaluating the performance of the irrigation scheme as a whole.

12. Refinement of System Operation Model.

Status: The refinement to the System Operation Model is pending the introduction of more monitoring and discharge measurement points and modification to the program. Refinement will begin in 1992.

In addition to the 12 items above, the following SYstem Operation exercises were also accomplished from 1988 to 30 December 1990.

An attempt was made to implement computer assisted water scheduling in the Giritale Scheme with a very limited number of monitoring points (9). A computer printout obtained during this execise indicates that the water management indices for these 9 monitored points for the week 6 July to 12 July 1990 are less than units, thus indicating that the actual releases are less than the calculated values. This is probably due to over estimation of on-farm losses (seepage and percolation).

Estimation f on-farm water requirements and an assessment of on-farm water requirements for low land paddy in Polonnaruwa was made based on Diyasenpura evapotranpiration data, probable monthly rainfall and average seepage and percolation values. A program for computing the theoretical on-farm water requirements in incorporated in the Seasonal Water Report computer model. This program taken into account time of planting, number of stages, percentage area in each stagger, land preparation eriod, land preparation water requirements and field losses.

A preliminary assessment of the costs of operation of the system and distributary system was developed by the System Operations Engineer during his assessment. This was done in order to determine the magnitude of operation costs. an initial attempt was made to assess the operation costs of the Giritale Scheme, and a more detailed study on this will be initiated in 1991 - 1992.

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS

5.1.1 REHABILITATION OF THE IRRIGATION SYSTEMS

The major conclusions that can be made by the O&M Engineer on the Rehabilitation of the Irrigation Systems are summarized below:

- The budget allocations for rehabilitation of the various types of canals under the ISMP System, i.e. Main Canal, Branch Canal, Distributary Canal and Field Canal were not adequate enough to bring the systems up to a level where they could be sustained under the Preventative Maintenance Program without further need for major rehabilitation. At the beginning of the Project, the Irrigation Department in Polonnaruwa was constrained in their planning for rehabilitation works based upon average allowable rates for rehabilitation, i.e. M/C Rs. 450,000/Km; B/C Rs. 360,000/Km; D/C Rs. 245,000/Km and F/C Rs. 60,000/Km. These rates varied greatly between Schemes based upon arbitrary criteria established and budgets set-up in the Project Paper which were not adequate to rehabilitate the systems to the level of sustainability.

- The SAI Consultants were to be able to utilize the data and information contained in the Diagnostic Analysis as baseline / pre-feasibility material in order to set up the ISMP Program, especially on Farmer Organization Development and Operations and Maintenance Programs. Unfortunately, the Diagnostic Analysis reports and data failed to provide some very basic information that would have started both the O&M and FO Programs off on the right foot. Major deficiencies in the Diagnostic Analysis for the ISMP which should have been available for the Consultants, IMD and ID were:

  1. Lack of adequate mapping of the four Schemes in the Polonnaruwa Range. Considerable money was invested in aerial surveys to map the four Schemes, however, the mapping was totally lacking the details needed to implement the O&M Component of the Project. Basic information such as, location of roads, water courses, drains, villages, high grounds, etc. were not included on the 1:24,000 maps provided under the Diagnostic Analysis. The major fault was that the 1200 - 1400 Km of Field Canals were not shown at all. (Only Main Canals, Branch Canals and Distributary Canals were shown on the maps). These Field Canals eventually had to be added by the Sheladia O&M Engineer, which required considerable time, effort and resources.

2. Up-dating of the issue trees in order to determine the latest extent of land to be cultivated under each Scheme should have been part of the Diagnostic Analysis, but was not. Therefore, the area to serve under each Scheme could not be established at the beginning of the Project within an average of + 15 percent; a major short coming of the Diagnostic Analysis.

3. Another major shortcoming of the Diagnostic Analysis in regard to both the O&M and FO Components was that no effort was made during the Diagnostic Analysis period, to identify preliminary boundaries of the Farmer Organization within each Scheme according to hydrological boundaries. This is an essential requirement for both FOs and O&M Programs. An attempt should have been made during the Diagnostic Analysis to at least demarcate preliminary boundaries of the Farmer Organizations so that when the Project started, both FO and O&M Components could have planned for both of their respective work programs in an efficient way based upon these preliminary boundaries.

- The Project Paper recommended that no earth work be paid for the in the rehabilitation of the Field Canals (F/C). This was a major mistake. A lessons learned from Gal Oya showed that the farmers are not going to do major or even minor efforts of earth work in the F/C without some sort of payment. In some field canals, in the four Polonnaruwa Schemes, major requirements of earthwork were needed to bring those canals up to a level they could be sustained. Especially in these cases, exceptions to the no pay for earthwork should have been made in the Project Paper. Furthermore, even earthwork around the structures and for 10 meters up and down was not paid. Therefore, many of the structures subsequently failed or will fail because of this no earthwork payment criteria adopted in the Project Paper and implemented under the Project.

  During the Mid-Term Evaluation it was decided to pay for earthwork above the 60 acre service area. This would have improved the earthwork situation, however, the ID had already plannned and made cost estimates without earthwork in these sections of the Canal, so this decision was too late, and therefore, providing no effective relief to the farmers.

- The rehabilitation work on the ISMP is far from over after the five years of the LOP. Not counting Gal Oya because rehabilitation work did not start until mid 1989; the work in the Polonnaruwa Range was only 30% complete as of 31/12/90 and will be only about 45% complete as of 30/6/92. Some of the reasons for this lack of progress was due to civil disturbances in Polonnaruwa District in 1988 and 1989, however, most of the shortfall in progress can be contributed to the fact that the construction period is much too short (2.5 months) between end of Yala and start of Maha to complete the planned work for each year and to complete the rehabilitation of the 1630 Km of M/C, B/C, D/C, F/C and Drainage Canals over the LOP. The 5 year LOP was too to allow completion of the rehabilitation of all of the targetted canals. The total construction period from 1987 to 1992 fo 5 x 2.5 or 11.5 months or less than one year complete year.

- Until the Farmer Organizations became viable and well organized, they should not have been offered construction contracts on D/C's and F/C's. The works scheduled to be accomplished by then fell behind with some contracts never completed and others completed two to three years later. This was a major mistake to offer contracts to the Farmer Organizations as early as 1988 when they weren't even organized enough to accept the responsibility of the work. Almost all of the contracts given to the FOs in 1988 either failed or were carried out over a two to three year period.

- Several innovations or designs adapted in the rehabilitation of the ISMP Systems were found to be very adaptable and cost effective. The innovations/designs that were found to be cost effective were:

  (1) Dry Rubble Packing (Normal to Slope) for protection of Canal Bank Slopes (See Exhibit V-1-1)
  (2) Vertical Concrete Drop Structures, ISMP Design (See Exhibit V-1-2, 2 sheets)
  (3) Uncontrolled Weir Type Regulator (See Exhibit V-1-3)
  (4) Masonry Retaining Walls (See Exhibit V-1-4, 2 Sheets)

  The innovations/designs that were not to be cost effective were:

  (5) ID designed Inclined Verticle Drop Structure (See Exhibit V-1-5, 2 Sheets). Too expensive and difficult to construct and poor hydraulic properties if the apron is not set at exact level.

  (6) Strip turfing on Embankment Slopes - Not effective, takes too long or never does fully turf the embankment slope.

- Mid Term Evaluation Report concluded that the Project should be extended at least two years beyond 30 June 1992 based upon the status of the O&M Component and FO Development Program at the time of the evaluation in early 1990. The recommendation for extension of the Project relative to the O&M Component was primarily made because of the lack of progress in the rehabilitation in Polonnaruwa and Ampara District up to that time. The lack of progress was considered primarily due to the civil unrest in those Districts. This obstacle made it impossible to complete the planned rehabilitation work by 30 June 1992. Attachment "A" presents the O&M Engineers conclusions on extension of the Project relative to the rehabilitation of D and F Canals remaining at the time of the Mid-Term Evaluation. Exhibit III, of that Attachment, indicates the progress of rehabilitation to 31 December 1990 and the projected progress to 31 December 1991 and the schedule to complete D and F Canals within the two year extension period. The attachment concludes that even with an extension of two years it most probably would not be possible to complete all the D and F Canals.

5.1.2 DEVELOPMENT OF A PREVENTATIVE MAINTENANCE PROGRAM

The major conclusion that can be made by the O&M Engineer on the Development of a Preventative Maintenance Program are summarized below:

- The Annual Maintenance Plans and Costs developed for the Main Systems of the Seven Schemes on the Project was a major effort of accomplishment. No where in Asia has a program been developed with such detail and planning. The information and data developed under the Annual Maintenance Plans, if implemented under the Preventative Maintenance Program after ISMP, should be effective in sustaining the Main Systems provided the maintenance funds determined under the Annual Maintenance Plans are provided to the ID by the GOSL for each Scheme. So far the funds for 1992 Maintenance to the ID for the ISMP Schemes does not reflect this needed requirements.

- The Annual Maintenance Plans and Costs developed for the Distributary Systems of each Scheme (201 DCOs) of the Project was a major effort of accomplishment. This information and data developed under the Annual Maintenance Plans if implemented by the DCFOs after the Project, should be effective provided the DCFOs develop the man-power and funds to fully implement the plans for sustaining the systems. So far these Annual Maintenance Plans have not yet been implemented by the DCOs, so conclusions as to the effectiveness of the Preventative Maintenance Program at the Distributary Canala Level remain to be seen.

- The Preventative Maintenance Program for the Gal Oya Left Bank and Priority Rehabilitation Work on the Ridi Bendi Ela Scheme remains to be completed, but is essential if these Schemes are to be at a level of rehabilitation that can be sustained without further need for major rehabilitation under the long-range Preventative Maintenance Program.

5.1.3 IMPROVEMENTS TO SYSTEMS OPERATIONS

The major conclusions that can be made by the O&M Engineer relates to the Improvements to the Systems Operation are summarized below:

- The Improved Systems Operation Program including the Water Management Organization, the Establishment of Water Measurement Facilities and Structures, the Infrastructure Facility and the Development of Computer Models for Reservoir Operation, Seasonal Water Reports and Systems Operation and Water Management has been partially implemented in only one of the seven Schemes under the Project. As of 30 June 1992, the Systems Operation Model has not been fully tested as to its effectiveness in improving the equitable distribution of water to the farmers.

- Although the Improved Systems Operation Program is well conceived and planned, it's sustainability after ISMP will be determined by the following ID efforts:

  - ID personnel assigned to the Water Management Organization / Cells must be dedicated and willing to carry out all the requirements of their job descriptions.

  - Adequate funds must be provided by ID as developed and established by the Consultant's O&M Engineer during the Life-of-Project for Operations.

  - Adequate funds for operation and maintenance of Computer facilities including; power supply, repairs, replacements parts, etc, must be available.

- The success of the improvements to Systems Operation at the Distributary and Field Canal level will be determined by the efforts given by the ID TA's to the DCOs and their operation personnel after the DCOs take over the Distributary and Field Canals. Training and assistance must be continued by the ID over a long period of time if the Water Management Improvements planned under the ISMP Water Management Program are to be fully realized and sustained at the DCO level.

5.2 RECOMMENDATIONS

5.2.1 REHABILITATION OF IRRIGATION SYSTEMS

The major recommendations that can be made by the O&M Engineer on the Rehabilitation of the Irrigation Systems are summarized below:

- The Plan of rehabilitating existing irrigation systems only to a level that they can be sustained by a Preventative Maintenance Program is a good concept but the level of rehabilitation to sustain the system must be clearly defined prior to implementation of a Project, such as, ISMP. The definition of Essential Structural Improvements (ESI) for Polonnaruwa Scheme and Pragmatic Rehabilitation (PR) for Gal Oya Scheme was not carefully defined; therefore the scope of work for each type of rehabilitation could not be adequately established. Furthermore, budget limitation, ,on these rehabilitation efforts were inadequate based upon what actually had to be done to bring the Systems to a level where they could be sustained. Therefore for future Irrigation rehabilitation programs that are similar to ISMP it is recommended that:

  (1) A thorough and detailed description of the rehabilitation requirements be established before start of Project.

  (2) Cost for this work can be estimated for planning and budget requirements but these budgets should not be restricted to a limit of Rs. per Kilometer for various types of Canals.

  (3) Cost estimates based upon the rehabilitation criteria established should be made and implementation of the rehabilitation work conducted to meet these estimates. If the estimating criteria for rehabilitation is well established at the beginning, the cost of rehabilitation will vary from canal to canal and the overall overrun in budget if any should be minimal.

- Adequate and appropriate maps of the irrigation Schemes are essential. It is recommended that the maps should be available before initiating any rehabilitation project. The maps should be at a scale the Field Canals can be delineated and the demarcation of DCO bounda ries easily identified.

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- Based on experience in the Water Management Project in Gal Oya LB and the Irrigation System Management Project, the farmers will not do the earth work in Field Canals without some sort of payment. It is therefore recommended that a fee be established and charged to the DCOs for implementing the rehabilitation of the Distributary Canal System under the Project. These fees can then be added to normal dornor or Government funds and rehabilitation of structure and earthwork of the field canals will then be fully paid for under the Project. The assessment to the DCOs could be made on the basis of an average Field Canal earthwork requirement including earthwork for canal bunds and all earthwork around Field Canal structures.

- Scheduling of rehabilitation work during the interim between Yala and Maha Season is just too short (2.5 months) a period to effectively implement a manageable and programmed rehabilitation program. The short gap of only 1.2 months interim period from end of Maha to beginning of Yala is not a viable period and cannot be counted especially in areas where the period falls in the middle of the Sinhalese New Year.

  Therefore, it is recommended that the following implementation program be initiated in the future to complete all M/C, B/C, D/C and F/C within a reasonable project duration period.

  MC and BC can be implemented by Private Contractors over the LOP independent to the Distributary System (D/C and F/C) rehabilitation work. Within each Scheme, one area (Say 20% of the area of the Scheme) will not be cultivated over a five year period. This would allow 4/5 of the area to be irrigated in the field every year with 1/5 of the area of the Scheme out of irrigation and under rehabilitation during the Yala season. By rotating the areas out of irrigation, completion of the rehabilitation of the total distributary canal system of the Scheme over the five year period of the Project. To compensate the farmers in the area not being irrigated, the DCFOs can take contracts for the rehabilitation and the farmers in the DCFO can still grow other food crops with special water management planning during the Yala. Alternatively, future projects must allow a sufficient number of years to allow for completion of rehabilitation work at the rate of 2.5 months pe year. ISMP would have required 7-8 years for full achievement of rehabilitation objection uder best of circumstances.

- It is recommended that rehabilitation work contracts not be awarded to DCOs unless they are well establish and developed and they have been given some training in construction management and quality control of construction by the ID.

- It is recommended that the use of ID standard designed sloping drop structures be eliminated from standard drawings for future rehabilitation projects. Instead, ISMP designed verticle Drop Structures for D-Canals and F-Canals should be adopted as the standard for these two types of canals. Cost is about 2/3 as much; construction much easier with no reinforcement; and the stilling capability of the vertical drop structure is far more effective in reducing down stream erosion and maintenance costs.

- Dry rubble packing with stones placed normal to the slope is a very effective measure of canal bank slope and erosion protection work; it is equally as effective as retaining walls for protection; cost about half the price per linear meter; it's life almost the same; and maintenance only a little more than retaining walls. Therefore it is recommended that Dry Rubble Packing be used whereever possible in the Main, Branch and along D-Canals.

5.2.2 DEVELOPMENT OF A PREVENTATIVE MAINTENANCE PROGRAM

The major recommendation that can be made by the O&M Engineer on the Preventative Maintenance Program are summarized below:

- It is recommended that the GOSL provide the funds developed in the Annual Maintenance Plans for the Seven Schemes in the Project for the maintenance of the Main Systems in order that these Systems can be sustained after the rehabilitation program has been implemented under the ISMP Maintenance Funds less than that developed under the Project for the Main System will jeopardize the sustainability. of the Project.

- For Preventative Maintenance to be successful for the Distributary Canal Systems to be Operated and Maintained by the DCFOs, it is recommended that continual assistance and training be given to the DCFOs by the Irrigation Department in the maintenance of these newly acquired Systems.

- It is recommended that for DCFO's still to be formed as of PACD (30 June 1992) that Annual Maintenance Plans for these DCOs be prepared by the ID and these Maintenance Documents (Annual Maintenance Plans. Cost Estimates Maintenance Diagrams and Schemetic Water Distribution Diagrams) officially transferred to the DCFOs when the official handing over takes place between ID and the DCFOs officers.

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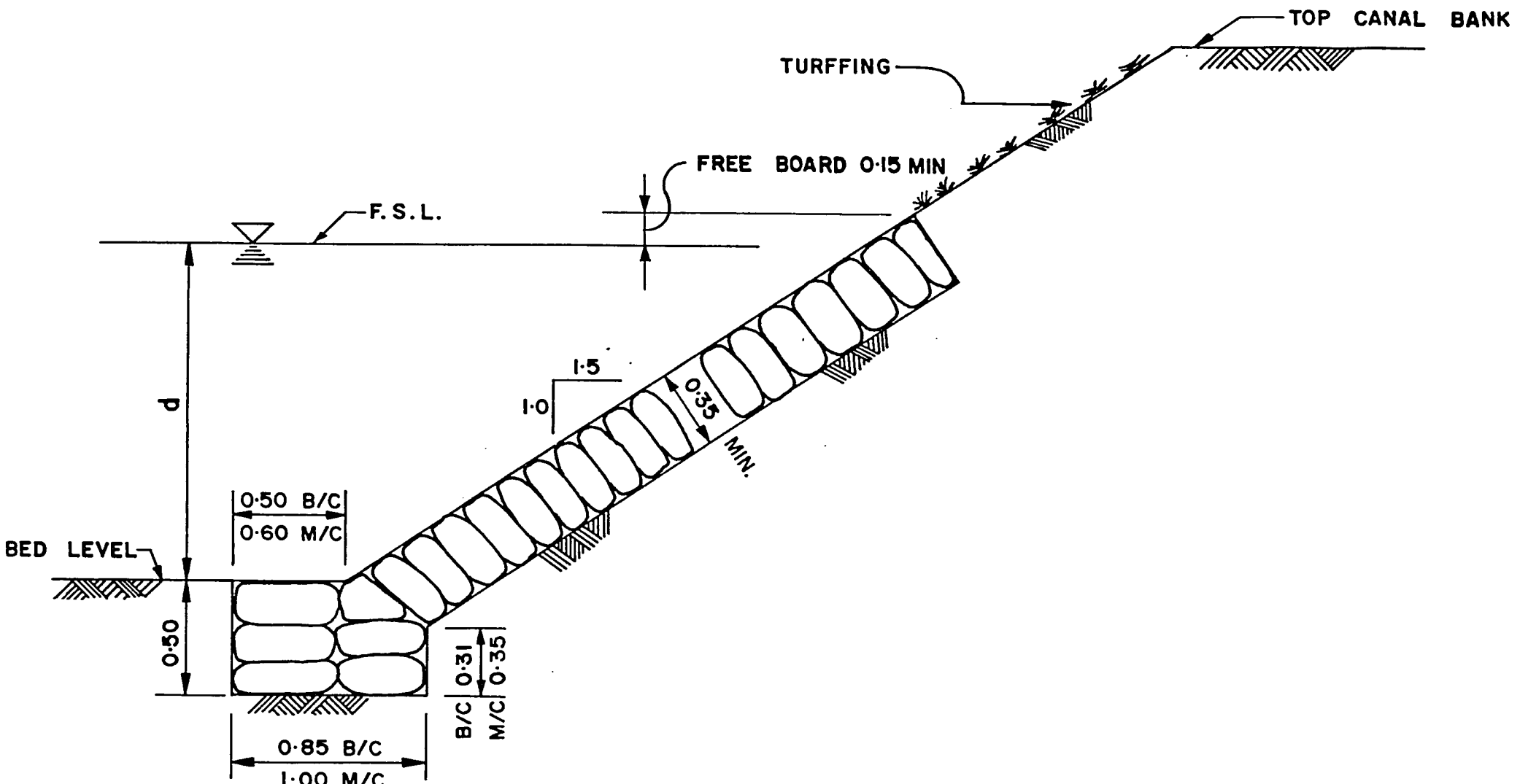
5.2.3 IMPROVEMENTS TO IRRIGATION SYSTEMS OPERATIONS

The majcr recommendations that can be made by the O&M Engineer on the Improvements to Irrigation Systems Operations are summarized below:

- It is recommended that the ID must assign people to the Systems Operator Program who have the desire to be involved in the Systems Operation Program and who will assume on the job responsibilities required to implement the Program. These personnel should be assigned to operations on a long-term basis.

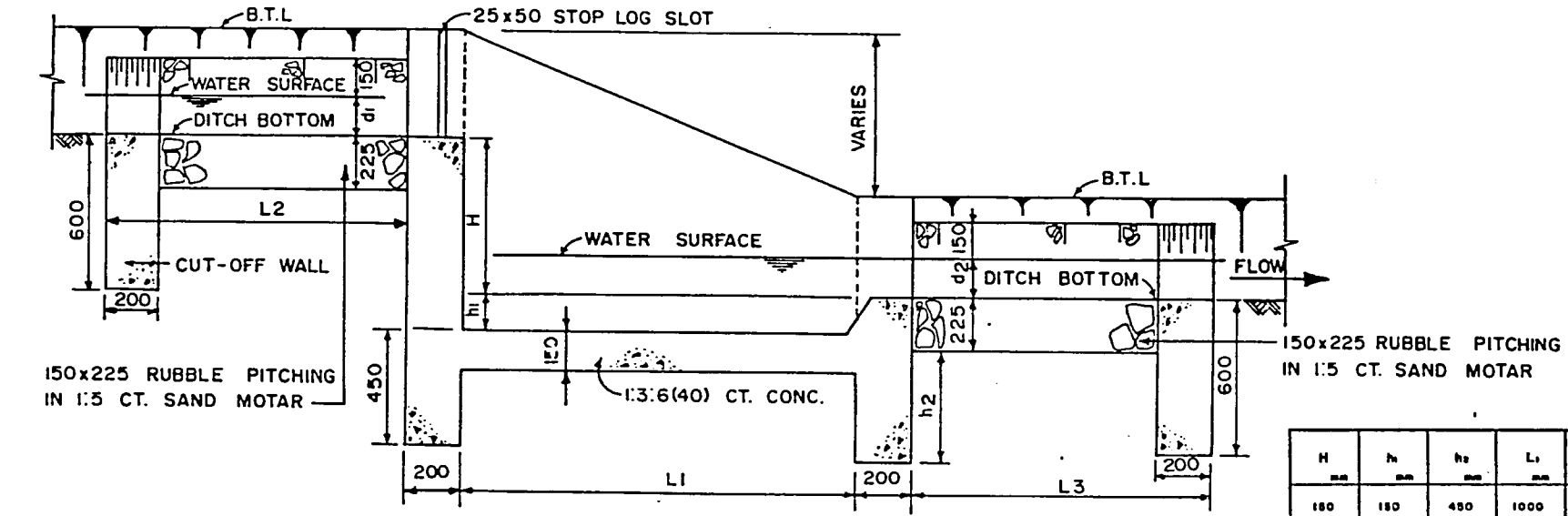
- It is recommended that IMD use funds from the Irrigation Sector Assistance Agreement to set up a periodic maintenance program for adequate maintenance of the computers assigned to the Division and Headquarters Operation Centers. This is essential if the sustainability of the Computer Assisted Systems Operation Program is to be maintained and remain in place after ISMP.

- As of PACD the development of the Systems Operation Water Management Program is still in an infant stage with only Giritale Scheme partially in operation. It is therefore recommended that every effort be made to implement the Water Management Programs in all of the Schemes under the ISMP. This Computer Program which has been developed after study and discussion over the last five years does not aim at creating sophisticated technological show-pieces but is the logical first steps in improving the management of Sri Lanka scarce water resources. The ID has the technical expertise and the resources to implement the program. It is further recommended that in order to motivate staff engaged in operations, it is necessary to recognize Water Management as an important technical field by providing opportunities for careeradvancement and other benefits for those engaged in it. If this can be done, then sustainability of the Water Management Program will be greatly enhanced.

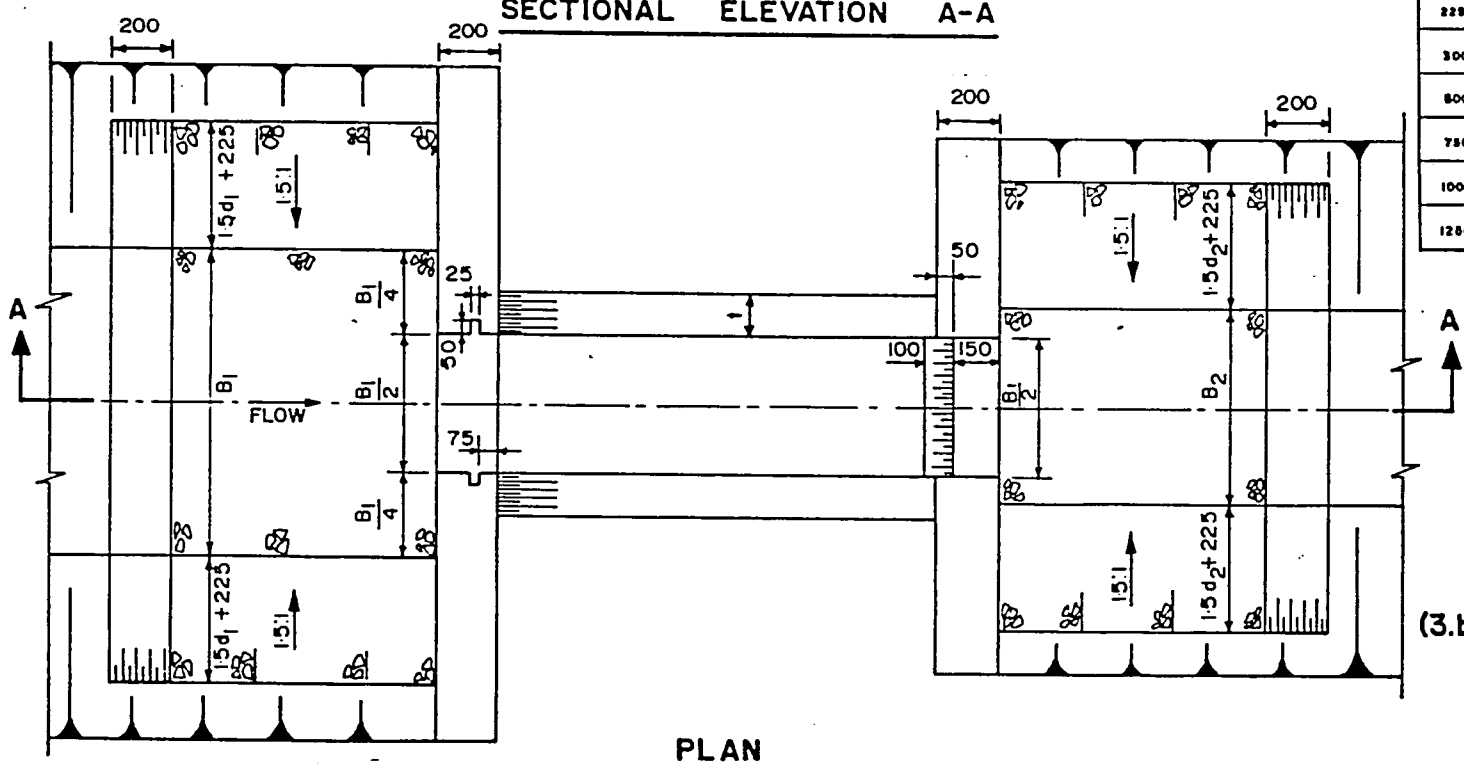


(1.a.2) DRY RUBBLE PACKING
TYPICAL DESIGN SECTION
RUBBLE NORMAL TO SLOPE

SCALE · 0 0·5 1·0 METER



SECTIONAL ELEVATION A-A



PLAN

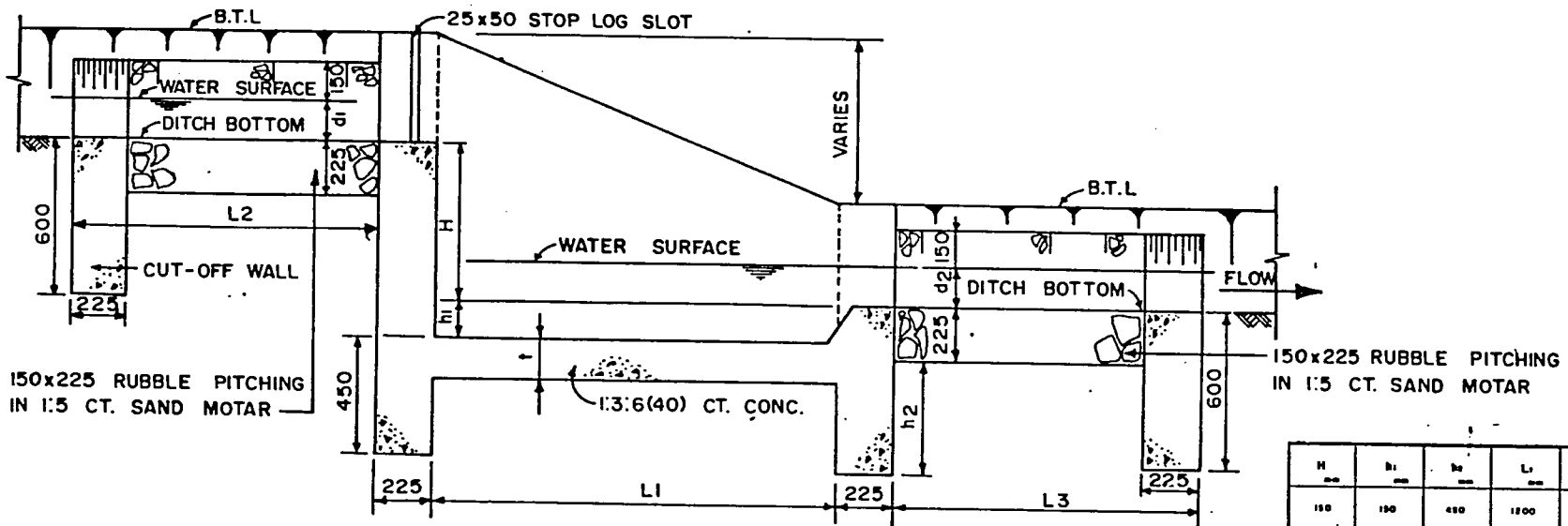
H mm	h1 mm	h2 mm	L1 mm	L2 mm	L3 mm	t mm
150	150	450	1000	1000	1200	150
225	150	450	1000	1000	1200	150
300	225	450	1200	1000	1200	150
600	225	450	1200	1200	1500	150
750	225	450	1500	1200	1500	200
1000	300	525	1500	1200	1500	200
1250	300	525	1750	1200	1500	225

TABLE OF DIMENSIONS

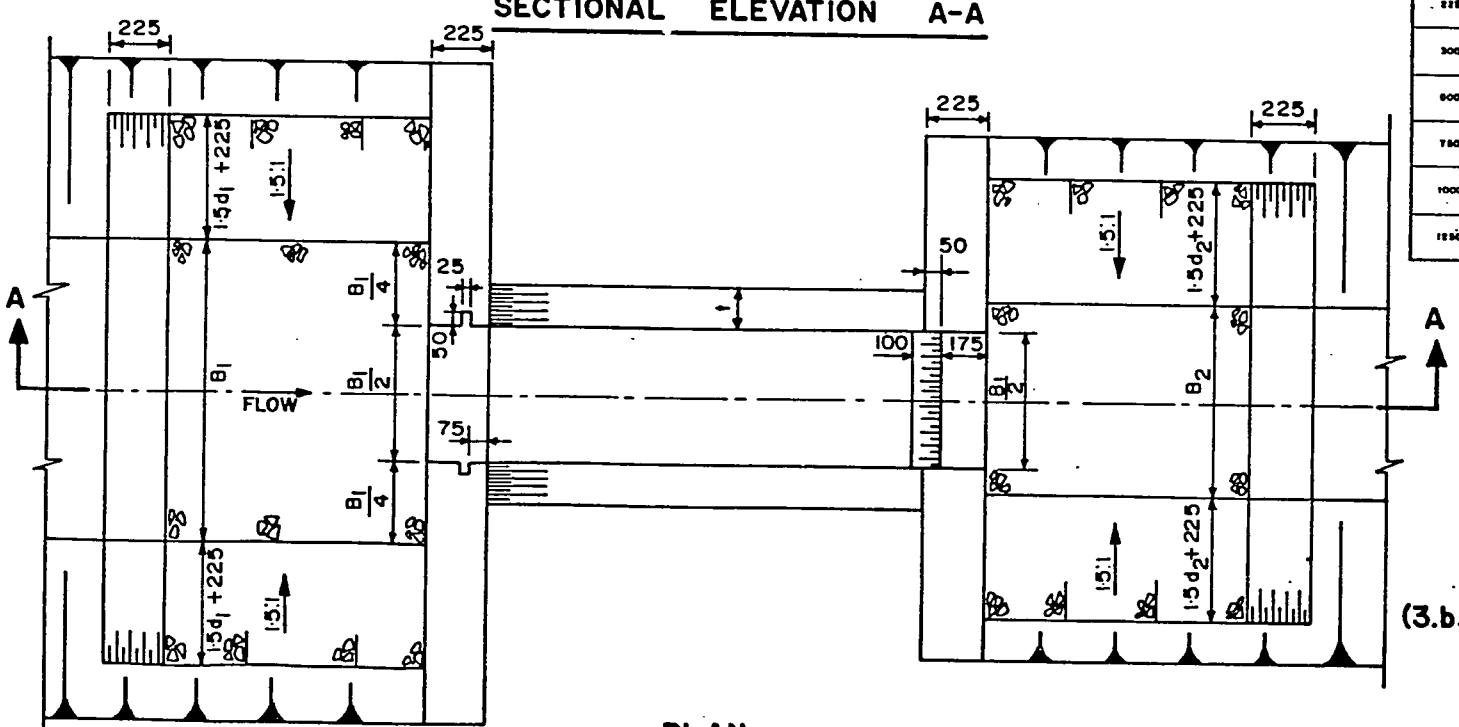
NOT TO SCALE

(3.b.1.) ISMP DESIGNED
DROP STRUCTURE
STANDARD PLAN
0-3 CFS

EXHIBIT V-1-2
SHEET 1 OF 2



SECTIONAL ELEVATION A-A



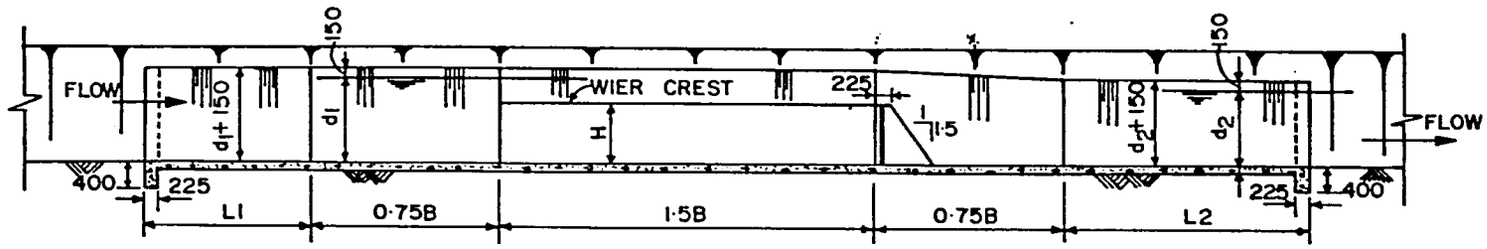
PLAN

H mm	h_1 mm	h_2 mm	L_1 mm	L_2 mm	L_3 mm	t mm
150	150	450	1200	1200	1200	150
225	150	450	1200	1200	1200	150
300	225	450	1200	1200	1500	150
600	225	300	1750	1500	1500	150
750	300	550	2000	1500	2000	200
1000	400	600	2250	1500	2000	200
1250	400	650	2500	1500	2000	225

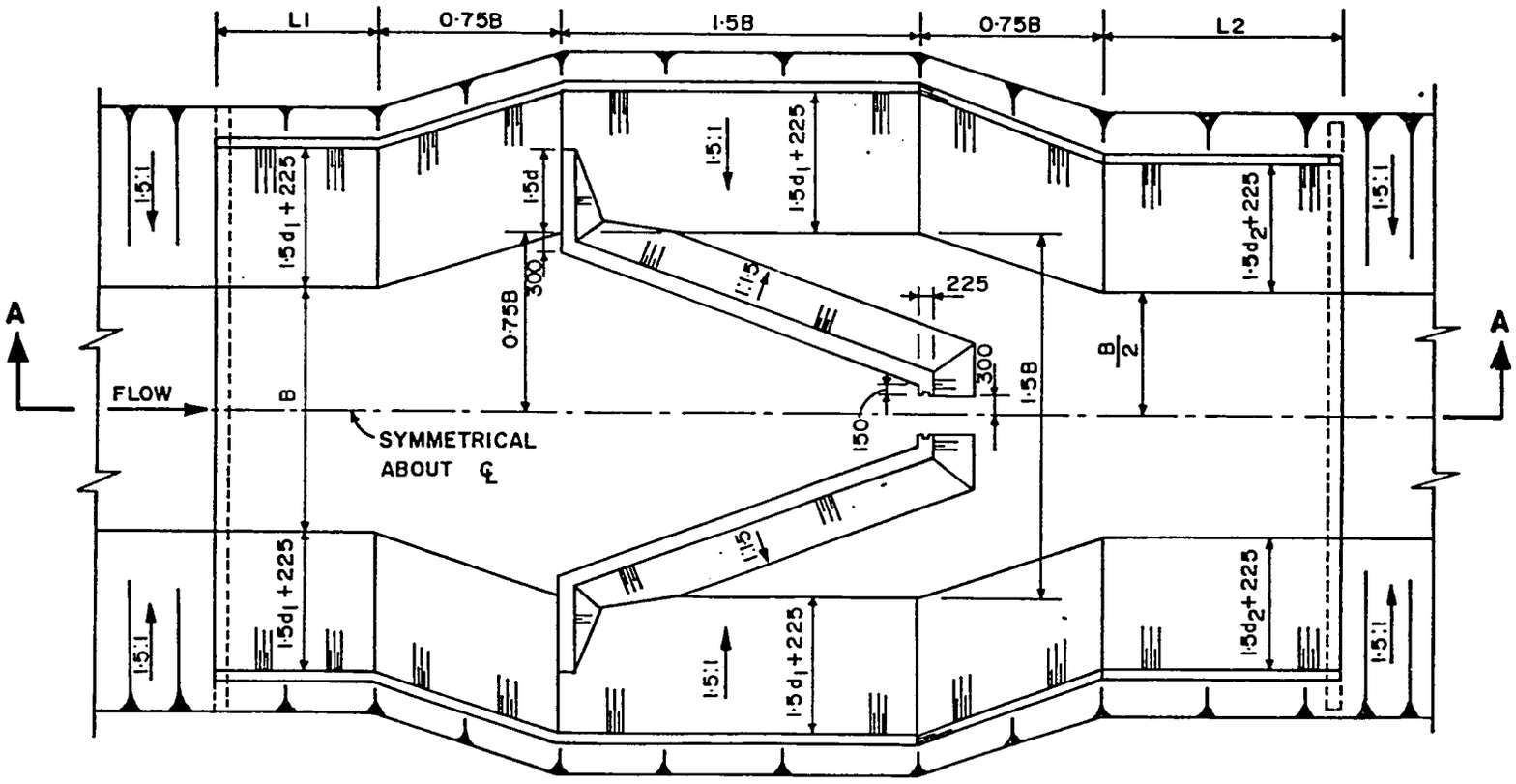
TABLE OF DIMENSIONS

(3.b.2) ISMP DESIGNED
DROP STRUCTURE
STANDARD PLAN
4 - 35 CFS
NOT TO SCALE

EXHIBIT V-1-2
SHEET 2 OF 2



SECTIONAL ELEVATION A-A



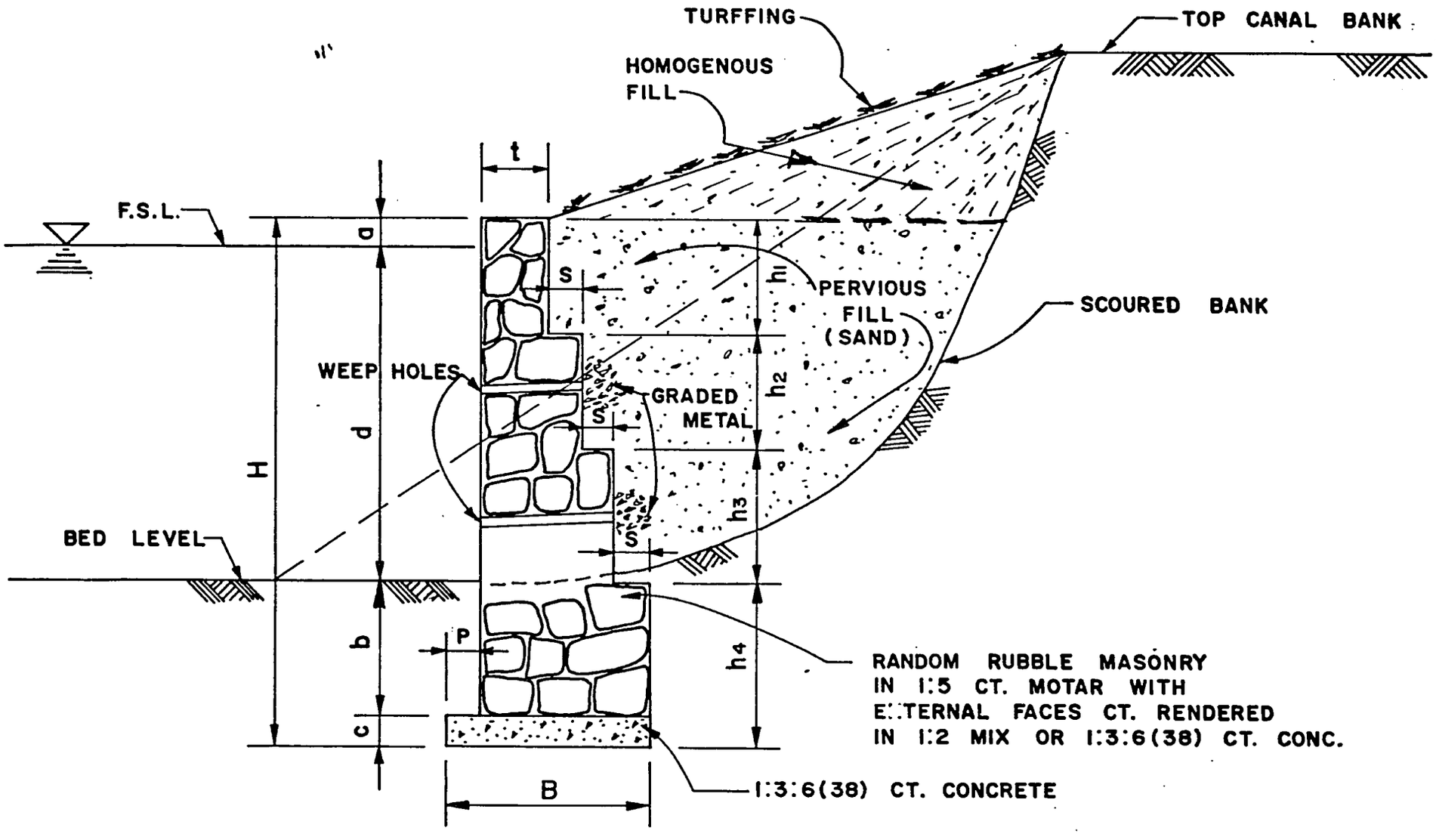
PLAN

(5.b) ISMP DESIGNED
UNCONTROLLED WIER REGULATOR

STANDARD PLAN

NOT TO SCALE

EXHIBIT Σ-1-3



(1.b) RETAINING WALL TYPICAL DESIGN SECTION

(SHEET 1 OF 2)

SCALE 0 0·5 1·0 METER

EXHIBIT V-1-4
SHEET 1 OF 2

d	0·30	0·60	0·90	1·20	1·50	1·80	2·10	2·40
t	0·225	0·225	0·225	0·30	0·30	0·375	0·375	0·375
S	0·075	0·075	0·15	0·15	0·15	0·15	0·15	0·225
n	1	2	2	2	3	3	4	4
W	0·075	0·15	0·30	0·30	0·45	0·45	0·60	0·90
P	0·00	0·00	0·00	0·15	0·15	0·15	0·15	0·15
B	0·30	0·375	0·525	0·75	0·90	1·00	1·15	1·45
a	0·075	0·075	0·15	0·15	0·15	0·225	0·225	0·225
b	0·30	0·30	0·375	0·45	0·525	0·60	0·60	0·60
c	0·075	0·075	0·15	0·15	0·15	0·15	0·15	0·15
H	0·75	1·067	1·60	2·00	2·36	2·82	3·125	3·43
h_1	0·375	0·45	0·45	0·54	0·54	0·60	0·60	0·60
h_2	0·375	0·375	0·54	0·69	0·54	0·69	0·60	0·60
h_3	—	0·375	0·60	0·76	0·60	0·76	0·60	0·69
h_4	—	—	—	—	0·69	0·76	0·60	0·76
h_5	—	—	—	—	—	—	0·67	0·76

n = NO. OF STEPS

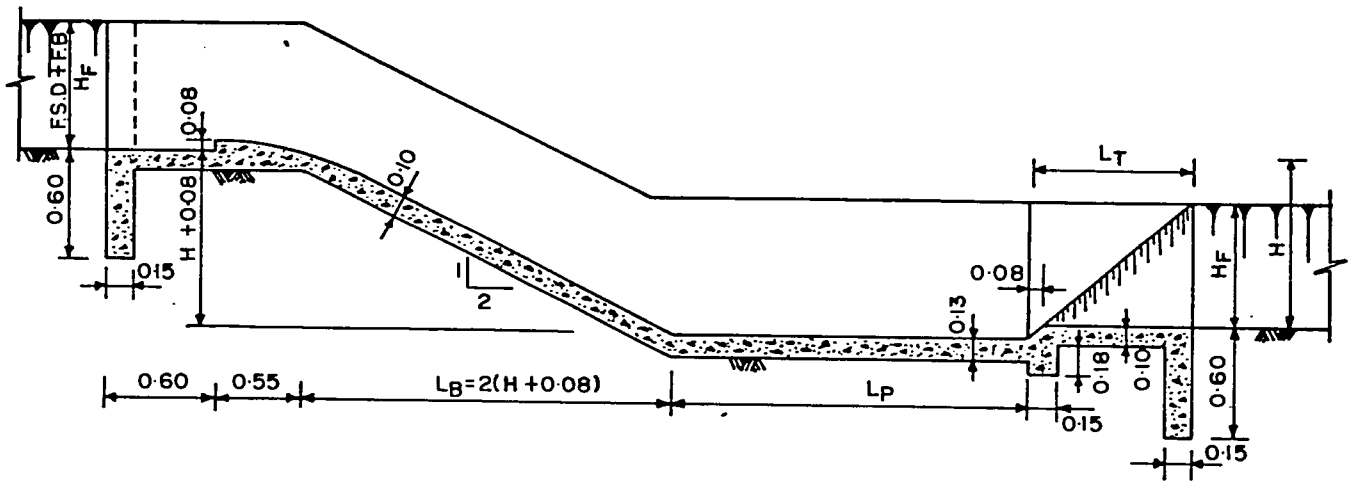
W = TOTAL WIDTH OF STEPS

(1.b) RETAINING WALL TYPICAL DESIGN DIMENSIONS

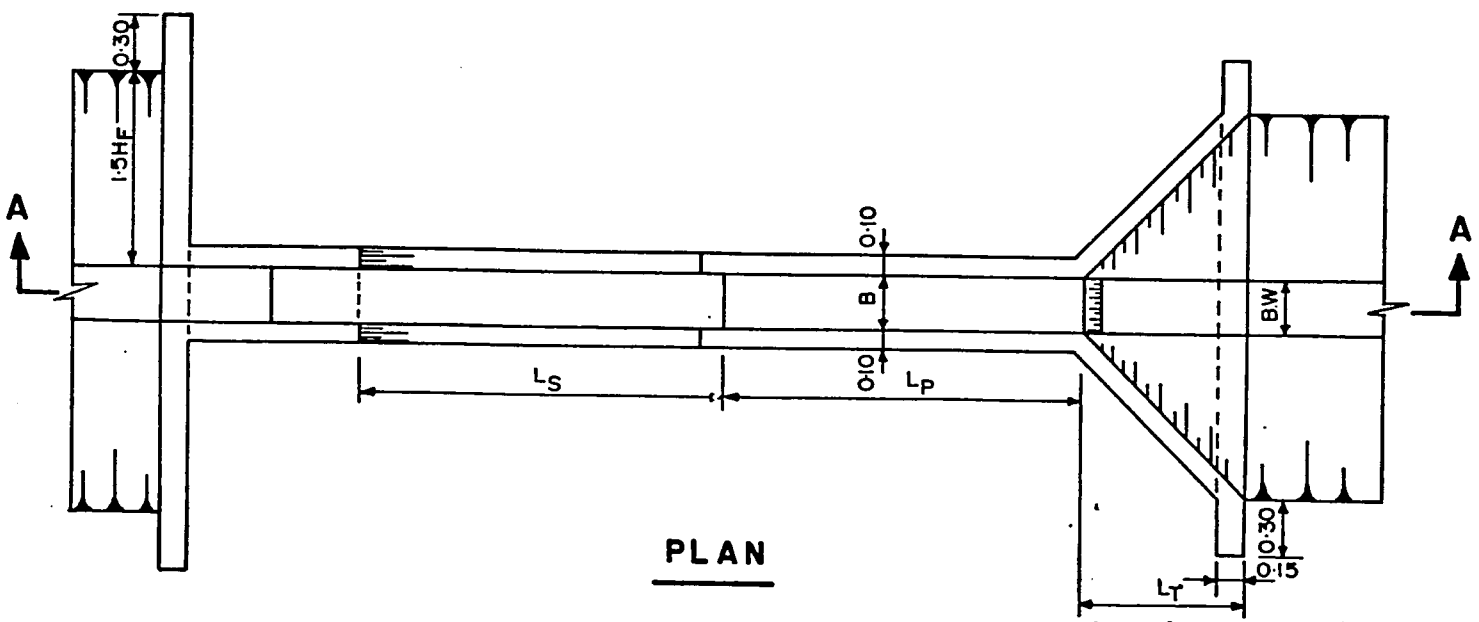
(SHEET 2 OF 2)

EXHIBIT V-1-4
SHEET 2 OF 2

EXHIBIT V-1-5
SHEET 1 OF 2



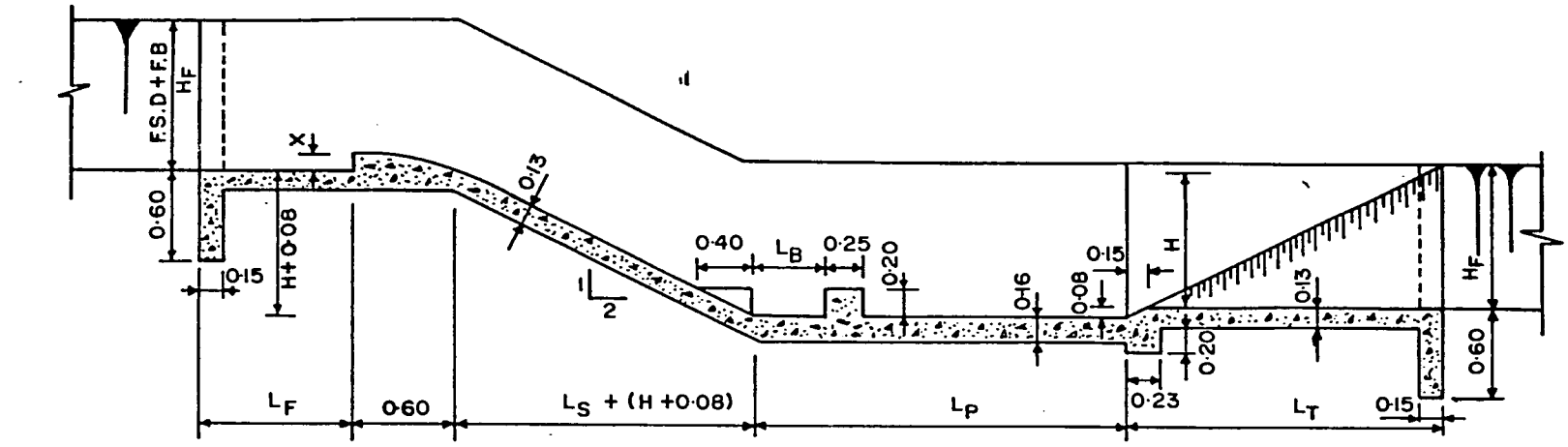
SECTION A-A



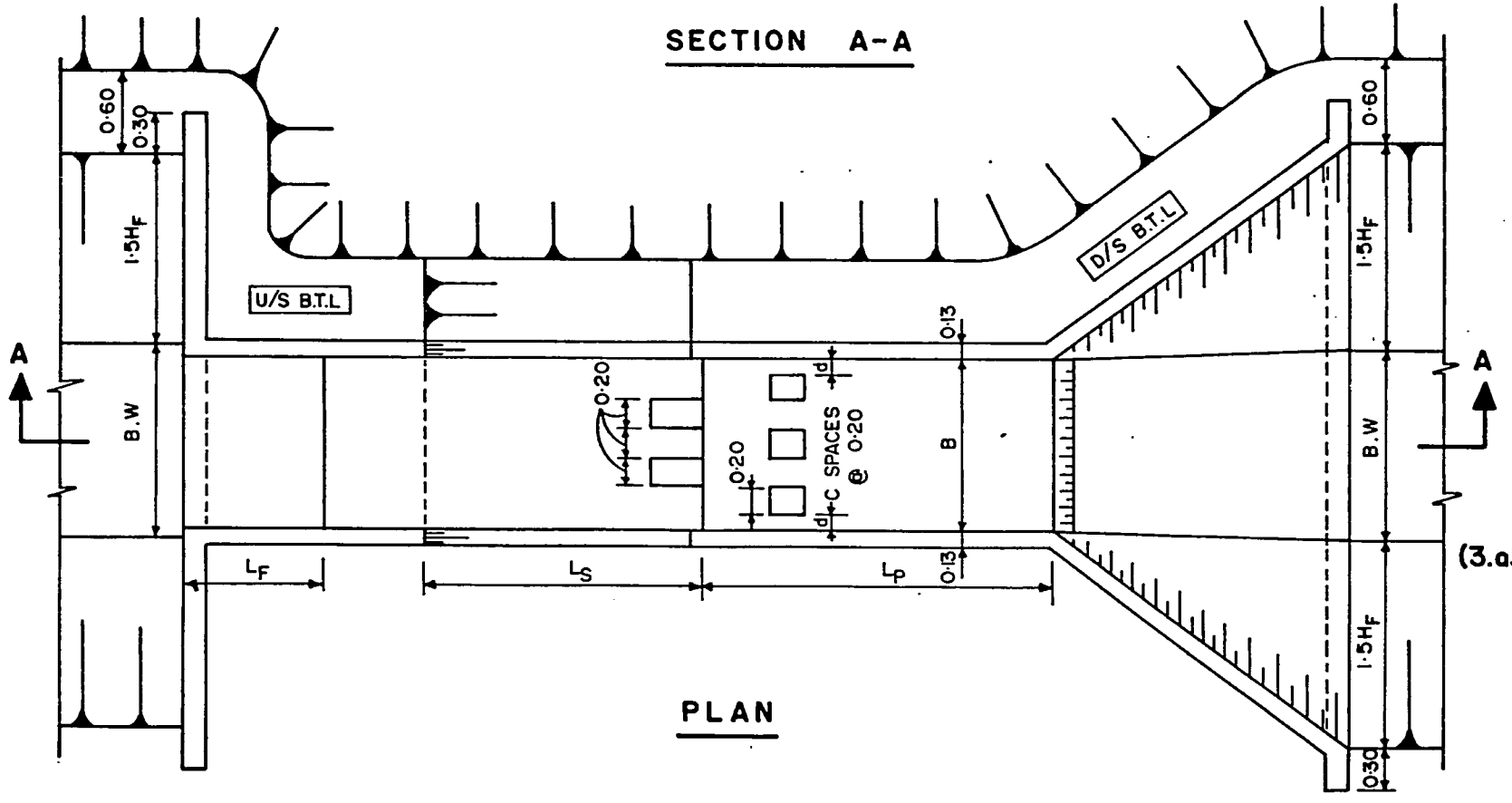
PLAN

(3.a.1) STANDARD I.D DROP STRUCTURE
TYPE I
(0 TO 3 CFS)
NOT TO SCALE

EXHIBIT V-1-5
SHEET 1 OF 2



SECTION A-A



PLAN

EXHIBIT V-1-5
SHEET 2 OF 2

(3.a.2)STD I.D DROP STRUCTURE TYPE II (4 TO 25 CFS)

NOT TO SCALE

SHELADIA ASSOCIATES INC.
O&M ENGINEER

CONCLUSION ON EXTENSION OF PROJECT RELATIVE TO REHABILITATION OF D AND F CANALS

In light of up-dated construction progress status as of 31 March 1990, Insert A sheet 2 of 2; Insert B sheet 2 of 2 and insert C sheet 2 of 2; a two year time extension may not be adequate to complete all of the D and F canals remaining to be done in 1990, 1991, 1992, 1993 and part of 1994. (see Exhibit II construction progress chart quarter ending 31 March 1990)

If we disregard the remaining Main and Branch canals, as they will be constructed by private contractors, the amount of D and F canals completed as of 31 December 1989 is 148.3 km and remaining to be completed is 1564.5 over LOP (Drains are expected to be completed within LOP as they can be done year around).

D and F canals planned for 1990 amount to 334.0 km. Assuming 80% of those canal can be completed in 1990 (267.2 km) then the D and F canals remaining for 1991, 1992, 1993 and part of 1994 is about 1300 km. Assuming only 6.0% (100km) of the D and F canals can be completed in the first half of 1994 then some 1200 km will remain to be done during 1991, 1992 and 1993 construction seasons or about 400 km per year. Exhibit III presents this preliminary D and F canal construction program. Since 400 km per year is about five times that which was accomplished from 1988 to 1989 it is doubtful that the D and F canal work can be completed in the two year time extension suggested.

Therefore, the senior ISMP management officers of ID/IMD/USAID must search for an alternative solution to accelerate the construction of the D and F Canals if they are to be completed even within the proposed two year extension period.

&midtmev.cfl

TABLE 2.1 (A)

* STATUS OF PHYSICAL PROGRESS
ISMP ESSENTIAL STRUCTURE IMPROVEMENT
AND
PRAGMATIC REHABILITATION PROGRAM
TOTAL POLONNARUWA AND GAL OYA

	TOTAL PROJECT LENGTH (KM)	COMPLETED END 1989 (KM)
SURVEYS		
Main Channels	86.7	78.7
Branch Channels	150.2	142.7
D-Channels	503.3	267.2
F-Channels	1209.5	459.2
Drains	245.0	0.0
	2194.7	947.8
DESIGNS		
Main Channels	86.7	70.8
Branch Channels	150.2	83.4
D-Channels	503.3	220.0
F-Channels	1209.5	364.4
Drains	245.0	0.0
	2194.7	738.6
CONSTRUCTION		
Main Channels	86.7	55.9
Branch Channels	150.2	58.0
D-Channels	503.3	89.6
F-Channels	1209.5	58.7
Drains	245.0	0.0
	2194.7	262.2

Up-dated as 31 March 1990

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TABLE II - 3
*ESI POLONNARUWA RANGE + PR AMPARA RANGE

	TOTAL PROJECT LENGTH (KM)	COMPLETED END 1989 (KM)	PLANNED FOR 1990 (KM)	REMAINING FOR LOP (KM)
SURVEYS				
Main Canals	86.7	78.7	8.0	0.0
Branch Canals	150.2	142.7	7.5	0.0
D-Canals	503.3	267.2	230.7	5.4
F - Canals	1209.5	459.2	403.6	346.7
Drains	245.0	0.0	67.0	178.0
TOTAL	2194.7	947.8	716.8	530.1
DESIGNS				
Main Canals	86.7	70.8	15.9	0.0
Branch Canals	150.2	83.4	66.8	0.0
D-Canals	503.3	220.0	229.1	54.2
F - Canals	1209.5	364.4	343.1	502.0
Drains	245.0	0.0	50.0	195.0
TOTAL	2194.7	738.6	704.9	751.2
CONSTRUCTION				
Main Canals	86.7	55.9	22.8	8.0
Branch Canals	150.2	58.0	47.0	45.2
D-Canals	503.3	89.6	102.6	311.1
F - Canals	1209.5	58.7	231.4	919.4
Drains	245.0	0.0	10.0	235.0
TOTAL	2194.7	262.2	413.8	1518.7

*Updated as of 31 March 1990

ESIPRRNG

TABLE 2.1 (B)

* STATUS OF PHYSICAL PROGRESS
ISMP ESSENTIAL STRUCTURE IMPROVEMENT
FOUR POLONNARUWA SYSTEMS

	TOTAL PROJECT LENGTH (KM)	COMPLETED END 1989 (KM)
SURVEYS		
Main Channels	51.5	43.5
Branch Channels	67.1	65.8
D-Channels	328.3	255.0
F-Channels	982.1	459.2
Drains	145.0	0.0
	1574.0	823.5
DESIGNS		
Main Channels	51.5	42.3
Branch Channels	67.1	65.8
D-Channels	328.3	220.0
F-Channels	982.1	364.4
Drains	145.0	0.0
	1574.0	692.5
CONSTRUCTION		
Main Channels	51.5	41.9
Branch Channels	67.1	58.0
D-Channels	328.3	89.6
F-Channels	982.1	58.7
Drains	145.0	0.0
	1574.0	248.2

Up-dated as of 31 March 1990

TABLE II - 1
*ESI POLONNARUWA RANGE
(PSS, MINNERIYA, GIRITALE AND KAUDULLA)

SURVEYS	TOTAL LENGTH (KM)	COMPLETED END 1989(KM)	PLANNED FOR 1990(KM)	REMAINING FOR LOP (KM)
Main Canals	51.5	43.5	8.0	0.0
Branch Canals	67.1	65.8	1.3	0.0
D-Canals	328.3	255.0	67.9	5.4
F - Canals	982.1	459.2	383.6	139.3
Drains	145.0	0.0	67.0	78.0
TOTAL	1574.0	823.5	527.8	222.7
DESIGNS				
Main Canals	51.5	42.3	9.2	0.0
Branch Canals	67.1	65.8	1.3	0.0
D-Canals	328.3	220.0	89.1	19.2
F - Canals	982.1	364.4	338.1	279.6
Drains	145.0	0.0	50.0	95.0
TOTAL	1574.0	692.5	487.7	393.8
CONSTRUCTION				
Main Canals	51.5	41.9	1.6	8.0
Branch Canals	67.1	58.0	6.0	3.1
D-Canals	328.3	89.6	100.4	138.3
F - Canals	982.1	58.7	231.0	692.4
Drains	145.0	0.0	10.0	135.0
TOTAL	1574.0	248.2	349.0	976.8

* Updated as of 31 March 1990

ESIPRRNG

TABLE 2.1 (C)

* STATUS OF PHYSICAL PROGRESS
PRAGMATIC REHABILITATION PROGRAM
AMPARA (GAL OYA)

	TOTAL PROJECT LENGTH (KM)	COMPLETED END 1989 (KM)
SURVEYS		
Main Channels	35.2	35.2
Branch Channels	83.1	76.9
D-Channels	175.0	12.2
F-Channels	227.4	0.0
Drains	100.0	0.0
	620.7	124.3
DESIGNS		
Main Channels	35.2	28.5
Branch Channels	83.1	17.6
D-Channels	175.0	0.0
F-Channels	227.4	0.0
Drains	100.0	0.0
	620.7	46.1
CONSTRUCTION		
Main Channels	35.2	14.0
Branch Channels	83.1	0.0
D-Channels	175.0	0.0
F-Channels	227.4	0.0
Drains	100.0	0.0
	620.7	14.0

Up-dated as of 31 March 1990

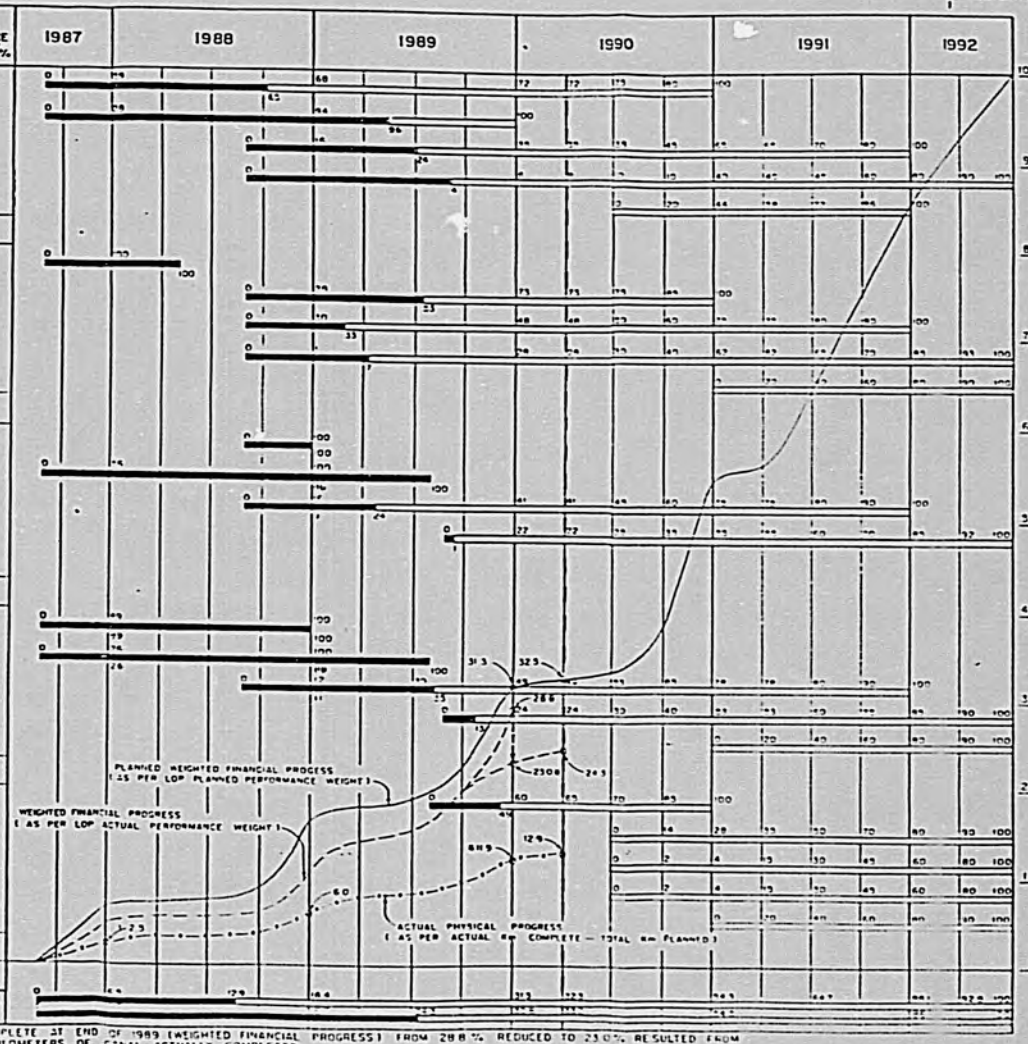
TABLE II - 2
*PR AMPARA RANGE
GAL OYA RB

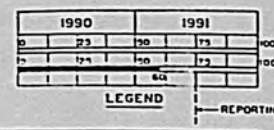
SURVEYS	TOTAL RB LENGTH (KM)	COMPLETED END 1989(KM)	PLANNED FOR 1990(KM)	REMAINING FOR LOP (KM)
Main Canals	35.2	35.2	0.0	0.0
Branch Canals	83.1	76.9	6.2	0.0
D-Canals	175.0	12.2	162.8	0.0
F - Canals	227.4	0.0	20.0	207.4
Drains	100.0	0.0	0.0	100.0
TOTAL	620.7	124.3	189.0	307.4
DESIGNS				
Main Canals	35.2	28.5	6.7	0.0
Branch Canals	83.1	17.6	65.5	0.0
D-Canals	175.0	0.0	140.0	35.0
F - Canals	227.4	0.0	5.0	222.4
Drains	100.0	0.0	0.0	100.0
TOTAL	620.7	46.1	217.2	357.4
CONSTRUCTION				
Main Canals	35.2	14.0	21.2	0.0
Branch Canals	83.1	0.0	41.0	42.1
D-Canals	175.0	0.0	2.2	172.8
F - Canals	227.4	0.0	0.4	227.0
Drains	100.0	0.0	0.0	100.0
TOTAL	620.7	14.0	64.8	541.9

*Updated as of 31 March 1990

ISMP LOP
CONSTRUCTION PROGRESS CHART
AS OF QUARTER ENDING 31 MARCH 1990

SCHEME	DESCRIPTION OF WORK	TOTAL ESTIMATED LENGTH (KM)	ESTIMATED COST (Rs. x10⁶)	FINANCIAL LOP PERFORMANCE WEIGHT %	COMPLETED KM AS OF MARCH 31 1990	% COMPLETE TO DATE	FINANCIAL PERFORMANCE WT. TO DATE %
PARAKRAMA SAMUDRA	MAIN CANALS	27·74	11·080	3·09	18·10	65·20	2·01
	BRANCH CANALS	19·89	9·519	2·65	19·09	96·00	2·54
	DISTRIBUTORY CANALS	144·66	40·681	11·34	34·72	24·00	2·72
	FIELD CANALS	266·34	22·582	6·29	10·65	4·00	0·25
	DRAINS	45·00	1·890	0·53	0·00	0·00	0·00
	SUB-TOTAL	503·63	85·752	23·90	82·56	16·40	7·52
MINNERIYA	MAIN CANALS	15·00	7·906	2·20	15·00	100·00	2·20
	BRANCH CANALS	17·06	10·283	2·87	9·04	53·00	1·52
	DISTRIBUTORY CANALS	90·19	23·605	6·58	29·76	33·00	2·17
	FIELD CANALS	268·35	19·965	5·56	18·79	7·00	0·39
	DRAINS	65·00	2·730	0·76	0·00	0·00	0·00
	SUB-TOTAL	455·60	64·489	17·97	72·59	15·90	6·28
GIRITALE	MAIN CANALS	1·60	0·614	0·17	1·60	100·00	0·17
	BRANCH CANALS	10·70	3·618	1·01	10·70	100·00	1·01
	DISTRIBUTORY CANALS	29·90	8·236	2·30	7·18	24·00	0·55
	FIELD CANALS	129·90	10·883	3·03	1·30	1·00	0·03
	DRAINS	—	—	—	—	—	—
	SUB-TOTAL	172·10	23·351	6·51	20·78	12·10	1·76
KAUDULLA	MAIN CANALS	7·17	2·728	0·76	7·17	100·00	0·76
	BRANCH CANALS	19·45	7·297	2·03	19·45	100·00	2·03
	DISTRIBUTORY CANALS	63·56	16·993	4·74	22·24	35·00	1·66
	FIELD CANALS	317·53	25·180	7·02	41·28	13·00	0·91
	DRAINS	35·00	1·470	0·41	0·00	0·00	0·00
	SUB-TOTAL	442·71	53·668	14·96	90·14	20·40	5·35
GALOYA-RB	MAIN CANALS	35·20	24·640	6·87	17·25	49·00	3·37
	BRANCH CANALS	83·10	33·464	9·33	0·00	0·00	0·00
	DISTRIBUTORY CANALS	175·00	49·875	13·90	0·00	0·00	0·00
	FIELD CANALS	227·40	19·329	5·39	0·00	0·00	0·00
	DRAINS	100·00	4·200	1·17	0·00	0·00	0·00
	SUB-TOTAL	620·70	131·508	36·66	17·25	2·78	3·37
	TOTALS	2194·74	358·768	100·00	283·30	12·90	24·28
					PHYSICAL (ACTUAL) PROGRESS (%)		
					FINANCIAL (WEIGHTED) PROGRESS (%)		





* NOTE — CORRECTION IN REPORTED PERCENTAGE COMPLETE AT END OF 1989 (WEIGHTED FINANCIAL PROGRESS) FROM 28·8 % REDUCED TO 23·0 % RESULTED FROM AN ERROR IN PREVIOUS REPORTING OF KILOMETERS OF CANAL ACTUALLY COMPLETED

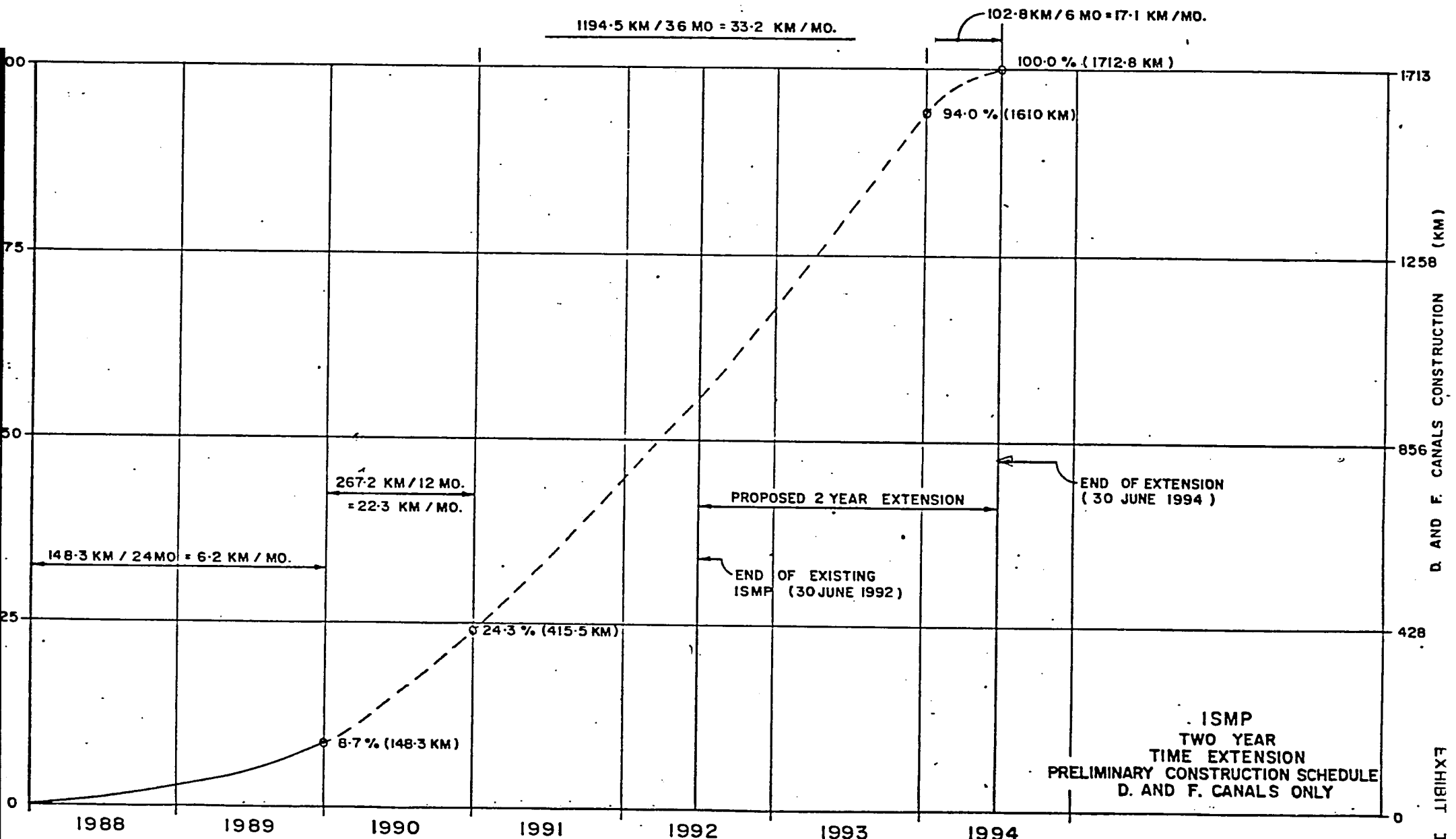

1194·5 KM / 36 MO = 33·2 KM / MO.
102·8 KM / 6 MO = 17·1 KM / MO.
100·0 % (1712·8 KM)
94·0 % (1610 KM)
24·3 % (415·5 KM)
8·7 % (148·3 KM)
267·2 KM / 12 MO.
= 22·3 KM / MO.
148·3 KM / 24 MO = 6·2 KM / MO.
PROPOSED 2 YEAR EXTENSION
END OF EXISTING ISMP (30 JUNE 1992)
END OF EXTENSION (30 JUNE 1994)
1713
1258
856
428
0
D. AND F. CANALS CONSTRUCTION (KM)
1988
1989
1990
1991
1992
1993
1994
ISMP
TWO YEAR
TIME EXTENSION
PRELIMINARY CONSTRUCTION SCHEDULE
D. AND F. CANALS ONLY

EXHIBIT III