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**DEMOCRATIC SOCIALIST REPUBLIC
OF
SRI LANKA**

**MINISTRY OF LANDS, IRRIGATION
AND
MAHAWELI DEVELOPMENT**

**SPECIAL REPORT
ON
ISMP PREVENTATIVE MAINTENANCE PROGRAM**

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ISMP PREVENTATIVE MAINTENANCE PROGRAM

TABLE OF CONTENTS

CONTENTS	PAGE
ACRONYMS	
CHAPTER I INTRODUCTION	I-1
CHAPTER II EXPERIENCE GAINED IN THE PREVENTATIVE MAINTENANCE PROGRAM OVER LIFE OF PROJECT	II-1
2.1 Preventative Maintenance Program	II-1
CHAPTER III DEVELOPMENT OF THE PREVENTATIVE MAINTENANCE PROGRAM OVER LIFE OF PROJECT	III-1
3.1 Introduction	III-1
3.2 Accomplishments in Polonnaruwa and Kurunegala Ranges as of 31 December 1990	III-1
3.3 Accomplishments in Polonnaruwa Range Range 1/1/91 - 30/6/92	III-2
3.4 Accomplishments in Kurunegala Range 1/1/91 - 30/6/92	III-4
3.5 Accomplishments in Ampara Range 1/1/91 - 30/6/92	III-7
CHAPTER IV RECOMMENDATIONS FOR IMPLEMENTATION PREVENTATIVE MAINTENANCE PROGRAM	IV-1
4.1 Introduction	IV-1
4.2 Range and Division Level Responsible for Implementation	IV-1
4.3 Project Level Responsibilities for Implementation	IV-2
4.4 Preventative Maintenance Implementation Strategies	IV-3

EXHIBITS

EXHIBIT	I-1	SCHEMATIC OF PREVENTATIVE MAINT. PROGRAM
EXHIBIT	III-3-1	ANNUAL MAINTENANCE PLAN GIRITALE SCHEME MAIN SYSTEM
EXHIBIT	III-3-2	ANNUAL MAINTENANCE PLAN - PURANAGAMA DCFO
EXHIBIT	III-3-3	STATUS OF DCFO ANNUAL MAINTENANCE PLANS - POLONNARUWA SCHEMES
EXHIBIT	III-3-4	DCFO ANNUAL MAINTENANCE COST IN POLONNARUWA SCHEMES
EXHIBIT	III-4-1	STATUS OF ANNUAL MAINTENANCE PLANS FOR DCFOs IN RIDI BENDI ELA
EXHIBIT	III-4-2	DCFO ANNUAL MAINTENANCE COSTS IN RBE
EXHIBIT	III-5-1	STATUS OF ANNUAL MAINTENANCE REQUIREMENTS IN GAL OYA

LIST OF ACRONYMS

BOP	Blocking Out Plan
D-	Distributory
DCFO	Distributory Canal Farmer Organization
DCS	Distributory Canal System
ESI	Essential Structural Improvement
F-	Field
FO	Farmer Organization
GOSL	Government of Sri Lanka
ID	Irrigation Department
IMD	Irrigation Management Department
ISMP	Irrigation Management Systems Project
LB	Left Bank
LBMC	Left Bank Main Canal
LOP	Life of Project
O&M	Operation and Maintenance
PMP	Preventative Maintenance Program
PP	Project Paper
PR	Pragmatic Rehabilitation
RB	Right Bank
RBE	Ridi Bendi Ela
RBMC	Right Bank Main Canal
TA	Technical Assistant
USAID	United States Agency for International Development
WM	Water Management

CHAPTER I

INTRODUCTION

Under the Irrigation Systems Management Project (ISMP) the procedure for developing the Preventative Maintenance Program (PMP) was outlined in the Project Paper (PP). This procedure is schematically shown in Exhibit I-1 and provides the guidelines for development of the PMP over the Life of Project (LOP). The PP recommended that the PMP should be developed over the LOP and implemented after the Project was completed in order to sustain the systems at a level of maintenance that they will not require major rehabilitation work in the future. This sustainability requirement is contingent upon the following:

For: Main System Maintenance (Irrigation Department [ID] Responsibility)

- o The Main System must first be rehabilitated to the level that they can be sustained indefinitely under the implementation of the PMP.
- o The Government of Sri Lanka (GOSL) provides the maintenance funds estimated over the LOP for each Scheme in accordance with the cost estimate developed in the Annual Maintenance Plans.

For: Distributory Canal System (DCS) Maintenance (Distributory Canal Farmer Organization (DCFO) Responsibility)

- o The DCS Distributory (D-) canal and Field (F-) canal must be first rehabilitated to the level that they can be sustained indefinitely under the implementation of the PMP.
- o The DCFOs, responsible for their DCS must generate adequate maintenance funds within their organization in order to implement the Annual Maintenance Plans. The amount needed each year has been determined over the LOP and varies between each DCFO. About 75% of this cost is for material, equipment and fuel, etc., and the remaining works involve only labor. Either the DCFO provides the total funds required or the members must contribute their time and labor if the PMP is to succeed and be sustained.

In the Status Report on the ISMP PMP, the following will be covered.

CHAPTER II Experience Gained in the PMP Over the LOP

In this Chapter the development of the PMP over the LOP will be discussed and how it was accomplished.

CHAPTER III Development of the Preventative Maintenance Program

In this Chapter the progress of the Development of the Annual Maintenance Plans will be presented by Scheme.

CHAPTER IV Recommendations for Implementation of the Preventative Maintenance Program

This Chapter will discuss how the Annual Maintenance Plan will be implemented under the PMP. The implementation of the Annual Maintenance Plans as of PACD have yet to start, therefore, this Chapter is the key to sustainability of the PMP after PACD.

CHAPTER II

EXPERIENCES GAINED IN PREVENTATIVE MAINTENANCE PROGRAM OVER LIFE OF PROJECT

2.1 Preventative Maintenance Program

The development of the PMP was accomplished over the LOP for all seven Main Systems, and some 92 of the 201 DCFOs under the seven Schemes under the Project. To accomplish this the Consultant assisted the ID in the following activities which have led to the development of the PMP. These activities are presented on Exhibit I-1, Chapter I, and are outlined in the sequence in which they have been developed over the LOP.

A discussion of each step in this development process will be made to outline the experiences gained over the LOP. This step by step process will be summarized for the Main System which is similar to the process for the DCS except that the Main System involves priority rehabilitation which was not provided for in the DCS.

STEP 1 - Conduct Walk-Through Maintenance Survey for Essential Structural Improvement (ESI)/Pragmatic Rehabilitation (PR) Improvements

The first step in developing of the PMP was to make a walk-through maintenance survey to establish the requirements of the System for rehabilitation. This was a major effort as pre-planning of the canals to be rehabilitated over the LOP was the first step in the process. Once the Technical Assistant (TA) staff identified the canals to be rehabilitated, they initiated the walk-through survey to determine the rehabilitation requirements provided in order to sustain the systems. During 1987 and 1988 this process was relatively easy as only Main and Branch canals were programmed for rehabilitation. The determination of what had to be rehabilitated was noted during the walk-through survey and the TAs brought these notes to the office for the survey, planning and design stage of the process which is outlined under Step 2.

STEP 2 - Prepare Surveys, Plans, Designs and Cost Estimate for ESI/PR Works

After completion of the Walk-Through Maintenance Survey in Step 1, the TAs would determine the survey requirements, make the necessary surveys and then plan design and prepare quantity and construction cost estimates for the rehabilitation works required for any specific sub-project. There may be 4 or 5 km of Main and Branch canal scheduled for a sub-project. Under the United States Agency for International Development (USAID) reimbursement criteria adopted for the project, two thirds (67%) of the allowable construction cost per kilometre of canal would be reimbursed to GOSL and GOSL would pay for the remaining (33%). Allowable reimbursement cost per kilometre of canal varied from Scheme to Scheme between Main, Branch, D- and F-canals. This allowable reimbursement cost was developed in the PP and had little basis for establishment. One of the major problems experienced in the early stage of the Project during the rehabilitation of the Main and Branch canals was that after TAs prepared the survey, plans, design and cost estimates invariably the rehabilitation cost per kilometre was considerably higher than the allowable USAID reimbursement amount. This caused considerable problems during the early stage of the Project as well as right up to PACD as the ID had to cut back on the rehabilitation needed to adequately bring the systems up to a maintenance stage where they could be sustained under the PMP. Because of this situation, revised estimates had to be made so that rehabilitation costs staggered within the allowable rate per kilometre. The ID made these reductions reluctantly, and the canals were rehabilitated based upon those modified rehabilitation plans.

Subsequently the Consultant realized that the Main Systems were not being rehabilitated under ESI to a level that could be sustained with recourse to further maintenance and requested Irrigation Management Department (IMD)/ID and USAID to provide Priority Rehabilitation Works on these canals where ESI works had been completed but not to the level necessary for sustainability. Priority Rehabilitation works were originally identified under the walk-through survey for ESI but were deferred or left off the program because

of budget constraints. Both USAID and IMD/ID agreed on the Priority Rehabilitation Program which was initiated in 1989 under Step 3 that follows.

STEP 3 - Conduct Walk-Through Maintenance Survey for Deferred Priority Rehabilitation Works

A second Walk-Through Maintenance Survey was conducted on all Main and Branch canals that were first rehabilitated under the ESI program but were not to the level of sustainability. The second survey identified all essential rehabilitation requirements that were left off the first ESI rehabilitation program. The TAs again took field notes and proceeded to their offices where requirements for additional surveys were identified. After completion of the survey and mapping, the plans, designs and cost estimates were developed without constraints of a budget limitation on Rs/kilometre.

STEP 4 - Implement Deferred Priority Rehabilitation Works

After preparation of the design and cost estimates, the works were awarded to private contractors for the Main and Branch canals and these Canal Systems were then brought up to the level that they could be sustained under the PMP. By that time (1989), dry rubble packing had been tried out for the first two years (1987 - 1988) and found to be extremely effective for canal bank stabilization material. Therefore, Deferred Priority Rehabilitation included a lot of dry rubble packing.

STEP 5 - Conduct Walk-Through Maintenance Survey for Preparation of Annual Maintenance Plan

After ESI and Deferred Priority Rehabilitation works had been completed on the Main and Branch Canals, the next step was to initiate the preparation of the Annual Maintenance Plans for the Main and Branch canals. The walk-through survey for Annual Maintenance requirements usually takes 2 or 3 days to conduct. The survey also includes other components of the Main System other than Main and Branch canals, namely, Inlet Canal; Headworks; Spillage and Embankment.

The Annual Maintenance Survey is conducted based upon criteria that had been developed by the ID to satisfy the many maintenance requirements that must be accomplished semi-annually, annually, bi-annually or periodically every three, four or five years. The criteria developed was done based upon experience of the ID over many years of maintenance work. Since the new concept of maintaining the system on a sustained renewal basis under the PMP was to start after completion of the Project, it was necessary to establish the Annual Maintenance Plans to a detail level that would allow the ID to know what to maintain, when to maintain it, how many times or frequency of maintenance, the amount of labor required, the amount materials needed; the types of equipment and the schedule of order the work was to be accomplished.

To determine all this information, the walk-through survey had to identify every requirement to be maintained to the detail where estimates of the work required and the costs involved could be accurately determined in order to develop the Annual Maintenance Plan as outlined under Step 6 that follows.

STEP 6 - Develop Annual Maintenance Plans, Cost Estimates, Maintenance Diagram, Schematic Water Distribution Diagram, Equipment, Labor and Material Requirements

Based on the Walk-Through Maintenance Survey the requirements were determined by the TAs in the field and notes prepared. The requirements that were noted in the survey, included the length and width of canal to be maintained; the estimated desilting and dewatering requirements; the number of different types of structures to be maintained; the length of canal bund to be maintained; length of canal roads to be gravel surfaced; etc. All of this information was used as the basis for developing the Annual Maintenance Plan, Annual Maintenance Quantities and Annual Maintenance Costs including labor, materials, equipment and fuel requirements. In addition to the Annual Maintenance Plan and Cost, the development of the Maintenance Diagram for the Main System was prepared. On this Diagram the location of all Main System facilities have been identified including the length of the various reaches of canal under the Main System of the Annual

Maintenance Plan. The Main System Maintenance Diagram also identifies the location, name and number of DCFOs that are being served by the Main System. The Maintenance Diagram shows the location of the Main, Branch, D- and F- canals in the System and the main drains, roads, buildings, maintenance and operation quarters, telephones, post offices, towns, villages, railroads, anicuts, rain gage locations, meteorological stations and the many irrigation structures located along the canals, such as, sluices, spillways, spills, regulators, drop structures, bridges, etc. In addition to the Maintenance Diagram, the Annual Maintenance Plan also includes the Issue Tree for the system which is presented on a Schematic Water Distribution Diagram and provides information on location and stationing of D-canal and F-canal turnout structures and the area served by each turnout. During the Walk-Through Maintenance Survey, the TAs up-dated the Issue Trees so as to establish the correct extents to be irrigated from any one turnout.

The development of the Annual Maintenance Plan also required the TAs to estimate the materials, labor, fuel and equipment needed to implement the Plan. Details covering every aspect of the Annual Maintenance Plan were prepared and all the information presented in a Report for both Main System and DCFO Annual Maintenance Plans. These Reports will be presented in Chapter III.

STEP 7 - Implement Preventative Maintenance Program Based Upon the Annual Maintenance Plan

After completion of the Annual Maintenance Plan for all Schemes, the ID using funds allocated for maintenance by the GOSL for the Main System must initiate and implement the works outlined on the Annual Maintenance Plan. Although, at PACD the Annual Maintenance Plans had yet to be implemented for the seven Main Systems under the Project it is planned that they will be started during the close season of the 1992/1993 Maha. Even though rehabilitation works will be going on in D- and F- canals the ID must assign adequate TAs to implement the Annual Maintenance Plans during 1992.

The allocation of adequate funds to implement the Annual Maintenance Plan is the constraint that must be overcome by the GOSL. The estimated annual maintenance costs for each of the seven Main Systems under the Project were developed over the LOP. These Annual Maintenance costs are summarized in the Table II-1 below:

TABLE II-1
MAIN SYSTEM
ANNUAL MAINTENANCE COSTS REQUIRED
TO IMPLEMENT PREVENTATIVE MAINTENANCE PROGRAM

<u>Scheme</u>	<u>Service Area (AC)</u>	<u>Total Annual (Rs)</u>	<u>Cost/Acre (Rs/Ac)</u>
Parakrama Samudra	23,000	2,507,300	109
Giritale	7,340	1,028,200	140
Minneriya	23,672	2,113,500	90
Kaudulla	10,824	2,117,600	195
Ridi Bendi Ela	5,553	2,223,363	400
Gal Oya LB	61,752	6,636,937	108
Gal Oya RB	34,474	6,840,314	198
	-----	-----	---
Totals	166,613	23,467,214	141

As can be seen from the above table for the seven Schemes under the ISMP the average Annual Maintenance cost for the Main System is only Rs 141/acre. This amount is the initial estimated requirement, however, this amount will be gradually reduced after the PMP has been implemented for several years where the amount required will most probably reduce to about 2/3 of the initial estimate cost or only about Rs 94,100/acre. GOSL however, must provide the initial funds required if the PMP is to be sustained.

STEP 8 - Conduct Walk-Through Maintenance Completion Survey and Submit Annual Maintenance Completion Report

After the implementation of the Annual Maintenance Plan, it is programmed to conduct a Walk-Through Maintenance Completion Survey to note down what was accomplished and to evaluate the results of the work accomplished. Based upon the evaluation, an Annual Maintenance Completion Report is prepared with its recommendations for the next year.

STEP 9 - Revise Annual Maintenance Plan to Meet Actual Maintenance Requirements Based Upon Recommendations in the Completion Report

After the Annual Maintenance Plan Completion Report has been submitted, the recommendations for the next years Annual Maintenance Plan will be reviewed and adjusted to meet the Report's recommendations, so that the plan can be modified to suite the conditions now existing in the field. Reduction in the amount of maintenance requirements will be apparent as the PMP is continued which will result in a reduction in the Annual Maintenance Cost. After 5 to 6 years of the PMP the Annual Maintenance requirements will stabilize and the cost will remain relatively constant as long as the PMP continues to be implemented.

STEP 10 - Improve Preventative Maintenance Program and Continue

The PMP will be refined and improved over time and the TAs assigned to the PMP will become very efficient in implementing and continuing the program and at the same time the cost of Annual Maintenance will be reduced to a level that will be adequate to sustain the system without further need for major rehabilitation and the GOSL will have achieved its goal of sustained renewal of the Irrigation System.

CHAPTER III

DEVELOPMENT OF THE PREVENTATIVE MAINTENANCE PROGRAM OVER THE LIFE OF PROJECT

3.1 Introduction

The PMP, for the Scheme under the ISMP which are planned to be implemented after completion of the Project on 30 June 1992, involves the preparation 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 Completion 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 DCFOs (Parakrama Samudra 28, Minneriya 20, Giritale 12, Kaudulla 22, Ridi Bendi Ela (RBE) 11, Gal Oya Right Bank (RB) 36 and Gal Oya Left Bank (LB) 72) that will have been formed under those seven Schemes. The PMP for the Main System of the seven Schemes will be implemented by the ID while the PMP for 201 DCFOs in those seven Schemes will be implemented by each of those respective FOs.

The PMP was initiated by the Consultant's first Operations and Maintenance (O&M) Engineer, Mr. C F. Leonhardt, from 16 August 1987 to 31 December 1990 and later followed-up by the Consultant's O&M Engineers, Mr. T.A. Cerdan and Mr. S. Balasingam from 1 January 1990 to 30 June 1992.

For continuity of the development of the PMP the accomplishments from 16 August 1987 to 31 December 1990 will be discussed and then followed with accomplishments up through PACD on 30 June 1992.

3.2 Accomplishments in Polonnaruwa and Kurunegala Ranges as of 31 December 1990

As of 31 December 1990 work on the PMP was confined primarily to the Main System of the four Schemes in the Polonnaruwa Range and the Main System of the RBE Scheme in the Kurunegala Range. In the Polonnaruwa Range, Annual Maintenance Plans were prepared for the Main System facilities that were rehabilitated during 1987 for each of the four Polonnaruwa Schemes. Table III-2-1 below, presents the accomplishment on the 1987 ESI works for the Main System of the four Schemes in the Polonnaruwa Range as of 31 December 1990.

TABLE III-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-Through Maint. Survey	100	100	100	100
2. Annual Maint. Plan	100	100	100	100
3. Annual Maint. Cost	100	100	100	100
4. Maintenance Diagram	0	100	0	0
5. Schematic Water Distribution Diagram	0	100	0	0
6. Report	0	100	0	0

For the Main System of the RBE Scheme in the Kurunegala Range the Walk-Through Maintenance Survey, the Annual Maintenance Plan 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.

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 DCFOs 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

3.3 Accomplishment in Polonnaruwa Range 1/1/91 - 30/6/92

During this period of time major accomplishments were achieved in the development of the PMP in the Polonnaruwa Range. A Summary of these achievements follows:

A. Annual Maintenance Plan - Main System

The Annual Maintenance Plans for the Main Systems (Inlet Canal, Headworks, Main and Branch canals) of the Parakrama Samudra, Giritale, Kaudulla and Minneriya Schemes were developed and completed during this period. A detailed Report on the Giritale Main System Annual Maintenance Plan was

prepared and submitted to ID/IMD on 21 August 1991 in order to illustrate the requirements needed to implement the Annual Maintenance Plan for the four Schemes in the Polonnaruwa Range.

This Report on the Giritale Main System Annual Maintenance Plan is enclosed in this Chapter as Exhibit III-3-1. It provides all the detailed information needed to develop the Annual Maintenance Plan for a Main Irrigation System (Inlet Canal, Headworks, Main and Branch canals). The report should be a guide for the development of the Annual Maintenance Plans for other Main Irrigation Systems in Sri Lanka.

A summary of the Annual Maintenance Costs for the Main Systems of the four Schemes in the Polonnaruwa Range is presented on the Table III-2-2 below:

TABLE III-2-2

POLONNARUWA RANGE
ANNUAL MAINTENANCE COST OF MAIN SYSTEM COMPONENTS

<u>Scheme</u>	<u>Command Area (AC)</u>	<u>Total Annual Cost (Rs)</u>	<u>Annual Cost/AC (Rs/AC)</u>
Giritale	7,340	1,028,200	140
PSS	23,000	2,507,300	109
Minneriya	23,672	2,113,500	90
Kaudulla	10,824	2,117,600	195
	-----	-----	----
Total PN Range	64,836	7,766,600	120

B. Annual Maintenance Plans - Distributory System

In the four Schemes of the Polonnaruwa Range there are 81 DCFOs. During the period from 1 January 1991 to 30 June 1992 the Annual Maintenance Plans for all 81 of these DCFOs were essentially completed. In the Giritale Scheme the Consultant completed the Annual Maintenance Plans for all 12 DCFOs and submitted detailed Reports to the ID/IMD as indicated on Table III-2-3 below:

TABLE III-2-3
GIRITALE SCHEME - DCFO - ANNUAL MAINTENANCE PLANS

<u>DCFO Name</u>	<u>Date Report Submitted</u>
1. Puranagama	July 8, 1991
2. Agbopura	September 27, 1991
3. Mahasen	February 25, 1992
4. Jayanthipura	February 20, 1992
5. Kadawala Wewa	February 25, 1992

<u>DCFO Name</u>	<u>Date Report Submitted</u>
6. Unagalawehera	September 27, 1991
7. Chandana Pokuna	September 10, 1991
8. Puranagama Muslim	March 25, 1992
9. Parakum	September 10, 1991
10. Bendi Wewa	March 25, 1992
11. Nagapokuna	February 6, 1992
12. Hatalisata	February 6, 1992

A typical DCFO Annual Maintenance Plan Report of the Puranagama DCFO in Giritale Scheme is enclosed in this Chapter as Exhibit III-3-2. It provides all the detailed information needed to develop the Annual Maintenance Plan for a DCFO. The Report should be a guide for all of the remaining DCFO Annual Maintenance Plans that must be completed in the Gal Oya RB (36 Nos.) and Gal Oya LB (72 Nos.).

For the remaining 69 DCFOs in Polonnaruwa Range, the Walk-Through Maintenance Surveys, Cost Estimates, Maintenance Plans and Issue Trees had been prepared and completed, only the preparation of detailed Maintenance Diagram on up-dated Blocking Out Plans (BOP) remain to be done. Translations of the Maintenance Plan in Sinhala had been accomplished for all of the DCFOs that officially took over the D-canals from the ID. Exhibit III-3-3 (4 sheets) present the status of DCFO Annual Maintenance Plans in the four Polonnaruwa Schemes.

The Annual Maintenance Cost of each of the DCFOs in Giritale (12), Minneriya (19), Parakrama Samudra (28) and Kaudulla (22) are presented on Exhibit III-3-4 (4 sheets). The average cost of Annual Maintenance for these 81 DCFOs in the Polonnaruwa Range was found to be Rs 220/Ac.

3.4 Accomplishments in Kurunegala Range 1/1/91 - 30/6/92

A. Annual Maintenance Plan

The preparation of the Annual Maintenance Plans and related documents of RBE Scheme main System were completed during the Fourth Quarter of 1991. These documents were reviewed during the First Quarter of 1992 and finalized. Based upon the Annual Maintenance Costs developed under the Annual Maintenance Plan for the Main System the following Table III-4-1 presents the costs and cost per acre were developed for the Total System, Anicut Headworks, Inlet Canal and Main System respectively.

TABLE III-4-1

TOTAL ANNUAL MAINTENANCE COST RBE SYSTEM (5553 Ac)

A.	RBE Anicut/Headworks		34,835	
B.	Inlet Canal		468,216	
C.	Magalle Tank Headworks		62,037	
D.	Right Bank Main Canal (RBMC)		517,784	
E.	LB off RBMC		169,004	
F.	LB Main and RB Branch Canals		137,337	
	Sub-Total		1,309,213	
	Contingencies @ 7.23%	=	100,440	
	Sub-Total (67%)	=	1,489,653	
	Dept. O/H (33%)	=	739,710	
	Total Annual Cost	=	2,223,363	= 400 Rs/Ac.

ANNUAL MAINTENANCE COST ANICUT/HEADWORK/INLET CANAL

A.	RBE Anicut / Headworks	=	34,835	
B.	Inlet Canal	=	468,216	
	Sub-Total	=	503,051	
	Contingencies @ 7.23%	=	36,370	
	Sub-total (67%)	=	539,321	
	Dept O/h (53%)	=	265,685	
	Total Annual Cost	=	805,106	= 145 Rs/Ac.

ANNUAL MAINTENANCE COST MAIN IRRIGATION SYSTEM

C.	Magalle Tank/Headwork	=	62,037	
D.	RB Main Canal	=	517,784	
E.	LB of RBM Canal	=	169,004	
F.	Left Bank Main Canal (LBMC)/LB off LBMC	=	137,337	
	Sub-Total	=	886,162	
	Contingencies @ 7.23%	=	64,070	
	Sub-Total (67%)	=	950,232	
	Dept. O/H @ 33%	=	468,025	
	Total Annual Cost	=	1,418,257	= 255 Rs/Ac.

O&M Units of the RBE Scheme were made operational and officially opened during February 1992. With the aid of the Annual Maintenance Plans, the implementation of PMP of the Main System Components can be implemented during June 1992.

B. Annual Maintenance Plan - Distributory Canal System

There are eleven DCFOs in the RBE Scheme. As of 30 June 1992, the Annual Maintenance Plans, Cost Estimates, Water Distribution Diagram (Issue Trees) for all eleven DCFOs have been completed.

The preparation of the Maintenance Diagram based upon up-dated BOFs were in the process of being developed as of 30 January 1992. Sinhala translations of five of the Annual Maintenance Plans have been completed.

The status of Annual Maintenance Plans for the eleven DCFOs in the RBE Scheme as of 30 June 1992 is shown on Exhibit III-4-1. Exhibit III-4-2 presents the Annual Maintenance Cost of these eleven DCFOs. The average cost of Annual Maintenance for the 11 DCFOs was found to be Rs 130/Ac. for the D- and F-canals.

C. Preventative Maintenance Program

Under the Project a PMP is being carried out on the RBE Scheme in the Kurunegala Range. The RBE Scheme was rehabilitated between 1978-1983 and the system has deteriorated during the intervening period so a program of Preventative Maintenance Works was initiated in 1989.

In the RBE Scheme in Kurunegala Range, the PMP is being carried out by Priority Rehabilitation of the LB, RB and Center Canal Systems. As of the end of June 1992 the status of the Preventative Maintenance Work on RBE is shown on Table III-4-2.

TABLE III-4-2

RIDI BENDI ELA
STATUS OF PREVENTATIVE MAINTENANCE WORK

<u>SP No.</u>	<u>Description Work</u>	<u>% Complete As of 30/6/92</u>
1	PR & Water Management (WM) Work LBMC	68.7
2	PR & WM Work RBMC/Central Canal	61.5
3	PR & WM Work Inlet Canal	83.2
4	Modification to/Inlet Canal	100.0
5	Modification to/Inlet Canal	86.3
6	Modification to/Inlet Canal	73.6
7	Modification to/Inlet Canal	20.0

19

SP No.	Description Work	% Complete As of 30/6/92
8	Modification to/Inlet Canal	15.0
9	Modification to/Inlet Canal	0.0
10	Modification to/Inlet Canal	0.0
11	Modification to/Inlet Canal	0.0
12	PR Field Canal RBMC	97.2
13	PR Field Canal LBMC	67.8
14	PR D- & F-Canal Inlet Canal	72.7
15	PR F-Canal Center Canal	75.0
16	PR LB off RBMC	0.0
17	PR LB off LBMC	100.0

3.5 Accomplishments in Ampara Range - 1/1/91 - 30/6/92

A. Annual Maintenance Plan - Main System

Under the Gal Oya LB Scheme the development of the Annual Maintenance Plan for the Main System component was completed and finalized by 30 March 1992 including the Headworks of Senanayake Samudra, LBMC, Branch canals and Inlet canals to the Headwork for the Tanks along the canal. The Annual Maintenance Cost for the LBMC System is presented on Table III-5-1.

TABLE III-5-1

ANNUAL MAINTENANCE COST OF THE MAIN SYSTEM COMPONENT
GAL OYA LEFT BANK SYSTEM (61,750 Ac.)
(31 MARCH 1992)

	Annual Cost (Rs)
A. Headworks/Senanayake Samudra	= 215,425
B. LBMC	= 1,331,500
C. Branch Canal off LBMC	= 2,600,000
Sub-Total	= 4,146,925
Contingencies @ (7.23%)	= 299,823
Sub-Total (67%)	= 4,446,748
Dept. O/H (33%)	= 2,190,189
Total-Annual Cost	= 6,636,937
	= Rs 107.5/Ac.

The progress on the development of the Annual Maintenance Plan for the Main System Components of the Gal Oya RB was completed by 30 June 1992. By 31 March 1992, the Walk-Through Maintenance Survey and Cost Estimates and other related documents were completed for the RBMC from Station 0+000 to

20

Station 35+208. Work on the Walk-Through Survey for the intermediate Tanks and the 10 Branch canals totalling 90 kilometres was initiated in early April and completed by 31 May 1992. Annual Maintenance Cost of the Main System Components for the Gal Oya RB System as of 30/6/92 is presented on Table III-5-2.

TABLE III-5-2

AMPARA RANGE
ANNUAL MAINTENANCE COST OF MAIN SYSTEM COMPONENTS
GAL OYA RIGHT BANK SYSTEM (34,474 AC) AS OF 30/6/92

	<u>Annual Cost (Rs)</u>
A. RBMC (Km 0.0-Km 35.2)	= 1,745,000.00
B. Branch Canal off RBMC	= 2,529,000.00

Sub-Total	= 4,274,000.00
Contingencies @ (7.23%)	= 309,010.20

Sub-Total (67%)	= 4,583,010.20
Dept. O/H Indirect Costs 33%	= 2,257,303.50

Total Annual Cost	= Rs 6,820,313.70
Annual Cost per Acre	Rs 198.42/Ac.

B. Annual Maintenance Plan - Distributory Systems

The preparation of the Annual Maintenance Plans for the initial 54 DCFDs out of the total 72 DCFD on the LB and the 36 DCFDs on the RB were in progress as of 30 June 1992. As of that date, only field work in 34 DCFDs of the 54 DCFDs on the LB have been surveyed and only 11 of the 36 DCFDs in the RB surveyed. Exhibit III-5-1 presents the Status of Annual Maintenance requirements of the DCFDs in the Gal Oya RB and LB as of 30 June 1992.

C. Preventative Maintenance Program - Gal Oya Left Bank

Under the Project, a PMP is being carried out on the Gal Oya LB System in the Ampara Range. The Gal Oya LB was rehabilitated between 1980 - 1985 and the system has deteriorated during the intervening period, so a program of Preventative Maintenance Works was initiated in 1989.

The main goal of the PMP under the ISMP is to bring the System up to a condition where it will be possible to sustain the System after ISMP is over without further need for major rehabilitation by implementing the long term PMP developed under the Project.

On the Gal Oya LB PMP, the status of completion of work is presented on the following Table III-5-3 as of 30 June 1992.

TABLE III-5-3

GAL OYA LEFT BANK - PREVENTATIVE MAINTENANCE WORK

<u>SP No.</u>	<u>Description of Work</u>	<u>% Complete As of 30/6/92</u>
1	LBMC (Km 3.5;Km 24.34.3) D- canal LB-22.12 Km	73.7
2	UBC (Km 0-14);(MB (Km 0-15.4)	55.9
3	UB 7, 9, 11 & M5-4, MB, 11, 12	62.5
4	LBMC LB-2, LB1A, LB-10-12, G-4, G13	0.0
5	Kalgurai 2-3 & 3-4	81.3
6	Sananinuvai 1-2, 2-4, 4-5, 5-7, 7-8 & 9-12	63.6

CHAPTER IV

IMPLEMENTATION OF THE PREVENTATIVE MAINTENANCE PROGRAM

4.1 Introduction

It was a major achievement under the ISMP over the LOP to complete the Annual Maintenance Plans for the seven Main Systems and for 92 DCFOs out of the 201 DCFOs in the seven Schemes. It is planned that the Annual Maintenance Plans for the remaining 36 DCFOs in Gal Oya RB and the 72 DCFOs in Gal Oya LB will be completed by mid-1993 so that all 201 DCFOs will have developed their Annual Maintenance requirements for implementing the PMP.

Although this is a major achievement, it is only the beginning of the PMP. As indicated in Chapter II, there are nine steps involved in the development and implementation of the PMP. At PACD we have only partly accomplished up through Step 6 and therefore the tough part of actually implementing the PMP to be done at PACD.

This Chapter will outline the requirements that will be needed to successfully implement the Program.

4.2 Range and Division Level Responsible for Implementation

An effective and efficient organization is a primary pre-requisite for the successful implementation of the PMP. At the Range and the Division Levels the following responsibilities are:

- o MAINTENANCE ACTIVITIES HAVE TO BE THE RESPONSIBILITIES OF SEPARATE AND DISTINCT OFFICIALS IN THE ID.
- o SELECTING AND PLACING OF APPROPRIATE MAINTENANCE STAFF IN THE RANGE LEVEL AND DIVISIONAL LEVEL IS A KEY FACTOR TO SUCCESS.
- o PROVIDING DETAILED AND RELEVANT JOB DESCRIPTIONS FOR ALL MAINTENANCE STAFF.
- o ASSISTING THE PROJECT LEVEL O&M STAFF IN THE ESTABLISHMENT OF O&M FIELD UNITS.
- o LOCATIONS OF FIELD UNITS SHOULD BE ACCEPTABLE TO THE MANAGEMENT STAFF, PUBLIC AND POLICY MAKERS.
- o COMMITMENT OF ASSIGNED PERSONNEL TO CARRY OUT EFFECTIVE SUPERVISION OF IMPLEMENTATION OF PREVENTATIVE MAINTENANCE WORKS.
- o COMMITMENT TO SUPPORT AND MOTIVATE THE PROJECT LEVEL STAFF IN THE PROPER IMPLEMENTATION OF THE PREVENTATIVE MAINTENANCE PROGRAM.

- o EFFECTING PERIODIC INSPECTIONS TO CHECK ON THE WORK COMPLETED.
- o RESOLVING PROBLEMS REFERRED BY THE DIVISIONAL/FIELD UNIT STAFF PROMPTLY IN ORDER TO AVOID CONFUSION AND LACK OF ACTION.
- o PROVIDING APPROPRIATE TRAINING COURSES TO ENHANCE THE QUALITY OF MAINTENANCE SERVICES RENDERED BY THE FIELD UNITS.
- o RECOGNIZING THE MAINTENANCE SERVICE IN PAR WITH OTHER ACTIVITIES OF THE DEPARTMENT BY PROVIDING INDUCEMENTS TO MAINTENANCE PERSONNEL SO THEY WILL CONTINUE TO REMAIN IN THE IRRIGATION SYSTEMS FOR AT LEAST FOR TWO YEARS.

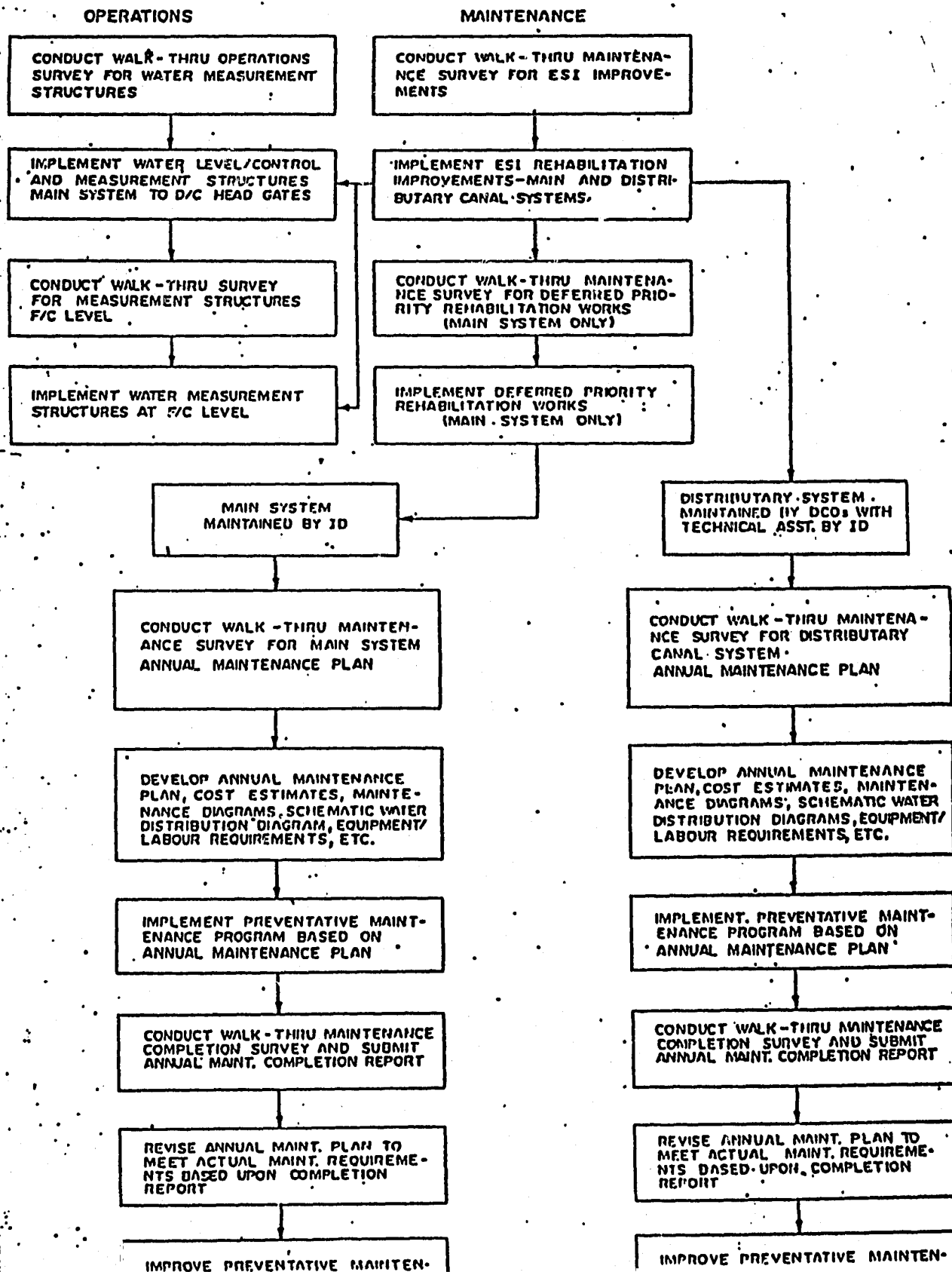
4.3 Project Level Responsibilities for Implementation

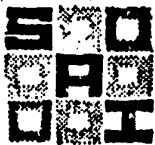
- o ACCEPTING MAINTENANCE SERVICE RESPONSIBILITIES WITH GREAT ENTHUSIASM.
- o FAMILIARIZATION OF THE COMMAND AREA WITHIN SHORTEST POSSIBLE TIME AND NOTING MAJOR MAINTENANCE SHORT-COMINGS.
- o GATHERING INTIMATE KNOWLEDGE OF THE MAIN SYSTEM COMPONENTS BY WALK-THROUGH SURVEYS.
- o REQUISITIONING ESSENTIAL TOOLS AND EQUIPMENTS FOR MAINTENANCE.
- o RECRUITING CAPABLE AND EFFICIENT MAINTENANCE CREW FOR DIFFERENT ACTIVITIES AND PLACING THEM AT STRATEGIC LOCATIONS THROUGHOUT THE SYSTEM.
- o UPDATING O&M DATA.
- o LOCATING RESOURCE CENTRES SUCH AS METAL QUARRIES / SAND PITS AND MECHANICAL UNITS.
- o IDENTIFICATION OF READILY AVAILABLE SKILLED WORKMEN WITHIN THE COMMAND AREA.
- o REGULAR FIELD INSPECTION OF PROJECT AREA BY IE.
- o REASONS FOR MAJOR DEVIATIONS FROM THE PROGRAMMED TARGETS HAVE TO BE FOUND IN CONSULTATION WITH THE EMPLOYEES AND PERSONNEL RESPONSIBLE .
- o USE OF MONTHLY PROGRESS AND COST RECORDS WHICH IS A VERY GOOD TOOL TO MONITOR MAINTENANCE ACTIVITIES SHOULD BE USED FROM INITIAL STAGE.
- o MONTHLY PHYSICAL AND FINANCIAL PERFORMANCE SHOULD BE DISPLAYED IN FIELD UNITS FOR THE REFERENCE OF THE PUBLIC CONCERNED.

4.4 Preventative Maintenance Implementation Strategies

- o PILOT AREAS TO BE ESTABLISHED WHERE IMPLEMENTATION OF PREVENTIVE MAINTENANCE WORKS ARE CARRIED OUT UNDER CLOSE SUPERVISION.
- o THESE VENUES SHOULD BE WELL MONITORED AND MAINTAINED TO CARRY OUT "ACTION TRAINING" FOR OTHER PROJECT PERSONNEL.
- o ONCE THE FINANCIAL ALLOCATION IS NOTIFIED, THE DRAFT ANNUAL MAINTENANCE PLAN HAS TO BE UPDATED BY ACCOMMODATING PRIORITY ITEMS TO MEET THE ALLOCATION.
- o PREPARATION OF ACTUAL COST ESTIMATES SHOULD BE EXPEDITED.
- o IMPLEMENT PREVENTATIVE MAINTENANCE ACTIVITIES.
- o CONTROL AND MONITOR THE IMPLEMENTATION FROM THE INITIAL STAGES TO THE COMPLETION.
- o PROPER RECORD BOOKS, NOTICE BOARDS AND OTHER INFORMATION EXCHANGE DEVICES SHOULD BE DEVELOPED AND USED.
- o PERIODIC REVIEW SESSIONS TO BE HELD WITH THE PARTICIPATION OF FARMERS AND OTHER PERSONNEL.
- o WORK EXECUTED SHOULD BE MEASURED PERIODICALLY IN THE PRESENCE OF EMPLOYEES/AGENCY WHO EXECUTED THE WORKS AND COSTING HAD TO BE DONE.

**IRRIGATION SYSTEMS MANAGEMENT PROJECT
PREVENTATIVE MAINTENANCE PROGRAM
SCHEMATIC DIAGRAM**





SHELADIA Associates, Inc.
Consulting Engineers Irrigation Systems Management Project

Riverdale
Colombo
Polonnaruwa

Rooms 2001-03, BMICH Office Complex, Bauddhaloka Mawatha, Colombo 7. Tel: 699823

21 August 1991

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

Subject: Final Report - Annual Maintenance Plan Giritala
Scheme - Main System

Dear Mr. Piyadasa:

Four copies of the Final Report for the Annual Maintenance Plan for the Giritala Scheme Main System are transmitted herewith for your information and use in initiating the Preventative Maintenance Program for the Giritala Main System. Estimating Criteria for the Headworks and Main and Branch Canals have been revised and are included in Section III of this Report. Unit Costs have been updated to July 1991 cost so that the Annual Maintenance Cost developed is current. All Exhibits have been checked and revised as necessary and are now in accordance with the Estimating Criteria and the physical characteristics of the Main System. The area of the Scheme as been up-dated based upon detailed investigation of each of the 12 DCOs in the Scheme. The latest service area was found to be 7240 Acres (2969 Hectares). The estimated total Annual Maintenance Cost for the Giritala Main System, based upon the current Estimating Criteria provided in Section III, was found to be Rs. 1,028,200 or approximately Rs. 140/Ac (Rs. 350/Ha).

The Annual Maintenance Plans for the Main Systems of Kaudulla, Minneriya and Parakrama Samudra Schemes are under final preparation and those Reports should be ready for submittal to you in September 1991.

If there is any question on the development of the Annual Maintenance Plan and Cost for the Giritala Scheme, please do not hesitate to contact me.



SHELADIA Associates, Inc.

We hope that this Report can be used to assist ID/IMD in setting the amount of the Annual Maintenance Budget needed for Giritala Main System as one of the requirements in the new Irrigation Sector Assistance Agreement with USAID and the GOSL.

Very truly yours,

A handwritten signature in cursive script, appearing to read 'C.F. Leonhardt'.

C.F. Leonhardt
Chief-of-Party
SHELADIA ASSOCIATES INC.,

Encl: S. Piyadasa - 4 Copies AMP Giritala Main System
 D. Jenkins - 1
 G.T. Jayawardena - 1
 L.T. Wijesooriya - 1
 D. W.R.M. Weerakoon - 1
 S.S. Ranatunga - 1
 MARD -1
 SAI PN - 4
 SAI HO - 1

DEMOCRATIC SOCIALIST REPUBLIC
OF SRI LANKA

MINISTRY OF LANDS, IRRIGATION
&
MAHAWELI DEVELOPMENT

IRRIGATION SYSTEMS MANAGEMENT PROJECT
USAID CONTRACT 383-0080-C-00-7035

ANNUAL MAINTENANCE PLAN
GIRITALE SCHEME MAIN SYSTEM
AUGUST - 1991

SHELADIA ASSOCIATES INC.,

ANNUAL MAINTENANCE PLAN - GIRITALE SCHEME

MAIN SYSTEM

OUTLINE

SECTION

- I. INTRODUCTION AND OBJECTIVE OF ANNUAL MAINTENANCE PLAN
- II. SCOPE OF WORK UNDER GIRITALE MAIN SYSTEM MAINT. PLAN
- III. ANNUAL MAINTENANCE PLAN ESTIMATING CRITERIA
- IV. WALK THROUGH MAINTENANCE SURVEY
- V. ANNUAL MAINTENANCE PLAN
- VI. ANNUAL MAINTENANCE PLAN QUANTITY ESTIMATE
- VII. ANNUAL MAINTENANCE PLAN COSTS
- VIII. MAINTENANCE DIAGRAM - GIRITALE MAIN SYSTEM
- IX. GIRITALE SCHEMATIC WATER DISTRIBUTION DIAGRAMS
- X. LOCATION OF DCO AREAS FOR OPERATIONS AND MAINTENANCE
- XI. CONCLUSIONS AND RECOMMENDATIONS

EXHIBIT

- V-1 ANNUAL MAINTENANCE PLAN - GIRITALE SCHEME MAIN SYSTEM
- VIII-1 GIRITALE SCHEME MAINTENANCE DIAGRAM - MAIN SYSTEM
- IX-1 GIRITALE SCHEMATIC WATER DISTRIBUTION DIAGRAM
RBMC SYSTEM A & KADAWALA Wewa SYSTEM A & B
- IX-II GIRITALE SCHEMATIC WATER DISTRIBUTION DIAGRAM
RBMC SYSTEM B & CHANDANA POKUNA SYSTEM
- X-I LOCATION OF DCO AREAS

ANNUAL MAINTENANCE PLAN - GIRITALE SCHEME

MAIN SYSTEM

OUTLINE (Cont.)

TABLES.

- III-1 ANNUAL MAINTENANCE PLAN ESTIMATING CRITERIA (2 Sheets)**
- VI-I MAINTENANCE PLAN GIRITALE MAIN SYSTEM
QUANTITY ESTIMATE (8 Sheets)**
- VII-1 TYPICAL O&M COST PER ACRE PER ANNUM FOR
GRAVITY IRRIGATION WORKS (3 Sheets)**
- VII-2 PAST O&M COST ON MAJOR IRRIGATION
SYSTEMS IN SRI LANKA**
- VII-3 ANNUAL MAINTENANCE COST OF MAJOR
IRRIGATION SYSTEMS**
- VII-4 PERCENTAGE OF ANNUAL MAINTENANCE INDIRECT COSTS**
- VII-5 SUMMARY ANNUAL MAINTENANCE COSTS
GIRITALE SCHEME - MAJN SYSTEM.**
- VII-6 ESTIMATE OF THE EXPENSES NECESSARY TO BE INCURRED
FOR ANNUAL MAINT. FLAN MAIN - SYSTEM (4'Sheets)**
- X-1 DCO SERVICE AREAS (2 Sheets)**

SECTION I

INTRODUCTION AND OBJECTIVE OF ANNUAL MAINTENANCE PLAN

I-1. INTRODUCTION

The Operation and Maintenance Improvement component of the ISMP involves the implementation of three major tasks. These three tasks involve the following:

Task 1. - Essential Structural Improvement/Fragmatic Rehab.:

This task involves the construction of water measurement and control structures; the improvement and or rehabilitation of the canals by desilting; stabilization of the canal banks by retaining walls and or dry rubble packing and the improvement to or reconstruction of old irrigation structures and the construction of new structures required to effectively operate and maintain the system.

Task 2 - System Operations:-

This task involves 1) preparation and implementation of a plan for improved system operation and 2) development of the following computer models to assist in the implementation of that plan:

- Reservoir Operation Model - To assist in pre-seasonal planning and optimum utilization of the available water resources.
- System Operation Model - For scheduling water issues and monitoring and evaluating water management operations.
- Seasonal Water Report Model - For preparation of a report evaluating the performance of the reservoir, distributary system and cultivation during the season.

Task 3 - Systems Maintenance:-

This task involves the establishment of three maintenance programs as listed below:

- 1) Annual Maintenance Plan - Each year of the Project the Annual Maintenance Plan and cost will be developed for each scheme after ESI/PR works have been completed. At the end of the Project the total Annual Maintenance Plan and relative cost will have been established for each scheme.

- 2) Priority Rehabilitation Work - A Priority Rehabilitation Survey will be prepared each year after ESI/PR has been completed. Priority Rehabilitation needs will be determined based upon the survey and cost estimates prepared. Implementation of this Priority Rehabilitation Work will be carried out each year during the LOP to ensure that the physical characteristics of the system are to a level that can be sustained indefinitely under the preventative maintenance program. Only Main and Branch Canals will be included in the Priority Rehabilitation Works.
- 3) Preventative Maintenance Program - Based upon the Annual Maintenance Plans developed during the LOP, a Preventative Maintenance Program will be established for the future. The Preventative Maintenance Cost will be determined for GOSL funding for sustained renewal of the system without future need for rehabilitation.

I-2 OBJECTIVE OF ANNUAL MAINTENANCE PLAN

Under the ISMP, the Annual Maintenance Plan and cost was to be developed over the LOP each year after ESI/PR works were implemented so by the end of the Project the total Annual Maintenance Plan and relative cost would have been established for the entire scheme. It was envisioned that the Annual Maintenance Plan would be divided in to two categories of work, namely:

- Main System. including Inlet Canal, Headworks, Tank Bund and Main and Branch Canals. The Main System to be operated and maintained by the Irrigation Department under GOSL funding.
- Distributary System, including the D-canals, F-canals and field drains. The Distributary System to be operated and maintained by the Distributary Canal Organization (DCO) responsible for those respective D and F canals.

Since Giritale Scheme is small and most of the Main and Branch Canals had been rehabilitated under the 1987, 1988 and 1989 ESI program it was decided to develop the Annual Maintenance Plan for the Main system of the Giritale Scheme with the overall objective to establish the cost necessary for the Irrigation Department to sustain the Main System under the Preventative Maintenance Program after the ISMP is over.

This Report therefore presents the Annual Maintenance Plan for the Giritale Main System to be operated and maintained by the ID.

The Annual Maintenance Plan for the twelve DCOs in the Giritale Scheme will be developed individually for each DCO. These will be submitted under separate reports for each DCO.

SECTION II

SCOPE OF WORK UNDER GIRITALE MAIN SYSTEM MAINTENANCE PLAN

The Annual Maintenance Plan for the Giritale Main System includes the following seven sections of the system:

- A. The Inlet Canal to Giritale Tank (Inlet Regulator to km 4+700)
- B. The Giritale Tank Bund, Sluice and Spillway
- C. Right Bank Main Canal to Dambalawewa (km 0+000 to km 5+922)
- D. Dambalawewa Tank Bund, Sluice and Spillway
- E. Right Bank Main Canal below Dambalawewa to Chandana Pokuna (km 6+500 to km 15+460)
- F. Chandanapokuna Tank Bund, Sluice and Spillway.
- G. D-6 Canal from RBMC to Kadawala Wewa, Tank Bund, Sluice and Spillway.

Although the Right Bank Main Canal below Dambalawewa beyond km 12+794 is a D-Canal, it is recommended that this section of the RBMC up to Chandana Pokuna be included under the Main System Maintenance Plan as it supplies Chandana Pokuna Reservoir. Also, the Chandana Pokuna Tank Bund, Sluice and Spillway will be included in this Plan.

Likewise, the D-6 Canal supplies Kadawalawewa Tank. Therefore it is recommended that the D-6 Canal be included under the Main System Maintenance Plan from its off-take to Kadawalawewa (km 0+000 to 3+260) along with the Kadawala Wewa Tank Bund, Sluice and Spillway.

The above 'cut-off' points were decided on the basic criteria used in the ISMP for deciding Main System and D and F Canal Systems. Also, the operational strategies of the whole system which would be recommended for implementation have been taken into consideration.

SECTION III

ANNUAL MAINTENANCE PLAN ESTIMATING CRITERIA.

Quantities for developing the Annual Maintenance Plan and Cost are based upon the estimating criteria established for the ISMP and shown on Table III-1, (2 sheets). Sheet 1 of 2 presents the Headwork Criteria and sheet 2 of 2 presents the Main and Branch Canal Criteria.

**ANNUAL MAINTENANCE PLAN MAIN SYSTEM ESTIMATING CRITERIA
HEADWORKS**

<u>Type of Maintenance</u>	<u>Frequency of Maint.</u>	<u>Unit Rate</u>	<u>Estimating Criteria</u>
<u>TANK BUND/ANICUT STRC/INLET CANAL</u>			
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 Graveling 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
<u>SLUICE STRUCTURE/GATES/LIFTING MECHANISM</u>			
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
<u>SPILL STRUCTURES/GATES/LIFTING MECHANISM/TAIL CHANNEL</u>			
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

AMPESTMS

36

ANNUAL MAINTENANCE PLAN MAIN SYSTEM ESTIMATING CRITERIA
MAIN AND BRANCH CANALS

Type of Maintenance	Frequency of Maint.	Unit Rate	Estimating Criteria
1 Weeding along 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

AMPMAINS

SECTION IV
WALK THROUGH MAINTENANCE SURVEY

The walk through maintenance survey provides three objectives depending on the status of ESI accomplished, as follows:

1. If ESI has not been completed the walk through maintenance survey provides a means to determine the existing type, number and length of structures and the additional new works that should be included in the ESI work program.
2. If ESI has been completed the walk through maintenance survey provides a means of determining the number and length of existing structure and those newly constructed structures under ESI.
3. If ESI has been completed the walk through maintenance survey provides a means to determining if additional works are required that were left out of the original ESI work resulting in the requirements for Deferred Priority Rehabilitation Program after ESI.

The walk through maintenance survey should be conducted by the T.A. responsible for that section of the canal system in coordination with the Consultants O&N Engineer or Engineering Assistant. In the case of the Giritale Main System, the Consultant's O&N Engineer made the survey with the ID/TA staff.

For the Giritale Scheme, in order to establish the Annual Maintenance Plan for the Main System, it was necessary to walk the canals and survey the state of maintenance and condition of the existing structures and canal banks. Although most of the canals involved in the Main System had been rehabilitated under the 1987, 1988 and 1989 ESI work program, some had yet to be rehabilitated and ESI works remain to be done.

This maintenance survey listed all of the various structures along the canal and their condition noting if repairs are required or if new structures or protective works were needed. The number, type and or length of structures including regulators, drops, turnouts, canal profiles, bridges, drainage crossings, spills, checks, dry rubble packing, rubble pitching, retaining or toe walls and bathing steps were noted during the survey to establish the extent and magnitude of the maintenance to be carried out. In addition the length and width of unpaved roads were determined for establishing the amount of gravel to be applied annually. The length of the canals were taken from the ID issue trees and checked by ESI survey data. The average width of the canals were determined during the survey for desilting and dewatering purpose. The lengths and width of tank bunds, number of sluice gates, spillways, and other facilities were also recorded during the walk through maintenance survey.

Field notes providing all data collected during the walk through survey have been recorded in bound field books and are available for reference.

SECTION V

ANNUAL MAINTENANCE PLAN

The Annual Maintenance Plan for the Giritale Main System is presented on Exhibit V-1 and includes the following:

- Component or reach of the scheme to be maintained
- Item/quantity number of work
- Length of bund/canal/number of structures, etc,
- Description of the work 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 man 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 items of maintenance may be required and the Plan should be modified accordingly.

SECTION VI
ANNUAL MAINTENANCE PLAN QUANTITY ESTIMATES

The quantities for the Annual Maintenance Plan have been developed from the Annual Maintenance Plan Estimating Criteria as presented under Chapter III.

The estimated annual maintenance quantities for the seven maintenance sections of the Giritale Main System are presented on Table VI-1, sheets 1 to 9 inclusive, and correspond to the item number and the quantities shown on the Annual Maintenance Plan, Exhibit V-1.

1. CLEANING/WEEDING LB BUND AND BANK (twice a year)
L= 4.7km A= 4,700m x 15m wide/10,000 m²/ha = 7.0ha x 2=14.0ha
2. GRAVELING ACCESS ROAD (once a year)
L= 4.7km V= 4.7km x 25m³/km = 117.5m³ Say 120m³
3. REPAIR TO CANAL BUND WITH EARTH FILLING (Once a year)
V=4.7km x 15m³/km = 70.5m³ Say 75m³/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 = 18,800m²/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=660m³ Say 660m³/yr
7. REGULATOR INLET STRUCTURE (once in 5 years)
Repairs: 10m³ 1:3:6 conc. every 5 years V= 2m³/yr
8. REPAIRS TO RUBBLE PITCHING (once a year)
A= 6 x 20m x 2m wide = 240m² Assume 10% of
Area requires repairs: A= 240 x 0.10 = 24m²
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=1.0m³/5yr x 2 Bridge = 0.40m³/yr Say 0.5m³/yr
11. REPAIRS TO T.O. STRUCTURES 1:3:6 Con. (once in two years)
No. Structure 5 EA (6 Gates)
V=0.75m³/2 x 5 = 1.875 Say 2.0m³/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 = 5m³/5 = 1.0m³/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

TABLE VI-1

Sheet 2 of 9

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 m²/ha = 3.575 x 2 x/year = 7.15 ha/yr
2. REPAIRS TO RIP RAP PROTECTION (once a year)
L=550m; @ 3m³ /km/Yr = 1.65m³ /Yr.
3. EARTH EXCAV/BORROW &/E.F. SCoured SECTIONS (once a year)
L=550m V = 0.55km x 30m³/km = 16.5m³/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 = 6m² x 4 x 2 = 48m² Wash coats
8. PAINTING STAFF GAGE ON SLUICE WALLS (once a year)
1 No.
9. UNGATED SPILLWAY - CLEANING U/S & D/S
APPROACH AND TAIL CHANNELS (once a year)
L= 40m V= 40m³/yr
10. REPAIRS TO SPILLWAY STRUCTURES WITH 1:3:6 CONC. (once in 5 years)
2.0 m³/5 Yrs/Struc = 0.4 m³/Yr/Struc. Say = 0.50 m³/Yr.
V = 50/5yrs = 10m³/yr
11. REPLACEMENT OF SPILL STOP LOGS (once in 3 years)
3 BAYS x 0.5m x 1.25m = 1.875 Say 2m²/3yr.
Low Level Spill 0.67m²/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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112

ANNUAL MAINTENANCE PLAN - GIRITALE
 QUANTITY ESTIMATE

TABLE VI-1

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/10,000m²/2 = 11.8 Say 12ha/yr
2. REPAIRING CANAL BUND W/EARTH FILLING (ONCE A YEAR)
 V = 5.9km x 15m³/km = 88.5m³ Say 90m³
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 = 1327.5m³ Say 1330m³/2yrs
 V = 665m³/year
4. GRAVELLING UNPAVED ROADS (once a year)
 L = 5.9km V = 5.9km x 25m³/km = 147.5m³ Say 150m³
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 = 7080m²/yr Say 7100m²/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
- REPAIRS TO DRY RUBBLE PACKING (once in two years)
 L = 20m Width = 2.0m
 Area = 20 x 2.0 = 40.0m²/2 yrs = 20m²/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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ANNUAL MAINTENANCE PLAN - GIRITALE MAIN SYSTEM
QUANTITY ESTIMATE

TABLE VI-1

Sheet 4 of 9

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

10. REPAIRS TO RUBBLE PITCHING 1:3mix (once a year)

$$L = 5+10 = 15m$$

$$\text{Area} = 15m \times 2m = 30m^2$$

Assume 10% Requires repairs

$$A = 30 \times .10 = 3.0m^2$$

11. LUBRICATION OF T.O. STRU. GATES (4 x A YEAR)

No of gates 12 each

$$12 \text{ Gates} \times 1/2kg/gate \times 4 \text{ times/year} = 24kg/year$$

12. APPLICATION OF ANTI-CORROSION PAINT
ON GATES/GATE STRUCTURES (ONCE A YEAR)

$$12 \text{ GATES} \times 1/2LT/GATES = 6LTS.$$

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

$$4 \text{ spills} = 1 \text{ set/year}$$

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

$$4 \text{ SPILLS} @ 25m^3/Str. = 100m^3$$

15. PAINTING, NUMBER AND STATION ON STRUCTURES.

$$24 \text{ Nos} \times 0.1 \text{ Lts/STRUCT} = 2.4 \text{ Lts. Say} = 2.5 \text{ Lts/Yr.}$$

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ANNUAL MAINTENANCE PLAN - GIRITALE MAIN SYSTEM
QUANTITY ESTIMATE

TABLE VI-1

Sheet 5 of 9

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 = $50 \times 770 / 10,000 = 3.85 \text{ ha} \times 2 = .7.7 \text{ ha/yr}$

2. REPAIRS TO RIP-RAP SLOPE PROTECTION (ONCE A YEAR)

L = 770m ; @ 3 m³/km = 0.77 x 3 = 2.31 m³/Yr . Say 2.5 m³/Yr.

3. EARTH EXCAV/BORROW W/EARTH FILLING SCOUR SECTIONS OF BUND(ONCE A YEA

L = 770 Vol = 0.77 x 30 m³/km = 23.1 m³

4. REMOVAL OF ANT HILLS ALONG BUND (ONCE A YEAR)

@ 3 Hills/km = 3 x 0.77 = 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 = 32m²

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
2.0m³/5Yrs = 0.4m³/yr Say 0.5M³/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 @ 1.0m³/m = 80m³/Year

12. GRAVELLING ON UNPAVED SECTION OF BUND (ONCE A YEAR)

L = 300m = 0.30km x 30m³/km = 9.0 m³/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

TABLE VI-1
 Sheet 6 of 9

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

1. WEEDING/CLEARING ALONG CANAL BUND (Twice a year)
 L = 8.960km Say 9.0 km
 Area = 9.0km 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 15m³/km/Yr = 135m³ Say 135m³/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 = 670m³/2Yr = 335m³/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 = 10,800m²
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 = 694m² Assume 10% of gross area require
 repairs A = 694m²x.10 = 69.4 Say 70.0m²
8. REPAIRS TO DRY RUBBLE FACKING (ONCE IN TWO YEARS)
 L = 929m Avg. width = 2.0m
 A = 929x2 = 1858m²/2Yrs = 929 Say 930m²/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 ³ /yr
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.

46

ANNUAL MAINTENANCE PLAN - GIRITALE MAIN SYSTEM
QUANTITY ESTIMATE

TABLE VI-1
Sheet 7 of 9

F. CHANDANA POKUNA TANK/SLUICE/SPILLWAY

1. CLEARING/WEEDING NEED (twice a year)
 $L = 500m \times 10m = 5000m^2/10,000m^2/ha = 0.5ha \times 2 = 1.0ha/yr$
2. REPAIRS TO RIP-RAP PROTECTION (ONCE A YEAR)
Length=0.50km ; @ $3.0 m^3/km$; $V = 0.5 \times 3m^3/Yr. = 1.5 m^3/Yr.$
3. EARTH EXCAVATION/BORROW W/E.F. (ONCE A YEAR)
 $0.50km \times 30m^3/yr/km = 15m^3/yr$
4. Removal of Ant Hills
 $3 \text{ Ant Hills}/km \times 0.5 = 1.5 \text{ Ant Hills}/yr$ Say $2.0 \text{ Ant Hills}/yr$
5. GRAVELLING UNPAVED BUND ROAD (ONCE A YEAR)
 $0.50km @ 30m^3/km = 15.0 m^3/Yr.$
6. REMOVAL OF DEBRIS D/S OF SPILL CHANNEL (ONCE A YEAR)
 $1.0m^3/L.M \text{ Spill} = 1.0 \times 10 = 10m^3$

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 = $7.5 \times 3260m/10,000 = 2.445ha \times 2 = 4.89ha$ Say $5.0ha$
2. REPAIR CANAL BUND W/EF (ONCE A YEAR)
 $L = 3.26km$ $V = 3.26km \times 25m^3/km = 81.5m^3$ Say $85m^3$
3. DESILTING ALONG CANAL (ONCE IN 2 YEARS)
 $L = 3.260m$ (Heavy desilting reqd.)
 $W = 2.0m$ $V = 2.0 \times 3260 \times 0.075 \times 0.50 = 245m^3$
50% of length Say $250m^3/2yr = 125m^3/yr$
4. GRAVELLING ACCESS ROAD ALONG CANAL BUND (once a year)
 $L = 3.26km$ $V = 3.26km \times 25m^3/km = 81.5m^3$ Say $85m^3$
5. REMOVAL OF WATER PLANTS ALONG CANAL (ONCE A YEAR) 20% OF LENGTH
 $A = 3,260 \times 4 \times 0.20 = 2608m^2$ Say $2600m^2$
6. REMOVAL OF ANT HILLS ALONG CANAL BUND (ONCE A YEAR)
 $3 \text{ Hills}/km \times 3.26 = 9.78$ 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)
 $L = 5m$ $A = 2m \times 5m = 10m^2 \times 10 = 1.0m^2$ Net
Assume 10% of Gross Area Requires repairs.

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ANNUAL MAINTENANCE PLAN - GIRITALE MAIN SYSTEM
 QUANTITY ESTIMATE

TABLE VI-1

Sheet 8 of 9

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.	$1 \times 0.25 \times 5 = 0.05$
Bridges	3	Every 5 yrs.	$3 \times 1.0/5 = 0.60$
Spills(Minor)	2	Every 5 yrs.	$2 \times 0.25/5 = 0.10$
Spills(Major)	1	Every 5 yrs.	$1 \times 1.0/5 = 0.20$
Regulators	1	Every 5 yrs.	$1 \times 2.0/5 = 0.40$
T.O. Struc.	7	Every 2 yrs	$7 \times 0.75/2 = 2.63$
	15	Total	$= 3.98 \text{m}^3$ Say $4.0 \text{m}^3/\text{yr}$

10. LUBRICATION TO GATES (4 x A YEAR)

No. Gates = $7 \times 1/2 \text{kg/Gate} \times 4 = 14 \text{kg/yr}$

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

7 GATES $\times 1/2 \text{ LTS/GATE} = 3.5 \text{LTS}$ Say 4 Lts/yr

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

Spill = 4 sets
 Regulators = 2 Sets

$6 \text{ Sets}/4 = 1.5 \text{ Sets/Yr}$

13. KADAWALA BUND CLEARING/ WEEDING (TWICE A YEAR)

$L=1150\text{m} \times 20\text{m} = 23,000 \text{m}^2/10,000 = 2.3 \text{ ha} \times 2 = 4.6 \text{ ha/Yr.}$

14. CLEANING D/S SPILL CHANNELS (ONCE A YEAR)

$L = 20+20+10 = 50 \text{ LM} \times 1.0 \text{m}^3/\text{m} = 50 \text{m}^3/\text{Yr.}$

15. REPAIRS TO TANK BUND W/EARTH FILLING (ONCE A YEAR)

$30 \text{m}^3 \times 1.15 \text{km} = 34.5 \text{m}^3$ Say $35 \text{m}^3/\text{yr.}$

16. GRAVELLING TANK BUND (ONCE A YEAR)

$L = 1.15 \text{KM} \times 30 \text{m}^3/\text{km} = 34.5 \text{m}^3$. Say $35 \text{m}^3/\text{yr}$

17. REMOVE ANT HILLS ALONG TANK BUND (ONCE A YEAR)

$3 \text{ Hill/km} \times 1.15 \text{km} = 3.45$ Say 4 Ant Hills/yr

18. CLEANING GATE GROVES/PAINT GATES/GUIDES(ONCE A YEAR)

W/Anti-Crossion paint
 $2 \text{ Gates} \times 3 \text{ Lts/Gate} = 6 \text{ Lts/yr}$

19. PAINTING/WHITE WASHING SLUICE STRUCTURE (2 COATS) (ONCE A YEAR)

$A = 2\text{m} \times 2\text{m} = 4 \text{m}^2 \times 3 \times 2 \text{ coats} = 24 \text{m}^2$

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ANNUAL MAINTENANCE PLAN - GIRITALE MAIN SYSTEM
QUANTITY ESTIMATE

TABLE VI-1
Sheet 9 of 9

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)

$L = 90m \times 1.0m^3/lm = 90m^3$

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.

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SECTION VII

ANNUAL MAINTENANCE COST

The development of the annual maintenance cost involves three major components namely:

- (1) The direct cost of labor, materials and equipment for maintenance
- (2) The indirect cost of supervision, drivers/operators, travel, fuel, depreciation of equipment and vehicles and administration and departmental overheads.
- (3) A contingency cost

The cost of item (1) can be directly identified with respect to the work, materials and equipment required to perform the maintenance and therefore easily determined on the basis of quantity estimates and unit costs of materials, equipment and labor.

The cost of item (2) involves a detailed analysis in order to establish what various additional costs are required by the Irrigation Department to implement the Annual Maintenance Plan for the Main and Branch Canal System of the Giritale Scheme.

In 1982 such an analysis of the typical O&M costs of gravity irrigation systems was made by the Irrigation Department on 16 selected schemes in the country (one from each Range). Summary copies of this analysis is presented on Table VII-1 (3 sheets). That analysis has recently been up-dated to 1988 costs by IMD and is presented on Table VII-2. Based upon this up-dated analysis, using 1988 costs, the following annual maintenance cost per acre and the percentage of each item of maintenance to the total annual maintenance cost is summarized on Table VII-3 below:

TABLE VII - 3
ANNUAL MAINTENANCE COST OF
MAJOR IRRIGATION SYSTEMS.

<u>Type of Maintenance Cost</u>	Annual Maint. Cost (1988)	Percentage %
(1) Maintenance Labor	133.25	47.64
(2) Supervision	7.98	2.85
(3) Drivers/Operators	5.69	2.03
(4) Travel & Bata Allowances	2.03	0.73
(5) Fuel/Repairs to Vehicles	11.64	4.16
(6) Material/Tools/Equipment	33.37	11.93
(7) Physical Contingencies	20.21	7.23
(8) Admin. and Dept. Overheads	26.50	9.48
(9) Depreciation Vehicles/ Equipment	39.80	13.95
Total	Rs. 279.67/ac	100.00%

The information given on the table above is considered to be the best available in Sri Lanka to establish the most realistic annual maintenance cost for major irrigation systems. Therefore, using the percentages listed above, the direct maintenance costs would involve item (1) Maintenance labor and Item (2) Materials, tools and equipment resulting in a total of 47.64 + 11.93 or 59.57% of the annual cost. Adding contingencies of 7.23% to that amount would provide a direct annual maintenance cost of 66.80% or approximately 67% of the total annual cost. Therefore the additional indirect costs required by the ID for Annual Maintenance would be 33% as taken from the above analysis and shown on Table VII-4 below:

TABLE VII - 4
PERCENTAGE OF ANNUAL MAINTENANCE
INDIRECT COSTS

<u>Type of Maintenance Cost</u>	<u>% Of Annual Maintenance</u>
(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%

Based upon the above analysis and percentages the Annual Maintenance cost for the Giritale Main System has been developed using the actual direct maintenance costs for labor, materials and equipment then adding 7.23% contingencies to obtain the total direct annual maintenance cost for the system. To that amount 33% has been added for ID departmental overheads, administration and other indirect costs involved in implementing the Annual Maintenance Plan.

The Hingurakgoda Division office provided the unit costs for each item of maintenance for the Giritale Main System and those unit costs have been up-dated to July 1991 costs.

The detailed Annual Maintenance cost estimate for the Giritale Main System is presented on Table VII-6 (4 sheets) and is summarized below on Table VII-5.

TABLE VII - 5
SUMMARY ANNUAL MAINTENANCE COSTS GIRITALE SCHEME
MAIN SYSTEM

<u>WORK AREAS</u>	<u>TOTAL ANNUAL COST (RS.)</u>
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

TABLE VII - 1
Sheet 1 of 3

TYPICAL O&M COSTS PER AC. PER ANNUM FOR GRAVITY IRRIGATION WORKS (1982 PRICES)

(Based on analysis of 1981 performance in 16 selected schemes at one per Range)

Description	Quantity	Manpower		Unit Rate Amount		Labour in ad 1/		
	2	Output/day	Daily Wage	in Rs.	in Rs.	Regular	Casual	
		3	4	5=4/3	6=2x5	7=6/4	8=6/4	
A LABOUR								
1. To Attendants including + 10% to cover headworks								
	1.0 ac	500ac/360	32.00 a/	25.40	25.40	0.79	--	
2. Weeding								
	28.0 sq	25.0 sq	28.50 b/	1.14	22.00	0.80	--	
3. Removal of salvinia								
	2.0 sq	12.0 sq	28.50	2.38	4.75	--	0.17	
4. Desilting								
	0.5 cu	0.5 cu	28.50	57.00	28.50	--	1.00	
5. Filling scours								
	6.15 ad	1.0 ad	28.50	28.50	4.28	0.15	--	
6. Repairs to structure								
	0.10 ad	1.0 ad	62.39 c/	62.39	6.24	0.10	--	
7. Spreading gravel								
	0.2 sq	10.0 sq	28.50	2.85	0.57	0.02	--	
Total for A					92.54	1.86	1.17	38.9%
B SUPERVISION								
Work Supervisor								
	1.0 ac	2500 ac/360	35.00	5.84	5.84	--	--	
3.2%								
C DRIVERS AND OPERATORS								
1. Drivers of jeeps, lorries, tippers @ 4% of Labour cost in A								
	1.0 ac	--	--	3.70	3.70	--	--	
2. Operators of farm tractors @ 2% of Labour cost in A								
	1.0 ac	--	--	1.85	1.85	--	--	
					5.55		3.5%	
D TRAVELLING & COMBINED ALLOWANCE								
1. Work Supervisor - 3600 mls m/c @ Rs.1/= plus 48 days @ Rs. 45/=								
	1.0 ac	2500ac/360	16.00	2.30	2.30	--	--	
2. To Attend - Bicycle allowance @ Rs. 16/= per month								
	1.0 ac	500ac/360	0.63	0.38	0.38	--	--	
					2.68		1.7%	
E FUELS & REPAIRS TO VEHICLES								
1. Fuel for jeeps, lorries, tippers and farm tractors								
	0.25 gal	--	--	28.00	7.00	--	--	
2. Repairs to vehicles @ 50% of fuel cost								
	1.0 ac	--	--	3.50	3.50	--	--	
3. Overtime for Drivers and Operators @ 0.5% of item 1								
	1.0 ac	--	--	0.35	0.35	--	--	
					10.85		6.9%	

TABLE VII - 1
Sheet 2 of 3

TYPICAL O&M COSTS PER AC. PER ANNUM FOR GRAVITY IRRIGATION WORKS (1982 PRICES)

(Based on analysis of 1981 performance in 16 selected schemes at one per Range)

Description 1	Quantity 2	Manpower		Unit Rate Amount		Labour in rd /		
		Output/day 3	Daily Wage 4	in Rs. 5=4/3	in Rs. 6=2x5	Regular 7=6/4	Casual 8=6/4	
F PURCHASE OF MATERIALS AND TOOLS								
1. Cement	0.1bg	--	--	82.75	0.28			
2. Sand	0.005cu	--	--	216.00	1.08			
3. Metal	0.005cu	--	--	526.00	2.63			
4. Rubble	0.005cu	--	--	461.00	2.31			
5. Gravel	0.05cu	--	--	228.00	11.40			
6. Paints	0.005gl	--	--	325.00	1.63			
7. Gunnybags	0.15bag	--	--	15.00	2.25			
8. Cane baskets	0.05No	--	--	8.00	0.40			
9. Miscellaneous materials @ 5% of items 1 to 8	1.0ac	--	--	1.50	1.50			
10. For replacement of tools @ 5% of items 1 to 8	1.0ac	--	--	1.50	1.50			
					32.98		21.0%	
G PHYSICAL CONTINGENCY at 5% of items A to F 1.0ac								
				7.48	7.48	--	4.8%	
Base cost for O&M per ac per annum					157.12 say Rs. 157.00		100.0%	
Total of items A to G								

H ADMINISTRATION AND OVERHEADS

Description	Annual Salary in Rs.	No.	Range	Division
			Amount in Rs.	No. Amount in Rs.
DD	38,000	1	38,000	--
SIE	25,000	1	25,000	--
IE	22,000	1	22,000	1 22,000
AO	28,000	1	28,000	--
Acct	24,000	1	24,000	--
HC	12,500	1	12,500	1 12,500
Clerks & Typists	18,500	12	126,000	7 73,500
Minor Employees	8,000	5	48,000	3 24,000
DOA	28,500	1	28,500	--
Draughtsman	18,500	5	92,500	2 21,000
DA	18,000	--	---	1 18,000
			388,500	171,000

Note:- The administration costs tabulated on the left hand side are apportioned equally for "Investigation, Design and Construction" and "Operation and Maintenance" respectively.

COST&TL

TYPICAL O&M COSTS PER AC. PER ANNUM FOR GRAVITY IRRIGATION WORKS (1982 PRICES)

(Based on analysis of 1981 performance in 16 selected schemes at one per Range)

Description	Quantity	Output per annum	Annual Cost in Rs.	Unit Rate in Rs	Amount in Rs.
1. Technical Assistants	1.0ac	5,000acs	14000	2.8	2.8
2. Administration & OH of Range Office	1.0ac	40,000acs	190250	4.76	4.76
3. -- do - - do - Divisional Office	1.0ac	12,000acs	85500	7.13	7.13
4. Travelling, CA, O/T and repairs @ 20% of items 1 to 3	1.0ac	--	--	2.94	2.94
5. Physical Contingency @ 5% of items 1 to 4	1.0ac	--	--	0.88	0.88
Adm. and OH cost for O&M per acre per annum					18.51 Say Rs. 18.50

DEPRECIATION OF VEHICLES AND EQUIPMENT

3 Jeeps, 1 Lorry and 5 Farm Tractor trailers are required for O&M for 15,000 acs
Assumed depreciation period is 5 years
Average Investment Cost (AIC) = 0.6 Capital Cost
Insurance is 1% of AIC
Depreciation per annum is as below:

	3 Jeep	1 Lorry	5 T/Trailers
Fixed Cost	90,000	47,000	155,000
Insurance	2,700	1,410	4,650
OH at 10%	9,270	4,841	15,965
	101,970	53,251	175,615

1. Depreciation cost of Jeep	1.0ac	6.80	6.80
2. - do - Lorry	1.0ac	3.55	3.55
3. - do - tractor trailers	1.0ac	11.71	11.71
4. - do - miscellaneous items @ 5% of 1 to 3	1.0ac	1.10	1.10
5. Contingency at 5% of 1 to 3	1.0ac	1.10	1.10
Depreciation Cost for O&M per ac. per annum			24.26 say Rs. 24.50
TOTAL O&M COST PER AC. PER ANNUM			Rs. 200.00

1) ad = man day

a) Semi-skilled wage (32.00) b) Unskilled wage (20.50) c) Skilled wage (33.89) unskilled wage (20.50)

Source-

Irrigation Department

March 1983

COST6TL

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

TABLE VII-2

	(1) 1982 cost	(2) Percen- tage	(3) 1988 Cost	(4) Percen- tage	(5) Oper- ation	(6) Percen- tage	(7) Maint- enance	(8) Percen- tage
Maintenance Labour	92.54	46.27	185.11	48.88	51.86	49.24	133.25	47.64
Supervision	5.84	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 & Con. allow.	2.68	1.34	3.63	0.94	1.68	1.52	2.03	0.73
Fuel & Repairs to Vehicles	18.85	5.43	15.36	3.99	3.72	3.53	11.64	4.16
Purchase of Materials & Tools	32.98	16.49	37.87	9.63	3.78	3.51	33.37	11.93
Physical Contingencies	7.48	3.74	24.15	6.27	3.94	3.74	28.21	7.23
Administration & Overheads	18.58	9.25	48.88	18.39	13.58	12.82	26.58	9.48
Depreciation of Vehicles & Equip.	24.38	12.18	68.88	15.58	21.88	19.94	39.88	13.95
	288.88	188.88	385.88	99.99	185.33	188.88	279.67	188.88

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 dated to 1988 prices.

MCOSTL

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	ANNUAL MAINT.		DESCRIPTION OF WORK ITEMS	COST OF EACH ITEM OF WORK	
	SUBQUANTITIES	UNITS		UNIT RATE	TOTAL ITEM COST
				Rs. Cts	Rs.Cts.
A. INLET SUPPLY CANAL					
1	14.00	HA	Weeding/cleaning bund/bank (Twice a year 7 ha)	3,079.00	43,106.00
2	120.00	M ³	Gravelling access road (once a year)	125.50	15,060.00
3	75.00	M ³	Repairs to canal bund W/EF (once a year)	99.45	7,450.75
4	18880.00	M ²	Removal of water plants from canal (once a year)	1.50	28,200.00
5	15.00	Hos	Removal of ant hills along canal (once a year)	200.00	3,000.00
6	660.00	M ³	Desilting along canal (once in 4 years-2640M ³)	50.50	33,330.00
7	2.00	M ³	Repairs to inlet regulator (once in 5 years-10M ³)	2,000.00	4,000.00
8	24.00	M ²	Repairs to rubble pitching (once a year)	202.00	4,848.00
9	200.00	M	Repairs to retaining walls (once a year)	5.00	1,000.00
10	0.50	M ³	Repairs to bridges (once in 5 years-2.5M ³)	2,000.00	1,000.00
11	2.00	M ³	Repair to TD Struc. (once in 2 years-4 M ³)	2,000.00	4,000.00
12	24.00	Kg	Lubrication of Regulator Gates (4 x a year-6kg)	100.00	2,400.00
13	12.00	Kg	Lubrication of T.O Gates (4 x a year-3kg)	100.00	1,200.00
14	10.00	LTS	Anti-corrosion paint on gates (once a year)	130.00	1,300.00
15	1.00	Set	Stop logs for Div. Weir (once in 4 years - 4 sets)	2,000.00	2,000.00
16	1.00	M ³	Repairs to Div. Weir (once in 5 years-5M ³)	2,000.00	2,000.00
17	2.00	LTS	Painting, Number and Station on structures (once a year)	150.00	300.00
				Sub total A	154,202.75
B. GIRITALE TANK/SLUICE/SPILLWAY					
1	7.15	HA	Weeding/Clearing Giritale Tank Bund (Twice A Year - 3.575 HA)	3,079.00	22,014.05
2	1.65	M ³	Repair to Rip Rap Protection (Once A Year)	400.00	660.00
3	16.50	M ³	Earth Excavation/Burrow W/E.F (Once A Year)	99.45	1,640.93
4	2.00	Nos.	Removed of Ant Hills (Once A Year)	200.00	400.00
5	16.00	KG.	Lubrication of Sluice Gates (4 x year - 4 Kg)	100.00	1,600.00
6	4.00	LTS.	Cleaning Gate Grooves/Paint Gates/Guide (Once A Year)	130.00	520.00
7	48.00	M ²	Paint Sluice Struc. White Wash (Once A Year)	7.00	336.00
8	1.00	No.	Painting Staff Gage on Sluice (Once A Year)	500.00	500.00
9	40.00	M ³	Clearing U/S & D/S Spilling Chl. (Once A Year)	65.00	2,600.00
10	0.50	M ³	Repairs to Spillway Structure with 1:3:6 conc.(Once in 5 Yrs.)	2,000.00	1,000.00
11	1.00	Set	Replacement to Spill Stoplogs (Once in 3 Years - 3 Sets)	1,500.00	1,500.00
12	0.50	Lts	Painting, Number and Station on structures (once a year)	150.00	75.00
				SUB TOTAL B	32,046.78
				Total Sheet 1	187,049.53

INATE.WK1

51

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	ANNUAL MAINT.			DESCRIPTION OF WORK ITEMS	COST OF EACH ITEM OF WORK	
	SUB-ITEM	QUANTITIES	UNITS		UNIT RATE Rs. Cts.	TOTAL ITEM COST Rs.Cts.
				C. RBMC - ABOVE DAMBALA WENA (KM 0+880-KM 5+922)		
	1	12.00	HA	Weeding/Clearing along Canal Bund (Twice A Year - 6.0 HA)	3,079.00	36,948.00
	2	98.00	M3	Repairing Canal Bund W/Earth Fill (Once A Year)	99.45	8,950.50
	3	665.00	M3	Desilting along Canal (Once in Two Years - 1330 M3)	50.50	33,592.50
	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	10.00	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 Rubble 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 WENA TANK,SLUICE/SPILLWAY		
	1	7.70	HA.	Weeding/Clearing Dambara Tank Bund (Twice A Year - 3.85 HA)	3,079.00	23,788.30
	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	0.00	KG.	Lubricate Sluce Gate (4 x year - 2 Kg)	100.00	000.00
	6	2.00	LTS.	Cleaning Gate Grooves/Paint Gates/Guide (Once A Year)	130.00	260.00
	7	32.00	M2	Paint Sluce Structure (Once A Year)	7.00	224.00
	8	1.00	Nos.	Painting Staff Gage on Sluce 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 - 6 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	40,936.05
					Total sheet 2	187,150.05

ESTIMATE.WK1

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

Sheet 3 of 4

SPECIFICATION	ANNUAL MAINT.	QUANTITIES	UNITS	DESCRIPTION OF WORK ITEMS	COST OF EACH ITEM OF WORK	
					UNIT RATE	TOTAL ITEM COST
					Rs.	Cts.
E. RBMC BELOW DAMBALA NEMA TO CHANDANA POKUNA (6+500 - 15+460)						
1	83.50	1HA		Weeding/Clearing Canal Bund (Twice A Year 6.75 HA)	3,079.00	41,566.50
2	135.00	1M3		Repairing Canal Bund W/Earth Fill (Once A Year)	99.45	13,425.75
3	335.00	1M3		Desilting along Canal (Once in Two Years - 670 M3)	50.50	16,917.50
4	10000.00	1M2		Removal of Water Plants along Canal (Once A Year)	1.50	16,200.00
5	27.00	1Nos.		Removal of Ant Hills along Canal (Once A Year)	200.00	5,400.00
6	722.00	1M		Repairs to Retaining Walls (Once A Year)	5.00	3,610.00
7	70.00	1M2		Repairs to Rubble Pitching (Once A Year)	202.00	14,140.00
8	930.00	1M2		Repairs to Dry Rubble Packing (Once Every 2 Years - 1860 M2)	6.00	5,580.00
9	19.00	1M3		Repairs to Structures (65 Nos) (Sequence Varies)	2,000.00	38,000.00
10	50.00	1KG		Lubrication T.O Structure Gates (4 x A Year 6.25 Kg)	100.00	5,000.00
11	13.00	1LTS.		Apply Anti-Corrosion Paint to Gate Structure (Once A Year)	130.00	1,690.00
12	6.50	1Lts		Painting, Number and Station on structures (once a year)	150.00	975.00
				SUB TOTAL E		162,584.75
F. CHANDANA POKUNA TANK/SLUICE/SPILLWAY						
1	1.00	1HA		Weeding/Clearing Tank Bund(Twice a Year-0.5ha)	3,079.00	3,079.00
2	1.50	1M^3		Repair to Rip Rap protection (Once a Year)	400.00	600.00
3	15.00	1M^3		Earth/Excav/Borrow & Earth filling Bund (Once a Year)	99.45	1,491.75
4	2.00	1Nos		Removal of Ant Hills from Bund (Once a Year)	200.00	400.00
5	15.00	1M^3		Graveling unpaved Bund Road (Once a Year)	125.50	1,882.50
6	10.00	1M^3		Removal of debris D/S Spill Channel (Once a Year)	65.00	650.00
				SUB TOTAL F		8,103.25
				Total Sheet 3		170,688.00

ESTIMATE.NK1

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

SPECIFICATION	ANNUAL MAINT.			DESCRIPTION OF WORK ITEMS	COST OF EACH ITEM OF WORK	
	SUR- ITEM	QUAN- TITIES	UNITS		UNIT RATE Rs. Cts.	TOTAL ITEM COST Rs. Cts.
16. D-6 CANAL TO KADAWALA NEWA AND KADAWALA TANK SLUICE/SPILLWAY						
	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	18.00	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 plank/s on spill/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 ch) (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 6	97,634.90
Admin./Dept. O/H (from 10/1MD)						
Supervision of constr. 2.85%						
Driver & Equip. Operation 2.83%						
Travel & Data Allowance 0.73%						
Vehicle O&M Cost 4.16%						
Admin./Overheads 9.48%						
Depreciation Veh/Equip. 13.95%						
Total						
Say						

					TOTAL SHEET 4	97,634.90
					TOTAL SHEET 1	107,049.53
					TOTAL SHEET 2	107,150.05
					TOTAL SHEET 3	170,600.00
					SUR TOTAL	642,442.48
					SHEET 1+2+3+4	642,442.48
					Contingencies	
					@ 7.25%	46,440.59
					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	

SECTION VIII

MAINTENANCE DIAGRAM - GIRITALE MAIN SYSTEM

The Maintenance Diagram for the Giritale Main System is presented on Exhibit VIII-1. The Diagram provides a means to identify all of the major physical features comprised under the main system that will require maintenance.

The purpose of the Maintenance Diagram is to assist the Divisional engineer and his staff in performing the Preventative Maintenance Program for the scheme. Separate Maintenance Diagrams will be developed for each of the twelve DCOs, however, the location of the twelve DCO areas and the D and F canals under each DCO are presented on the Giritale Main System Maintenance Diagram along with details of each DCO service area.

Some of the other important items included on the Maintenance Diagram are:

- Legend identifying the various project features, and symbols.
- Location of field operation units and sub-units
- Location of ID Quarters and Labor Line Depots
- Location of towns or village centers
- Number of ID Officials and O&M staff
- Location of rain gages
- Location of reservoirs and tanks
- Location of railroad lines, main and secondary roads
- Location of Post Offices and Sub-Post Offices
- Locations of Telephones
- Name, length of canals and drains
- Name and length of tank bunds
- Length of paved and unpaved canal or bund roads
- Number and type of structure on each canal
- Structures involved with headworks, inlet canal, spillways, etc.
- Service area of each canal
- Location of spills, spillways, sluice gates, etc.
- DCO areas and detail of D & F canals under each DCO
- Location of anicuts and areas served by anicut

the Maintenance Diagram should be located in the IE's Division Office and at each Field Operation Unit. Each DCO should be provided with the Maintenance Diagram for the Main System, as well as, the Maintenance Diagram for their respective DCO.

The Diagram should be updated and revised to meet any modification to the system from time to time.

SECTION IX

GIRITALE SCHEMATIC WATER DISTRIBUTION DIAGRAMS

A schematic Water Distribution Diagram for the Giritale Main System (REMC) and D-6 Canal to Kadawala Wewa is presented on Exhibits IX-1, and IX-2 respectively.

The diagrams present the location and stationing of all major water level control structures, regulators, turnout structures and bridges located along the canals. In addition, the diagrams present the location of planned water measurement gages and the service area in hectares under each turnout structure off the Main Canal and Branch Canal System.

SECTION X

LOCATION OF DCO AREAS FOR OPERATION AND MAINTENANCE

Exhibit X-1 shows the name, location and area of each DCO and the respective canals that are to be operated and maintained off of the Giritale Main System by the DCO.

Table X-1 Presents the details of the Service Area for each DCO.

DETAILS OF DCO SERVICE AREAS

DCO No./NAME	D - CANALS			F - CANALS	
	NAME	LENGTH KM	COMMAND AREA (HA)	NUMBER	LENGTH
1 Puranagama	LBMC	3.596	266.7	21	8.973
	RB-1	1.826	72.8	2	0.875
	RB-2	1.062	91.1	--	--
	Total Puranagama DCO	6.484	430.6	23	9.848
2 Agbo	D-1	0.250	22.9	4	1.082
	D-2	0.915	39.8	9	1.075
	D-3	0.960	24.3	3	0.433
	D-3A	0.786	22.3	1	0.107
	D-4	1.723	113.3	18	3.107
	D-5	1.296	45.3	4	0.960
Total Agbo	5.930	267.9	39	6.764	
3 Mahasen (Down to km 2+912)	D-7	2.912	148.6	28	8.428
	D-8	0.713	33.5	6	0.732
	Total Mahasen DCO	3.625	182.1	34	9.160
4 Jayanthipura	D-9	1.037	34.0	1	0.488
	D-10	2.595	128.3	17	3.562
	D-11	2.928	118.6	12	2.120
	D-13	2.805	238.4	26	7.024
Total Jayanthipura DCO	9.365	519.3	56	13.194	
5 Kadawalawewa	D-6(To road	3.541	163.3	16	6.295
	D-1/6	1.171	129.3	14	6.808
Total Kadawalawewa DCO	4.712	292.6	30	13.103	
6 Unagalawehera	D-18	0.690	16.5	1	0.099
	* D-19	2.816	156.6	33	9.342
	D-20	1.326	48.6	5	0.568
	D-21	0.300	28.6	1	0.098
	D-21A	0.982	39.7	2	0.244
Total Unagalawehera DCO	6.114	290	42	10.352	
* Service Area above LB-7					

DETAILS OF DCO SERVICE AREAS

DCO No./NAME	D - CANALS			F - CANALS	
	NAME	LENGTH KM	COMMAND AREA (HA)	NUMBER	LENGTH
7 Chandanapokuna	D-22	1.809	59.3	9	1.603
	D-23	1.858	178.5	35	7.427
	D-24	1.567	53.4	4	0.982
	Total Chandanapokuna DCO	5.234	291.2	48	10.012
8 Purana Muslim (Below Palugaswewa)	D-7	3.411	183.7	29	8.089
		3.411	183.7	29	8.089
9 Perakum (Up to Kadawala)	D-6	3.260	112.9	16	4.891
	Total Perakum DCO	3.260	112.9	16	4.891
10 Bendiwewa (Below road)	D-6	1.333	135.6	15	7.012
	Total Bendiwewa DCO	1.333	135.6	15	7.012
11 Nagapokuna (Pulathisi)	D-12	1.593	33.6	2	0.137
	D-14	1.143	31.6	2	0.186
	D-14A	0.570	13.5	1	0.159
	D-15	0.701	19.0	3	0.351
	D-16	0.854	23.9	4	0.396
	D-16A	1.019	34.4	--	--
	D-17	1.507	60.6	10	1.023
Total Nagapokuna DCO	7.387	216.6	22	2.252	
12 Hatalisata (Below LF-7)	D-19	1.910	152.8	24	7.598
	Total Hatalisata DCO	1.910	152.8	24	7.598
TOTAL GIRITALE SCHEME		58.765	3075.3	378	102.275

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65

SECTION XI ✓

CONCLUSION AND RECOMMENDATIONS

XI-1 CONCLUSIONS

Based upon the Annual Maintenance Plan for the Giritale Main System, it has been determined by detailed analysis that the annual cost of maintenance will be approximately Rs. 1,028,200/. The service area of the Giritale Scheme has been recently updated and found to be 7,240 Acres (2936 Ha), therefore, the annual cost per acre will be Rs. 140/Ac ((Rs. 350/Ha).

XI-2 RECOMMENDATIONS

The Annual Maintenance Plan has been developed for use in the Preventative Maintenance Program after completion of the ISMP. The goal of the Preventative Maintenance Program is to provide adequate maintenance after ESI has been completed so that the irrigation systems can be sustained in working order without future need for a major rehabilitation program. In order to meet this goal, adequate funds must be provided by the GOSL to the ID for this Preventative Maintenance Program for the Main System of each scheme. Presently, the GOSL is providing Rs. 50/ac for maintenance of both the main and distributary systems. Assuming that each DCO will eventually be responsible to maintain the distributary system (D-canals and F-canals), then, GOSL must allocate an annual maintenance budget for the Giritale Main System of Rs. 140/ac or approximately Rs. 90/ac more than the present annual maintenance budget provided. Unless this annual maintenance budget is increased the goal of sustaining the system will not be achieved.

Using Giritale Scheme as an example, the following suggestions are made:

- IMD/ID must prepare a proposal to the GOSL requesting the additional funds be allocated for the Preventative Maintenance Program.
- USAID must meet with GOSL to ensure that the requirement in the Project Paper regarding the Preventative Maintenance Program is achieved and that adequate funds required for maintenance of the Main System are provided annually to all the schemes in the Project (ie. Parakrama samudra, Giritale, Minneriya, Kaudulla, Gal Oya, RB & LB and Ridi Bendi Ela Schemes).
- IMD/ID to follow up so that the funds become available within the LOP so that the Preventative Maintenance Program can proceed after ISMP.

- In the mean time present budget allocation should be prioritized to implement the more essential maintenance works as outlined under the Annual Maintenance Plan.
- The DCOs should commence to implement the Annual Maintenance Plan for their respective distributary systems, initially using some funds from ID along with the labor force from their DCO. Eventually, the funds provided by the ID to the DCO should be eliminated with DCO assuming the full financial and physical burden of maintenance for the distributary system.
- It is suggested that the Annual Maintenance Plan for DCOs be prepared during the LOP to assist each DCO in implementing their respective preventative maintenance programs.
 - The Annual Maintenance Plan for Parakrama Samudra, Minneriya, Kaudulla, Ridi Bendi Ela and the Gal Oya Right and Left Bank Schemes should be developed over the LOP after ESI/PR so that the maintenance cost of their respective schemes will be determined and appropriate budget requirement can be submitted to GOSL for funding.
- While requesting the estimated funds to implement the approved Annual Maintenance Plan, the ID staff should sketch out strategies and pragmatic methodologies to execute the program to achieve the ultimate objectives.
- The following principles are recommended for successful implementation.
 - Establishment of Maintenance offices/centers at convenient locations. There can be easily located within the operation centres of in the near proximity to curb expenses on security and upkeeping.
 - Minimum requirement of skilled work force, machineries and implements should be assigned to each maintenance units.
 - The work force is to be provided with relevant 'Job Description' to enable them to perform their duties diligently.
 - Planning and training sessions to be conducted with the active participation of all relevant people. Similarly monitoring and evaluation procedures should be developed and implemented.

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- For successful implementation, the maintenance crew should stay for long period in a system. therefore, there should be incentive packages such as site allowance, reimbursement of travelling cost, overtime/holiday payment, study tours, foreign training and staff-exchange program. Wherever applicable commendations to promote to higher salary scales is another tangible benefit.

- Senior ID staff must recognize the maintenance works in par with other development work and they should provide all guidance and encouragement to the field level staff. At least, quarterly Range level plenary should be conducted where the maintenance accomplishments and constraints could be reviewed.

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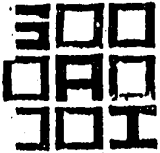
MINISTRY OF LANDS, IRRIGATION
&
MAHAWELI DEVELOPMENT

IRRIGATION SYSTEMS MANAGEMENT PROJECT
USAID CONTRACT 383-0080-C-00-7035

ANNUAL MAINTENANCE PLAN
GIRITALE SCHEME - FURANAGAMA DCO
JUNE - 1991

SHELADIA ASSOCIATES INC.,

69



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

July 8, 1991

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

Subject: Annual Maintenance Plan and Cost for Puranagama DCO No. 1 in Giritale Scheme.

Dear Mr. Piyadasa.

Transmitted herewith is a copy of the Final Report for the Annual Maintenance Plan for the Puranagama DCO in the Giritale Scheme.

The following Exhibits are included in the Report along with details of Annual Maintenance Costs:

- Exhibit I-1 Giritale Scheme Maintenance Diagram - Main System
- Exhibit V-1 Annual Maintenance Plan Giritale Scheme-Puranagama DCO
- Exhibit VIII-1 Giritale Scheme Maintenance Diagram-Puranagama DCO
- Exhibit IX-1 Giritale Scheme Water Distribution Diagram LPMC System - Puranagama DCO

It is recommended that the Report be distributed to the people listed at the end of this letter. The IE Mr. S. Seraratna or the TA responsible for this DCO Annual Maintenance Plan, Mr. Amarasinghe, should officially turn over two copies of the Report to the DCO President as the formal maintenance document provided by the ID. The TA should then carefully explain the use of the Exhibits, as well as, how the Annual Maintenance Cost was developed. It may be necessary to translate some of the tables for assistance to the DCO.

The preparation of the Annual Maintenance Plans for the remaining eleven DCOs in Giritale Scheme are in progress and will be submitted to you as they become available. It is expected that all remaining eleven DCO Annual Maintenance Plans for the Giritale Scheme will be submitted by the end of August 1991. Similar Reports along with Exhibits will be prepared for all eleven DCOs so that you can officially present them to the DCO Presidents as one of the formal documents the ID will hand over to the DCO.


Sheladia hopes that this Report and Exhibits will provide the necessary information to the DCO to assist them to carryout the Preventative Maintenance Program after ESI is completed and the ISMP is over.



SHELADIA Associales, Inc.

Furthermore it is recommended that assistance be provided to the DCOs by the ID in implementing these Annual Maintenance Plans so that a smooth transition can take place from ID Maintenance to DCO Maintenance in the next 2-3 years. Maintenance funds can gradually be withdrawn from the DCO during this transition period after ESI works are completed on all of the D and E canals under the DCO.

Very truly yours,


C. F. Leonhardt
Chief-of-Party/SAI

Encl: A copy of Puranagama DCO Annual Maintenance Plan Report

cc:

- G. T. Jayawardena w/2 copies
- L. T. Wijesooriya wo/copy
- D. W. R. Weerakoon wo/copy
- D. Jenkins w/2 copies
- IE Giritale w/copy
- TA Puranagama DCO w/copy
- President Puranagama DCO w/2 copies
- SAI File w/copy

AMPPGDCCO.CFL

ANNUAL MAINTENANCE PLAN - GIRITALE SCHEME

PURANAGANA DCO

OUTLINE

SECTION

- I. INTRODUCTION
- II. SCOPE OF WORK UNDER GIRITALE PURANAGANA DCO MAINT. PLAN
- III. ANNUAL MAINTENANCE PLAN DCO ESTIMATING CRITERIA
- IV. WALK THROUGH MAINTENANCE SURVEY
- V. ANNUAL MAINTENANCE PLAN - PURANAGANA DCO
- VI. ANNUAL MAINTENANCE PLAN - QUANTITY ESTIMATE
- VII. ANNUAL MAINTENANCE PLAN - COSTS
- VIII. MAINTENANCE DIAGRAM - GIRITALE PURANAGANA DCO
- IX. GIRITALE SCHEMATIC WATER DISTRIBUTION DIAGRAM
LEMC SYSTEM - PURANAGANA DCO
- X. CONCLUSIONS AND RECOMMENDATIONS

EXHIBIT

- I-1 GIRITALE SCHEME MAINTENANCE DIAGRAM - MAIN SYSTEM
- V-1 ANNUAL MAINT. PLAN GIRITALE SCHEME PURANAGANA DCO
- VIII-1 GIRITALE SCHEME MAINTENANCE DIAGRAM - PURANAGANA DCO
- IX-1 GIRITALE SCHEMATIC WATER DISTRIBUTION DIAGRAM
LEMC SYSTEM - PURANAGANA DCO

ANNUAL MAINTENANCE PLAN - GIRITALE SCHEME

PURANAGAMA DCO

OUTLINE (Cont.)

TABLES.

- II-1** **SUMMARY PURANAGAMA DCO CANAL MAINTENANCE DATA**
- III-1** **ANNUAL MAINT. PLAN-DCO ESTIMATING CRITERIA (3 Sheets)**
- VI-1** • **MAINTENANCE PLAN GIRITALE PURANAGAMA DCO
 QUANTITY ESTIMATE (6 Sheets)**
- VII-1** **ESTIMATE OF THE EXPENSES NECESSARY TO BE INCURRED
 FOR ANNUAL MAINT. PLAN - PURANAGAMA DCO (2 Sheets)**
- VII-2** **SUMMARY ANNUAL MAINTENANCE COSTS
 GIRITALE SCHEME - PURANAGAMA DCO**

SECTION I

INTRODUCTION

Under the ISMP the Annual Maintenance Plan and cost was to be developed over the LOP each year after ESI was implemented so that by the end of the Project the total Annual Maintenance Plan and relative cost would have been established for the entire scheme. It was envisioned that the Annual Maintenance Plan would be divided in to two categories of work, namely:

- Main System, including Inlet Canal, Sluices, Tank Bunds, Spillways and Main and Branch Canals. The main system to be operated and maintained by the Irrigation Department under GOSL funding.
- Distributary System, including the D-canals, F-canals and field drains. The distributary system to be operated and maintained by the Distributary Canal Organization (DCO) responsible for those respective D and F canals.

Since Giritale Scheme is small and most of the Main and Branch Canals had been rehabilitated under the 1987, 1988 and 1989 ESI program it was decided to develop the Annual Maintenance Plan for the Giritale Scheme with the overall objective to establish the cost necessary for the Irrigation Department to sustain the Main System and for the DCO's to sustain the Distributary Systems.

The development of the Giritale Scheme Main System Maintenance Plan and cost was prepared and submitted to the Irrigation Department in a Draft Report for review and comments on August 17, 1990. Exhibit I-1 presents the Maintenance Diagram for the Main system of the Giritale Scheme. The location of all twelve (12) DCOs are shown on this Maintenance Diagram along with Maintenance Data on the Main System as well as general data for the twelve DCOs.

Subsequently, it was decided to prepare a sample Annual Maintenance Plan for one of the DCO's in the Giritale Scheme so that comments could be received before preparing the Plan for all of the remaining eleven DCO's in that Scheme. Puranagama DCO was selected as the first DCO to prepare the Annual Maintenance Plan.

This report therefore presents the Annual Maintenance Plan for the Puranagama DCO (LBMC) of the Giritale Scheme which is to be operated and maintained by that DCO.

The Annual Maintenance Plan for the remaining eleven DCO's in the Giritale Scheme is under preparation by the Consultant in cooperation with ID TA Staff for each DCO. Those respective Maintenance Plans will be submitted to the ID as they are completed for submittal to the respective DCO Officers.

SECTION II

SCOPE OF WORK UNDER GIRITALE PURANAGAMA DCO MAINTENANCE PLAN

The Annual Maintenance Plan for the Giritale Puranagama DCO has been divided into the following three types of canals in the system:

Type 1 D-canal (Q > 3 cfs < 50 cfs; A > 50 HA < 800 HA)

The canals in the Puranagama DCO that fall under this category of canal are:

✓ LBMC - L = 3.595km; A = 430.6 HA
✓ RB-1/LBMC - L = 1.826km; A = 72.8 HA
✓ RB-2/LBMC - L = 1.062km; A = 91.1 HA

TYPE 2 F-CANAL (Q > 1 cfs < 3 cfs; A > 15 HA < 50 HA)

The canals in the Puranagama DCO that fall under this category of canal are:

✓ LB-2/LBMC - L = 0.692km; A = 30.6 HA
✓ RB-3/LBMC - L = 0.510km; A = 27.1 HA
✓ FC-13/LBMC - L = 0.630km; A = 29.5 HA
✓ RB7/LBMC - L = 0.635km; A = 25.3 HA
✓ RB6/LBMC - L = 0.433km; A = 22.3 HA
✓ RB-5/LBMC - L = 1.220km; A = 29.8 HA

TYPE 3 F CANAL (Q > 0 cfs < 1 cfs; A > 0 HA < 15 HA)

The canals in the Puranagama DCO that fall under this category of canal are:

✓ FC-1/RB-1/LBMC - L = 0.698km; A = 14.2 HA
✓ FC-2/RB-1/LBMC - L = 0.177km; A = 16.2 HA
✓ LB-1/LBMC - L = 0.978km; A = 11.4 HA
✓ FC-1/LB-1/LBMC - L = 0.408km; A = 4.0 HA
✓ FC-1/LB-2/LBMC - L = 0.450km; A = 8.9 HA
✓ LB-4/LBMC - L = 0.432km; A = 14.0 HA
✓ FC-1/LB-4/LBMC - L = 0.366km; A = 1.6 HA
✓ FC-2/LB-4/LBMC - L = 0.270km; A = 3.2 HA
✓ LB-5/LBMC - L = 0.365km; A = 6.7 HA
✓ FC-1/LB-5/LBMC - L = 0.122km; A = 4.0 HA
✓ LB-3/LBMC - L = 0.613km; A = 16.7 HA
✓ FC-1/LB-3/LBMC - L = 0.183km; A = 1.6 HA
✓ RB-4/LBMC - L = 0.208km; A = 9.3 HA
✓ FC-1/RB-4/LBMC - L = 0.140km; A = 2.0 HA
✓ RB-3A/LBMC - L = 0.096km; A = 7.3 HA
✓ LB-1A/LBMC - L = 0.064km; A = 5.3 HA
✓ FC-1/RB5/LBMC - L = 0.158km; A = 6.1 HA

The Annual Maintenance Plan for the Puranagama DCO will be developed for each of these three categories of canals. The location of the canals under each of the categories included on the Puranagama DCO Maintenance Plan is indicated on the Puranagama DCO Maintenance Diagram shown on Exhibit VIII - 1.

A summary of Puranagama DCO Canal Maintenance Data is shown on Table II-1 that follows:

CANAL DESCRIPTION			EXISTING AND PROPOSED ESI STRUCTURES																				
CANAL TYPE	CANAL DESIGNATION	LENGTH KM	SERVICE AREA (HA)	PAVED UNPAVD.		T.O. STRUCT.	WOOD GATES	C.I. CATES	DROP STRUC.	CULV. ERTS	CHL. PROF.	END REGU. STRUC.	IF.P. CHECK	T.O. FLUME	THIR/WALL (M)	CHL. LIN (M)	TRUSL. PITCH (M)	DRY RUB (M)	BATH DIV. STEPS	BRIDGE CUM BRIDGE BOX			
				ROAD (KM)	ROADS (KM)																1	2	3
TYPE 1 F/C	123AC (230AC) RB1/LBMC	3.596	438.6	11.328	2.146	13	—	13	10	—	4	1	1	2	—	351	286	294	116	6	—	7	3
	123AC (230AC) RB2/LBMC	1.826	172.8	42.4	—	—	2	2	—	1	4	8	1	1	12	—	—	—	—	—	2	—	—
	123AC (230AC) RB3/LBMC	1.262	91.1	—	—	—	—	—	—	2	3	7	1	2	15	—	228	—	—	—	—	—	—
	TOTALS	6.484	133.5	11.328	2.146	15	2	13	13	7	19	3	4	29	—	551	286	294	116	6	2	7	3
TYPE 2 F/C	123AC (230AC) RB4/LBMC	0.692	38.6	—	0.638	1	1	—	5	—	2	1	—	11	—	28	—	—	—	—	—	—	—
	123AC (230AC) RB5/LBMC	0.518	27.1	—	0.518	—	—	—	7	1	—	—	—	9	—	20	26	6	—	—	—	—	—
	123AC (230AC) RB6/LBMC	0.638	29.5	—	0.788	—	—	—	3	—	2	1	—	8	—	24	—	—	—	—	—	—	—
	123AC (230AC) RB7/LBMC	0.655	25.3	—	0.628	1	1	—	7	1	2	1	—	10	—	4	—	—	—	—	—	—	—
	TOTALS	4.123	164.5	—	3.378	3	3	—	34	3	17	5	—	59	—	88	34	6	—	—	—	—	—
TYPE 3 F/C	123AC (230AC) RB8/LBMC	0.678	14.2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	123AC (230AC) RB9/LBMC	0.277	16.2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	123AC (230AC) RB10/LBMC	0.978	11.4	0.728	0.328	1	1	—	8	5	3	—	—	5	1	8	—	12	10	—	—	—	—
	123AC (230AC) RB11/LBMC	0.428	4.8	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	123AC (230AC) RB12/LBMC	0.458	8.9	—	0.458	—	—	—	4	—	1	—	—	4	—	—	—	—	—	—	—	—	—
	123AC (230AC) RB13/LBMC	0.432	14.8	—	—	2	2	—	2	1	—	1	—	4	—	—	—	—	—	—	—	—	—
	123AC (230AC) RB14/LBMC	0.355	1.8	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—
	123AC (230AC) RB15/LBMC	0.278	3.2	—	—	—	—	—	1	—	2	1	—	2	—	—	—	—	—	—	—	—	—
	123AC (230AC) RB16/LBMC	0.355	6.7	—	0.488	1	1	—	3	1	1	1	—	4	—	38	—	—	—	—	—	—	—
	123AC (230AC) RB17/LBMC	0.122	4.8	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—
	123AC (230AC) RB18/LBMC	0.513	16.7	—	—	—	—	—	4	—	3	1	—	6	—	18	5	—	—	—	—	—	—
	123AC (230AC) RB19/LBMC	0.193	1.6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	123AC (230AC) RB20/LBMC	0.228	9.3	—	—	—	—	—	2	—	1	8	—	2	—	—	18	—	—	—	—	—	—
123AC (230AC) RB21/LBMC	0.148	2.8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
123AC (230AC) RB22/LBMC	0.896	7.3	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	
123AC (230AC) RB23/LBMC	0.264	5.3	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	
123AC (230AC) RB24/LBMC	0.158	6.1	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	
TOTALS	9.728	132.5	0.728	1.158	4	4	—	22	9	11	6	—	31	1	48	13	18	18	—	—	—	—	—
TOTAL DCU	16.332	438.6	12.828	7.174	22	9	13	69	19	47	14	4	119	1	679	335	318	126	6	2	7	3	—

SECTION III

ANNUAL MAINTENANCE PLAN DCO ESTIMATING CRITERIA.

Quantities for developing the Annual Maintenance Plan and cost for DCO's are based upon the estimating criteria established for the ISMP and shown on Table III-1, III-2 and III-3 for Types 1, 2, and 3 canals respectively.

III-1

18

Table III-1

ANNUAL MAINTENANCE PLAN DCO ESTIMATING CRITERIA
TYPE 1 D/C (Q>3 CFS Q<50 CFS)

Type of Maintenance	Frequency of Maint.	Unit Rate	Estimating Criteria
1 Weeding Canal Bund	twice a year	Ha	----
2 Earthwork on D/C Type 1	once a year	km	10 m ³ /km
3 Desilting Along Canal	once a year	m ³	50% length 3" depth
4 Graveling Roads	once a year	km	20m ³ /km
5 Removing Water Plants	once a year	m ²	20%Area Avg. W=4.52m
6 Lubricating of TO Gate	4 x year	kg	1/4 kg/gate
7 Paint Gates w/Anti Corrosion Paint	once a year	Lts	1/2 Lts/gate
8 Removal of Ant Hills From Canal Bunds	once a year	km	3 Nos./km
9 Repairs to Dry Rubble Facking	once in 2 yrs	m ²	Rs. 6/m ²
10 Repairs to canal lining	once a year	Lm	Rs. 4/m ²
11 Repairs to Rubble Pitching	once a year	m ²	10% of area
12 Repairing Retaining Walls	once a year	lm	Rs. 5/lm
13 Repairs to Structures w/1:3:6 Concrete	varies	m ³	----
Bridges	once in 5 yrs	m ³	0.05m ³ /yr
Regulators	once in 5 yrs	m ³	0.10m ³ /yr
TO Structures	once in 2 yrs	m ³	0.09m ³ /yr
Chl. Profiles	once in 5 yrs	m ³	0.025m ³ /yr
Drops	once in 2 yrs	m ³	0.125m ³ /yr
Bath Steps	once in 5 yrs	m ³	0.012m ³ /yr
Culverts	once in 5 yrs	m ³	0.05m ³ /yr
Check/End Structures	once in 5 yrs	m ³	0.025m ³ /yr
F.P.T.O	once in 2 yrs	m ³	0.0125m ³ /yr
Div. Box	once in 5 yrs	m ³	0.025m ³ /yr
Drain Cross/Spills	once in 5 yrs	m ³	0.05m ³ /yr
14 Replace wooden gates	once in 5 yrs	EA	

AMPDCOL

Table III-2

**ANNUAL MAINTENANCE PLAN DCO ESTIMATING CRITERIA
TYPE 2 F/C (Q>1 CFS Q<3 CFS)**

Type of Maintenance	Frequency of Maint.	Unit Rate	Estimating Criteria
1 Weeding Canal Bund	twice a year	Ha	----
2 Earthwork on F/C Type 2	once a year	km	7.5m ³ /km
3 Desilting Along Canal	once a year	m ³	50% length 2" depth
4 Graveling Roads	once a year	km	15m ³ /km
5 Removing Water Plants	once a year	m ²	20%Area Avg. W=2.08m
6 Lubricating of TO Gate	4 x year	kg	1/4 kg/gate
7 Paint Gates w/Anti Corrosion Paint	once a year	Lts	1/2 Lts/gate
8 Removal of Ant Hills From Canal Bunds	once a year	km	3 Nos./km
9 Repairing Retaining Walls	once a year	lm	Rs. 5/lm
10 Repairs to canal lining	once a year	lm	Rs. 4/lm
11 Repairs to Rubble Pitching	once a year	m ²	10% of area
12 Repairs to Dry Rubble Packing	once in 2 yrs	m ²	Rs. 6/m ²
13 Repairs to Structures w/1:3:6 Concrete	varies	m ³	----
FPTO	once in 2 yrs	m ³	0.006m ³ /yr
Bridges	once in 5 yrs	m ³	0.025m ³ /yr
Regulators	once in 5 yrs	m ³	0.05m ³ /yr
TO Structures	once in 2 yrs	m ³	0.045m ³ /yr
Chl. Profiles	once in 5 yrs	m ³	0.012m ³ /yr
Drops	once in 2 yrs	m ³	0.0625m ³ /yr
Bath Steps	once in 5 yrs	m ³	0.006m ³ /yr
Culverts	once in 5 yrs	m ³	0.025m ³ /yr
Check/End Structures	once in 5 yrs	m ³	0.012m ³ /yr
Cut Throat Flume	once in 5 yrs	m ³	0.02m ³ /yr
Drain Cross/Spills	once in 5 yrs	m ³	0.025m ³ /yr
Division Box	once in 5 yrs	m ³	0.012m ³ /yr
14 Replace wooden gates	once in 5 yrs	EA	

AMPDCOL

Table III-3

**ANNUAL MAINTENANCE PLAN DCO ESTIMATING CRITERIA
TYPE 3 F/C (Q>0 CFS Q<1 CFS)**

Type of Maintenance	Frequency of Maint.	Unit Rate	Estimating Criteria
1 Weeding Canal Bund	twice a year	Ha	----
2 Earthwork on F/C Type 3	once a year	km	5 m ³ /km
3 Desilting Along Canal	once a year	m ³	50% length 2" depth
4 Graveling Roads	once a year	km	15m ³ /km
5 Removing Water Plants	once a year	m ²	20%Area Avg. W=1.29m
6 Lubricating of TO Gate	4 x year	kg	1/4 kg/gate
7 Paint Gates w/Anti Corrosion Paint	once a year	lts	1/2 lts/gate
8 Removal of Ant Hills From Canal Bunds	once a year	km	3 Nos./km
9 Repairing Retaining Walls	once a year	lm	Rs. 5/Lm
10 Repairs to canal lining	once a year	lm	Rs. 4/Lm
11 Repairs to Rubble Pitching	once a year	m ²	10% of area
12 Repairs to Dry Rubble Packing	once in 2 yrs	m ²	Rs. 6/m ²
13 Repairs to Structures w/1:3:6 Concrete	varies	m ³	----
Bridges	once in 5 yrs	m ³	0.013m ³ /yr
Regulators	once in 5 yrs	m ³	0.025m ³ /yr
TO Structures	once in 2 yrs	m ³	0.022m ³ /yr
Chl. Profiles	once in 5 yrs	m ³	0.006m ³ /yr
Drops	once in 2 yrs	m ³	0.03m ³ /yr
Bath Steps	once in 5 yrs	m ³	0.003m ³ /yr
Culverts	once in 5 yrs	m ³	0.012m ³ /yr
Check/End Structures	once in 5 yrs	m ³	0.006m ³ /yr
Cut Throat Flume	once in 5 yrs	m ³	0.01m ³ /yr
FPTO	once in 2 yrs	m ³	0.003m ³ /yr
Division Box	once in 5 yrs	m ³	0.006m ³ /yr
Draining Cross/Spill.	once in 5 yrs	m ³	0.012m ³ /yr
14 Replace wooden gates	once in 5 yrs	EA	

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SECTION IV

WALK THROUGH MAINTENANCE SURVEY

The walk through maintenance survey provides three objectives depending on the status of ESI accomplished, as follows:

1. If ESI has not been completed the walk through maintenance survey provides a means to determine the existing type, number and length of structures and the additional new works that should be included in the ESI work program.
2. If ESI has been completed the walk through maintenance survey provides a means of determining the number and length of existing structure and those newly constructed structures under ESI.

The walk through maintenance survey should be conducted by the T.A. responsible for that section of the canal system in coordination with the Consultants O&M Engineer or Engineering Assistant. In the case of the Giritale Puranagama DCO, the Consultant's O&M Engineer made the survey with the ID TA staff.

For the Giritale Scheme, in order to establish the Annual Maintenance Plan for the Puranagama DCO, it was necessary to walk the canals and survey the state of maintenance and condition of the existing structures and canal banks. As of the date of the walk through survey no rehabilitation work had been accomplished under the 1987, 1988 and 1989 ESI work programs, therefore, it was necessary to determine what additional ESI works should be included during the survey. This maintenance survey listed all of the various existing structures along the canal and their condition noting if repairs are required or if new structures or protective works were needed under the ESI Program. The number, type and or length of structures including regulators, drops, turnouts, canal profiles, bridges, drainage crossings, spills, end structures, checks, dry rubble packing, rubble pitching, retaining or toe walls and bathing steps were noted during the survey to establish the extent and magnitude of the maintenance to be carried out. In addition the length and width of unpaved roads were determined for establishing the amount of gravel to be applied annually. The length of the canals were taken from the ID issue trees and checked by ESI survey data and notes. The TA who accompanied the Consultants O&M Engineer noted the recommendations of work to be included in the ESI Program.

Field notes providing all data collected during the walk through survey for the Puranagama DCO have been recorded in bound field books and are available for reference.

SECTION V

ANNUAL MAINTENANCE PLAN - PURANAGAMA DCO

The Annual Maintenance Plan for the Giritale Puranagama DCO is presented on Exhibit V-1 and includes the following:

- Component or reach of the scheme to be maintained
- Item/quantity number of work
- Length of bund/canal/number of structures, etc.
- Description of the work to be maintained
- Quantity of the work to be maintained
- Frequency of maintenance
- Schedule of time to perform the maintenance
- DCO officers and personnel responsible for the maintenance
- Estimated labor requirement to perform the maintenance in man days

The Annual Maintenance Plan for the Giritale Puranagama DCO has been developed for use in the Preventative Maintenance Program after the ESI work has been completed. The Plan will change if new features and structures are added to the system during the ESI Program. Estimates of proposed ESI works have been included in the Plan, however, the number of new structures should be checked after the ESI works are completed and the Plan modified accordingly. The Plan should be reviewed periodically to ensure that the work planned for maintenance 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 items of maintenance may be required and the Plan should be modified accordingly.

SECTION VI

ANNUAL MAINTENANCE PLAN DCO QUANTITY ESTIMATES

The quantities for the Puranagama DCO Annual Maintenance Plan have been developed from the Annual Maintenance Plan DCO Estimating Criteria as presented under Section III.

The estimated annual maintenance quantities for the three types of canals for the Puranagama DCO are presented on Table VI-1, Sheets 1 to 6 inclusive, and correspond to the item number and the quantities shown on the Annual Maintenance Plan, Exhibit V-1.

The size of the canal section for each of the three types of canals were determined on the basis of a weighted average discharge of the canals. Type 1 D/C ($Q > 3$ CFS < 50 CFS) was found to have an average discharge of 23 CFS with a bed width of 2.00 meters and a flow depth of 0.70 meters ($n = 0.04$; $s = 0.0004$).

Type 2 F/C ($Q > 1$ CFS < 3 CFS) was found to have an average discharge of 2.5 CFS with a bed width of 1.00 meters and a flow depth of 0.30 meters ($n = 0.04$; $s = 0.0004$).

Type 3 F/C ($Q > 0$ CFS < 1 CFS) was found to have an average discharges of 0.85 CFS with a bed width of 0.50 meters and a flow depth of 0.22 meters ($n = 0.04$; $s = 0.0004$).

These three average sections were used to develop the maintenance quantities for the total length of each of the three types of canals.

ANNUAL MAINTENANCE PLAN
PURANAGAMA DCO
QUANTITY ESTIMATE

TABLE VI - 1

Sheet 1 of 6

TYPE 1 D-CANALS (>3 CFS <50 CFS; A>36 HA <607 HA)

LBMC 0+000 - 3+596
RB-1 0+000 - 1+826
RB-2 0+000 - 1+062

6.484km Say 6.5km

- 1 Weeding and clearing along canal bunds (Twice a year)
AVG. clearing width = 5m; Area = 5.0m x 6500m = 32500m² = 3.25HA
2 x 3.25 = 6.5HA/yr.
- 2 Repairs to canal bund w/Earth filling (once a year)
Assume D/C = 10.0m³/km/yr. V = 10m³ x 6.5km = 65m³ Say 65m³/yr
- 3 Desilting along canal (every year)
Avg. width canal bed = 1.50m
Assume 50% of canal req's. desilting
Avg. depth = 0.075m for D/C (>3 <50cts)
V = 6500m x 0.075m x 0.50 x 2.0m = 488m³/yr
- 4 Graveling unpaved roads (once a year)
L = 2.2 km Assume 20m³/km for D-C (>3 <50cts)
V = 2.2 x 20m³ = 44m³/yr
- 5 Removal of water plants from canal (once a year)
Assume 20% of length Avg. width = 4.52m
A = 4.52m x 0.20 x 6500m = 5876m²
Say 5880m²
- 6 Lubrication of T.O Gates 13Nos. (4 x a year)
15 Gates x 1/4kg/gate x 4 = 13kg/yr.
- 7 Application of Anti corrosive Paint (once a year)
13 Gates x 1/2Lt/gate = 6.5Lts Say 7 Lts.
- 8 Removal of Ant Hills along canal (once a year)
3 Ant Hills/km
No. = 3 x 6.5 = 19.5 Say 20/Year
- 9 Repairs to Retaining walls (once a year)
L = 551 LM
- 10 Repairs to canals lining (once a year)
L = 286m
- 11 Repairs to Rubble pitching (once a year)
1:3 mix
L = 294m Assume 10% gross area
W = 1.5 m
A = 0.10 x 294 x 1.5m = 44.1 Say 45m²

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35

ANNUAL MAINTENANCE PLAN
PURANAGAMA DCO
QUANTITY ESTIMATE

TABLE VI - 1
Sheet 2 of 6

TYPE 1-D-CANALS (Contd.)

12 Repairs to Dry Rubble Facking (once in 2 years)

L = 116m Avg width = 1.5m

Area = 116m x 1.5 = 174m² Say 175m²/2 Yr. = 87.5 Say 90m²/yr

13 Repairs to structures w/1:3:6 conc. (sequence varies)
for D/CO>3 CFS <500CFS

Type of struc.	No.	Frequency	Vol. Conc. m ³ /Year
Drops	13	Every 2 yrs.	0.125m ³ /yr x 13 = 1.625m ³
T.O Struc.	15	Every 2 yrs.	0.09m ³ /yr x 15 = 1.350m ³
Channel Profile	19	Every 5 yrs.	0.025m ³ /yr x 19 = 0.475m ³
Culverts	7	Every 5 yrs.	0.05m ³ /yr x 7 = 0.350m ³
Bridges/ End Struc.	12	Every 5 yrs.	0.05m ³ /yr x 12 = 0.600m ³
FP.T.O	3	Every 5 yrs.	0.025m ³ x 3 = 0.075m ³
Bath steps	29	Every 2 yrs.	0.0125m ³ /yr x 29 = 0.363m ³
Regulators	6	Every 5 yrs.	0.012m ³ /yr x 6 = 0.072m ³
Div Box	4	Every 5 yrs.	0.10/m ³ /yr x 5 = 0.400m ³
	2	Every 5 yrs.	0.025/m ³ /yr x 2 = 0.05m ³
Total	110		5.360m³/yr

Say 5.4m³/yr

5.4m³/110 = 0.04909m³/str/yr

14 Replacement of wooden gates (every 5 yrs) 2 Nos.

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86

ANNUAL MAINTENANCE PLAN
PURANAGAMA DCO
QUANTITY ESTIMATE

TABLE VI - 1
Sheet 3 OF 6

Type 2 F-Canal (Q>1.0CFS <3.0CFS; A>12HA <36HA)

RB-3 0+000 - 0+510
LB-2 0+000 - 0+682
FC-13 0+000 - 0+630
RE-7 0+000 - 0.635
RE-6 0+000 - 0+433
RE-5 0+000 - 1+220

4+120 Say 4.0km

- 1 Weeding & clearing along canal bund (Twice a year)
Avg. Clearing width = 4.5m; Area = $4.5 \times 4,000 = 18,000m^2 = 1.8HA$
 $1.8HA \times 2 = 3.6 HA/yr$
- 2 Repairs to canal bund w/Earth filling (once a year)
Assume for F/C (Q>1 CFS <3 CFS) $7.5m^3/km/yr$
 $V = 7.5m^3/km \times 4.0km = 30m^3/yr$
- 3 Desilting along canal (every year)
Avg. Width = 1.00m Assume 50% of canal req's. desilting
Avg. depth = 0.05m for F/C (Q>1 <3CFS)
 $V = 1.00m \times 0.05m \times 4000m \times 0.5 = 100m^3/yr$
- 4 Graveling unpaved roads (once a year)
 $L = 3.878km$ Assume $15m^3/km$ for FC (Q>1 <3CFS)
 $V = 3.9 km \times 15m^3/km = 58.5m^3$ Say $60m^3$
- 5 Removal of water plants from canal (once a year)
Assume 20% of canal length Avg. width = 2.08m
 $A = 2.08m \times .20 \times 4,000 = 1664m^2$
Say $1665m^2$
- 6 Lubrication of T.O. Gates (4 x 4 Year)
Nil
- 7 Application of Anti corrosive paint (once a year)
3 Gates x 1/2 Lt/gate = 1.5Lts/yr
- 8 Removal of Ant Hills along canal (once a year)
3 hills/km x 4 km = 12 Hills/yr
- 9 Repairs to Retaining walls (once a year)
 $L = 80m$
- 10 Repairs to canal lining (once a year)
 $L = 34m$

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87

ANNUAL MAINTENANCE PLAN
 PURANAGAMA DCO
 QUANTITY ESTIMATE

TABLE VI - 1
 Sheet 4 OF 6

Type 2 F-Canal (Q>1.0CFS <3.0CFS; A>12HA <36HA) (Cont..)

- 11 Repairs to Rubble pitching (once a year) 1:3 mix
 L = 6m, width = 1.0m 10% Gross area
 A = 6 x 1.0 x 0.1 = 0.6m² Say 1.0m²
- 12 Repairs to Dry Rubble packing Nil
- 13 Repairs to Structures w/1:3:6 conc. (Sequence varies)
 For F/C Q>1CFS <3CFS

Type of Struc.	No.	Frequency	Vol. Conc. m ³ /yr
Drops	34	Every 2 yrs	0.0625m ³ /yr x 34 = 2.125
T0 Struc.	3	Every 2 yrs	0.045m ³ /yr x 3 = 0.135
Culverts	3	Every 5 yrs	0.025m ³ /yr x 3 = 0.075
Chl. Profiles	17	Every 5 yrs	0.012m ³ /yr x 17 = 0.204
End Struc.	5	Every 5 yrs	0.012m ³ /yr x 5 = 0.06
F.P.T.O	50	Every 2 yrs	0.006m ³ /yr x 50 = 0.354
	121		2.953m ³ Say 3.0m ³ /y

$$3.0m^3/121 = 0.025m^3/str/yr$$

- 14 Replacement of wooden gates (once in 5 years)
 3 Gates

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43

ANNUAL MAINTENANCE PLAN
PURANAGAMA DCO
QUANTITY ESTIMATE

TABLE VI - 1
Sheet 5 of 6

Type 3 FC (Q>0CFS <1CFS; A>0HA <12HA)

FC-1/RB-1; FC2/RB1; LB1/LBMC; FC1/LB1; LB4/LBMC; FC1/LB4; FC2/LB4;
LB5/LBMC; FC1/LB5; LB3/LBMC; FC1/LB3; RB4/LBMC; FC1/RB4; RB3A/LBMC
LB1A/LBMC; FC1/RB5

Total length of canals = 5570m

Total length of roads = 1150m

- 1 Weeding/clearing along canal bund (Twice a year)
Avg. width = 2.5m; Area = $2.5 \times 5,570\text{m} = 13,925\text{m}^2 = 1.4\text{HA}$
 $2 \times 1.4\text{HA} = 2.8\text{HA/yr}$
- 2 Repairs to canal Bynd w/earth filling (once a year)
Assume for F/C (Q>0CFS < 3CFS) $5.0\text{m}^3/\text{km}$
 $V = 5.0\text{m}^3/\text{km} \times 5.5/\text{km} = 27.85\text{m}^3$ Say $30\text{m}^3/\text{yr}$
- 3 Desilting along canal bed (every year)
 $W = 0.50\text{m}$ Assume $d = 0.05\text{m}$ 50% of length
 $V = 0.50\text{m} \times 0.05\text{m} \times .50 \times 5,570\text{m} = 69.6$ Say $70\text{m}^3/\text{yr}$
- 4 Gravelling unpaved road (once a year)
 $L = 1,150\text{m}$ Assume $15\text{m}^3/\text{km}$ for FC (0-3 CFS)
 $V = 1.15\text{km} \times 15\text{m}^3 = 17.25$ Say $20\text{m}^3/\text{yr}$
- 5 Removal of water plants along canal (once a year)
Assume 20% of length Avg. width = 1.20m
 $A = 0.20 \times 5,570\text{m} \times 1.20\text{m} = 1457\text{m}^2$ Say 1500m^2
- 6 Lubricate to Gates (4 x a year)
Nil
- 7 Paint gates w/Anti corrosion paint (once a year)
4 gates x 1/2 Lt/gate = 2 Lts/yr
- 8 Removal of Ant Hills along canal (once a year)
3 Hills/km x $5.57\text{km}^2 = 16.71$ Say 17 Hills
- 9 Repairs to retaining walls (once a year)
 $L = 48\text{m}$
- 10 Repairs to canal lining (once a year)
 $L = 15\text{m}$
- 11 Repairs to Rubble Pitching (once a year)
 $L = 10\text{m} \times 0.10 \times 1.0 = 1.0\text{m}^2$
- 12 Repairs to Dry. rubble packing (once a year)
 $A = 10\text{m} \times 1.0 \text{ width} = 10\text{m}^2$

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ANNUAL MAINTENANCE PLAN
 PURANAGAMA DCO
 QUANTITY ESTIMATE

TABLE VI - 1
 Sheet 6 of 6

Type 3 FC (Q)OCFS <1CFS; A>OHA <13HA) (Cont.)

13 Repairs to Struc. w/1:3:6 Conc. (Sequence varies)

Type of Struc.	No.	Frequency	Vol. Conc.M ³ /yr
Drops	22	Once in 2 yrs	.03m ³ /yrx22 = 0.66
T.O. Struc.	4	Once in 2 yrs	.022m ³ /yrx4 = 0.088
Chl. Profiles	11	Once in 5 yrs	.006m ³ /yrx11 = 0.066
Culverts	9	Once in 5 yrs	.012m ³ /yrx9 = 0.108
End. Struc.	6	Once in 5 yrs	.006m ³ /yrx6 = 0.036
F.P.T.O	31	Once in 2 yrs	.003m ³ /yrx31 = 0.093
Cut Throat Flume	1	Once in 5 yrs	.01m ³ /yrx1 = 0.01
Total	84		1.061m³ Say 1.1m ³

$$1.1m^3/84 = 0.013m^3/Str/yr$$

14 Replace wooden gates (once in 5 yrs)

4 Nos Rs. 500/gate = Rs. 100/Gate/yr

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90

SECTION VII

ANNUAL MAINTENANCE COST - PURANAGAMA DCO

The development of the Annual Maintenance cost for the Puranagama DCO is based upon the quantity estimating criteria presented under Section III. Unit costs were provided by IE Hingurakgoda Division. The estimated Direct Construction Cost for the three types of canals in the Puranagama DCO is presented on Table VII-1 (2 Sheets). Table VII-2 presents the summary of the Direct Construction Cost for the three types of canals and the distribution of cost between labor and material, equipment and transport. It was found by analysis that the distribution of labor to materials, equipment and transport was 78.9% to 21.1%. To the Direct Construction Cost 7.5% contingencies have been added to obtain the Total Construction Cost. An additional 5% has been added to the Total Construction Cost for DCO administration and overhead costs to obtain the Total DCO Annual Maintenance Cost.

The total Puranagama DCO Annual Maintenance Cost was found to be approximately Rs. 183,000 per year (Rs. 173/Acre) of which labor amounted to Rs. 130,000 per year. If the DCO members provide the labor for the Annual Preventative Maintenance Program only Rs. 36,500 will be required annually from DCO funds to pay for material, equipment and transport or approximately Rs. 37/acre.

The average yield of paddy per year (yala and maha season) is 161 Bushels/Acre in the Holonnaruwa Range resulting in a gross value of approximately Rs. 20,000 per year at Rs. 125/bushels. The total annual maintenance cost of Rs. 173/acre is only 0.8% of the annual gross value of paddy which is equivalent to about 2.0% of the farmers annual net profit per acre. Therefore the cost of annual maintenance of the DCO is well within the financial capacity of the farmer to provide the maintenance funds even if payment is made to the DCO members for labor.

BIRITALE SCHEME - PURANAGAMA DCO

TAPALE VII-1

ESTIMATE OF EXPENSES NECESSARY TO BE INCURRED FOR : ANNUAL MAINT. PLAN

A. TYPE 1 - D/C O>3CFS <50CFS
LBNC; RB-1; and RB-2

Sheet 1 of 2

SUB ITEM	QUNTY	UNIT	DESCRIPTION	UNIT RATE Rs.	TOTAL ITEM COST Rs.
1	6.5	HA	Cleaning/weeding canal bund (twice a yr)	3,079.00	20,013.50
2	65	M ³	Repairs to bund w/Earth Fill (once a yr)	99.45	6,464.25
3	488	M ³	Desilting along canal (once a year)	50.50	24,644.00
4	44	M ³	Gravelling road (once a year)	125.50	5,522.00
5	5888	M ²	Removal of water plants from canal (once a yr)	1.50	8,820.00
6	13	kg	Lubricate Gate/struc (4 x a year)	100.00	1,300.00
7	7	Lts	Paint Gates w/anti corrossive pt. (once a year)	130.00	910.00
8	20	Nos	Removal of Ant Hills from canal (once a year)	200.00	4,000.00
9	551	Lm	Repairs to Retaining walls (once a year)	5.00	2,755.00
10	286	Lm	Repairs to canal lining (once a year)	4.00	1,144.00
11	45	M ²	Repairs to Rubble Pitching (once a year)	202.00	9,090.00
12	90	M ²	Repairs to Dry Rubble Packing (once in 2 yrs)	6.00	540.00
13	5.4	M ³	Repairs to Struc.(Nos.114) w/1:3:6 Conc.(varies)	2,000.00	10,800.00
14	2	Nos	Replacement of wooden gates (once in 5 yrs)	100.00	200.00
TOTAL COST TYPE 1					76,202.75

B. TYPE 2-F/C O>10CFS <30CFS
LR-2; RR-3; FC-13; RR-7; RR-6; & RR-5

1	3.6	HA	Weeding and cleaning canal bund (twice a year)	3,079.00	11,084.40
2	30	M ³	Repairs to canal bund w/Earth Fill (once a year)	99.45	2,983.50
3	100	M ³	Desilting along canal (once a year)	50.50	5,050.00
4	60	M ³	Gravelling unpaved canal roads (once a year)	125.50	7,530.00
5	1665	M ²	Removal of water plants along canal (once a year)	1.50	2,497.50
6	Nil				
7	1.5	Lts	Paint Gates w/anti corrossive paint (once a year)	130.00	195.00
8	12	Nos	Removal of Ant Hills from canal bund(once a year)	200.00	2,400.00
9	80	M	Repairs to retaining walls (once a year)	5.00	400.00
10	34	M	Repairs to canal lining (once a year)	4.00	136.00
11	1	M ²	Repairs to Rubble Pitching (once a year)	202.00	202.00
12	Nil		Nil		
13	3.0	M ³	Repairs to Struc. w/1:3:6 Conc. (varies) (117Nos)	2,000.00	6,000.00
14	3	Nos	Replace wooden gates (once in 5 yrs)	100.00	300.00
TOTAL COST TYPE 2					30,778.40

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GIRITALE SCHEME - PURAHAGAMA DCU
 ESTIMATE OF EXPENSES NECESSARY TO BE INCURRED FOR : ANNUAL MAINT. FLGN

TABLE VII-1

Sheet 2 of 2

C. TYPE 3 - F/C D)BCFS <ICFS

FC-1/RB-1; FC2/RB1; LB1/LBMC; FC1/LB1; LB4/LBMC; FC1/LB4; FC2/LB4;
 LB5/LBMC; FC1/LB5; LB3/LBMC; FC1/LB3; LB4/LBMC; FC1/RB4; RB3A/LBMC;
 LB1A/LBMC; & FC1/RB5/LBMC

SUR ITEM	QUNTY	UNIT	DESCRIPTION	UNIT RATE Rs.	TOTAL ITEM COST Rs.
1	2.8	HA	Clearing/weeding canal bund	3,079.00	8,621.20
2	30	M^3	Repairs to canal bund w/Earth Filling (once a yr)	99.45	2,983.50
3	70	M^3	Desilting along canal (once a year)	50.50	3,535.00
4	20	M^3	Gravelling along canal Roads (once a year)	125.50	2,510.00
5	1500	M^2	Removal of water plants along canal (once a year)	1.50	2,250.00
6	Nil				
7	2	Lts	Paint gates W/Anti crossion paint (once a year)	130.00	260.00
8	17	Nos	Remove Ant Hills along canal (once a year)	200.00	3,400.00
9	40	M	Repairs to retaining walls (once a year)	5.00	240.00
10	15	M	Repairs to canal lining (once a year)	4.00	60.00
11	1	M^2	Repairs to rubble pitching (once a year)	202.00	202.00
12	10	M^2	Repairs to Dry Rubble Packing (once 2 years)	6.00	60.00
13	1.1	M^3	Repairs to Struc. W/1:3:5 conc. (Varies) (80 Nos)	2,000.00	2,200.00
14	4	Nos	Replace wooden gates (once in 5 yrs)	100.00	400.00
TOTAL COST TYPE 3					26,721.70

DCOCCSTL

93

SUMMARY ANNUAL MAINTENANCE COST ESTIMATE - JCO PURANAGAMA AND ALLOCATION OF LABOUR MATERIALS/EQUIPMENT/TRANSPORT

TABLE VII - 2

SUB ITEM	DESCRIPTION	TOTAL COST			LABOR		MATERIAL		EQUIP/TRAN RS.
		TYPE 1 D/C	TYPE 2 F/C	TYPE 3 F/C	(RS.)	%	%		
1	Clearing/weeding canal bund (twice a year)	20,013.50	11,084.40	5,621.70	39,724.72	98	2	794.30	
2	Repairs to bund w/Earth fill (once a year)	5,484.25	2,987.50	2,987.50	11,459.25	98	10	1,293.15	
3	Desilting along chl (once a year)	24,534.00	5,050.00	3,535.00	33,119.00	70	2	694.50	
4	Gravelling roads (once a year)	5,522.00	7,530.20	2,510.00	15,562.20	44	55	0,714.72	
5	Removal of water plants/weeding from canals (once a year)	5,920.00	2,197.50	2,250.00	13,276.15	30	2	271.35	
6	Lubricate gate str. (4 x a year)	1,300.00	---	---	1,300.00	25	75	975.00	
7	Paint gate w/Anti Corrosive Paint (once a year)	310.00	195.00	250.00	755.00	40	60	919.00	
8	Removal of Ant Hills from canal bund (once a year)	4,300.00	2,400.00	3,400.00	9,500.00	70	2	196.00	
9	Repairs to Ret/walls (once a year)	2,755.00	480.00	240.00	3,475.00	40	60	2,237.00	
10	Repairs to Canal Lining (once a year)	1,240.00	150.00	50.00	1,440.00	40	60	304.00	
11	Repairs to rubble pitching (once a year)	3,050.00	207.20	282.00	3,539.20	40	60	5,595.00	
12	Repairs to Dry Rubble Packing (once a year)	540.00	---	50.00	590.00	70	30	180.00	
13	Repairs to struc. w/375 Conc (varies)	10,000.00	6,000.00	2,200.00	18,200.00	40	60	11,420.00	
14	Replacement of wooden gates (once in 5 yrs)	200.00	300.00	400.00	900.00	20	80	700.00	
SUB TOTAL CONSTR. COST		96,202.75	38,770.40	25,721.70	161,702.35	79.9	20.1	34,515.50	
CONTINGENCIES 3 %		7215.61	2988.30	2084.13	12127.71			2588.57	
TOTAL CONSTR. COST		103,418.36	41,668.70	29,725.83	173,830.56			37,104.25	
JCO ADMIN/OP COST 4 %		5070.70	2084.74	1436.29	8611.53			1959.21	
TOTAL JCO ANNUAL MAINT. COST		108,589.06	43,771.12	30,162.12	182,522.89			39,099.46	

SERVICE AREA OF PURANAGAMA JCO = 450.6 Ha = 1064 AC Rs. 171.54/AC Rs. 134.93/AC Rs. 35.56.62/AC

SOURCE

24

SECTION VIII

MAINTENANCE DIAGRAM - PURANAGAMA DCO

The Maintenance Diagram for the Giritale Puranagama DCO is presented on Exhibit VIII-1. The Diagram provides a means to identify all of the major physical features comprised under the Puranagama DCO LBMC System that will require maintenance.

The purpose of the Maintenance Diagram is to assist the DCO officers and their FO maintenance staff in performing the Preventative Maintenance Program for the DCO. Some of the other important items included on the Maintenance Diagram are:

- o Legend identifying the various project features, and symbols.
- o Location of ID field operation units and sub-units
- o Location of ID Quarters and Labor Line Depots
- o Location of towns or village centers
- o Location of rain gages
- o Location of reservoirs and tanks
- o Location of railroad lines, main and secondary roads
- o Location of Post Offices and Sub-Post Offices
- o Locations of Telephones
- o Name, length of canals and drains
- o Length of paved and unpaved canal or bund roads
- o Number and type of structures on each canal
- o Location of typical irrigation structures
- o Location of farm pipes turnouts (FPTO)
- o Service area of each canal
- o Location of Spills, Spillways, Sluice gates, etc.
- o Location of anicuts and areas served by anicut

The DCO should be provided with the Maintenance Diagram for the Main System, as well as, the Maintenance Diagram for their respective DCO. The Diagram should be updated and revised to meet any modification to the system from time to time.

A Summary of the Puranagama DCO Service Area for maintenance is presented below:

PURANAGAMA DCO SERVICE AREA

			D - CANALS	F - CANALS		
DCO No./NAME	NAME	LENGTH KM .	COMMAND AREA (HA)	NUMBER	LENGTH	
1. Puranagama	LBMC	3.586	266.7	21	8.873	
	RB-1	1.826	72.8	2	0.876	
	RB-2	1.062	91.1	---	---	
Total Puranagama DCO			6.484	430.6	23 0.848	

SECTION IX

GIRITALE SCHEMATIC WATER DISTRIBUTION DIAGRAM LBMC SYSTEM - PURANAGAMA DCO

A Schematic Water Distribution Diagram for the Giritale Puranagama DCO (LBMC System) is presented on Exhibit IX-1. The Diagram presents the location and stationing of all major water level control structures, regulators, turnout structures and bridges located along the canals. In addition the Diagram present the location of planned water measurement gages and the service area in hectares under each turnout structure off the LBMC.

SECTION X

CONCLUSION AND RECOMMENDATIONS

X-1 CONCLUSIONS

Based upon the Annual Maintenance Plan for the Giritale Puranagama DCO, it has been determined by detailed analysis that the annual cost of maintenance will be approximately Rs. 183,000. The service area of the Giritale Puranagama DCO has been recently up-dated and found to be 1064 Acres (430.6 Ha), therefore, the total annual cost per acre will be Rs. 171.54/Ac.

The distribution of the Total Annual Maintenance Cost between labor and material, equipment and transport was found to be 78.9% and 21.1% respectively for the Puranagama DCO, resulting in a distribution of Rs. 134.83/Ac for labor and Rs. 36.62/Ac for material, equipment and transport.

This distribution percentage of labor versus material/equipment/transport will vary slightly between different DCO's depending upon the type and number of canals and structures under each DCO, however; 70-80% for labor to 20-30% for material, equipment and transport can be expected to be the average range of distribution for DCO Annual Maintenance requirements. This distribution percentage should be developed independently for each DCO when the Annual Maintenance Plan for the DCO is prepared.

X-2 RECOMMENDATIONS

The Annual Maintenance Plan for the Puranagama DCO has been developed for use in the Preventative Maintenance Program after completion of the ISMP. The goal of the Preventative Maintenance Program is to provide adequate maintenance after ESI has been completed so that the irrigation system can be sustained in working order without future need for a major rehabilitation program. In order to meet this goal adequate funds must be provided by the GOSL to the ID for this Preventative Maintenance Program for Main System and the DCO's must provide the labor, material, equipment and transport to implement the Preventative Maintenance Program for their respective DCO distributary services area.

Presently the GOSL is providing the ID with only Rs. 50/Ac for maintenance of the Main and Distributary Systems of the Giritale Scheme. Based upon the assumption that the DCO's will be responsible for the costs of operations and maintenance of their distributary canal systems after conclusion of ESI and the ISMP, then the following suggestions are made with respect to the DCO Annual Maintenance Plan and the implementation of the Preventative Maintenance Programs for those DCO's.

- o The ID should support and assist the DCO in implementing the Annual Maintenance Plan during the life of the ISMP as a means of providing a sound transition from ID maintained distributary canal system to DCO maintained distributary canal system.
- o Until ESI works have been completed on the D and F canals in the DCO services areas the ID should continue to provide a portion of their annual maintenance budget to the DCO for maintenance of those canals.
- o After completing of the ESI work on the D and F canals in the DCO service areas the DCO should take the full responsibility of performing all the maintenance work required under their respective DCO Annual Maintenance Plan. This should include the labor from the DCO organization and also DCO funds for material, equipment and transport to fully implement the Preventative Maintenance Program.
- o The ID should phase out the maintenance funding of the distributary canal system to the DCO as soon as the ESI work has been completed in the DCO service areas and utilize the annual maintenance funds provided by GOSL only for the Main System. (Rs. 50/Ac presently provided by the GOSL must be supplemented to Rs. 130/Ac if the Preventative Maintenance Program for the Main System is to be successful).
- o The Consultant, with the assistance of ID TA staff, will continue to prepare the Annual Maintenance Plan for the remaining eleven DCO's in the Giritala Scheme so that the Preventative Maintenance Program for the Giritala Main System and the Distributary Systems will be completed for the whole Scheme within 1991.
- o For Parakrama Samudra, Minneriya and Kaudulla Schemes, The Division IE's and their staff should be responsible for preparing, over the LOP, the Main System Annual Maintenance Plan and the Annual Maintenance Plans for all of the DCO's in their respective Schemes. The Annual Maintenance Plan for Main and DCO Systems should follow the Annual Maintenance Plan samples as submitted for Giritala Main System and Furangama DCO after approval of these Plans by ID/IHD.

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ANNUAL MAINTENANCE PLAN & COST ESTIMATES
TERTIARY SYSTEMS - PSS
(30 JUNE 1992)

DCO No	NAME OF DCO	FIELD WORK %	COST EST %	MAINT PLAN %	ISSUE TREE %	BOP %	Sinhala Trans.
1	AMBANGANGA	100	100	100	100	0	100
2	ALUTHWEWA	100	100	100	100	0	100
3	D - 4 CHL	100	100	100	100	0	100
4	LAXAUAYANA	100	100	100	100	0	0
5	MANIKKAMPATTIYA	100	100	100	100	0	100
6	TALPOTHA	100	100	100	100	0	100
7	THAMBALA (ALHILALPURA)	100	100	100	100	0	0
8	SOMAWATHIYA	100	100	100	100	0	0
9	KEGALUGAMA	100	100	100	100	0	0
10	PULASTIGAMA	100	100	100	100	0	0
11	GEMUNUPURA	100	100	100	100	0	0
12	GALTHAMBARANA	100	100	100	100	0	0
13	SEWAGAMA	100	100	100	100	0	0
14	PALUGASDAMANA	100	100	100	100	0	0
15	MONARATENNA	100	100	100	100	0	0
16	VIJAYARAJAPURA	100	100	100	100	0	100
17	SINHARAJAPURA	100	100	100	100	0	0
18	PAHALAKALINGAELA	100	100	100	100	0	0
19	SUNGAWILA/MOHIDEEN	100	100	100	100	0	0
20	WEERAPURA	100	100	100	100	0	100
21	KALAHAGALA	100	100	100	100	0	0
22	DAMANA GEMUNUPURA	100	100	100	100	0	0
23	SINHAPURA	100	100	100	100	0	0
24	VIJAYABAPURA	100	100	100	100	0	0
25	LANKAPURA	100	100	100	100	0	100
26	WEERA PEDESA	100	100	100	100	0	100
27	2 CHL/WEERAPARAKRAMA	100	100	100	100	0	100
28	MAHASEN	100	100	100	100	0	0

AMPCETS

ANNUAL MAINTENANCE PLANS & COST ESTIMATES
TERTIARY SYSTEMS - MINNERIYA
30 JUNE 1992

DCO No.	NAME OF DCO	FIELD WORK %	COST EST %	MAINT PLAN %	ISSUE TREE %	BOP %	Sinhala Trans.
1	Raja Ela	100	100	100	100	0	0
2	Kotalawela	100	100	100	100	0	0
3	Hinguraka	100	100	100	100	0	0
4	Kumaragama	100	100	100	100	0	0
5	Hingurakdamana	100	100	100	100	0	0
6	Kotigahapitiya						
7	Kaudulla	100	100	100	100	0	0
8	Galamuna Gamunu	100	100	100	100	0	0
9	Galamuna Perakum	100	100	100	100	0	0
10	Galamuna Wijaya	100	100	100	100	0	0
11	Yoda Ela	100	100	100	100	0	100
12	Kusumpokuna	100	100	100	100	0	0
13	Viharamawatha	100	100	100	100	0	100
14	Yatigalpothana	100	100	100	100	0	0
15	Hathamuna	100	100	100	100	0	100
16	Ulpathwewa	100	100	100	100	0	100
17	Divulankadawela	100	100	100	100	0	100
18	Mahasen	100	100	100	100	0	100
19	Govt. Farm						
20	Nissanka	100	100	100	100	0	0
21	Sansungama	100	100	100	100	0	0

AMPCETS

ANNUAL MAINTENANCE PLANS & COST ESTIMATES
TERTIARY SYSTEMS - GIRITALE
(30 JUNE 1992)

No.	NAME OF DCO	FIELD WORK %	COST EST %	MAINT PLAN %	ISSUE TREE %	BOP %	Sinhala Transla
1	PURANAGAMA	100	100	100	100	100	0
2	AGBO	100	100	100	100	100	0
3	MAHASEN	100	100	100	100	100	0
4	JAYANTHIPURA	100	100	100	100	100	0
5	KADAWALA WEWA	100	100	100	100	100	100
6	UNAGALAWEHERA	100	100	100	100	100	0
7	CHANDANAPOKUNA	100	100	100	100	100	100
8	PURANA MUSLIM	100	100	100	100	100	0
9	PARAKUM	100	100	100	100	100	0
10	BENDIWEWA	100	100	100	100	100	0
11	NAGAPOKUNA (PULASTI)	100	100	100	100	100	0
12	HATASISATA	100	100	100	100	100	0

AMPCETS

ANNUAL MAINTENANCE PLANS AND COST ESTIMATES
TERTIARY SYSTEMS. - KAUDULLA
(30. JUNE . 1992)

DCO No	NAME OF DCO	FIELD WORK %	COST EST %	MAINT PLAN %	ISSUE TREE %	BOP %	Sinhala Trans.
1	EKSATH	100	100	100	100	0	100
2	MENIK HOROWWA	100	100	100	100	0	100
3	SAMA	100	100	100	100	0	100
4	GOVISETHA	100	100	100	100	0	100
5	MANDALAGIRI	100	100	100	100	0	0
6	KALINGA ELA	100	100	100	100	0	0
7	C.P PURA PERAKUM	100	100	100	100	0	0
8	PUBUDU	100	100	100	100	0	0
9	SUHADA EKSATH	100	100	100	100	0	100
10	SRI NAGA	100	100	100	100	0	0
11	VIJAYAPURA VIJAYA	100	100	100	100	0	0
12	SAMAGI	100	100	100	100	0	100
13	MAHINDAPURA	100	100	100	100	0	100
14	MAHAWELI	100	100	100	100	0	0
15	D.S. SENANAYAKE	100	100	100	100	0	0
16	SRI VIJAYA	100	100	100	100	0	0
17	WEERA KEPPEPITOLA	100	100	100	100	0	0
18	NAGARAPURA SAHANA	100	100	100	100	0	100
19	MAHASEN	100	100	100	100	0	0
20	EKSATHGOVI	100	100	100	100	0	0
21	VIJITHA	100	100	100	100	0	0
22	PRAGATHI	100	100	100	100	0	0

AMPCETS

ANNUAL MAINTENANCE COST OF DCU SYSTEM - GIRITALE SCHEME

DCU No.	DCU NAME	COMMAND AREA		LABOUR COST Rs.	MAT/ENUP. TRANS. COST Rs.	TOTAL COST Rs.	UNIT COST	
		Ha	Ac				PER Ha	PER Ac
1	PURANAGAMA	430.60	1064.00	143,560	30,960	182,520	423.87	171.54
2	INGOOPURA	272.50	675.00	70,700	29,360	120,860	440.59	177.87
3	PARAKUM	109.35	270.20	28,730	11,920	40,650	371.74	150.44
4	KADAWALAWENA	240.55	595.00	97,350	32,350	129,700	539.18	217.98 (1)
5	BENDIYENA	126.70	313.00	51,450	17,150	68,600	541.44	219.17 (1)
6	JAYANTIPURA	449.40	1110.50	164,760	50,270	223,230	496.73	201.02
7	MAHASEN	206.60	510.50	84,550	23,220	109,775	531.34	215.03
8	PURANA MUSLIM	211.35	522.00	100,160	33,020	133,180	630.14	255.13 (2)
9	MANGADUKUMA	201.20	477.00	67,760	23,560	91,320	453.88	183.74
10	MANGALAWENARA	277.60	735.00	117,540	37,130	154,670	519.72	210.44
11	MUNDIMADUKUMA	270.00	607.00	110,400	30,785	149,265	536.92	217.27
12	MATALISATA	146.00	361.00	75,050	23,200	98,250	672.95	272.16 (2)
TOTAL		2767.05	7340.70	11,132,270	360,930	11,501,220	505.49	204.52
SAY		2770 Ha	17340 Ac					

Average Cost per Ac. $1,501,220/7,340 = Rs. 204.53$

1. All paddy lots of extent 2.0 Ac
 2. Re-use of water from anicut (Independent water supply)
- aucdu

ANNUAL MAINTENANCE COST OF DCO₂ SYSTEM - NIMMERIYA SCHEME.

IDCO No.	DCO NAME	COMMAND AREA		PLANT COST Rs.	MAINTENANCE TRANS. COST Rs.	TOTAL COST Rs.	UNIT COST	
		Ha	Ac				PER Ha	PER Ac
1	SULPOTIINCHA	423.45	1045	86898	48076	127765	302	122
2	KOTALANELA	508.74	1434	127878	53975	156865	278	189
3	KUHARAGANA	233.80	575	105153	48769	153922	661	260
4	VIIHARANAMATHA	664.16	1640	246878	91349	338439	518	286
5	SHINGURAKADAHANA	975.90	2462	122377	47499	169876	178	69
6	GALANIUNA GEMUNI	467.15	1157	171684	57356	229040	488	198
7	SHISSANNA	441.50	1071	138757	25438	156387	354	143
8	GALANIUNA VIJAYA	274.00	677	60005	30438	107243	371	158
9	SANISUNGANA	377.97	983	142556	66365	206921	528	210
10	KAUDULLA	367.21	912	105167	51473	156642	424	172
11	RAJAEALA	664.00	1640	252261	105465	357726	539	218
12	NAVAKUSUMPOKUNA	747.73	1847	153650	63886	217436	291	110
13	SHINGURAKA	608.56	1761	86727	35755	122684	178	78
14	MAHASEN	361.44	873	196731	65878	265801	755	298
15	YODAEALA	535.21	1322	56433	51815	140248	277	112
16	YATIYALPOTANA	412.17	1018	86485	49953	136438	331	134
17	PERAKUN	438.60	1064	146571	41626	188197	437	177
18	SHATANIUNA	656.18	1621	104778	42497	147275	224	91
19	DIVILANIADANELA	237.83	587	64719	21639	86358	364	147
TOTAL		9503.77	23731.00	12,470,120	11,003,355	13,473,403	7,467	3,821

Average Annual Maintenance Cost = $\frac{13,473,403}{73,731}$ = Rs. 146

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ANNUAL MAINTENANCE COST OF DCU SYSTEM - PARAKARA SAMUDRA SCHEME

DCU No.	DCU NAME	COMMAND AREA		PLANNED COST	ESTIMATED COST	TOTAL COST	UNIT COST	
		Ha	Ac	Rs.	Rs.	Rs.	PER Ha	PER Ac
1	AMRANGANGA	443.79	1077	176,750	52,250	229,000	516.81	200.75
2	ALUTHINEXA	364.3	900	195,600	52,650	248,250	601.07	275.03
3	MEERAGEDESA	22.3	55	17,600	4,600	22,200	995.52	403.64
4	2 ELA DCU	93.7	231.5	26,500	14,700	41,200	439.70	177.97
5	4 ELA DCU	145.7	368	40,050	19,850	60,000	471.52	190.83
6	MANIKKAMPITIYA	414.33	1024	116,700	39,000	155,000	374.10	151.37
7	GALTIAMBARAWA	271	717	120,500	71,500	200,000	687.29	278.16
8	VIJAYARAJAPURA	442	1072	105,500	67,000	255,700	578.31	234.16
9	SIMHARAJAPURA	410.6	1035	05,250	35,700	121,150	287.42	117.85
10	PANALA YALINGA ELA	357.7	887	87,700	42,300	132,000	366.97	148.48
11	MOHARATEENIA	108.6	463	60,000	26,100	74,900	583.18	204.09
12	PANANGI GEMMUPURA	276.72	684	75,700	38,700	134,100	404.61	196.03
13	PALUGASDAMANA	511.75	1265	141,350	78,000	212,150	414.40	167.71
14	SEKAGAMA	556.67	1673	257,700	62,200	319,900	487.14	197.18
15	LAASAUWANA	255	630	70,900	31,700	122,000	481.57	194.92
16	VIJAYAPURA	100	443	57,150	19,000	76,150	423.06	171.12
17	SIMHAPURA	302.12	747	62,050	35,700	97,750	323.55	138.06
18	TALPUTHA	216.19	534	105,150	36,200	141,350	653.02	264.70
19	LANIKAPURA	244.01	605	101,700	38,800	105,700	431.76	174.71
20	MEERAPURA	263	658	114,100	36,250	150,350	571.67	231.31
21	THANIMALA	151.05	375	74,700	27,200	102,100	672.37	272.27
22	GEMMUPURA	400	1000	126,000	36,300	163,100	399.75	161.01
23	MAHASEE	320	770	120,500	47,300	167,800	530.63	214.94
24	DEGALUGANA	700	474	94,650	43,000	130,450	692.25	208.26
25	ISORUPURA/ SAPAYAPURA	260	642	151,550	52,650	207,200	796.92	322.74
26	SUSIGAEILA	274	677	107,600	43,000	150,600	549.64	222.45
27	PULASTIGAMA	305	751	162,700	01,000	244,000	633.77	256.57

ANNUAL MAINTENANCE COST OF DCOs SYSTEM - KAUDULLA SCHEME

DCO No.	DCO NAME	COMMAND AREA		LABOUR COST Rs.	MAT/EDUP. TRANS. COST Rs.	TOTAL COST Rs.	UNIT COST		
		Ha	Ac				PER Ha	PER Ac	
1	TEKSATH	102.28	458	148607	36357	176964	971	393	
2	THENIKIDROHWA	78.40	243	44155	16369	68524	615	249	
3	ISANA	176.00	484	92894	32631	124725	636	258	
4	IGOVISETHA	115.00	206	52234	19283	71517	618	258	
5	MANGALAGIRI	178.00	467	104508	38626	143214	754	385	
6	IKALINGA ELA	211.25	525	125254	41751	167005	791	318	
7	ICP PURA PERAKUM	405.00	1000	275744	75183	350847	866	351	
8	IPURUDU	289.00	714	171354	57118	228472	791	320	
9	ISUNADA EYSATH	253.50	626	130776	40691	179467	708	287	
10	ISRI NAGA	131.58	325	64534	23858	87592	664	269	
11	VIJAYAPURA VIJAYA	157.80	378	93563	31188	124751	791	320	
12	ISAHAGI	252.40	623	156716	49546	206262	817	331	
13	MAHINDAPURA	241.00	595	118314	34068	152382	632	256	
14	MAHAHEL	77.68	192	33491	11421	44912	578	234	
15	IDS SEHAHAYAKE	168.70	417	108433	37198	137623	816	330	
16	ISRI VIJAYA	178.00	487	53282	24589	77871	393	159	
17	MEGRA - KEPPETIPOLA	183.60	454	107797	42422	150419	819	331	
18	MAGAPURA SCHEME	310.50	767	158245	57350	207683	669	271	
19	MAHANSEN	316.00	783	284678	119999	404677	1277	517	
20	TEKSATH GOVI	112.00	277	125276	38332	163608	1461	591	
21	VIJITHA	165.60	409	86892	28335	115627	698	283	
22	PRAGATHI	174.00	388	96745	30625	127370	1021	414	
TOTAL		4302.01	10027	268877	874467	3503474	117305.2	17035.71	
Average annual maintenance Cost		3,503,434/10027 =						324	

ANNUAL MAINTENANCE PLANS & COST ESTIMATES
TERTIARY SYSTEMS - RBE
(30 JUNE 1992)

No.	NAME OF DCO	FIELD WORK	COST EST %	MAINT PLAN %	ISSUE TREE %	ROP %	Sinhala Transla
1	KATAGAMUWA (INLET CANAL)	100	100	100	100	50	100
2	MAGALLEGAMA	100	100	100	100	50	100
3	CENTRAL CANAL	100	100	100	100	50	100
4	DANDUWAWA	100	100	100	100	50	100
5	THARANAGOLLA	100	100	100	100	50	100
6	DANGAHAWELAYAYA	100	100	100	100	50	100
7	HEELOGAMA	100	100	100	100	50	100
8	DIVULLEWA	100	100	100	100	50	100
9	BUDUMUTTAWA	100	100	100	100	50	100
10	BALANGOLLAGAMA	100	100	100	100	50	100
11	IBBAWELA	100	100	100	100	50	100

AMPCETS

ANNUAL MAINTENANCE COST OF UCU'S SYSTEM - RIDI RENDI ELA SCHEME

UCU No.	UCU NAME	COMMAND AREA		LABOUR COST Rs.	MAT/EQUIP. TRANS. COST Rs.	TOTAL COST Rs.	UNIT COST	
		Ha	Ac				PER Ha	PER Ac
1	IKATAGAMUWA	245.00	605	146500	27300	175800	718	291
2	IMAGALLEGAMA	129.00	319	21478	7160	28638	222	90
3	CENTER CANAL	161.00	398	63953	21310	85271	530	214
4	IDANDUWANA	176.50	435	23957	7906	31945	182	73
5	ITARANAGOLLA	211.00	521	38215	12738	50953	241	98
6	IDANGAMELAYAYA	197.00	487	71214	14243	85457	434	175
7	MEELUGAMA	113.00	279	12254	4804	16338	145	59
8	IDIULLENA	209.00	516	38797	12932	51729	248	100
9	IDUDUNUTTEKA	238.00	588	48071	16024	64095	269	109
10	DALAGOLLAGAMA	431.00	1064	77205	26420	105713	245	99
11	IDIRAMELA	130.00	341	21372	7131	28523	287	84
TOTAL		2240.00	5553.00	1565110.00	1159344.00	1724462.00	13439.33	11392.11

Average Annual Maintenance Cost per Acre = $724,462 / 5,553 = \text{Rs. } 130$

ANNUAL MAINTENANCE PLANS & COST ESTIMATES
TERTIARY SYSTEMS - GAL OYA LB
(30 JUNE 1992)

DCO No	NAME OF DCO	FIELD WORK	COST EST	MAINT PLAN	ISSUE TREE	BOP	Sinhala Trans.
1	LB 1A BATAHIRA DUNGALA	100	0	0	0	0	0
2	LB 1,2,& 3	100	0	0	0	0	0
3	LB 4	100	0	0	0	0	0
4	LB 5	100	0	0	0	0	0
5	LB 6	100	0	0	0	0	0
6	LB 7 (upper)	100	0	0	0	0	0
7	LB 7 (lower)	100	0	0	0	0	0
8	LB 8	100	0	0	0	0	0
9	LB 10	100	0	0	0	0	0
10	LB 11	0	0	0	0	0	0
11	LB 11A & B	0	0	0	0	0	0
12	LB 12	0	0	0	0	0	0
13	LB14	0	0	0	0	0	0
14	LB 15	0	0	0	0	0	0
15	LB 16	0	0	0	0	0	0
16	UB 1 - Udarigama	0	0	0	0	0	0
17	UB 2	0	0	0	0	0	0
18	UB 5,4 & 5B	0	0	0	0	0	0
19	UB 7	0	0	0	0	0	0
20	UB 8 & 8A	0	0	0	0	0	0
21	UB 9 & 10	0	0	0	0	0	0
22	UB 11	0	0	0	0	0	0
23	UB 12	0	0	0	0	0	0
24	UB 13,14,15 & 16	0	0	0	0	0	0