FINAL REPORT
On
WATER USE EFFICIENCY STUDIES

GODAVARI DELTA SYSTEM PROJECT



Sponsored by
Central Water Commission

IRRIGATION & COMMAND AREA DEVELOPMENT DEPARTMENT

GOVT OF ANDHRA PRADESH

FINAL REPORT OF
GODAVARI DELTA SYSTEM
CONTENTS

Sl.No	Item	Page No.
1	Abbreviations	1-2
2	Units	3
3	Executive summary	4-12
4	**Chapter – 1**	
	Project Details	13-20
	Index map	20A
5	**Chapter – 2**	
	Hydrology.	21-25
6	**Chapter – 3**	
	Canal conveyance efficiency	26-33
7	**Chapter – 4**	
	On farm application efficiency	34-47
8	**Chapter – 5**	
	Drainage efficiency	48-55
9	**Chapter – 6**	
	Irrigation potential created and utilized	56-62
10	**Chapter – 7**	
	Findings and recommendations	63-70
11	**Annexures**	**71-116**

ABBREVIATIONS

I & CAD Dept.	-	Irrigation and Command area development Department
Govt of AP	-	Government of Andhra Pradesh.
Dy	-	Distributary
C.C.A	-	Culturable Command Area
P.P.A.	-	Project Proposed Area
P.C	-	Potential Created.
P.U	-	Potential Utilized.
mm	-	Millimeter
Cm	-	Centimeter
m	-	Meter
Km	-	Kilometer
M.m3 or M.Cum	-	Million cubic meter
Msqm.	-	Million square meter
Mcft.	-	Million cubic feet
I.D	-	Irrigated dry
Ha or Hects.	-	Hectares
R.L.	-	Reduced level
F.R.L	-	Full reservoir level
F.S .L	-	Full supply level
H.F.L	-	High flood level
Hect.m	-	Hectare meter
Cumecs	-	Cubic meter per second
C/s or Cusecs	-	Cubic feet per second
ET0	-	Reference evapotranspiration
Kc	-	Crop-co-efficient
ET crop	-	Crop-evapo-transpiration
Re	-	Effective rain fall
P	-	Percolation loss
GIR	-	Gross irrigation requirement

FIR	-	Field irrigation requirement
NIR	-	Net irrigation requirement
C.C	-	Cement concrete.
CM and	-	Cross Masonry and
CD works	-	Cross Drainage works
CWC	-	Central Water Commission
etc	-	etcetera
@	-	at
APMS	-	Adjustable proportional Modules.
OFM's	-	Open Flume modules.
CNS soils	-	Cohesive non swelling soils

Units

Area	Hect.
Rainfall	mm.
Potential (created or Utilized)	Hect.
Water availability	Hect.m.
Storage capacity	Million cubic meter M.m3 or M.Cum.
Command area	Hects
Evaporation and seepage losses	Cumecs/Million Sqm
Length of channels	Km
Temperature	^{0}C
Humidity	%
Wind Speed	Km/hour
Crop water requirement	mm
Discharge	cumecs in M.K.S. unit or cusecs in f.p s unit

EXECUTIVE SUMMARY

SUMMARY OF WATER USE EFFICIENCY STUDIES

INTRODUCTION:

The Central Water Commission, Ministry of Water Resources, Government of India has initiated the study of water use efficiency of all major and medium projects of India including Andhra Pradesh in a phased manner to enable to take necessary steps for improving the system. The objectives of the water use efficiency studies are 1). To show when and where improvements can be made (2) More efficient Irrigation.

The main objectives of the study is to examine the status of the following efficiencies and to suggest necessary improvements in the system.

Scope of the Water Use Efficiency Studies:-

The study will focus on the following aspects

1. Dam/Reservoir efficiency,
2. Canal/Conveyance efficiency
3. On-farm application efficiency
4. Drainage efficiency
5. Irrigation potential created and utilized.

PROJECT DETAILS:

1. **Name of the Project** : GODAVARI DELTA SYSTEM (SIR ARTHUR COTTON BARRAGE)
2. **River / Main River /Basin** : Godavari River
3. **Type of Project (Major/Medium)** : Major Irrigation project
4. **Type of Structure (Dam/Barrage/Weir)** : Barrage (S.A.C. Barrage)
5. **Location:**

I.
- a) Latitude : 16^0 55 " N
- b) Longitude : 81^0.45 " E

II. Village : Dowlaiswaram

III. Mandal : Kadiam

IV. District : East Godavari

V. State : Andhra Pradesh

The barrage is located 6 Km from Rajahmundry at Dowlaiswarm (V) in Kadiam Mandal, East Godavari .District Andhra Pradesh State

6. **Length / Period of data used for study:** 10 Years.

1.	Dam filling data (Inflows):		1995-96 to 2004-05 (10 years)
2.	with drawls	:	1995-96 to 2004-05 (10 years)
3.	Irrigated area	:	1996-97 to 2004-05 (9 years)
4.	Rain fall data	:	1995-96 to 2004-05 (10 years)

7. **Culturable Command Area (C.C.A)** : 410108 Ha

8. **Ultimate irrigation potential** : 410108 Ha

9. **Potential created** Kharif : 410108 Ha

Rabi : 410108 Ha

10. **Potential utilized during the years (1996-97 to 2004-05)**

Kharif : Minimum 3,13,295 (in 2002-03) Maximum 4, 10,108 ha in all the years except 2001-02.

Rabi : Minimum 3, 13,295 (in 2002-03) Maximum 4, 10,108 ha in all the years except 2001-02.

11. <u>Major recommendations for over all improvement of the project.</u>

i) <u>Dam / Reservoir Efficiency</u>

<u>Barrage Efficiency:</u> The present gross storage capacity of barrage is 83MM^3 against the designed capacity of 113 MM^3 and the same is being maintained. The condition of the barrage in general is satisfactory. The following are the recommendations made with reference to barrage efficiency.

a. Regular maintenance of Dam, every year is to be done.
b. Strengthening of flood banks is to be carried out to suit for the maximum flood received during August 1986. The estimated cost is Rs. 549.32 Crores for strengthening the flood banks so as to protect the villages from in undation and submersion of fields during the floods.
c. To ensure safety of dam it is better not to allow public movement through vehicular traffic.

ii) **Canal system / Delivery System Conveyance efficiency:-**

The distribution system of Godavari delta system is an age old one. The irrigation system needs improvement to carry out the designed discharges. The head sluice of Godavari Eastern Delta canal, Central Delta Canal and Godavari Western Delta Canals were only improved but the 135 years age old distributory system is yet to be improved. Hence the following measures need be taken.

a. Remodeling of canals to the designed capacity
b. Lining of branch canals and distributary system at least for the reaches passing through sandy soils.
c. Construction of additional regulators, repairs and reconstructions of age old locks etc.
d. Providing Gates to Sluices and construction of Masonry sluices in place of pipes embedded in earth.
e. Providing Telephone, Wireless along the canal banks of three delta canals.
f. Installation of measuring devices on canals and distributaries for ensuring optimum use of water for irrigation.
g. Inspection paths are to be provided wherever necessary.

The above measures are proposed to be implemented under modernization of age old Godavari Delta System with an estimated cost of Rs. 3060 Crores.

iii) **On Farm application Efficiency:**

The on farm application efficiency of Godavari Delta System command area under the canal system have been evaluated for the wet and I.D areas grown during the year 2004-05 and the results are as follows.

1. On farm application efficiency for wet crops	41.74 %
2. On farm application efficiency for I.D crops	66.56 %
3. Average on farm efficiency	54.15 %
4. Overall project efficiency	45.05 %

The present practice of supply of water on continuous basis involves lack of uniform supply and wastage. But this is inevitable as the head system itself is barrage where water has to be delivered as it comes into the barrage. Paddy is the Major crop grown in the project command which requires more water. The following are suggested.

a. There are hundreds of irrigation pipes and sluices fixed in the earth without proper regulating shutters resulting in considerable wastage of water in distribution. Proper arrangements for fixing pipes in masonry (or) concrete and shutters are to be made to ensure regulated supply to the farmers.
b. The possibility of providing water meter at field level to be explored to supply water as per actual requirements.
c. Farmers are to be involved fully in water management with latest technologies for optimum use of water.
d. 'Warabandi' system or SRI method for paddy crops may be introduced for the equitable distribution of water and to feed tail end reaches effectively. The practice of irrigating wet crops may be discouraged at least during Rabi season and in its place short term I.D crops may be encouraged so that more areas could be irrigated with available water.

iv) <u>Drainage efficiency:</u>

The drainage congestion under Godavari Delta System arises only due to un precedent flood during rain season for which the existing drains are not designed to carry the extra water.

The deltaic area gets in undated easily due to heavy rains. The drains existing are functioning as irrigation source in addition to drainage system. The drainage congestion in the drains are at its worst when the local rains and the floods in the river are experienced simultaneously. The drains are also serving as irrigation sources. For the effective use of the drains as irrigation sources and to release the drainage congestion the following are suggested.

a. Modification of drains are required so as to raise the water levels to suit for irrigating the command area.

b. The entire drainage system needs improvements such as removal of weed growth twice in every year.

c. Silt clearance, Strengthening of banks at vulnerable locations are required to be done.

d. Clearing of vents of al the cross Masonry and cross drainage works well before the on set of rainy season.

e. As the present existing drainage system is not designed to cope up with the extra ordinary conditions of floods it is necessary to revise the design criteria for drains and effect further improvements.

f. Some Major drains which are perennial and existing in the command can be utilized for supplementing the command area.

The modernization of Godavari Delta System Distribution system along with the drainage system has been taken up at a cost of Rs. 2047 Crores under various packages.

12. Name of consultant who carried out the study — A team of consultants are working in the project under the guidance of Principal. Secretary and Spl. Commissioners I &CAD. A list of consultants already given in Inception Report. A copy of the same is given in Annexure – B.

13. Storage Efficiency:

a. <u>Reservoir / Barrage filling efficiency</u>

The present gross storage capacity of the barrage is 83 M.cum against the designed capacity of 113 M.cum and the same is maintained. This is a diversion scheme and the canals are taking the discharges hence the barrage is able to maintain the driving head entailing FSD encroaching into free board. Therefore the barrage efficiency can be taken as 100%.

The Barrage efficiency from the year 1995-96 to 2004-05 is presented in relevant chapter.

b. Inflows Pattern: -

As this is a Barrage scheme the inflows are diverted to the extent of requirements for the crops and the balance over and above the maximum storage spills over the barrage. Even the maximum storage can not be allowed to be retained in case of expected continuous inflows. The inflows are encouraging and the irrigation potential created is effectively utilized. The project (Barrage) has surplussed in all the years indicating the success of the Barrage. The inflow pattern from 1995-96 to 2004-05 is furnished in Format-I (PART-A).

14. Conveyance efficiency

(a) Main canals (b) Branch canals (c) Distributaries	Field studies for evaluating conveyance efficiency have been carried out on Godavari Central Main canal from Km 3.20 to 6.50 and Km 6.50 to 12.10. Gannavaram canal from Km 16.95 to 31.08, Km 31.08 to 34.00 and Km 34.00 to 52.00 and Kadali canal from Km 0.95 to 6.50, by using current meter. The weighted average efficiency is working out to be 95.91 %, 84.01 % and 95.39 % respectively. The efficiency of Central canal system is working out to 76.86 %

Similarly the field studies for evaluating conveyance efficiency have been carried out by using current meter method on Godavari Western Main Canal, V & W canal and Undi canal, Anakoderu canal from Km 0.00 to 9.88 from Km 25.85 to 50.38 and Km 0.00 to 11.92 and Singavaram Ava Channel from Km 0.00 to 1.40. The conveyance efficiencies are working out to 98.52 % for western main canal 96.30 % in respect of V & W canal and Undi canal 96.47 % for Anakoderu canal and 97.86 % on Singavaram Ava canal. The efficiency of Western main canal, V & W canal, Undi canal and Anakoderu canal is working out to 89.56 %.

The overall system efficiency in respect of Godavari Central and Godavari Western canal system works out to 76.86 % and 89.56 % and the combined efficiency works out to 83.21 %.

The conveyance losses seems to be more which may be due to the age old system of canals, poor maintenance in the system due to damaged shutters, non existence of sufficient berms and also disturbance of hydraulic gradient of the berms. The delivery system is unlined resulting in losses observed in specially in sandy soils. A number of Irrigation sluices are fixed in earth with out proper regulating arrangements resulting in considerable wastage of water in the distribution.

Due to in adequate number of cross regulators across the canals and channels command able levels could not be maintained resulting in much wastage of water specially during Rabi season. Some of the drainage works across the canals are not adequate and also the discharging capacity of the most of lock weirs is in adequate to meet the peak demand and there are leakages in the lock weirs resulting in losses. To regulate the required flows into the canals, there are no measuring devices.

15. **On Farm application efficiencies for all Major Crops:**

Designed Cropping Pattern

The general cropping pattern followed in the command area is paddy. Paddy is sown in 87% of the cultural command in both Kharif and Rabi, 3% is sown with sugarcane, 6% is sown with horticulture crops, 2% sown with I.D like ground nut and Banana and Aquaculture in 2% of area. Pulses like green gram black gram etc after harvesting paddy vegetables are also grown in small extents.

Observation of percolation losses is not possible in normal paddy fields where water would be supplied from field to field. The studies can be taken up only by special observation in open fields arranged for the purpose unlike the command area. The farmers are in the habit to maintain 3" to 4" depth of water in the fields, draining the fields frequently and letting in water again after every such drainage which results in water logging and losses of chemical nutrients.

The on farm application efficiency of Godavari delta system has been evaluated for wet and irrigated dry crops separately and the results are given below.

On farm application efficiency	54.15 %
Overall project efficiency	45.05 %

It is noticed that the entire three existing Delta distributory canals sections are condensed to U. shape and at some locations with raise in the bed level and hence not capable of carrying the designed discharge. The canals are to be improved to carry the Designed discharge. Also the CD and CM works, regulators, lock chambers, main off take head sluices constructed 135 years back require repairs and reconstruction. The shutters of the main 3 sluices, regulators, weirs etc are frequently tampered by the farmers. Heavy floods occurred during the months of September 2005, August, 2006 caused further damages to the canals systems.

16 **Drainage efficiency:-**

a. **Godavari Western Delta:-** The area irrigated in the Western Delta is mostly served by net work of Drainage sources. There are 22 Major drains, 56 Medium Drains and 559 Minor Drains in the Delta and serve the entire Ayacut of 214473 Ha (5,29,962 Acres). The inflows of the drain in the delta area is of three types. Some drains join in Kolleru Lake, which in turn is connected to the Sea by a narrow out let called Upputeru. The other drains join the sea through Upputeru or Vasista Godavari River.

b. **Godavari Eastern & Central Delta:-** There are 11 Major Drains, 19 Medium & 117 Minor Drains and serve, the entire Ayacut of 111954 Ha. (2,76,528 Acres) and in the Godavari Central Delta there are 8 Major Drains, 25 Medium Drains and 145 Minor Drains to serve the entire Ayacut of 83760 Ha (2,06,887 Acres). The total quantum of water released to the field is less than the crop water requirement calculated as per Modified pen man method which indicates that there is no drainage problem in the command area. But actually problem is being encountered during the rainy season specially during floods. In usual course of time the drainage water from the drains is also being utilized for irrigation by cross bunding. The drainage system requires modernization and maintenance.

As the crop water requirement combined with Ground Water potential is more than the seepage plus evaporation losses, there is no drainage problem.

Participatory Irrigation Management.

There are 16 Distributory Committees, 89 Water User Associations functioning under Eastern deltas and 9 Distributory Committees, 56 Water User Associations functioning under Central delta of East Godavari District. and 20 Distributaries committees, 131 Water User Associations functioning under Western delta of West Godavari District.

CHAPTER-1
PROJECT DETAILS

CHAPTER – 1

1. PROJECT DETAILS:

1.1 Introduction – including objectives of the studies.

Water is a vital natural resource, a basic human need and a precious national asset. It is a key source for all activities right from agriculture to industry. In view of increasing water demand for various purposes namely Irrigation, drinking, domestic, power (thermal and hydro) industrial and other uses there is severe stress on water resources. It's scarcity is more pronounced with increasing population and needs.

The performance of the existing irrigation system (particularly the major and medium irrigation schemes in the state) suffers from low water use efficiency, distribution losses, poor operational maintenance and management of soil salinity, water logging and tail end problems.

Keeping in view of above scenario the central water commission, ministry of water resources, Government of India has initiated the study of water use efficiency of all the major and medium projects of India including Andhra Pradesh in a phased manner so as to enable to take necessary steps for improving the system.

The study will focus on dam/reservoir efficiency, canal conveyance efficiency, on farm application efficiency, drainage efficiency, irrigation potential created and utilised etc. The efficiency studies on 14 Major and 6 Medium irrigation projects of Andhra Pradesh have been taken up during the year 2005-06. Sir Arthur Cotton Barrage Project is one of the above major irrigation projects for which efficiency studies are taken up.

OBJECTIVES OF WATER USE EFFICIENCY STUDIES :

The objectives of the water use efficiency studies

(1) Is to show when and where improvements can be made.

(2) More efficient irrigation

Scope of Water Use Efficiency Studies:-

The main objective of the study is to examine the status of the following efficiencies and to suggest necessary improvements in the system.

The study will focus on the following aspects:-

(1) Dam efficiency (inflows and release pattern)

(2) Delivery system/Conveyance efficiency

(3) On farm efficiency studies

(4) Drainage efficiency and

(5) Irrigation potential created and utilized.

The above efficiency study of the project involves collection of primary as well as secondary data.

Primary data:

Primary data is the data actually observed/measured first hand by standard data observations or measurement techniques using standard and properly calibrated instruments.

Field studies conducted on canals and in the command area and collection of field data particularly include recording observations in proper formats for evaluation of efficiencies belongs to primary data. The field observation supported with the data are discussed in detail in forth coming chapter.

Collection of primary data in regard to the following field studies involve the methodology as detailed below.

Conveyance efficiency:

The studies for evaluating conveyance efficiency were taken up into two parts.

i) For main canals and distributaries having discharge more than 150 Cusecs

ii) For main canals and distributaries having discharge less than 150 Cusecs

Representative samples of above (i.) & (ii) categories of discharge are to be taken from head, middle and tail reaches. The above studies are to be conducted for lined and unlined canal separately.

On farm application efficiency:

It is to be evaluated based on the ratio of actual water delivered to the field to the water requirement of the crop considering effective rain fall in the command.

Three chalks are to be selected in head, middle and tail end reaches for conducting field studies. Data in respect of actual water delivered to the chaks is to be measured in various reaches and compared with water requirements of crops in respective area for evaluation of efficiency.

Drainage efficiency:

This is indicated as a ratio of the total water drained from the system to the total delivered to the system plus effective rainfall minus water used by crops.

Secondary data:

Secondary data is the data actually obtained from the agencies authorized and well qualified for collection of such data by standard data / observation measurement techniques using standard and properly calibrated instruments. Secondary data is collected for the past 10 years in the formats prescribed by the C.W.C.

They all relate to dam / reservoir listing salient features, inflows, surplus, evaporation loss in the reservoir, seepage loss from the reservoir, rain fall data, designed capacities of canal system, data on ayacut particulars and command area etc.

The data collected on the above aspects have been properly entered in the specified formats and discussed in detail in the forth coming chapters at appropriate places of the detailed report.

Sir Arthur Cotton Barrage

History in brief :(Preamble)

a) The original structure consists of Anicut on four arms of the River Godavari at Dowlaiswram constructed by Sir Arthur Cotton about 135 yeas ago to mitigate the distress caused by the recurring floods and famine to coastal districts at that time. The ayacut originally proposed was 2.48 lakh Hectares. It is a diversion scheme.

b) The Irrigation system comprises a Masonry Weir rough stone aprons built across the river Godavari near Dowlaiswaram with a net work of canals on either bank of the river and in the central delta drawing supplies from the river for irrigating to an ayacut of 2.48 lakh hectares.

a) Prior to 1862, the Anicut Crest Level is +36.00 ft. During 1862-67 the crest was raised to +38.00 ft. In the year 1898 the crest level was again raised to +38.75 ft and 2.00 ft falling shutters were fitted on top. Even this level was found inadequate and in 1936 0.91mts (3' 0") were fixed. The salient features of the Anicut are given in 2.2.2

b) The present Barrage is 24 m above the existing Anicut which is implemented as per the advice of experts committee headed by Sri A C Mitra duly fixing the pond level at + 13.60 m and to store 4 TMC of water in excess of existing capacity. The new Barrage is named as Sir Arthur cotton barrage. The ultimate irrigation potential under the project is 410108 hectares (1013376 Acers).

1.2. Project - Salient features of Godavari anicut:

Length of Old Anicut:-

1. Dowlaiswaram Branch	- 1474.80 mt	Across Gowthami
2. Ralli Branch	- 871.30 Mt	Rivers
3. Madduru Branch	- 472.40 Mt	across Vasista
4. Vizzeswaram Branch	- 792.80 Mt	Rivers
	3611.30mt	

Crest of Anicut :	+11.81 M (+ 38.75 ft)
Crest of Anicut Shutters:	+12.72 M (+ 41.75 ft)
Height of Shutters:	0.91M (3' 0")
No. of Shutters:	1103 Nos of 3M long
Catchment area of Godavari: at Anicut site	3, 10,000 Sq Km (1,92,666 Sq. miles)
Length of River:	1465 Km (894 Miles)
M.F.D: Observed on 15-8-53	32,27,334 Cusecs or 91,400 cumecs

HEAD SLUICE

1) Eastern Delta Main Canal at Dowlaiswaram

No. of Vents:	14 Nos
F.S.L:	+ 12.50 M (+ 41' 0")
Sill Level:	+ 9.75 M (+ 32' 0")
Bed Width of Main Canal:	50.90 M (167 ft)
F.S. Depth:	2.74 M (9 ft)
Ayacut:	1, 11,909 Ha or 2, 76,527 acres
Observed Discharge capacity:	3000 Cusecs or 84.96 cumecs

2) Central Delta Main Canal at Bobberlanka

No. of Vents:	15 Nos
F.S.L Rear:	+ 12.58 M (+ 41.30')
Sill Level:	+ 9.69 M (+ 31.8')

Bed Width of Main Canal:	32.61 M (107 ft)
F.S. Depth:	2.90 M (9.50 ft)
Ayacut:	206887 Acres or 83,726 Hectares
Observed Discharge capacity:	2500 Cusecs or 70.80 cumecs

3) Western Delta Main Canal at Vijjeswaram

No. of Vents:	8 Nos
F.S.L Rear:	+ 12.71 M (+ 41.70')
Sill Level:	+ 9.62 M (+ 31.55')
Bed Width of Main Canal:	51.821 M (170 ft)
F.S. Depth:	2.80 M (9.15 ft)
Ayacut:	5, 29,962 Acres or 214473 Hectares
Observed Discharge Capacity:	6000 cusecs or 170 cumecs

Due to the higher potential of water ponded by the Anicut and due to passage of time the soundness of the structure deteriorated. Hence extensive damages were caused near the left end of Ralli Arm during the 1963 floods.

After detailed examination, the Expert Committee headed by Sri A.C. Mitra recommended for the construction of Barrage 24 Mtrs upstream of the existing Anicut duly fixing the pond level of the Barrage as + 13.60 M. The rise in pond level will increase the impounding capacity by about 4.0 TMC. The newly proposed Barrage was named as Sir Arthur Cotton Barrage Project, which includes construction of new Head Sluice for all the three Main Canals. The salient features of the SACB are as follows.

I. Length of Barrage

S.No	Name of arm	Length	No of vents
1	Dowlaiswaram Branch	1437.92 Mts	70
2	Ralli Branch	884.45 Mts	43
3	Madduru Branch	469.66 Mts	23
4	Vijjeswaram Branch	800.64 Mts	39
	Total:	3592.67 Mts	175

II.	Pond Level	:	+13.64 mt
	Sill Level of Spillway	:	+10.67 mt
	Top of Shutters	:	+14.01 mt
	Size of Shutters	:	3.34 x 18.29 mt
	Top of Road way	:	+22.21 mt
	Width of the Road way	:	7.50 mt
	Width of Piers	:	2.13 mt
	Hoist Platform level	:	+26.62mt

III. Details of Head Sluices:

a) Godavari Eastern Delta Head Sluice

No. of Vents	:	4 Nos
Size of each vent	:	12.195 mt x 3.89 mt
Discharge Capacity	:	6000 Cusecs
Sill Level	:	+ 9.76 t
Designed Discharge	:	6000 cusecs or 170 cumecs

b) Godavari Central Delta Head Sluice

No. of Vents	:	3 Nos
Size of each vent	:	12.195 mt x 3.90 mt
Discharge Capacity	:	4260 Cusecs
Sill Level	:	+ 9.69 mt
Designed Discharge	:	4260 cusecs or 120.50 cumecs

c) Godavari Western Delta Head Sluice

No. of Vents	:	5 Nos
Size of each vent	:	12.195 mt x 3.90 mt
Discharge Capacity	:	9937 Cusecs
Sill Level	:	+ 9.62 mt
Designed Discharge	:	9000 cusecs or 255 cumecs

In this project all the three main canals and Distributory system canals are not improved to suite the new constructed head sluices of Eastern delta , Central and Western delta canals. The lengths of Main canals in the three deltas is 29.40 Km and the lengths of branch canals is 794.25 Kms. The length of Distributaries is 3790.6 Kms. Eastern delta and central delta serves East Godavari District and Western Delta serves West Godavari District.

The irrigated area in East and West Godavari Districts is served by the following canals.

Sl.No	Name of the Canal	Designed Ayacut in Ha	Length of the Canal Km
1	2	3	4
Godavari Eastern Delta, East Godavari District			
1	Main Canal	1089	6.70
2	Bank Canal	23501	63.59
3	Kakinada Canal	21168	40.55
4	Samalkota Canal	21573	53.01
5	K.M.J. Canal	5501	14.87
6	Mandapeta Canal	14916	21.75
7	Coringa Canal	16395	35.80
8	Injaram Canal	7766	17.70
	Total	**1,11,909**	**253.97**
Godavari Central Delta, East Godavari District			
1	Main Canal	6118	13.20
2	Gannavaram Canal	24030	59.43
3	Amalapuram Canal (Banda canal)	25870	50.37
4	Bank Canal	27708	62.66
	Total	**83726**	**185.66**

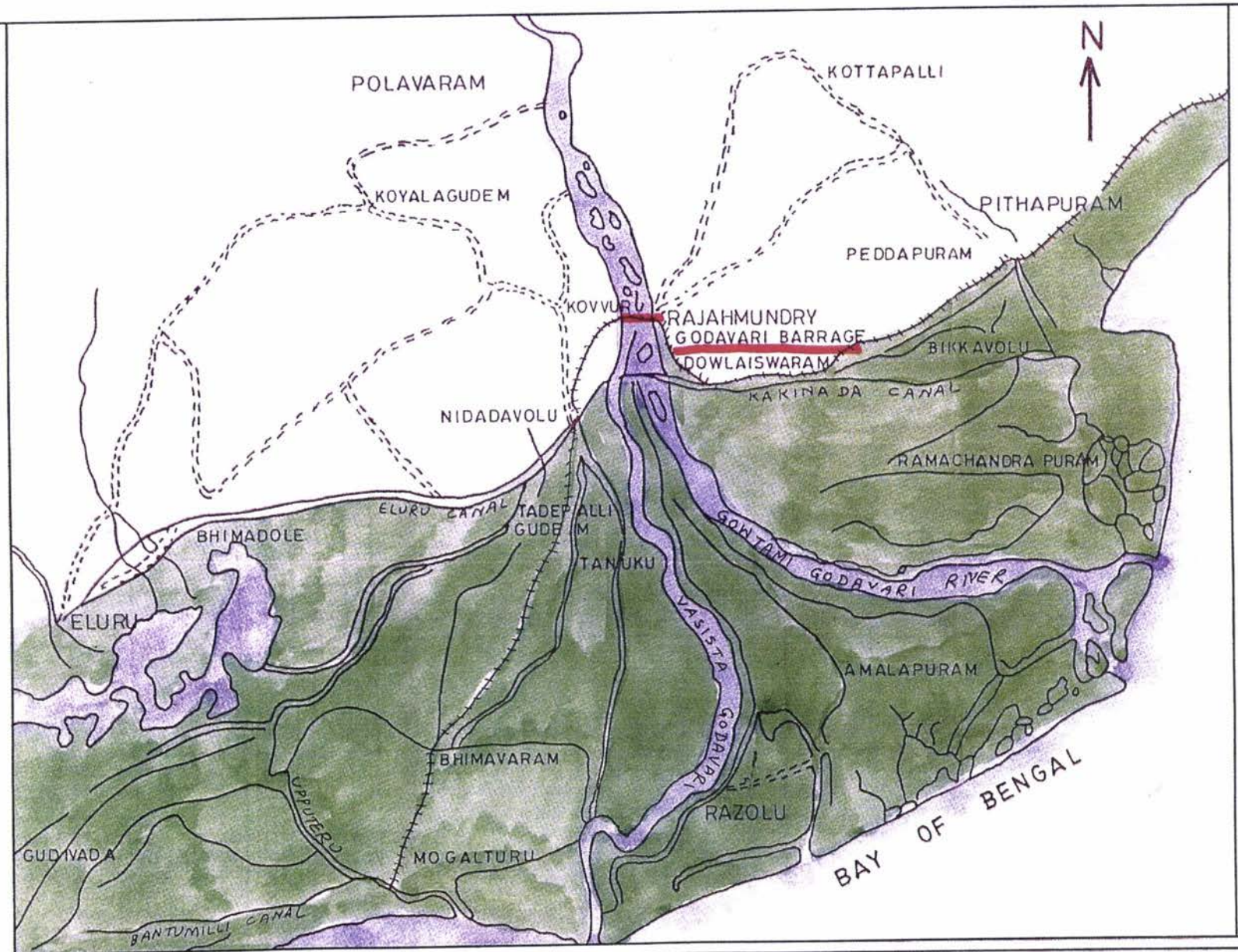
Benefits:

1) Ayacut benefits 1013376 Acres (410108 ha)

2) Villages served in East Godavari 436 Nos

3) Villages served in West Godavari 397 Nos

PLAN OF GODAVARI DELTA SYSTEM



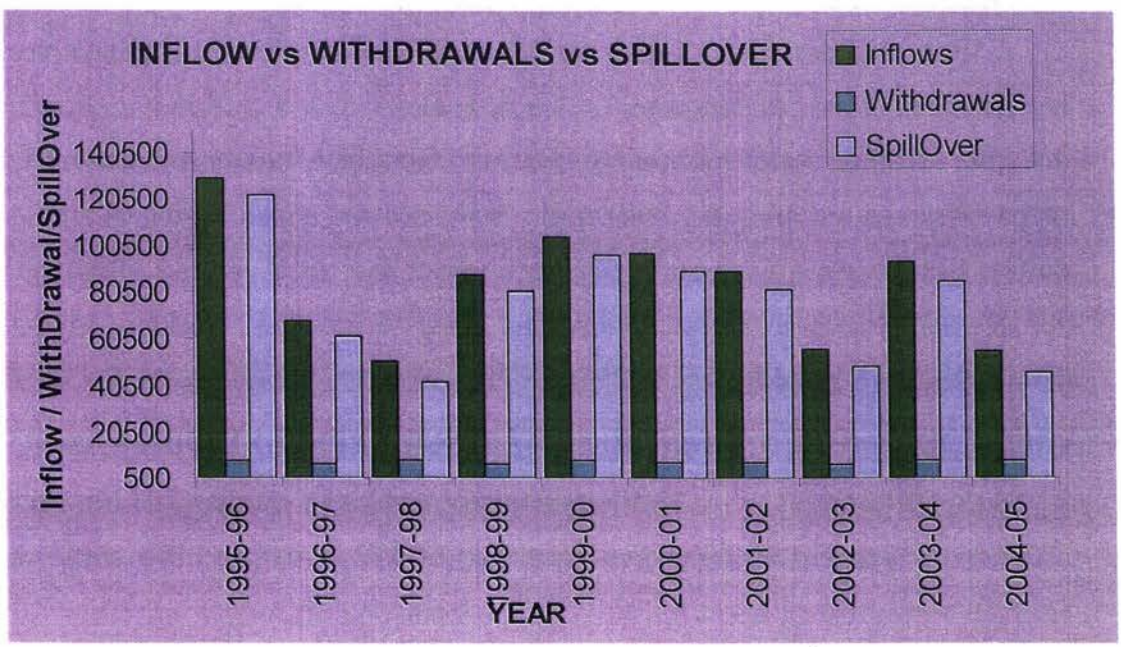
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Live Storage: 60.06 Mm^3 **Gross storage: 83.00 Mm^3**

S. No	Year	Inflows $M.m^3$	With drawals $M.m^3$	Spill over $M.m^3$	Evaporation	Seepage	Actual Storage/ Month	Efficiency %
	1	2	3	4	5	6	7	8
1	1995-96	130121	8185	121936	*	*	68.55 (8/95)	75.94
2	1996-97	67666	6978	60699	-	-	67.96(01/97)	74.95
3	1997-98	50399	8129	42267	-	-	67.36 (01/98)	73.96
4	1998-99	87905	6685	81220	-	-	66.46 (04/99)	73.39
5	1999-00	104501	8151	96346	-	-	67.96 (3/00)	74.96
6	2000-01	97241	7535	89708	-	-	75.01(8/00)	86.70
7	2001-02	89346	7701	81645	-	-	68.55(11/01)	75.94
8	2002-03	55678	6912	48769	-	-	67.96 (09/02)	74.96
9	2003-04	93865	8519	85342	-	-	67.96(07/03)	74.96
10	2004-05	54729	8041	46688	-	-	67.98(11/04)	74.16

Note: This is a diversion scheme for which storage will not be considers. The canals are taking the required discharge hence the barrage is able to maintain the driving head, entailing FSD encroaching into free board also. Therefore the Barrage efficiency is 100 %.

* Being a diversion scheme there values are not observed.



As can be seen from the data, the maximum spillage of 121936 Mm^3 was noticed in the year 1995-96 against the 100 years maximum of 146985 Mm^3 and the minimum spillage of 42267 Mm^3 was observed in the year 1997-98.

2.2 Evaporation losses in the Reservoir / Barrage

Evaporation of water from the storage reservoir or Barrage is a natural phenomenon. Evaporation is a direct function of water spread area and the rate of evaporation varies directly with temperature and wind velocity and inversely with humidity. Huge quantities of water lost through evaporation means loss of Irrigation. The need for minimizing evaporation losses is greater in the reservoir of Andhra Pradesh.

In the case of SACB Project, evaporation losses are not observed and in all working tables of the years from 1995 to 2005 under study as the Pan Evaporation Method is not being taken up at the barrage site.

In this connection, it is to be presented that the evaporation losses of the Barrage are not considered, in all the working tables of the years from 1995 to 2005. This is mainly a diversion scheme designed for letting out the required releases to the ayacut of 3 deltas based on the inflows and the excess will be allowed to spill over.

2.3 Seepage losses from the Reservoir / Barrage:

The principal factor influencing seepage losses in the reservoir are the permeability and thickness of the soil layers in the ponded area and the total head of water producing seepage. Seepage losses are generally more when reservoirs are underlain with porous strata having ample outlets beneath the surrounding hills or under the dam. Incase of SACB, no seepage losses were noticed as seen from the working tables from1995-96 to 2004-05.

2.4 Calculation and presentation of efficiencies in tabular form:

Barrage Efficiency: The Present gross storage capacity of barrage is 83 $M.m^3$ against the designed capacity of 113 $M.m^3$ and the same is being maintained as seen from the inflow data and spillage for the last 10 years. The barrage efficiency in the last 10 years is presented as under.

CHAPTER-2

DAM / RESERVOIR EFFICIENCIES

CHAPTER – 2

2.0 Dam/ Reservoir Efficiency:

2.1 Hydrology:

2.1.1 75% Annual dependable flows

River Godavari is the largest of the Indian perennial rivers. It is an inter state river having its water sheds in the state of Maharastra, Karnataka, Madhyapradesh, Orissa and Andhrapradesh. The river takes its origin at a place called Triambak 112 km North east of Bombay. The catchment area of the Godavari is 3146685 Sq.Km. of which 48.60% lies in Maharastra, 20.70% in Madhyapradesh, 1.40% in Karnataka, 5.50% in Orissa and 23.80% in Andhra pradesh.

The tiny stream at Triambak flows across the peninsula, collecting the drainage from various tributaries in between for about 1465 Km and falls in to Bay of Bengal between Kakinada and Narasapur. After the confluence of the Sabari which is one of the chief tributaries of the river, the river finds its way

Godavari Western Delta, West Godavari District			
1	Godavari Western Main Canal	5260	9.500
2	Eluru Canal	25082	66.45
3	Junction Canal	10254	5.630
4	Old Wuyyeru Canal	3271	7.830
5	Undhi Canal	32978	32.130
6	Venkayya Wuyyeru Canal	24180	32.130
7	Gostanadi & Velpuru Canal	27669	58.830
8	Attili Canal	20540	25.670
9	Bank Canal	18866	39.500
10	Kakaraparru Canal	9503	28.880
11	Narasapur Canal	36870	48.070
	Total	**214473**	**354.62 K.M**

through the spurns of Eastern ghats, till they close up into a gorge near Perantalapalli village about 80 Km above Rajahmundry. After traveling through a series of lake like reaches the river emerges into the plains at Polavaram about 40 Km from Rajahmundry. The river widens from here and finally when it reaches Dowlaiswaram attains a width of nearly 3 Miles.

The River is familiarly known as Akhanda Godavari up to Dowlaiswaram. At Dowlaiswaram the river bifurcates into two branches the northern branch is known as Gowthami Godavari and southern branch is called as Vasista Godavari named after the great sages of Hindu Mythology. In between the two branches lies the rich alluvial deposit 500 Sq. Miles in extent known as Godavari Central Delta.

2.1.2 Actual 75% dependable Annual flows

The annual yield at 75 % dependability works out to 2031.51 T.M.C or 57,534 $M.m^3$. The maximum yield received till now is 5190.49 TMC or 1, 46,997 $M.m^3$ and the minimum is 1956.14 TMC or 55,399 $M.m^3$.

2.1.3 Inflow Pattern

The year wise inflow pattern of river Godavari at S.A.C. Barrage project from the year 1995 to 2005 is furnished in Format - I of electronic data base. The trend of in flows, withdrawals and spillage are furnished in format –I (Part-A)

It is noticed that 7 out of 10 years, the inflows received were more than 75 % dependable yield.

It can be seen from the above, that the maximum inflows of 1,30,121 $M.m^3$ were received in the year 1995-96 and the minimum inflows of 50394 $M.m^3$ were received in the year 1997-98 during the last 10 years.

The Maximum and minimum spillovers were noticed during these two years only. However the maximum with drawals were noticed during the year 2003-04, which was 8519 MM^3 while the minimum with drawal of 6684 MM^3 was in the year 1998-99. This is mainly due to receipt of heavy rainfall

The state government has undertaken in the year 1970, the construction of new Barrage across the river at 24 Mts U/s of the existing weir so that the existing anicut could be made integral part of the new structure to serve as a rear protection. The work was completed in 1985.

2.1.4 Water Spillage

The surplus history of the SACB Project shows that the project surplussed in all the years. The performance indicators, showing inflows, withdrawals and spillage are furnished.

The following observations are made with reference to Barrage efficiency, with the following suggestions.

1. The water level over the S.A.C. Barrage generally touches 4.20 meters over the sill +11.81m every year against M.W.L of +14.87m discharging 13 Lakh cusecs. The maximum flood discharge was 101292 cumecs during the month of August, 1986.
2. It is essential to carryout the repairs to the shutter for arresting leakages and maintain the same every year by greasing etc.
3. Improvements to the flood banks is necessary in view of the maximum flood received in 1986 and strengthen the flood banks protecting the near by villages and submersion of fields during the flood.

CHAPTER-3
CANAL CONVEYANCE EFFICIENCIES

CHAPTER – 3

3.0 Canal Conveyance Efficiency:

Conveyance efficiency is the ratio of total water delivered at the out let to the block of field and the water releases at the project head work. It is expressed in percentage.

3.1. Canal capacity:

3.1.1. Designed carrying capacity:

The original designed capacities of the main canals of SAC Barrage are as follows.

S.No	Name of the canal	Designed Discharging capacities of the canals in cusecs	Present carrying capacities of the canals in cusecs
1.	G.E. Main Canal 2,76,528 Acres or (1,11,909 hectares)	4940	3950
2	G.C. Main Canal 20,6,887 Acres or (83,726 hectares)	3695	2955
3	G.W. Main Canal 5,29,962 Acres or (2,14,473 hectares)	9465	7570
	Total	**18100**	**14,475**

3.1.2 Actual Carrying Capacity:

The present carrying capacity of 3 canals is 14,475 cusecs as against the designed capacity of 18,100 cusecs. The existing section of canals and distributaries are condensed to 'U' shape or widened in certain locations with rise in bed levels and hence not capable of carrying the designed discharges.

Comparative statement showing the designed discharges and actual carrying capacities of the canals under Godavari Delta System is here with tabulated below.

Sl.No	Name of the Canal	Ayacut in Hectares	Length of the Canal	Designed Discharge Cumecs	Actual Carrying capacities Cumecs
1	2	3	4		
Godavari Eastern Delta, East Godavari District					
1	Main Canal	1089	6.70	1.36	1.09
2	Bank Canal	23501	63.59	29.36	23.49
3	Kakinada Canal	21168	40.55	26.45	21.16
4	Samalkota Canal	21573	53.01	26.95	21.56
5	K.M.J. Canal	5501	14.87	6.87	5.50
6	Mandapeta Canal	14916	21.75	18.68	14.91
7	Coringa Canal	16395	35.80	20.49	16.39
8	Injaram Canal	7766	17.70	9.70	7.76
	Total	**111909**	**253.97**	**139.90**	**111.86**
Godavari Central Delta, East Godavari District					
1	Main Canal	6118	13.20	7.64	6.12
2	Gannavaram Canal	24030	59.43	30.02	24.02
3	Amalapuram Canal (Banda canal)	25870	50.37	32.33	25.86
4	Bank Canal	27708	62.66	34.62	27.69
	Total	**83726**	**185.66**	**104.61**	**83.69**

Godavari Western Delta, West Godavari District					
Sl.No	Name of the Canal	Ayacut in hectares	Length of the Canal	Designed Discharge Cum	Actual withdrawals Cum
1	Main Canal	40597	9.50	50.72	40.58
2	Eluru Canal		66.45		
3	Junction Canal		5.63		
4	Old Wuyyeru Canal	60429	7.83	75.50	60.40
5	Undhi Canal		32.13		
6	Venkayya Wuyyeru Canal		32.13		
7	Gostanadi & Velpuru Canal	27669	58.83	34.57	27.66
8	Attili Canal	20540	25.67	25.66	20.53
9	Bank Canal	65238	39.50	81.51	65.21
10	Kakaraparru Canal		28.80		
11	Narasapur Canal		48.07		
		2,14,473	**354.62**	**267.96**	**214.38**

NOTE: The actual carrying capacities of canal have been taken from Irrigation Department authorities.

3.2 Conveyance losses in various reaches of various canal

The method usually adopted is direct measurement of seepage losses from open channels by "inflow-out flow" method.

The method involves the measurement of water which flows into the up stream end and the amount of water which flows out through down stream end of the reach under study in a situation when no water is being diverted between the two Up stream and Down stream control points. If at all any water is diverted, the quantity is to be taken into account in the calculation. The difference between the inflows and out flows is taken as seepage losses. Conveyance studies were conducted on the following unlined canals for the capacities more than 150 cumecs and for less than 150 cusecs separately.

A. The canals of the capacities more than 150 cusecs.

1. Godavari Central main canal taking off 0.00 Km of River Godavari at Bobbarlanka.
2. Gannavaram canal taking off @ Km 13.2 of Godavari central main canal East Godavari District.
3. Western main canal taking @ 0.00 Km of River Godavari at Vijjeshwaram.
4. V & W canal takes off at Duvva Head Sluice from Yenamaduru Drain.
5. Undi canal takes off @ Km 31.689 of G.W. Canal at Chilakalapadu.
6. Anakoderu channel taking off @ Km 50.674 of Undi canal (Western Delta) West Godavari District.

B. The canals of capacities less than 150 cusecs

7. Kadali canal taking off @ Km 52.060 of Gannavaram canal East Godavari District.
8. Singavaram Ava Channel taking off @ Km 8.720 of Godavari western main canal.

The results are furnished under para 3.40.

3.3 Evaporation losses in various canals:

These losses take place from the exposed water surface which would vary with temperature, humidity, wind velocity etc. In hot and dry weather months (summer) these losses are maximum. But they may seldom exceed

10 % of the total water entering into the canal. The average may vary between 4 mm to 10 mm per day.

The conveyance losses now evaluated in the canals selected are inclusive of evaporation losses and no separate studies could be possible.

3.4 Calculation and presentation of efficiencies:

Three main canals, two in East Godavari i.e. Eastern main canal and Central Main canal and one in West Godavari i.e. Western main canal from S.A.C.B Project (Godavari Delta System)

A. East Godavari District.

1. Godavari Central Delta Main Canal > 150 Cusecs

The canal takes off at Km 0.00 of Godavari River at Bobbarlanka. The total length of canal is Km 13.20 with Designed discharge of 3695 Cusecs to serve an ayacut of 2,06,887 Acres or 83,726 Ha.

2. Gannavaram Canal > 150 Cusecs

The canal takes off at Km 13.20 of Godavari Central Main canal. The total length of canal is 69.50 Km with designed discharge of 30.02 cumecs or 1060 cusecs to serve an ayacut of 59,378 Acres or 24,030 Ha.

3. Kadali Canal < 150 Cusecs

The canal takes off Km 52.06 of Gannavaram canal. The total length of canal is 8.10 Km with designed discharge of 121.76 cusecs to serve an ayacut of 12,280 Acres.

Canal conveyance studies have been conducted by using Current meter method for calculating the discharge on Godavari Central Main canal, Gannavaram canal and Kadali canal.

B. West Godavari District (Western Delta).

1. Godavari Western Main canal >150 Cusecs

The main canal takes from Vijjeshwaram Head sluice i.e. from 0.00 Km of Godavari River. The length of Main canal is 9.550 and below. This, is called as Eluru canal. The Designed discharge is 9000 Cusecs to serve an ayacut of 5,29,962 Acres or 2,14,473 Ha.

2. V & W canal > 150 Cusecs

The V & W canal takes off at Duvva Head sluice from Yerrasamudram Drain ('Y' Drain) which is a continuation of Yerracalva Near Nandamuru

Aqueduct and the discharge will be released from Chattipelu weir of G.W. Main canal. The total length of the canal is 64.380 Km with a designed discharge of 1079 cusecs to serve an ayacut 149320 acres (or) 60429 Ha.

3. **Undi canal > 150 Cusecs**

The Undi canal takes off at Km 31,986 of V & W canal from Chilakalapadu lock. The length of the Undi canal is 32.20 Km with a designed discharge of 1176 Cusecs to serve an ayacut of 82310 Acres or 33310 Ha.

4. **Anakoderu Channel > 150 Cusecs.**

The channel takes off at Km 50.674 of Undi canal. The total length of canal is 12.415 Km with a designed discharge of 227 cusecs to serve an ayacut of 15,905 Acres or 6437 Ha.

5. **Singavaram Ava Channel < 150 Cusecs.**

The Singavaram Ava Channel takes off at Km 8.720 of Godavari Western Main canal. The total length of Channel is 6.80 Km with a designed discharge of 53.67 cusecs or 1.52 cumecs.

Canal conveyance studies have been conducted by using Current Meter Method for computing the discharge on G.W.Main canal, V & W canal, Undi canal Anakoderu and Singavaram Ava Channels. The results are indicated in the proformae as detailed below.

Conveyance Losses in Main Canals

S. No	Name of Channel		Average wetted Perimeter (m)	Length of study reach (m)	Water lost in the reach (cumec)	Conveyance loss factor (Cumecs/ M sqm.)
1	Godavari Central Delta Main Canal	Km 3.20 to 6.50	64.79	3,300	1.492	6.98
		Km 6.50 to 12.10	52.67	5,600	3.571	12.11
2	Godavari Western Main Canal	Km 3.00 to 9.88	65.92	6,880	2.71	5.97

Conveyance Losses in Distributaries

S. No	Name of Channel		Average wetted Perimeter (m)	Length of study reach (m)	Water lost in the reach (cumecs)	Conveyance loss factor (cumecs / M. sqm)
1	Gannavaram canal of Godavari Central Delta	Km 16.95 to 31.08	17.99 21.715	1450 12,680	0.612	2.03
		Km 31.08 to 34.00	21.49	1,920	1.264	20.15
		Km 34.00 to 54.00	17.70 19.025	15,640 2,360	4.865	15.12
2	Kadali Canal	Km 0.95 to 6.50	9.38	5,550	0.133	2.555
3	V & W Canal of Godavari Western Main Canal	Km 25.85 to 39.675	28.84	13,825	1.72	4.31
		Km 39.675 to 50.385	26.595	10,710	1.070	3.75
4	Anakoderu Canal	Km 0.80 to 4.237 & 9.17	16.29 11.455	3437 4,933	0.132	1.173
5	Singavaram Channel	Km 0.40 to 1.80	5.215	400	0.03	14.38

Conveyance Efficiency of Main Canals

S. N0	Name of Channel	Discharge at Head (cumec)	Effective Length (m)	Avg. Wetted Perimeter (m)	Conveyance Loss Factor (cumec/M.sqm)	Total Loss in Channel (3x4x5)x10-6 (cumec)	Water Delivered (2-6) (cumec)	Ratio (Water Delivered/Discharge at Head) (7/2)
	1	2	3	4	5	6	7	8
1	Godavari Central Delta Main Canal	69.795	3,300	64.79	6.98	1.492	68.303	0.9786
		68.303	5,600	52.67	12.11	3.571	64.732	0.9477
2	Godavari Western Main Canal	183.87	6,880	65.92	5.97	2.71	181.16	0.9852

Conveyance Efficiency of Distributaries

Name of Channel	Discharge at Head (cumec)	Effective Length (m)	Avg.Wetted Perimeter (m)	Conveyance Loss factor (cumec/ M.sqm)	Total Loss in Channel $(3x4x5)x10^{6}$ (cumec)	Water Delivered to Minors (2-6) (cumec)	Ratio of Water delived to Dist Head
1	2	3	4	5	6	7	8
Gannavaram canal of Godavari Central Delta	19.617	1,450	17.99	2.03	0.612	19.005	0.9688
	19.005	2,920	21.49	20.15	1.264	17.741	0.9334
	17.63	15,640	17.70	15.12	4.865	12.765	0.7240
Kadali Canal	2.89	5,550	9.38	2.555	0.133	2.757	0.9539
V & W Canal of Godavari Western Main Canal	52.73	13,825	28.84	4.31	1.72	51.01	0.9673
	25.22	10,710	26.595	3.75	1.07	24.15	0.9575
Anakoderu Canal	3.740	3,437	16.29	1.173	0.132	3.608	0.9647
Singavaram Channel	1.40	400	5.215	14.38	0.03	1.370	0.9786

I. **Efficiency of Godavari Central Delta system**

1. Efficiency of Central Main Canal = 95.91 %
2. Efficiency of Gannavaram Canal = 84.01 %
3. Efficiency of Kadali Canal = 95.39 %

The combined efficiency of Central Delta Canal System

= 95.91 % x 84.01 % x 95.39 % = 76.86 %.

II. **Efficiency of Godavari Western Delta system**

1. Efficiency of Western Main Canal = 98.52 %.
2. Efficiency of V & W canal and Undi Canal = 96.30 %
3. Efficiency of Anakoderu Channel = 96.47 %
4. Efficiency of Singavaram channel = 97.86 %

Efficiency of Godavari Western Delta System

= 0.9852 x 0.9630 x 0.9647 x 0.978 = 89.56 %

Conveyance efficiency of Godavari Delta Canal distribution system

= Efficiency of Central Delta System + Efficiency of Godavari Delta System

$$= \frac{76.86 + 89.56}{2} = 83.21\ \%.$$

As per CWC recommendations, the following are the limitations for transmission losses per million square meters of wetted perimeter depending on the type of soils.

C.W.C Recommendations

Sl.No	Type of Soils	Transmission losses per Million Sq. m of wetted perimeter unlined channels i.e. cumecs/Million sq. m
1	Rock	0.91
2	B.C. Soil	1.83
3	Alluvial Soil	2.74
4	Decayed rock or Gravel	3.00

As percentage of total discharge.

Main Canal and Branches	15 to 20 %
Distributaries and Minors	6 to 7 %
Water Courses	17 to 22 %

The over all System efficiency in respect of Godavari Central canal and Godavari Western canals system works out to 76.86 % and 89.56%, and the combined efficiency works out to 83.21 %. This indicates that the performance of conveyance efficiency is better where as the conveyance losses are exceeding by 4 to 8 times more when compared with the CWC recommendations and limitations of the transmission losses of 1.83 to 2.74. The reasons for the more seepage losses may be due to age old system of canals, poor maintenance, and leakages in the system due to damaged shutters, non-existence of berms to the required thickness and also disturbance of hydraulic gradient. The existing Irrigation canals of Godavari Delta System are also unlined resulting to considerable losses observed specially where the canal runs in sandy soil. There are hundreds of irrigation sluices fixed in earth without proper regulatory arrangements resulting in considerable wastage of water in distribution. It is therefore essential to conserve water and minimizing the losses by lining the canals specially in sandy reaches and construction of sluices etc.

Due to inadequate number of cross regulators across the canals and channels commendable levels could not be maintained resulting in much wastage of water specially in Rabi season. Some of the Drainage works across the canals are not adequate and also discharging capacity of most of the lock weirs is inadequate to meet the peak demand. There are leakages in the lock weirs resulting in losses. There are no measuring devices to regulate the required flows in to the canals.

CHAPTER-4
ON-FARM APPLICATION EFFICIENCY

CHAPTER – 4

4.0 On Farm Application Efficiency

On farm application efficiency is the ratio of actual water delivered to the field to the water requirements of the crops considering effective rainfall in the command. When the water supply is abundant.

4.1.1 Designed cropping pattern

The S.A.C.B project has cultural command area of 4, 10,108 Hectares Irrigation in Kharif and Rabi seasons. The entire command area was designed to irrigate paddy, sugarcane and I.D crops because of good rainfall and humid climatic conditions suitable for cultivation of above three crops.

4.1.2 Actual cropping pattern

The actual crops raised in Godavari Delta System during last 10 years is presented at Format-III (PART-C)

Rice being the staple food, paddy is the predominant crop grown here in Kharif under irrigated conditions partly supplemented by rainfall. This is followed by paddy crop in Rabi under irrigated conditions followed by pulses. As adequate ground water is also available, a number of filter points and bore wells exist in the command area sugar cane crop is also grown in small extents which is supplemented through ground water if necessary in Rabi season. In addition to this, horticultural crops like coconut, Banana, are grown to an extent of 6% of the culturable command. Groundnut crops are also grown in Rabi in limited extents.

The general cropping pattern followed in the command area is paddy sown in 87 % of the culturable command in both Kharif & Rabi 3% is sown with sugarcane, 6% is sown with horticultural crops, 2% is sown with I.D crops like ground nut, Banana and aquaculture in 2% of the area.

Pulse crops like green gram, black gram etc are also sown after harvesting paddy. Vegetable crops are also grown in small extents.

Practically there is little or no change in the cropping pattern followed during the last 10 years.

4.1.3 Comparison and Proposed cropping pattern

According to the existing cropping pattern, peak transplantation of paddy takes place in July, August more or less uniformly through out the Godavari Delta, making it difficult to cater to the requirements of water simultaneously. In order to avoid this, the area is divided into 3 zones, each zone following a specific crop calendar, thus making it possible to supply water to the entire delta matching with the inflows and distribution pattern. Incidentally this would also bring in an additional area of 0.19 Lakh acres during Kharif.

Zone.I: Kharif: 15th may to 26th October

Rabi: 15th November to 24th March.

Zone.II: Kharif: 1oth June to 21st November

Rabi: 1st December to End of March

Zone.III: Kharif: 20th June to 6th November

Similarly Rabi paddy area can be increased by 0.97 Lakh acres, perennial crop by 0.09 Lakh acres vegetable crop by 0.71 Lakh acres.

Verification of cropping pattern through utilization of Remote sensing Imageries in Irrigation Project

Introduction:

Water use efficiency studies have been taken up in 14 major irrigation projects in A.P, sponsored by C.W.C Cropping pattern in the command area of each project is an important parameter required for generating useful Indicators for determining the water use efficiency. Through water use efficiency studies information relating to the C.C.A, designed cropping pattern in each project under Kharif and Rabi seasons and the actual utilization pattern during last 10 years was collected. This would help in analyzing a comparison of the actual cropping pattern followed, changes in the pattern observed if any during the period, departures if any from the designed cropping pattern. In addition to this indicators like duty realized in terms of area irrigated in Hectares per unit of water utilized, percentage of Irrigation potential utilized to Irrigation potential created etc could also be worked out for determining, the water use efficiency and for comparison with other projects.

Sources of Data:

Revenue:

Enumeration of cropped area in the command areas of the projects is not uniform in all the projects. Regular information relating to cropped area, land utilization etc are collected at village level by the village secretary, who is under the control of the revenue department, and they are aggregated for the and administrative units of mandal, District, state. Earlier this information was collected by the village patwari who was well trained and well varied with this task. These post were abolished in 1984 resulting in a severe set back to the system, diluting the quality of data. This data has therefore not been made use of in the report.

Irrigation Department:

The Engineering Staff of the irrigation projects are mainly responsible for regulation of water and maintenance and they do not have a regular mechanism of collecting the cropped area irrigated under the project. However, the required information is generated based on the area localized for wet or I.D crops and the designed duty at section level and aggregated at the Division circle and project level. Water user associations for major, medium and minor irrigation projects were formed in 1997 through APFMIS act. One W.U.A was created for 2000 Has under major & medium irrigation projects. These W.U.As are responsible for regulation of water and maintenance of the minor distributory channels under their control. The W.U As have fair knowledge of the cropping pattern in their jurisdiction. The area irrigated and they will assist the revenue Dept. in assessment of and tax collection. These W.U.As work under the supervision of Section officer of the Irrigation I.Dept. Who is designated as competent authority. Since the establishment of this set up, the project wise cropped areas are generated with the involvement of W.U.A and the quality of data improved, though it has its own deficiencies.

Andhra Pradesh State Remote Sensing Application Centre (APSRAC):

In the light of the circumstances explained above, it was felt necessary to cross check the data on cropped areas of the selected projects through analyzing satellite data obtained thro' APSRAC for the year 2005-06.Satellite remote-sensing technique provides objective primary data on agriculture and productivity. The methodology includes acquisition of satellite data, ground truth verification, digital database creation for geometric rectification of satellite data, digitization of command area features like command boundary and canal net work. Geometrically rectified multi-data satellite images taken during Kharif and Rabi seasons were sequentially analyzed using ground truth verification of randomly selected fields for generating the cropping pattern in the command area of the project.

During the presentation of the scientists of APSRAC of season wise agricultural data. The following discrepancies were observed.

I. The irrigated area presented by APSRAC was much more than the localized area in certain projects.

II. The productivity was also at variance with the official estimates.

The scientists put forward the following reasons for variation in the area.

The area irrigated under wet and I..D crops furnished by APSRAC for the project area includes not only the area irrigated under canals but also these area irrigated through ground water sources and other minor irrigation sources like tanks in the command area as the imagery analysis is done for the entire project command area.

I. The area irrigated during Kharif season is based on the satellite image taken during the month of November and for Rabi during the month of February.

II. Late Kharif standing crops in the month of February are also included in Rabi season inflating the actual Rabi area.

Keeping in view of the above limitations, project specific variations between the two sets of figures are discussed below.

Godavari Delta System:

The actual irrigated area particulars as reported by APSRAC and Irrigation Department for the year 2005-06 are furnished below.

Agency	2005-06 (Area in Lakh Acres)								Grand Total
	Kharif				Rabi				
	Wet	ID	Aqua	Total	Wet	ID	Aqua	Total	
APSRAC	9.43	0.20	1.65	11.28	9.06	0.28	1.65	10.99	22.27
Irrigation Dept	9.15	0.32	0.67	10.14	9.15	0.12	0.67	9.94	20.08

It could be seen that APSRAC reported an extent of 0.28 Lakh acres in excess in case of Kharif wet area than reported by Irrigation Department. This is attributed to un-authorized lift irrigation from the canals. The difference under I.D crops between the two agencies is 0.12 Lakh Acres. Excess is reported by the Irrigation Department. The reasons may be due to not considering the areas under early harvested crops by the APSRAC. The difference in area under Aqua is due to inclusion of Kolleru lake area in the satellite imagery which is not considered by Irrigation Department since it is out side the command.

During Rabi an extent of 0.12 Lakh acres is reported under I.D crops by irrigation Department against 0.28 Lakh acres by APSRAC. This is due to the reason that perennial crops like Banana, turmeric, sugar cane etc are accounted for only in Kharif by Irrigation Department and not in Rabi. The difference in respect of wet areas during Rabi season is however negligible. Thus the irrigation department figures could be accepted.

4.2 Weighted average rainfall

The weighted average rain fall in the command area during the last 10 years is presented in format IV (PART-D).

This area is benefited by both the monsoons of South West & North East. South west monsoon sets in normally during second week of June and withdraws by September. North East monsoon rainfall is received in the months of October, November & December. The rest of the period from January to May is usually dry period.

The normal rainfall in the command area of G.D.S is 1186 mm out of which the contribution from south west monsoon is 768.5 mm forming 65% of the annual rain fall and that from N.E monsoon is 282.5 mm or 24 % of the annual rainfall. Thus the influence of S.W monsoon is most predominant in the command area than the N.E monsoon.

It could be seen that out of the 10 years data, only 3 are normal rainfall years, six are deficit years and in one year there is surplus rain fall. The deficit of rain fall varied from 15% in 97-98 to 47% in 02-03 which is worst drought year. Maximum annual rainfall of 1492 mm was received during 1996-97 Maximum monthly rain fall of 400 mm was received in September 97-98.

Impact of rainfall on regulation of Water:

When there is heavy rainfall in the command area supply of water through Irrigation canals is controlled to avoid wastage of water and damage to canal system.

It could be seen that generally less water supply is released through canals when there is heavy rainfall in the region.

4.3 Reference evapo-transpiration in the area under study:

The command area of S.A.C.B. Project is influenced by Hydro-Meteorological station at Nidadavole. The monthly evaporation (E.To) of the station are furnished as under.

Month		mm/day	Month		mm/day
June	:	150.20	January	:	106.10
July	:	114.30	February	:	116.40
August	:	109.80	March	:	149.70
September	:	105.40	April	:	151.10
October	:	100.20	May	:	162.30
November	:	101.90			
December	:	98.90			

4.4 Crop- Coefficients in respect of various crops:

The values of Crop-coefficients in respect of the following crops in practice in Andhra Pradesh are furnished as under:

Sl.No.	Name of the Crop	K.C. Values					
		1st Month	2nd Month	3rd Month	4th Month	5th Month	6th Month
1	2	3	6	5	6	7	8
1	Paddy	1.10	1.10	1.10	0.95	---	----
2	Ground Nut	0.40	0.70	0.95	0.75	---	----
3	Chillies	0.30	0.60	0.60	0.95	0.60	0.35 15days
4	Cotton	0.40	0.70	0.70	1.05	1.05	0.80 15days
5	Hybrid Sajja	0.30	0.90	0.70 15days	---	----	----
6	Hybrid Jonna	0.30	0.70	0.70	0.75	---	----

The crop coefficients in respect of Banana plantation is adopted as per FAO 33 considering the crop period as 10 months for initial plantation (first year crop) and 12 months with rattoon. This is adopted in crop water requirement prepared as per modified pen man method. The crop coefficients in respect of sugarcane is adopted as per the polavaram project

4.5. Effective rainfall in the command area:

Effective rain supplies a portion of the consumptive use by the crops. It may nearly be insignificant portion in arid areas or it may be major portion in humid areas. It is difficult to determine what portion of consumptive use will be met by effective rainfall and what portion to be supplied by irrigation. However, it is necessary to estimate the total rainfall that can be effective. The month wise values of effective rainfall for the year 2004-05 is worked out and incorporated in the crop water requirement of the project in format-V (PART-E). The effective rainfall is worked out as per the procedure laid down in the guide lines for estimating irrigation water requirements published by Govt. of India in MOWR considering the table 10 and 11.

4.6. Percolation losses in paddy fields:

The percolation losses vary from soil to soil in the command area and depends on the type of crop and also the season. For the paddy crop a constant pond level of water is required through out the crop-period. Therefore, the deep percolation losses should be considered for the entire crop period based on the observations in the command area.

Observation of percolation losses is not possible in normal paddy fields where water would be supplied from field to field. These studies can be taken up only by special observation in open fields arranged for the purpose unlike the command area. However traditional method of flood irrigation is adopted by the farmers in the delta which is resulting in considerable loss of water. The farmers are in the habit to maintain 3" to 4" depth of water in the fields, draining the field frequently and letting in water again after every such drainage which results in water logging and loss of chemical nutrients.

Soil percolation losses is taken as 0.12" per day for black soils and 0.18" per day for sandy soils

4.7 Ground Water Component

4.7.1. Monitoring network

The statistics of observation wells and piezometers in the state, in the command as well as in the non command areas is given in the following table.

1	Observation wells in non-command areas	1582
2	Observation wells in command areas	1404
3	Total Piezometers	1017
4	i. Piezometers with AWL Rs. ii. Piezometers with manual measurement	888 129
5	Piezometers in the project command	

4.7.2. Increase in Ground Water potential due to irrigation net work.

The project has command in 55 mandals, which falls in 55 assessment units. The Ground Water Department has assessed ground water recharge due to irrigation network and utilization for irrigation in the command through the assessment units for 2004-05. As per the records available the Recharge is148156 ha. m and utilisation is 12215 ha.m.

S.No	Assessment Unit	Recharge Due to Irrigation Projects (ha.m)	Utilisation for Irrigation (ha.m)
1	Kadiam	3956	481
2	Anaparthy	935	148
3	Mandapeta	1654	667
4	Biccavolu	3409	13
5	Pedapudi	2043	296
6	Kakinada	789	12

7	Karapa	3201	37
8	Thallarevu	2489	53
9	Kajuluru	9800	35
10	Ramachandrapuram	10256	479
11	Rayavaram	6751	335
12	Kapileswarapuram	4065	341
13	Alamuru	3785	1250
14	Atreyapuram	3603	1746
15	Ravulapalem	6383	515
16	K.Gannavaram	3233	221
17	Kothapeta	4986	689
18	P.Gannavaram	5044	273
19	Ambajipeta	3480	551
20	Ainavilli	3873	291
21	Mummdivaram	642	171
22	I.Polavaram	3152	36
23	Katrenikona	1597	0
24	Uppalaguptam	685	60
25	Amalapuram	3488	228
26	Allavaram	2987	157
27	Mandikrolu	592	175
28	Rajolu	604	76
29	Malikipuram	1115	879
30	Sakhinetipalle	2675	31
31	Nidadavole	0.	0
32	Bhimadole	1991	8
33	Thammileru	1950	0
34	Nidamarru	1930	1
35	Ganapavaram	1930	12
36	Pentapadu	1930	0
37	Tanuku	1975	157
38	Undrajavaram	2064	564
39	Peravali	2084	654
40	Iragavaram	1934	18
41	Attili	1932	9
42	Undi	1930	8
43	Akiveedu	1937	10
44	Kalla	1932	9
45	Bheemavaram	1932	8
46	Palakoderu	1937	25
47	Veerasagaram	1930	0
48	Penumantra	1934	21
49	Penugonda	1945	57
50	Achanta	1965	133
51	Poduru	1957	99
52	Palacole	1944	51
53	Elamanchili	1951	78
54	Narsapuram	1934	18
55	Mogalthur	1936	29
		148156	**12215**

The total ground water utilization in the command area of SACB is 12,215 Ham.

4.8 Gross irrigation requirement

It is net irrigation requirement computed based on 'Modified Penman Method' plus water application losses at field plus losses in the conveyance system.

In the present project studies, the field irrigation requirement have been calculated considering 80% for field requirement as discussed in the para 4.90, over net irrigation requirement for wet crops and 70 % for I.D crops.

Now, the gross irrigation requirement is arrived at by dividing the field irrigation requirement with attainable conveyance efficiency of 70 % for both wet and dry crops and worked out as per Modified Pen man Method.

4.9 Field irrigation requirement

The field irrigation requirement is net irrigation requirement plus losses in water application. The losses in water application depend on the type of soil, grade (slope) of the land of the field, method of irrigation and cropping pattern etc.

The paddy crop is generally sown in clayey and loamy soils in Andhra Pradesh. The method of cultivation is check or basin method. The attainable field application efficiency is considered as 80 % as per Table-12 of 'A guide for estimating irrigation water requirements' (Technical Series-2) published by Government of India, Ministry of Irrigation water management division, New Delhi.

The field irrigation requirement is worked out by dividing net irrigation requirement by the attainable field application efficiency of 80 % as discussed above.

Similarly, field irrigation requirement is worked out by dividing net irrigation requirement by the attainable field application efficiency of 70 % in respect of I.D which are cultivated as per Furrow Method indicated crops in Table-12 of 'A guide for estimating irrigation water requirements' (Technical Series-2) published by Government of India, Ministry of Irrigation water management division, New Delhi.

4.10 Net irrigation requirement

In normal soils and in crops other than paddy (where standing water results in percolation losses), it is the amount or the depth of water required to bring the soil moisture level in the effective root zone to field capacity from the soil moisture content before applying irrigation water. The net irrigation requirements have been worked out based on "Modified Penman method". The month wise net requirements for paddy cultivation in kharif and Rabi cultivation for I.D under the project are worked out in FORMAT – V (Part-E).

4.11 Calculation and presentation of efficiencies in tabular farm

On farm application efficiency

Status of Three Main Canals of Godavari Eastern Delta, Godavari Central Delta and Godavari Western Delta Canal System.

The S.A.C.B. Project and three main head sluices were constructed during 1986 except improving the old canal system. It is supplying water to an Ayacut of 10.13 Lakh Acres (4.10 Lakh ha) covering in 36 Mandals in East Godavari and 29 Mandals in West Godavari District.

The designed ayacut, canals length, designed discharge and Actual carrying capacities of the Three Canals are indicated in para 3.1.2

It is noticed that the entire three existing Delta distributory Canals sections are condensed to 'U' shape are either widened at some locations with raise in the bed levels and hence not capable of carrying the designed discharge. The canals are to be improved to carry the designed discharges. Also the CD & CM works, regulators, lock chambers, main off take head sluices constructed 135 years back require repairs and reconstruction. The shutters of the main off take sluices, regulators weirs etc are frequently tampered by the ryots. Heavy floods occurred during the months of September, 2005 and August 2006 caused further damages to the canals systems.

On farm application efficiency:

It is the ratio of water delivered to the field to the water requirements of the crops considering effective rainfall in the command when the water supply is abundant.

Paddy is the principal major crop sown under Godavari Delta System in Kharif and Rabi seasons corps like Sugarcane, Groundnut and Banana are also sown in Kharif and Rabi seasons along with paddy in the command.

On farm application efficiency of the Godavari Delta System has been evaluated for wet and Irrigated Dry crops considering the total annual canal with drawls to the field at the pipe out lets and deducting the field losses such as percolation losses water courses losses, for arriving at the field irrigation requirement. This is calculated considering the areas and crops irrigated during the year 2004-05 and the water releases. The quantum of water available at pipe out lets is worked out by applying the canal conveyance efficiencies of the canal system to the quantum of water supplied through canal system. The quantum of water available for the corps at the field command is arrived at by deducting the losses like seepage and percolation and water courses losses depending on the type of crops at the command. The On farm application efficiency is worked out by dividing the quantum of water available for the crops on command at field with the quantum of water released at the canal system head for the crops.

The overall efficiency is worked out by multiplying the on farm application with canal efficiencies. The average on farm application efficiency of command of Godavari Delta System is working out to 54.15% and the over all project efficiency is working out to 45.05 %. The on farm application efficiency and the project efficiency of Godavari Delta System are tabulated below.

<table>
<tr><th>Sl. No</th><th>Details of Canal</th><th>Canal Conveyance Efficiency</th><th>Average Canal Conveyance Efficiency</th><th>On farm application efficiency</th></tr>
<tr><td>1</td><td>Godavari Central Delta System</td><td>76.86 %</td><td rowspan="2">83.21 %</td><td rowspan="2">46.09 %</td></tr>
<tr><td>2</td><td>Godavari Western System</td><td>89.56 %</td></tr>
<tr><td>3</td><td colspan="3">On farm application efficiency
i) For wet crops command 41.74 %
ii) For I.D crops command 66.56 %
Average on farm application efficiency $\frac{41.74 + 66.56}{2}$ = 54.15 %</td><td></td></tr>
<tr><td>4</td><td colspan="3">Overall project efficiency = On farm application efficiency x canal conveyance efficiency
= 54.15 x 83.21 = 45.05 %</td><td></td></tr>
</table>

EVALUATION OF ONFARM APPLICATION EFFICIENCY

Wet Crops

1. Water released for wet crops (including Sugarcane areas) of 7.83.818 ha of command area through canal systems during the year 2004-05

   = 3790.80 + 3013 = 6803.80 M.cum

2. Canal conveyance efficiency of G.D.S canal system

   Godavari central delta system 76.86 %

   Godavari Western delta system 89.56 %

   Taking the above as representative sample of whole delta system, the canal conveyance efficiency = 76.86 + 89.56

   = 83.21 %

3. Quantity of water available at pipe out lets of command area of delta system for wet crops

   = Item No.1 x Item No. 2

   = 6803.80 X 83.21 %

   = 5661.44 M.cum

4. Quantum of water available for crops at field command area

   = Quantum of water available at pipe outlets (as per item3) – losses due to seepage and percolation.

   $$= 5661.44 - \left[\frac{2}{1000} \times 180 \times \frac{7,83,818}{100} \right]$$

   = 5661.44 – 2821.74 = 2839.70 M.cum

5. On farm application efficiency command area

   $$= \frac{\text{Quantum of water available on field for crops}}{\text{Quantum of water released through canal system}} \times 100$$

   $$= \frac{2839.70 \times 100}{6803.80} = 41.74\ \%$$

I.D Crops

1. Water released for I.D crops of 36,398 ha of command area through canal system during 2004-05 = 369.20 M.cum
2. Canal conveyance efficiency of G.D.S canal system = 83.21 %
3. Quantity of water available at pipe out lets of command area of delta system for I.D crops

   = 369.20 X 83.21 %

   = 307.21 M.cum
4. Quantum of water available on field for I.D crops

   = Quantum of water available at pipe outlets (as per item3) – Water course losses at 20%.

   = 307.21 – 20% (307.21)

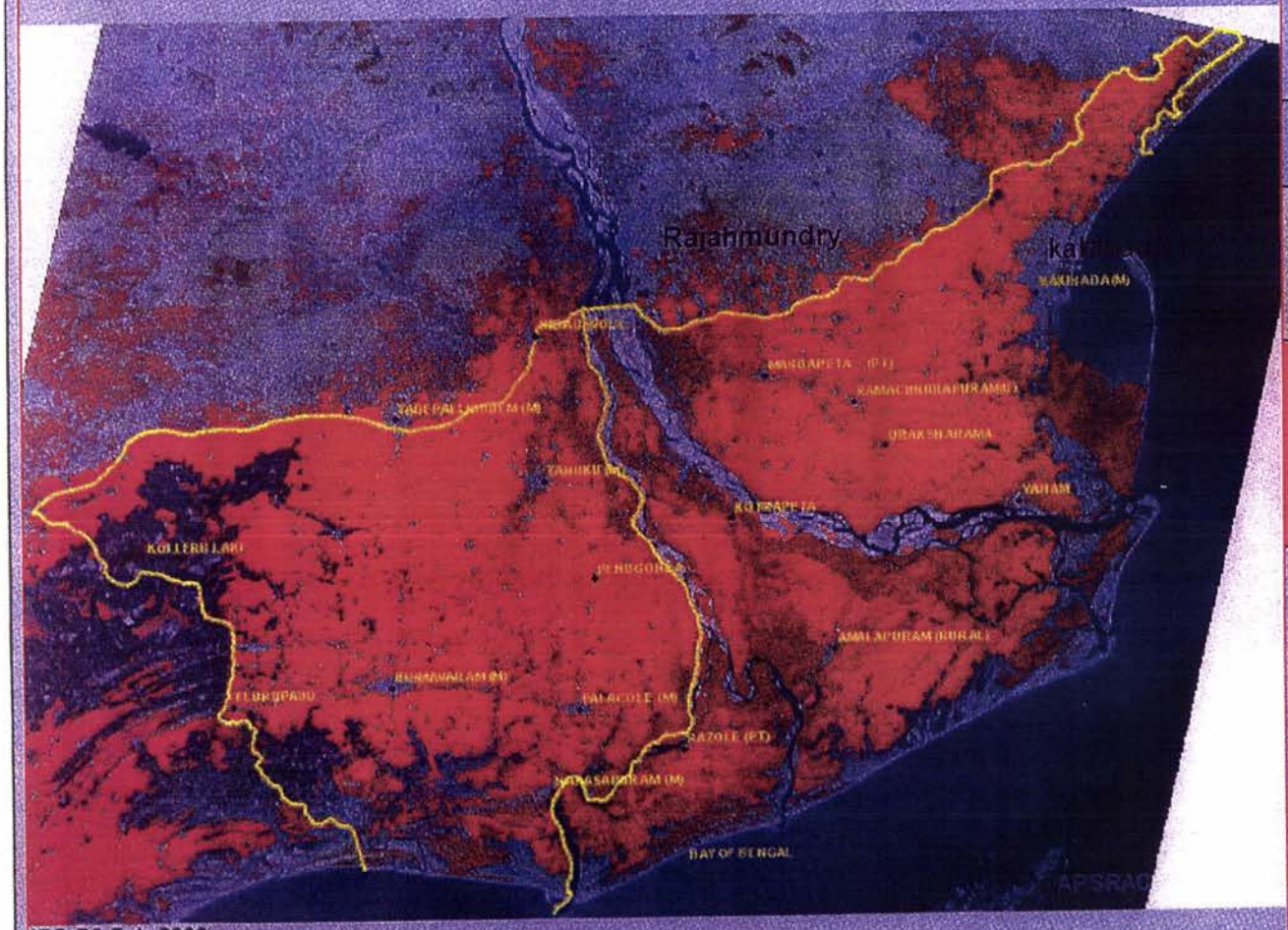
   = 307.21 – 61.44

   = 245.77 M.cum
5. On farm application efficiency for I.D crops command area

   $$= \frac{\text{Quantum of water available on field for crops}}{\text{Quantum of water released through canal system}} \times 100$$

   $$= \frac{245.77 \times 100}{369.20} = 66.56\ \%$$

GODAVARI DELTA



IRS-P6-Feb 2006

SALIENT FEATURES

Localized Area (Wet)

10.13 Lakh Ac.

Disaggregated Spatial Units

Districts (Admin.units) 2

East & West Godavari Districts

Total Cropped Area (K+R) Based on RS data during 2005-06

Area in Lakh Acres

Season	Wet	ID	Aqua	Total
Kharif	9.43	0.20	1.65	11.28
Rabi	9.06	0.28	1.65	10.99
Total	**18.49**	**0.48**	**3.30**	**22.27**

Water released : 241.03 TMC

CHAPTER-5
DRAINAGE EFFICIENCY

CHAPTER – 5

5. Drainage efficiency:

The drainage in agriculture is a process of removal of excess water from the soil which may be due to irrigation, rainfall, or both. The drainage accelerates microbial decomposition of the accumulated organic matter and more rapid release of nutrients making the soil more-productive.

The excess water discharged by flow over the water surface is referred to as" Surface drainage" where as the flow through the soil is termed as Internal or Sub surface drainage.

The drainage efficiency is the ratio of total annual water drained from the system to the total water delivered to the system plus effective rainfall minus water used by crops.

The irrigated area is below +41.00 ft or +12.50 m Contour. The ground fall, on an average is about 1/5000 in head reach and 1/7500 in the lower reaches of Delta. Consequently the outflow of the drainage from the irrigated area, through the network of surface drains, is rather slow, resulting in drainage problems of severe nature, especially in the lower reaches of the delta.

Based on the recommendations of A.C.Mitra. Committee the drains Godavari Delta System have been improved by the state drainage Board.

5.1 Total amount of water released to various field:

5.1.1 Surface water:

Paddy is the predominant crop under the command area of Godavari Eastern canal, Godavari central canal, Godavari western canals with a little sugarcane crop Banana and I.D crops Ground nut etc. Total quantum of water released to the field during 2004-05 is 7173 M. m^3

Kharif 4160 M m^3 +Rabi 3013 M.m^3 =7173 M.m^3

5.1.2 Ground water:

The ground water availability in the Mandals of command area of Godavari Delta System is furnished in the following table

Mandal Wise Ground Water Potential -East Godavari District (AP)

Sl.No	Mandal	Ground Water Availability Ha.m
1	Allamuru	4216
2	Ainavilli	4538
3	Allavaram	3939
4	Amalapuram	4090
5	Ambajipeta	3741
6	Anaparthi	1857
7	Aathreyapuram	4167
8	Bikkavolu	3664
9	Gollaprolu	206
10	Iland Polavaram	4415
11	K.Gangavaram	3948
12	Kadiam	5398
13	Kajuluru	1037
14	Kakinada Rural	2713
15	Kapileshwarapuram	4762
16	Karapa	3985
17	Katrainkona	3209
18	Kerlampudi	2336
19	Kothapeta	5260
20	Mlkipuram	2549
21	Mamidikuduru	1415
22	Mandapeta	2241
23	Bommidivaram	1801
24	P.Gannavaram	1697
25	Peddapudi	3378
26	Peddapuram	585
27	Pithapuram	2634
28	Ramachandrapuram	10497
29	Ravulapalem	6469
30	Rayavaram	6899
31	Razol	1453
32	Sakhinetipally	5627
33	Samarlakota	1762
34	Tallarevu	3847
35	U.Kothapalli	2175
36	Uppalaguptam	2359
	Total	**1,24,869**

Mandal Wise Ground Water Potential-West Godavari District (AP)

Sl.No	Mandal	Ground Water Availability Ha.m
1	Achanta	2615
2	Akhivedu	2811
3	Athili	2641
4	Bhemadolu	2633
5	Bhemavaram	3527
6	Daduluru	2401
7	Eluru	3323
8	Ganapavaram	2620
9	Eragavaram	2620
10	Khalla	3158
11	Kovvuru	0
12	Mogalthuru	3128
13	Narsapuram	3566
14	Nidadhavolu	0
15	Nadamarru	2704
16	Palakoderu	2635
17	Palakollu	2766
18	Pentapadu	2890
19	Penugonda	2463
20	Penumantra	2588
21	Peravali	2731
22	Poduru	2500
23	Thadepalligudem	1022
24	Thanuku	2550
25	Undi	3217
26	Undrajavaram	2704
27	Ungutur	1807
28	Veeravasaram	2633
29	Yelamanchili	2725
	Total	**72.978**

The ground water potential available in 36 mandals in East Godavari and 29 mandals in West Godavari Districts totaling to 65 mandals of command area during the year 2004-05 is furnished in the above table and the total works out to 1, 97,847 Ha.m

I. East Godavari: 1, 24,869 Ha. m

II. West Godavari: 72,978 Ha. m

Total 1, 97,847 Ha.m

5.2 Amount of water required by various crops:

Irrigation water requirements as per Modified Penman method for Kharif and Rabi For an area of 3, 68,442 Ha, 5268 ha Sugarcane and 36398 ha I.D crops 404840 ha wet — 14,287 M m^3

5.3 Amount of water drained out from the command area:

The quantum. This may be due to conjunctive use of water. The water supplied of water released to the field during the year 2004-05 and the irrigation water requirements for the above year as indicated in para 5.1 and 5.2 are as follows.

a) total quantum of water released to field through canal system for 4.10 Lakh Ha in Kharif +4.05 Lakh Ha in Rabi during 2004-05 — 7173 M.cum

b) Irrigation water requirements as per Modified Penman's method. For 4.094 Lakh .Ha in Kharif +4.094 Lakh Ha in Rabi= 8.188 Lakh Ha. — 14,287 M.cum

As seen from the above the releases are less than the crop water requirement computed as per Modified Penman method for the same areas of irrigation. This trend is also noticed for last 9 years of canal releases of the project as shown in Annexureduring season might have been effectively utilized by better water management. The drained irrigation water after its use from the paddy fields is also being utilized for the area at problematic tail end reaches by cross bunding the drains wherever feasible. The above figures indicate that there is no drainage problem since the quantum of water released from the system is less than the crop water requirement. Actually the area irrigated in the delta system is mostly served by net work of drainage courses. Thus the drained water is also being utilized for the crops. There may be change of cropping pattern in actual practice than that reported.

5.4 Adequacy and performance of existing drainage system:

The infilling of drains in Western delta are of 3 types. Some drains join the Kolleru lake which in turn is connected to the sea by narrow outlet called Upputeru. The other drains join the sea through Upputeru and Vashista Godavari. There are 22 Major drains, 56 Medium drains and 559 Minor drains in Western delta. Some drains function as irrigation-cum-drainage system. Regarding Central delta some drains directly join the sea viz, the lower Kowsika, Vasalatippa and Kunavaram. And some other drains join the sea through arms of the river Godavari. There are 10 Major, 16 Medium drains and 138 Minor drains. The drains are also functioning as irrigation source in addition to drainage system.

In respect of Eastern delta 6 Major, 116 Medium drains and some other drains are also functioning as irrigation source in addition to drainage system at the same time some of the drains directly join the sea through the arms of river Godavari.

Whenever the river is in high floods, the flood waters back up into these drains and cause inundation over the low lying marginal areas. The drainage congestion in the drains is at its worst when the local rains and the floods in the river are experienced simultaneously. The period of flooding over the marginal lands some times extends over a period of 30 to 40 days. Some times even without local rains, if the river is in floods, certain areas get flooded due to backing up of the flood waters of the River. The sand dunes formed along the coast, due to lateral drift of sand are also responsible for drainage congestion in the areas of coastal belt.

5.5 Need for extended drainage system if any:

The entire system needs improvements such as removal of weed growth twice in every year, silt clearance strengthening of banks at vulnerable locations, clearing vents of all the CM & CD works well before the onset of rainy season to facilitate free flow to avoid drainage congestion and also to save the crops from inundation. This may result in releasing the drainage congestion for the irrigated area in the delta in the years of normal rainfall, for which they are designed and executed. However in the abnormal rainfall, such as those experienced during the year 1978 under the influence of

cyclonic depression, the flood and drainage problems are felt acute since the drainage system is not designed to cope up with such extra-ordinary conditions.

It is therefore considered necessary to revise the present design criteria for drains in the coastal deltaic areas and effect further improvements to the drainage system. The maintenance of the drainage system of GDS is under the purview of separate board called the Andhra Pradesh State Drainage Board.

5.6 Problems of water logging, salinity and alkalinity:

There is no problem of water logging and salinity except in few areas at tail end reaches.

5.7 Calculation and presentation of efficiency :

There is no problem of drainage in the command area of SACB project as the releases from the canals are less than the crop water requirement as discussed in para 5.3 above. Actually the drainage congestion arises only due to unprecedented floods for which the drains are not designed to carry the extra water.

The deltaic area gets inundated easily due to heavy rains, much can be done to relieve the drainage congestion by Judicious and prompt water regulations. The canals and channels can function as drains by maintaining low water levels in the system. The delta system is also served by a number of major medium and minor drains to drain out the surplus water from the fields that get accumulated especially during the monsoon. The maintenance of these drains forms an important factor to over-come the drainage problem.

Drainage Efficiency of S.A.C.B

1. Total water released through canal system (during 2004-05) For 4.10 Ha in Khariff +4.05 Ha in Rabi =8.15 Ha. 4160 Mm^3 in Kharif +3013 Mm^3 in Rabi — 7173 M,cum

2. Add rain water component in the command Area (716 m.m)

$$\frac{0.716 \times 4,10108 \times 10000}{10^6}$$

— 2936.37 Mm^3

3. Water requirement for crops as per crop water Requirements (As per Modified penman Method) — **13,018.24** Mm^3

	Paddy	$\frac{368442 \times 1.485 \times 10^4}{10^6}$	=	5471.36
	Sugar cane	$\frac{5268 \times 1.955 \times 10^4}{10^6}$	=	102.98
I.D				
a)	Ground nut	$\frac{14559 \times 0.19 \times 10^4}{10^6}$	=	27.66
b) 1)	Banana 10 months	$\frac{21,839 \times 1.489 \times 10^4}{10^6}$	=	325.18

Rabi

	Paddy	$\frac{4,04,840 \times 2.065 \times 10^4}{10^6}$	=	8359.94
		Total		14,287.12 M.cum

4. Ground water potential (potential due to rainfall and canal water) — 1784.15 Mm^3

Ground water availability—utilization = 1, 97,847 Ha. m

(As per G.W. resource book vol.II) = (-) 19,432 Ha. m

1, 78,415 Ha. M

= or $\frac{178415 \times 10^4}{10^6}$ = 1784.15 M.cum

It can be seen from the above that the canal drawals are less than the crop water requirement which indicates that there is no drainage problem.

Further, the crop water requirement plus ground water potential put together i.e. 14287 + 1784 = 16071 $M.m^3$ is more than the canal releases plus rain water component in the command put together (i.e. 7173+2936.37 = 10,109.37 M.cum). This indicates that there is no drainage congestion in the command area.

CHAPTER-6
POTENTIAL CREATED & UTILISED

CHAPTER – 6

6.1 6.2 Irrigation potential created and utilized:

Irrigation potential is created taking into account the quantum of water available for irrigation and hydrological features of the project, nature of command area, rain fall pattern and envisaged cropping pattern. The potential is then localized as wet or ID depending upon the construction of field channels, land development, cropping pattern and making available water for irrigation. The gaps in utilization to the potential creation arise due to defective policies adopted at the time of designing the cropping pattern, excess drawl of water in the head reaches, unsuitable cultivation practices of the users, vandalism, political interference, poor maintenance of the system.

Analysis of gap in utilization of potential created would throw light on various factors contributing to under utilization and to improve the performance by taking up suitable corrective measures.

Potential utilization:

Under GDS Irrigation potential of 410108 Ha is created for irrigated wet during Kharif. Depending upon the availability of water during Rabi season paddy is sown in the Kharif areas or part there of.

It could be seen from the table below that the entire potential created is irrigated in all the 10 years except during the years 2001-02 and 2002-03 where the percentage of utilization was 88 % and 76% respectively, due to less and late inflows. This may be due to the reason that this is an age old delta system where the water is available in sufficient quantities round the year.

A table showing the percentage of utilization to potential created during last 10 years is furnished in respect of SACB project. Year wise potential created and utilized is shown in format VI (PART-F)

Year	Potential created (Ha)	Potential utilization (Ha)	% Utilization
1	2	3	4
1995-96	820216	820216	100%
1996-97	820216	820216	100%
1997-98	820216	820216	100%
1998-99	820216	820216	100%
1999-00	820216	820216	100%
2000-01	820216	820216	100%
2001-02	820216	719276	88%
2002-03	820216	626591	76%
2003-04	820216	820216	100%
2004-05	820216	820216	100%

ADDITIONAL INFORMATION

Participatory irrigation management:

INTRODUCTION

The irrigation sector in the country has been under performing with low irrigation system efficiency and the yields and irrigated agriculture did not match with expected levels. Therefore, it was felt that the irrigation system efficiency has to be improved by adopting Participatory Irrigation Management (PIM) which is found to be very effective in improving the irrigation efficiency. It is in this back ground the Govt of Andhra Pradesh had enacted the APFMIS Andhra Pradesh Farmers Management of Irrigation Systems in April, 1997 with an ultimate aim of transferring irrigation management to farmers covering the entire state including all major, medium and minor irrigation projects except irrigation sources in schedule areas and minor irrigation tanks and ponds whose management vested with the Gram Panchayaths.

Participatory irrigation Management (PIM) is the manner of managing irrigation, water distribution and use with all its related aspects, under which the management responsibilities are taken over by the Water Users Association (WUA) in upwardly manner, as we proceed from out lets through micros, distributaries, and branch canal to main canals & head works. The basic essence of PIM is the transfer of authority & responsibility for irrigation Management along with operation & management system below an interface from Irrigation department to the WUAs & their participation in management of the components which are retained by department for O&M.

OBJECTIVES OF PIM

The objectives of participatory irrigation Management (PIM) are as follows.

1. To improve the service through better operation & maintenance.
2. To achieve the optimum utilization of available source through improved systems of delivery of water, matching to the extent possible the needs of the crops.
3. To achieve equity in the distribution of water.
4. To increase production per unit of water or per unit of the land as the case may be.
5. To make the optimum use of natural precipitation as ground water in conjunction with flow irrigation.
6. To help the farmers to have a greater choice of crop sequence & timing of water supply I period of supply & frequency of supply depending on soils, climate & other infrastructure facilities available in the command such as road, market, cold storage etc., so as to maximize the income & returns.
7. To inculcate a sense of ownership & responsibility among the farmers and to ensure the collection of water charges from the members.
8. To develop professional relation ship between the personnel of the agency of irrigation & farmers.
9. To promote economy in the use of water.
10. To Mobilize local resources in cast, labour to wards capital cost and or O & M changes and.
11. To branch out activities other than the distribution of water for purpose of raising sources, so long as they one consistent with basic responsibilities of the WUA.
12. To resolve differences of conflicts regarding water distributions any other related issue.

SETUP IN MAJOR, MEDIUM AND MINOR IRRIGATION PROJECTS.

S. No	Nature of Irrigation System	Setup
1	Micro Irrigation Scheme up to 2000 ha	Water Users Associations (WUAs)
2	Medium Irrigation Scheme (2000-10,000 ha)	1. WUA. 2. Project level Committee

3	Major Irrigation Scheme (more than 10,000 ha)	1. WUA 2. Distribution level Committee 3. Project level Committee

The functions of WUAs, Distributory Committees and Project level Committees are discussed as follows.

FUNCTIONS OF WATER USERS ASSOCIATIONS

The Water Users Association shall perform the following functions, namely.

1. To prepare and implement a warabandi schedule for each irrigation season, consistent with the operational plan, based upon the entitlement, area, soil and cropping pattern as approved by the Distributory Committee, or the Project Committee as the case may be
2. To prepare a plan for the maintenance of irrigation system in the area of its operation at the end of each crop season and carry out the maintenance works of both distributory system and minor and field drains in its area of operation with the funds of the association from time to time subject to such terms and conditions as may be prescribed
3. To regulate the use of water among the various pipe outlets under its area of operation according to the warabandi schedule of the system
4. To promote economy in the use of water allocated
5. To assist the Revenue Department in the preparation of demand and collection of water rates
6. To maintain a register of landholders as published by the Revenue Department
7. To prepare and maintain a register of co-opted members
8. To prepare and maintain an inventory of the irrigation system within the area of operation
9. To monitor flow of water for irrigation
10. To resolve the disputes, if any, between the members and water users in its area of operation
11. To raise resources
12. To maintain accounts
13. To cause annual audit of its accounts
14. To assist in the conduct of elections to the Managing Committee
15. To maintain other records as may be prescribed

16. To abide by the decisions of the Distributory and Project Committee
17. To conduct General Body Meetings, as may be prescribed
18. To encourage avenue plantation on canal bunds and tank bunds by leasing such bunds
19. To conduct regular water budgeting and also to conduct periodical social audit, as may be prescribed
20. To encourage modernization of agriculture in its area of operation and
21. To maintain the feeder channels of minor irrigation tanks by the respective Water Users Associations, in the manner prescribed

FUNCTIONS OF DISTRIBUTORY COMMITTEE.

The Distributory Committee shall perform the following functions namely

1. To prepare an operational plan based on its entitlement, area, soil, cropping pattern at the beginning of each irrigation season, consistent with the operational plan prepared by the Project Committee
2. To prepare a plan for the maintenance of both distributaries and medium drains within its area of operation at the end of each crop seasons and execute the maintenance works with the funds of the committee form time to time
3. To regulate the use of water among the various Water Users Associations under its area of operation
4. To resolve disputes, if any, between the Water Users Associations in its area of operation
5. To maintain a register of Water Users Associations in its area of operation
6. To maintain an inventory of the irrigation system in the area of its operation, including drains
7. To promote economy in the use of water allocated
8. To maintain accounts
9. To cause annual audit
10. To maintain other records as may be prescribed
11. To monitor the flow of water for irrigation
12. To conduct General Body Meetings as may be prescribed
13. To abide by the decisions of the Project Committee
14. To cause regular water budgeting and also the periodical social audit as may be prescribed

15. To assist in the conduct of elections to the Managing Committee
16. To encourage avenue plantations in its area of operation; and
17. To encourage modernization of agriculture in its area of operation

POWER TO LEVY AND COLLECT FEE

A Farmers Organization may, for carrying out achieving the objects of the Organization and performing its functions, levy and collect such fees as may be prescribed from time to time.

SUSTAINABLE IRRIGATION MANAGEMENT BY IMPLEMENTATION OF PIM ON IRRIGATION SECTOR.

In order to fulfill the objectives of PIM in irrigation sector, farmers are being encouraged adequately as indicated in the following steps duly conducting frequent trainings on farm seminars and awareness programmes on latest trends and technologies.

1. Focus on needs and requirements at WUA level to enhance the benefits of irrigation infrastructure to maximize the out puts
2. To provide a common direction and goal for moving ahead with confidence
3. To enlighten the farmers on water use efficiency, tail end problem canal status, O & M status, actual irrigated area, cropping pattern tax collection and adoption of latest technology by WUAs
4. Efforts to secure equity in distribution of water among its users
5. Awareness in maintenance of irrigation system, performance and effective utilization of available resources
6. Empowering WUAs for resources mobilization and water management
7. To enlighten / encourage tail end farmers to switch to conjunctive use of canal water with Ground water
8. Incentive drive for cess collection
9. Encouraging 'Joint Ajmaeesh'
10. Ploughing back funds for O & M works from cess collection.

The Government of Andhra Pradesh has created a budgetary support for replough of tax to all the Water Users Associations the shone of the WUAs, Distributory Committees and Project Committees is as indicated in the following table.

Sector	Allocation (Percentage)						
	WUAs		D.Cs		P.Cs		G.P
	Works	Admn	Works	Admn	Works	Admn	
Major	50	10	15	5	14	1	5
Medium	50	10	-	-	30	5	5
Minor	80	10	-	-	-	-	10

11. Providing funds for establishment of farmers organization office and infrastructure facilities, upto a maximum of 10 % of the ploughed back amount received can be utilized towards administration, incidental charges etc by the farmers organizations.

PARTICIPATORY IRRIGATION MANAGEMENT IN THE PROJECT

There are 16 Distributory Committees, 89 Water User Associations functioning under Eastern deltas and 9 Distributory Committees, 56 Water User Associations functioning under Central delta of East Godavari District. and 20 Distributaries committees, 131 Water User Associations functioning under Western delta of West Godavari District. Thus there are 45 Distributary Committees and 276 Water Users Associations functioning under the project. The Project Committees are yet to be formed.

CHAPTER-7
FINDINGS & RECOMMENDATIONS

CHAPTER – 7

7. Findings and Recommendations:

7.1 Recommendations for improving in water use efficiencies:

7.1.1 Dam/ Reservoir Efficiency:

a) Findings

The water level over the SACB Barrage generally touches 4.2 m over the sill. every year at MWL of +14.87 m discharging 13 Lakh Cusecs. The maximum flood discharge was 101292 cumecs (35, 77,200 cusecs) during month of August 1986 resulting in the inundation of villages and field during the floods. Due to the floods there is throat on the shutters resulting in leakages and damages to the flood banks.

b) Recommendations

1. It is essential that maintenance works for improvements to the Barrage such as arresting leakages, repairs to the shutters, greasing etc are required to be taken up ever year.
2. Improvements to flood banks such as strengthening removing and resetting the revetment etc.

In view of the maximum flood received to a tune of 35, 77,220 cusecs (which is encroaching free board) during the month of August 1986, it is necessary to improve and strengthen the flood bank protecting the near by villages and submersion of fields during the floods and for which the estimate cost is Rs. 549.32 Crores.

7.1.2 Canal conveyance efficiency:

The present discharging capacities of the entire three main canals of East & West Godavari Districts are varying from the designed discharges.

a) Findings

1. There is difficulty in delivering water to the tail end reaches since leakages were observed in the distribution system specially at the existing regulating arrangements.

2. The present carrying capacities of the canals are less than the designed discharges and the conveyance losses are found to be more.
3. The existing cross regulators are found to be in sufficient for maintaining required heads of water.
4. The existing drainage system also contribute supply of water for irrigation but adequate number of cross regulators are not existing to maintain better command levels.
5. There are certain major drains existing in the deltaic command which can be also be proposed for supplementing water for irrigation.

b) Recommendations

1. In view of difficulty in delivering water to tail end reaches, the existing regulating arrangements of canal system needs improvements, repairs and replacements to damaged shutters of Main canals and Distributaries to ensure effective water delivering and arrest wastage of water through leakages.
2. The canals are to be improved to carry the required designed discharge.
3. For minimizing the seepage losses, lining of canals may be resorted to, with suitable materials wherever necessary.
4. Adequate cross regulators across the irrigation canal and channel may be provided since the existing cross regulators are not sufficient for maintaining the necessary heads of water.
5. As the drainage system also contribute supply of water for irrigation, adequate number of cross regulators may be constructed across the drains wherever feasible to maintain better command levels and to curb wastage of water and proper utilization.
6. It is therefore considered necessary to revise the present criteria for the drains and effect further improvements to the drainage system.
7. As the deltaic areas get inundated easily due to heavy rains, much can be done to relieve the drainage congestion by Judicious and prompt water regulation. The canals and channels can function as drains, by maintaining low water levels in the system.
8. With a view to supplement this area from drains, the following major drains which are perennial may be selected for supplementation. The drain water

can be proposed to be diverted into canals in June and January to February. The drains are (1) Tulyabhaga drain (2) Teki drain (3) Biccavole drain in Eastern Delta, (1) Kunavaram drain, Vasalthippa drains in Central Delta (1) Yenamadurru drain (2) nakkala drain (3) Bondada drain in Western Delta.

S.No.	Name of the Drain	Minimum dependable discharge in c/s.
1	Tulyabhaga drain 4 cum/sec	140
2	Teki drain 3 cum/sec.	100
3	Biccavole drain 0.3 4 cum/sec	10
4	Kunvaram drain 2.25 cum/sec	80
5	Vasalathippa drain 2 cum/sec	70
6	Yanamadurru drain 7.05 cum/sec	250
7	Nakkala drain 0.7 cum /sec	25
8	Bondada drain 0.7 cum/sec	25
	Total	700

9. Introduction of VHF communication system is desirable for the Eastern, Central and Western delta canals.

10. **Measuring devices**:

Optimum use of water for irrigation depends to a large extent on rational management of water. It is noticed that no measuring devices like V-notches, broad crested weirs, parshall flumes, cut throat flumes are available on canal system. Measuring devices increases operational efficiencies of the canal and also to measure seepage losses in these three canals of SAC Barrage.

So it is recommended to introduce the above measuring devices on canals, distributaries preferably near head regulator of three main canals, head reaches of all off taking canals and below outlets. These measuring devices can also be installed at intermediate locations like off linking channels, near heavy banking sections of canals etc.

7.1.3 On farm application efficiency:

a) Findings

On farm application efficiencies of the Godavari Delta System command area under canal system has been evaluated for the wet and Irrigated dry crops. The on farm application efficiency of Godavari Delta System is working out to 54.15 % and the overall project efficiency of Godavari Delta System in respect of on farm application is working out to

45.05 %. Which is with in the limitation of world ranging from 11 % to 60 %. As seen from the above, it reveals that much water is being wasted in the system and the system requires modernization. However it is a diversion scheme where water will be diverted whenever required by the crops and the excess water will go as spill over. This is a tail end project and all the surplus water would go into the sea. The following suggestions are made for improving the on farm application efficiency.

b) Recommendations

1. In all three delta canals in East and West Godavari Districts most of the direct pipe sluices are being operated without the shutters resulting in wastage of water. In these cases the sluices and shutters are tampered by ryots contributing for damage.
2. Suitable shutters to be provided for operation .of sluices and to be maintained regularly with watch and ward for avoiding damages.
3. Possibility of providing water meters at field level for supply of water as per actual requirements is to be explored.
4. To ensure sustainable water management in conservation of water and equitable distribution to the farmers, it is highly desirable to involve the farmers fully in Irrigation Management.
5. Lining to the bed and sides of the distributory system may also be proposed especially for channels running in sand mixed soils of porous nature, where the seepage losses observed to be high as discussed in chapter-3. The banks may be strengthened which facilitate for conducting agriculture activities and also transportation of agriculture products.
6. Conjunctive use may be advised as the ground water potential is sufficiently available.

It is proposed to take up the Modernization of Godavari Delta System in East Godavari and West Godavari Districts with an estimated cost of Rs 1142 Crores and 905 Crores respectively as detailed below.

East Godavari District:

1. Godavari Eastern Main canal, Samarlakota canal and its distributary system with an estimated cost of 93.95Crores.
2. Kakinada canal including KMJ canal and its distributary system with an estimated cost of Rs 118.97 Crores.
3. Mandapeta canal and its distributary system with an a estimated cost of Rs 74.50 Crores
4. Coringa canal, Injaram canal, KMJ canal and its distributary system with an estimated cost of Rs 130.92 Crores.
5. Bank canal and distributary system under Eastern Delta with an estimated cost of 127.84 Crores.
6. Pithapuram branch canal and its distributary system with an estimated cost of Rs 22.03 Crores.
7. Central Delta main canal and its distributary system with an estimated cost of 53.85 Crores.
8. Gannavaram canal and its distributary system with an estimated cost of Rs 203.60 Crores.
9. Amalapuram canal and its distributary system with an estimated cost of Rs. 170.91 Crores.
10. Bank canal and its distributary system under Central Delta with an estimated cost of Rs. 145.22 Crores.

West Godavari District

1. G.W. Main canal, Eluru canal, Junction canal and Channels system with an estimated cost of Rs. 143.19 Crores.
2. Kakariporru canal and channels system with an estimate cost of Rs 38.62 Crores.
3. Bank canal and channels system with an estimate of cost of Rs. 75.29 Crores
4. Narsapuram canal and channels system with an estimate cost of Rs. 132.03 Crores.
5. G & V canal and channels system with an estimate cost of Rs. 118.32 Crores
6. Athili canal and channels system with an estimate cost of Rs. 40.44 Crores.

7. V & W, O. W canal and channels system at an estimate cost of Rs. 66.37 Crores.
8. Undi canal and channels system with an estimate cost of Rs. 80.41 Crores.
9. Yenamadurru drain with an estimate cost of Rs. 101.54 Crores.
10. Yerrakaluva with an estimate cost of Rs 87.15 Crores.
11. Diversion of Yerrakaluva flood water to Thammileru with an estimate cost of Rs. 21.50 Crores.

7.1.4 Drainage efficiency

a) Findings

There is no problem of drainage in the command area of SACB Project as the releases from the canals are less than the crop water requirement. Actual drainage congestion arises only due to unprecedented floods for which the existing drains are not designed to carry the extra water.

The deltaic area gets in undated easily due to heavy rains. There are about 38 major, 188 medium drains and 697 minor drains existing in the delta command area which are also functioning as irrigation source in addition to drainage system. Some drains directly join the sea through arms of the river Godavari.

Whenever the river is in high floods, the flood water back up into the drains and cause inundation over the low lying and marginal areas. The drainage congestion in the drains are at its worst when the local drains and the floods in the river are experienced simultaneously. Sand dunes are formed along the coast and due to lateral drift of sand drainage congestion exists in the areas of coastal belt. Some of these drains are also serving as irrigation source. To use these drains effectively as irrigation source, some modifications are required so as to raise the water level to suit for irrigating the command area. To release the drainage congestion the following are suggested.

b) Recommendations

1. The entire drainage system need improvements such as removal of weed growth twice in every year.
2. Silt clearance, Strengthening of banks at vulnerable locations are required to be done.
3. Clearing of vents of all the cross Masonry and cross drainage works well before the on set of rainy season to facilitate free flow to avoid drainage congestion and also to save crops from inundation.
4. It is necessary to revise the present design criteria for drains in the coastal deltaic areas and effect further improvements to the drainage system. Since the existing drainage system is not designed to cope up with extra ordinary conditions of floods. The maintenance of drainage system of GDS in under the preview of separate Board called the Andhra Pradesh State Drainage Board.
5. As the drainage system also contribute supply of water for irrigation, adequate number of cross regulators may be constructed across the drains to maintain better command levels and to curb wastage of water.
6. With a view to supplement the command area from drains. Some of the major drains which are perennial may be selected for supplementation namely 1) Tulya Bhaja drain 2) Teki drain 3) Bikkavolu drain 4) Kunavaram Drain 5) Vasaltippa drain 6) Yenamadduru drain 7) Nakkala drain 8) Bondada drian.

Some of the above drains are proposed to be taken up for modernization so as to utilize the water for irrigating the command area. The modernization of GDS distribution system has been taken up at a cost of Rs. 2047 Crores under various packages.

ANNEXURES

ANNEXURES

Sl.No	Annexures	Page No
1	**DATA VOLUME**	
	Part – A Reservoir Storage Status in format I for 10 Years	71-80
	Part – B Canal Withdrawals in format II for 10 Years	81
	Part – C Actual Cropping Pattern in format III for 10 Years	82-84
	Part – D Weighted Average Rainfall in the Command of the Project in format IV for 10 Years	85
	Part – E Irrigation Water Requirement by Modified Penman Method in format V	86-90
	Part – F Year wise Potential Created and Utilized in format VI for 10 Years	91
	Part – G Data required for working out drainage efficiency in format VII	92
2	**PLATES**	
	Projects Location Map – Major	93
	Projects Location Map – Medium	94
	Index Map	95
	Photographs	96-99
3	**Annexure – A** **TOR**	**100-115**
4	**Annexure – B** **List of Consultants**	**116**

GODAVARI DELTA SYSTEM

Reservoir Storage Status

FORMAT I (PART-A)

Year 1995-1996

Unit Million.cum

Gross Storage 83.00

Live Storage 60.06

Month	Storage (on the first day of the month)	Inflow during the month	With Drawal	SpillOver	Balance (2+3-4-5)	Evaporation	Net Storage (6-7)	Seepage (8-10)	Actual Storage (8)
1	2	3	4	5	6	7	8	9	10
JUNE	66.03	1273.39	677.35	595.53	66.54	0	66.54	0	66.54
JULY	66.54	22086.56	632.28	21454.36	66.46	0	66.46	0	66.46
AUGUST	66.46	16887.23	936.83	15948.31	68.55	0	68.55	0	68.55
SEPTEMBER	68.55	32119.17	796.72	31324.46	66.54	0	66.54	0	66.54
OCTOBER	66.54	20536	408.43	20127.94	66.17	0	66.17	0	66.17
NOVEMBER	66.17	31358.79	582.87	30775.15	66.94	0	66.94	0	66.94
DECEMBER	66.94	1533.59	996.38	537.49	66.66	0	66.66	0	66.66
JANUARY	66.66	1132.8	1029.17	103.83	66.46	0	66.46	0	66.46
FEBRUARY	66.46	903.58	903.58	1.79	64.67	0	64.67	0	64.67
MARCH	64.67	882.53	831.22	49.1	66.88	0	66.88	0	66.88
APRIL	66.88	729.99	241.2	488.65	67.02	0	67.02	0	67.02
MAY	67.02	677.54	148.87	529.15	66.54	0	66.54	0	66.54
Total		130121.17	8184.9	121935.76		0		0	

GODAVARI DELTA SYSTEM

Reservoir Storage Status

FORMAT I (PART-A)

Year 1996-1997

Unit Million.cum

Gross Storage 83.00

Live Storage 60.06

Month	Storage (on the first day of the month)	Inflow during the month	With Drawal	SpillOver	Balance (2+3-4-5)	Evaporation	Net Storage (6-7)	Seepage (8-10)	Actual Storage (8)
1	2	3	4	5	6	7	8	9	10
JUNE	66.54	4003.17	523.74	3479.71	66.26	0	66.26	0	66.26
JULY	66.26	8355.02	716.15	7639.44	65.69	0	65.69	0	65.69
AUGUST	65.69	21878.32	896.67	20981.36	65.98	0	65.98	0	65.98
SEPTEMBER	65.98	19423.07	841.08	18581.71	66.26	0	66.26	0	66.26
OCTOBER	66.26	6516.91	450.74	6065.89	66.54	0	66.54	0	66.54
NOVEMBER	66.54	2394.47	29.22	2365.53	66.26	0	66.26	0	66.26
DECEMBER	66.26	1064.27	749.37	314.33	66.83	0	66.83	0	66.83
JANUARY	66.83	808.75	807.62	0	67.96	0	67.96	0	67.96
FEBRUARY	67.96	763.1	763.1	3.4	64.56	0	64.56	0	64.56
MARCH	64.56	825	771.06	51.11	67.39	0	67.39	0	67.39
APRIL	67.39	839.7	271.33	571.77	63.99	0	63.99	0	63.99
MAY	63.99	794.57	148.67	644.65	65.24	0	65.24	0	65.24
Total		67666.35	6968.75	60698.9		0		0	

GODAVARI DELTA SYSTEM

Reservoir Storage Status

FORMAT I (PART-A)

Year 1997-1998

Unit Million.cum

Gross Storage 83.00

Live Storage 60.06

Month	Storage (on the first day of the month)	Inflow during the month	With Drawal	SpillOver	Balance (2+3-4-5)	Evaporation	Net Storage (6-7)	Seepage (8-10)	Actual Storage (8)
1	2	3	4	5	6	7	8	9	10
JUNE	65.24	443.69	443.69	2.92	62.32	0	62.32	0	62.32
JULY	62.32	2839.35	904.68	1934.67	66.6	0	66.6	0	66.60
AUGUST	66.6	17994.04	1047	16947.04	66.32	0	66.32	0	66.32
SEPTEMBER	66.32	15523	838.93	14684.07	66.51	0	66.51	0	66.51
OCTOBER	66.51	3597.5	795.41	2802.09	66.94	0	66.94	0	66.94
NOVEMBER	66.94	2300.24	474.84	1825.4	66.32	0	66.32	0	66.32
DECEMBER	66.32	3012.74	887.61	2125.13	66.34	0	66.34	0	66.34
JANUARY	66.34	1853.71	962.48	891.23	67.36	0	67.36	0	67.36
FEBRUARY	67.36	1261.04	933.96	327.08	65.24	0	65.24	0	65.24
MARCH	65.24	711.45	711.45	0	61.9	0	61.9	0	61.90
APRIL	61.9	436.6	128.44	308.16	67.22	0	67.22	0	67.22
MAY	67.22	420.39	1	419.39	67.22	0	67.22	0	67.22
Total		50393.75	8129.49	42267.18		0		0	

GODAVARI DELTA SYSTEM

Reservoir Storage Status

FORMAT I (PART-A)

Year 1998-1999

Unit Million.cum

Gross Storage 83.00

Live Storage 60.06

Month	Storage (on the first day of the month)	Inflow during the month	With Drawal	SpillOver	Balance (2+3-4-5)	Evaporation	Net Storage (6-7)	Seepage (8-10)	Actual Storage (8)
1	2	3	4	5	6	7	8	9	10
JUNE	67.22	1314.19	522.01	793.08	66.32	0	66.32	0	66.32
JULY	66.32	9278.88	899.84	8382.5	62.86	0	62.86	0	62.86
AUGUST	62.86	21983.06	621.97	21358.99	64.96	0	64.96	0	64.96
SEPTEMBER	64.96	25845.35	561.57	25283.16	65.58	0	65.58	0	65.58
OCTOBER	65.58	18295.87	427.32	17870.05	64.08	0	64.08	0	64.08
NOVEMBER	64.08	6391.02	252.47	6137.67	64.96	0	64.96	0	64.96
DECEMBER	64.96	1479.39	936	541.89	66.46	0	66.46	0	66.46
JANUARY	66.46	914.68	914.68	1.36	65.1	0	65.1	0	65.10
FEBRUARY	65.1	717.03	717.03	1.13	63.97	0	63.97	0	63.97
MARCH	63.97	690.32	690.32	3.83	60.14	0	60.14	0	60.14
APRIL	60.14	497.03	113.49	376.66	67.02	0	67.02	0	67.02
MAY	67.02	498.25	28.14	473.31	63.82	0	63.82	0	63.82
Total		87905.07	6684.84	81220.23		0		0	

GODAVARI DELTA SYSTEM

Reservoir Storage Status

FORMAT I (PART-A)

Year 1999-2000

Unit Million.cum

Gross Storage 83.00

Live Storage 60.06

Month	Storage (on the first day of the month)	Inflow during the month	With Drawal	SpillOver	Balance (2+3-4-5)	Evaporation	Net Storage (6-7)	Seepage (8-10)	Actual Storage (8)
1	2	3	4	5	6	7	8	9	10
JUNE	63.82	5316	188.27	5124.81	66.74	0	66.74	0	66.74
JULY	66.74	9547.49	811.15	8737.24	65.84	0	65.84	0	65.84
AUGUST	65.84	31148.22	965.02	30182.87	66.17	0	66.17	0	66.17
SEPTEMBER	66.17	31591.02	922.24	30668.49	66.46	0	66.46	0	66.46
OCTOBER	66.46	18368.47	818.34	17549.99	66.6	0	66.6	0	66.60
NOVEMBER	66.6	3685.31	541.32	3143.23	67.36	0	67.36	0	67.36
DECEMBER	67.36	1244.34	1014.1	231	66.6	0	66.6	0	66.60
JANUARY	66.6	927.44	926.51	0	67.53	0	67.53	0	67.53
FEBRUARY	67.53	882.42	882.14	0	67.81	0	67.81	0	67.81
MARCH	67.81	786.84	786.69	0	67.96	0	67.96	0	67.96
APRIL	67.96	540.44	261.41	279.37	67.62	0	67.62	0	67.62
MAY	67.62	462.99	33.89	429.24	67.48	0	67.48	0	67.48
Total		104500.98	8151.08	96346.24		0		0	

75

GODAVARI DELTA SYSTEM

Reservoir Storage Status

FORMAT I (PART-A)

Year 2000-01

Unit Million.cum

Gross Storage 83.00

Live Storage 60.06

Month	Storage (on the first day of the month)	Inflow during the month	With Drawal	SpillOver	Balance (2+3-4-5)	Evaporation	Net Storage (6-7)	Seepage (8-10)	Actual Storage (8)
1	2	3	4	5	6	7	8	9	10
JUNE	67.48	3840.74	697.83	3144.39	66	0	66	0	66.00
JULY	66	29810.73	971.88	28838.53	66.32	0	66.32	0	66.32
AUGUST	66.32	35142.37	734.7	34398.98	75.01	0	75.01	0	75.01
SEPTEMBER	75.01	20463.07	924.3	19547.32	66.46	0	66.46	0	66.46
OCTOBER	66.46	3637.99	857.28	2780.43	66.74	0	66.74	0	66.74
NOVEMBER	66.74	1268.51	715.61	552.62	67.02	0	67.02	0	67.02
DECEMBER	67.02	832.53	832.53	0.89	66.13	0	66.13	0	66.13
JANUARY	66.13	544.95	544.95	0.75	65.38	0	65.38	0	65.38
FEBRUARY	65.38	539.06	539.06	4.64	60.74	0	60.74	0	60.74
MARCH	60.74	501.68	501.68	1.15	59.59	0	59.59	0	59.59
APRIL	59.52	253.79	198.62	47.41	67.28	0	67.28	0	67.28
MAY	67.28	405.77	16.65	390.4	66	0	66	0	66.00
Total		97241.19	7535.09	89707.51		0		0	

GODAVARI DELTA SYSTEM

Reservoir Storage Status

FORMAT I (PART-A)

Year 2001-2002

Unit Million.cum

Gross Storage 83.00

Live Storage 60.06

Month	Storage (on the first day of the month)	Inflow during the month	With Drawal	SpillOver	Balance (2+3-4-5)	Evaporation	Net Storage (6-7)	Seepage (8-10)	Actual Storage (8)
1	2	3	4	5	6	7	8	9	10
JUNE	66	10932.54	434.26	10497.96	66.32	0	66.32	0	66.32
JULY	66.32	17016.62	1016.79	15999.64	66.51	0	66.51	0	66.51
AUGUST	66.51	40408.43	1001.61	39406.87	66.46	0	66.46	0	66.46
SEPTEMBER	66.46	8161.45	1065.09	7097.15	65.67	0	65.67	0	65.67
OCTOBER	65.67	7493.12	690.89	6801.9	66	0	66	0	66.00
NOVEMBER	66	1634.79	430.35	1201.89	68.55	0	68.55	0	68.55
DECEMBER	68.55	1093.72	870.7	227.43	64.14	0	64.14	0	64.14
JANUARY	64.14	689.33	687.3	0	66.17	0	66.17	0	66.17
FEBRUARY	66.17	576.21	576.21	2.54	63.63	0	63.63	0	63.63
MARCH	63.63	668.27	668.27	1.36	62.27	0	62.27	0	62.27
APRIL	62.27	408.34	245.61	158.26	66.74	0	66.74	0	66.74
MAY	66.74	263.45	13.93	249.94	66.32	0	66.32	0	66.32
Total		89346.27	7701.01	81644.94		0		0	

GODAVARI DELTA SYSTEM

Reservoir Storage Status

FORMAT I (PART-A)

Year 2002-2003

Unit Million.cum

Gross Storage 83.00

Live Storage 60.06

Month	Storage (on the first day of the month)	Inflow during the month	With Drawal	SpillOver	Balance (2+3-4-5)	Evaporation	Net Storage (6-7)	Seepage (8-10)	Actual Storage (8)
1	2	3	4	5	6	7	8	9	10
JUNE	66.32	3345.28	528.07	2817.86	65.67	0	65.67	0	65.67
JULY	65.67	5402.34	1165.19	4236.02	66.8	0	66.8	0	66.80
AUGUST	66.8	25080.15	725.15	24355.48	66.32	0	66.32	0	66.32
SEPTEMBER	66.32	16849.77	1095.56	15752.57	67.96	0	67.96	0	67.96
OCTOBER	67.96	1967.59	848.95	1118.73	67.87	0	67.87	0	67.87
NOVEMBER	67.87	883.33	502.76	380.96	67.48	0	67.48	0	67.48
DECEMBER	67.48	489.25	489.25	0.82	66.66	0	66.66	0	66.66
JANUARY	66.66	393.03	393.03	2.86	63.8	0	63.8	0	63.80
FEBRUARY	63.8	382.04	379.18	0	66.66	0	66.66	0	66.66
MARCH	66.66	468.15	468.15	0.88	65.78	0	65.78	0	65.78
APRIL	65.78	348.74	316.29	38.34	59.89	0	59.89	0	59.89
MAY	59.89	68.04	0	64.3	63.63	0	63.63	0	63.63
Total		55677.71	6911.58	48768.82		0		0	

78

GODAVARI DELTA SYSTEM

Reservoir Storage Status

FORMAT I (PART-A)

Year 2003-2004

Unit Million.cum

Gross Storage 83.00

Live Storage 60.06

Month	Storage (on the first day of the month)	Inflow during the month	With Drawal	SpillOver	Balance (2+3-4-5)	Evaporation	Net Storage (6-7)	Seepage (8-10)	Actual Storage (8)
1	2	3	4	5	6	7	8	9	10
JUNE	63.63	167.35	167.35	2.52	61.11	0	61.11	0	61.11
JULY	61.11	24021.05	887.83	23126.37	67.96	0	67.96	0	67.96
AUGUST	67.96	32489.96	927.99	31564.41	65.52	0	65.52	0	65.52
SEPTEMBER	65.52	18063.33	1043.94	17018.23	66.68	0	66.68	0	66.68
OCTOBER	66.68	10787.34	817.64	9969.78	66.6	0	66.6	0	66.60
NOVEMBER	66.6	2953.55	623.38	2329.29	67.48	0	67.48	0	67.48
DECEMBER	67.48	1258.36	825.23	432.71	67.9	0	67.9	0	67.90
JANUARY	67.9	1040.11	986.2	54.96	66.85	0	66.85	0	66.85
FEBRUARY	66.85	1106.97	905.98	201.64	66.2	0	66.2	0	66.20
MARCH	66.2	906.89	906.89	0.08	66.12	0	66.12	0	66.12
APRIL	66.12	440.31	419.76	18.91	67.76	0	67.76	0	67.76
MAY	67.76	629.42	7.22	622.96	67	0	67	0	67.00
Total		93864.64	8519.41	85341.86		0		0	

GODAVARI DELTA SYSTEM

Reservoir Storage Status

FORMAT I (PART-A)

Year 2004-2005

Unit Million.cum

Gross Storage 83.00

Live Storage 60.06

Month	Storage (on the first day of the month)	Inflow during the month	With Drawal	SpillOver	Balance (2+3-4-5)	Evaporation	Net Storage (6-7)	Seepage (8-10)	Actual Storage (8)
1	2	3	4	5	6	7	8	9	10
JUNE	67	5247.17	522.1	4725.56	66.51	0	66.51	0	66.51
JULY	66.51	3672.33	902.78	2769.21	66.85	0	66.85	0	66.85
AUGUST	66.85	30096.1	841.99	29254.28	66.68	0	66.68	0	66.68
SEPTEMBER	66.68	5002.2	971.28	4030.26	67.34	0	67.34	0	67.34
OCTOBER	67.34	5420.24	1088.09	4332.49	67	0	67	0	67.00
NOVEMBER	67	1672.74	541.41	1130.85	67.48	0	67.48	0	67.48
DECEMBER	67.48	833.15	785.55	52.64	62.44	0	62.44	0	62.44
JANUARY	62.44	634.12	634.12	0.46	61.98	0	61.98	0	61.98
FEBRUARY	61.98	929.88	811.35	114.84	65.67	0	65.67	0	65.67
MARCH	65.67	648.25	648.25	4.45	61.22	0	61.22	0	61.22
APRIL	61.22	572.61	293.58	272.77	67.48	0	67.48	0	67.48
MAY	67.48	0	0	0	67.48	0	67.48	0	67.48
Total		54728.79	8040.5	46687.81		0		0	

GODAVARI DELTA SYSTEM

FORMAT II (PART_B)

Canal WithDrawals in Million.cum

Year	During Seasons			% Withdrawls	
	Khariff	Rabi	Total (Annual)	Kharif	Rabi
1	2	3	5	6	7
1995-96	4383	3802	8185	53.55	46.45
1996-97	3732	3236	6968	53.56	46.44
1997-98	4464	3665	8129	54.91	45.09
1998-99	3331	3354	6685	49.83	50.17
1999-2000	4001	4150	8151	49.09	50.91
2000-2001	4609	2926	7535	61.17	38.83
2001-2002	4533	3133	7666	59.13	40.87
2002-2003	4486	1674	6160	72.82	27.18
2003-2004	4252	3334	7586	56.05	43.95
2004-2005	4160	3013	7173	58.00	42.00

GODAVARI DELTA SYSTEM

Culturable Command Area (in Ha): 410108 Format -III (Part-C)

Year :1996-1997

Sl. No.	Crops		Area in Ha.		Percentage(w. r.t.total area)	Base Period of Crop (Days)
			khariff:	Rabi		
1	2		3		4	5
1	Paddy		384613	404827	98.71	120
2	sugarcane		5281	5281	1.29	330
3	I.D	Banana	12128			
4		Ground nut	8086			
	Total :		**410108**	410108	100.00	

Culturable Command Area (in Ha): 410108

Year :1997-1998

Sl. No.	Crops		Area in Ha.		Percentage(w. r.t.total area)	Base Period of Crop (Days)
			khariff:	Rabi		
1	2		3		4	5
1	Paddy		360823	404827	98.71	120
2	sugarcane		5281	5281	1.29	330
3	I.D	Banana	26402			
4		Ground nut	17602			
	Total :		**410108**	410108	100.00	

Culturable Command Area (in Ha): 410108

Year :1998-1999

Sl. No.	Crops		Area in Ha.		Percentage(w. r.t.total area)	Base Period of Crop (Days)
			khariff:	Rabi		
1	2		3		4	5
1	Paddy		360823	404827	98.71	120
2	sugarcane		5281	5281	1.29	330
3	I.D	Banana	26402			
4		Ground nut	17602			
	Total :		**410108**	410108	100.00	

GODAVARI DELTA SYSTEM

Culturable Command Area (in Ha): 410108

Year :1999-2000

Sl. No.	Crops		Area in Ha.		Percentage(w.r.t.total area)	Base Period of Crop (Days)
			khariff:	Rabi		
1	2		3		4	5
1	Paddy		367833	406022	99.00	120
2	sugarcane		4086	4086	1.00	330
3	I.D	Banana	22913			
4		Ground nut	15276			
	Total :		**410108**	410108	100.00	

Culturable Command Area (in Ha): 410108

Year :2000-2001

Sl. No.	Crops		Area in Ha.		Percentage(w.r.t.total area)	Base Period of Crop (Days)
			khariff:	Rabi		
1	2		3		4	5
1	Paddy		367833	406022	99.00	120
2	sugarcane		4086	4086	1.00	330
3	I.D	Banana	22913			
4		Ground nut	15276			
	Total :		**410108**	410108	100.00	

Culturable Command Area (in Ha): 410108

Year :2001-2002

Sl. No.	Crops		Area in Ha.		Percentage(w.r.t.total area)	Base Period of Crop (Days)
			khariff:	Rabi		
1	2		3		4	5
1	Paddy		354357	316168	77.09	120
2	sugarcane		5281	5281	1.29	330
3	I.D	Banana	22913			
4		Ground nut	15276			
	Total :		**397827**	321449	78.38	

GODAVARI DELTA SYSTEM

Culturable Command Area (in Ha): 410108

Year :2002-2003

Sl. No.	Crops		Area in Ha.		Percentage(w.r.t.total area)	Base Period of Crop (Days)
			khariff:	Rabi		
1	2		3		4	5
1	Paddy		352038	231896	56.55	120
2	sugarcane		5281	2729	0.67	330
3	I.D	Banana	20788			
4		Ground nut	13859			
	Total :		**391966**	234625	57.21	

Culturable Command Area (in Ha): 410108

Year :2003-2004

Sl. No.	Crops		Area in Ha.		Percentage(w.r.t.total area)	Base Period of Crop (Days)
			khariff:	Rabi		
1	2		3		4	5
1	Paddy		369201	405599	98.90	120
2	sugarcane		4509	4509	1.10	330
3	I.D	Banana	21839			
4		Ground nut	14559			
	Total :		**410108**	410108	100.00	

Culturable Command Area (in Ha): 410108

Year :2004-2005

Sl. No.	Crops		Area in Ha.		Percentage(w.r.t.total area)	Base Period of Crop (Days)
			khariff:	Rabi		
1	2		3		4	5
1	Paddy		368442	404840	98.72	120
2	sugarcane		5268	5268	1.28	330
3	I.D	Banana	21839			
4		Ground nut	14559			
	Total :		**410108**	410108	100.00	

GODAVARI DELTA SYSTEM

Weighted Average Rainfall in the Command of the Project

Units: mm Format IV (Part-D)

Year	Month												Total
	June	July	August	September	October	November	December	January	February	March	April	May	
1995 - 1996	87	271	197	154	383	21	0	0	1	0	2	8	1081
1996 - 1997	264	255	148	211	317	179	27	17	0	20	53	1	1190
1997 - 1998	64	160	68	400	106	52	73	10	18	2	21	43	1018
1998 - 1999	93	216	362	329	217	142	0	0	0	0	7	77	1442
1999 - 2000	57	206	147	118	233	37	0	0	24	0	3	16	840
2000 - 2001	172	143	352	97	93	7	2	0	0	0	31	53	953
2001 - 2002	124	105	102	173	211	72	2	19	0	1	5	30	845
2002 - 2003	62	48	194	76	194	15	0	2	0	34	0	0	625
2003 - 2004	120	244	116	130	219	7	87	4	0	0	3	71	716
2004 - 2005	116	155	182	102	158	4	0	0	0	0	0	0	716

GODAVARI DELTA SYSTEM

FORMAT-V (PART_E) **(2004-05)**

Irrigation Water Requirement by Modified Penman Method

Name of Crop	Crop Period (Days)	ET crop (MM)	KC	ET.Crop (MM)	Add for nursery	Add for land Preparation	P (mm)	Add for Minimum Depth	Norm RF	$R_{e\ (mm)}$	NIR (ET Crop+ P-Re)(mm)	FIR (NIR) (mm)	GIR (FIR) (mm)
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Rice (Kharif)	120												
July		114	1.1	125.4	40	160	90	50	155	78.31	387.09	483.86	691.23
August		110	1.1	121	0	0	90	0	182	85.3	125.7	157.13	224.46
September		105	1.1	115.5	0	0	90	50	102	53.39	202.11	252.64	360.91
October		100	0.95	95	0	0	90	0	158	68.56	116.44	145.55	207.93
Total		**429**			**40**	**160**	**360**	**100**	**597**	**285.56**	**831.34**	**1039.18**	**1484.54**
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Rice (Rabi)	120												
December		99	1.1	108.9	40	160	90	50	-	-	448.90	561.13	801.61
January		106	1.1	116.6	0	0	90	0	-	-	206.60	258.25	368.93
February		116	1.1	127.6	0	0	90	50	-	-	267.60	334.50	477.86
March		150	0.95	142.5	0	0	90	0	-	-	232.50	290.63	415.18
Total		**471**			**40**	**160**	**360**	**100**	**0**	**0**	**1155.60**	**1444.50**	**2063.57**
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Sugar Cane													
June		150.2	0.75	112.65					116	65.76	46.89	58.61	83.73
July		114.3	0.6	68.58					155	55.96	12.62	15.78	22.54
August		109.8	0.85	93.33					182	76.15	17.18	21.48	30.68
September		105.4	1.25	131.75					102	61.04	70.71	88.39	126.27
October		100.2	1.25	125.25					158	88.31	36.94	46.18	65.96
November		101.9	1.25	127.38					4	3.26	124.12	155.15	221.64
December		98.9	1.25	123.63					-	-	123.63	154.54	220.77
January		106.1	1.25	132.63					-	-	132.63	165.79	236.84
February		116.4	1.25	145.5					-	-	145.50	181.88	259.82
March		149.7	1	149.7					-	-	149.70	187.13	267.32
April		151.1	0.75	113.33					-	-	113.33	141.66	202.38
May		162.3	0.75	121.73					-	-	121.73	152.16	217.38
Total		**1466.3**			**0**	**0**	**0**	**0**	**717**	**350.48**	**1094.98**	**1368.73**	**1955.32**

GODAVARI DELTA SYSTEM

Ground Nut (Kharif)	120							(2004-05)					
July		114.30	0.40	45.72				155	35.25	10.47	14.96	21.37	
August		109.80	0.70	76.86				182	59.26	17.60	25.14	35.92	
September		105.11	0.95	100.13				102	54.06	46.07	65.81	94.02	
October		100.2	0.75	75.15				158	57.83	17.32	24.74	35.35	
Total		**429.41**						**597.00**	**206.40**	**91.46**	**130.66**	**186.65**	
Ground Nut (Rabi)	120												
December		98.90	0.40	39.56		10.00		-	-	49.56	70.80	101.14	
January		106.10	0.70	74.27				-	-	74.27	106.10	151.57	
February		116.40	0.95	110.58				-	-	110.58	157.97	225.67	
March		149.7	0.75	112.28				-	-	112.28	160.40	229.14	
Total		**471.10**						**0.00**	**0.00**	**346.69**	**495.27**	**707.53**	
Banana (First Year Crop)													
March	300	179.70	0.65	97.31				-	-	97.31	139.01	198.59	
April		151.10	0.60	90.66				-	-	90.66	129.51	185.02	
May		162.30	0.55	89.27				-	-	89.27	127.53	182.18	
June		150.20	0.60	90.12				116	65.73	24.39	34.84	49.78	
July		114.30	0.70	80.01				155	80.45	-	-	-	
August		109.80	0.85	93.33				182	91.02	2.31	3.30	4.71	
September		105.40	0.95	100.13				102	58.67	41.46	59.23	84.61	
October		100.20	1.00	100.20				158	81.68	18.52	26.46	37.80	
November		101.90	1.00	101.90				4	3.26	98.64	140.91	201.31	
December		98.90	1.00	98.90				-	-	98.90	141.29	201.84	
Total		**1273.80**						**717.00**	**380.81**	**561.46**	**802.09**	**1145.84**	
Banana (Ratton)													
February	360	116.40	0.80	93.12				-	-	93.12	133.03	190.04	
March		149.70	0.75	112.28				-	-	112.28	160.40	229.14	
April		151.10	0.70	105.77				-	-	105.77	151.10	215.86	
May		162.30	0.70	113.61				-	-	113.61	162.30	231.86	
June		150.20	0.75	112.65				116	65.73	46.92	67.03	95.76	
July		114.30	0.90	102.87				155	80.45	22.42	32.03	45.76	
August		109.80	1.05	115.29				182	91.02	24.27	34.67	49.53	
September		105.40	1.05	110.67				102	58.67	52.00	74.29	106.12	
October		100.20	1.05	105.21				158	81.68	23.53	33.61	48.02	
November		101.90	1.00	101.90				4	3.26	98.64	140.91	201.31	
December		98.90	1.00	98.90				-	-	98.90	141.29	201.84	
January		106.10	1.00	106.10				-	-	106.10	151.57	216.53	
Total		**1466.30**						**717.00**	**380.81**	**897.56**	**1282.23**	**1831.76**	

GODAVARI DELTA SYSYEM

Calculation of Effective Rainfall (Re)

Annual Rainfall= 716 mm (2004-05)

S. No	Month	ETo Crop	Monthly Rainfall in mm	Normal Monthly eff. Rainfall 75mm (based on mm depth of application as per TABLE-10	Normal monthly eff.rainfall in mm (based on 50 mm depth correction factor 0.9	Effective Rainfall @ 80 % Chance of occurance C.F: 0.816	Effective Rainfall @ 80 % Chabce of occurance as per TABLE -11
1	2	3	4	5	6	7	8
Rice (Kharif)							
1	July	125.4	155	106.64			78.31
2	August	121	182	116.16		C.F. 0.816	89.55
3	September	115.5	102	72.7			80.59
4	October	95	158	93.37			93.43
Rice (Rabi)							
1	December	108.9	-	-			-
2	January	116.6	-	-		C.F. 0.816	-
3	February	127.6	-	-			-
4	March	142.5	-	-			-

GODAVARI DELTA SYSYEM

S. No	Month	ETo Crop	Monthly Rainfall in mm	Normal Monthly eff. Rainfall 75mm (based on mm depth of application as per TABLE-10	Normal monthly eff.rainfall in mm (based on 50 mm depth correction factor 0.9	Effective Rainfall @ 80 % Chance of occurance C.F: 0.816	Effective Rainfall @ 80 % Chabce of occurance as per TABLE -11
1	2	3	4	5	6	7	8
Sugar Cane							
1	June	112.65	116	80.6	Not Applicable	C.F. 0.816	65.76
2	July	68.58	155	68.58			55.96
3	August	93.33	182	93.33			76.15
4	September	131.75	102	74.8			61.04
5	October	125.25	158	108.23			88.31
6	November	127.38	4	4			3.26
7	December	123.63	-	-			-
8	January	132.63	-	-			-
9	February	145.5	-	-			-
10	March	149.7	-	-			-
11	April	113.33	-	-			-
12	May	121.73	-	-			-
Ground Nut (Kharif)							
1	July	45.72	155	45.72	-	C.F. 0.816	35.25
2	August	76.86	182	76.86	-		59.26
3	September	100.13	102	70.12	-		54.06
4	October	75.15	158	75	-		57.83
Ground Nut (Rabi)							
1	December	39.56	-	-	-	C.F. 0.816	-
2	January	74.27	-	-	-		-
3	February	110.58	-	-	-		-
4	March	112.28	-	-	-		-

GODAVARI DELTA SYSYEM

S. No	Month	ETo Crop	Monthly Rainfall in mm	Normal Monthly eff. Rainfall 75mm (based on mm depth of application as per TABLE-10	Normal monthly eff.rainfall in mm (based on 50 mm depth correction factor 0.9	Effective Rainfall @ 80 % Chance of occurance C.F: 0.816	Effective Rainfall @ 80 % Chabce of occurance as per TABLE -11
1	2	3	4	5	6	7	8
Banana (First Year Crop)							
1	March	97.31	-	-	Not Applicable	C.F. 0.816	-
2	April	90.66	-	-			-
3	May	89.27	-	-			-
4	June	90.12	116	75.34			61.48
5	July	80.01	155	79.52			64.88
6	August	93.33	182	93.33			76.15
7	September	100.13	102	70.12			57.21
8	October	100.20	158	98.04			80
9	November	101.90	4	4			3.26
10	December	98.90	-	-			-
Banana (Ratton)							
1	February	93.12	-	-	Not Applicable	C.F. 0.816	-
2	March	112.28	-	-			-
3	April	105.77	-	-			-
4	May	113.61	-	-			-
5	June	112.65	116	80.56			65.73
6	July	102.87	155	98.6			80.45
7	August	115.29	182	111.54			91.02
8	September	110.67	102	71.9			58.67
9	October	105.21	158	100.1			81.68
10	November	101.90	4	4			3.26
11	December	98.90	-	-			-
12	January	106.10	-	-			-

GODAVARI DELTA SYSTEM

Year-Wise Total Potential Creation and Utilisation

Format VI (Part-E)

Year	Potential Creation (Ha)				Potential Utilisation (Ha)				% Utilisation
	Khariff	Rabi	Summer	Total	Khariff	Rabi	Summer	Total	
1	2	3	4	5	6	7	8	9	10
1996-97	410108	410108	0	820216	410108	410108	0	820216	100
1997-98	410108	410108	0	820216	410108	410108	0	820216	100
1998-99	410108	410108	0	820216	410108	410108	0	820216	100
1999-00	410108	410108	0	820216	410108	410108	0	820216	100
2000-01	410108	410108	0	820216	410108	410108	0	820216	100
2001-02	410108	410108	0	820216	397827	321449	0	719276	88
2002-03	410108	410108	0	820216	391966	234625	0	626591	76
2003-04	410108	410108	0	820216	410108	410108	0	820216	100
2004-05	410108	410108	0	820216	410108	410108	0	820216	100

GODAVARI DELTA SYSTEM

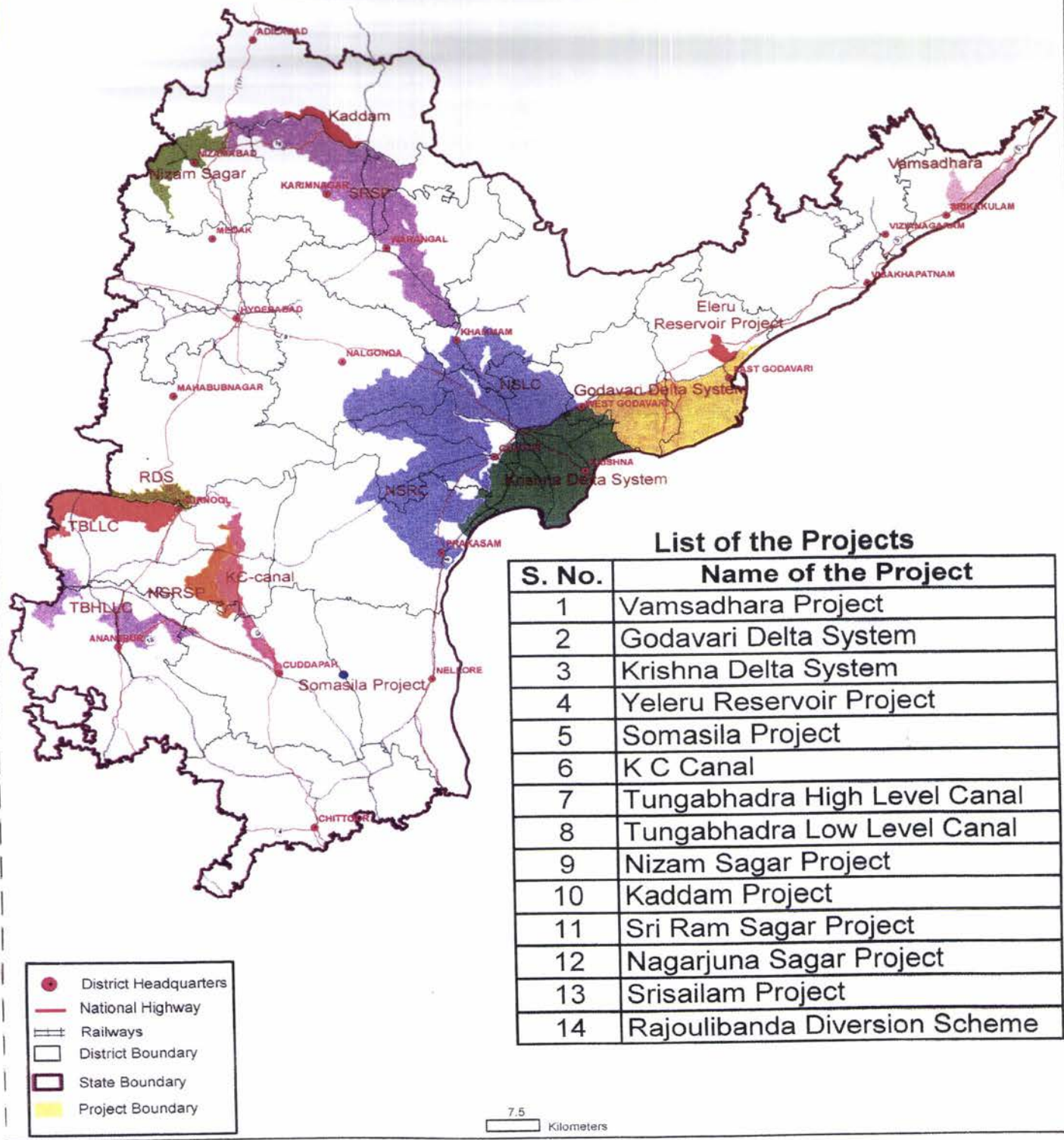
Data required for working out Drainage Efficiency

FORMAT-VII

Year	Amount of water released from dam / weir in Mm3	Amount of water utilised by all crops CET in Mm3	Amount of water drained out of command in Mm3	Depth of G.W. Level in the command	Change in ground water level in the command	Remarks
1995 - 1996	8185	3141	1) Natural Drainage	No information is available		
1996 - 1997	6968	2674	2. field to field Drainage inrespect of paddy crop			
1997 - 1998	8129	3119				
1998 - 1999	6685	2565	3 No gauges are available to measure water dranied out of command			
1999 - 2000	8151	3128				
2000 - 2001	7535	2991	4. Draiange problem experienced only during un presedented floods			
2001 - 2002	7701	2955				
2002 - 2003	6912	2652	5) No drainage problem on account of release. Since the later is less than the crop requirement			
2003 - 2004	8519	3269				
2004-2005	8041	3085				

GOVERNMENT OF ANDHRA PRADESH

MAJOR PROJECTS SELECTED FOR WATER USE EFFICIENCY STUDIES BY CWC



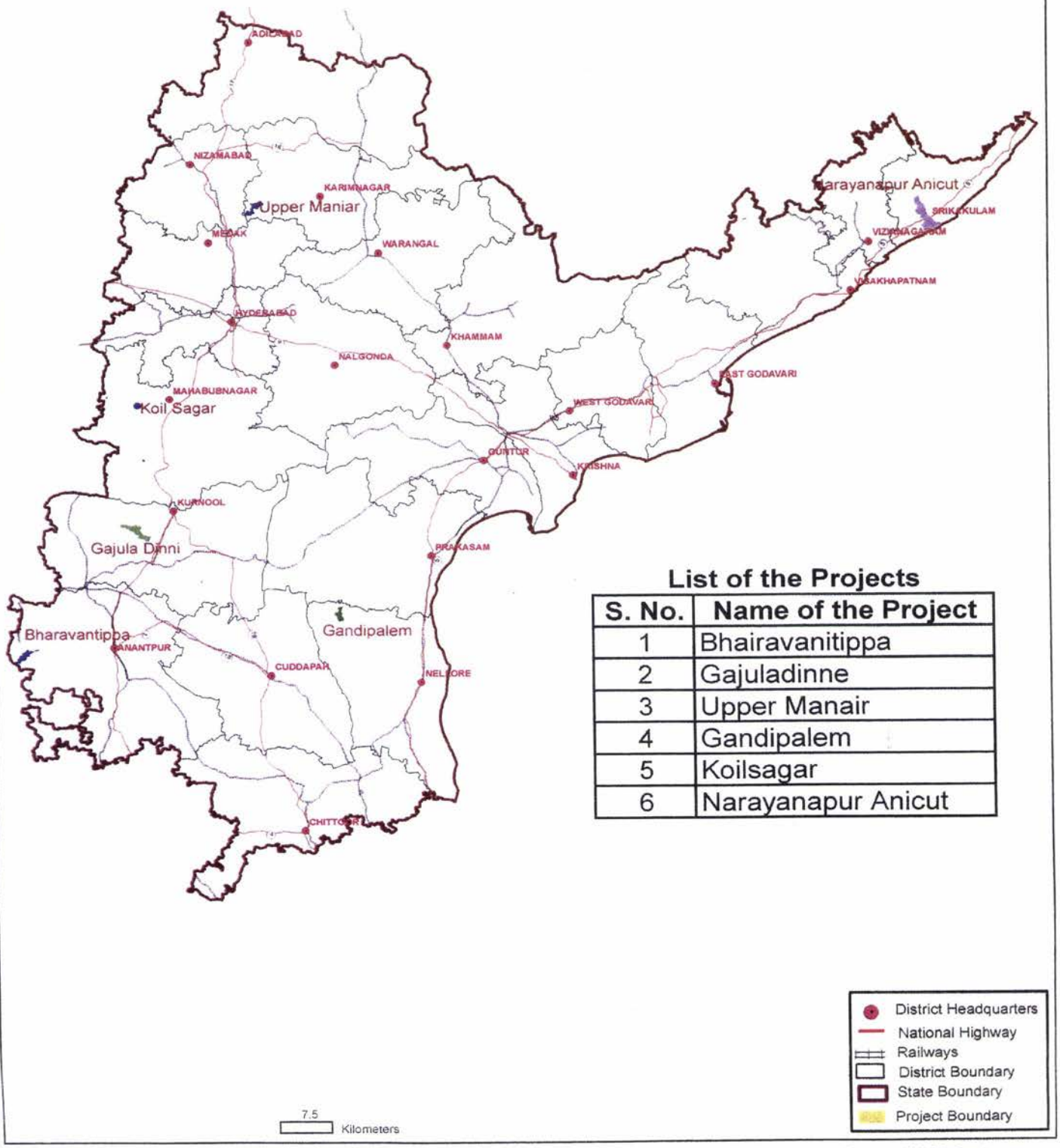
List of the Projects

S. No.	Name of the Project
1	Vamsadhara Project
2	Godavari Delta System
3	Krishna Delta System
4	Yeleru Reservoir Project
5	Somasila Project
6	K C Canal
7	Tungabhadra High Level Canal
8	Tungabhadra Low Level Canal
9	Nizam Sagar Project
10	Kaddam Project
11	Sri Ram Sagar Project
12	Nagarjuna Sagar Project
13	Srisailam Project
14	Rajoulibanda Diversion Scheme

Data Source: I&CAD Dept.
Prepared by: UMASRI, AEE, CADA

GOVERNMENT OF ANDHRA PRADESH

MEDIUM PROJECTS SELECTED FOR WATER USE EFFICIENCY STUDIES BY CWC



List of the Projects

S. No.	Name of the Project
1	Bhairavanitippa
2	Gajuladinne
3	Upper Manair
4	Gandipalem
5	Koilsagar
6	Narayanapur Anicut

Data Source: I&CAD Dept.
Prepared by: UMASRI, AEE, CADA

PLAN OF GODAVARI DELTA SYSTEM

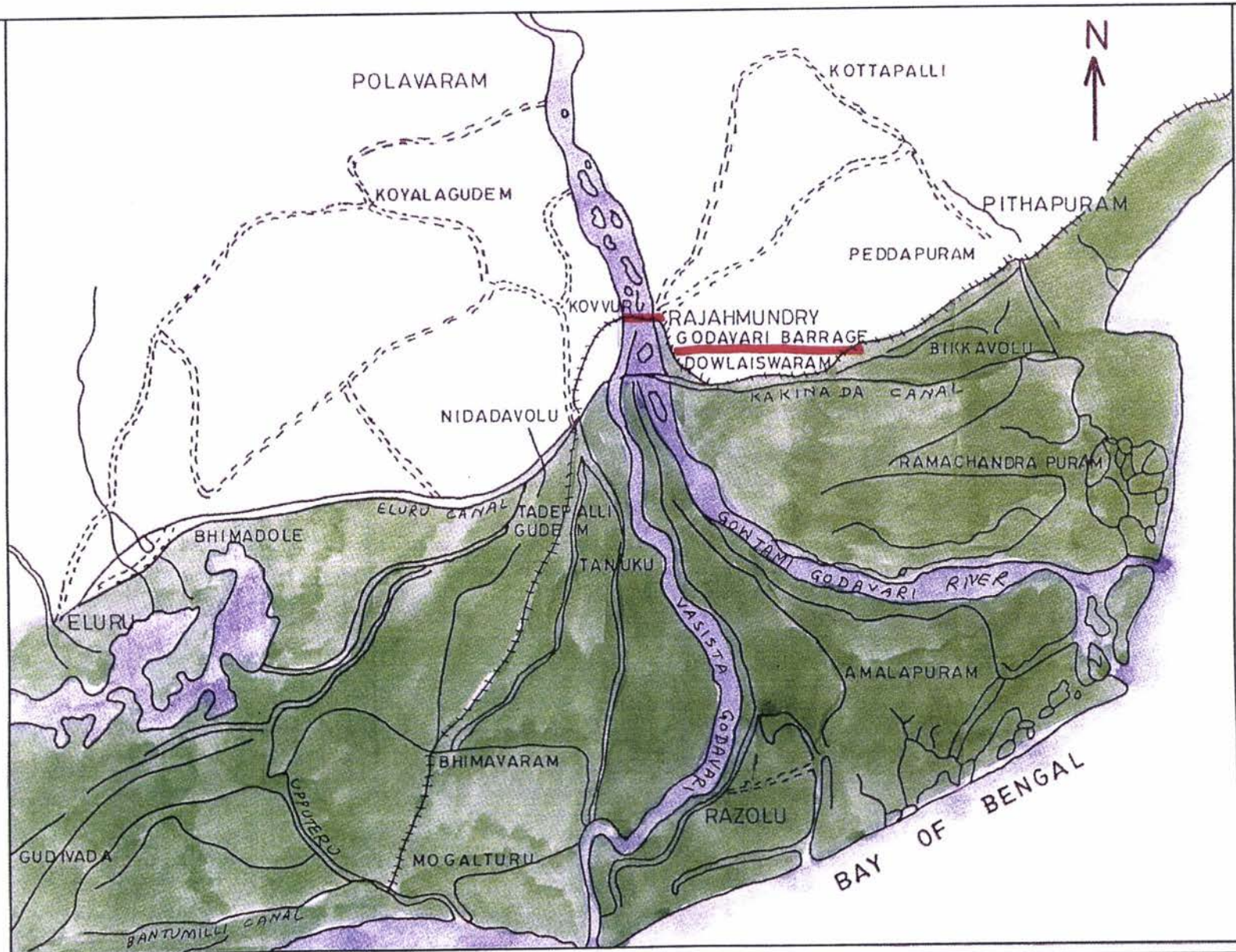




Figure 1: Ambaji peta Channel

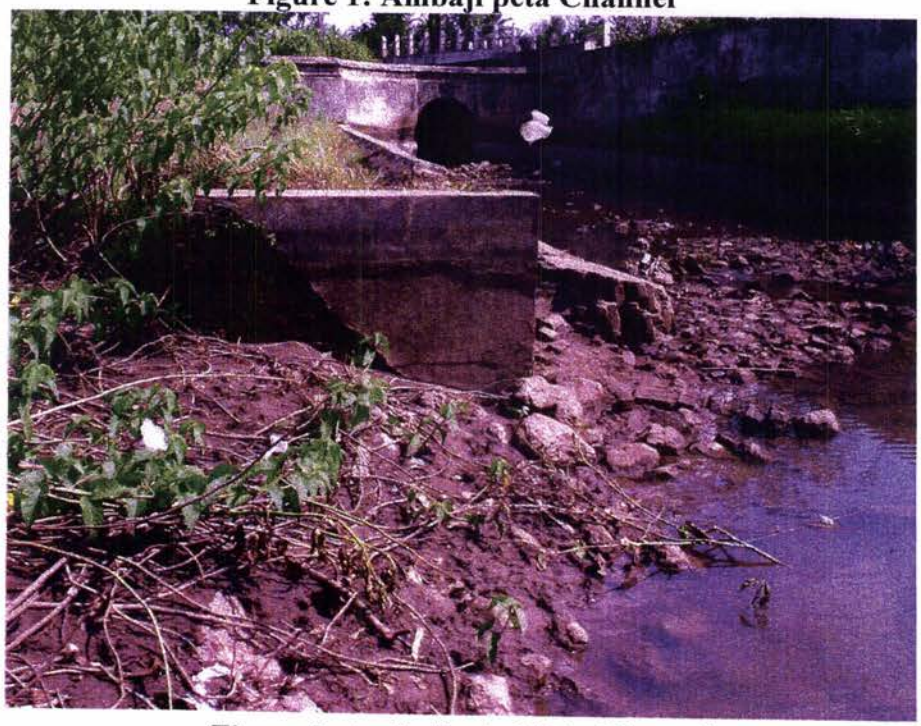


Figure 2: Ambajipeta Main Channel



Figure 3: Ambajipeta Main Channel

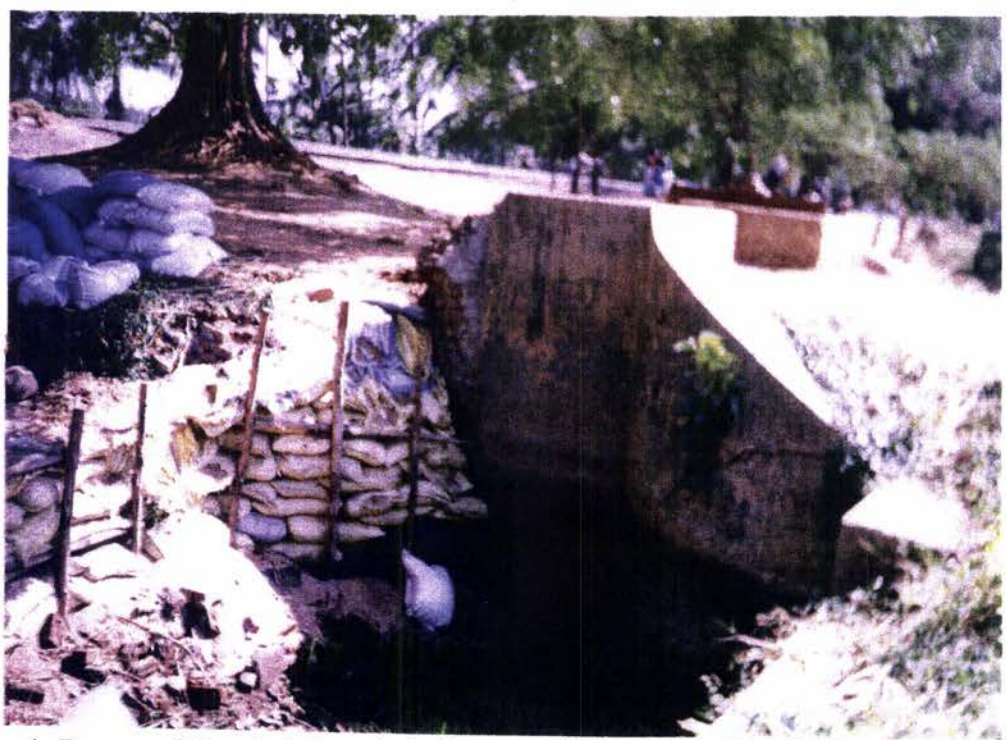


Figure 4: Damaged head sluice of chelluru no 1 channel at km 28.320 ow mandapeta canal



Figure 5: GODAVARI BARRAGE

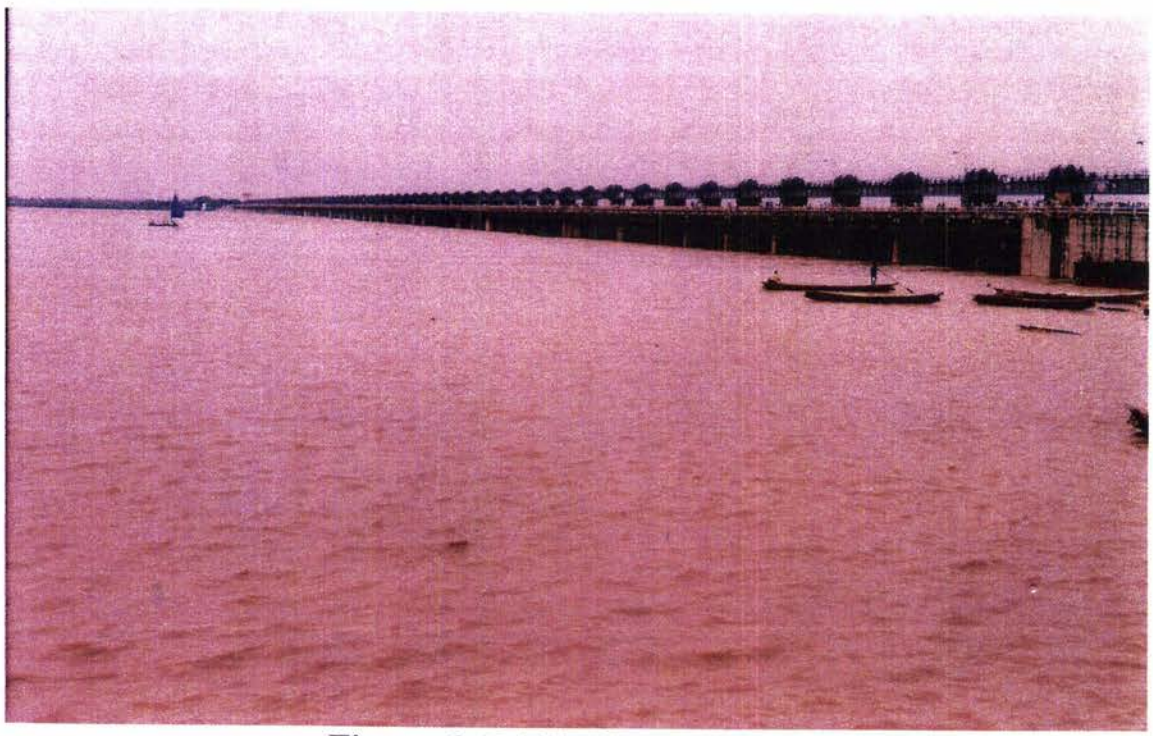


Figure 6: RAIL-CUM-BRIDGE

GODAVARI DELTA SYSTEM

Hydrology Studies using Current Meters

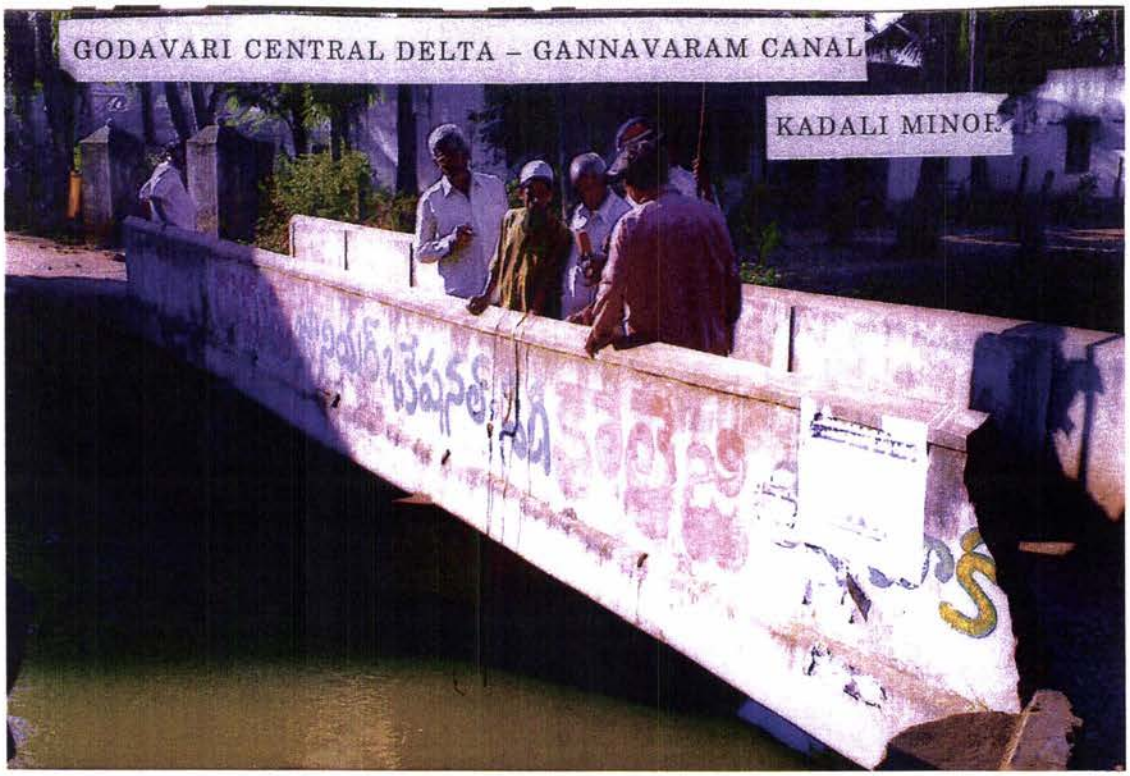


Figure 7:

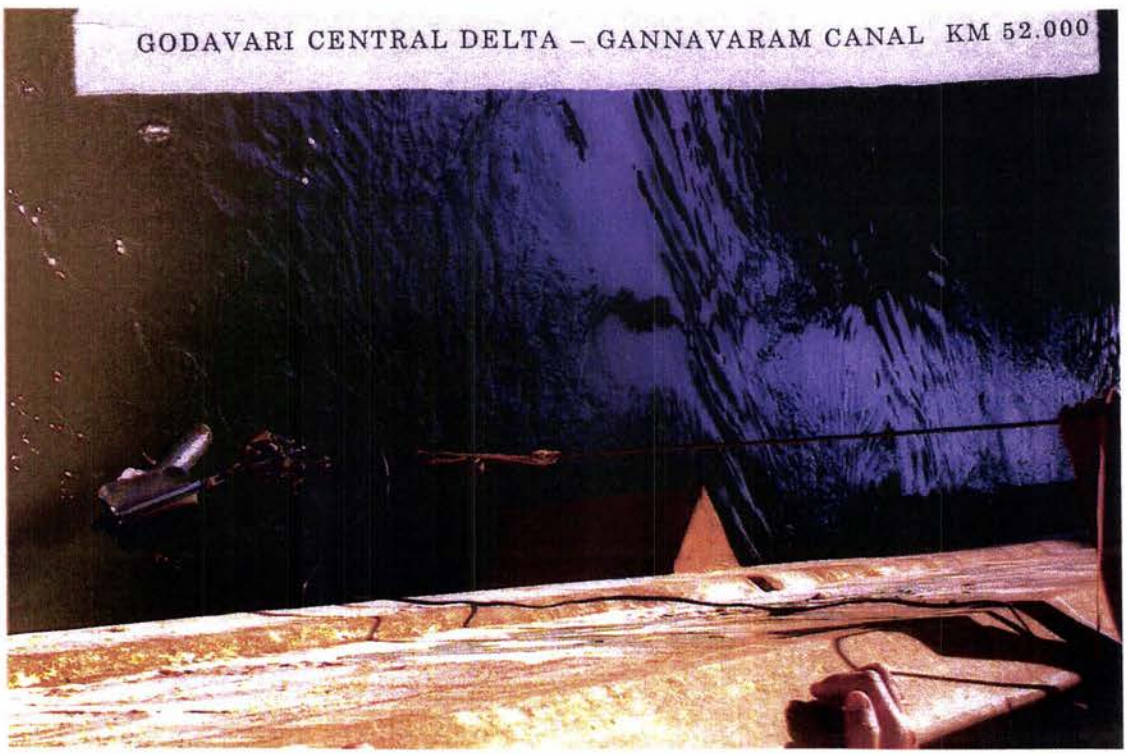


Figure 8

ANNEXURE – A

TOR

WATER USE EFFICIENCY STUDIES OF THE IRRIGATION PROJECTS AS PER THE LIST

1. **PROJECT PARTICULARS (To be given initially to the consultant)**
   a) Name of the Project/State:
   b) River:
   c) Basin:
   d) Year of operation
   e) Culturable Command Area (CCA)
   f) Any other information

2. **OBJECTIVES OF THE STUDY**

The study will cover evaluation of Efficiency of the following aspects of irrigation project

(i). Dam Efficiency(inflow and release pattern)

(ii). Delivery System/ Conveyance Efficiency

(iii). On farm Application Efficiency

(iv). Drainage Efficiency

(v). Irrigation potential created and utilized

The broad criteria for evaluation of the efficiencies will be as under:

2.1 Dam Efficiency

Reservoir Filling Efficiency - Reservoir filling efficiency may be considered as the ratio of maximum live storage attained in the reservoir in a particular year to the designed Live Storage of Reservoir. Data in this regard will be collected as indicated in Format I. This Format must be filled for each year of operation of reservoir.

In addition to this, following will also be determined:

A. actual inflow pattern vs. anticipated inflow pattern at time of formulation of project

B. Operational efficiency of various water control/regulation structures in the head works as well as in distribution network

2.2 Delivery System Efficiencies /Conveyance Efficiency

Study of delivery system should be divided into two parts, one for the main canal and distributaries having discharge more than 150 cusec and other for distribution network having discharge less than 150 cusec. With representative sample of each region (head/middle/tail)

Study should be carried out as indicated under (a) and (b) given below for canals (lined and unlined both) in consultation with concerned project authorities.

(a) The ratio of total water delivery at inlet to the block of fields over Water released, at the project headwork (Total Water Delivery at inlet to the block of fields and Wi1tI:T released at the Project/Canal head)

(b) Actual water carrying capacity of canals representing head/middle/tail should be measured and compared with the designed capacity of canals.

2.3 On Farm application Efficiency

It is to be worked out as the ratio of actual Water Delivered to the field to the water requirement of the crops considering effective rainfall in the command, when water supply is abundant.

In addition, 'Water supply adequacy Index' should also be worked out in case of scarce supply, as a ratio of Water supplied to the crops to water required by crops. Format II to V may be used for collection of data for this purpose.

Study should be carried out in the command to represent the area representing head/ middle/tailends. The study should also focus to suggest the need for suitable cropping pattern for the command area.

2.4 Drainage Efficiency

This can be indicated as the ratio of total annual water drained from the system to total annual water delivered to the system plus effective annual rainfall minus water used by crops representing head/ middle/ tailends.

Data pertaining to fluctuations of ground water table in the command will also be collected.

3. PROGRAMME OF WORK INCLUDING PAYMENT SCHEDULE (Payment Schedule applicable only for Govt. or Semi Govt. Organizations).

The study will be guided by a Technical Advisory Committee (TAC) constituted for the purpose as per Annex-A haying power to review the study at all stages. It will be undertaken as per an agreement between Central Water Commission and consultant. The CWC may render assistance to the consultant in the form of request to the concerned State Government / Project Authority for nomination of a nodal officer for providing data and extending co-operation in conducting studies by consultant. The schedule of work will spread over a period of 6 months from the date of signing agreement. The report will be completed into 3 stages. Inception report of the study will be submitted within two months of signing the memorandum of understanding (MOU) and Draft Final Report in a period of 5' months after signing the MOU. After its approval by T AC, the final report will be submitted within one month's time after approval of draft final report i.e. within 6 months after signing the agreement duly incorporating the modifications, if :my, as suggested by T AC. The schedule of payment to the consultant (only for Govt. or Semi Govt. Organizations) shall be:

20% after signing of Memorandum of Understanding (MOU)

30% after submission and acceptance of the inception report.

30% after approval of draft final report.

20% after submission of sufficient number of copies of final report, duly modified as per the comments of T AC on 'Draft Final Report'.

- **Inception Report**

The inception report shall properly highlight project details, objectives and scope of the study as indicated in Terms of Reference (TOR) detailed methodology to be adopted by the consultant, initial interaction with project authority and officials from concerned departments of state government. The report may also include (a) names of the experts,

In the projects where drainage system is already existing, its efficiency i.e. ratio of its actual delivery to designed capacity will also be evaluated.

Data in this regard will be collected in a format as indicated in format No. V

2.5 Irrigation potential created and utilized

Irrigation Potential Created (IPC): The irrigation potential created by a project at a given time during or after its construction is the aggregate gross area that can be irrigated annually by the quantity of water that could be made available by all the connected and completed 'works up to the end of the water courses or the last point in the water delivery system.

It is the area that can be irrigated from a project *in* a design agriculture year that is, from the 1st July to 30th June next year for the projected cropping pattern and accepted water allowance on its full development. Before an area is included under potential created, it has to be ensured that the water for the area to be reported upon is available and the conveyance system upto and including the irrigation outlet to serve an area on an average up to 40 hectares in the area to be irrigated is completed representing /head/ middle! tailends.

Irrigation Potential Utilized: The irrigation potential utilized is the total area for which water is actually delivered to the outlet on an average up to 40 hectare blocks as planned (representing / head/ middle/ tailends). Details in this regard may be collected as per Formal VI.

At least 10 years data will be collected to arrive at reliable, performance efficiency of the systems. In case data for a particular aspects of the study is not available, it will be observed at least for one crop season .The total area under actual cultivation and its cropping pattern etc for different years should be checked by using Remote sensing data. All the data and study outputs will be entered in the electronic data base.

sub-consultants and the works to be assigned to them (along with the allotted time frame) (b) man-month chart for experts / sub-consultants and (c) Schedule of work. The inception report will be supported with primary and secondary data on the basis of which the studies are proposed to be undertaken. The inception report should discuss the following:

a) Quantum of data requirement.
b) Secondary data source and period of data availability.
c) Assessment for requirement of primary data.
d) The above information should be compiled as per Annexure-B.

At least 5 copies of inception report covering various aspects as indicated under "objectives of the study" and supported by relevant drawings, maps, sketches and other graphics may be submitted to IPQ Directorate of CWC for, further processing and the consultant will present the inception report to the core group as described below.

The inception report will be placed before a core group constituted by Technical Advisory Committee (1' AC) for its consideration and approval. The composition of the core group will be as given below:

Chief Engineer (POMIO), CWC	Chairman
Member Secretary, INCID	Member
Senior Joint Commissioner, CAD& WM	Member
Superintending Hydro geologist, CGWB	Member
Director, IPO, CWC	Member Secretary

(A representative of ICAR may also be c4illed as special invitee in the core group meetings.)

The consultant may be required to comply observations (if any) of the core group on the inception report. The Core Group as mentioned above will check the data and inception reports etc. for releasing the payment installment. Only draft final report will be put up to Technical Advisory Committee for approval. Inception report will be approved by the aforesaid core group.

Draft Final Report.

The third stage is the formulation of draft final report. This report would be developed on the basis of the inception report and will cover all aspects, in detail as indicated in the scope of studies. The draft final report will be submitted by the consultant as per details given at appendix in 15 copies.

- **Final Report**

Five copies of the report incorporating the comments of I' AC will be required to be sent to CWC for approval. Once it is approved by the core group of TAC, 25 copies of final report will be required to be sent to CWC. The [mal report should also be furnished in electronic form i.e. in CD. Final instal1ment will be released thereafter.

4. **Reporting of Progress.**

The consultant shall furnish monthly Physical and Financial report to the CWC. The consultant will also submit interim report to CWC as and when required.

5. **Other Terms and Conditions**

- No request for extension of time limit and for enhancement of cost of evaluation studies win normally be entertained. However under extraordinary situation, beyond the control of consultant, Central Water Commission may entertain such a request, with adequate justification. The decision of Central Water Commission on such request will be final and binding on consultant. Further the decision of CWC in no way will legally be challenged in any court.
- For release of payments, except at the time of signing of agreement, the consultant would have to produce utilization certificate both for the purpose of audit and reimbursement of payments.
- The equipments purchased with these funds will remain the property of the Government of India who will have the right to transfer such equipments from the consultant when it is no longer required for the purpose allotted to them to another institute/agency/department under

MOWR.

- All raw data and documents collected for the purpose of perform3.J."1ce evaluation of irrigation projects will be property of Central Water Commission and will be submitted to ewe after completion of studies.
- The copyright of all reports prepared by the consultant in connection with the assigned work shall rest with Central Water Commission. The report on performance evaluation of irrigation project will not be reproduced in any shape, partially or fully, by the consultant for any purpose without prior approval of Central Water Commission.
- Central Water Commission shall not be liable *for* any damage or compensation payable at law in respect or in consequence of any accident or injury to any personnel deployed by the consultant and the consultant shall indemnify and keep Central Water Commission indemnified against all such damages and compensation and against all claims towards proceedings, court charges and expenses whatever in respect thereof in relation thereto.
- The consultant shall be responsible for the correctness of data, calculations and results of analysis.
- Central Water Commission shall have right to make modifications in the scope and objective of studies in connection with WALMTARI/WALMI
- No assets (equipments) under this assignment will be created by the consultant.
- Consultant will submit utilization certificate as per Appendix II alongwith his bill in the format given at Appendix I for payment of subsequent installment.

6. FINDINGS AND RECOMMENDATIONS

Consultants will give findings and suggest recommendations for improving overall efficiency of the system.

ANNEXURE-A

TAC Constituted for Evaluation of Water Use Efficiency of Major & Medium Irrigation Projects.

Chairman of TAC	Member (WP&P), CWC
Vice Chairman	Commissioner (CAD & WM), MOWR
Member Secretary	Director (IPO), CWC

Members

1. Chief Engineer (POMIO), CWC
2. Commissioner (PP), MOWR
3. Financial Advisor, MOWR
4. Deputy Commissioner (WM), Ministry of Agriculture
5. Assistant Director General ,ICAR
6. Joint Advisor (Water Resources), Planning commission
7. Member (SML), Central Ground Water Board
8. Chief Engineer of concerned Project
9. Director *IP(N/S*) (Depending upon the region from where the reports are to be considered)
10. Director, EWU, CWC.

ANNEXURE-B

Data Requirement and Arrangement for Data Collection.

SL. No	Details of Data Collection / Observation						
	Activity	Location	Period	Data			
				Secondary**		Primary*	Remarks
				Source	Duration		
1	2	3	4	5	6	7	8
1	Reservoir filling Efficiency						
2	Canal / Conveyance Efficiency						
3	On Farm Application Efficiency						
4	Drainage Efficiency						
5	Potential Created and Utilized						

*- Primary data is the data actually observed/measured first hand by standard data observation/measurement techniques using standard and properly calibrated instruments.

**- Secondary data is the data obtained from agencies authorized and well qualified for collection of such data by standard data/observation /measurement techniques using standard and properly calibrated instruments.

Note:

1. Column of 'Activity' constitutes all sub-topics of chapters of Water Use Efficiency study report as given at Appendix and all tables included in the TOR.
2. Column on 'Remarks' may be used for indicating status of secondary data actually collected / proposed to be collected from various sources and primary data actually observed / proposed to be observed at identified sites by the consultant.

Summary of Water Use Efficiencies

1. Name of the Project
2. River / Main River/ Basin
3. Type of Project – Major / Medium
4. Type of Structure – Dam / Barrage/ Weir
5. Location – Latitude
   Town/District/ State
6. Length / period of data used for study
7. Culturable command area (CCA)
8. Ultimate irrigation potential (UIP)
9. Potential crated (PC)
10. Potential utilised (PU)
11. Main recommendations for overall improvement of the project
12. Name of the consultant! agency who carried out study
13. Storage Efficiency
    a. Reservoir Filling Efficiency
    b. Inflow Patterns
14. Conveyance Efficiency
    a. Main canals
    b. Branch canals
    c. Distributaries
    d. Minors
15. Field Application Efficiencies for all major crops
16. Drainage Efficiency

Data base to include all details collected during study such as cropping pattern (planned/ actual) withdrawals, irrigation water requirement for each crop etc.

Format for the Report on Water Use Efficiency

Executive Summary of the Report may be given in the beginning of the report highlighting the details as given in Annexure – C.

Contents (Chapter 1 to 7 as given below).

1. Project Details
   - 1.1. Introduction – including objective of the studies
   - 1.2. Project – Salient features
   - 1.3. Index Map
2. Dam/Reservoir Efficiencies
   - 2.1. Hydrology
     - 2.1.1. 75 % annual dependable flows (designed / anticipated)
     - 2.1.2. Actual 75 % dependable annual flows
     - 2.1.3. Inflow pattern on monthly basis
     - 2.1.4. Water Spillage.
   - 2.2. Evaporation losses in the reservoir.
   - 2.3. Seepage losses from the reservoir
   - 2.4. Calculation and presentation of Efficiencies in tabular form
3. Canal / Conveyance Efficiencies
   - 3.1. Canal Capacity
     - 3.1.1. Designed carrying capacity
     - 3.1.2. Actual carrying capacity
   - 3.2. Seepage in various reaches of various canals
   - 3.3. Evaporation losses in various canals
   - 3.4. Calculation and presentation of Efficiencies in tabular form in 2 parts as given below.
   - (A) For canals having discharge more than 150 cusec
   - (B) For canals having discharge upto 150 cusec
4. On Farm Application Efficiency
   - 4.1. Cropping Pattern
     - 4.1.1. Designed cropping pattern
     - 4.1.2. Actual cropping pattern

4.1.3. Comparison

4.2. Weighted average rainfall in the command of the project

4.3. Reference evapo-transpiration in the area under study

4.4. Crop co-efficient in respect of various crops

4.5. Effective rainfall in the command

4.6. Percolation losses in paddy fields

4.7. Ground Water component

4.8. Gross irrigation requirement

4.9. Field irrigation requirement

4.10. Net irrigation requirement

4.11. Calculation and presentation of Efficiencies in tabular form

5. Drainage Efficiency

5.1. Total amount of water released to various fields

5.1.1. Surface Water

5.1.2. Ground Water

5.2. Amount of water required by various crops

5.3. Amount of water drained out from the command area

5.4. Adequacy and performance of existing drainage system

5.5. Need for external drainage system, if any

5.6. Problems of water logging, salinity, alkalinity, if any

5.7. Calculation and presentation of Efficiencies in tabular form

6. Potential created and utilized.

6.1. Yearwise Potential Creation

6.2. Yearwise Potential Utilisation

7. Findings and Recommendations

7.1. Recommendation for improvement in Water Use Efficiency

7.1.1. Dam/Reservoir Efficiency

7.1.2. Canal/Conveyance Efficiency

7.1.3. On Farm Application Efficiency

7.1.4. Drainage Efficiency

DATA VOLUME

- Part-A Reservoir Storage Status in format-I for different years since commission
- Part-B Canal Withdrawals in format-II for different years since commission.
- Part-C Actual Cropping Pattern in format-III since beginning of irrigation
- Part-D Weighted Average Rainfall in the Command of the Project in format-IV.
- Part-E Irrigation Water Requirement by Modified Pen man Method in format –V
- Part-F Yearwise Potential created and utilized in format-VI
- Part-G Data required for working out drainage efficiency in format-VII.

PLATES

- Index Map
- Irrigation Map (showing measuring and control structure)
- Drainage Map
- Photographs of important components of Irrigation System
- Photographs of damaged system components
- Photographs of water logged, saline and alkaline areas

APPENDIX

- Appendix – I Bill
- Appendix – II Utilization Certificate

UNITS

• Catchment Area	Sq. Km.
• Area	Hectare
• Rainfall	mm.
• Potential (created or utilized)	Th. Ha.
• Crop production	Metric tones
• Water availability	Cubic metres
• Storage capacity	Cubic metres
• Command Area	Hectares
• Expenditure/ Income per hectare	Rupees
• Evaporation loss	Cubic metres
• Length of channels	Km.
• Slope	Metre per km.
• Temperature	°C
• Humidity	%
• Wind Speed	Km / day
• Solar Radiation	Million Joules / Sq.m./day
• Crop Water Requirement	mm.
• Av. Annual inflow	Hectare metre
• Discharge	Cumecs

(To be submitted on Official Letter Head)

Appendix-I

No.

Date:

BILL

Name of work	**Water Use Efficiency Studies of the Irrigation Projects as per the list**
Name of Authority for Payment	Director, Irrigation Performance Overview Directorate, Central Water Commission, New Delhi.
Agreement Value	
Status of the Bill	
Date of Agreement	

BILL Particulars

Description	**Amount**
20 % of the cost of contract (Rs. Lakhs) for Water Use Efficiency Studies of the Irrigation Projects as per the list	
Total	
	(Rupees lakhs Thousand only)

Payment Particular

Payable to : .....
Payable at
Mode of Payment :

Signature with Stamp

(Name & Designation)

Appendix-II

Utilisation Certificate

Utilization certificate for the financial year
Title of the Project / Scheme
Name of the Institution
Principal Investigator
Ministry of Water Resources letter reference sanctioning the project
Head of account as given in he original sanction pertains
(Hereinafter Referred to as the UC Financial Year)

	Reference (MOWR letter and date)	Amount
Amount brought forward from the previous financial Year		
Amount received during the UC Financial Year		
Total amount that was available for expenditure during the UC Financial Year		
Actual expenditure incurred during the UC Financial year		
Balance amount available at the end of UC Financial Year		

Unspent balance is to be Refunded OR Carried forward to the next financial year.

Certified that:

1. The information given above is correct.
2. The balance of Rs. _____ remaining unutilized at the end of the year has been refunded to the MOWR vide DD No.....
   Dt._____ drawn on

(Bank).....

OR

The balance of Rs_____ remaining unutilized at the end of the year is carried forward for utilization during the next year i.e.

_____

Signature of Principal Investigator Signature of Registrar / Accounts Officer Signature of Head of the Institute

Date Date Date

ANNEXURE- B

LIST OF CONSULTANTS

S.No	Name of Consultants	Qualification	Designation	Subject
1.	Sri C.Chandra Mohan	M.Tech, MBA	Consultant	Irrigation specialist
2.	Sri. M.V Rama Rao	BE, M.Tech (DIP Structure)	Consultant	Irrigation specialist
3.	Sri. K.Prabhakar Rao	BE	Consultant	Irrigation specialist
4.	Sri. D. Gopal Kishan Rao	BE	Consultant	Irrigation specialist
5..	Sri. K.Mahendranath	BE	Consultant	Irrigation specialist
6.	Sri. K Venkata Reddy	BE	Consultant	Irrigation specialist
7.	Sri A Krishna Murthy.	M.Tech	Sr. Faculty	Irrigation specialist
8.	Sri G Venkata Ratnam	M.E	Sr. Faculty	Irrigation specialist
9.	Sri DRK Appa Rao	B.Tech	Sr. Faculty	Irrigation specialist
10.	Sri S Vijaya Kumar	M.Tech	Faculty	Irrigation specialist
11.	Sri G Surender	M.Tech	Faculty	Irrigation specialist
12.	Sri. G.Kishan	M.sc	Sr. Faculty	Ground water specialist
13.	Sri. Dr:M.S. Reddy	Ph.D	Sr. Faculty	Agrl. research
14.	Sri. Md. Habeebuddin	M.Sc	Sr. Faculty	Agrl. specialist
15.,	Sri. M A Basit	M.Sc	Faculty	Agrl. Specialist
16.	Sri. C Venkateswarlu	M.Sc	Faculty	Agrl. specialist
17.	Ms. Anne Chappius	Ph.D	Consultant	GIS / MIS Specialist
18.	Ms. G. Mohana	M.Tech	Consultant	GIS Specialist
19.	Ms. B. Swapna	M.Tech	Consultant	GIS Specialist
20	Sri. G. Ramakrishna	MCA	Consultant	MIS Specialist
21	Sri. S.Laxminarayana	M.Sc	Consultant	MIS Specialist
22	Sri. K Koteswara Rao	M.A	Consultant	Agro-economist
23	Sri. V Srinivasa Rao	M.A	Consultant	MIS Specialist
24	Sri S.K.Rayalu	M.Tech	Consultant	Hydrology
25	Sri K. Srinivasu	Technical	Consultant	DEO

PRIMARY DATA

Annexure –I- Central Delta Main Canal

Water Use Efficiency Studies

Delivery system Efficiencies / Conveyance Efficiencies

FORMAT – A

I. Identification Particulars:

1. Name of the Project	:	S.A.C.Barrage , (Godavari Delta System) Dowalaisaram.
Major/Medium	:	Major
2. Circle	:	Irrigation Circle, Dowlaiswaram
3. Division	:	Godavari Central Division, Dowlaiswaram
4. Nature of Field Studies:		Measurement of seepage loss of Distributory by inflow-Out flow method
5. Particulars of canal reach	:	Godavari Central main canal from km 0.00 of River Godavari
(i) Main canal / Distributary	:	Main canal
(ii) Lined / Unlined	:	unlined
(iii) Discharge above 150 C/s	:	---
(iv) Discharge above 150 C/s	:	Above 150 Cusecs, i.e. 69.795 ~~Cusecs~~ cumecs.
(v) Length of reach	:	K.M.~~0.00 to km 13.200~~ 3.20 to kms. 12.10.
6. Crop season details	:	Rabi
7. Duration of Field Studies	:	20.02.2007, 22.12.2007

G Rajeswara Rao
Engg Consultant

FIELD OBSERVATIONS:

DATA SHEET

1. Measurements of Discharge at upstream control point at Km 3.20 0on Godavari Central Main canal at Peravaram

A) using current meter = 69.795 Cumec

2. Discharge @ intermediate openings& off taking channels.
There is no intermediate opening & off taking channels — Nil —

3. Measurements of Discharge at Down Stream Control Point @ KM 6.50 on Godavari Central Main Canal Vellicheru

= 68.303 cumecs

4. Seepage loss = Iteam No (1) –Iteam No (2)-Iteam No (3)
=69.795-0-68.303 = 1.492 Cumecs

5. Wetted perimeter of section

S.NO	Distance from u/s control point	Wetted perimeter as per cross section in meters	Mean wetted perimeter	Lengths In meters	Wetted area in Sq. meters.
1	2	3	4	5	6
1	Km 3.20 on Godavari Central Main canal at Peravaram	69.18	-	-	-
2	Km 6.50 on Godavari Central Main canal at Vellicheru	60.40	64.79	3300	213807
Total					213807 Sqm

6. Seepage losses in Cumces / Million Sq Meters = $\frac{1.492 \times 10^6}{213807}$ = 6.98 Cumecs/M.sq.m

7. Conveyance efficiency:
= Quantity of water delivered at various out flows and d/s points
= Quantity of water as received at u/s control point

$\frac{(68.303 \times 100}{69.795}$ = ~~97.8%~~ 97.86 %.

discharge @ up stream control point @ 6.50. 68.303 cumecs.

8. Discharge @ intermediate openings& off taking channels.

S.No	Distance of outlets from U/S Control points	Discharge in Cusecs
1	Utichili L.I. Scheme at Km 9.28	3.00
2	D.P at Km 10.529	0.13
3	D.P at Km 11.087	0.28
4	D.P at Km 11.574	0.42
	Total	3.83 Cusecs or 0.108 Cumecs

9. Measurements of Discharge at Down Stream Control Point @ KM 12.10 on Godavari Central Main Canal at Atreyapuram using Current meter
= 64.624 cumecs

10. Seepage loss = Item No (3) –Item No (8)-Item No (9)
=68.303-0.108-64.624 = 3.571 Cumecs

11. Wetted perimeter of section

S.NO	**Distance from u/s control point**	**Wetted perimeter as per cross section in meters**	**Mean wetted perimeter**	**Lengths In meters**	**Wetted area in Sq. meters.**
1	**2**	**3**	**4**	**5**	**6**
1	Km 6.50 on Godavari Central Main canal at Vellicheru	60.40	-	-	-
2	Km 12.10 on Godavari Central Main canal at Atreyapuram	44.94	52.67	5600	294952
Total					294952 Sqm

12. Seepage losses in Cumecs/Million Sq Meters = $\frac{3.571 \times 10^6}{294952}$ = 12.11 Cumecs/M.sq.m

13. Conveyance efficiency:
= Quantity of water delivered at various out flows and d/s points
= Quantity of water as received at u/s control point
= [Item No (8) + Item No (9)]
Item No (2)
= $\frac{(0.108+64.624) \times 100}{68.303}$
= 64.732 x 100 = ~~94.77%~~ 94.77%

Water Use Efficiency Studies

CWC, Government of India 2006-2007

Delivery system Efficiencies /Conveyance Efficiency

FORAMT – A

I. Identification Particulars:

1) Name of the Project	:	S.A.C Barrage (Godavari Delta System)
Major/Medium	:	Major
2) Circle	:	Irrigation circle, Dowlaswaram
3) Division	:	G.C Division
4) Nature of Field Studies	:	Measurement of seepage loss of Distributary by Inflow-Outflow method.
5) Particulars of canal reach	:	Gannavaram canal from Km 16.950 to Km 31.08
(i) Main canal / Distributary	:	Distributary
(ii) Lined / Unlined	:	Unlined
(iii) Discharge above 150 Cusses / discharge below 150 Cusses:		Above 150 Cusses
(iv) Length of reach	:	From CH—16.95------- to CH—31.08---------- Head/Middle/Tailed
6) Crop season details	:	Rabi
7) Duration of Field Studies	:	24.12.2007

II. FIELD OBSERVATIONS:

DATA SHEET

1. Measurements of Discharge at upstream control

point @ CH-------16.95----------

USING (i) Weir

(ii) Standing wae flume

(iii) Rectangular not

(iv) Current meter

(v) Any other measuring device.

} 19.617Cumecs

2. Discharges @ intermediate openings & off taking channels.

(i) Pipe outlets:

S.No.	Distance of outlet from U/S control point	Dia of Pipe (m)	Area of Pipe (a) (Sqm.)	Head (h) (m)	Discharge Q=Ka h K=Constant (cumecs)
1.	DP at Km 20.88				Closed
2.	DP at Km 22.042				Closed
3	DP at Km 23.12				Closed
4	DP at Km 26.874				Closed

A. Total discharge of pipe outlets---- NIL ----------

(ii) **Off taking Channels:**

S.NO.	Location of off taking channels from U/S control points	Nature of opening and formula used for discharge	Discharge Q Cumecs
1.	I Polavaram at Km 22.867		**Closed**
2.	R.C Puram Channel 23.862		**Closed**
3.	Ethakota Channel 25.317		**Closed**
4	Boorugu Channel 26.008		**Closed**
5	Boorugu Channel 26.010		**Closed**
6	Gopalapuram site Channel 27.775		**Closed**

B. **Total discharge of off takes** Nil

(iii) Total discharges from all openings. (A+B) } 0 — Nil —

3. Measurements of Discharge at down stream

Control point @ CH—31.08---------

Using Current meter (1613) 19.005 Cumecs.

4. Seepage loss 1 – 2 – 3 =19.617- 0-19.005 = 0.612cumecs

5.Wetted perimeter of section

S.NO.	Distance from u/s control point	Wetted perimeter as per cross section in meters	Mean wetted perimeter	Lengths In meters	Wetted area in Sq. meters.
1	2	3	4	5	6
1	16.95	17.93	-	-	-
2	18.40	18.05	17.99	1450	26085.5
3	31.08	25.38	21.715	12680	275346.2
				Total	**301431.7**

6. Seepage losses in Cumes / Million Sq Metres = $\frac{0.612 \times 10^6}{301431.7}$ = ~~2.00~~ 2.03 cumecs / M. Sq m.

7.Conveyance efficiency:

Quantity of water delivered at various outflow points and end d/s point 19.005 x 100 = **96.88%**

Quantity of water as received at u/s control point. 19.617

~~**8. Hydraulic particulars of canal under study:**~~

~~(A separate sheet may be enclosed)~~

~~**9. General Remarks:**~~

Signature of Officer
In charge of Field Studies

Water Use Efficiency Studies

CWC, Government of India 2006-2007

Delivery system Efficiencies /Conveyance Efficiency

FORAMT – A

I. Identification Particulars:

1) Name of the Project	:	S.A.C Barrage (Godavari Delta System)
Major/Medium	:	Major
2) Circle	:	Irrigation circle, Dowlaswaram
3) Division	:	G.C Division
4) Nature of Field Studies	:	Measurement of seepage loss of Distributary by Inflow-Outflow method.
		Gannavaram canal dmo
5) Particulars of canal reach	:	Km 31.08 to 34.00 Km
(i) Main canal / Distributary	:	Distributary
(ii) Lined / Unlined	:	Unlined
(iii) Discharge above 150 Cusses / discharge below 150 Cusses	:	Above 150 Cusses
(iv) Length of reach	:	From CH—31.08------- to CH—34.00---------- Head/Middle/Tailed
6) Crop season details	:	Rabi
7) Duration of Field Studies	:	03.01:2008

II. FIELD OBSERVATIONS:

DATA SHEET

1. Measurements of Discharge at upstream control

point @ CH-------31.08----------

USING (i) Weir

(ii) Standing wae flume

(iii) Rectangular not

(iv) Current meter

(v) Any other measuring device.

} 19.005Cumecs

2. Discharges @ intermediate openings & off taking channels.

(i) Pipe outlets:

S.No.	Distance of outlet from U/S control point	Dia of Pipe (m)	Area of Pipe (a) (Sqm.)	Head (h) (m)	Discharge Q=Ka h K=Constant (cumecs)
1.	DP at Km 32.712				1.630
2.	DP at Km 32.990				0.680
3.	DP at Km 33.307				1.600
				Total	3.910 c/s or 0.111 Cum

A. **Total discharge of pipe outlets----** 0.111 **Cum----------**

(ii) **Off taking Channels:**

S.NO.	Location of off taking channels from U/S control points	Nature of opening and formula used for discharge	Discharge Q Cumecs
1.	NIL		
2.	NIL		
3.	NIL		

B. **Total discharge of off takes** **Nil**

(iii) Total discharges from all openings. (A+B) } 0.111 + 0.00

3. Measurements of Discharge at down stream

Control point @ CH—34.00-------

Using Current meter (1613) 17.630 Cumecs.

4. Seepage loss 1 – 2 – 3 =19.005- 0.111-17.630 = 1.264 cumecs

5. Wetted perimeter of section

S.NO.	Distance from u/s control point	Wetted perimeter as per cross section in meters	Mean wetted perimeter	Lengths In meters	Wetted area in Sq. meters.
1	2	3	4	5	6
1	31.080	25.38	-		-
2	34.00	17.60	21.49	~~29.20~~ 29.20	62750.8
				Total	**62750.8**

6. Seepage losses in Cumes / Million Sq Metres = $\frac{1.264 \times 10^6}{62750.8}$ **= 20.15** cumecs / M. Sq. m.

7. Conveyance efficiency:

0.111 + 17.63 = 17.741

Quantity of water delivered at various outflow points and end d/s point = $\frac{17.741 \times 100}{19.005}$ **= 93.34%**

Quantity of water as received at u/s control point.

8. ~~Hydraulic particulars of canal under study~~:

(~~A separate sheet may be enclosed~~)

9. ~~General Remarks~~:

Signature of Officer
In charge of Field Studies

Water Use Efficiency Studies

CWC, Government of India 2006-2007

Delivery system Efficiencies /Conveyance Efficiency

FORAMT – A

I. Identification Particulars:

1) Name of the Project	: S.A.C Barrage (Godavari Delta System)
Major/Medium	: Major
2) Circle	: Irrigation circle, Dowlaswaram
3) Division	: G.C Division
4) Nature of Field Studies	: Measurement of seepage loss of Distributary by Inflow-Outflow method. Gannavaram canal from
5) Particulars of canal reach	: Km 34.00 to Km 52.00
(i) Main canal / Distributary	: Distributary
(ii) Lined / Unlined	: Unlined
(iii) Discharge above 150 Cusses	: ---
discharge below 150 Cusses	: Above 150 Cusses
(iv) Length of reach	: From CH—34.00------- to CH—52.00---------- Head/Middle/Tailed
6) Crop season details	: Rabi
7) Duration of Field Studies	: 04.01.2008

II. FIELD OBSERVATIONS:

DATA SHEET

1. Measurements of Discharge at upstream control

point @ CH-------34.00----------

USING (i) Weir
(ii) Standing wae flume
(iii) Rectangular not
(iv) Current meter
(v) Any other measuring device.

} 17.630Cumecs

2. Discharges @ intermediate openings & off taking channels.

(i) Pipe outlets:

S.No.	Distance of outlet from U/S control point	Dia of Pipe (m)	Area of Pipe (a) (Sqm.)	Head (h) (m)	Discharge Q=Ka h K=Constant (cumecs)
1.	DP at Km 34.437				Closed
2.	DP at Km 34.519				Closed
3.	DP at Km 34.781				Closed
4.	DP at Km 34.996				Closed
5.	DP at Km 35.00				Closed
6.	DP at Km 36.312				Closed
7.					Closed

A. **Total discharge of pipe outlets---** nil

(ii) **Off taking Channels:**

S.NO.	Location of off taking channels from U/S control points	Nature of opening and formula used for discharge	Discharge Q Cumecs
1.	Bodepati Channel at	Km 41.48	**Closed**
2.	Boorugu Channel at	Km 41.74	**Closed**
3.	Hospital Channel at	Km 42.68	**Closed**
4.	Yenagulapalli Channel at	Km 43.04	**Closed**
5.	Mundepulalanka Channel at	Km 44.82	**Closed**
6.	Manapalli Channel at	Km 49.69	**36.22**
7..	Vadarevu Channel at	Km 49.87	**4.25**
		Total	**40.47 c/s**

B. **Total discharge of off takes = 1.146 Cum**

(iii) Total discharges from all openings. (A+B) } 0

0 + 1.146 = 1.146 cum

3. Measurements of Discharge at down stream

Control point @ CH—52.00-------

Using Current meter (1613) 11.619 Cumecs.

4. Seepage loss 1 – 2 – 3 =17.630- 1.146-11.619 = 4.865 cumecs

5.Wetted perimeter of section

S.NO.	Distance from u/s control point	Wetted perimeter as per cross section in meters	Mean wetted perimeter	Lengths In meters	Wetted area in Sq. meters.
1	2	3	4	5	6
1	34.00	17.60	-	-	-
2	49.64	17.80	17.70	15640	276828
3	52.00	20.25	19.025	2360	44899
				Total	**321727**

6. Seepage losses in Cumes / Million Sq Metres = $\frac{4.865 \times 10^6}{321727}$ = ~~15.10~~ 15.12 cumecs / M. Sq.m.

7.Conveyance efficiency:

= $\frac{1.146 + 11.619}{17.63} \times 100$ =

Quantity of water delivered at various outflow points and end d/s point $\frac{12.765 \times 100}{17.630}$ = **72.40%**

Quantity of water as received at u/s control point.

~~8. Hydraulic particulars of canal under study:~~

(A ~~separate sheet may be enclosed~~)

~~9. General Remarks: Gates leakage~~

Signature of Officer
In charge of Field Studies

Annexure III - Kadali

Water Use Efficiency Studies

Delivery system Efficiencies / Conveyance Efficiencies

FORMAT – A

I. Identification Particulars:

1. Name of the Project	:	S.A.C.Barrage , (Godavari System) Dowalaisaram.
Major/Medium	:	Major
2. Circle	:	Irrigation Circle, Dowlaiswaram
3. Division	:	Godavari Central Division, Dowlaiswaram
4. Nature of Field Studies:		Measurement of seepage loss of Distributory by inflow-Out flow method
5. Particulars of canal reach	:	Kadali canal taking off km 52.060 of Gannavaram canal
(i) Main canal / Distributary	:	Minor
(ii) Lined / Unlined	:	unlined
(iii) Discharge above 150 C/s	:	---
(iv) Discharge above 150 C/s	:	Less than 150 Cusecs
(v) Length of reach	:	K.M.0.00 to km 8.100 (0.95 to km 6.50)
6. Crop season details	:	Rabi
7. Duration of Field Studies	:	05.01.2008

FIELD OBSERVATIONS:

DATA SHEET

1. Measurements of Discharge at upstream control point at Km 0.950 using using current meter = 2.89 Cumecs

2. Discharge @ intermediate openings& off taking channels.

S.No	Distance of outlets from U/S Control points	Discharge in Cusecs
1	Edarada Channel at Km 1.781	19.718
2	Geddada channel at Km 3.141	11.800
3	Enamula channel at Km 4.900	4.389
4	D.Ps 14 Nos (List enclosed)	3.933
	Total	39.840 Cusecs or 1.128 Cumecs

3. Measurements of Discharge at Down Stream Control Point @ KM 6.50 on using current meter

= 1.629 cumecs

4. Seepage loss = Iteam No (1) –Iteam No (2)-Iteam No (3)
=2.89-1.128-1.629 = 0.133 Cumecs

5. Wetted perimeter of section:

S.NO	Distance from u/s control point	Wetted perimeter as per cross section in meters	Mean wetted perimeter	Lengths In meters	Wetted area in Sq. meters.
1	2	3	4	5	6
1	0.950	10.622	-	-	
2	~~6.450~~ 6.50	8.133	9.38	~~5500~~ 5550	~~51590~~ 52059

6. Seepage losses in Cumces / Million Sq Meters = $\frac{0.133 \times 10^6}{\text{~~51590~~ } 52059 / \text{~~5550~~ } 2.555}$ = ~~2.578~~ Cumecs/M.sq.m

7. Conveyance efficiency:
= Quantity of water delivered at various out flows and d/s points
= Quantity of water as received at u/s control point

$$\frac{(1.128 + 1.629) \times 100}{2.89} = 95.39\%$$

Water Use Efficiency Studies

C.W.C, Government of India 2006-2007

Delivery system Efficiencies / Conveyance Efficiencies

FORMAT – A

I. Identification Particulars:

1. Name of the Project	:	GODAVARI DELTA SYSTEM.
Major/Medium	:	MAJOR IRRIGATION PROJECT.
2. Circle	:	Irrigation circle Eluru.
3. Division	:	Godavari western Division Nidadavolu
4. Nature of Field Studies	:	Measurement of Conveyance losses of Main canal / ~~Distributary~~ by Inflow – outflow method.
5. Particulars of canal reach	:	Godavari western Main Canal. from km 0.00 to km 9.880
(i) Main canal / Distributary	:	Main Canal
(ii) Lined / Unlined	:	un lined.
(iii) Discharge above 150.C/s Discharge below 150 C/s	:	Above 150 cusecs.
(iv) Length of reach	:	From k.m. 3.00(0.00) to km. 9.880. Head/ ~~Middle/Tail~~ reaches.
6. Crop season details	:	Kharif / Rabi Season.
7. Duration of Field Studies	:	28.12.2007.

FIELD OBSERVATIONS:

DATA SHEET

1. Measurements of Discharge at upstream control

Point @ .K.m....3.80.....
Using Current Meter

} Q1 = 183.870 cumecs

2. Discharge @ intermediate openings
& off taking channels.

(i) Pipe outlets:

S.No.	Distance of outlet from U/S control point	Dia of Pipe (m)	Area of Pipe (a) (Sqm.)	Head (h) (m)	Discharge $Q=Ka\sqrt{h}$ K=Constant (cumecs)
1.	@ km 6.80.	-	-	-	0.16
2.	-	-	-	-	-
3.	-	-	-	-	-
4.					
5.					
6.					

A. Total discharge of pipe outlets 0.16 cumecs.

(ii) Off taking Channels:

S.NO.	Location of off taking channels from U/S control points	Nature of opening and formula used for discharge	Discharge Q Cumecs
1.	9 channels.	49.74+0.18+	
2.		22.78+53.70	
3.		+0.15+1.40+	128.92
4.		0.06+0.91	
5.			
6.			

B. Total discharge of off takes= 128.92 cumecs

(iii) Total discharges from all openings. } 0.160 + 128.92
(A+B)Q2= 129.08 Cumecs

3. Measurements of Discharge at down stream Control point @...km...9...8ea... } Q3 = 52.08 cumecs or c/s

4. Seepage loss = 1 – 2 – 3 = 183.87 – 129.08 – 52.08 =
= 2.71 cumecs

5. Wetted perimeter of section

S.NO	Distance from u/s control point	Wetted perimeter as per cross section in meters	Mean wetted perimeter	Lengths In meters	Wetted area in Sq. meters.
1	2	3	4	5	6
1	@ km 3.00	77.71			
2	@ km 9.880	54.13	65.92	6880	453530
3					
4					

6. Seepage losses in Cumes / Million Sq Meters = $\frac{2.71 \times 10^6}{453530} = 5.97$ = 5.97 Cumecs/M.Sq.m.

7.Conveyance efficiency:

$$\frac{\text{Quantity of water delivered at various outflow points and end d/s point}}{\text{Quantity of water as received at u/s control point.}} \times 100$$

$$100\left(\frac{129.08+52.08}{183.87}\right) = \left[\frac{181.16}{183.87}\right] \times 100 = 98.52\%.$$

8. General Remarks:

Water Use Efficiency Studies

C.W.C, Government of India 2006-2007

Delivery system Efficiencies / Conveyance Efficiencies

FORMAT – A

I. Identification Particulars:

1. Name of the Project	:	Godavari Delta System.
Major/Medium	:	Major Irrigation Project
2. Circle	:	Irrigation circle, Eluru.
3. Division	:	G.W. Division Nidadavolu.
4. Nature of Field Studies	:	Measurement of Conveyance losses of ~~Main canal~~ / Distributary by Inflow – outflow method.
5. Particulars of canal reach	:	V & W canal and Undi canal.
(i) Main canal / Distributary	:	Distributary.
(ii) Lined / Unlined	:	Un lined.
(iii) Discharge above 150.C/s	:	~~Above~~ 150 cusecs.
Discharge below 150 C/s		
(iv) Length of reach	:	From k.m. 25.850 to km. 39.675
		Head / ~~Middle/Tail~~ reaches.
6. Crop season details	:	~~Khariff~~ / Rabi season.
7. Duration of Field Studies	:	29-12.07 & 30-12-07.

FIELD OBSERVATIONS:

DATA SHEET

1. Measurements of Discharge at upstream control

Point @ .K.m....25.850.....
Using Current Meter

Q1 = 52.730 cumecs.

2. Discharge @ intermediate openings & off taking channels.

(i) Pipe outlets:

S.No.	Distance of outlet from U/S control point	Dia of Pipe (m)	Area of Pipe (a) (Sqm.)	Head (h) (m)	Discharge Q=Ka√h K=Constant (cumecs)
1.	Inv.	-	-	-	0.09
2.	-	-	-	-	-
3.	-	-	-	-	-
4.					
5.					
6.					

A. Total discharge of pipe outlets 0.09 cumecs

(ii) Off taking Channels:

S.NO.	Location of off taking channels from U/S control points	Nature of opening and formula used for discharge	Discharge Q Cumecs
1.	channels from 25.850 to	0.01+1.59+0.02	
2.	km 31.986 and from 31.986	+0.01+1.05+	
3.	to 39.675. 10 Nos.	0.02+0.30+0.14	
4.		+0.02+1.43= 4.59 cumecs.	
5.	from km 25.85 to 31.986	=	21.11
6.	from km 31.986 to 39.675	=	4.59
			25.70,

B. Total discharge of off takes= 25.70, cumecs

(iii) Total discharges from all openings. } 25.70 + 0.09 (A+B)Q2= 25.79 Cumecs

3. Measurements of Discharge at down stream Control point @...km 39.675. (~~at Pallavolu Aqueduct~~) ~~as per calculation marked (B) by area velocity method~~ } Q3 = 25.22 cumecs or c/s

4. Seepage loss = 1 – 2 – 3 = 52.730 – 25.79 – 25.22 =

= 1.720 cumecs

5. Wetted perimeter of section

S.NO	Distance from u/s control point	Wetted perimeter as per cross section in meters	Mean wetted perimeter	Lengths In meters	Wetted area in Sq. meters.
1	2	3	4	5	6
1	25.850	34.10			
2	39.675	23.580	28.84	13,825	398713
3					
4					

$\frac{1.72 \times 10^6}{398713} = 4.31$

6. Seepage losses in Cumes / Million Sq Meters = $= 4.31$ Cumecs/M.Sq.m.

7.Conveyance efficiency:

Quantity of water delivered at various outflow points and end d/s point x 100
Quantity of water as received at u/s control point.

$100\left[\frac{25.79+25.22}{52.73}\right] = \left[\frac{51.01}{52.73}\right] \times 100 = 96.73\%$

8. General Remarks:

Water Use Efficiency Studies

C.W.C, Government of India 2006-2007

Delivery system Efficiencies / Conveyance Efficiencies

FORMAT – A

I. Identification Particulars:

1. Name of the Project	:	Godavari Delta System.
Major/Medium	:	Major Irrigation Project.
2. Circle	:	Irrigation circle Eluru.
3. Division	:	Godavari western Division, Nidadavolu.
4. Nature of Field Studies	:	Measurement of Conveyance losses of ~~Main canal~~ / Distributary by Inflow – out flow method.
5. Particulars of canal reach	:	UNDI CANAL from km 39.675 to km 50.385
(i) Main canal / Distributary	:	Distributary
(ii) Lined / Unlined	:	un lined.
(iii) Discharge above 150.C/s	:	Above 150 cusecs.
Discharge below 150 C/s		
(iv) Length of reach	:	From k.m. 39.675 to km. 50.385 Head / ~~Middle~~ / ~~Tail~~ reaches.
6. Crop season details	:	~~Kharif~~ / Rabi season.
7. Duration of Field Studies	:	29.12.07 & 30.12.07.

FIELD OBSERVATIONS:

DATA SHEET

1. Measurements of Discharge at upstream control

Point @ .K.m....39...6.7.5.....
Using Current Meter

} Q1 = 25.220 cumecs.

2. Discharge @ intermediate openings & off taking channels.

(i) Pipe outlets:

S.No.	Distance of outlet from U/S control point	Dia of Pipe (m)	Area of Pipe (a) (Sqm.)	Head (h) (m)	Discharge Q=Ka√h K=Constant (cumecs)
1.	5 Nos D. P's.	-	-	-	-
2.	(0.01+0.01+	0.05+0.01+0.01)		-	0.09
3.	-	-	-	-	-
4.					
5.					
6.					

A. Total discharge of pipe outlets 0.09

(ii) Off taking Channels:

S.NO.	Location of off taking channels from U/S control points	Nature of opening and formula used for discharge	Discharge Q Cumecs
1.	14 channels.		
2.	(0.09 + 0.04 + 0.07 + 0.61 + 0.41 +		
3.	1.76 + 0.06 + 0.31 + 0.43 + 0.94 +		5.63
4.	0.04 + 0.57 + 0.20 + 0.10]		
5.			
6.			

B. Total discharge of off takes= 5.63 cumecs

(iii) Total discharges from all openings. 0.09 + 5.63 = (A+B)Q2= 5.72 Cumecs

3. Measurements of Discharge at down stream Control point @...@ km 50.385

Q3 = 18.43 cumecs or c/s

4. Seepage loss = 1 – 2 – 3 = 25.22 – 5.72 – 18.43 =

= 1.070 cumecs

5. Wetted perimeter of section

S.NO	Distance from u/s control point	Wetted perimeter as per cross section in meters	Mean wetted perimeter	Lengths In meters	Wetted area in Sq. meters.
1	2	3	4	5	6
1	@ km 39.675	23.580			
2	@ km 50.385	29.610	26.595	10710	284832
3					
4					

6. Seepage losses in Cumes / Million Sq Meters = $\frac{1.07 \times 10^6}{284832} = 3.75$ = 3.75 Cumecs/M.Sq.m.

7.Conveyance efficiency:

$$\frac{\text{Quantity of water delivered at various outflow points and end d/s point}}{\text{Quantity of water as received at u/s control point.}} \times 100$$

$$100\left(\frac{5.72+18.43}{25.22}\right) = \left[\frac{24.15}{25.22}\right] \times 100 = 95.75\%.$$

8. General Remarks:

Water Use Efficiency Studies

C.W.C, Government of India 2006-2007

Delivery system Efficiencies / Conveyance Efficiencies

FORMAT – A

I. Identification Particulars:

1. Name of the Project	:	GODAVARI DELTA SYSTEM.
Major/Medium	:	MAJOR IRRIGATION PROJECT
2. Circle	:	Irrigation circle Eluru.
3. Division	:	Godavari western Division Nidadavolu
4. Nature of Field Studies	:	Measurement of Conveyance losses of ~~Main canal~~ / Distributary by Inflow-outflow method.
5. Particulars of canal reach	:	Distributary from km 0.00 to 9.170 of Anakoderu channel.
(i) Main canal / Distributary	:	Distributary
(ii) Lined / Unlined	:	un lined.
(iii) Discharge above 150 C/s	:	Above 150 cusecs.
Discharge below 150 C/s		
(iv) Length of reach	:	From k.m. 0.80 to km. 4.237
		Head/ ~~Middle~~/ ~~Tail~~ reaches.
6. Crop season details	:	~~Khariff~~/ Rabi season.
7. Duration of Field Studies	:	30.12.07 to 31.12.07

FIELD OBSERVATIONS:

DATA SHEET

1. Measurements of Discharge at upstream control

Point @ .k.m....0..80.....
Using Current Meter

} Q1 = 3.740 cumecs.

2. Discharge @ intermediate openings
& off taking channels.

(i) Pipe outlets:

S.No.	Distance of outlet from U/S control point	Dia of Pipe (m)	Area of Pipe (a) (Sqm.)	Head (h) (m)	Discharge Q=Ka√h K=Constant (cumecs)
1.	27 outlets.	-	-	-	-
2.	8 nos = 0.055	-	-	-	-
3.	5 nos = 0.032	-	-	-	-
4.	1 no = 0.004 5 nos = 0.022	= 0.173			0.173
5.	8 nos = 0.060				
6.					

A. Total discharge of pipe outlets ------ 0.173 cumecs.

(ii) Off taking Channels:

S.NO.	Location of off taking channels from U/S control points	Nature of opening and formula used for discharge	Discharge Q Cumecs
1.	4 channels		
2.	(1.804 + 0.116 + 0.370 +		
3.	0.085) = 2.455		2.455
4.			
5.			
6.			

B. Total discharge of off takes= 2.455 cumecs

(iii) Total discharges from all openings. } 0.173 + 2.455 = (A+B)Q2= 2.628 Cumecs

3. Measurements of Discharge at down stream Control point @ km 9.170. } Q3 = 0.980 cumecs or c/s

4. Seepage loss = 1 – 2 – 3 = 3.740 – 2.628 – 0.980 =

= 0.132 cumecs

5. Wetted perimeter of section

S.NO	Distance from u/s control point	Wetted perimeter as per cross section in meters	Mean wetted perimeter	Lengths In meters	Wetted area in Sq. meters.
1	2	3	4	5	6
1	@ 0.800 km	15.80.			
2	@ km 4.237	16.78	16.29	3437	55988.13
3	@ km 9.170	6.13	11.455	4933	56507.51
4					1,12,496.64

$\frac{0.132 \times 10^6}{1,12,496} = 1.173$ or 1,12,496 Sq.m

6. Seepage losses in Cumes / Million Sq Meters = 1.173. Cumecs/M.Sq.m.

7.Conveyance efficiency:

$$\frac{\text{Quantity of water delivered at various outflow points and end d/s point}}{\text{Quantity of water as received at u/s control point.}} \times 100$$

$$\left[\frac{2.628+0.980}{3.740.}\right] = \left[\frac{3.608}{3.740}\right] \times 100 = 96.47\%$$

8. General Remarks:

Water Use Efficiency Studies

C.W.C, Government of India 2006-2007

Delivery system Efficiencies / Conveyance Efficiencies

FORMAT – A

I. Identification Particulars:

1. Name of the Project	:	Godavari Dolta System.
Major/Medium	:	Major Irrigation Project
2. Circle	:	Irrigation Circle Eluru.
3. Division	:	Godavari western Division Nidadavole.
4. Nature of Field Studies	:	Measurement of Conveyance losses of ~~Main canal~~ / Distributary by Inflow – out flow method.
5. Particulars of canal reach	:	Singavaram Ava channel
(i) Main canal / Distributary	:	Distributary
(ii) Lined / Unlined	:	Un lined
(iii) Discharge above 150.C/s Discharge below 150 C/s	:	below 150 Cusecs.
(iv) Length of reach	:	From k.m. 1.40 to km. 1.80. Head/ ~~Middle~~/ ~~Tail~~ reaches.
6. Crop season details	:	~~Khariff~~ / Rabi season.
7. Duration of Field Studies	:	31. 12. 2007

FIELD OBSERVATIONS:

DATA SHEET

1. Measurements of Discharge at upstream control

Point @ .K.m.....1.40.....
Using Current Meter

} Q1 = 1.40 Cumecs.

2. Discharge @ intermediate openings & off taking channels.

(i) Pipe outlets:

S.No.	Distance of outlet from U/S control point	Dia of Pipe (m)	Area of Pipe (a) (Sqm.)	Head (h) (m)	Discharge $Q=Ka\sqrt{h}$ K=Constant (cumecs)
1.	direct pipes SR & QL.	-	-	-	-
2.		-	-	-	-
3.	-	-	-	-	0.01
4.					
5.					
6.					

A. Total discharge of pipe outlets 0.01 cumecs.

(ii) Off taking Channels:

S.NO.	Location of off taking channels from U/S control points	Nature of opening and formula used for discharge	Discharge Q Cumecs
1.	Singavaram Branch		
2.	channel	By Crossley	
3.		meter	0.81
4.			
5.			
6.			

B. Total discharge of off takes= 0.81 cumecs

(iii) Total discharges from all openings. } 0.01+0.81 = (A+B)Q2= 0.82 Cumecs

3. Measurements of Discharge at down stream Control point @...kms.....1..80... } Q3 = 0.550 cumecs or c/s

4. Seepage loss = 1 – 2 – 3 = 1.40 – 0.82 – 0.55 =

= 0.03 cumecs

5. Wetted perimeter of section

S.NO	Distance from u/s control point	Wetted perimeter as per cross section in meters	Mean wetted perimeter	Lengths In meters	Wetted area in Sq. meters.
1	2	3	4	5	6
1	@ km 1.40	6.03			
2	@ km 1.80.	4.40.	5.215	400	2086.
3					
4					

6. Seepage losses in Cumes / Million Sq Meters = $\frac{0.03 \times 10^6}{2086} = 14.38$ = 14.38 Cumecs/M.Sq.m.

7.Conveyance efficiency:

Quantity of water delivered at various outflow points and end d/s point x 100
Quantity of water as received at u/s control point.

$100 \left[\frac{0.82+0.55}{1.40}\right] = \left[\frac{1.37}{1.40}\right] \times 100 = 97.86\%$

8. General Remarks:

II

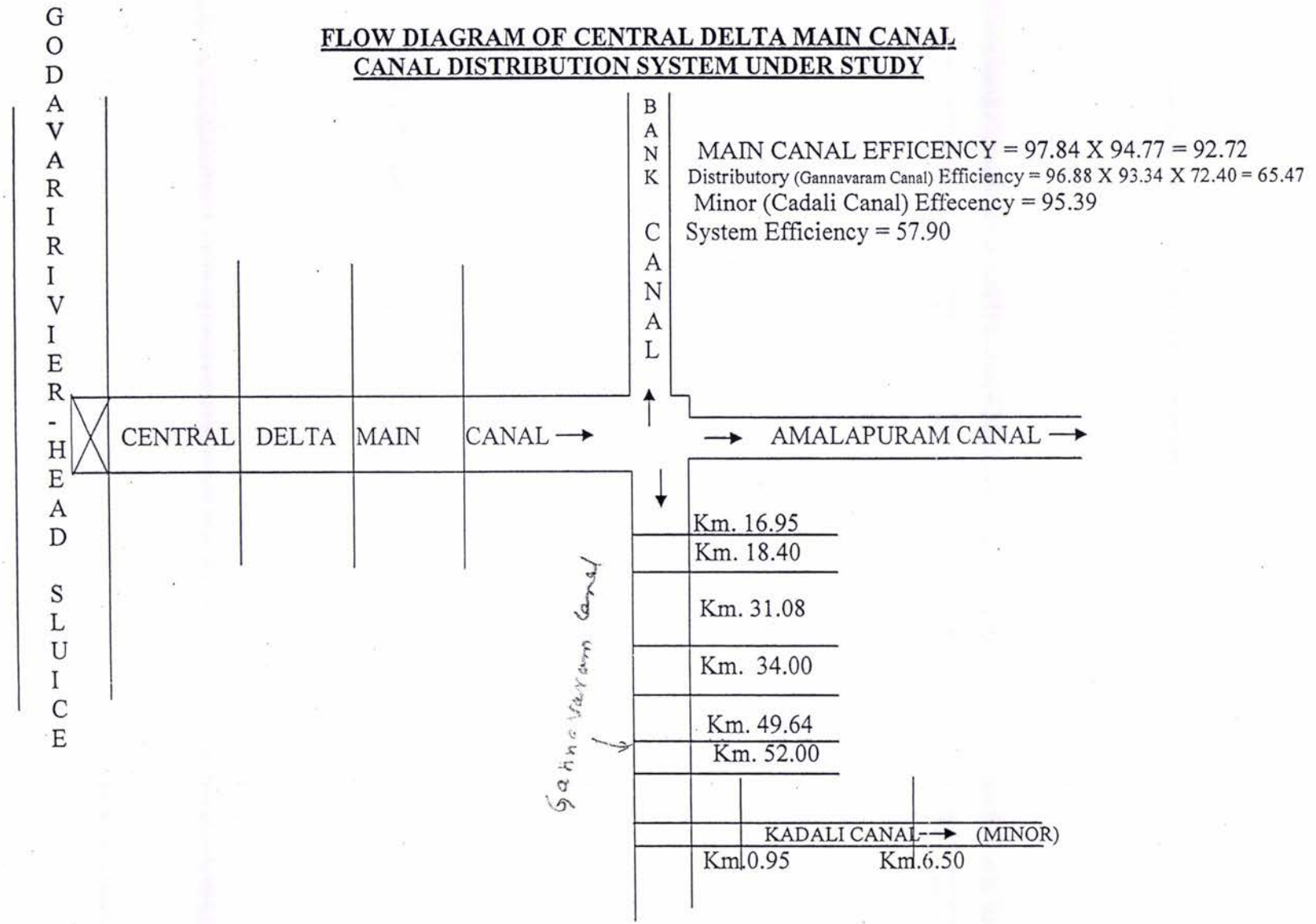
GODAVARI CENTRAL DELTA

WATER USE EFFICIENCY STUDIES

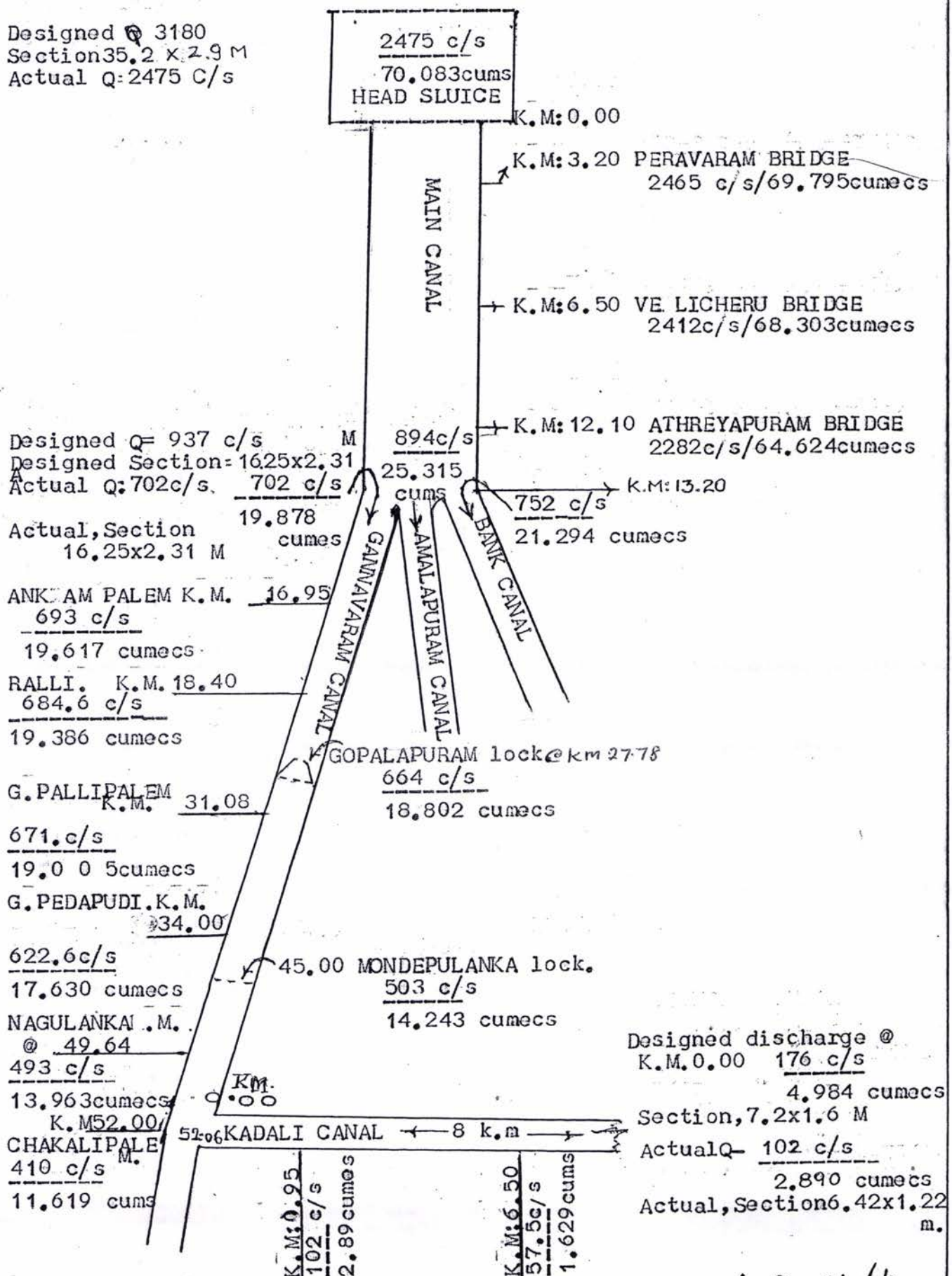
DISCHARGE

OBSERVATIONS BY CURRENT METER

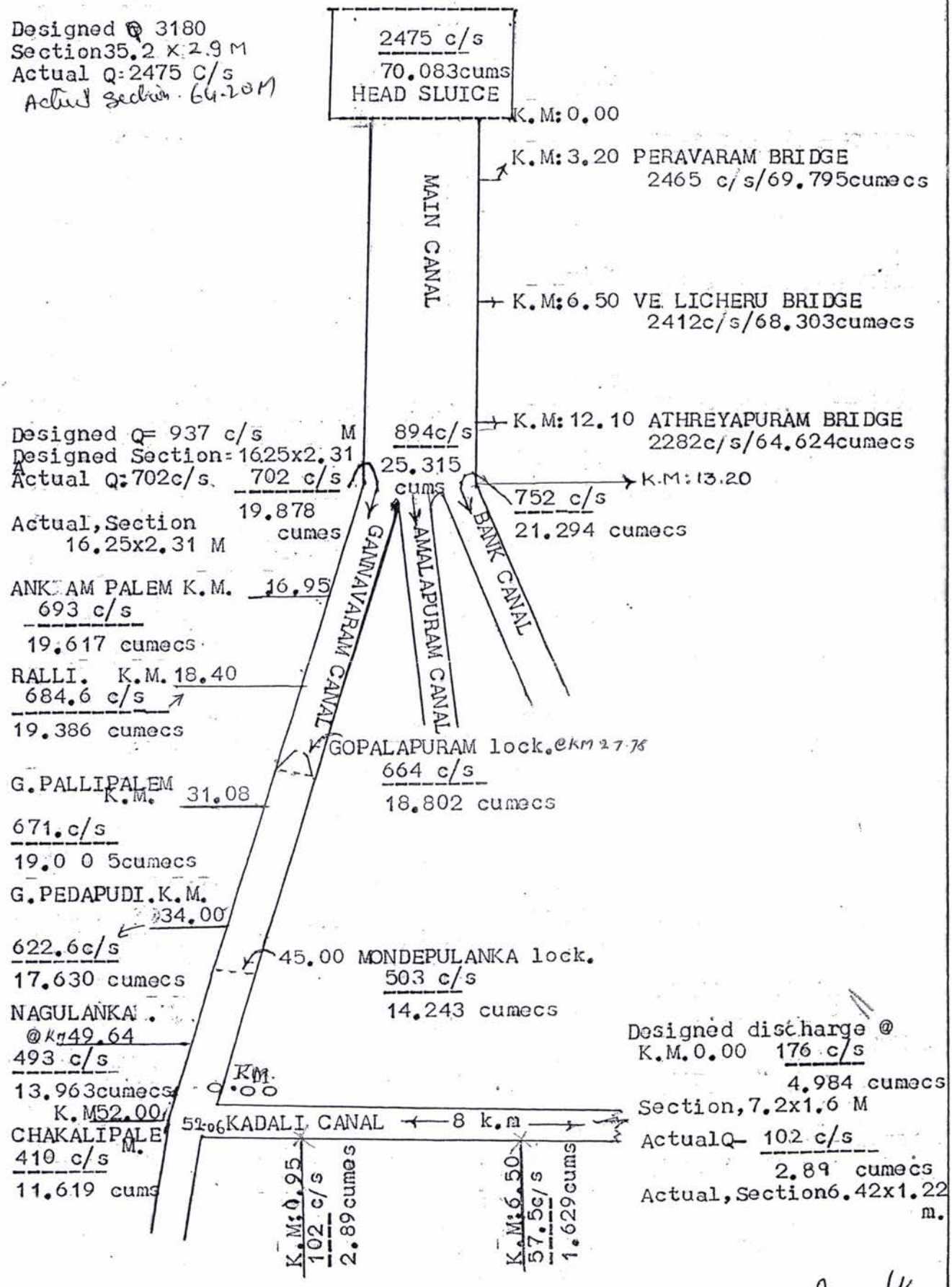
FLOW DIAGRAM OF CENTRAL DELTA MAIN CANAL
CANAL DISTRIBUTION SYSTEM UNDER STUDY



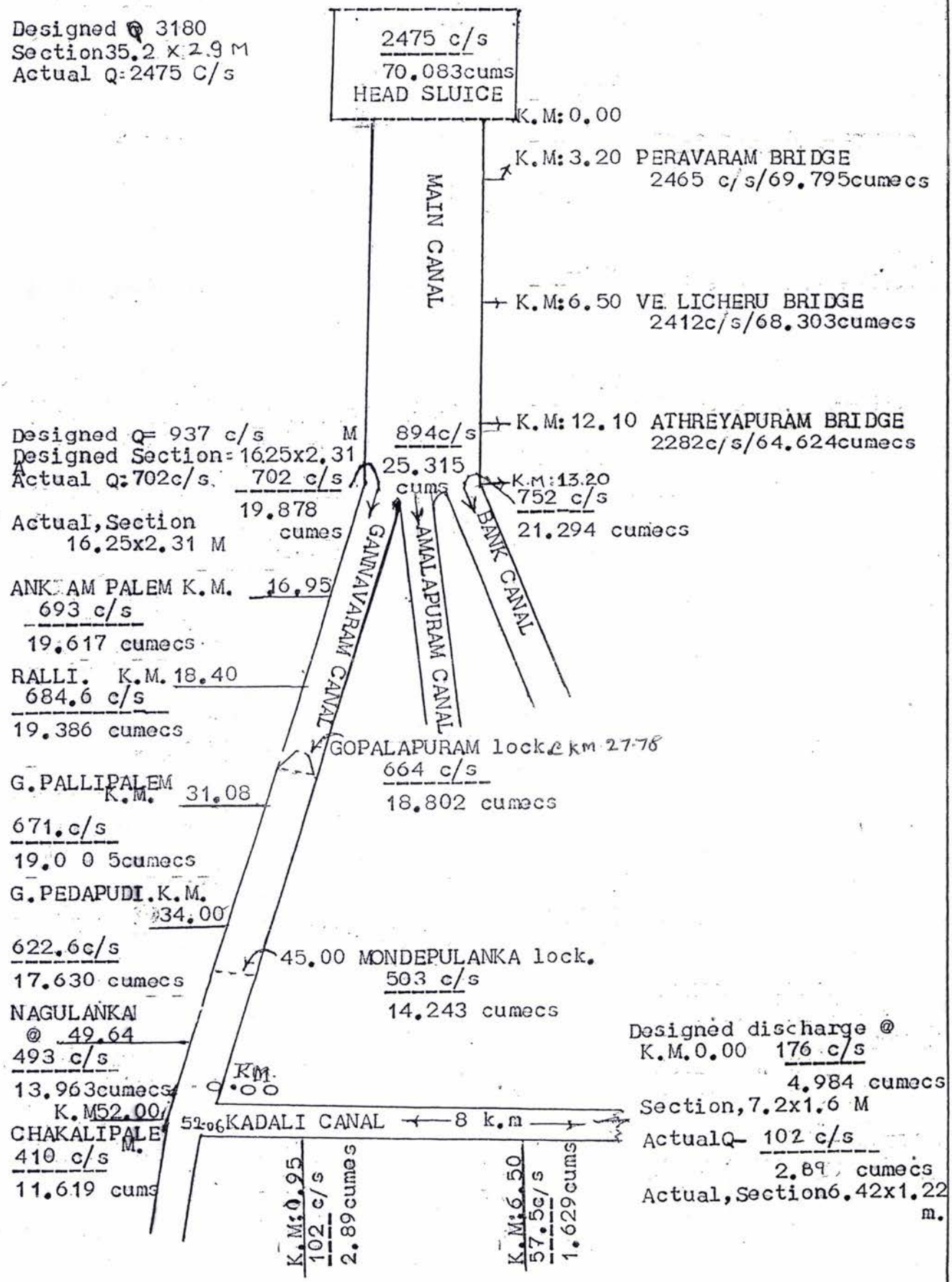
FLOW DIAGRAM OF CENTRAL DELTA MAIN CANAL.



FLOW DIAGRAM OF CENTRAL DELTA MAIN CANAL.



FLOW DIAGRAM OF CENTRAL DELTA MAIN CANAL.



Stage-Discharge Summary Data

Station Code : GCD MAIN
Local River/Basin : Godavari

Station Name : GCD main canal
Sub-Division : Gauging Sub-Division No. I, Dowlaiswarm
Division : WQ Level II Laboratory, Dowlaiswarm

Day	Ob. No	Mean Gauge (m)	WL w.r.t. M.S.L. (m)	Discharge (Q) (m³/s)	Ob / Co	Area (A) (Sq.m)	Surface Slope (S) (m/m)	Top Width (T) (m)	Wetted Perimeter (P) (m)	Hyd. Radius (R) (m)	Mean Vel. (m/s)	Manning Coeff. (V)	Mode of crossing	No.of vrticals (N) / Float	Max. Velocity (m/sec)	Weather Condition	Wind velocity (Vmax) (kms/hr)	Wind Dir. wrt. Flow (Deg.)	Remarks
20	1	9.10ft.	..	69.795	O	109.6	..	68.90	69.18	1.584	0.637	..	Bridge	19	0.807	Slightly Cloudy	..		KM 3.200 on GCD Main canal at Peravaram
22	1	9.10ft.	..	68.303	O	104.4	..	59.70	60.40	1.728	0.654	..	Bridge	17	0.856	Clear sky	..		KM6.50 on GCD at Velichedu
22	2	9.10ft.	..	64.624	O	102.1	..	43.50	44.94	2.271	0.633	..	Bridge	17	0.792	Clear sky	..		KM12.100 on GCD main canal at Athreyapuram
24	1	8.20ft.	..	19.386	O	31.8	..	18.00	18.05	1.760	0.610	..	Bridge	10	0.880	Clear sky	..		KM 18.40 on Gannavaram canal at Ankampalem
20	2	8.20ft.	..	19.617	O	38.3	..	17.80	17.93	2.139	0.512	..	Bridge	10	0.867	Clear sky	..		16.95KM on Gannavaram canal at Anklampalem
3	1	8.00ft.	..	19.005	O	41.2	..	23.40	25.38	1.623	0.461	..	Bridge	14	0.653	Clear sky	..		KM 31.080on Gannavaram canal at G. Pallipalem
3	2	8.00ft.	..	17.630	O	40.5	..	17.40	17.60	2.299	0.436	..	Bridge	10	0.632	Clear sky	..		KM 34.00 on Gannavaram canal at G. Pedapudi
4	1	6.80ft.	..	13.963	O	34.9	..	17.50	17.80	1.960	0.400	..	Bridge	15	0.621	Clear sky	..		KM 49.640 on Gannavaram canal at Nagulanka
4	2	6.80ft.	..	11.619	O	27.3	..	18.40	20.25	1.350	0.425	..	Bridge	14	0.610	Clear sky	..		KM 52.00 on Gannavaram Canal at Chakalipalem
5	1	..	..	2.890	O	7.8	..	10.50	10.62	0.735	0.370	..	Bridge	15	0.578	Clear sky	..		.95 KM of Kadali Minor
5	2	..	..	1.629	O	6.0	..	8.00	8.13	0.743	0.270	..	Bridge	10	0.407	Clear sky	..		KM 6.450 of Kadali Minor

Assistant Executive Engineer
I & C A D Dept.
Gauging Section No. I
DOWLAISWARAM – 533 125.

Assistant Director
Gauging Sub-Division No. I
DOWLAISWARAM-533125

RESEARCH OFFICER, I/c
Water Quality Level II Lab,
IRRIGATION & CAD,
DOWLAISWARAM

Flow Measurement Data at KM 3.200 of Godavari Central Delta Main Canal at Peravcaram

Station Code : GCD MAIN **Station Name :** GCD main canal **River :** **Sub-Division Office :** Gauging Sub-Division No. I, Dowlaiswaram

Division : WQ Level II Laboratory, Dowlaiswaram

Obs. No : 1 **Year :** 2007 **Month :** 12 **Day :** 20 **Time From** 08.30 **Time To :** 11.30

General Information :-

Mode of	Bridge	Method of Velocity Observation:	Current Meter	River Water Temperature:	
Location of Discharge	Temporary Site	Distance from Permanent Site:	3200	Wind Direction wrt Current:	
Sounding Taken with:	Metallic reel	Sounding Weight	30lb (13.6Kg)	Velocity of Wind:	
Condition of	Slightly silty water	Weather	Slightly Cloudy	Strength of Wind:	
Atmospheric Temperature:					

Constant 9 constants.

$V = N a + b$

No. of revolu.

$V = 0.690 \times N + 0.1400$: mt/Sec

$N = \frac{\text{Rev}}{\text{Min}}$; Rev/Sec.

Gauge Information :-

Gauge reading at Start - Permanent: 9.100 Ft. Gauge reading at Start - R L of Zero Gauge - Permanent:

Gauge reading at End - Permanent: 9.100 Ft. Gauge reading at End - Temporary: R L of Zero Gauge - Temporary:

Twin Station Code: Time of Fall Observation: Fall

Current Meter Information :-

Meter No: 1613 Method of Suspending Meter: Weight used with meter: No of compartments: 1

Compartment No.	No. of Sections	Section	R. D. of sections	Water depth (m)	Vertical angle (deg).	Airline depth (m)	Airline Correction (m)	Wetline correction (m)	Corrected Water	Area for section (m)	No. of velocity Observs.	Depth of Obs.	Coeff.	No. of Rev.	Time Taken	Velocity (m/s)	Mean Velocity	Angle of	Corr. Mean vel.	Drift Dist.	Time for Drift.	Drift Corr.	Final Mean Vel.	Disch Seg.
1	19	1	0.00	0.00			0.00	0.00	0.00	0.00						0.000	0.000		0.000				0.000	0.0
		2	2.00	0.55			0.00	0.00	0.55	1.65	1	0.60	1	21	50	0.281	0.281		0.281				0.281	0.5
		3	6.00	1.00			0.00	0.00	1.00	4.00	1	0.60	1	37	50	0.486	0.486		0.486				0.486	1.9
		4	10.00	1.30			0.00	0.00	1.30	5.20	1	0.60	1	41	50	0.538	0.538		0.538				0.538	2.8
		5	14.00	1.90			0.00	0.00	1.90	7.60	1	0.20	0.5	62	50	0.807	0.743		0.743				0.743	5.6
											2	0.80	0.5	52	50	0.679								
		6	18.00	2.00			0.00	0.00	2.00	8.00	1	0.20	0.5	50	50	0.653	0.659		0.659				0.659	5.3
											2	0.80	0.5	51	50	0.666								
		7	22.00	2.25			0.00	0.00	2.25	9.00	1	0.20	0.5	55	50	0.717	0.691		0.691				0.691	6.2
											2	0.80	0.5	51	50	0.666								
		8	26.00	2.30			0.00	0.00	2.30	9.20	1	0.20	0.5	61	50	0.794	0.762		0.762				0.762	7.0
											2	0.80	0.5	56	50	0.730								
		9	30.00	2.20			0.00	0.00	2.20	8.80	1	0.20	0.5	59	50	0.768	0.698		0.698				0.698	6.1
											2	0.80	0.5	48	50	0.627								
		10	34.00	2.20			0.00	0.00	2.20	8.80	1	0.20	0.5	54	50	0.704	0.685		0.685				0.685	6.0
											2	0.80	0.5	51	50	0.666								
		11	38.00	2.15			0.00	0.00	2.15	8.60	1	0.20	0.5	52	50	0.679	0.608		0.608				0.608	5.2
											2	0.80	0.5	41	50	0.538								

(Contd)

Current Meter Information :-

Meter No: 1613 Method of Suspending Meter: Weight used with meter: No of compartments: 1

Compartment No.	No. of Sections	Section	R. D. of sections	Water depth (m)	Vertical angle (deg).	Airline depth (m)	Airline Correction (m)	Wetline correction (m)	Corrected Water	Area for section (m)	No. of velocity Observs.	Depth of Obs.	Coeff.	No. of Rev.	Time Taken	Velocity (m/s)	Mean Velocity	Angle of	Corr. Mean vel.	Drift Dist.	Time for Drift.	Drift Corr.	Final Mean Vel.	Disch Seg.
1		12	42.00	2.20			0.00	0.00	2.20	8.80	1	0.20	0.5	62	50	0.807	0.743		0.743				0.743	6.5
											2	0.80	0.5	52	50	0.679								
		13	46.00	2.00			0.00	0.00	2.00	8.00	1	0.20	0.5	62	50	0.807	0.730		0.730				0.730	5.8
											2	0.80	0.5	50	50	0.653								
		14	50.00	1.90			0.00	0.00	1.90	7.60	1	0.20	0.5	50	50	0.653	0.634		0.634				0.634	4.8
											2	0.80	0.5	47	50	0.615								
		15	54.00	1.50			0.00	0.00	1.50	6.00	1	0.20	0.5	42	50	0.550	0.525		0.525				0.525	3.1
											2	0.80	0.5	38	50	0.499								
		16	58.00	1.10			0.00	0.00	1.10	4.40	1	0.60	1	31	50	0.409	0.409		0.409				0.409	1.8
		17	62.00	0.60			0.00	0.00	0.60	2.40	1	0.60	1	23	50	0.307	0.307		0.307				0.307	0.7
		18	66.00	0.45			0.00	0.00	0.45	1.55	1	0.60	1	7	50	0.102	0.102		0.102				0.102	0.2
		19	68.90	0.00			0.00	0.00	0.00	0.00						0.000	0.000		0.000				0.000	0.0

Top Width : 68.900 M **W. Perimeter** 69.182 M **Total Area :** 109.603 M² **Total Discharge** 69.795 Cumecs

Assistant Executive Engineer
I & C A.D Dept.
Gauging Section No I,
DOWLAISWARAM – 533 125.

Assistant Director
Gauging Sub-Division No. I
DOWLAISWARAM-533 125

RESEARCH OFFICER
Water Quality Level II Lab.
IRRIGATION & CAD,
DOWLAISWARAM

- 94 -

Flow Measurement Data at KM 6.500 of Godavari Central Delta Main Canal at Velichedu (v)

Station Code : GCD MAIN **Station Name :** GCD main canal **River :** **Sub-Division Office : :** Gauging Sub-Division No. I, Dowlaiswaram

Division : WQ Level II Laboratory, Dowlaiswaram

Obs. No : 1 **Year :** 2007 **Month :** 12 **Day :** 22 **Time From** 09.00 **Time To :** 12.30

General Information :-

Mode of	Bridge	Method of Velocity Observation:	Current Meter	River Water Temperature:	
Location of Discharge	Temporary Site	Distance from Permanent Site:		Wind Direction wrt Current:	
Sounding Taken with:	Metallic reel	Sounding Weight	30lb (13.6Kg)	Velocity of Wind:	
Condition of	Clear water	Weather	Clear sky	Strength of Wind:	
Atmospheric Temperature:					

Gauge Information :-

Gauge reading at Start - Permanent: 9.100 ft. Gauge reading at Start - R L of Zero Gauge - Permanent:

Gauge reading at End - Permanent: 9.100 ft. Gauge reading at End - Temporary: R L of Zero Gauge - Temporary:

Twin Station Code: Time of Fall Observation: Fall

Current Meter Information :-

Meter No: 1613 Method of Suspending Meter: Gauging Reel Weight used with meter: 30lb No of compartments: 1

Compartment No.	No. of Sections	Section	R. D. of sections	Water depth (m)	Vertical angle (deg).	Airline depth (m)	Airline Correction (m)	Wetline correction (m)	Corrected Water	Area for section (m)	No. of velocity Observs.	Depth of Obs.	Coeff.	No. of Rev.	Time Taken	Velocity (m/s)	Mean Velocity	Angle of	Corr. Mean vel.	Drift Dist.	Time for Drift.	Drift Corr.	Final Mean Vel.	Disch Seg.
1	17	1	0.00	0.00			0.00	0.00	0.00	0.00						0.000	0.000		0.000				0.000	0.0
		2	2.00	1.25			0.00	0.00	1.25	3.75	1	0.60	1	48	60	0.525	0.525		0.525				0.525	2.0
		3	6.00	1.90			0.00	0.00	1.90	7.60	1	0.20	0.5	59	60	0.642	0.616		0.616				0.616	4.7
											2	0.80	0.5	54	60	0.589								
		4	10.00	1.90			0.00	0.00	1.90	7.60	1	0.20	0.5	69	60	0.749	0.717		0.717				0.717	5.4
											2	0.80	0.5	63	60	0.685								
		5	14.00	2.00			0.00	0.00	2.00	8.00	1	0.20	0.5	71	60	0.771	0.712		0.712				0.712	5.7
											2	0.80	0.5	60	60	0.653								
		6	18.00	2.10			0.00	0.00	2.10	8.40	1	0.20	0.5	70	60	0.760	0.690		0.690				0.690	5.8
											2	0.80	0.5	57	60	0.621								
		7	22.00	2.05			0.00	0.00	2.05	8.20	1	0.20	0.5	74	60	0.803	0.696		0.696				0.696	5.7
											2	0.80	0.5	54	60	0.589								
		8	26.00	2.00			0.00	0.00	2.00	8.00	1	0.20	0.5	67	60	0.728	0.669		0.669				0.669	5.4
											2	0.80	0.5	56	60	0.610								
		9	30.00	2.05			0.00	0.00	2.05	8.20	1	0.20	0.5	79	60	0.856	0.792		0.792				0.792	6.5
											2	0.80	0.5	67	60	0.728								
		10	34.00	2.00			0.00	0.00	2.00	8.00	1	0.20	0.5	71	60	0.771	0.706		0.706				0.706	5.7
											2	0.80	0.5	59	60	0.642								

47

Current Meter Information :-

Meter No: 1613 Method of Suspending Meter: Gauging Reel Weight used with meter: 30lb No of compartments: 1

Compartment No.	No. of Sections	Section	R. D. of sections	Water depth (m)	Vertical angle (deg).	Airline depth (m)	Airline Correction (m)	Wetline correction (m)	Corrected Water	Area for section (m)	No. of velocity Observs.	Depth of Obs.	Coeff.	No. of Rev.	Time Taken	Velocity (m/s)	Mean Velocity	Angle of	Corr. Mean vel.	Drift Dist.	Time for Drift.	Drift Corr.	Final Mean Vel.	Disch Seg.
1		11	38.00	1.95			0.00	0.00	1.95	7.80	1	0.20	0.5	70	60	0.760	0.712		0.712				0.712	5.6
											2	0.80	0.5	61	60	0.664								
		12	42.00	1.95			0.00	0.00	1.95	7.80	1	0.20	0.5	69	60	0.749	0.642		0.642				0.642	5.0
											2	0.80	0.5	49	60	0.535								
		13	46.00	1.85			0.00	0.00	1.85	7.40	1	0.20	0.5	62	60	0.674	0.648		0.648				0.648	4.8
											2	0.80	0.5	57	60	0.621								
		14	50.00	1.80			0.00	0.00	1.80	7.20	1	0.20	0.5	54	60	0.589	0.519		0.519				0.519	3.7
											2	0.80	0.5	41	60	0.450								
		15	54.00	1.00			0.00	0.00	1.00	4.00	1	0.60	1	39	60	0.429	0.429		0.429				0.429	1.7
		16	58.00	0.85			0.00	0.00	0.85	2.42	1	0.60	1	26	60	0.290	0.290		0.290				0.290	0.7
		17	59.70	0.00			0.00	0.00	0.00	0.00						0.000	0.000		0.000				0.000	0.0

Top Width : 59.700 W. Perimeter 60.399 Total Area : 104.372 Total Discharge 68.303

Assistant Executive Engineer
I & C AD Dept.,
Gauging Section No I,
DOWLAISWARAM – 533 125.

Assistant Director
Gauging Sub-Division No. 1
DOWLAISWARAM-533125

RESEARCH OFFICER
Water Quality Level II Lab,
IRRIGATION & CAD,
DOWLAISWARAM

-48-

Flow Measurement Data at KM 12.100 of Godavari Central Delta Main Canal at Athreyapuram (v)

Station Code : GCD MAIN **Station Name :** GCD main canal **River :** **Sub-Division Office : :** Gauging Sub-Division No. I, Dowlaiswaram

Division : WQ Level II Laboratory, Dowlaiswaram

Obs. No : 2 **Year :** 2007 **Month :** 12 **Day :** 22 **Time From** 14.00 **Time To :** 15.30

General Information :-

Mode of	Bridge	Method of Velocity Observation:	Current Meter	River Water Temperature:	
Location of Discharge	Temporary Site	Distance from Permanent Site:		Wind Direction wrt Current:	
Sounding Taken with:	Metallic reel	Sounding Weight	30lb (13.6Kg)	Velocity of Wind:	
Condition of	Slightly silty water	Weather	Clear sky	Strength of Wind:	
Atmospheric Temperature:					

Gauge Information :-

Gauge reading at Start - Permanent: 9.100 ft. Gauge reading at Start - R L of Zero Gauge - Permanent:

Gauge reading at End - Permanent: 9.100 ft. Gauge reading at End - Temporary: R L of Zero Gauge - Temporary:

Twin Station Code: Time of Fall Observation: Fall

Current Meter Information :-

Meter No: 1613 Method of Suspending Meter: Gauging Reel Weight used with meter: 30lb No of compartments: 1

Compartment No.	No. of Sections	Section	R. D. of sections	Water depth (m)	Vertical angle (deg).	Airline depth (m)	Airline Correction (m)	Wetline correction (m)	Corrected Water	Area for section (m)	No. of velocity Observs.	Depth of Obs.	Coeff.	No. of Rev.	Time Taken	Velocity (m/s)	Mean Velocity	Angle of	Corr. Mean vel.	Drift Dist.	Time for Drift.	Drift Corr.	Final Mean Vel.	Disch Seg.
1	17	1	0.00	0.00			0.00	0.00	0.00	0.00						0.000	0.000		0.000				0.000	0.0
		2	1.50	1.00			0.00	0.00	1.00	2.25	1	0.60	1	21	40	0.349	0.349		0.349				0.349	0.8
		3	4.50	2.25			0.00	0.00	2.25	6.75	1	0.20	0.5	35	60	0.386	0.407		0.407				0.407	2.7
											2	0.80	0.5	39	60	0.429								
		4	7.50	2.55			0.00	0.00	2.55	7.65	1	0.20	0.5	58	60	0.632	0.584		0.584				0.584	4.5
											2	0.80	0.5	49	60	0.535								
		5	10.50	2.50			0.00	0.00	2.50	7.50	1	0.20	0.5	62	60	0.674	0.610		0.610				0.610	4.6
											2	0.80	0.5	50	60	0.546								
		6	13.50	2.50			0.00	0.00	2.50	7.50	1	0.20	0.5	68	60	0.738	0.685		0.685				0.685	5.1
											2	0.80	0.5	58	60	0.632								
		7	16.50	2.55			0.00	0.00	2.55	7.65	1	0.20	0.5	61	60	0.664	0.616		0.616				0.616	4.7
											2	0.80	0.5	52	60	0.568								
		8	19.50	2.60			0.00	0.00	2.60	7.80	1	0.20	0.5	67	60	0.728	0.680		0.680				0.680	5.3
											2	0.80	0.5	58	60	0.632								
		9	22.50	2.65			0.00	0.00	2.65	7.95	1	0.20	0.5	67	60	0.728	0.664		0.664				0.664	5.3
											2	0.80	0.5	55	60	0.600								
		10	25.50	2.65			0.00	0.00	2.65	7.95	1	0.20	0.5	60	60	0.653	0.616		0.616				0.616	4.9
											2	0.80	0.5	53	60	0.578								

(contd).

Current Meter information :-

Meter No: 1613 Method of Suspending Meter: Gauging Reel Weight used with meter: 30lb No of compartments: 1

Compartment No.	No. of Sections	Section	R. D. of sections	Water depth (m)	Vertical angle (deg).	Airline depth (m)	Airline Correction (m)	Wetline correction (m)	Corrected Water	Area for section (m)	No. of velocity Observs.	Depth of Obs.	Coeff.	No. of Rev.	Time Taken	Velocity (m/s)	Mean Velocity	Angle of	Corr. Mean vel.	Drift Dist.	Time for Drift.	Drift Corr.	Final Mean Vel.	Disch Seg.
1		11	28.50	2.60			0.00	0.00	2.60	7.80	1	0.20	0.5	73	60	0.792	0.744		0.744				0.744	5.8
											2	0.80	0.5	64	60	0.696								
		12	31.50	2.75			0.00	0.00	2.75	8.25	1	0.20	0.5	68	60	0.738	0.653		0.653				0.653	5.4
											2	0.80	0.5	52	60	0.568								
		13	34.50	2.60			0.00	0.00	2.60	7.80	1	0.20	0.5	67	60	0.728	0.669		0.669				0.669	5.2
											2	0.80	0.5	56	60	0.610								
		14	37.50	2.55			0.00	0.00	2.55	7.65	1	0.20	0.5	72	60	0.781	0.754		0.754				0.754	5.8
											2	0.80	0.5	67	60	0.728								
		15	40.50	2.30			0.00	0.00	2.30	5.17	1	0.20	0.5	68	60	0.738	0.658		0.658				0.658	3.4
											2	0.80	0.5	53	60	0.578								
		16	42.00	1.60			0.00	0.00	1.60	2.40	1	0.20	0.5	43	60	0.471	0.477		0.477				0.477	1.1
											2	0.80	0.5	44	60	0.482								
		17	43.50	0.00			0.00	0.00	0.00	0.00						0.000	0.000		0.000				0.000	0.0

Top Width : 43.500 **W. Perimeter** 44.937 **Total Area :** 102.075 **Total Discharge** 64.624

Assistant Executive Engineer
I & C A D Dept.
Gauging Section No. 1
DOWLAISWARAM – 533 125.

25/1/08

Assistant Director
Gauging Sub-Division No. 3
DOWLAISWARAM-533125.

25/1/08

RESEARCH OFFICER,
Water Quality Level I Lab.
IRRIGATION & CAD,
DOWLAISWARAM

25/1/08

Flow Measurement Data at KM 16.950 of Gannavaram Branch GCD Main at Anakampalem (v)

Station Code : GCD MAIN **Station Name :** Gannavaram Branch **River :** **Sub-Division Office : :** Gauging Sub-Division No. I, Dowlaiswaram

Division : WQ Level II Laboratory, Dowlaiswaram

Obs. No : 2 **Year :** 2007 **Month :** 12 **Day :** 20 **Time From** 15.00 **Time To :** 17.15

General Information :-

Mode of	Bridge	Method of Velocity Observation:	Current Meter	River Water Temperature:	
Location of Discharge	Temporary Site	Distance from Permanent Site:		Wind Direction wrt Current:	
Sounding Taken with:	Metallic reel	Sounding Weight		Velocity of Wind:	
Condition of	Slightly silty water	Weather	Clear sky	Strength of Wind:	
Atmospheric Temperature:					

Gauge Information :-

Gauge reading at Start - Permanent: 8.200 ft. Gauge reading at Start - R L of Zero Gauge - Permanent:

Gauge reading at End - Permanent: 8.200 ft. Gauge reading at End - Temporary: R L of Zero Gauge - Temporary:

Twin Station Code: Time of Fall Observation: Fall

Current Meter Information :-

Meter No: 1613 Method of Suspending Meter: Weight used with meter: 30lb No of compartments: 2

Compartment No.	No. of Sections	Section	R. D. of sections	Water depth (m)	Vertical angle (deg).	Airline depth (m)	Airline Correction (m)	Wetline correction (m)	Corrected Water	Area for section (m)	No. of velocity Observs.	Depth of Obs.	Coeff.	No. of Rev.	Time Taken	Velocity (m/s)	Mean Velocity	Angle of	Corr. Mean vel.	Drift Dist.	Time for Drift.	Drift Corr.	Final Mean Vel.	Disch Seg.
																0.000	0.000		0.000				0.000	0.0
1	5	1	0.00	2.10			0.00	0.00	2.10	1.55														
		2	1.48	2.30			0.00	0.00	2.30	5.15	1	0.20	0.5	0	60	0.012	0.183		0.183				0.183	0.9
											2	0.80	0.5	32	60	0.354								
		3	4.48	2.75			0.00	0.00	2.75	8.17	1	0.20	0.5	71	60	0.771	0.701		0.701				0.701	5.7
											2	0.80	0.5	58	60	0.632								
		4	7.42	2.27			0.00	0.00	2.27	5.02	1	0.20	0.5	77	60	0.835	0.765		0.765				0.765	3.8
											2	0.80	0.5	64	60	0.696								
		5	8.90	2.10			0.00	0.00	2.10	1.55						0.000	0.000		0.000				0.000	0.0
																0.000	0.000		0.000				0.000	0.0
2	5	1	10.10	2.10			0.00	0.00	2.10	1.55														
		2	11.58	2.20			0.00	0.00	2.20	4.89	1	0.20	0.5	80	60	0.867	0.829		0.829				0.829	4.1
											2	0.80	0.5	73	60	0.792								
		3	14.55	1.85			0.00	0.00	1.85	5.49	1	0.20	0.5	78	60	0.845	0.749		0.749				0.749	4.1
											2	0.80	0.5	60	60	0.653								
		4	17.52	1.70			0.00	0.00	1.70	3.78	1	0.20	0.5	16	60	0.183	0.247		0.247				0.247	0.9
											2	0.80	0.5	28	60	0.311								
		5	19.00	1.60			0.00	0.00	1.60	1.18						0.000	0.000		0.000				0.000	0.0

Top Width : 17.800 **W. Perimeter** 17.927 **Total Area :** 38.354 **Total Discharge** 19.617

Assistant Executive Engineer
I & C.A.D. Dept

Assistant Director 27/1/08

RESEARCH OFFICER

Flow Measurement Data at KM 18.400 of Gannavaram Branch Canal of GCD Main at Ralli (v)

Station Code : GCD MAIN **Station Name :** Gannavaram Baranch **River :** **Sub-Division Office : :** Gauging Sub-Division No. I, Dowlaiswaram

Division : WQ Level II Laboratory, Dowlaiswaram

Obs. No : 1 **Year :** 2007 **Month :** 12 **Day :** 24 **Time From** 11.00 **Time To :** 13.30

General Information :-

Mode of	Bridge	Method of Velocity Observation:	Current Meter	River Water Temperature:	
Location of Discharge	Temporary Site	Distance from Permanent Site:		Wind Direction wrt Current:	
Sounding Taken with:	Metallic reel	Sounding Weight	30lb (13.6Kg)	Velocity of Wind:	
Condition of	Slightly silty water	Weather	Clear sky	Strength of Wind:	Slight
Atmospheric Temperature:					

Gauge Information :-

Gauge reading at Start - Permanent: 8.20 ft. Gauge reading at Start - R L of Zero Gauge - Permanent:

Gauge reading at End - Permanent: 8.20 ft. Gauge reading at End - Temporary: R L of Zero Gauge - Temporary:

Twin Station Code: Time of Fall Observation: Fall

Current Meter Information :-

Meter No: 1613 Method of Suspending Meter: Weight used with meter: 30lb No of compartments: 2

Compartment No.	No. of Sections	Section	R. D. of sections	Water depth (m)	Vertical angle (deg).	Airline depth (m)	Airline Correction (m)	Wetline correction (m)	Corrected Water	Area for section (m)	No. of velocity Observs.	Depth of Obs.	Coeff.	No. of Rev.	Time Taken	Velocity (m/s)	Mean Velocity	Angle of	Corr. Mean vel.	Drift Dist.	Time for Drift.	Drift Corr.	Final Mean Vel.	Disch Seg.
1	5	1	0.00	1.40			0.00	0.00	1.40	0.99						0.000	0.000		0.000				0.000	0.0
		2	1.42	1.55			0.00	0.00	1.55	3.29	1	0.60	1	48	60	0.525	0.525		0.525				0.525	1.7
		3	4.25	1.80			0.00	0.00	1.80	5.09	1	0.20	0.5	76	60	0.824	0.787		0.787				0.787	4.0
											2	0.80	0.5	69	60	0.749								
		4	7.08	1.80			0.00	0.00	1.80	3.82	1	0.20	0.5	76	60	0.824	0.813		0.813				0.813	3.1
											2	0.80	0.5	74	60	0.803								
		5	8.50	1.55			0.00	0.00	1.55	1.10						0.000	0.000		0.000				0.000	0.0
2	5	1	9.70	1.75			0.00	0.00	1.75	1.24						0.000	0.000		0.000				0.000	0.0
		2	11.12	1.85			0.00	0.00	1.85	3.93	1	0.20	0.5	94	60	1.016	0.856		0.856				0.856	3.4
											2	0.80	0.5	64	60	0.696								
		3	13.95	1.90			0.00	0.00	1.90	5.38	1	0.20	0.5	75	60	0.813	0.803		0.803				0.803	4.3
											2	0.80	0.5	73	60	0.792								
		4	16.78	1.85			0.00	0.00	1.85	4.86	1	0.20	0.5	60	60	0.653	0.589		0.589				0.589	2.9
											2	0.80	0.5	48	60	0.525								
		5	19.20	1.70			0.00	0.00	1.70	2.06						0.000	0.000		0.000				0.000	0.0

Top Width : 18.000 **W. Perimeter** 18.050 **Total Area :** 31.771 **Total Discharge** 19.386

1521

Assistant Executive Engineer
I & C A D Dept.
Gauging Section No.
DOWLAISWARAM – 533 125.

Assistant Director
Gauging Sub-Division No. I
DOWLAISWARAM-533 125

RESEARCH OFFICER
Water Quality Level II Lab,
IRRIGATION & CAD.

Flow Measurement Data at KM 31.080 of Gannavaram Branch Canal of GCD Main at Pallipalem (v)

Station Code : GCD MAIN **Station Name :** Gannavaram Branch **River :** **Sub-Division Office :** Gauging Sub-Division No. I, Dowlaiswaram

Obs. No : 1 **Year :** 2008 **Month :** 1 **Day :**3 **Time From** 9.00 **Time To :** 12.30

General Information :-

Mode of	Bridge	Method of Velocity Observation:	Current Meter	River Water Temperature:	
Location of Discharge	Temporary Site	Distance from Permanent Site:		Wind Direction wrt Current:	
Sounding Taken with:	Metallic reel	Sounding Weight		Velocity of Wind:	
Condition of	Slightly silty water	Weather	Clear sky	Strength of Wind: slight	
Atmospheric Temperature:					

Gauge Information :-

Gauge reading at Start - Permanent: 8.00ft.	Gauge reading at Start -	R L of Zero Gauge - Permanent:
Gauge reading at End - Permanent: 8.00ft	Gauge reading at End - Temporary:	R L of Zero Gauge - Temporary:
Twin Station Code:	Time of Fall Observation: Fall	

Current Meter Information :-

Meter No: 1613 Method of Suspending Meter: Gauging Reel Weight used with meter: 15lb No of compartments: 1

Compartment No.	No. of Sections	Section	R. D. of sections	Water depth (m)	Vertical angle (deg).	Airline depth (m)	Airline Correction (m)	Wetline correction (m)	Corrected Water	Area for section (m)	No. of velocity Observs.	Depth of Obs.	Coeff.	No. of Rev.	Time Taken	Velocity (m/s)	Mean Velocity	Angle of	Corr. Mean vel.	Drift Dist.	Time for Drift.	Drift Corr.	Final Mean Vel.	Disch Seg.
1	14	1	0.00	0.00			0.00	0.00	0.00	0.00						0.000	0.000		0.000				0.000	0.0
		2	1.00	1.65			0.00	0.00	1.65	2.47	1	0.20	0.5	28	60	0.311	0.290		0.290				0.290	0.716
											2	0.80	0.5	24	60	0.268								
		3	3.00	1.75			0.00	0.00	1.75	3.50	1	0.20	0.5	38	60	0.418	0.407		0.407				0.407	1.425
											2	0.80	0.5	36	60	0.397								
		4	5.00	1.85			0.00	0.00	1.85	3.70	1	0.20	0.5	31	60	0.343	0.471		0.471				0.471	1.743
											2	0.80	0.5	55	60	0.600								
		5	7.00	1.90			0.00	0.00	1.90	3.80	1	0.20	0.5	56	60	0.610	0.552		0.552				0.552	2.098
											2	0.80	0.5	45	60	0.493								
		6	9.00	2.00			0.00	0.00	2.00	4.00	1	0.20	0.5	50	60	0.546	0.519		0.519				0.519	2.076
											2	0.80	0.5	45	60	0.493								
		7	11.00	2.05			0.00	0.00	2.05	4.10	1	0.20	0.5	55	60	0.600	0.573		0.573				0.573	2.349
											2	0.80	0.5	50	60	0.546								
		8	13.00	2.05			0.00	0.00	2.05	4.10	1	0.20	0.5	60	60	0.653	0.626		0.626				0.626	2.567
											2	0.80	0.5	55	60	0.600								
		9	15.00	1.90			0.00	0.00	1.90	3.80	1	0.20	0.5	55	60	0.600	0.562		0.562				0.562	2.136
											2	0.80	0.5	48	60	0.525								

531

Flow Measurement Data at KM 31.080 of Gannavaram Branch Canal of GCD Main at Pallipalem (v)

Station Code : GCD MAIN **Station Name :** Gannavaram Baranch **River :** **Sub-Division Office :** Gauging Sub-Division No. I, Dowlaiswaram

Division : WQ Level II Laboratory, Dowlaiswaram

Obs. No : 1 **Year :** 2008 **Month :** 1 **Day :** 3 **Time From** 09.00 **Time To :** 12.30

General Information :-

Mode of	Bridge	Method of Velocity Observation:	Current Meter	River Water Temperature:	
Location of Discharge	Temporary Site	Distance from Permanent Site:		Wind Direction wrt Current:	
Sounding Taken with:	Metallic reel	Sounding Weight	30lb (13.6Kg)	Velocity of Wind:	
Condition of	Slightly silty water	Weather	Clear sky	Strength of Wind:	Slight
Atmospheric Temperature:					

Gauge Information :-

Gauge reading at Start - Permanent: 8.00 ft. Gauge reading at Start - R L of Zero Gauge - Permanent:

Gauge reading at End - Permanent: 8.00 ft. Gauge reading at End - Temporary: R L of Zero Gauge - Temporary:

Twin Station Code: Time of Fall Observation: Fall

Current Meter Information :-

Meter No: 1613 Method of Suspending Meter: Weight used with meter: No of compartments: 1

Compartment No.	No. of Sections	Section	R. D. of sections	Water depth (m)	Vertical angle (deg).	Airline depth (m)	Airline Correction (m)	Wetline correction (m)	Corrected Water	Area for section (m)	No. of velocity Observs.	Depth of Obs.	Coeff.	No. of Rev.	Time Taken	Velocity (m/s)	Mean Velocity	Angle of	Corr. Mean vel.	Drift Dist.	Time for Drift.	Drift Corr.	Final Mean Vel.	Disch Seg.
1	14	1	0.00	0.00			0.00	0.00	0.00	0.00						0.000	0.000		0.000				0.000	0.0
		2	1.00	1.65			0.00	0.00	1.65	2.47	1	0.20	0.5	28	60	0.311	0.290		0.290				0.290	0.7
											2	0.80	0.5	24	60	0.268								
		3	3.00	1.75			0.00	0.00	1.75	3.50	1	0.20	0.5	38	60	0.418	0.407		0.407				0.407	1.4
											2	0.80	0.5	36	60	0.397								
		4	5.00	1.85			0.00	0.00	1.85	3.70	1	0.20	0.5	31	60	0.343	0.471		0.471				0.471	1.7
											2	0.80	0.5	55	60	0.600								
		5	7.00	1.90			0.00	0.00	1.90	3.80	1	0.20	0.5	56	60	0.610	0.552		0.552				0.552	2.1
											2	0.80	0.5	45	60	0.493								
		6	9.00	2.00			0.00	0.00	2.00	4.00	1	0.20	0.5	50	60	0.546	0.519		0.519				0.519	2.1
											2	0.80	0.5	45	60	0.493								
		7	11.00	2.05			0.00	0.00	2.05	4.10	1	0.20	0.5	55	60	0.600	0.573		0.573				0.573	2.3
											2	0.80	0.5	50	60	0.546								
		8	13.00	2.05			0.00	0.00	2.05	2.05	1	0.20	0.5	60	60	0.653	0.626		0.626				0.626	1.3
											2	0.80	0.5	55	60	0.600								
		9	15.00	1.90			0.00	0.00	1.90	3.80	1	0.20	0.5	55	60	0.600	0.562		0.562				0.562	2.1
											2	0.80	0.5	48	60	0.525								

54

Current Meter information :-

Meter No: 1613 Method of Suspending Meter: Weight used with meter: No of compartments: 1

Compartment No.	No. of Sections	Section	R. D. of sections	Water depth (m)	Vertical angle (deg).	Airline depth (m)	Airline Correction (m)	Wetline correction (m)	Corrected Water	Area for section (m)	No. of velocity Observs.	Depth of Obs.	Coeff.	No. of Rev.	Time Taken	Velocity (m/s)	Mean Velocity	Angle of	Corr. Mean vel.	Drift Dist.	Time for Drift.	Drift Corr.	Final Mean Vel.	Disch Seg.
1		10	17.00	1.75			0.00	0.00	1.75	3.50	1	0.20	0.5	38	60	0.418	0.397		0.397				0.397	1.4
											2	0.80	0.5	34	60	0.375								
		11	19.00	1.70			0.00	0.00	1.70	3.40	1	0.20	0.5	40	60	0.439	0.397		0.397				0.397	1.3
											2	0.80	0.5	32	60	0.354								
		12	21.00	1.60			0.00	0.00	1.60	3.20	1	0.20	0.5	26	60	0.290	0.274		0.274				0.274	0.9
											2	0.80	0.5	23	60	0.258								
		13	23.00	1.35			0.00	0.00	1.35	1.62	1	0.60	1	15	60	0.172	0.172		0.172				0.172	0.3
		14	23.40	0.00			0.00	0.00	0.00	0.00						0.000								

Top Width : 23.400 W. Perimeter 25.376 Total Area : 41.195 Total Discharge 19.005

Assistant Executive Engineer
I & C AD Dept.,
Gauging Section No I,
DOWLAISWARAM - 533 125.

Assistant Director
Gauging Sub-Division No. I
DOWLAISWARAM-533125

RESEARCH ASSISTANT
Water Quality Cell / PRL
IRRIGATION & CAD,
DOWLAISWARAM

Flow Measurement Data at KM 34.000 of Gannavaram Branch Canal of GCD Main at Pedapudi (v)

Station Code : GCD MAIN **Station Name :** Gannavaram Baranch **River :** **Sub-Division Office :** Gauging Sub-Division No. I, Dowlaiswaram

Division : WQ Level II Laboratory, Dowlaiswaram

Obs. No : 2 **Year :** 2008 **Month :** 1 **Day :** 3 **Time From** 15.30 **Time To :** 15.45

General Information :-

Mode of	Bridge	Method of Velocity Observation:	Current Meter	River Water Temperature:	
Location of Discharge	Temporary Site	Distance from Permanent Site:		Wind Direction wrt Current:	
Sounding Taken with:	Metallic reel	Sounding Weight	30lb (13.6Kg)	Velocity of Wind:	
Condition of	Slightly silty water	Weather	Clear sky	Strength of Wind:	Slight
Atmospheric Temperature:					

Gauge Information :-

Gauge reading at Start - Permanent:	9.200	Gauge reading at Start -		R L of Zero Gauge - Permanent:
Gauge reading at End - Permanent:	9.200	Gauge reading at End - Temporary:		R L of Zero Gauge - Temporary:
Twin Station Code:		Time of Fall Observation:	Fall	

Current Meter Information :-

Meter No: 1613 Method of Suspending Meter: Gauging Reel Weight used with meter: 30lb No of compartments: 2

Compartment No.	No. of Sections	Section	R. D. of sections	Water depth (m)	Vertical angle (deg).	Airline depth (m)	Airline Correction (m)	Wetline correction (m)	Corrected Water	Area for section (m)	No. of velocity Observs.	Depth of Obs.	Coeff.	No. of Rev.	Time Taken	Velocity (m/s)	Mean Velocity	Angle of	Corr. Mean vel.	Drift Dist.	Time for Drift.	Drift Corr.	Final Mean Vel.	Disch Seg.
1	5	1	0.00	1.80			0.00	0.00	1.80	1.31						0.000	0.000		0.000				0.000	0.0
		2	1.45	2.40			0.00	0.00	2.40	5.22	1	0.20	0.5	51	60	0.557	0.509		0.509				0.509	2.7
											2	0.80	0.5	42	60	0.461								
		3	4.35	2.50			0.00	0.00	2.50	7.25	1	0.20	0.5	58	60	0.632	0.562		0.562				0.562	4.1
											2	0.80	0.5	45	60	0.493								
		4	7.25	2.65			0.00	0.00	2.65	5.76	1	0.20	0.5	52	60	0.568	0.519		0.519				0.519	3.0
											2	0.80	0.5	43	60	0.471								
		5	8.70	2.40			0.00	0.00	2.40	1.74						0.000	0.000		0.000				0.000	0.0
2	5	1	9.70	2.35			0.00	0.00	2.35	1.70		0.60	1	0	60	0.000	0.000		0.000				0.000	0.0
1		2	11.15	2.55			0.00	0.00	2.55	5.55	1	0.20	0.5	51	60	0.557	0.514		0.514				0.514	2.9
											2	0.80	0.5	43	60	0.471								
25		3	14.05	2.25			0.00	0.00	2.25	6.53	1	0.20	0.5	49	60	0.535	0.493		0.493				0.493	3.2
											2	0.80	0.5	41	60	0.450								
1		4	16.95	1.90			0.00	0.00	1.90	4.13	1	0.20	0.5	45	60	0.493	0.445		0.445				0.445	1.8
											2	0.80	0.5	36	60	0.397								
		5	18.40	1.75			0.00	0.00	1.75	1.27						0.000	0.000		0.000				0.000	0.0

Top Width : 17.400 **W. Perimeter** 17.604 **Total Area :** 40.455 **Total Discharge** 17.630

Assistant Executive Engineer
I & CAD Dn. I, A

Assistant Director 27/1/08
Gauging Sub-Division No. I
DOWLAISWARAM-533125

RESEARCH OFFICER
Water Quality Laboratory

Flow Measurement Data at KM 49.640 of Gannavaram Branch Canal of GCD Main at Nagulanka (v)

Station Code : GCD MAIN **Station Name :** Gannavaram Branch **River :** **Sub-Division Office :** Gauging Sub-Division No. I, Dowlaiswaram

Division : WQ Level II Laboratory, Dowlaiswaram

Obs. No : 1 **Year :** 2008 **Month :** 1 **Day :** 4 **Time From** 09.30 **Time To :** 12.30

General Information :-

Mode of	Bridge	Method of Velocity Observation:	Current Meter	River Water Temperature:
Location of Discharge	Temporary Site	Distance from Permanent Site:		Wind Direction wrt Current:
Sounding Taken with:	Metallic reel	Sounding Weight		Velocity of Wind:
Condition of	Slightly silty water	Weather	Clear sky	Strength of Wind:
Atmospheric Temperature:				

Gauge Information :-

Gauge reading at Start - Permanent: 6.80 ft. Gauge reading at Start - R L of Zero Gauge - Permanent:

Gauge reading at End - Permanent: 6.80 ft. Gauge reading at End - Temporary: R L of Zero Gauge - Temporary:

Twin Station Code: Time of Fall Observation: Fall

Current Meter Information :-

Meter No: 1613 Method of Suspending Meter: Weight used with meter: No of compartments: 3

Compartment No.	No. of Sections	Section	R. D. of sections	Water depth (m)	Vertical angle (deg).	Airline depth (m)	Airline Correction (m)	Wetline correction (m)	Corrected Water	Area for section (m)	No. of velocity Observs.	Depth of Obs.	Coeff.	No. of Rev.	Time Taken	Velocity (m/s)	Mean Velocity	Angle of	Corr. Mean vel.	Drift Dist.	Time for Drift.	Drift Corr.	Final Mean Vel.	Disch Seg.
1	5	1	0.00	1.65			0.00	0.00	1.65	0.79						0.000	0.000		0.000				0.000	0.0
		2	0.96	1.80			0.00	0.00	1.80	2.61	1	0.20	0.5	39	60	0.429	0.413		0.413				0.413	1.1
											2	0.80	0.5	36	60	0.397								
		3	2.90	2.30			0.00	0.00	2.30	4.46	1	0.20	0.5	51	60	0.557	0.477		0.477				0.477	2.1
											2	0.80	0.5	36	60	0.397								
		4	4.84	2.30			0.00	0.00	2.30	3.34	1	0.20	0.5	48	60	0.525	0.477		0.477				0.477	1.6
											2	0.80	0.5	39	60	0.429								
		5	5.80	2.10			0.00	0.00	2.10	1.01						0.000	0.000		0.000				0.000	0.0
2	5	1	6.70	2.60			0.00	0.00	2.60	1.25						0.000	0.000		0.000				0.000	0.0
		2	7.66	2.80			0.00	0.00	2.80	4.06	1	0.20	0.5	55	60	0.600	0.493		0.493				0.493	2.0
											2	0.80	0.5	35	60	0.386								
		3	9.60	2.40			0.00	0.00	2.40	4.66	1	0.20	0.5	57	60	0.621	0.514		0.514				0.514	2.4
											2	0.80	0.5	37	60	0.407								
		4	11.54	2.15			0.00	0.00	2.15	3.12	1	0.20	0.5	50	60	0.546	0.530		0.530				0.530	1.7
											2	0.80	0.5	47	60	0.514								
		5	12.50	1.95			0.00	0.00	1.95	0.94						0.000	0.000		0.000				0.000	0.0
3	5	1	13.40	1.60			0.00	0.00	1.60	0.77						0.000	0.000		0.000				0.000	0.0

Current Meter information :-

Meter No: 1613 Method of Suspending Meter: Weight used with meter: No of compartments: 3

Compart-ment No.	No. of Sections	Section	R. D. of sections	Water depth (m)	Vertical angle (deg).	Airline depth (m)	Airline Correction (m)	Wetline correction (m)	Corrected Water	Area for section (m)	No. of velocity Observs.	Depth of Obs.	Coeff.	No. of Rev.	Time Taken	Velocity (m/s)	Mean Velocity	Angle of	Corr. Mean vel.	Drift Dist.	Time for Drift.	Drift Corr.	Final Mean Vel.	Disch Seg.
3		2	14.36	1.75			0.00	0.00	1.75	2.54	1	0.20	0.5	41	60	0.450	0.418		0.418				0.418	1.1
											2	0.80	0.5	35	60	0.386								
		3	16.30	1.60			0.00	0.00	1.60	3.10	1	0.20	0.5	46	60	0.503	0.471		0.471				0.471	1.5
											2	0.80	0.5	40	60	0.439								
		4	18.24	1.20			0.00	0.00	1.20	1.80	1	0.60	1	30	60	0.332	0.332		0.332				0.332	0.6
		5	19.30	0.85			0.00	0.00	0.85	0.45						0.000	0.000		0.000				0.000	0.0

Top Width : 17.500 **W. Perimeter** 17.808 **Total Area :** 34.885 **Total Discharge** 13.963

Assistant Executive Engineer
I & C A D Dept
Gauging Section No. 1,
DOWLAISWARAM - 533 125.

Assistant Director
Gauging Sub-Division No. 1
DOWLAISWARAM

RESEARCH OFFICER
Water Quality Devel. Lab,
IRRIGATION & CAD,
DOWLAISWARAM

1851

Flow Measurement Data at KM 52.000 of Gannavaram Branch Canal of GCD Main at Chakalipalem (v)

Station Code : GCD MAIN **Station Name :** Gannavaram Branch **River :** **Sub-Division Office :** Gauging Sub-Division No. I, Dowlaiswaram

Division : WQ Level II Laboratory, Dowlaiswaram

Obs. No : 2 **Year :** 2008 **Month :** 1 **Day :** 5 **Time From** 15.00 **Time To :** 17.30

General Information :-

Mode of	Bridge	Method of Velocity Observation:	Current Meter	River Water Temperature:	
Location of Discharge	Temporary Site	Distance from Permanent Site:		Wind Direction wrt Current:	
Sounding Taken with:	Metallic reel	Sounding Weight		Velocity of Wind:	
Condition of	Slightly silty water	Weather	Clear sky	Strength of Wind:	
Atmospheric Temperature:					

Gauge Information :-

Gauge reading at Start - Permanent: 6.800 ft. Gauge reading at Start - R L of Zero Gauge - Permanent:

Gauge reading at End - Permanent: 6.800 ft. Gauge reading at End - Temporary: R L of Zero Gauge - Temporary:

Twin Station Code: Time of Fall Observation: Fall

Current Meter Information :-

Meter No: 1613 Method of Suspending Meter: Weight used with meter: No of compartments: 1

Compartment No.	No. of Sections	Section	R. D. of sections	Water depth (m)	Vertical angle (deg).	Airline depth (m)	Airline Correction (m)	Wetline correction (m)	Corrected Water	Area for section (m)	No. of velocity Observs.	Depth of Obs.	Coeff.	No. of Rev.	Time Taken	Velocity (m/s)	Mean Velocity	Angle of	Corr. Mean vel.	Drift Dist.	Time for Drift.	Drift Corr.	Final Mean Vel.	Disch Seg.
1	14	1	0.00	0.00			0.00	0.00	0.00	0.00						0.000	0.000		0.000				0.000	0.0
		2	0.75	1.50			0.00	0.00	1.50	1.69	1	0.20	0.5	43	60	0.471	0.439		0.439				0.439	0.7
											2	0.80	0.5	37	60	0.407								
		3	2.25	1.65			0.00	0.00	1.65	2.47	1	0.20	0.5	56	60	0.610	0.455		0.455				0.455	1.1
											2	0.80	0.5	27	60	0.300								
		4	3.75	1.50			0.00	0.00	1.50	2.25	1	0.20	0.5	45	60	0.493	0.466		0.466				0.466	1.0
											2	0.80	0.5	40	60	0.439								
		5	5.25	1.30			0.00	0.00	1.30	1.95	1	0.60	1	39	60	0.429	0.429		0.429				0.429	0.8
		6	6.75	1.05			0.00	0.00	1.05	1.57	1	0.60	1	31	60	0.343	0.343		0.343				0.343	0.5
		7	8.25	1.75			0.00	0.00	1.75	2.63	1	0.20	0.5	48	60	0.525	0.471		0.471				0.471	1.2
											2	0.80	0.5	38	60	0.418								
		8	9.75	1.55			0.00	0.00	1.55	2.32	1	0.20	0.5	40	60	0.439	0.397		0.397				0.397	0.9
											2	0.80	0.5	32	60	0.354								
		9	11.25	1.80			0.00	0.00	1.80	2.70	1	0.20	0.5	45	60	0.493	0.445		0.445				0.445	1.2
											2	0.80	0.5	36	60	0.397								
		10	12.75	1.95			0.00	0.00	1.95	2.93	1	0.20	0.5	42	60	0.461	0.407		0.407				0.407	1.2
											2	0.80	0.5	32	60	0.354								

Current Meter information :-

Meter No: 1613 Method of Suspending Meter: Weight used with meter: No of compartments: 1

Compartment No.	No. of Sections	Section	R. D. of sections	Water depth (m)	Vertical angle (deg).	Airline depth (m)	Airline Correction (m)	Wetline correction (m)	Corrected Water	Area for section (m)	No. of velocity Observs.	Depth of Obs.	Coeff.	No. of Rev.	Time Taken	Velocity (m/s)	Mean Velocity	Angle of	Corr. Mean vel.	Drift Dist.	Time for Drift.	Drift Corr.	Final Mean Vel.	Disch Seg.
1		11	14.25	1.85			0.00	0.00	1.85	2.78	1	0.20	0.5	42	60	0.461	0.423		0.423				0.423	1.2
											2	0.80	0.5	35	60	0.386								
		12	15.75	1.50			0.00	0.00	1.50	2.25	1	0.20	0.5	41	60	0.450	0.413		0.413				0.413	0.9
											2	0.80	0.5	34	60	0.375								
		13	17.25	1.35			0.00	0.00	1.35	1.79	1	0.60	1	34	60	0.375	0.375		0.375				0.375	0.7
		14	18.40	0.00			0.00	0.00	0.00	0.00						0.000	0.000		0.000				0.000	0.0
Top Width :			**18.400**		**W. Perimeter**			**20.247**		**Total Area :**		**27.326**				**Total Discharge**			**11.619**					

27/1/08
Assistant Executive Engineer
I & C AD Dept.
Gauging Section No 1,
DOWLAISWARAM – 533 125.

25/1/08
Assistant Director
Gauging Sub-Division No. 1
DOWLAISWARAM-533125

25.1.08
RESEARCH OFFICER
Water Quality Level II Lab.
IRRIGATION & CAD.
DOWLAISWARAM

1
0
1

Flow Measurement Data at KM 0.950 of Kadali Minor of Gannavaram Branch of GCD Main

Station Code : GCD MAIN **Station Name :** Kadali Minor **River :** **Sub-Division Office :** Gauging Sub-Division No. I, Dowlaiswaram

Division : WQ Level II Laboratory, Dowlaiswaram

Obs. No : 1 **Year :** 2008 **Month :** 1 **Day :** 5 **Time From** 09.00 **Time To :** 15.00

General Information :-

Mode of	Bridge	Method of Velocity Observation:	Current Meter	River Water Temperature:	
Location of Discharge	Temporary Site	Distance from Permanent Site:		Wind Direction wrt Current:	
Sounding Taken with:	Metallic reel	Sounding Weight		Velocity of Wind:	
Condition of	Slightly silty water	Weather	Clear sky	Strength of Wind:	
Atmospheric Temperature:					

Gauge Information :-

Gauge reading at Start - Permanent:	Gauge reading at Start -	R L of Zero Gauge - Permanent:
Gauge reading at End - Permanent:	Gauge reading at End - Temporary:	R L of Zero Gauge - Temporary:
Twin Station Code:	Time of Fall Observation: Fall	

Current Meter Information :-

Meter No: 1613 Method of Suspending Meter: Weight used with meter: No of compartments: 3

Compartment No.	No. of Sections	Section	R. D. of sections	Water depth (m)	Vertical angle (deg).	Airline depth (m)	Airline Correction (m)	Wetline correction (m)	Corrected Water	Area for section (m)	No. of velocity Observs.	Depth of Obs.	Coeff.	No. of Rev.	Time Taken	Velocity (m/s)	Mean Velocity	Angle of	Corr. Mean vel.	Drift Dist.	Time for Drift.	Drift Corr.	Final Mean Vel.	Disch Seg.
1	5	1	0.00	0.60			0.00	0.00	0.60	0.18						0.000	0.000		0.000				0.000	0.0
		2	0.60	0.65			0.00	0.00	0.65	0.57	1	0.60	1	49	60	0.535	0.535		0.535				0.535	0.3
		3	1.75	0.70			0.00	0.00	0.70	0.61	1	0.60	1	53	60	0.578	0.578		0.578				0.578	0.4
		4	2.35	0.65			0.00	0.00	0.65	0.57	1	0.60	1	22	60	0.247	0.247		0.247				0.247	0.1
		5	3.50	0.60			0.00	0.00	0.60	0.35						0.000	0.000		0.000				0.000	0.0
2	5	1	4.10	0.75			0.00	0.00	0.75	0.22						0.000	0.000		0.000				0.000	0.0
		2	4.70	1.00			0.00	0.00	1.00	0.88	1	0.60	1	30	60	0.332	0.332		0.332				0.332	0.3
		3	5.85	1.05			0.00	0.00	1.05	1.21	1	0.60	1	47	60	0.514	0.514		0.514				0.514	0.6
		4	7.00	0.95			0.00	0.00	0.95	0.83	1	0.60	1	48	60	0.525	0.525		0.525				0.525	0.4
		5	7.60	0.75			0.00	0.00	0.75	0.22						0.000	0.000		0.000				0.000	0.0
3	5	1	8.20	0.65			0.00	0.00	0.65	0.20						0.000	0.000		0.000				0.000	0.0
		2	8.80	0.70			0.00	0.00	0.70	0.61	1	0.60	1	45	60	0.493	0.493		0.493				0.493	0.3
		3	9.95	0.70			0.00	0.00	0.70	0.81	1	0.60	1	37	60	0.407	0.407		0.407				0.407	0.3
		4	11.10	0.50			0.00	0.00	0.50	0.44	1	0.60	1	23	60	0.258	0.258		0.258				0.258	0.1
		5	11.70	0.40			0.00	0.00	0.40	0.12						0.000	0.000		0.000				0.000	0.0

Top Width : 10.500 **W. Perimeter** 10.622 **Total Area :** 7.809 **Total Discharge** 2.890

Assistant Executive Engineer
I & C A.D Dept,
Gauging Sub-Division No I,
DOWLAISWARAM – 533 125

Assistant Director
Gauging Sub-Division No. I
DOWLAISWARAM-533125

RESEARCH OFFICER
Water Quality

Flow Measurement Data at KM 6.500 of Kadali Minor of Gannavaram Branch of GCD Main

Station Code : GCD MAIN **Station Name :** Kadali Minor **River :**

Sub-Division Office : Gauging Sub-Division No. I, Dowlaiswaram

Division : WQ Level II Laboratory, Dowlaiswaram

Obs. No : 2 **Year :** 2008 **Month :** 1 **Day :**5 **Time From** 15.00 **Time To :** 17.15

General Information :-

Mode of	Bridge	Method of Velocity Observation:	Current Meter	River Water Temperature:	
Location of Discharge	Temporary Site	Distance from Permanent Site:		Wind Direction wrt Current:	
Sounding Taken with:	Metallic reel	Sounding Weight		Velocity of Wind:	
Condition of	Slightly silty water	Weather	Clear sky	Strength of Wind:	
Atmospheric Temperature:					

Gauge Information :-

Gauge reading at Start - Permanent: Gauge reading at Start - R L of Zero Gauge - Permanent:

Gauge reading at End - Permanent: Gauge reading at End - Temporary: R L of Zero Gauge - Temporary:

Twin Station Code: Time of Fall Observation: Fall

Current Meter Information :-

Meter No: 1613 Method of Suspending Meter: Weight used with meter: No of compartments: 2

Compartment No.	No. of Sections	Section	R. D. of sections	Water depth (m)	Vertical angle (deg).	Airline depth (m)	Airline Correction (m)	Wetline correction (m)	Corrected Water	Area for section (m)	No. of velocity Observs.	Depth of Obs.	Coeff.	No. of Rev.	Time Taken	Velocity (m/s)	Mean Velocity	Angle of	Corr. Mean vel.	Drift Dist.	Time for Drift.	Drift Corr.	Final Mean Vel.	Disch Seg.
																0.000	0.000		0.000				0.000	0.0
1	5	1	0.00	0.65			0.00	0.00	0.65	0.21						0.407	0.407		0.407				0.407	0.3
		2	0.66	0.70			0.00	0.00	0.70	0.70	1	0.60	1	37	60	0.204	0.204		0.204				0.204	0.2
		3	2.00	0.70			0.00	0.00	0.70	0.94	1	0.60	1	18	60	0.194	0.194		0.194				0.194	0.1
		4	3.35	0.55			0.00	0.00	0.55	0.55	1	0.60	1	17	60	0.000	0.000		0.000				0.000	0.0
		5	4.00	0.40			0.00	0.00	0.40	0.13						0.000	0.000		0.000				0.000	0.0
2	5	1	4.60	0.55			0.00	0.00	0.55	0.18						0.322	0.322		0.322				0.322	0.3
		2	5.26	0.90			0.00	0.00	0.90	0.90	1	0.60	1	29	60	0.365	0.365		0.365				0.365	0.5
		3	6.60	0.95			0.00	0.00	0.95	1.28	1	0.60	1	33	60	0.322	0.322		0.322				0.322	0.3
		4	7.95	0.90			0.00	0.00	0.90	0.90	1	0.60	1	29	60	0.000	0.000		0.000				0.000	0.0
		5	8.60	0.75			0.00	0.00	0.75	0.24														

Top Width : 8.000 **W. Perimeter** 8.133 **Total Area :** 6.039 **Total Discharge** 1.629

1621

Assistant Executive Engineer 25/1/08
I & C A D Dept,
Gauging Section No I,
DOWLAISWARAM-533 125.

Assistant Director 25/1/08
Gauging Sub-Division No. 1
DOWLAISWARAM-533 125

RESEARCH OFFICER 25/1/08
Water Quality Level II Lab,
IRRIGATION & CAD,
DOWLAISWARAM

(IV)

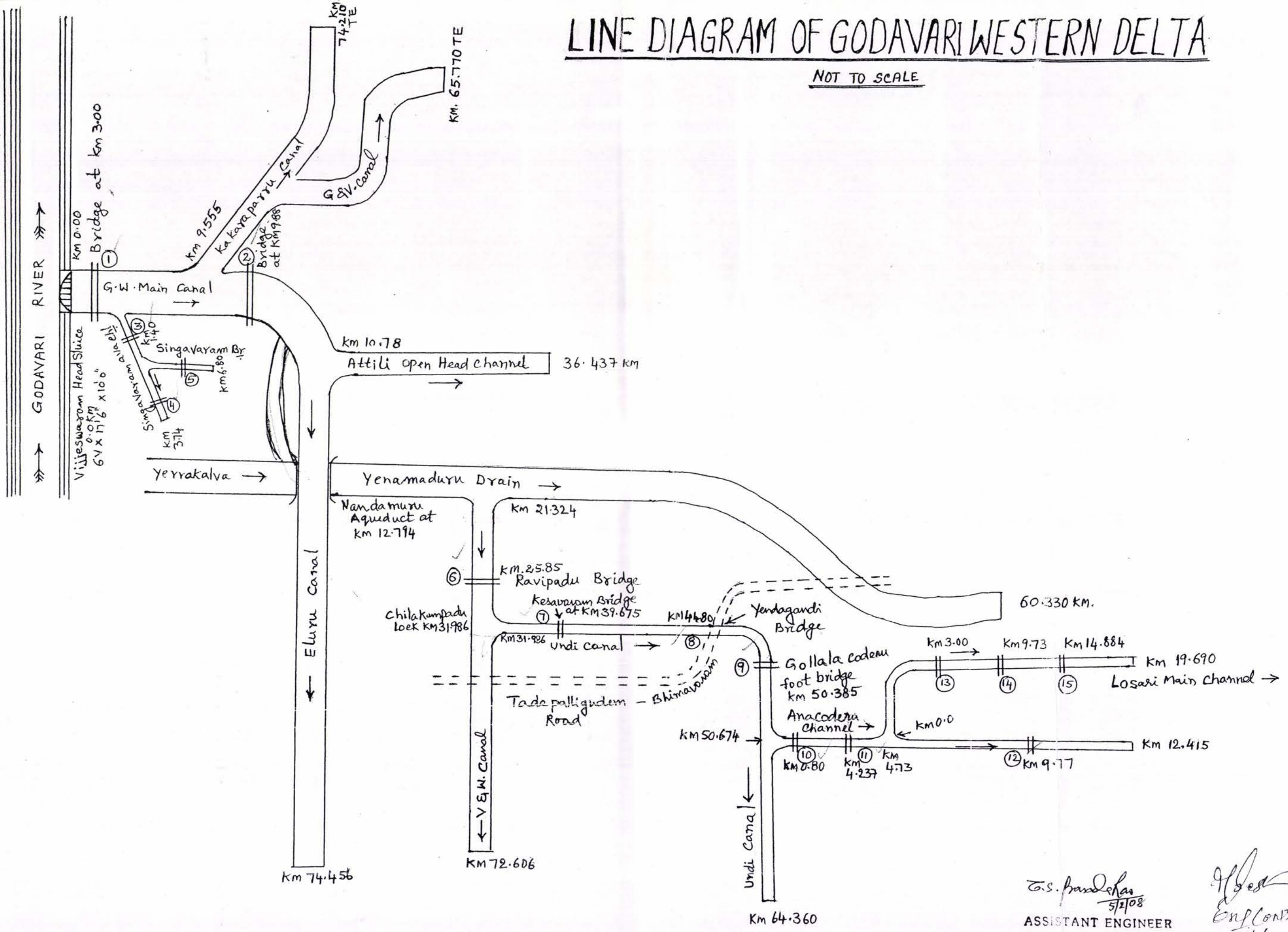
GOVERNMENT OF ANDHRA PRADESH
IRRIGATION & CAD DEPARTMENT

WATER USE EFFICIENCY STUDIES
ON
GODAVARI WESTERN DELTA

-63-

LINE DIAGRAM OF GODAVARI WESTERN DELTA

NOT TO SCALE



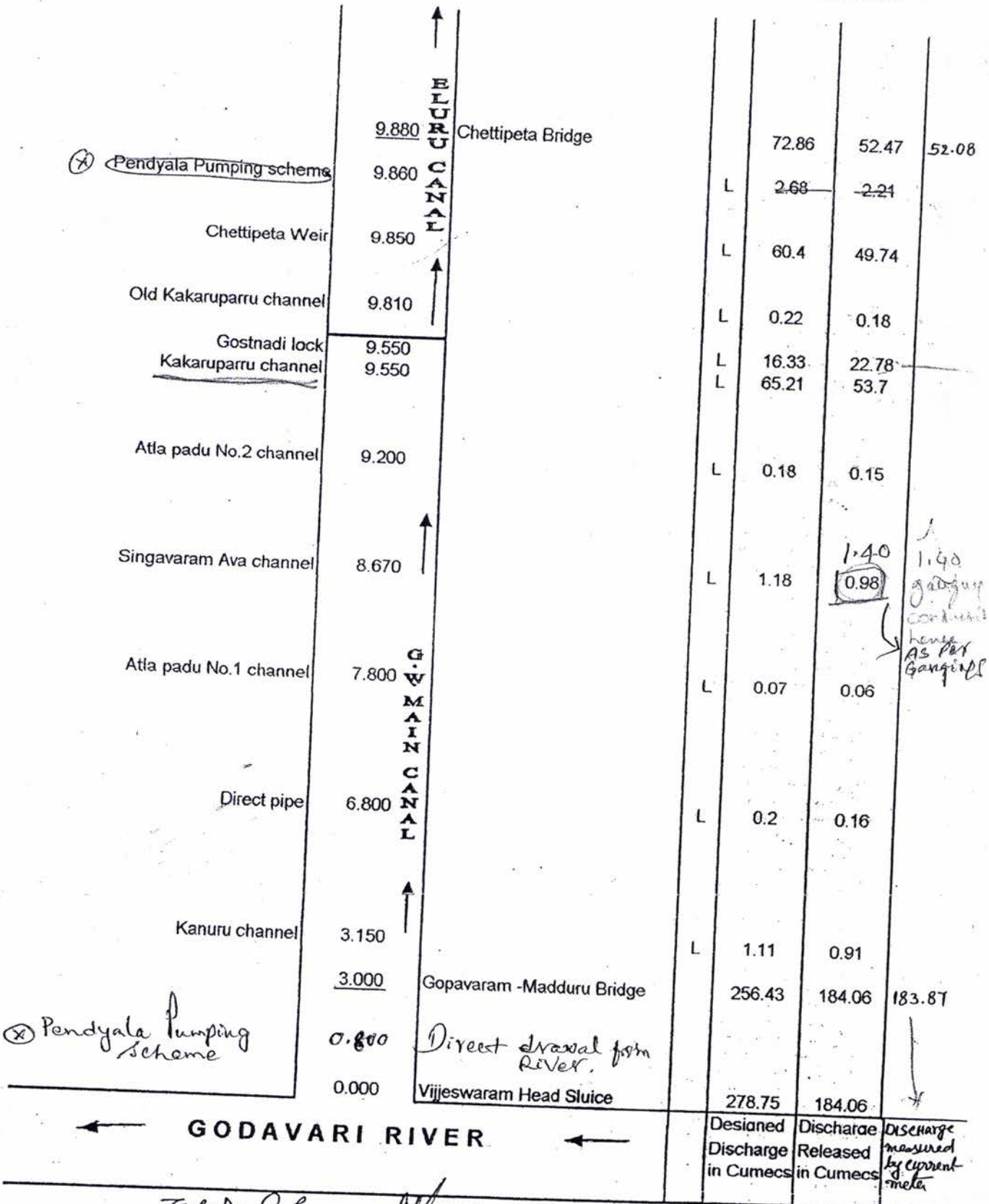
-64-

T.S. Prasad Rao
5/2/08
ASSISTANT ENGINEER
GAUGING SECTION-V (Div)
ELURU

Exe Engineer
I C / Eluru

FLOW DIAGRAM OF G.W.MAIN CANAL

DT. 28.12.2007



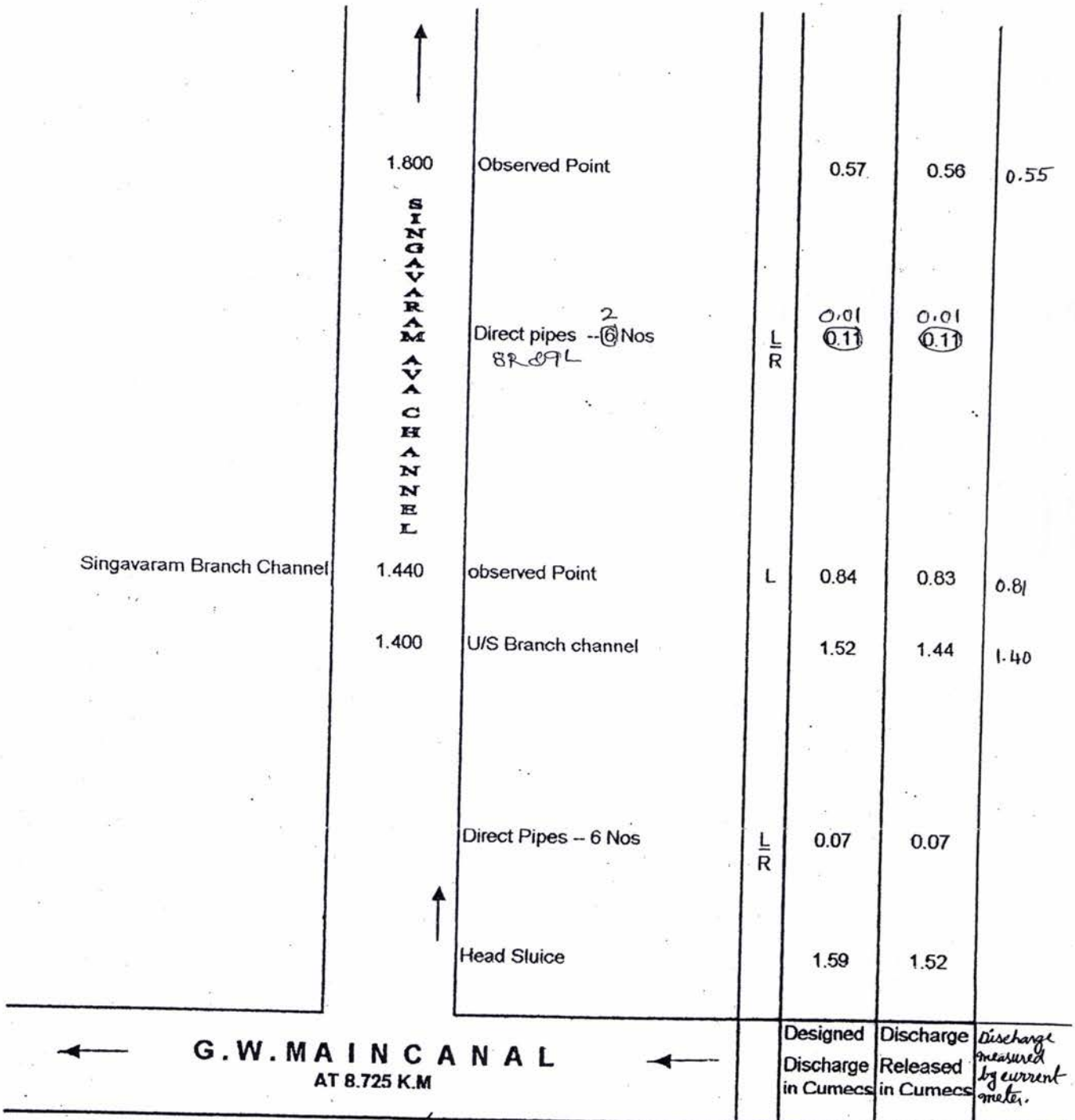
		Desianed Discharge in Cumecs	Discharge Released in Cumecs	Discharge measured by current meter
		72.86	52.47	52.08
	L	~~2.68~~	~~2.21~~	
	L	60.4	49.74	
	L	0.22	0.18	
	L	16.33	22.78	
	L	65.21	53.7	
	L	0.18	0.15	
			1.40	1.40
	L	1.18	0.98	Gadguy conduct hents As per Gangiles
	L	0.07	0.06	
	L	0.2	0.16	
	L	1.11	0.91	
		256.43	184.06	183.87
		278.75	184.06	

T.S. Prasada Rao 5/2/08
ASSISTANT ENGINEER

(25)

FLOW DIAGRAM OF SINGAVARAM AVA CHANNEL

DT: 28.12.2007



T.S. Prasada Rao 5/2/08
ASSISTANT ENGINEER
GAUGING SECTION-V (Div)

Sd/- C/E
Engg. Consultant

FLOW DIAGRAM OF V&W. CANAL

DT. 29.12.2007

	↑					
	25.850	Ravipadu Bridge		59.58	53.6	52.73
Rallagandi Channel	25.416		L	0.1	0.09	
	↑					
Ravipadu Channel	25.076		L	0.97	0.94	
	V & W CANAL					
		Head Sluice		60.65	54.65	
← YENAMADURU DRAIN AT K.M 21.324 →				Designed Discharge in Cumecs	Discharge Released in Cumecs	Discharge measured by current meter.

T. S. Prasada Rao 5/1/08
ASSISTANT ENGINEER
GAUGING SECTION-V (Div)
ELURU

Engg Consultant

FLOW DIAGRAM OF UNDI CANAL DT. 29.12.07,30-12-07

contd.p.2

				Designed Discharge in Cumecs	Discharge Released in Cumecs	Current - Meter Discharge
	44.6	Yendagandi Bridge		23.57	21.48	20.55
Direct Pipe (2)	44.498		L	0.06	0.05	
Direct Pipe (9)	44.289		L	0.01	0.01	
	44.286	Garagaparra Parallel Channel 9	R	0.48	0.43	
Direct Pipe (1)	44.200		L	0.01	0.01	
	44.085	Yendagandi Channel 8	R	0.34	0.31	
	43.419	Uppuluru side vent 7	R	0.06	0.06	
	43.418	Uppuluru Channel 6	R	1.97	1.76	
	40.369	Panduva parallel Channel 5	R	0.46	0.41	
	40.365	Panduva Channel 4	R	0.68	0.61	
Kesavaram II Channel 3	39.773		L	0.08	0.07	
	39.779	Kesavaram Sluice 2	R	0.04	0.04	
	39.767	Kakinada Sluice 1	R	0.1	0.09	
	39.675	Kesavaram Bridge		27.87	25.36	25.22
	38.795	Aredu Channel	R	0.63	1.43 (0.43)	
Kesavaram No.1 Channel	38.530		L	0.02	0.02	
	37.321	Muggallu Channel (Parallel)	R	0.16	0.14	
	37.320	Muggallu Channel	R	0.37	0.3	
	36.725	Pippara No.3 Sluice	R	0.03	0.02	
	36.325	Ganapavaram Channel	R	1.2	1.05	
	36.090	Pippara No 2 Channel	R	0.01	0.01	459
	34.662	Kommaro vent	R	0.05	0.02	
	34.661	Kommaro Channel	R	1.82	1.59	
	34.659	Kommaro right vent	R	0.01	0.01	
	33.665	Direct Pipe (1)	R	0.1	0.09	
Chilakampadu Lock	31.986			33.3	21.11 (30.04)	

→ V & W CANAL AT 31.986 K.M →

FLOW DIAGRAM OF UNDI CANAL DT. 29.12.07,30-12-07

	50.385	Gollalakoderu foot Bridge		21.55	19.6	18.43
Direct Pipe (3)	50.379		L	0.02	0.01	
	49.660	Mahadeva patnam lower parellel Channel 14	R	0.11	0.1	
(2)	49.527	Direct Pipe	R	0.02	0.01	
	48.881	Mahadeva patnam parellel Channel 13	R	0.22	0.2	
	48.880	Mahadeva patnam Channel 12	R	0.61	0.57	
	48.361	Chilukuru side vent 11	R	0.05	0.04	
	48.360	Chilukuru Channel 1	R	1	0.94	
				23.57	21.48	
Undi Canal				Designed Discharge in Cumecs	Discharge Released in Cumecs	Current - Meter Discharge

T.S. Prasada Rao 5/2/08
ASSISTANT ENGINEER
GAUGING SECTION-V (Div)
ELURU

Exy Engineer

FLOW DIAGRAM OF ANACODERU CHANNEL

DT. 30.12.07,31-12-07

	9.170	Observed Point		1.48	—	0.98
		Direct Pipes -- 8 Nos	L/R	0.12	0.060 (0.1)	
	7.064	Rayalam Pipes Channel	R	0.16	0.085 (0.14)	
		Direct Pipe -- 5 Nos	L/R	0.05	0.022 (0.04)	
	6.288	Vempedu Branch	R	0.72	0.37 (0.63)	
	6.284	Direct Pipe -- 1 No	R	0.01	0.006 (0.01)	
	5.335	Balusumudi Branch Ch 1	L	0.22	0.116	
					1.886	
L . M . Channel	4.729		L	3.63	(3.18)	
		Direct Pipes -- 5 Nos	L/R	0.06	0.032 (0.05)	
	4.237	Bhimavaram (V) Limits		6.23	~~1.834~~ (3.68)	3.60
		Direct Pipes -- 8 5 Nos	L/R	0.2	0.055 (0.08)	
	0.800	Observed Point		6.43	3.76	3.74
	0.000	Head Sluice		6.43	3.88	
UNDI CANAL ⟶ **AT 50.764 K.M**				Designed Discharge in Cumecs	Discharge Released in Cumecs	Discharge measured by current meter.

T. S. Prasada Rao 5/2/08
ASSISTANT ENGINEER

Executive Engineer

Statement Showing the Designed discharges, Released discharges and Discharge by current meter in G.W. Delta

SL. No	Name of the places where current meter studies conducted	Designed Discharge (m3/sec)	Released Discharge (m3/sec)	Discharge byCurrent.Meter(m3/sec)	
1.	G.W.Main canal at K.M.0.00	278.75	184.06		
2.	G.W.Main canal at K.M.3.00 near Gopavaram to Madduru bridge.	256.43	184.06	183.87	
3	Eluru canal at K.M.9.880 at Chettipeta bridge.	72.86	52.47	52.08	
4.	Singavaram Ava Channel at k.m. 0.00 (K.M.8.725 Main Channel)	1.59	1.52		
5.	Singavaram Ava channel (u/s of KM 1.40)	1.52	1.44	1.40	
6.	Singavaram Ava channel D/s of road bridge at K.M.1.80	0.57	0.56	0.55	
7.	Singavaram branch channel at K.M.0.20	0.84	0.83	0.81	
8.	V&W. canal at K.M. 0.00 (km.21.324 main canal)	60.65	54.65		
9..	V&W. canal at Ravipadu bridge at km.25.85	59.58	53.6	52.73	
10.	Undi canal @km.0.00 (km. 31.986 main canal) at Chilakampadu lock.	33.30	30.04		
11.	Undi canal at km. 39.675 at Kesavaram bridge.	27.87	25.36	25.22	
12.	Undi canal at Yendagandi bridge km. 44.60.	23.57	21.48	20.55	
13.	Undi canal at km. 50.385 at Gollalakoderu footbridge.	21.55	19.60	18.43	
14.	Anakoderu channel at km.0.00 (taking off at km.50.674 of Undi canal)	6.43	3.88		
15.	Anakoderu channel at km. 0.80.	6.43	3.76	3.74	

16.	Anakoderu channel at km.4.237 at Bhimavaram village limits.	6.23	3.68	3.6	
17.	Anakoderu channel at km. 9.17.	1.48	No gauge	0.98	
18.	Losari Main channel at km.0.00 (taking of at km.4.729 of Anakoderu channel)	3.62	2.41		
19.	Lasari Main channel at km 3.00 (u/s of current transformar.)	2.72	2.21	2.12	
20.	Lasari Main channel near Gollavanitippa (v) (u/s of culvert at km.9.73)	1.81	No gauge	1.43	
21.	Lasari Main canal near Gutlapadu (v) (u/s of culvert at km.14.884)	0.54	No gauge	0.31	

B.S. Prasad Rao 5/2/08
ASSISTANT ENGINEER
GAUGING SECTION-V (Div)
ELURU

SE/Ell

EXECUTIVE ENGINEER
GAUGING SUB-DIVISION
IRRIGATION & CAD DEPT
GUNTUR

EXECUTIVE ENGINEER
GAUGING DIVISION, GUNTUR-4

-22-

Statement Showing canal width of water level, wetted perimeter, Total area & Discharge by current meter in G.W. Delta

SL. No	Name of the places where current meter studies conducted	Width of Canal at Water level (M)	Wetted Perimeter (M)	Total Area (M2)	Discharge byCurrent.Meter (m3/sec)	
1.	G.W.Main canal at K.M.3.00 near Gopavaram to Madduru Bridge	76.00	77.71	252.00	183.89	
2.	Eluru canal at K.M.9.880 at Chettipeta bridge.	54.00	54.13	91.92	52.08	
3.	Singavaram Ava channel (u/s of KM 1.40)	5.50	6.03	3.84	1.4	
4.	Singavaram Ava channel D/s of road bridge at km 1.80	3.7	4.09	1.85	0.55	
5.	Singavaram branch channel at km.0.20	6.00	6.28	3.07	0.81	
6.	V&W. canal at Ravipadu bridge at km.25.85	28.20	28.46	71.756	52.73	
7.	Undi canal at km. 39.675 at Kesavaram bridge.	22.00	23.58	42.60	25.22	
8.	Undi canal at Yendagandi bridge km. 44.60.	23.10	23.46	48.507	20.55	
9	Undi canal at km. 50.385 at Gollalakoderu bridge.	29.00	29.61	52.20	18.43	
10.	Anakoderu channel at km. 0.80.	10.80	11.00	13.50	3.74	
11.	Anakoderu channel at km.4.237 at Bhimavaram village limits.	11.80	11.80	13.57	3.6	
12.	Anakoderu channel at km. 9.17.	5.70	6.13	3.75	0.98	
13.	Lasari Main channel at km 3.00	9.50	9.91	7.36	2.12	
14.	Lasari Main channel near Gollavanitippa (v) (u/s of culvert at km.9.73)	9.00	9.42	6.97	1.43	
15.	Lasari Main canal near Gutlapadu (v) (u/s of culvert at km.14.884)	4.70	5.01	2.30	0.31	

G. S. Prasada Rao 5/2/08
ASSISTANT ENGINEER
GAUGING SECTION-V (Div)
ELURU

EE/Con

-73-

PROFORMA

Recording current meter observations and discharge computaions.

Canal G.W.Main canal

Current meter : Type: cup / No.595
TYPE

Location of observation: K.M. 3.00 near Gopavaram to Madduru bridge.
Date of observation : 28/12/07
Name/s of observer: C.S.Prasad Rao, Assistant Engineer

Sl. No	Distance from Ref.point (m)	Comp No.	Width of compartment (m)	Sounding depth (d) (m)	Area of comp (m2)	Current Meter Observations				Velocity in (m/sec)	Mean velocity (m/Sec)	Discharge (6) x(12) (m3/sec)	Designed Discharge	Released Discharge	Remarks
						Fraction of depth	Value (m)	No. of Revolution	Time taken (Seconds)						
1	2	3	4	5	6	7	8	9	10	11	12	13	14		
	0														
	3		3	2.15	6.45	0.2d	0.43	15	40	0.2568					
						0.8d	1.72	8	40	0.1374	0.1971	1.2713			
	6		3	2.9	8.7	0.2d	0.58	14	40	0.2398					
						0.8d	2.32	8	40	0.1374	0.1886	1.6408			
	9		3	3.45	10.35	0.2d	0.69	45	40	0.7686					
						0.8d	2.76	34	40	0.5809	0.6747	6.9831			
	12		3	3.85	11.55	0.2d	0.77	51	40	0.8709					
						0.8d	3.08	40	40	0.6833	0.7771	8.9755			
	15		3	3.9	11.7	0.2d	0.78	52	40	0.888					
						0.8d	3.12	32	40	0.5468	0.7174	8.3935			
	18		3	4.2	12.6	0.2d	0.84	63	40	1.0756					
						0.8d	3.36	49	40	0.8368	0.9562	12.0481			
	21		3	4.3	12.9	0.2d	0.86	41	40	0.7					
						0.8d	3.44	44	40	0.751	0.725	9.3525			
	24		3	4.3	12.9	0.2d	0.86	70	40	1.195					
						0.8d	3.44	55	40	0.939	1.067	13.7643			
	27		3	4.3	12.9	0.2d	0.86	71	40	1.212					
						0.8d	3.44	54	40	0.922	1.067	13.7643			

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PROFORMA

Recording current meter observations and discharge computaions.

Canal: Current meter : Type : / No.

Location of observation :
Date of observation :
Name/s of obse :

Sl. No	Distance from Ref.point (m)	Comp No.	Width of compartment (m)	Sounding depth (d) (m)	Area of comp (m2)	Current Meter Observations				Velocity in (m/sec)	Mean velocity (m/Sec)	Discharge (6) x(12) (m3/sec)	Designed Discharge	Released Discharge	Remarks
						Fraction of depth	Value (m)	No. of Revolution	Time taken (Seconds)						
1	2	3	4	5	6	7	8	9	10	11	12	13	14		
	30		3	3.3	9.9	0.2d	0.66	43	40	0.734	0.64	6.336			
						0.8d	2.64	32	40	0.547					
	33		3	4.1	12.3	0.2d	0.82	65	40	1.11	0.982	12.0786			
						0.8d	3.28	50	40	0.854					
	36		3	4.1	12.3	0.2d	0.82	66	40	1.127	1.007	12.3861			
						0.8d	3.28	52	40	0.888					
	39		3	3.9	11.7	0.2d	0.78	31	40	0.529	0.649	7.5933			
						0.8d	3.12	42	40	0.717					
	42		3	3.9	11.7	0.2d	0.78	63	40	1.085	0.978	11.4426			
						0.8d	3.12	51	40	0.871					
	45		3	3.9	11.7	0.2d	0.78	62	40	1.058	0.956	11.1852			
						0.8d	3.12	50	40	0.854					
	48		3	3.7	11.1	0.2d	0.74	28	40	0.479	0.543	6.0273			
						0.8d	2.96	35	40	0.607					
	51		3	4	12	0.2d	0.8	55	40	0.939	0.853	10.236			
						0.8d	3.2	45	40	0.768					
	54		3	4	12	0.2d	0.8	49	40	0.837	0.717	8.604			
						0.8d	3.2	36	40	0.598					
	57		3	4	12	0.2d	0.8	46	40	0.795	0.679	8.148			
						0.8d	3.2	33	40	0.564					

PROFORMA

Recording current meter observations and discharge computaions.

Canal: Current meter : Type : / No.

Location of observation :
Date of observation :
Name/s of obs :

Sl. No.	Distance from Ref.point (m)	Comp No.	Width of compartment (m)	Sounding depth (d) (m)	Area of comp (m2)	Current Meter Observations				Velocity in (m/sec)	Mean velocity (m/Sec)	Discharge (6) x(12) (m3/sec)	Designed Discharge	Released Discharge	Remarks
						Fraction of depth	Value (m)	No. of Revolution	Time taken (Seconds)						
1	2	3	4	5	6	7	8	9	10	11	12	13	14		
	60		3	3.6	10.8	0.2d	0.72	40	40	0.683	0.615	6.642			
						0.8d	2.88	32	40	0.547					
	63		3	3.2	9.6	0.2d	0.64	16	40	0.274	0.239	2.2944			
						0.8d	2.56	12	40	0.205					
	66		3	2.95	8.85	0.2d	0.59	25	40	0.427	0.376	3.3276			
						0.8d	2.36	19	40	0.325					
	69		3	1.4	4.2	0.2d	0.28	13	40	0.223	0.291	1.2222			
						0.8d	1.12	21	40	0.359					
	72		3	0.6	1.8	0.2d	0.12	5	40	0.085	0.085	0.1537			
						0.8d	0.48		--						
	76		4	0											
					252							183.8704			
					sqm							or183.87	256.43	184.06	
													m3/sec	m3/sec	

T.S. Prasada Rao 5/2/08
ASSISTANT ENGINEER
GAUGING SECTION-V (Div)
ELURU

M Ladi 8/2/08
Exg Consultancy
Irrigation Circle
Eluru

-26-

PROFORMA

Recording current meter observations and discharge computaions.

Canal: Eluru Canal

Current meter · Cup Type No:595

Location of observation : K.M.9.88 on Chettipeta bridge
Date of observation : 28.12.2007
Name/s of observer : C.S. Prasad Rao A.E.

Sl. No	Distance from Ref.point (m)	Comp No.	Width of compartment (m)	Sounding depth (d) (m)	Area of comp (m2)	Current Meter Observations				Velocity in (m/sec)	Mean velocity (m/Sec)	Discharge (6) x(12) (m3/sec)	Designed Discharge	Released Discharge	Remarks
						Fraction of depth	Value (m)	No. of Revolution	Time taken (Seconds)						
1	2	3	4	5	6	7	8	9	10	11	12	13	14		
	0	I	1.085	0.3	0.3255						0.0948	0.0308			
	2.17		3.25	0.3	0.975	0.2d	0.06	7	40	0.1204	0.0948	0.0924			
						0.8d	0.24	4	40	0.0692					
	6.5		4.33	0.7	3.031	0.2d	0.14	6	40	0.1033	0.082	0.2485			
						0.8d	0.56	3.5	40	0.0607					
	10.83		3.25	1.5	4.875	0.2d	0.3	17	40	0.291	0.2227	1.0856			
						0.8d	1.2	9	40	0.1545					
	13		1.085	1.5	1.6275						0.2227	0.3624			
	14.3	II	1.135	1.9	2.1565						0.6833	1.4735			
	16.57		3.4	1.9	6.46	0.2d	0.38	42	40	0.7174	0.6833	4.4141			
						0.8d	1.52	38	40	0.6492					
	21.1		4.53	2.1	9.513	0.2d	0.42	37	40	0.6321	0.5041	4.7955			
						0.8d	1.68	22	40	0.3762					
	25.63		3.4	2.4	8.16	0.2d	0.48	54	40	0.9221	0.7131	5.8189			
						0.8d	1.92	29.5	40	0.5042					
	27.9		1.135	2.4	2.724						0.7131	1.9425			

Total Discharges

PROFORMA

Recording current meter observations and discharge computaions.

Cana Eluru canal

Current meter : Type : Cup / No.595

Location of observatio K.M.9.88 on Chettipeta bridge
Date of observation 28/12/07
Name/s of obse : C.S. Prasada Rao

Sl. No	Distance from Ref.point (m)	Comp No.	Width of compartment (m)	Sounding depth (d) (m)	Area of comp (m2)	Current Meter Observations				Velocity in (m/sec)	Mean velocity (m/Sec)	Discharge (6) x(12) (m3/sec)	Designed Discharge (m3/sec)	Released Discharge (m3/sec)	Remarks
						Fraction of depth	Value (m)	No. of Revolution	Time taken (Seconds)						
1	2	3	4	5	6	7	8	9	10	11	12	13	14		
	29.2	III	1.135	2	2.27						0.6662	1.5122			
	31.47		3.4	2	6.8	0.2d	0.4	48	40	0.8197	0.6662	4.5301			
						0.8d	1.6	30	40	0.5127					
	36		4.53	2	9.06	0.2d	0.4	44	40	0.7515	0.615	5.5719			
						0.8d	1.6	28	40	0.4786					
	40.53		3.4	1.5	5.1	0.2d	0.3	43	40	0.7345	0.6065	3.0931			
						0.8d	1.2	28	40	0.4786					
	42.8		1.135	1.5	1.7025						0.6065	1.0325			
	44.1	IV	1.15	2	2.3						0.6747	1.5518			
	46.4		3.45	2	6.9	0.2d	0.4	48	40	0.8197	0.6747	4.6554			
						0.8d	1.6	31	40	0.5298					
	51		4.6	1.9	8.74	0.2d	0.38	42.5	40	0.7259	0.5937	5.1839			
						0.8d	1.52	27	40	0.4615					
	55.6		3.45	2	6.9	0.2d	0.4	39	40	0.6662	0.5084	3.508			
						0.8d	1.6	20.5	40	0.3507					
	57.9		1.15	2	2.3						0.5084	1.1693			
					91.92						Total	52.0724 or			
					sqm							52.08	72.86	52.47	

- 46 -

C.S. Prasada Rao 5/2/08
ASSISTANT ENGINEER
GAUGING SECTION-V (Div)
ELURU

Dy Executive Engineer

PROFORMA

Recording current meter observations and discharge computaions.

Canal : Singavaram Ava Channel

Current meter : Type : Pigmy / No.566

Location of observation : U/S of 1.40 K.M.
Date of observation : 29/12/07
Name/s of observer : C.S.Prasad Rao AE

Sl. No.	Distance from Ref.point (m)	Comp No.	Width of compa rtment (m)	Sounding depth (d) (m)	Area of comp (m2)	Current Meter Observations				Velocity in (m/sec)	Mean velocity (m/Sec)	Discharge (6) x(12) (m3/sec)	Designed discharge (m3/sec)	Released discharge (m3/sec)	Remarks
						Fraction of depth	Value (m)	No. of Revol utions	Time taken (Seconds)						
1	2	3	4	5	6	7	8	9	10	11	12	13	14		
	0														
	1		1	0.4	0.4	0.2d	0.08	24	40	0.2251	0.1926	0.077			
						0.8d	0.32	16	40	0.1601					
	2		1	0.85	0.85	0.2d	0.17	51	40	0.4446	0.3958	0.3364			
						0.8d	0.68	39	40	0.3471					
	3		1	1.05	1.05	0.2d	0.21	53	40	0.4609	0.4121	0.4327			
						0.8d	0.84	41	40	0.3633					
	4		1	0.97	0.97	0.2d	0.194	54	40	0.469	0.4202	0.4076			
						0.8d	0.776	42	40	0.3714					
	5		1	0.57	0.57	0.2d	0.114	31	40	0.2829	0.2495	0.1422			
						0.8d	0.456	23	40	0.217					
	5.5		0.5	0											
					3.84										
					sqm							1.3959	1.52	1.44	
												or 1.4			

-24-

G.S. Prasada Rao 5/1/08
ASSISTANT ENGINEER
GAUGING SECTION-V (Div)
ELURU

Exe Consultancy
I-C/SLR

PROFORMA

Recording current meter observations and discharge computaions.

Canal: Singavaram Ava Channe

Current meter : Type : Pigmy / No.566

Location of observation D/S of Road Bridge at K.M. 1.80
Date of observation : 29/12/07
Name/s of obsen : C.S.Prasad Rao, AE

Sl. No	Distance from Ref.point (m)	Comp No.	Width of compartment (m)	Sounding depth (d) (m)	Area of comp (m2)	Current Meter Observations				Velocity in (m/sec)	Mean velocity (m/Sec)	Discharge (6) x(12) (m3/sec)	Designed discharge (m3/sec)	Released discharge (m3/sec)
						Fraction of depth	Value (m)	No. of Revolutions	Time taken (Seconds)					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	0													
	1		1	0.52	0.52	0.2d	0.104	21	40	0.2007	0.1763	0.0916		
						0.8d	0.416	15	40	0.1519				
	2		1	0.7	0.7	0.2d	0.14	52	40	0.4527	0.4039	0.2827		
						0.8d	0.56	40	40	0.3552				
	3		1	0.63	0.63	0.2d	0.126	38	40	0.3389	0.2901	0.1827		
						0.8d	0.504	26	40	0.2414				
	3.7		0.7	0										
				Total	1.85 sqm						Total	0.5570 or		
												0.55	0.57	0.56

-98-

T.S. Prasada Rao 5/1/08
ASSISTANT ENGINEER
GAUGING SECTION-V (Div)
ELURU

Consultant
EC/ELR

PROFORMA

Recording current meter observations and discharge computaions.

Canal: Singavaram Branch channel

Current meter : Type :Pigmy / No. 566

Location of observation K.M.0.20

Date of observation 29/12/07

Name/s of obsen : C.S.Prasad Rao,AE

Sl. No	Distance from Ref.point (m)	Comp No.	Width of compartment (m)	Sounding depth (d) (m)	Area of comp (m2)	Current Meter Observations				Velocity in (m/sec)	Mean velocity (m/Sec)	Discharge (6) x(12) (m3/sec)	Designed discharge (m3/sec)	Released discharge (m3/sec)	Remarks
						Fraction of depth	Value (m)	No. of Revolutions	Time taken (Seconds)						
1	2	3	4	5	6	7	8	9	10	11	12	13	14		
	0														
	1		1	0.46	0.46	0.2d	0.092	30	40	0.2739	0.2413	0.1109			
						0.8d	0.368	22	40	0.2088					
	2		1	0.65	0.65	0.2d	0.13	39	40	0.3471	0.2901	0.1885			
						0.8d	0.52	25	40	0.2332					
	3		1	0.68	0.68	0.2d	0.136	34	40	0.3064	0.2739	0.1862			
						0.8d	0.544	26	40	0.2414					
	4		1	0.7	0.7	0.2d	0.14	37	40	0.3308	0.2901	0.203			
						0.8d	0.56	27	40	0.2495					
	5		1	0.58	0.58	0.2d	0.116	27	40	0.2495	0.217	0.1258			
						0.8d	0.464	19	40	0.1845					
	6		1	0											
					3.07							0.8144			
					sqm							or 0.81	0.84	0.83	

T.S. Prasada Rao 5/2/08

ASSISTANT ENGINEER

GAUGING SECTION-V (Div)

ELURU

Dy Controller

DC/ELR

-18-

PROFORMA

Recording current meter observations and discharge computaions.

Canal: V & W canal

Current : cup type /No 595

Location of observation : Ravipadu bridge at K. .M.25.85
Date of observation : 29/12/07
Name/s of observer : C.S.Prasada Rao A.E.

Sl.NO	Distance from Ref.point (m)	Comp No.	Width of compartment (m)	Sounding depth (d) (m)	Area of comp (m2)	Current Meter Observations				Velocity in (m/sec)	Mean velocity (m/Sec)	Discharge (6) x(12) (m3/sec)	Designed discharge	Released discharge	remarks
						Fraction of depth	Value (m)	No. of Revolutions	Time taken (Seconds)						
1	2	3	4	5	6	7	8	9	10	11	12	13	14		
	0	I	0.78	2.4	1.872										
	1.56		2.35	2.4	5.64	0.2d	0.48	34	40	0.5809	0.5127	0.9598			
						0.8d	1.92	26	40	0.4445	0.5127	2.8916			
	4.7		3.14	2.6	8.164	0.2d	0.52	49	40	0.8368					
						0.8d	2.08	37	40	0.6321	0.7344	5.9956			
	7.83		2.35	2.8	6.58	0.2d	0.56	53	40	0.905					
						0.8d	2.24	41	40	0.7003	0.8026	5.2811			
	9.4		0.78	2.8	2.184										
		II									0.8026	1.7529			
	10.6		0.78	3	2.34										
											0.7856	1.8383			
	12.16		2.35	3	7.05	0.2d	0.6	52	40	0.888					
						0.8d	2.4	40	40	0.6833	0.7856	5.5385			
	15.3		3.14	3.2	10.048	0.2d	0.64	54	40	0.9221					
						0.8d	2.56	40	40	0.6833	0.8027	8.0655			
	18.43		2.35	3.1	7.285	0.2d	0.62	52	40	0.888					
						0.8d	2.48	40	40	0.6833	0.7856	5.7231			
	20		0.78	3.1	2.418										
											0.7856	1.8996			

PROFORMA

Recording current meter observations and discharge computaions.

Canal:

Current meter : Type : / No.

Location of observation : v.&w canal
Date of observation : 29.12.2007
Name/s of obsen :

Sl.NO	Distance from Ref.point (m)	Comp No.	Width of compartment (m)	Sounding depth (d) (m)	Area of comp (m2)	Current Meter Observations				Velocity in (m/sec)	Mean velocity (m/Sec)	Discharge (6) x(12) (m3/sec)	Designed discharge (m3/sec)	Released discharge (m3/sec)	Remarks
						Fraction of depth	Value (m)	No. of Revolutions	Time taken (Seconds)						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	21.2	III	0.78	2.7	2.106						0.9045	1.9049			
	22.76		2.35	2.7	6.345	0.2d	0.54	58	40	0.9903	0.9045	5.739			
						0.8d	2.16	48	40	0.8187					
	25.9		3.14	2.1	6.594	0.2d	0.42	44	40	0.7515	0.7003	4.6181			
						0.8d	1.68	38	40	0.6492					
	29.03		2.35	1	2.35	0.2d	0.2	11	40	0.1886	0.1671	0.3927			
						0.8d	0.8	8.5	40	0.1456					
	30.6		0.78	1	0.78						0.1671	0.1307			
					71.756Sqm										
												52.73	59.58	53.6	

T. S. Prasada Rao
5/2/08
ASSISTANT ENGINEER
GAUGING SECTION-V (Div)
ELURU

Dy Controller
I C/ Elr

-831-

PROFORMA

Recording current meter observations and discharge computaions.

Canal: Undi canal

Current meter : Type : Cup / No.595
TYPE

Location of observation : Kesavaram Bridge at K.M.39.675
Date of observation : 29/12/07
Name/s of observer : C.S.Prasad Rao, AE

Sl. No	Distance from Ref.point (m)	Comp No.	Width of compartment (m)	Sounding depth (d) (m)	Area of comp (m2)	Current Meter Observations				Velocity in (m/sec)	Mean velocity (m/Sec)	Discharge (6) x(12) (m3/sec)	Designed discharge (m3/sec)	Released discharge (m3/sec)	Remaks
						Fraction of depth	Value (m)	No. of Revolutions	Time taken (Seconds)						
1	2	3	4	5	6	7	8	9	10	11	12	13	14		
	0		0												
	3		3	2	6	0.2d	0.4	27	40	0.4615	0.3933	2.3598			
						0.8d	1.6	19	40	0.3251					
	6		3	2.1	6.3	0.2d	0.42	36	40	0.6151	0.5639	3.5526			
						0.8d	1.68	30	40	0.5127					
	9		3	2	6	0.2d	0.4	41	40	0.7003	0.6491	3.8946			
						0.8d	1.6	35	40	0.598					
	12		3	2.2	6.6	0.2d	0.44	46	40	0.7856	0.7344	4.847			
						0.8d	1.76	40	40	0.6833					
	15		3	2.2	6.6	0.2d	0.44	48	40	0.8197	0.7174	4.7348			
						0.8d	1.76	36	40	0.6151					
	18		3	2	6	0.2d	0.4	35	40	0.598	0.5639	3.3834			
						0.8d	1.6	31	40	0.5298					
	21		3	1.7	5.1	0.2d	0.34	32	40	0.5468	0.4786	2.4408			
						0.8d	1.36	24	40	0.4104					
	22		1	0											
					42.6 sqm						Total	25.213 or			
												25.22	27.87	25.36	

-84-

T.S. Prasada Rao
5/2/08
ASSISTANT ENGINEER
GAUGING SECTION-V (Div)

6/2
Exe Controller

PROFORMA

Recording current meter observations and discharge computaions.

Canal: Undi canal

Current meter : Type : Cup / No.600 Type

Location of observation : Yendagandi Bridge at K M 44.60
Date of observation : 30/12/07
Name/s of observer : C.S.Prasada Rao A.E

Sl. No	Distance from Ref.point (m)	Comp No.	Width of compartment (m)	Sounding depth (d) (m)	Area of comp (m2)	Current Meter Observations				Velocity in (m/sec)	Mean velocity (m/Sec)	Discharge (6) x(12) (m3/sec)	Designed discharge	Released discharge	Remarks
						Fraction of depth	Value (m)	No. of Revolutions	Time taken (Seconds)						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	0	I	0.64	1.2	0.768						0.2503	0.1922			
	1.28		1.925	1.2	2.31	0.2d	0.24	18	40	0.3006	0.2503	0.5782			
						0.8d	0.96	12	40	0.2001					
	3.85		2.57	1.6	4.112	0.2d	0.32	32	40	0.5352	0.443	1.8216			
						0.8d	1.28	21	40	0.3509					
	6.42		1.925	1.8	3.465	0.2d	0.36	30	40	0.5017	0.4179	1.448			
						0.8d	1.44	20	40	0.3341					
	7.7		0.64	1.8	1.152						0.4179	0.4814			
	8.9	II	0.64	2.3	1.472						0.485	0.7139			
	10.18		1.925	2.3	4.427	0.2d	0.46	32	40	0.5352	0.485	2.1471			
						0.8d	1.84	26	40	0.4347					
	12.75		2.57	1.8	4.626	0.2d	0.36	41.5	40	0.6944	0.6232	2.8829			
						0.8d	1.44	33	40	0.552					
	15.32		1.925	2.9	5.582	0.2d	0.58	12	40	0.2001	0.1665	0.9294			
						0.8d	2.32	8	40	0.1331					
	16.6		0.64	2.9	1.856						0.1665	0.309			

PROFORMA

Recording current meter observations and discharge computaions.

Canal:

Current meter : Type : / No.

Location of observation :
Date of observation :
Name/s of observer :

Sl.NO	Distance from Ref.point (m)	Comp No.	Width of compartment (m)	Sounding depth (d) (m)	Area of comp (m2)	Current Meter Observations				Velocity in (m/sec)	Mean velocity (m/Sec)	Discharge (6) x(12) (m3/sec)	Designed discharge (m3/sec)	Released discharge (m3/sec)	Remarks
						Fraction of depth	Value (m)	No. of Revolutions	Time taken (Seconds)						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	17.8	III	0.64	2.6	1.664						0.5855	0.9742			
	19.08		1.925	2.6	5.005	0.2d	0.52	41	40	0.686	0.5855	2.9304			
						0.8d	2.08	29	40	0.485					
	21.65		2.57	2.6	6.682	0.2d	0.52	35	40	0.5855	0.5184	3.4365			
						0.8d	2.08	26.5	40	0.4431					
	24.22		1.925	2.1	4.042	0.2d	0.42	23	40	0.3844	0.3174	1.2829			
						0.8d	1.68	15	40	0.2504					
	25.5		0.64	2.1	1.344						0.3174	0.4266			
					48.507						Total	20.5543 or			
					sqm							20.55	23.57	21.48	

T.S. Prasada Rao 5/2/08
ASSISTANT ENGINEER
GAUGING SECTION-V (Div)
ELURU

5/2/08
2nd Consultation

Total Discharges

-98-

PROFORMA

Recording current meter observations and discharge computaions.

Canal: Undi canal

Current meter : Type : Cup / No.600
Type

Location of observation : Gollakoderu foot Bridge at K.M. 50.385
Date of observation : 30/12/07
Name/s of observer/ : C.S.Prasad Rao,AE

Sl. No	Distance from Ref.point (m)	Comp No.	Width of compa rtment (m)	Sounding depth (d) (m)	Area of comp (m2)	Current Meter Observations				Velocity in (m/sec)	Mean velocity (m/Sec)	Discharge (6) x(12) (m3/sec)	Designed discharge	Released discharge	Remarks
						Fraction of depth	Value (m)	No. of Revol utions	Time taken (Seconds)						
1	2	3	4	5	6	7	8	9	10	11	12	13	14		
	0														
	3		3	1.9	5.7	0.2d	0.38	19	40	0.3174	0.2671	1.5224			
						0.8d	1.52	13	40	0.2168					
	6		3	1.8	5.4	0.2d	0.36	23	40	0.3848	0.3173	1.7134			
						0.8d	1.44	15	40	0.25036					
	9		3	1.9	5.7	0.2d	0.38	29	40	0.485	0.4179	2.382			
						0.8d	1.52	21	40	0.3509					
	12		3	2.2	6.6	0.2d	0.44	29	40	0.485	0.4179	2.7581			
						0.8d	1.76	21	40	0.3509					
	15		3	2.2	6.6	0.2d	0.44	34	40	0.5687	0.4682	3.0901			
						0.8d	1.76	22	40	0.3676					
	18		3	1.9	5.7	0.2d	0.38	30	40	0.5017	0.4179	2.382			
						0.8d	1.52	20	40	0.3341					
	21		3	1.8	5.4	0.2d	0.36	29	40	0.4849	0.4179	2.2566			
						0.8d	1.44	21	40	0.3509					
	24		3	1.7	5.1	0.2d	0.34	25	40	0.4179	0.3509	1.7895			
						0.8d	1.36	17	40	0.2839					
	27		3	1.2	3.6	0.2d	0.24	9	40	0.1498	0.1163	0.4186			
						0.8d	0.96	5	40	0.0828					

PROFORMA

Recording current meter observations and discharge computaions.

Canal:

Current meter : Type : / No.

Location of observation :
Date of observation :
Name/s of obser :

Sl. No	Distance from Ref.point (m)	Comp No.	Width of compartment (m)	Sounding depth (d) (m)	Area of comp (m2)	Current Meter Observations				Velocity in (m/sec)	Mean velocity (m/Sec)	Discharge (6) x(12) (m3/sec)	Designed discharge (m3/sec)	Released discharge (m3/sec)	Remarks
						Fraction of depth	Value (m)	No. of Revolutions	Time taken (Seconds)						
1	2	3	4	5	6	7	8	9	10	11	12	13	14		
	29		2	1.2	2.4	0.2d	0.24	4	40	0.066	0.0492	0.1181			
						0.8d	0.96	2	40	0.0325					
				Total	52.2sqm						Total	18.4308 or			
												18.43	21.55	19.6	

T.S. Prasada Rao
5/2/08
ASSISTANT ENGINEER
GAUGING SECTION-V (Div)
ELURU

6/2
Exe. Constructions
DE/ ELR

-88-

PROFORMA

Recording current meter observations and discharge computaions.

Canal:Anacoderu channel

current meter no 600 cup type

Location of observatio K.M.0.80
Date of observation 30.12.2007
Name/s of obs : C.S. Prasada Rao, A.E.

Sl. No	Distance from Ref.point (m)	Comp No.	Width of compartment (m)	Sounding depth (d) (m)	Area of comp (m2)	Current Meter Observations				Velocity in (m/sec)	Mean velocity (m/Sec)	Discharge (6) x(12) (m3/sec)			
						Fraction of depth	Value (m)	No. of Revol-ution	Time taken (Seconds)				Designed discharge (m3/sec)	Released dischargr (m3/sec)	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	0	I	0.45	1.1	0.495						0.2001	0.099			
	0.9		1.35	1.1	1.485	0.2d	0.22	15	40	0.2504	0.2001	0.2971			
						0.8d	0.88	9	40	0.1498					
	2.7		1.8	1.45	2.61	0.2d	0.29	26	40	0.4347	0.376	0.9814			
						0.8d	1.16	19	40	0.3174					
	4.5		1.35	0.95	1.282	0.2d	0.19	3	40	0.0828	0.066	0.0846			
						0.8d	0.76	3	40	0.0493					
	5.4		0.45	0.95	0.427						0.066	0.0282			
		II													
	6.4		0.45	1	0.45						0.0492	0.0221			
	7.3		1.35	1	1.35	0.2d	0.2	4	40	0.066	0.0492	0.0664			
						0.8d	0.8	2	40	0.0325					
	9		1.8	1.6	2.88	0.2d	0.32	31	40	0.5185	0.4598	1.3242			
						0.8d	1.28	24	40	0.4012					
						0.8d	1.28	24	40	0.4012					
	10.9		1.35	1.4	1.89	0.2d	0.28	22	40	0.3676	0.334	0.6313			
						0.8d	1.12	18	40	0.3005					
	11.8		0.45	1.4	0.63						0.334	0.2104			
					13.499							3.7447			
					sqm							or 3.74	6.43	3.76	

T.S. Prasada Rao 5/2/08
ASSISTANT ENGINEER
GAUGING SECTION-V (Div)
ELURU

Exp Construction
F.C. Eluru

PROFORMA

Recording current meter observations and discharge computaions.

Cana Anacoderu Channel

Current meter Cup Type 600

Location of observation K.M. 4.237 Bhimavaram (V) Limits
Date of observation :30.12.2007
Name/s of obse : C.S. Prasada Rao.

Sl. No	Distance from Ref.point (m)	Comp No.	Width of compa rtment (m)	Sounding depth (d) (m)	Area of comp (m2)	Current Meter Observations				Velocity in (m/sec)	Mean velocity (m/Sec)	Discharge (6) x(12) (m3/sec)	Designed Discharge (m3/sec)	Released Discharge (m3/sec)	Remarks
						Fraction of depth	Value (m)	No. of Revol utions	Time taken (Seconds)						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	0	I	0.49	1	0.49						0.2252	0.1103			
	0.98		1.475	1	1.475	0.2d	0.2	16	40	0.2671	0.2252	0.3322			
						0.8d	0.8	11	40	0.1833					
	2.95		1.97	1.1	2.167	0.2d	0.22	19	40	0.3174	0.2671	0.5788			
						0.8d	0.88	13	40	0.2168					
	4.92		1.475	1.2	1.77	0.2d	0.24	18	40	0.3006	0.2503	0.4431			
						0.8d	0.96	12	40	0.2001					
	5.9		0.49	1.2	0.588						0.2503	0.1472			
	6.8	II	0.49	1.2	0.588						0.2754	0.1619			
	7.78		1.475	1.2	1.77	0.2d	0.24	20	40	0.3341	0.2754	0.4875			
						0.8d	0.96	13	40	0.2168					
	9.75		1.97	1.2	2.364	0.2d	0.24	20	40	0.3341	0.3006	0.7106			
						0.8d	0.96	16	40	0.2671					
	11.72		1.475	1.2	1.77	0.2d	0.24	19	40	0.3174	0.2671	0.4728			
						0.8d	0.96	13	40	0.2168					
	12.7		0.49	1.2	0.588						0.2671	0.157			
				Total	13.57Sqm						Total	3.6014 or 3.6	6.23	3.68	

T. S. Prasada Rao 5/2/08
ASSISTANT ENGINEER
GAUGING SECTION-V (Div)

Executive Engineer

PROFORMA

Recording current meter observations and discharge computaions.

Cana Anakoderu channel

Current meter : Type :Pigmy/ No.566

Location of observatio K.M.9.17
Date of observation : 31/12/07
Name/s of obse : C.S.Prasad Rao

Sl. No	Distance from Ref.point (m)	Comp No.	Width of compartment (m)	Sounding depth (d) (m)	Area of comp (m2)	Current Meter Observations				Velocity in (m/sec)	Mean velocity (m/Sec)	Discharge (6) x(12) (m3/sec)	Designed Discharge (m3/sec)	Released Discharge (m3/sec)	Remarks
						Fraction of depth	Value (m)	No. of Revolution	Time taken (Seconds)						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	0														
	1		1	0.55	0.55	0.2d	0.11	5	40	0.0706	0.0665	0.0366			
						0.8d	0.44	4	40	0.0625					
	2		1	0.8	0.8	0.2d	0.16	28	40	0.2576	0.2393	0.19144			
						0.8d	0.64	23.5	40	0.221					
	3		1	0.98	0.98	0.2d	0.196	48	40	0.4202	0.3959	0.388			
						0.8d	0.784	42	40	0.3715					
	4		1	0.82	0.82	0.2d	0.164	42	40	0.3715	0.3836	0.3145			
						0.8d	0.656	45	40	0.3958					
	5		1	0.6	0.6	0.2d	0.12	9	40	0.1032	0.0828	0.0497			
						0.8d	0.48	4	40	0.0625					
	5.7		0.7												
				Total	3.75sqm						Total	0.9802 or			
												0.98	1.48	No Gauge	

T.S. Prasad Rao 5/2/08
ASSISTANT ENGINEER
GAUGING STATION-V (DIV)
ELURU

Exe Engineer
Irrg Construction
Eluru

Total Discharges

PROFORMA

Recording current meter observations and discharge computaions.

Canal: Losari main channel

Current meter : : Pigmy /No : 566
type

Location of observation At K.M. 3.00
Date of observation : 02/01/08
Name/s of obser : C.S.Prasada Rao

Sl. No	Distance from Ref.point (m)	Comp No.	Width of compartment (m)	Sounding depth (d) (m)	Area of comp (m2)	Current Meter Observations				Velocity in (m/sec)	Mean velocity (m/Sec)	Discharge (6) x(12) (m3/sec)	Designed discharge (m3/sec)	Released discharge (m3/sec)	Remarks
						Fraction of depth	Value (m)	No. of Revolution	Time taken (Seconds)						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	0														
	1		1	0.35	0.35	0.2d	0.07								
						0.8d	0.28								
	2		1	0.68	0.68	0.2d	0.136	38	40	0.3389	0.2982	0.2028			
						0.8d	0.544	28	40	0.2576					
	3		1	0.95	0.95	0.2d	0.19	50	40	0.4365	0.3877	0.3683			
						0.8d	0.76	38	40	0.3389					
	4		1	1.05	1.05	0.2d	0.21	44	40	0.3877	0.3633	0.3814			
						0.8d	0.84	38	40	0.3389					
	5		1	1.18	1.18	0.2d	0.236	35	40	0.3145	0.3633	0.4287			
						0.8d	0.944	47	40	0.4121					
	6		1	1.2	1.2	0.2d	0.24	26	40	0.2414	0.217	0.2604			
						0.8d	0.96	20	40	0.1926					
	7		1	1.15	1.15	0.2d	0.23	38	40	0.3389	0.282	0.3243			
						0.8d	0.92	24	40	0.2251					
	8		1	0.8	0.8	0.2d	0.16	23	40	0.217	0.1926	0.1541			
						0.8d	0.64	17	40	0.1682					
	9.5		1.5												
				Total	7.36 sqm							2.12	2.72	2.21	

C.S. Prasada Rao
5/2/08
ASSISTANT ENGINEER
GAUGING SECTION-V (Div)
ELURU

Exe Engineer

-92-

PROFORMA

Recording current meter observations and discharge computaions.

Cana Losari main channel — Current meter : Type :Pigmy / No.566

Location of observatio: U/S of culvert at K.M.9.73 near Gollavaritippa (v)
Date of observation 02/01/08
Name/s of obse : C.S.Prasad Rao, AE

Sl. No	Distance from Ref.point (m)	Comp No.	Width of compa rtment (m)	Sounding depth (d) (m)	Area of comp (m2)	Current Meter Observations				Velocity in (m/sec)	Mean velocity (m/Sec)	Discharge (6) x(12) (m3/sec)	Designed discharge (m3/sec)	Released discharge (m3/sec)	Remarks
						Fraction of depth	Value (m)	No. of Revol utions	Time taken (Seconds)						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	0														
	1		1	0.42	0.42	0.2d	0.084								
						0.8d	0.336								
	2		1	0.6	0.6	0.2d	0.12	15	40	0.1519	0.1356	0.0814			
						0.8d	0.48	11	40	0.1194					
	3		1	0.9	0.9	0.2d	0.18	29	40	0.2658	0.2414	0.2173			
						0.8d	0.72	23	40	0.217					
	4		1	1.2	1.2	0.2d	0.24	28	40	0.2576	0.2332	0.2798			
						0.8d	0.96	22	40	0.2088					
	5		1	1.2	1.2	0.2d	0.24	30	40	0.2739	0.2495	0.2994			
						0.8d	0.96	24	40	0.2251					
	6		1	1.18	1.18	0.2d	0.236	29	40	0.2658	0.2414	0.2848			
						0.8d	0.944	23	40	0.217					
	7		1	0.97	0.97	0.2d	0.194	30	40	0.2739	0.2413	0.234			
						0.8d	0.776	22	40	0.2088					
	8		1	0.5	0.5	0.2d	0.1	5	40	0.0706	0.0625	0.0312			
						0.8d	0.4	3	40	0.0544					
	9		1												
				Total	6.97sqm						Total	1.4279 or			
												1.43	1.81	No Gauge	

G.S. Prasad Rao 5/2/08
ASSISTANT ENGINEER
GAUGING SECTION-V (Div)
ELURU

Exe. Engineer
DC/ELR

PROFORMA

Recording current meter observations and discharge computaions.

Car Losari main channel

Current meter : Type : Pigmy / No. 566

Location of observatic U/S of culvert at K.M.14.884 near Gutlapadu
Date of observation 02/01/08
Name/s of obs : C.S. Prasad Rao,AE

Sl. No	Distance from Ref.point (m)	Comp No.	Width of compartment (m)	Sounding depth (d) (m)	Area of comp (m2)	Current Meter Observations				Velocity in (m/sec)	Mean velocity (m/Sec)	Discharge (6) x(12) (m3/sec)	Designed discharge (m3/sec)	Released discharge (m3/sec)	Remarks
						Fraction of depth	Value (m)	No. of Revolutions	Time taken (Seconds)						
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	0														
	1		1	0.4	0.4	0.2d	0.08								
						0.8d	0.32								
	2		1	0.75	0.75	0.2d	0.15	23	40	0.217	0.1926	0.1444			
						0.8d	0.6	17	40	0.1682					
	3		1	0.65	0.65	0.2d	0.13	25	40	0.2332	0.2088	0.1357			
						0.8d	0.52	19	40	0.1845					
	4		1	0.5	0.5	0.2d	0.1	5	40	0.0706	0.0625	0.0312			
						0.8d	0.4	3	40	0.0544					
	4.7		1												
					2.3							0.3113			
					sqm							or 0.31	0.54	No Gauge	

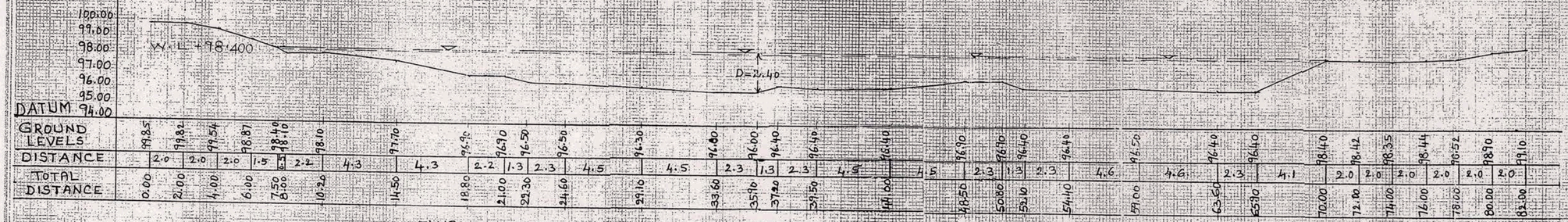
C.S. Prasada Rao 5/2/08
ASSISTANT ENGINEER
GAUGING SECTION, DIV.
ELURU

Total Discharges

Engg. Consultant

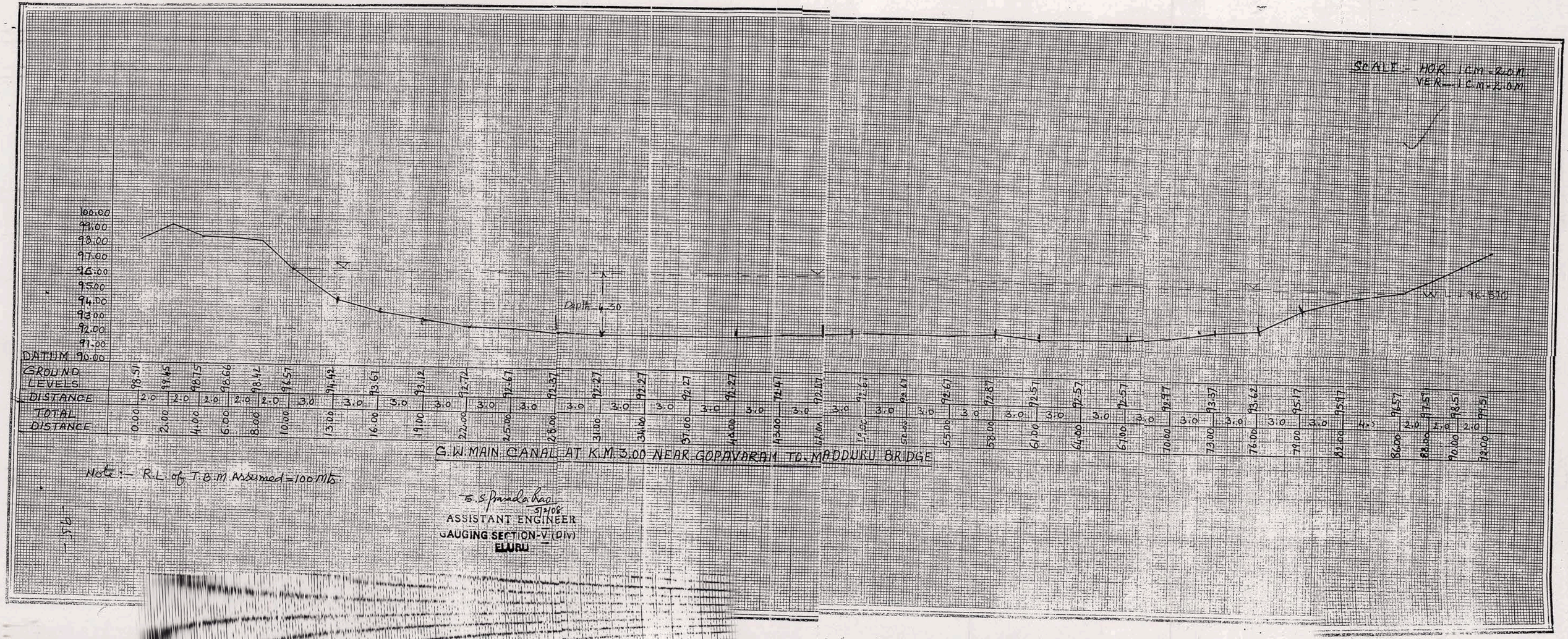
- 94 -

SCALE:- HOR – 1CM = 2.0M
VER – 1CM = 2.0M



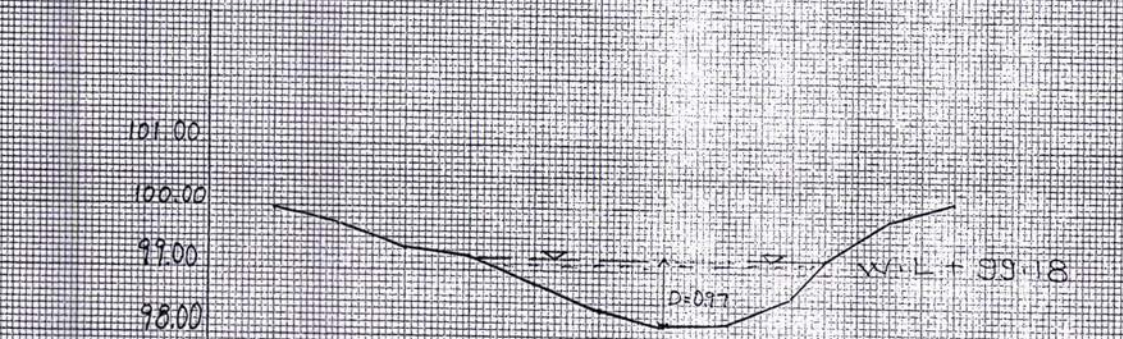
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SCALE — HOR 1 CM = 2.0 M.
VER — 1 CM = 2.0 M.



| | | |

SCALE:- HOR - 1CM = 1M
VER - 1CM = 1M



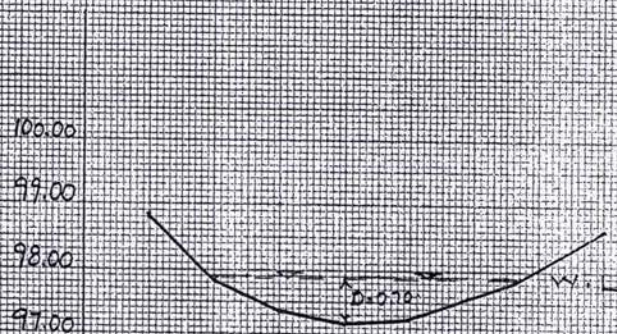
GROUND LEVELS		99.97	99.71	99.32	99.18	98.78	98.33	98.13	98.21	98.61	99.18	99.85	100.13
DISTANCE			1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.5	1.00	1.00
TOTAL DISTANCE	0.00	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	8.50	9.50	10.50	

SINGAVARAM AVA CHANNEL U/S OF K.M. 1.40

Note:- R.L. of T.B.M Assumed = 100 Mts.

T.S. Prasada Rao
5/2/08
ASSISTANT ENGINEER
GAUGING SECTION-V (Div.)
ELURU

SCALE :- 1 CM = 1M - HOR
1 CM = 1M - VER



DATUM 96.00

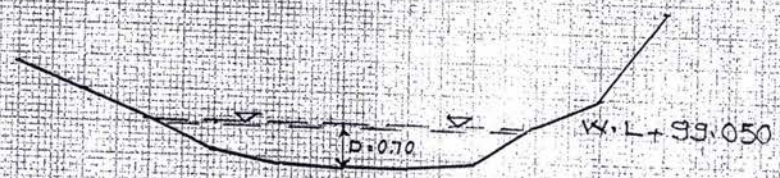
GROUND LEVELS	98.87	97.87	97.35	97.17	97.24		97.87	98.62
DISTANCE		1.00	1.00	1.00	1.00	1.70		1.30
TOTAL DISTANCE	0.00	1.00	2.00	3.00	4.00	5.70		7.00

SINGAVARAM AVA CHANNEL D/S OF ROAD BRIDGE

Note :- R.L of T.B.M. Assumed = 100 Mts.

G.S. Pavan Kumar
5/08
ASSISTANT ENGINEER
GAUGING SECTION-V (Div)
ELURU

SCALE :- HOR-1CM=1M
VER-1CM=1M



GROUND LEVELS	99.85	99.45	99.05	98.59	98.40	98.37	98.35	98.47	99.05	99.44	99.82	
DISTANCE		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
TOTAL DISTANCE	0.00	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	

DATUM 96.00
100.00
99.00
98.00
97.00

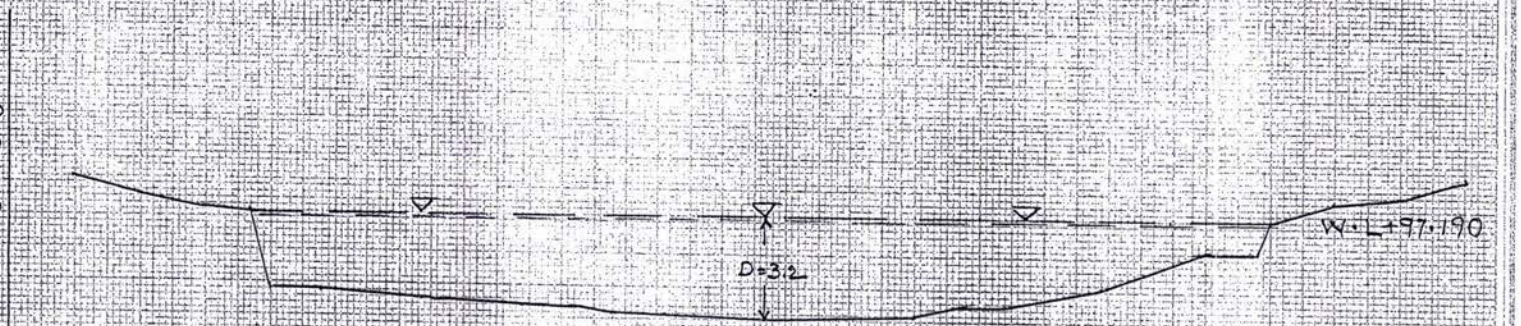
SINGAVARAM BRANCH CHANNEL

Note :- R.L. of T.B.M Assumed = 100 mts.

T.S. Prasada Rao
5/2/08
ASSISTANT ENGINEER
GAUGING SECTION-V (Div)
ELURU

99.66

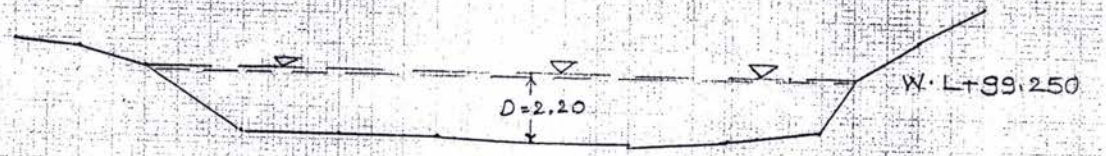
SCALE:- HOR- 1 C.M. = 2.0 M
VER- 1 C.M. = 2.0 M



| | | |

(7)

SCALE:- HOR-1CM=2.0M
VER-1CM=2.0M



GROUND LEVELS	100.04	99.77	99.25	97.25	97.15	97.25	97.05	97.05	97.25	97.55	99.25	100.37	101.55	
DISTANCE		2.0	2.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	1.0	2.0	2.0	
TOTAL DISTANCE	0.00	2.00	4.00	7.00	10.00	13.00	16.00	19.00	22.00	25.00	26.00	28.00	30.00	

DATUM 95.00

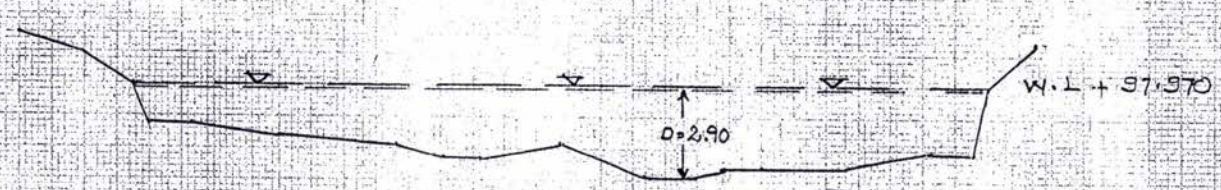
102.00
101.00
100.00
99.00
98.00
97.00
96.00

UNDI CANAL AT K.M 39.675 AT KESAVARAM BRIDGE

Note:- R.L of T.B.M Assumed = 100mts.

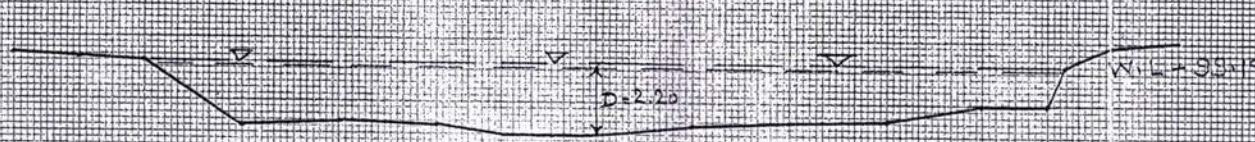
T. S. Prasada Rao
5/2/08
ASSISTANT ENGINEER
GAUGING SECTION-V (Div)
ELURU

2.41
3.72
2.5
2.7
10


100.00
99.00
98.00
97.00
96.00
95.00
94.00
93.00
DATUM 92.00
D=2.90
W.L + 97.970

| | | |

SCALE:- HOR- 1CM=2M
VER- 1CM=1M



GROUND LEVELS	99.50	99.35	99.19	97.39	97.39	97.29	96.99	96.99	97.29	97.39	97.49	97.99	97.99	97.49	99.83	100.03			
DISTANCE		2.00	2.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	2.00	1.50	2.80				
TOTAL DISTANCE	0.00	2.00	4.00	7.00	10.00	13.00	16.00	19.00	22.00	25.00	28.00	31.00	33.00	34.50	37.30				

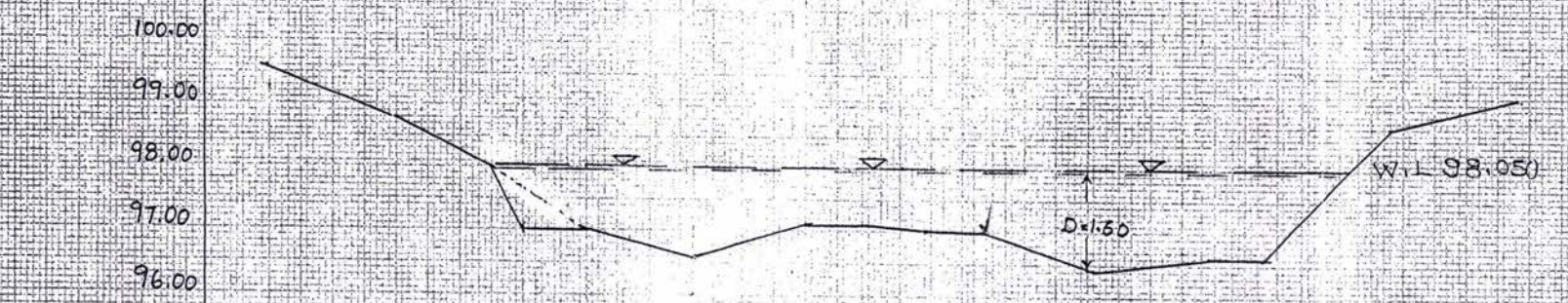
UNDI CANAL AT K.M. 50.385 AT GOLLALAKODERU FOOT BRIDGE

Note:- R.L. of T.B.M. Assumed = 100 mts.

Sd/-

G. Siva Prasada Rao
5/2/08
ASSISTANT ENGINEER
GAUGING STATION DIVN
ELURU

SCALE :- HOR - 1CM = 1.0M
VER - 1CM = 1.0 M



GROUND LEVELS	99.66		98.83		98.05	97.95	96.85		96.60		97.10	97.10	97.05	97.05		96.45		96.65	96.65		98.13		99.21	
DISTANCE		2.0		1.5	.25	0.9		1.8		1.8		0.9	1.0	0.9	1.8		1.8		0.9	2.0		2.0		
TOTAL DISTANCE	0.00		2.00		3.50	4.00	4.90		6.70		8.50	9.40	10.40	11.30		13.10		14.90	15.80		17.80		19.80	

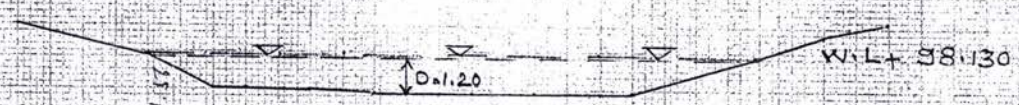
ANAKODERU CHANNEL AT K.M. 0.80

Note :- R.L of T.B.M Assumed - 100 mts.

T.S. Prasada Rao
5/2/08
ASSISTANT ENGINEER
GAUGING SC[illegible]ON-V (Div)
ELURU

SCALE:- HOR- 1CM=2.0M
VER-1CM=2.0M

6.80
1.50
8.3



100.00																							
99.00																							
98.00																							
97.00																							
96.00																							
95.00																							
94.00																							
93.00																							
92.00																							
91.00																							
DATUM 90.00																							
GROUND LEVELS		99.02		98.13		97.13	97.13	97.03	96.93	96.93	96.93	96.93	96.93	96.93	96.93	96.93	96.93		98.13		98.67		99.19
DISTANCE			4.0		2.0	1	2.0	2.0	1.0	1.0	1.0	2.0	2.0	2.0	1.0	4.0				2.0		2.0	
TOTAL DISTANCE	0.00		4.00		6.00	7.00	9.00	11.00	12.00	13.00	14.00	16.00	18.00	19.00		23.00			25.00		27.00		

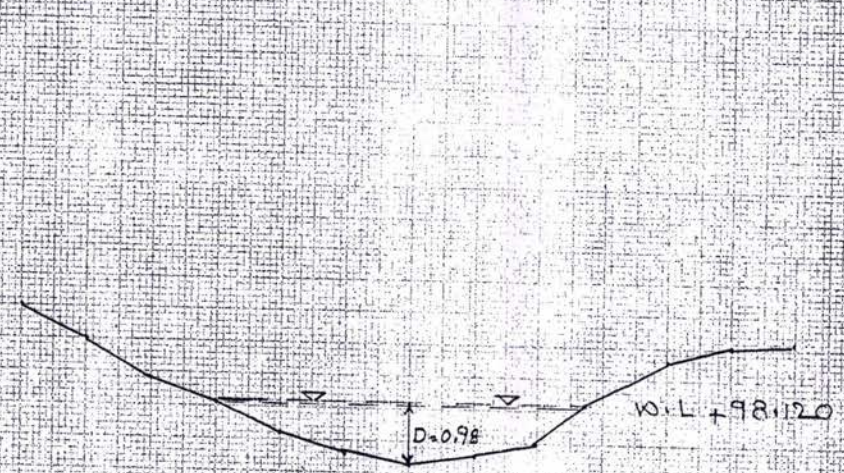
ANAKODERU CHANNEL AT K.M. 4.237 AT BHIMAVARAM(V) LIMITS

Note:- R.L. of T.B.M. assumed = 100mts.

1.30

T.S. Prasada Rao
5/2/08
ASSISTANT ENGINEER
GAUGING STATION-V (Div)
ELURU

SCALE :- HOR-1CM=1.0M
VER-1CM=1.0M



DATUM=95.00

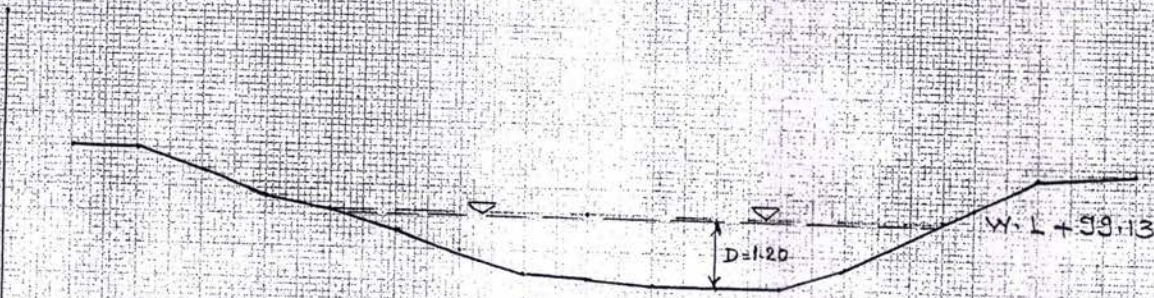
GROUND LEVEL		99.5	99.0	98.42	98.12	97.57	97.32	97.14	97.30	97.52	98.12		98.79	98.98	99.13
DISTANCE		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.7	1.3		1.0	1.0	
TOTAL DISTANCE	0.00	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	8.70	9.00	10.00	11.00	12.00	

ANAKODERU CHANNEL AT K.M 9.17

Note:- R.L. of T.B.M. Assumed = 100 Mts.

T.S. Prasada Rao
5/2/08
ASSISTANT ENGINEER
GAUGING SECTION-V (DIV)
ELURU

SCALE :- HOR- 1CM = 1M
VER- 1CM = 1M



GROUND LEVELS	100.06	99.99	99.72	99.30	99.13	98.78	98.45	98.18	98.08	97.95	97.93	97.98	98.33	99.13	99.30	99.82	99.91	
DISTANCE		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.50	0.5	1.0	1.51	
TOTAL DISTANCE	0.00	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00	12.00	13.50	14.00	15.00	16.50	

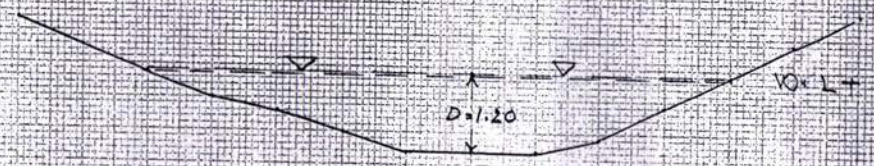
LOSARI MAIN CHANNEL AT K.M 3.00

Note :- R.L. of T.B.M. Assumed = 100 mts.

107

G. S. Prasad Rao
5/2/08
ASSISTANT ENGINEER
GAUGING SECTION-V (Div)
ELURU

SCALE — HOR – 1 CM = 1.0 M
VER – 1 CM = 1.0 M



DATUM 95.00

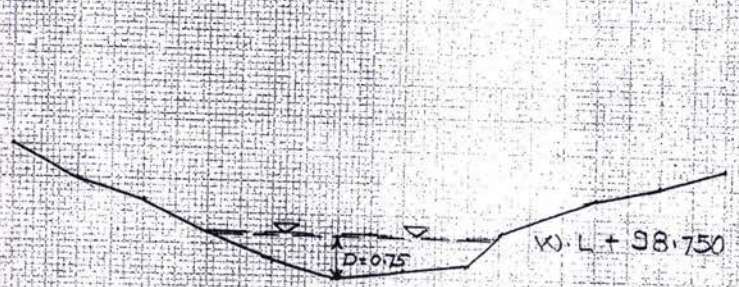
GROUND LEVELS	100.67	100.35	99.90	99.46	99.30	99.00	98.70	98.70	98.72	98.93	99.40	99.90	100.40	100.88
DISTANCE														
TOTAL DISTANCE	0.00	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	9.00	10.00	11.00	12.00	13.00

L.O SARI MAIN CHANNEL NEAR GOLLAVANI TIPPA (V) U/S OF CULVERT AT KM 9.73

Note :- R.L. of T.B.M. Assumed = 100 Mts.

T.S. Prasada Rao
5.2.08
ASSISTANT ENGINEER
JAUGING [illegible]-N-V (DIV)
ELURU

SCALE :- HOR- 1Cm = 1.0M
VER- 1Cm = 1.0M



DATUM = 95.00

GROUND LEVELS	100.03	99.52	99.27	98.15	98.35	98.100	98.10	98.25	98.75	99.30	99.54	99.82	
DISTANCE		1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.7	1.3	1.0	1.0	
TOTAL DISTANCE	0.00	1.00	2.00	3.00	4.00	5.00	6.00	7.00	7.70	9.00	10.00	11.00	

LOSARI MAIN CANAL NEAR GUTLAPADU (V) U/S OF CULVERT AT KM 14.884

Note :- R.L of T.B.M. Assumed = 100 mts.

G.S. Prasada Rao
5/2/08
ASSISTANT ENGINEER
GAUGING SECTION-V (Div)
ELURU