UTTAR PRADESH JAL NIGAM

INDO-DUTCH RURAL WATER SUPPLY AND SANITATION PROGRAMME-INDIA/UTTAR PRADESH

FINAL REPORT ON STUDY OF OPERATION AND MAINTENANCE COSTS

MARCH 1993

A. F. FERGUSON & CO.

INDIA

UTTAR PRADESH JAL NIGAM

INDO-DUTCH RURAL WATER SUPPLY AND SANITATION PROGRAMME INDIA/UTTAR PRADESH

REVIEW OF OPERATION AND MAINTENANCE COSTS

SL.NO.	CONTENTS	PAGE NO.
1.	INTRODUCTION	1
2.	EXECUTIVE SUMMARY	4
3.	BACKGROUND TO UP JAL NIGAM	17
4.	APPROACH TO THE STUDY	31
5.	O&M COST OF SCHEMES	39
6.	ANALYSIS OF O&M COSTS	57
7.	SYSTEMS AND PROCEDURES	68
8.	CONCLUSION	73

LIST OF TABLES

TABLE	TITLE	PAGE NO.
2.1	SCHEMES SELECTED FOR REVIEW	4
2.2	BASIC PARAMETERS OF SCHEMES SELECTED	5
2.3	ACTUAL O&M COSTS	7
2.4	REAL O&M COSTS - PIPED SCHEMES	8
2.5	REAL UNIT COST OF WATER	9
2.6	ANALYSIS OF COSTS - 1991-92	12
2.7	ANALYSIS OF COSTS (1991-92)	13
2.8	1991-92 ANALYSIS OF ADDITIONAL COSTS (REAL)	14
3.1	PER CAPITA INCOME	18
3.2	PROFILE OF DUTCH ASSISTANCE	21
3.3	O&M OF PIPED SCHEMES - UPJN [PLAINS]	22
3.4	KEY INDICATORS - PIPED SCHEMES - PLAINS - UPJN	23
3.5	KEY INDICATORS - HAND PUMPS - PLAINS - UPJN	25
3.6	UP JAL PLAN ALLOCATION	27
3.7	UPJN OVERALL FINANCIAL PERFORMANCE	28
3.8	SCHEMES SELECTED	30
5.1	DESIGN PARAMETERS - PIPED SCHEMES	39
5.2	KEY PARAMETERS - PIPED SCHEMES	41
5.3	ORGANISATION	42
5.4	ACTUAL O&M COSTS	44
5.5	REAL O&M COSTS	45

LIST OF TABLES (CONTD.)

TABLE	TITLE	PAGE NO.
5.6	O&M COST OF WATER PER UNIT (1991-92)	47
5.7	COST PER CONNECTION/HOUSEHOLD - 1991-92	51
5.8	1991-92 ANALYSIS OF ADDITIONAL COSTS	52
5.9	CONTRIBUTION ANALYSIS	53
5.10	COST ANALYSIS (1991-92)	54
5.11	SCHEME SAIDABAD - PHYSICAL PARAMETERS	55
5.12	SCHEME - TIKRI - PHYSICAL PARAMETERS	56
6.1	REAL COST PER KL OF WATER PRODUCED - 1991-92	58
6.2	PIPED SCHEMES - COMPARISON WITH UPJN [PLAINS]	59
6.3	HAND PUMPS - COMPARISON - PLAINS - UPJN	60
6.4	COST - DEPRECIATION ONLY FOR PVT CONNECTIONS	62

LIST OF EXHIBITS

EXHIBIT	TITLE	PAGE NO.
2.1	UNIT COSTS OF WATER	6
2.2	COMPOSITION OF COST - SAIDABAD [1991-92]	10
2.3	COMPOSITION OF COST - TIKRI [1991-92]	10
2.4	COMPOSITION OF COST - HAND PUMPS	11
2.5	TREND IN COSTS - PIPED SCHEMES	11
3.1	ORGANISATION STRUCTURE	20
3.2	COMPONENTS OF O&M COST - PIPED - PLAINS - UPJN	24
3.3	COMPOSITION OF O&M COST - HAND PUMPS - PLAINS - UPJN	26
3.4	UPJN - O&M - FINANCIAL POSITION	29
4.1	OVERALL APPROACH TO THE STUDY	31
5.1	COST PER KL OF WATER PRODUCED - 1991-92	46
5.2	TREND IN COSTS	48
5.3	COMPOSITION OF COST - SAIDABAD [1991-92]	49
5.4	COMPOSITION OF COST - TIKRI [1991-92]	50
5.5	COMPOSITION OF COST - HAND PUMPS	50

LIST OF ANNEXURES

ANNEXURE	TITLE	PAGE NO.
I.	QUESTIONNAIRES	
II.	LIST OF PEOPLE MET	
III.	SET OF OUTPUTS	

1. INTRODUCTION

BACKGROUND

1.1 The Public Health Engineering Department (PHED) has been responsible for provision of water supply in the state of Uttar Pradesh from the year 1927 onwards. The PHED was renamed as the Local Self Government Engineering Department (LSGED). In June 1975, an autonomous corporation in the name of Uttar Pradesh Jal Nigam (UPJN) was formed to take over the functions of LSGED. At the same time, Jal Sansthans were formed for provision of water supply to the major cities/towns in the state.

1.2 The Kingdom of the Netherlands has been financing water supply projects in Uttar Pradesh from 1978 onwards with the basic objective of 'improvement of the health situation and the general living conditions in the rural areas of Uttar Pradesh (UP) through better drinking water supply'. The first sub project (SPI) included 22 piped water supply schemes in 724 villages in 3 districts using ground water as the source. The project was completed in 1986.

OPERATION AND MAINTENANCE

1.3 The schemes completed under SPI have been maintained by UPJN. The evaluation mission of May 1992 looked at the operation and maintenance (O&M) costs and mentions substantial lack of funds for O&M. The mission also felt the need for more detailed knowledge of costs and of the various components of operation, maintenance and repair costs of both piped and hand pump schemes under Dutch assisted projects.

NEED FOR THE STUDY

1.4 Considering the criticality of operation and maintenance of water supply schemes in providing better drinking water supply, the evaluation mission felt the need for a better understanding of the actual costs of O&M. The results of the study was proposed to be useful for

(a) better financial justification of projects under preparation

(b) taking steps to improve cost recovery and

(c) better control over the cost elements.

Against this background the Review and Support Mission (RSM) approached A. F. Ferguson & Co. (AFF) to conduct the study to arrive at the actual cost of operation and maintenance of a few select schemes.

SCOPE OF WORK AND OBJECTIVES

1.5 The objective of the study is to arrive at the actual cost of O&M of two piped water supply schemes and of a group of hand pumps. The review and support mission to UP of November 1992 had decided on

- one piped scheme each in Varanasi and Allahabad
- group of hand pumps in Allahabad

for review of the O&M costs for three years.

1.6 The scope of work can be broadly defined as :

(1) Determining the actual operating hours of the piped schemes for each of the three years

(2) Review of the actual revenues for each scheme

(3) Determining the direct costs of O&M towards manpower, chemicals, power, materials etc.

(4) Determining the indirect cost towards manpower, vehicle usage and allocating a portion of the same to the scheme

(5) Providing for depreciation based on the estimated technical life of the schemes / hand pumps

(6) Arriving at unit cost of water produced

(7) Advise on procedures for better information on O&M costs of dutch assisted projects.

EXCLUSIONS

1.7 The following are excluded from the scope of work :

(1) Socio-economic survey of the benefitted population to study water usage patterns, ability to pay, actual water distribution etc.

(2) Development of an O&M model to provide for sensitivity analysis on critical factors like power tariff, inflation etc.

PURPOSE OF THE REPORT

1.8 AFF commenced the study on 12th November 1992 at Lucknow, after an initial meeting with Mr. Robert Trietsch, member RSM to UP. Field visits were made to Varanasi and Allahabad. The preliminary findings of the study was presented to RSM on 23 November 1992 and to UPJN on 25 November 1992. A brief meeting was also held with the Secretary, Ministry of Urban Development on 25 November 1992.

1.9 The report presents the results of the study carried out and does not intend to generalise the results of the study to evaluate applicability of the same to the whole of UP. The sample size of 2 piped schemes and a group of hand pumps is too small to do this generalisation.

1.10 This report presents AFF's findings and analysis of the O&M costs and is organised on the following lines :

Chapter	2	Executive Summary
Chapter	3	Background to UP Jal Nigam
Chapter	4	Approach to the study
Chapter	5	O & M Costs
Chapter	6	Analysis of O&M Costs
Chapter	7	Systems and procedures
Chapter	8	Conclusions.

2. EXECUTIVE SUMMARY

BACKGROUND

2.1 The Government of Netherlands has been financing water supply projects in UP from 1978 onwards. The first sub project aimed at providing piped drinking water supply to 724 villages in 3 districts. This project was completed in 1986 and have been since maintained by UPJN. The Review and Support Mission [RSM] to UP felt the need for a better understanding of actual costs of Operation and Maintenance [O&M] of two piped water supply schemes and one group of hand pumps. A. F. Ferguson & Co. (AFF) were retained to conduct the study on review of O&M costs.

SCHEMES SELECTED AND CRITERIA

2.2 Based on the broad criteria defined by RSM, the schemes selected and reasons for the same are presented in the table below :

TABLE 2.1

SCHEMES SELECTED FOR REVIEW

SL. NO.	SCHEME	TYPE	REASON FOR SELECTION
1.	Saidabad, Allahabad	Piped	Smaller population 25 kms from city [rural]
2.	Tikri, Varanasi	Piped	Larger population 5-6 kms from city [semi-urban]
3.	Group of hand pumps in Division VI, Allahabad	Hand pumps	Both Mark II/Mark III type of pumps maintained

BASIC PARAMETERS OF SCHEMES

2.3 The basic parameters of the schemes selected as originally envisaged and as of 1991-92 is presented in the table below :

TABLE 2.2

BASIC PARAMETERS OF SCHEMES SELECTED

PARAMETERS	SAIDABAD		TIKRI		HAND PUMPS (NORM PER PUMP)
	AS ENVISAGED	1991-92	AS ENVISAGED	1991-92	
1. Source of water	Ground 2 Tube wells	Ground 2 Tube wells	Ground 2 Tube wells	Ground 2 Tube wells	Ground -
2. Villages covered	19	19	27	27	-
3. Population covered	35360 (2011)	34051	61560 (2011)	59000	250@
4. Number of connections	1458 (2011)	890	1310 (2011)	1400	-
5. Public stand posts	212	238	219	219	-
6. Production (KLD)	3888	2592	3504	3866	10
7. LPCD	70 & 90*	45+	70 & 90*	45+	40
8. Pumping Hours	16 hours	(10.70 x 2)	16 hours	(15.34 x 2)	-
9. Service Hours	8	6	8	6	-

NOTE : @ 50 families at 5 members per family, which is the maximum assumed in the design stage

* 70 LPCD for villages with less than 4000 inhabitants and 90 lpcd for villages with more than 4000 inhabitants

\+ 1991-92 LPCD is calculated on water distributed

TABLE 2.3

ACTUAL O&M COSTS

(VALUE IN RS.)

PARTICULARS	SAIDABAD			TIKRI			27 HAND PUMPS	
	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1990-91	1991-92
1. Direct cost	220100	231100	199400	274550	352500	424565	7327	6973
2. Indirect cost	69450	163250	96800	62345	144035	82830	7350	7179
3. Depreciation	196133	196133	196133	310000	310000	310000	25032	25032
Total	485683	590483	492333	646895	806535	817395	39709	39183
4. Income collected	106000	108000	162800	94000	90000	124000	-	-
5. Deficit	(379683)	(482483)	(329733)	(552895)	(716535)	(693395)	(39709)	(39183)
6. Cost recovery	21.82%	18.29%	33.03%	14.53%	11.16%	15.17%	-	-

NOTE . In the year 1990-91, arrears of salary were paid to staff and officers and that explains the reason for the large increase in indirect costs.

TABLE 2.4

REAL O&M COSTS - PIPED SCHEMES

(VALUE IN RS.)

PARTICULARS	SAIDABAD			TIKRI		
	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92
Direct cost	436318	488969	518786	681335	754482	1017538
Indirect cost	69450	163250	96800	62345	144035	82830
Depreciation	196133	196133	196133	310000	310000	310000
TOTAL	701901	848352	811719	1053680	1208517	1410368
	= +45%	+44%	+65%	+63%	+50%	+73%
Income Collected	106000	108000	162600	94000	90000	124000
Deficit	(595901)	(740352)	(649119)	(959680)	(1118517)	(1286368)
Cost recovery	15.10%	12.73%	20.03%	8.92%	7.45%	8.79%

The final scheme particulars were not made available and hence the following assumptions have been made :

(a) the envisaged production in KLD for Saidabad is based on the release per minute (lpm) of the pumps and the expected pumping hours. For Tikri it is as per the questionnaire

(b) the LPCD envisaged is as mentioned in the questionnaires.

ACTUAL O&M COSTS

2.4 The actual cost of O&M for each scheme for each year for which data was made available is presented in Table 2.3.

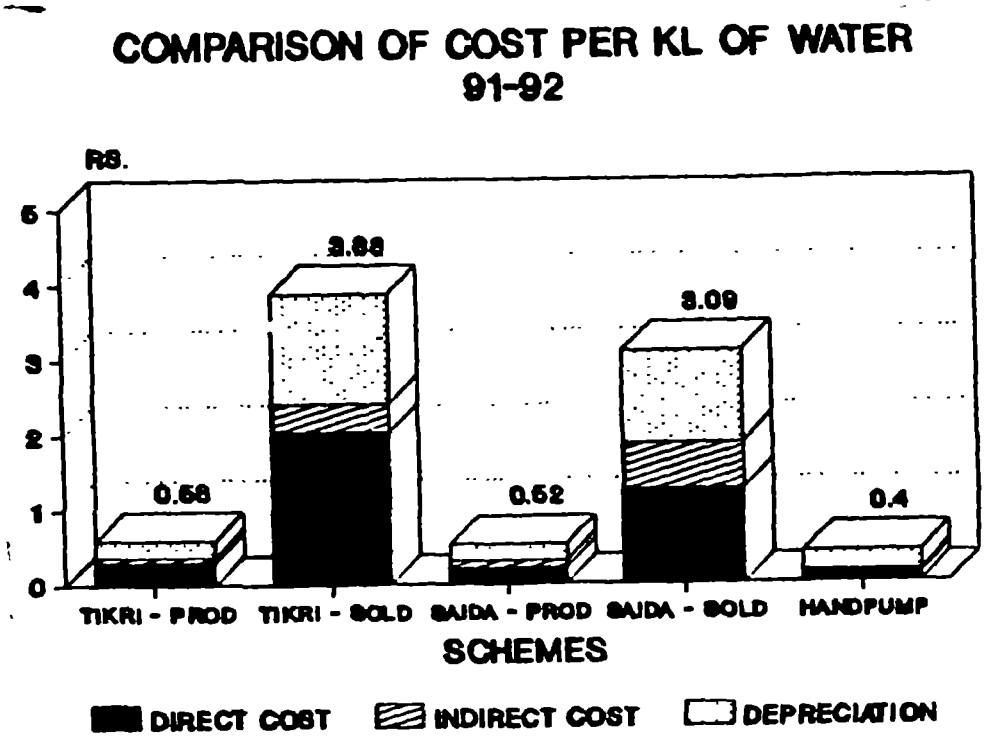
REAL O&M COSTS

2.5 UPJN is presently not paying the power charges at the division level but the same is getting adjusted at the Government level. But power constitutes an important component of direct costs and hence to arrive at the real cost of O&M, power charges based on actual consumption and ruling tariff has been calculated and included. Table 2.4 shows the real cost of O&M for the piped schemes.

UNIT COST OF WATER

2.6 The total real O&M cost of water was analysed into the unit cost per kilo litre (KL) of production as well as per KL of water sold. The water sold is defined as the water billed to the private connections. The Exhibit 2.1 depicts the unit cost per KL of water produced/sold for the two piped schemes in 1991-92 and the unit cost per KL of water produced for the hand pumps in 1991-92.

EXHIBIT 2.1



2.7 As can be seen from the table below the unit cost of water sold increases 5 to 6 times as compared to the cost per KL of water produced. This is due to the fact that a very small percentage of the population has private connections and this is the only available avenue for revenue generation.

TABLE 2.5

REAL UNIT COST OF WATER - 1991-92

(RS. PER KL)

	WATER PRODUCED	WATER SOLD	DEFICIT ON WATER PRODUCED	DEFICIT ON WATER SOLD
1. Saidabad	0.86	5.10	(0.69)	(4.08)
2. Tikri	1.00	6.70	-(0.91)	(6.11)
3. Handpumps	0.40	0.40	(0.40)	(0.40)

NOTE : Cost includes depreciation

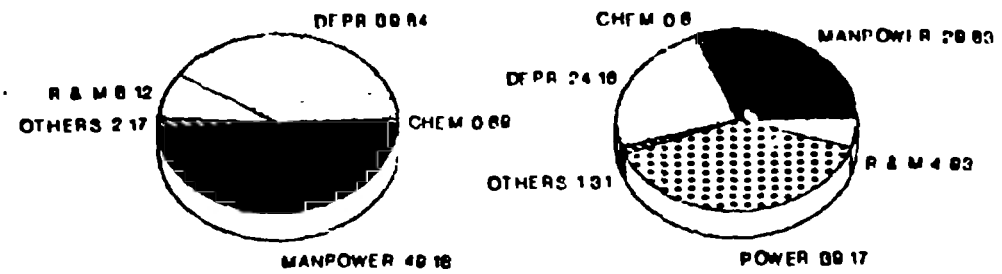
COMPOSITION OF COSTS

2.8 On a review of the real costs of water it can be seen that power charges account for 40-42% of the total cost in 1991-92 for the piped schemes. Manpower and depreciation costs together account for 41% in Tikri and 54% in Saidabad. The exhibits below present the composition of costs in 1991-92 for both actual and real costs.

EXHIBIT 2.2

COMPOSITION OF COST - SAIDABAD (1991-92)

COMPOSITION OF COST (%)
SAIDABAD PIPED SCHEME 91-92

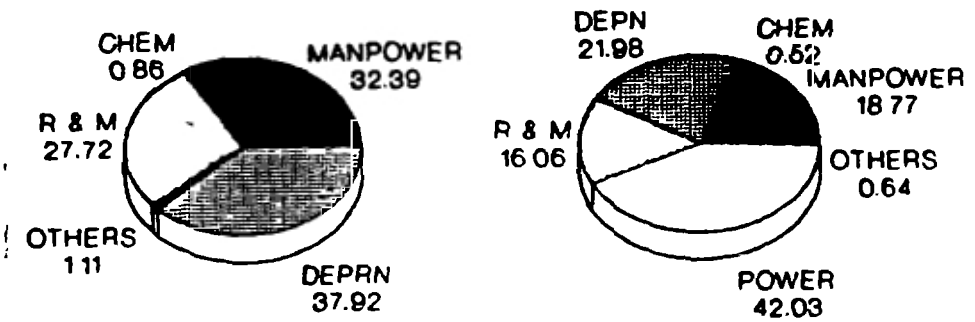


ACTUAL COST REAL COST

EXHIBIT 2.3

COMPOSITION OF COST - TIKRI (1991-92)

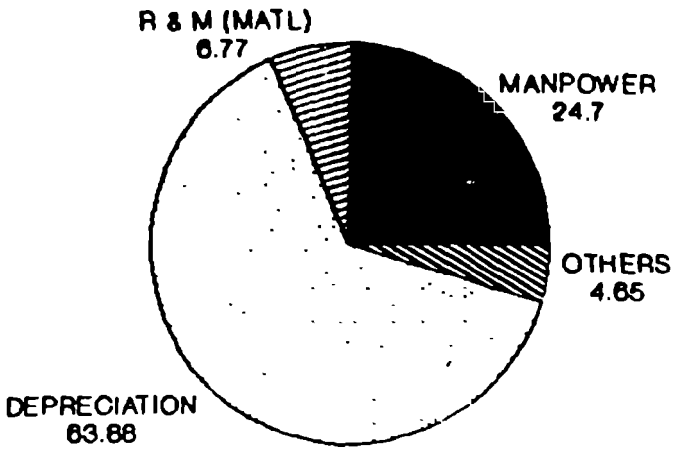
COMPOSITION OF COST (%)
TIKRI PIPED SCHEME 91-92



ACTUAL COST REAL COST

EXHIBIT 2.4

COMPOSITION OF COST (%)
KAURIHAR/CHAYAL HAND PUMP SCHEMES 91-92

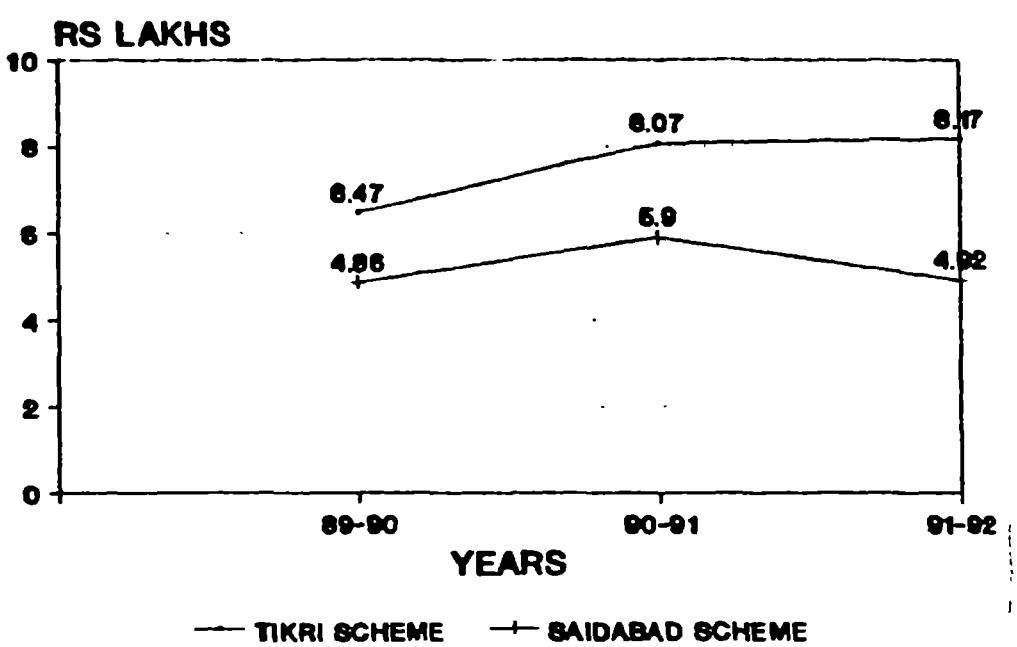


TREND IN REAL COSTS

2.9 The total real costs of O&M in the piped schemes are showing an increasing trend essentially due to inflation, higher power costs and the revised tariff for power from 1991-92 onwards. In the year 1990-91, arrears of salary were paid to officers and staff, resulting in steep increase in costs. Exhibit 2.5 below shows the trend of costs for the piped schemes.

EXHIBIT 2.5

TREND IN O & M COST (ACTUAL)



ANALYSIS OF COSTS/REVENUES

2.10 Real costs derived were further analysed into fixed and variable, in order to arrive at the contribution per KL of water produced/sold. It is interesting to note that operation of both the piped schemes results in a negative contribution meaning that for every KL of water produced UPJN is loosing money. The analysis further shows that the real O&M cost per KL of water produced is ranging from Rs.0.86/KL to Rs.1.00/KL while the tariff fixed by the UP Government is Rs.1.00/KL. But due to a very small percentage of water produced being actually sold, the cost recovery fall downs drastically. Table 2.6 below presents the analysis of costs.

TABLE 2.6

ANALYSIS OF COSTS - 1991-92

(VALUE IN RS. PER KL)

ELEMENTS	TIKRI		SAIDABAD		HAND-PUMPS
	PRO-DUCT-ION	SALES	PRO-DUCT-ION	SALES	
1. Revenue demanded	0.15	0.98	0.17	0.99	-
2. Variable cost	0.59	3.92	0.38	2.28	0.07
3. Contribution	(0.44)	(2.95)	(0.21)	(1.29)	(0.07)
4. Fixed cost	0.41	2.77	0.47	2.82	0.33
5. Surplus/ (Deficit)	(0.85)	(5.72)	(0.68)	(4.11)	(0.40)

2.11 As can be seen from the above table the variable cost per KL of production in hand pumps is comparitively lower as compared to the piped schemes. This is based on the assumption of 250 people using the handpump at the rate of 40 lpcd. But according to available indications the average number of people using the handpump is around 150. In this case the variable cost per KL will go upto Rs.0.12, which is still much lower than piped schemes.

2.12 The costs were further analysed into cost per person covered and cost per household and the following results were obtained from the same. The cost per connection in piped schemes is based on the assumption that the O&M cost for the entire scheme is borne by the population having private connections and hence a complete cross subsidy.

TABLE 2.7

ANALYSIS OF COSTS (1991-92)

(VALUE IN RS.)

	SAIDABAD	TIKRI	HANDPUMPS
REAL COSTS			
1. Total cost per person p.a. (All inhabitant)	23.84	23.90	6.00
2. Total cost per connection p.m.	76.00	83.95	2.42 [Household]
3. Variable cost per connection p.m.	33.97	49.20	0.43 (Household)
4. Fixed cost per connection p.m.	42.03	34.75	1.99 (Household)
ACTUAL COSTS			
1. Total cost per person p.a. (All inhabitant)	14.46	13.85	-
2. Total cost per connection p.m.	46.10	48.65	-
3. Variable cost per connection p.m.	4.06	13.90	-
4. Fixed cost per connection p.m.	42.03	34.75	-

The UPJN is charging Rs.15/- per month as the flat rate for unmetered connections, which does not even cover the variable real cost of O&M. The costs indicated above are total costs spread over the private connections including depreciation for the total scheme/handpump.

2.13 On an analysis of the additional costs required to support the private connections the following results are obtained.

TABLE 2.8

1991-92 ANALYSIS OF ADDITIONAL COSTS (REAL)

(VALUE IN RS.)

REAL COSTS	SAIDABAD	TIKRI
(1) Total cost per population covered by private connections p.a.	32.35	33.78
(2) Total cost per KL of water		
- produced	0.76	0.93
- distributed / sold	1.27	1.32
(3) Total cost per connection pm	21.57	22.52
(4) Variable cost per connection p.m.	10.79	14.36
(5) Fixed cost per connection p.m.	10.78	8.16

As can be seen the cost per KL of water distributed is very close to the tariff being charged today from private metered connections. In the above working depreciation on the capital cost as well as the O&M cost relevant for production for private connections alone was considered hence removing the cross subsidy assumed in Table 2.7.

PROCEDURAL CHANGES NEEDED

2.14 The procedural changes proposed are essentially in the nature of better information generation from available records. It is important that the persons to whom information is made available have adequate authority to take decisions to remedy the pointers from the information.

SUGGESTIONS

2.15 It is clear from the analysis of costs and revenues that cost recovery is very low and for every KL of water produced the UPJN is incurring losses. It is pertinent to note that even in the scheme design [as informed to us] only about 20% of the population are to be covered by private connections, implying an assumed cross subsidy if the scheme is to breakeven. The possible methods to improve the situation are given below but these are not based on a field survey and hence would have to be studied in that light.

(1) Educating the population on the need for 'safe' water and the need to pay for it.

(2) Involving the population right from planning of the scheme and eventually handing over the same for maintenance to the local bodies. The decision whether to take up a scheme should be made by the local bodies and there should be a undertaking that maintenance will be their responsibility. UPJN should just execute the scheme.

(3) Recovering a portion of the costs through a 'Tax' on all households in the village - both for handpump and piped schemes. Since there seems to be a basic lack of inclination in paying for water, this may be an indirect way of recovery. The modalities for this 'Tax' needs to be worked out.

(4) Conducting a socio-economic survey before a scheme is approved. This is essential to get a feel for need for water, ability to pay, intention to pay and other social factors which have a strong bearing on a sensitive issue like provision of water supply. The survey should be a pre-requisite for approval of the scheme, say if the scheme value is above a certain limit.

(5) Due to lower cost recovery, lesser money will be spent on O&M of schemes, which will have a bearing on the quality of service and hence on the collection efficiency. The revenues and O&M costs of a scheme should be closely evaluated during the planning stage itself and the sensitivity of the same to critical parameters like inflation, tariffs, wastage factor etc. need to be studied. The results of the evaluation should justify taking up the scheme. Development of a O&M financial model may be taken up for the purpose.

(6) Involving private contractors / voluntary agencies in maintenance of piped as well as hand pump schemes.

(7) For existing schemes, there is a tariff fixed for public stand posts also. Efforts may be taken to recover these charges from the households, which may have a good bearing on the cost recovery. The responsibility of recovering the PSP charges may be given to the local bodies / voluntary organisation.

(8) It is to be remembered that all assets have a life span. They need to be replaced or extended. It is important to recover depreciation charges also in order to ensure availability of funds for replacements/extensions. This has a long term impact on the efficiency of the organisation.

(9) There is need for a closer monitoring of O&M costs at various levels through improved Management Information Systems (MIS).

CONCLUSION

2.16 It is near impossible for a commercial organisation like UPJN to achieve the twin objectives of providing service and also breakeven on costs. The situation on O&M is quite alarming and immediate steps are needed to ensure better recovery of costs. The experience gained in the past should become inputs for future planning through better evaluation of schemes and critical importance given to review O&M costs and revenues.

3. BACKGROUND TO UP JAL NIGAM

STATE OF UP

3.1 Uttar Pradesh (UP) had population of 139 million in 1991 constituting 16.5% of India's population but with only 9% of India's total area. The population growth in UP during the period 1981-1991 is slightly higher as compared to the All India average (ie)

1981-1991	UP	2.29% p.a.
	All India	2.14% p.a.

[Source : Report of the 1992 Evaluation Mission - June 1992]

71% of the population is said to be agriculture based as compared to 60% All India average, indicating a higher component of rural population.

3.2 The state is organised on the following lines :

DIVISIONS	13
DISTRICTS	63
TEHSILS	282
DEVELOPMENT BLOCKS	859
VILLAGES	112566

The population in each village is said to be relatively small as shown below :

(a)	villages with less than 500 population	47% of total villages	14% of total population
		Average population per village	370
(b)	villages with between 500-1999 population	44% of total villages	55% of total population
		Average population per village	1545

[Source : Report of the 1992 Evaluation Mission - June 1992]

3.3 The state can further be classified as

- Plains (55 out of 63 districts)
- Hills Himalayas
- Rocky Bundelkand

ECONOMIC PROGRESS OF UP

3.4 The state of UP had a per capita income of Rs.3072 in 1989-90 which is lower than the All India figure by Rs.1180. The growth in per capita income has been lower than the All India growth as shown below :

TABLE 3.1

PER CAPITA INCOME

YEAR	UP	ALL INDIA	DIFFERENCE	% OF DIFFERENCE
1980-81	1286	1630	344	27%
1984-85	1812	NA	NA	NA
1989-90	3072	4252	1180	38%

[Source : Report of the 1992 Evaluation Mission - June 1992]

INTRODUCTION TO UPJN

3.5 Provision of water supply in the state of Uttar Pradesh (UP) was the responsibility of the Public Health Engineering Department (PHED) from the year 1927 onwards. The PHED was subsequently renamed as the Local Self Government Engineering Department (LSGED). Considering the importance of providing water supply, an autonomous corporation in the name of Uttar Pradesh Jal Nigam (UPJN) was formed in 1975 to take over the functions of LSGED. For the provision and maintenance of water supply in major towns, Jal Sansthans were also formed.

ROLE OF UPJN

3.6 UPJN is responsible for the following functions :

- Provision and maintenance of water supply in the whole of UP except the major towns
- Provision and maintenance of sewerage treatment facilities (except in major towns)
- Provision of sanitation facilities (except in major towns)

The state of UP is said to possess a higher level of surface and ground water as compared to the All India figures.

3.7 Inspite of the higher levels of water availability and the Government's thrust towards provision of safe drinking water, specially in the rural areas, many problems have been encountered in terms of

- large area of the state as well as higher population growth
- wide disbursement of the population (small villages)
- different types of terrains (hilly, rocky, plains)
- lower economic status of the population

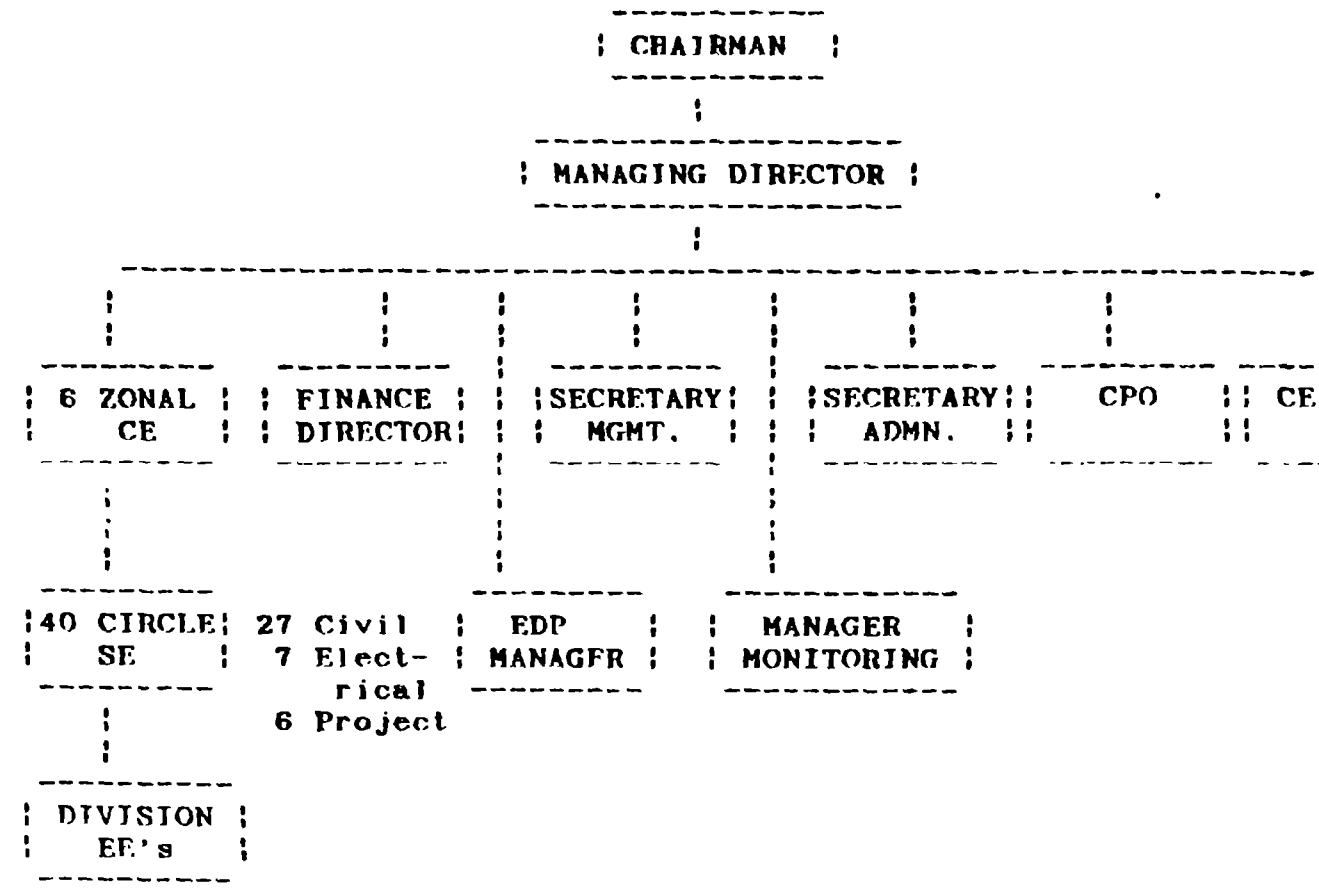
But still a lot of work in creation of water supply assets have been done and the focus is now on better utilisation of created assets and resources.

ORGANISATION OF UPJN

3.8 UPJN is managed by a Board and is headed by a Chairman. It also has a Managing Director and a Finance Director. UPJN employs around 15000 staff in addition to work charge and non-muster roll employees. It has its head quarters at Lucknow and is organised into 6 geographical areas headed by Chief Engineers (CE). The organisation structure is as depicted below :

EXHIBIT 3.1

ORGANISATION STRUCTURE



135 construction, 25 electrical and mechanical, 19 project a addition special divisions.

NOTE : (1) Organisation structure as given by UP Jal Nigam

(2) Do not necessarily indicate grades/levels.

INDO-DUCTH CO-OPERATION

3.9 As part of the bilateral co-operation between Government of India and Kingdom of the Netherlands, UP has been getting assistance for water supply projects from the year 1978 onwards. At the time of commencement the objectives for the Dutch assistance were

> "The improvement of the health situation and the general living conditions in the rural areas of UP through better drinking water supply."
>
> The assistance is for the creation of the scheme and the responsibility for operation and maintenance is with UPJN and the State Government.

3.10 The Dutch Government has so far financed 6 schemes [SPI and SP III to SP VII] covering various districts and types of schemes. The profile of the projects financed by the Dutch Government are given below :

TABLE 3.2

PROFILE OF DUTCH ASSISTANCE

Sl. NO.	PROJECT	TYPE OF SCHEME	COVERAGE	NUMBER OF SCHEMES	ALLOCATION IN DG ('000)
1.	Sub Project (SP) I	Piped	724 villages in 3 dists.	22	22140
2.	SP III	Hand pumps	960 villages in 6 dists.	5830 pumps	11100
3.	SP IV	Piped	237 villages in 2 dists.	13	17000
4.	SP V	Sanitation	13000 house-holds 32 schools	-	5210
5.	SP VI	a. Hand pumps	1638 villages in 7 dists.	13589	25000
		b. Commun-ity parti-cipation	-	-	968
6.	SP VII	Piped	3605 villages	10	81400

DG = Dutch Guilders

Source : Report of the 1992 Evaluation Mission - June 1992

PROFILE OF OPERATION AND MAINTENANCE (RURAL)

3.11 The UPJN operates and maintains 817 piped water supply schemes and about 295000 hand pumps in rural areas as at the beginning of 1991-92. The overall profile of O&M in rural areas and some of the key ratios are presented below. These are essential to present so as to compare the same with results from the study.

TABLE 3.3

O&M OF PIPED SCHEMES - UPJN (PLAINS)

(1)	Total schemes	817
(2)	Estimated cost at the time of construction [Rs.lacs]	19385
(3)	Total number of tube wells	1375
(4)	Total number of overhead tanks	1020
(5)	Length of pipeline in KMS	25820
(6)	Number of private connections	205519
(7)	Number of villages benefitted	9942
(8)	Population benefitted	10595449

NOTE : Source : (1) Report on the recommendations of the committee constituted for working out norms

(2) Figures are approximate

TABLE 3.4

KEY INDICATORS - PIPED SCHEMES - PLAINS - UPJN

PARTICULARS	VALUE (RS.LACS)			AS A% OF PROJECT COST			PER PRIVATE CONNECTION P.M.			PER PERSON BENEFITTED P.M.		
	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92
1. Receipts	165	205	240	0.65%	1.06%	1.24%	6.69	8.31	9.73	0.11	0.16	0.19
2. Total expenditure on O&M without centage	888	1116	2252	4.58%	5.76%	11.62%	36.00	45.25	91.31	0.70	0.88	1.77
3. Cost recovery	19%	18%	11%									

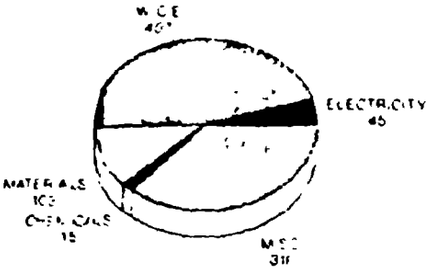
NOTE : SOURCE : (1) Report on the recommendations of the committee constituted for working out norms

(2) 1989-90 and 90-91 are actuals while 91-92 is anticipated, costs exclude depreciation.

EXHIBIT 3.2

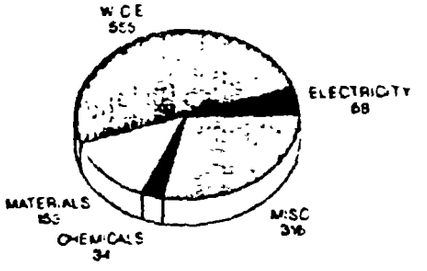
COMPONENTS OF O&M COST - PIPED - PLAINS - UPJN

COMPONENTS OF O & M COST (RS.LAKHS)
PIPED SCHEME - PLAINS - UPJN - 89-90



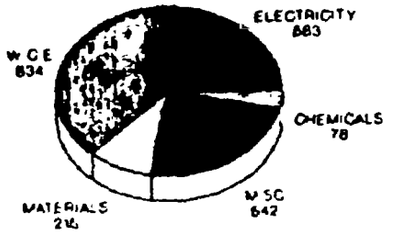
TOTAL Rs. 888 Lakhs

COMPONENTS OF O & M COST (RS.LAKHS)
PIPED SCHEME - PLAINS - UPJN - 90-91



TOTAL Rs.1116 Lakhs

COMPONENTS OF O & M COST (RS.LAKHS)
PIPED SCHEME - PLAINS - UPJN - 91-92



TOTAL Rs.2252 Lakhs

3.12 The overall profile of O&M of hand pumps in rural areas by UPJN is given below :

TABLE 3.5

KEY INDICATORS - HAND PUMPS - PLAINS - UPJN

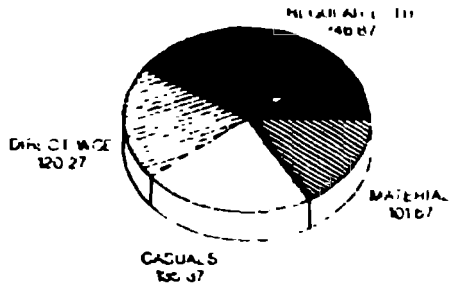
	1989-90	1990-91	1991-92
1. Number of hand pumps maintained [approx.]	219310	252325	296880
2. Total cost of O&M [Rs. lakhs]	604.10	806.88	945.39
3. Norms			
a. Families [50 per pump]	10965500	12616250	14844000
b. Population [250 per pump]	54827500	63081250	74220000
c. KL production [40 lpcd]	800481500	920986250	1083612000
4. Key Ratios			
a. Cost per house-hold per month	0.46	0.53	0.53
b. Cost per person per month	0.09	0.11	0.11
c. Cost per KL of production	0.08	0.09	0.09
d. Cost per pump p.a.	275.45	319.78	318.44

NOTE : Source : (1) Report on the recommendations of the committee constituted for working out norms

(2) Cost excludes depreciation.

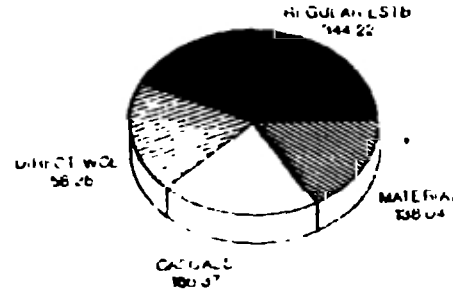
EXHIBIT 3.3

COMPOSITION OF O & M COST (RS.LAKHS)
HAND PUMP SCHEME - PLAINS - UPJN - 89-90



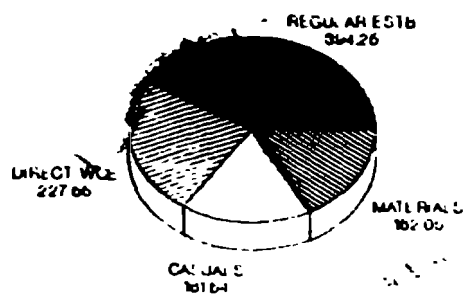
TOTAL Rs.604.08 Lakhs

COMPOSITION OF O & M COST (RS LAKHS)
HAND PUMP SCHEME - PLAINS - UPJN - 90-91



TOTAL Rs. 806.88

COMPOSITION OF O & M COST (RS.LAKHS)
HAND PUMP SCHEME - PLAINS - UPJN - 91-92



TOTAL Rs 946.39 Lakhs

UP JAL NIGAM FINANCES

3.13 A sum of Rs.7000 million was spent during the seventh plan for water supply and sanitation in UP. Against this a provision of Rs.14500 million has been made for the eighth plan. The details are as given below, which indicate the importance being given to rural water supply.

TABLE 3.6

UP JAL PLAN ALLOCATION

(RS. MILLION)

H E A D S	VII PLAN ACTUALS	%	VIII PLAN BUDGET	%
(1) Rural water supply	5570	80	10250	71
(2) Rural sanitation	230	3	150	1
Total	5800	83	10400	72
(3) Urban water supply	1090	16	3200	22
(4) Urban sanitation	110	1	900	6
Total	1200	17	4100	28
GRAND TOTAL	7000	100	14500	100

Source : (1) Indo-Dutch rural water supply and sanitation projects - UP - India - Report of 1992 Evaluation Mission - June 1992

(2) Includes assistance under Netherlands Assisted Projects (NAP)

FINANCIAL POSITION OF UP JAL

3.14 The UP Jal Nigam essentially depends on the State Government through the Minimum Needs Programme (MNP) and the Central Government through the Accelerated Rural Water Supply Programme (ARWSP) for financing new projects. In addition funds are obtained under the NAP. For maintenance of schemes and hand pumps funds are received from

- water charges recovery
- percentage of plan funds allotted by government for O&M and
- government subsidy.

3.15 UPJN has been continuously incurring deficits which essentially means that the cost of supervision of projects and maintenance is much more than the centage being charged. The following table presents the overall financial performance :

TABLE 3.7

UPJN OVERALL FINANCIAL PERFORMANCE

(RS. MILLION)

YEARS	INCOME	% INC.	EXPENDITURE	% INC.	DEFICIT	% OF INCOME
1984-85	193		338		145	75
1985-86	305	58	395	17	90	29.
1986-87	316	4	447	13	131	41
1987-88	352	11	525	17	173	49
1988-89	407	16	664	26	257	63
1989-90	391	(4)	724	9	333	85
1990-91	326	(17)	948	31	622	191
Average p.a.		11		30		

NOTE : Source : (1) Report of the 1992 evaluation mission June 1992

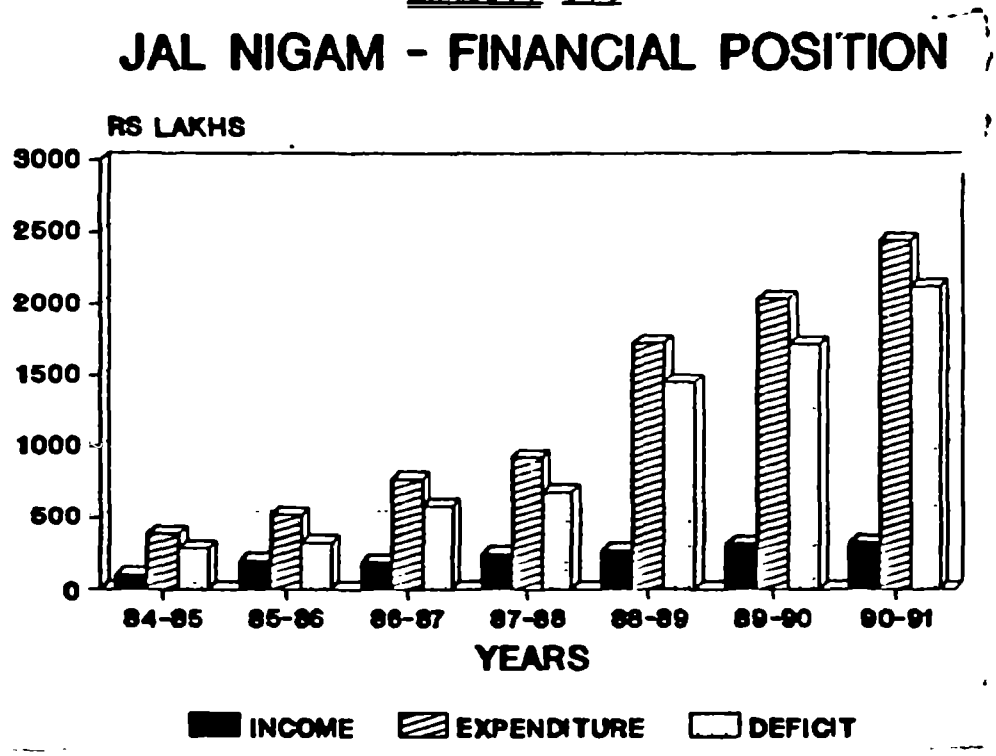
(2) Income excludes state government grants but includes centage.

As can be seen the rate of increase in expenditure is almost thrice that of increase in income resulting in higher percentage of deficits.

O&M - FINANCIAL POSITION

3.16 The financial position on operation and maintenance is no different, with increasing deficits each year. The following exhibit presents the income, expenditure and deficit on O&M account.

EXHIBIT 3.4



3.17 On an analysis of the costs the following are indicated :

- deficit as a % of income has been growing consistently in the last 4-5 years to stand at 657% in 1990-91
- the average increase in income is 37% during 1984-85 to 1990-91 as compared to a 88% increase in expenditure thus contributing to the growing deficits
- the cost recovery has fallen from about 26% in 1984-85 to 13% in 1990-91.

STUDY ON O&M COSTS

3.18 Considering the alarming situation of UPJN finances on O&M, the RSM felt the need for a clearer understanding of the actual costs of O&M. This is essential to ensure that the resources created over a period of time are actually used effectively and the objectives set out for the assistance is met. As already indicated SPI provided 22 piped schemes in the districts of Rai Bareli, Varanasi and Allahabad. The RSM decided on a review of O&M costs of SPI schemes, since they have been in operation from 1986 onwards.

SCHEMES SELECTED AND CRITERIA

3.19 The RSM decided on one piped scheme each in Varanasi and Allahabad and a group of hand pumps in Allahabad for review of O&M costs. It was decided to take only dutch assisted piped schemes, though it would have been difficult to adopt that for hand pumps. The final selection of schemes was based on population coverage and the distance of the scheme from the nearest city. Table 3.8 below shows the selection of schemes and the criteria adopted for the same.

TABLE 3.8

SCHEMES SELECTED

SL. NO.	SCHEME	TYPE	REASON FOR SELECTION
1.	Saidabad, Allahabad	Piped	Smaller population 25 kms from city [rural]
2.	Tikri, Varanasi	Piped	Larger population 5-6 kms from city [semi-urban]
3.	Group of hand pumps in Division VI	Hand pumps	Both Mark II/Mark III type of pumps maintained

3.20 The schemes selected were discussed with RSM and agreed upon. Subsequent to this a detailed plan for conduct of the study was drawn up. The approach to the study, data collected and analysis of the same are presented in the subsequent chapters.

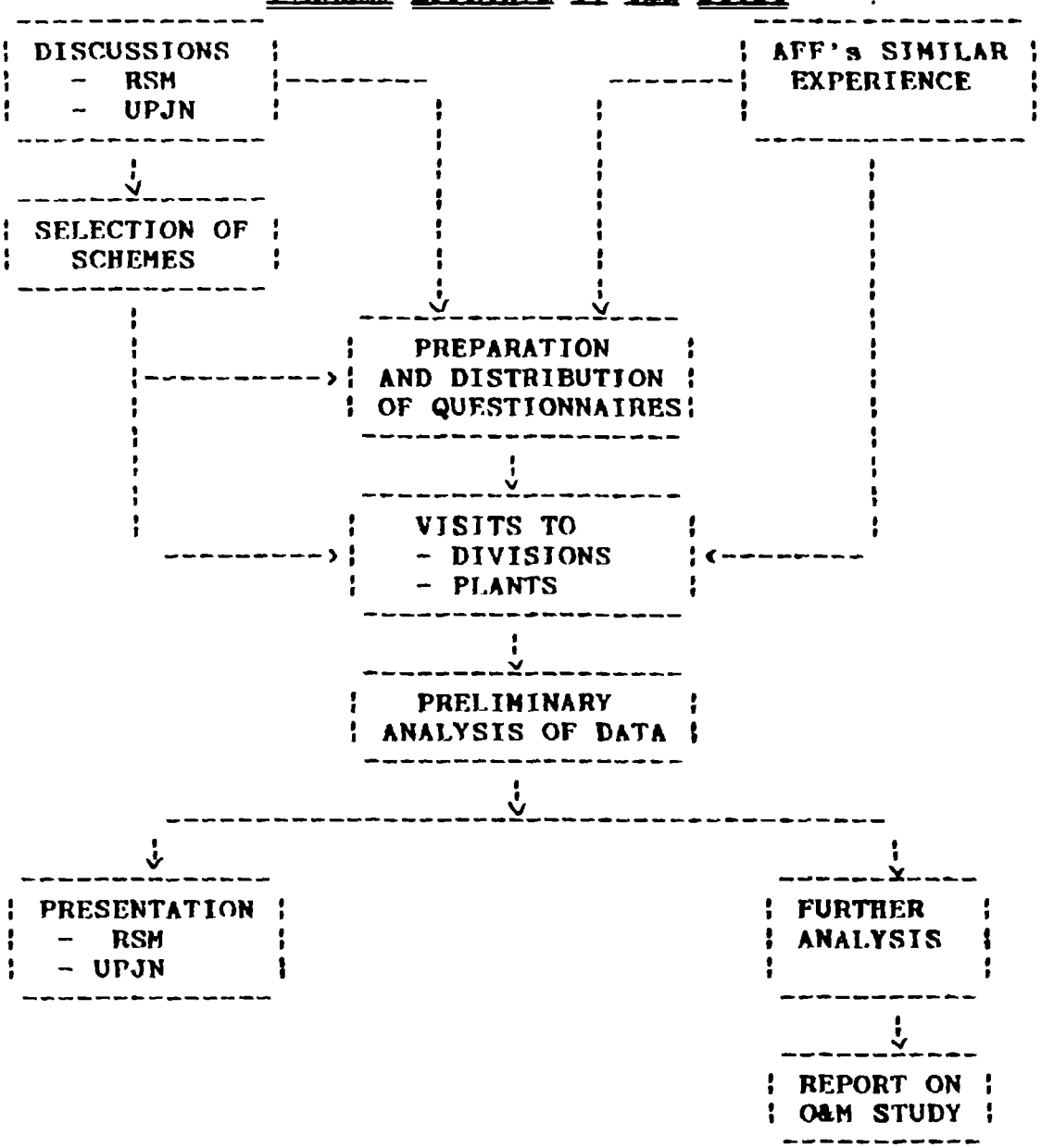
4. APPROACH TO THE STUDY

BASIC APPROACH

4.1 The study was commenced on 12 November 1992 with discussions on the objectives of the study and the schemes to be selected with Mr. Robert Trietsch of the RSM. The overall approach to the study was based on the combination of our experience in conducting similar studies and actual field visits to divisions/plants to get a first hand feel of the operation and maintenance aspects. Exhibit 4.1 depicts the overall approach to the study.

EXHIBIT 4.1

OVERALL APPROACH TO THE STUDY



4.2 Some of the critical steps in the approach are discussed in detail in the subsequent paragraphs. The critical assumptions in analysing the costs and revenues are also indicated under 'Analysis'.

QUESTIONNAIRE

4.3 After discussions with RSM and UPJN, detailed questionnaire, one each for piped schemes and hand pumps, was prepared and sent to the divisions concerned for updation. The questionnaire is broadly organised as follows :

Piped

(1) Schemes detail at project completion time

(2) Scheme/yearwise details [1989-90 to 1991-92]

- (a) physical parameters
- (b) financial parameters
- (c) operation and maintenance costs
  - various heads

(3) General [problems faced, suggestions]

(4) List of records maintained

(5) Enclosures, if any

Hand pumps

(1) General [Location, Make, Cost of purchase etc.]

(2) Norms for maintenance [manpower, materials]

(3) Physical parameters

(4) O&M Costs [headwise] for the pump

(5) Division O&M costs on hand pumps

(6) General

(7) Records maintained

(8) Enclosures, if any

Copies of the questionnaire are enclosed as Annexure I.

VISITS TO DIVISION/PLANTS

4.4 Visits were made to the divisions responsible for O&M of the piped schemes and the group of hand pumps and in addition the pumping plants at Tikri, Varanasi and Saidabad, Allahabad were also visited. The focus of the visit, apart from helping UPJN divisions to update the questionnaire, was to get a first hand feel of O&M by talking to the people at the plant and division office. The visits were aimed at

(a) review of the log books / sheets maintained at the plant to derive / judge

- service hours
- number of hours of pumping for each tube well per day for each year
- chemicals consumption per day
- days on which plant/(s) not working

(b) review of other records to look at

- type of complaints received & quickness of action taken
- availability of chemicals

(c) getting ca feel of the time spent by each category of labour / cstaff on various activities of O&M by talking to them

(d) talking to the people in the nearest village, very briefly, on water availability, hours of supply, whether meters available, why not paying for water etc.

4.5 The Executive Engineer (EE) in charge of the division and the Assistant Executive Engineer (AEE) in charge of the scheme were also met to understand the problems in O&M and to estimate the time spent by each of them on O&M of the scheme concerned. Records maintained at the division for expenditure was also briefly reviewed.

4.6 For hand pumps, details were essentially obtained through the questionnaires but wherever made available the cards maintained to record the repairs carried out and the cost of materials and casual labourers reviewed. In addition details on number of hand pumps maintained by the JE/AE/EE concerned were obtained to help in allocation of indirect manpower cost.

4.7 To the extent available, the annual balance sheet of the division, at least for the year 1991-92 was obtained to get an overall view of the total cost of O&M for that division.

4.8 The list of people met during the study is enclosed as Annexure II.

ANALYSIS

4.9 The data obtained from the field visit and from the questionnaires was critically reviewed and analysed with a view to derive :

(a) Total cost of operation and maintenance [split into direct and indirect] as well as the revenues demanded and collected

(b) Composition of total cost in to manpower, power, chemicals, other expenses and depreciation

(c) Cost per KL of water produced, distributed and sold for piped schemes and cost per KL of water and per pump for hand pumps

(d) Contribution in total and per KL after splitting costs into fixed and variable elements

(e) Cost per connection and person covered.

The power charges that would have been due based on actual pumping hours was added to the actual costs to derive the real costs. The detailed analysis mentioned above was also carried out on the real costs.

4.10 The analysis of the data was carried out by using a financial model developed for this purpose on Lotus 1-2-3.

ASSUMPTIONS

4.11 The assumptions made in working out the actual O&M costs are listed below :

Piped Schemes

(1) To arrive at the population covered by private connections, the average household size was taken as 8 for Tikri and Saidabad schemes.The balance population was presumed to be covered by Public Stand Posts (PSP).

(2) The actual pumping hours were compiled from the log books available at the plant. If particular year's log book were not made available the previous years average was considered. Wherever log books were not made available for a month, the average pumping hours per month in each season was assumed to derive year / monthwise pumping hours. For this purpose the year was split into two seasons [ie.] summer and winter [April to September and October to March]. Most of the data for the year 1991-92 was available for both the schemes.

(3) Water distribution was difficult to assess due to lack of records in this regard. This was essentially picked up from the questionnaire but suitably adjusted for

- lpcd in each category
- revenue demand from private connections

For eg. - in the Tikri scheme while distribution to metered connections was given as 370679 KL, the actual revenue demand was only Rs.2.06 lakhs. In this case, the revenue demand was taken as the basis for arriving at water distribution. It has been assumed that water demand has been at Rs.1/- per KL (ie.) without the rebate for early payment.

(4) Water sold excludes distribution through public stand posts.

(5) The indirect manpower cost was arrived at on the following basis :

LEVEL	TIKRI % ASSUMED	SAIDABAD % ASSUMED
EE	5	5
AE	20	15
JE	50	85
Admn. staff	5	5

These were based on discussions with respective level of people as well as indications in the questionnaire. The EE's % was also assumed for administration staff.

(6) The real power charges (which are not based on bills received or on the flat rate) were arrived at based on the following formula :

Number of hours of pumping x HP x 0.735 x rate per unit

The power tariff assumed are

1989-90	Rs.1.10/unit
1990-91	Rs.1.10/unit
1991-92	Rs.1.60/unit

Since proper data on the load factor of the pump was not made available, the same has been assumed as 1. But in most cases the load factor may be less than 1 and hence the power charges may be lower. The power charges worked out are as if for metered power connections. But meters have not been installed for both the schemes visited. The electricity board is charging only a flat rate per month, which also are not being paid.

(7) The price for bleaching powder was assumed at :

1989-90	Rs.3.75/kg.
1990-91	Rs.3.90/kg.
1991-92	Rs.5.13/kg.

(8) Cost of O&M of vehicles was as mentioned in the questionnaire

(9) Other administration overheads was allocated at 5%

(10) Depreciation was provided on straightline method based on 30 years life.

(11) The cost per connection is arrived based on the assumption that the population covered by private connections bears the total O&M cost of the entire scheme resulting in a complete cross subsidy.

(12) Interest factor is not considered in the calculations since the capital and O&M cost is today funded from interest free sources. If interest is included the O&M cost would go up. The ruling risk free rate is about 10% p.a. and the bank rate for cash credit is around 18-20% p.a.

Hand pumps (HP)

(1) 27 hand pumps were chosen for a detailed analysis

15 in Kaurihar
12 in Chayal

(2) Data for 1989-90 was not available in full and hence results are presented only for 1990-91 and 1991-92.

(3) The salary of the work charged establishment (WCE) directly involved in hand pumps maintenance was equally distributed over the handpumps maintained by the group of WCE.

(4) 33% of the JE's time was presumed to be spent on hand pumps maintenance and the proportional salary thus derived was distributed equally over the number of hand pumps maintained. Similarly 11% of AE's salary and 16% of EE's salary were assumed.

(5) The average number of hand pumps maintained in each year was arrived at based on the formula

$$\frac{\text{HP at beginning of year} + \text{HP at closing of year}}{2}$$

(6) Cost per KM of vehicle was indicated in the questionnaire along with estimated number of kms run for each hand pump; which was the basis for vehicle expenditure per pump.

(7) The administrative overheads were distributed along the same basis as the EE's salary.

(8) Depreciation was arrived at based on straightline method with 15 years life.

PRESENTATION

4.12 The detailed analysis of the data based on assumptions mentioned above was carried out and the preliminary results presented to RSM and the UPJN.

REPORT

4.13 Further analysis, essentially in the nature of different assumptions on distribution, revenues from PSP's, proportional depreciation on private connections were carried out and the results are presented in this report. The detailed findings from the study are presented in the subsequent chapters.

5. O&M COST OF SCHEMES

BACKGROUND

5.1 The data collected on the piped schemes and the group of hand pumps was analysed to arrive at the total cost and unit cost per Kl.. As explained in the previous chapter, further analysis on the components of costs and the nature of costs [ie.] fixed/variable was also carried out. This chapter presents the results of this analysis.

SCHEME SPECIFIC INFORMATION

5.2 At the time of design of the piped schemes, various parameters were decided and the same are presented below :

TABLE 5.1

DESIGN PARAMETERS - PIPED SCHEMES

PARAMETERS	SAIDABAD	TIKRI
1. Scheme completed in	1983	1983
2. Source of water	2 tube wells	2 tube wells
3. Villages to be covered	19	27
4. Population in design year(2011)	35360	61560
5. Pumping station and capacity	30 HP and 40 HP 1950 lpm and 2100 lpm resp.	45 HP and 40 HP 2100 lpm each
6. Capacity of over-head tank	650 KL	1200 KL
7. Length of distribution lines	59 kms	80 kms
8. Number of metered connections(2011)	1458	1312

TABLE 5.1 (CONTD.)

PARAMETERS	SATDABAD	TIKRI
9. Number of PSP's planned	212	219
10. LPCD assumed *	70/90	70/90
11. Anticipated O&M cost per Kl. of water production	Rs.0.24	Rs.0.13
12. Total actual scheme cost [Rs. lakhs]	58.84	92.78

* 70 lpcd for villages with less than 4000 inhabitants and 90 for villages with more than 4000 inhabitants.

NOTE : Information as provided in the questionnaire. Actual design records not made available and hence not verified.

5.3 The hand pumps were planned with the following norms :

Number of persons per pump	250
lpcd	40
Number of families per pump	50 @ 5 per family. (being the maximum assumed in the design stage)

5.4 The key physical parameters of the piped schemes as of 1991-92 as compared to the design parameters are presented below to enable evaluation of certain parameters like population and service hours, which seem to have undergone drastic changes.

TABLE 5.2

KEY PARAMETERS PIPED SCHEMES

PARAMETERS	SAIDABAD		TIKRI	
	AS ENVISAGED	1991-92	AS ENVISAGED	1991-92
1. Source of water	Ground 2 Tube wells	Ground 2 Tube wells	Ground 2 Tube wells	Ground 2 Tube wells
2. Villages covered	19	19	27	27
3. Population covered	35360 (2011)	34051	61560 (2011)	59000
4. Number of connections	1458 (2011)	890	1310 (2011)	1400
5. Public stand posts	212	238	219	219
6. Production (KLD)	3888	2592	3504	3888
7. LPCD	70 & 90*	45+	70 & 90*	45+
8. Pumping Hours	16 hours	(10.70 x 2)	16 hours	(15.34 x 2)
9. Service Hours	8	6	8	6

* 70 lpcd for villages with less than 4000 inhabitants and 90 lpod for villages with more than 4000 inhabitants

\+ 1991-92 LPCD is calculated on water distributed

NOTE: The final scheme particulars were not made available and hence the following assumptions have been made :

(1) the envisaged production in KLD for Saidabad is based on the release per minute (lpm) of the pumps and the expected pumping hours. For Tikri it is as per the questionnaire

(2) the LPCD envisaged is as mentioned in the questionnaire

ORGANISATION OF THE SCHEMES

5.5 The organisation structure for operation and maintenance of the schemes as of 1991-92 is shown below. The salary cost of these people have been allocated to the scheme based on the assumptions given in chapter 4.

TABLE 5.3

ORGANISATION

LEVEL OF PEOPLE	SAIDABAD	TIKRI	KAURIHAR HPS	CHAYAL HPS
INDIRECT				
1. Executive Engineer	1	1	1	1
2. Assistant Engineer	1	1	1	1
3. Junior Engineer	1	1	1	1
TOTAL	3	3	3	3
DIRECT			2*	4*
4. Pump operators	2	5@		
5. Tax collector	1	1		
6. Fitter	1	2		
7. Beldar	1	2		
8. Sweeper [part time]	1	-		
9. Pump attendants	5	-		
TOTAL	11	10	2	4
GRAND TOTAL	14	13	5	7

@ May include attendants also

* Levels not available.

5.6 It is pertinent to note that inspite of Tikri being a bigger scheme with more private connections and distribution lines it has lesser number of direct labour as of 1991-92.

ACTUAL COST OF O&M

5.7 The actual cost of O&M of the piped schemes and of the group of hand pumps is presented in Table 5.4. As can be seen the cost recovery is very low in the piped schemes and nil for the hand pumps. While the Tikri scheme is showing consistent increase in costs, Saidabad scheme is showing lower direct cost in 91-92, compared to 89-90. This is due to lower repairs cost even in absolute terms which may not be healthy for maintenance of the system.

TABLE 5.4

ACTUAL O&M COSTS

(VALUE IN RS.)

PARTICULARS	SAIDABAD			TIKRI			27 HAND PUMPS	
	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1990-91	1991-92
1. Direct cost	220100	231100	199400	274550	352500	424565	7327	6973
2. Indirect cost	69450	163250	96800	62345	144035	82830	7350	7179
3. Depreciation	196133	196133	196133	310000	310000	310000	25032	25032
Total	485683	590483	492333	646895	806535	817395	39709	39183
4. Income collected	106000	108000	162800	94000	90000	124000	-	-
5. Deficit	(379683)	(482483)	(329733)	(552895)	(716535)	(693395)	(39709)	(39183)
6. Cost recovery	21.82%	18.29%	33.03%	14.53%	11.16%	15.17%	-	-

NOTE : In the year 1990-91, arrears of salary were paid to staff and officers and that explains the reason for the large increase in indirect costs of piped schemes.

REAL COST OF O&M

5.8 The real cost of O&M includes the actual cost and in addition the power charges calculated based on actual operating hours of the pumping station. In the real costs, power charges become a very important component as is evident from the increased direct costs. The real costs of O&M of the piped schemes are presented in Table 5.5 below :

TABLE 5.5

REAL O&M COSTS

(VALUE IN RS.)

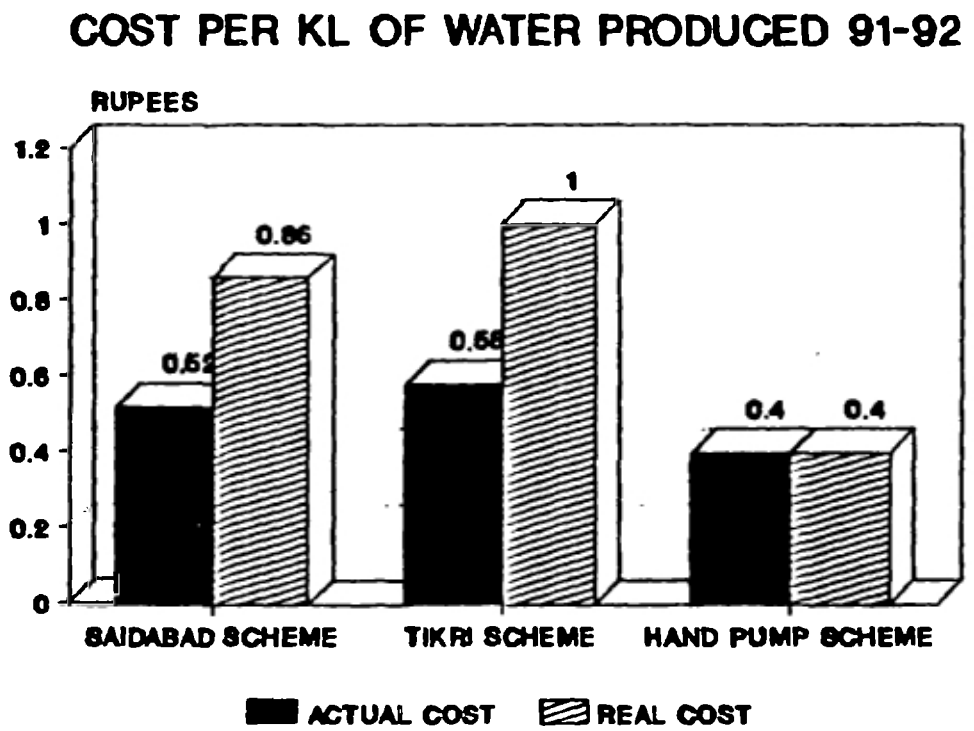
PARTICULARS	SAIDABAD			TIKRI		
	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92
Direct cost	436318	488969	518786	681335	754482	1017538
Indirect cost	69450	163250	96800	62345	144035	82830
Depreciation	196133	196133	196133	310000	310000	310000
TOTAL	701901	848352	811719	1053680	1208517	1410368
Income Collected	106000	108000	162600	94000	80000	124000
Deficit	(595901)	(740352)	(649119)	(959680)	(1118517)	(1286368)
Cost recovery	15.10%	12.73%	20.03%	8.92%	7.45%	8.79%

COST PER KL OF WATER

5.9 The actual and real cost of water was distributed over the extent of water produced, distributed and sold to arrive at the unit cost of water. Since 1991-92 is a representative year, because of revised pay scales from 1990-91, the cost per KL of water produced in 1991-92 will be a good indicator of the costs. The following exhibit presents the cost per KL of water produced in 1991-92.

EXHIBIT 5.1

COST PER KL OF WATER PRODUCED - 1991-92



5.10 Table 5.6 gives the actual and real cost per KL of water produced and sold. Two interesting inferences can be made from this table [ie.]

(1) The cost per KL of water sold in piped schemes goes up 5 to 6 times as compared to the cost per KL of water produced

(2) The deficit of Rs.0.40 in O&M of hand pumps is comparable with the actual cost deficit in piped schemes in terms of KL of water produced (Rs.0.35 and Rs.0.49). But the real cost of O&M in piped schemes per KL of water produced is much higher.

TABLE 5.8

O&M COST OF WATER PER UNIT (1991-92)

O & M COST OF WATER

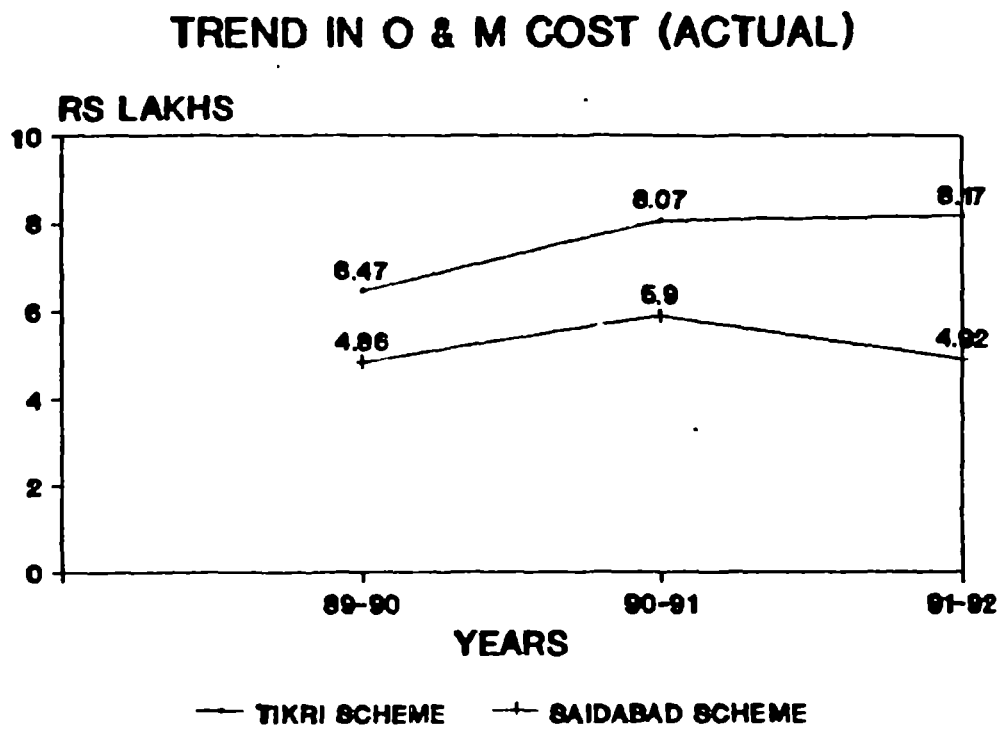
YEAR:1991-92	(COST PER BL) PIPED SCHEMES				(COST PER PUMP) BANDPUMPS		(COST PER BL)	
	HERI		SAIDABAD		27 BANDPUMPS		27 BANDPUMPS	
	PRODUCED	SOLD	PRODUCED	SOLD	WITH DEP	WITHOUT DEP	WITH DEP	WITHOUT DEP
ACTUAL COST								
BROAD COST ELEMENTS								
(1) DIRECT COST	0.30	2.02	0.21	1.25	258.00	258.00	0.12	0.12
(2) INDIRECT COST	0.06	0.39	0.10	0.61	266.00	266.00	0.03	0.03
(3) DEPRECIATION	0.22	1.47	0.21	1.23	927.00		0.26	
TOTAL	0.58	3.88	0.52	3.09	1451.00	524.00	0.40	0.15
(4) INCOME RECEIVED	0.09	0.59	0.17	1.02			0	0
(5) SURPLUS/(DEFICIT)	-0.49	-3.29	-0.35	-2.07			-0.40	-0.15
(6) RECOVERY % ON TOTAL COST	15.52%	15.21%	32.69%	33.01%			0.00%	0.00%
REAL COST								
BROAD COST ELEMENTS								
(1) DIRECT COST	0.72	4.84	0.55	3.26				
(2) INDIRECT COST	0.06	0.39	0.10	0.61				
(3) DEPRECIATION	0.22	1.47	0.21	1.23				
TOTAL	1.00	6.70	0.86	5.10				
(4) INCOME RECEIVED	0.09	0.59	0.17	1.02				
(5) SURPLUS/(DEFICIT)	-0.91	-6.11	-0.69	-4.08				
(6) RECOVERY % ON TOTAL COST	9.00%	8.81%	19.77%	20.00%				

TREND IN COSTS

5.11 The real costs have been showing an increasing trend essentially due to inflation, increase in manpower costs and the revised tariff for power from 1991-92 onwards. The salary scales were revised from 1990-91, arrears of salary were also paid and hence the steep increase in cost, during that year. Exhibit 5.2 below shows the trend in costs.

EXHIBIT 5.2

TREND IN COSTS



COMPOSITION OF COSTS

5.12 The major components of actual cost of O&M of piped schemes are

- manpower
- repairs and maintenance and
- depreciation.

These three account for more than 95% of the total costs. These three components also account for about 95% of O&M of hand pumps. In the components of real cost power charges make about 40% of the total cost. The components of actual and real costs for 1991-92 are presented diagrammatically in Exhibit 5.3 to Exhibit 5.5.

EXHIBIT 5.3

COMPOSITION OF COST (%)
SAIDABAD PIPED SCHEME 91-92

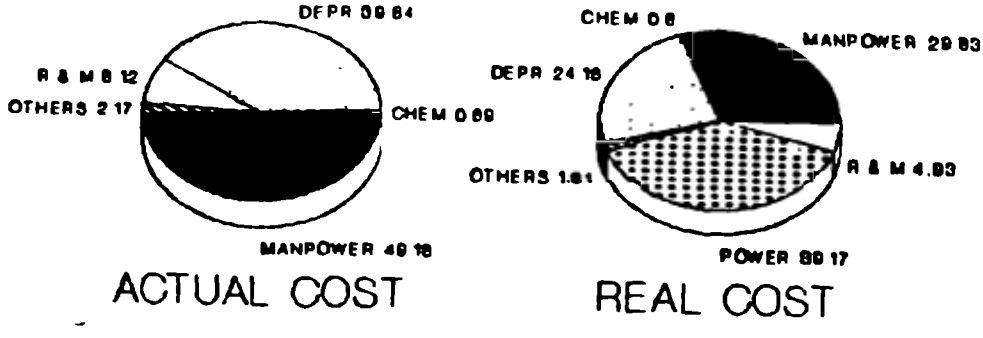


EXHIBIT 5.4

COMPOSITION OF COST (%)
TIKRI PIPED SCHEME 91-92

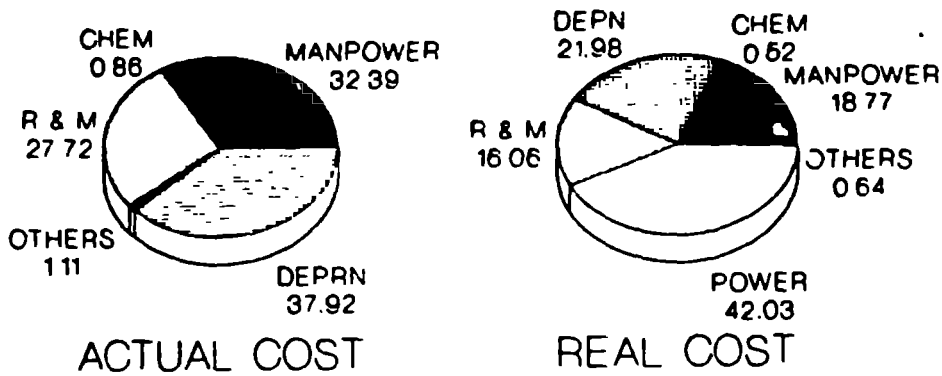
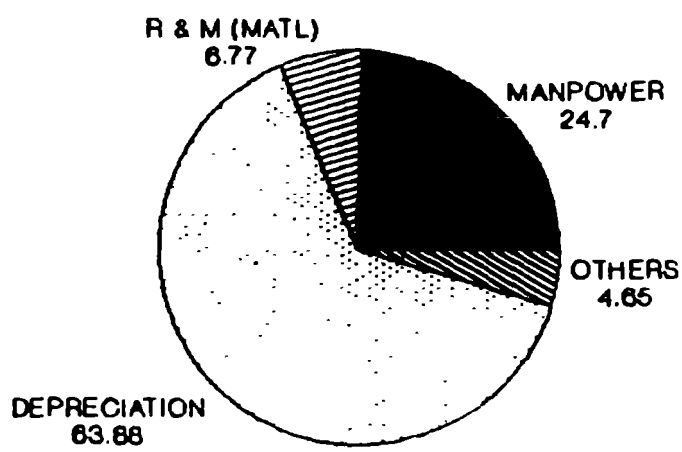


EXHIBIT 5.5

COMPOSITION OF COST (%)
KAURIHAR/CHAYAL HAND PUMP SCHEMES 91-92



ANALYSIS OF COSTS

5.13 The costs derived were further analysed into cost per private connection and cost per person covered by the scheme in both piped as well as hand pumps. The real cost per connection for the year 1991-92 comes in the region of Rs.77/- to Rs.84/- per month, which is about 5.5 times the minimum charge of Rs.15/- being levied today. This difference explains the cost recovery being as low as 15-20%. Table 5.7 gives an idea of the cost per person/connection for both types of schemes. As can be seen the cost per household in hand pumps (assuming 50 families per pump) works out to less than Rs.3 per month.

TABLE 5.7

COST PER CONNECTION/HOUSEHOLD - 1991-92

(VALUE IN RS.)

	SAIDABAD		TIKRI		
	ACTUAL COST	REAL COST	ACTUAL COST	REAL COST	HAND PUMPS COSTS
1. Cost per person pa (All inhabitants)	14.46	23.84	13.85	23.90	6
2. Cost per connection pa	553.18	912.04	583.85	1007.41	29
3. Cost per connection pm	46.10	76.00	48.65	83.95	2.42

5.14 The above figures have been worked out after considering the entire cost of O&M, including depreciation, being paid for by the private connections in piped schemes and by all households to be covered by the hand pumps. As far as piped schemes this would mean a complete cross subsidy with the population covered by private connections bearing the O&M cost for the entire scheme. Even if a recovery of Rs.3/- per household per month is made for hand pumps, an attempt can be made to recover the entire cost of O&M of hand pumps.

Additional real cost for private connections

5.15 The additional real cost for private connections was worked out and the following results obtained :

TABLE 5.8

1991-92 ANALYSIS OF ADDITIONAL COSTS (REAL)

(VALUE IN RS.)

	REAL COSTS	SAJDABAD	TIKRI
(1)	Total cost per population covered by private connections p.a.	32.35	33.79
(2)	Total cost per KL of water		
	- produced	0.76	0.93
	- distributed / sold	1.27	1.32
(3)	Total cost per connection pm	21.57	22.52
(4)	Variable cost per connection p.m.	10.79	14.36
(5)	Fixed cost per connection p.m.	10.78	8.16

The above was worked out on the following assumptions :

(1) The design LPCD of 70 was used to derive the water distributed to private connections based on population covered. The wastage factor for each scheme was applied to arrive at water produced for private connections

(2) The real variable cost per KL was applied to the water produced to arrive at the variable cost for private connection

(3) Depreciation on capital cost was arrived at after giving weightage to design population to be covered by private connections and the lpcd of 70

(4) Fixed cost per person covered was used to derive fixed cost relevant to private connections.

5.16 As can be seen the real cost per KL of production for the private connections at 0.93 is less than the tariff charged today at Re.1/- per KL. Further the total cost per connection per month comes down to about Rs.22 as compared to Rs.76-Rs.83 if a complete cross subsidy is assumed.

CONTRIBUTION ANALYSIS

5.17 The costs were further analysed into fixed and variable, in order to arrive at the contribution per Kl. of water produced/sold. It is interesting to note that operation of both the piped schemes results in a negative contribution meaning that for every Kl. of water produced UPJN is loosing money. The analysis further shows that the real O&M cost per Kl. of water produced is ranging from Rs.0.86/Kl. to Rs.1.00/Kl. while the tariff fixed by the UP Government is Rs.1.00/Kl.. But due to a very small percentage of water produced being actually sold, the cost recovery fall downs drastically. Table 5.9 below presents the analysis of costs.

TABLE 5.9

CONTRIBUTION ANALYSIS

(VALUE IN RS. PER Kl.)

ELEMENTS	TIKRI		SAIDABAD		HAND-PUMPS
	PRO-DUCT-ION	SALES	PRO-DUCT-ION	SALES	
1. Revenue demanded	0.15	0.98	0.17	0.99	-
2. Variable cost	0.59	3.92	0.38	2.28	0.07
3. Contribution	(0.44)	(2.95)	(0.21)	(1.29)	(0.07)
4. Fixed cost	0.41	2.77	0.47	2.82	0.33
5. Surplus/ (Deficit)	(0.85)	(5.72)	(0.68)	(4.11)	(0.40)

5.18 As can be seen from the above table the variable cost per Kl. of production in hand pumps is comparatively lower as compared to the piped schemes. This is based on the assumption of 250 people using the handpump at the rate of 40 lpcd. But according to available indications the average number of people using the handpump is around 150. In this case the variable cost per Kl. will go upto Rs.0.12, which is still much lower than piped schemes.

5.19 The costs were further analysed into cost per person covered and cost per household and the following results were obtained from the same.

TABLE 5.10

COST ANALYSIS (1991-92)

(VALUE IN RS.)

	SAIDABAD	TIKRI	HANDPUMPS
REAL COSTS			
1. Total cost per person p.a.(All inhabitants)	23.84	23.90	6.00
2. Total cost per connection p.m.	76.00	83.95	2.42 (Household)
3. Variable cost per connection p.m.	33.97	49.20	0.43 (Household)
4. Fixed cost per connection p.m.	42.03	34.75	1.99 (Household)
ACTUAL COSTS			
1. Total cost per person p.a.(All inhabitants)	14.46	13.85	-
2. Total cost per connection p.m.	46.10	48.65	-
3. Variable cost per connection p.m.	4.06	13.90	-
4. Fixed cost per connection p.m.	42.03	34.75	-

PHYSICAL RESULTS

5.20 The analysis of costs was done based on the approach and assumptions indicated in chapter 4. The analysis also indicated certain key physical parameters, which are shown below. These resultant parameters have to be studied in relation to the assumptions. Further these are derived from the records available and hence may not reflect the actual situation on the ground in terms of water distribution, wastage, actual lpcd etc.

WORKINGS

5.21 A set of outputs from the model showing the calculations and workings are enclosed as Annexure III.

TABLE 5.11

SCHEME SAIDABAD - PHYSICAL PARAMETERS

	1989-90	1990-91	1991-92
1. Pumping hours			
- Pump 1	4354	4354@	3608
- Pump 2	3096	4776	4201
2. No.of days not worked			
- Pump 1	- (1)	- (1)	47/305
- Pump 2	- (1)	- (1)	51/274
3. Production Kl. (Total)	910836	1107396	946125
4. lpcd calculated			
- domestic metered	NA	NA	60
- domestic unmetered	62	62	62
- PSP	40	40	40
5. Average production per day in Kl.	2495	3034	2592
6. Chemicals			
Number of days not treated			Full of March 92 no treatment was done
Average per day			2.75 kg/day
Per Kl. of production			1.06 gm/Kl.
7. Composition of repairs			
- Pumping station	34%	43%	48%
- Distribution system	61%	57%	52%
- Others	5%	-	-
8. Revenues (Rs.lacs)			
- Demand	0.92	0.97	1.58
- Collection (incl) arrears	1.06	1.08	1.63

NOTE : @ Since 1990-91 log books not made available, 1989-90 figures assumed

(1) Full details of daily pumping not made available.

TABLE 5.12

SCHEME - TIKRI - PHYSICAL PARAMETERS

	1989-90	1990-91	1991-92
1. Pumping hours			
- Pump 1	5162	5163	5884
- Pump 2	5902	5901	5317
2. No.of days not worked			
- Pump 1	-	-	18/335
- Pump 2	-	-	43/335
3. Production Kl	1394138	1384094	1411269
4. Lpcd calculated			
- domestic metered	-	42	52
- domestic unmetered	51	-	51
- PSP	59	48	43
5. Average production per day in Kl.	3820	3819	3866
6. Chemicals			
Number of days not treated			Full of April October and November 91 not treated
Average per day		8.19 kg	2.83 kg.
Per Kl. of production		2.14 gms	0.73 gms
7. Composition of repairs			
- Pumping station	25%	47%	40%
- Distribution system	57%	46%	54%
- Overhead tank	1%	2%	- (<1%)
- Others	17%	5%	6%
8. Revenues (Rs.lacs)			
- Demand	1.63	1.58	2.06
- Collection	0.94	0.90	1.24
- Efficiency	58%	57%	60%

6. ANALYSIS OF O&M COSTS

6.1 The costs derived, as indicated in chapter 5, were further reviewed with a view to

- compare the same across schemes and with UPJN as a whole
- do sensitivity analysis on certain key parameters.

The results of this review are described in the subsequent paragraphs.

COMPARISON ACROSS SCHEMES - PIPED

6.2 On a comparison of the real cost per Kl. of water produced in 1991-92 the conclusions that may be drawn are :

(a) Saidabad scheme has been spending less each year on repairs resulting in lower repair cost per KL

(b) Tikri scheme has been operating at a higher capacity resulting in higher power charges and lower manpower cost per Kl. of water produced

(c) In other aspects of revenues/costs they present almost a similar picture.

Table 6.1 below presents the comparison.

TABLE 6.1

REAL COST PER KL OF WATER PRODUCED - 1991-92

	SAIDABAD	TIKRI
1. Income demanded	0.17	0.15
COSTS		
2. Manpower	0.26	0.19
3. Power	0.34	0.42
4. Chemicals	0.01	0.01
5. Repairs	0.04	0.16
6. Others	0.01	0.01
7. Depreciation	0.21	0.22
TOTAL	0.86	1.01
SURPLUS/ (DEFICIT)	(0.69)	(0.85)

COMPARISON WITH UPJN

6.3 The overall profile of O&M of piped and hand pumps schemes in UPJN has been presented in chapter 3. Some of the key parameters are compared here. Table 6.2 depicts the cost analysis of piped schemes in comparison to O&M of piped schemes in UPJN (plains).

TABLE 6.2

PIPED SCHEMES - COMPARISON WITH UPJN (PLAINS)

PARAMETERS	1989-90			1990-91			1991-92		
	UPJN (ACTUALS)	SAIDABAD	TIKRI	UPJN (ACTUALS)	SAIDABAD	TIKRI	UPJN (EST)	SAIDABAD	TIKRI
1. Revenue receipts									
a. % of project cost	0.85	1.80	1.01	1.06	1.84	0.97	1.24	2.77	1.34
b. Per connection (Rs.pm)	6.69	10.54	7.09	8.31	10.53	5.86	9.73	15.22	7.38
c. Per person (Rs.pm)	0.13	0.28	0.16	0.16	0.28	0.13	0.19	0.40	0.18
2. O&M Cost [without centage and depreciation]									
a. % of project cost	4.58	8.60	8.02	5.76	11.08	9.69	11.62	10.47	11.86
b. Per connection (Rs.pm)	36.00	50.30	56.08	45.25	63.57	58.50	91.31	57.64	65.50
c. Per person (Rs.pm)	0.70	1.36	1.23	0.88	1.67	1.30	1.77	1.51	1.55
3. Cost recovery %	19	21	13	18	17	10	11	26	11

The O&M cost as a % of project cost for Tikri and Saidabad (ie) 11.86% and 10.47% compares favourably with the UPJN average of 11.62%.

6.4 A similar review for hand pumps was also done and the results are as shown below :

TABLE 6.3

HAND PUMPS - COMPARISON - PLANS - UPJN

PARAMETERS	1990-91		1991-92	
	UPJN	27 HPS	UPJN	27 HPS
(1) Cost per household per month	0.53	1	0.53	1
(2) Cost per person per per month	0.11	0.17	0.11	0.17
(3) Cost per KL of production	0.09	0.15	0.09	0.15
(4) Cost per pump p.a.	319.78	545	318.44	524

Unlike in piped schemes, the cost for the 27 handpumps looks to be higher then that for UPJN as a whole which can be explained by the fact that a greater percentage of pumps may not undergo any repair or limited number of repairs. Further UPJN costs do not seem to include vehicle expenditure and allocated administrative overheads.

SENSITIVITY ANALYSIS

Recovery of PSP charges

6.5 As per the tariff fixed by the State Government an amount of Rs.3/50 per month per household is to be collected for usage of public stand posts. This rate is effective from 1/7/91. Earlier the rate was Rs.2/50 per month per household. Due to various reasons this charge is not being 'demanded' from households.

6.6 Sensitivity analysis was done on the working based on the following assumptions :

- demand will be net rate (ie) after discount

89-90	Rs.2 per household/month
90-91	Rs.2 per household/month
91-92	Rs.2.50 per household/month

- collection efficiency of 50% of current demand.

The results obtained from the analysis are :

Tikri	Cost recovery improves to 26% in 1991-92 on actual cost basis and to 15% on real cost basis
Saidabad	Cost recovery improves to 43% in 1991-92 on actual cost basis and to 26% on real cost basis.

6.7 There is almost a doubling of the cost recovery if PSP charges are recovered at 50% collection efficiency. If depreciation is not considered the recovery would be much higher.

Tikri	42% on actual costs
	19% on real costs
Saidabad	
	72% on actual costs
	35% on real costs

Normal lpcd distribution

6.8 The water distributed in the workings was based on the revenue demanded/ruling tariff for the private connections. A sensitivity of the workings assuming the lpcd as below was attempted :

- domestic metered - 70
- domestic unmetered - 100
- PSP - 40

Accordingly the water revenue demanded was also suitably adjusted at the ruling tariff.

6.9 The cost recovery in Tikri on income demanded/real costs goes up from 15% to 20% in such a situation in the year 1991-92. Similarly in Saidabad the cost recovery goes up to 19%. Further this brings down the wastage in Tikri and Saidabad to around 30%.

Depreciation only on private connections

6.10 The depreciation charge relevant for the private connections only based on weightage for the population coverage and higher lpcd was allocated and costs worked out. The results are as shown below :

TABLE 6.4

COST - DEPRECIATION ONLY FOR PVT CONNECTIONS

(1991-92)
(VALUE IN RS.)

SCHEME	PRODUCED		SOLD		DISTRIBUTED	
	ACT-UAL	REAL	ACT-UAL	REAL	ACT-UAL	REAL
Cost per KL						
Tikri	0.42	0.84	2.81	5.63	0.61	1.23
Saidabad	0.38	0.72	2.25	4.26	0.65	1.23
Cost per connection pm						
Tikri	35.28	70.57				
Saidabad	33.57	63.47				

6.11 Even with proportional depreciation for private connections the real cost per KL of water distributed is Rs.1.23 in Tikri and Saidabad against a tariff of Rs.1/- per KL. The real cost per connection is around Rs.70.57 per month in Tikri and Rs.63.47 per month in Saidabad.

CRITICAL PROBLEMS

6.12 From the review of costs and revenues an attempt has been made to derive the critical problems which need to be addressed by UPJN. This list is not to be taken as an exhaustive one but only indicative. Further, a detailed analysis of the problems can be done only after a socio-economic survey of the population is carried out.

Design related

(1) The design provides only for 20-25% of households being provided private connections. The rest are to be supplied by PSP's. It is very difficult to justify the scheme based on revenues from only 25% of the population, unless a large cross subsidy had been assumed.

(2) The decision on taking up the scheme seems to have been made by UPJN without a detailed analysis of the socio-economic conditions in the rural area concerned (ie) need for drinking water, water quality today, inclination and ability to pay for water, other sources of water, need for water for other purposes etc. In effect the decision has been made without a request and hence the non-participation of the people concerned. This results in a feeling that the system is being owned by UPJN and not by the people/society.

(3) The location of the plant itself is not sometimes central to the area to be covered, say for eg. in Tikri. This effects distribution to the tail end areas resulting in poor service. This observation is based on the drawing of the scheme and no further technical analysis has been carried out.

(4) The population projections in both the schemes has been grossly underestimated, with the design population being reached halfway through the scheme itself.

O&M related

(1) It is observed from the log books that one of the two pumping plants are not functioning sometimes for long periods of say a month. During the visit to Saidabad scheme, one of the plants was undergoing repair. For eg. : in Tikri, one of the pumps was not used from 5-12-91 to 1-1-92. Similarly in Saidabad the plant with 40 BHP was not used for the whole of October 1991. It is essential that preventive maintenance of these plants are done at regular intervals so as to avoid long breakdowns.

(2) It is also clear from the log books that for days at a stretch treatment with bleaching powder is not being done due to non-availability of stock. This has a critical effect on the quality of the water and subsequently on quality of service to the consumers.

(3) In Saidabad scheme, it was mentioned that no documents / records are kept of the chemical analysis or tests, if any, being conducted. This is also absolutely essential to ensure quality of water being distributed.

(4) On the discussion with division officers and staff there is a feeling that due to non-availability of sufficient funds many repairs and maintenance jobs are getting postponed. In fact in Saidabad scheme we can see a fall in the absolute amounts being spent on repairs and maintenance. Even though it is difficult to estimate the extent of repairs to be carried out, the feeling is we are a year behind in repairs. The lesser importance to repairs will have long term consequences in terms of quality of service, collection efficiency etc.

(5) The collection efficiency is in the region of 55-60% resulting in a reasonably huge accumulation of arrears. This might be related to the poor service levels and even delays in carrying out repair jobs.

(6) By not providing for power charges and depreciation, the expenditure on O&M is being understated with resultant implications on incorrect figures being reported. It is to be remembered that all assets have a life span and hence need to be replaced at some future date. It is very important that depreciation charge is provided for in the accounts.

(7) The most difficult part of the study was to 'estimate' the distribution of water in total and to individual category of consumers. No records are available for the purpose. For private connections the income demanded might be a good indication. A study on water distribution was done at Tikri scheme by installing bulk meters at certain villages. This can give important pointers on water distribution, wastage and the problem locations.

(8) There is very little of analytical reporting on O&M costs on a regular basis to divisions and other administrative offices. The reporting today is restricted to copies of log books being sent to the divisions by the plants. Further, very little information was made available to us from the head quarters at Lucknow either due to non-availability of records or difficulty in consolidation / analysing the available records. Timely information reporting is very critical for control of O&M aspects and costs.

HANDPUMPS

6.13 The critical problems on hand pumps, as analysed from the questionnaires and records made available to us are :

(1) It is told to us that the hand pumps are actually used by around 125-150 people which is only 50% of the design population. This implies that

(a) either the distance to be covered for reaching the hand pump is much longer than envisaged or

(b) the design objective of two identified groups (socially weaker section and others) to have atleast one hand pump in each hamlet is being adhered to.

It may not be right to assume the common norm for all pumps. This may have to be revised based on the location concerned, dispersement of population etc.

(2) Similar to piped schemes, there is very little information on actual usage of hand-pumps, water wastage, quality of water etc. An analysis of these aspects is critical for a comparison with piped schemes and for future decision making.

(3) It is observed that for all most any kind of repair a team of 4-5 people are engaged on a daily basis. It is informed to us that for most repairs the time required will be in the region of 4-5 hours. This means that 4-5 people are engaged for 5 hours but get paid for eight hours. The wages for the 5 people was Rs.120/- day of 8 hours and hence, on an average, Rs. 45/- is wages for which labourers may not be working. It is told to us that from 92-93 onwards the practice of engaging daily labour has been stopped.

(4) Depreciation on hand pumps is not being provided, even for analysis sake. As indicated earlier this is essential to get the real picture on O&M costs.

(5) It is observed that the 27 hand pumps put together were not working for 139 days, in 1991-92. This works out to 5 days on an average per pump per year.

6.14 The problems highlighted above may be known by people at various levels in UPJN. But the problem is quite alarming. In a few years, if the same trend continues, it would be difficult to operate and maintain many schemes without a huge subsidy from the government. The thinking now should be to make UPJN, over a period of time, a self sustaining institution at least as far as O&M is concerned. It is difficult for a commercial organisation like UPJN to meet the twin objectives of providing service as well as breaking even on costs.

6.15 Some suggestions to rectify some of the problems listed above are discussed in chapter 8. These suggestions have been made based on discussions with UPJN staff, review of records made available to us and our experience in conducting similar studies. As indicated earlier these are not made after a socio-economic survey and hence have to be studied in that light.

7. SYSTEMS AND PROCEDURES

BACKGROUND

7.1 One of the components of the study is to look at existing records maintained for O&M and to recommend changes, if any, for improved reporting on O&M costs and revenues. It is to be remembered that information availability is not an end in itself but a beginning for better decision making. Hence it is essential that people reviewing the information have adequate authority to take decisions.

7.2 A brief review of records maintained at divisions and at the plants was made and brief recommendations on information that needs to be captured is presented in this chapter. A much more detailed study needs to be done covering more schemes/divisions before recommendation on formats for the records/MIS can be made.

INFORMATION CAPTURE

7.3 The information that needs to be captured and source for the same are mentioned below :

Information	Source
1. Number of days on which each pumping plant not working	Log book/sheet
2. Actual operating hours of plant and service hours. Power availability	Log book/sheet
3. Results of chemical analysis	Needs to be recorded in the log book itself
4. Number of days on which bleaching powder not available	Stock register
5. Extent of bleaching powder used on a daily basis	Log book/sheet

Information	Source
6. Complaints received classified into categories such as - taps broken - tap missing - water not flowing - chockages/leakage in pipelines - water quality not good (blackish etc.)	Complaints register to be modified to include such a classification
7. Days within which each complaint was repaired and if delayed reasons therefor such as - material not available - labour not available etc	Complaints register to be modified
8. Other repairs carried out with details of - when problem detected - nature of problem - reason for the problem (old equipment, lack of maintenance etc.) - when repair completed - cost (material and labour - days on which service could not be provided	Repair register to be introduced, wherever not existing
9. Villagewise and assessee-wise demand raised, collected and arrears	Demand register
10. Cost of labour directly involved in scheme maintenance	Work register of scheme
11. Cost of casual labourers involved in repair and maintenance	To be separately recorded in works register

Information	Source
12. Record of inspections carried out by - JE - AEE - EE with time spent for each scheme and purpose of inspection	To be introduced wherever not available
13. Usage of vehicles to be identified to schemes	Log book to include this in a form such that compilation becomes easier

NOTE : (1) List may not be exhaustive

(2) Where ever applicable similar records to be maintained for hand pumps also

(3) Existing records should be continued.

RECOMMENDED MIS

7.4 The MIS that needs to be generated are essentially from the records to be maintained at the plant and at the divisions.

MIS

7.5 (1) Schemewise/plantwise number of days on which plant not working and % of total number of days in a period. The same compared with % in last 2 years for the same period.

(2) Actual average operating hours per day of the plant pumpwise for a particular period and average service hours per day. Same compared with data for last two years.

(3) Production in total KL per pump and in total for the scheme for a period as compared with production during the same period in the last 2 years.

(4) Periodic reporting of actual distribution in KL to various points arrived at by installation of bulk meters and calculation of wastage in total and as a %. Result to be compared with last two similar studies.

(5) Schemewise number of days on which chemical tests not carried out and corresponding chlorine content in those days.

(6) Analysis of complaints received and arriving at % for each category in relation to the total number of complaints.

(7) Arriving at cost per KL of water produced, distributed and sold split into direct costs, indirect costs and depreciation.

(8) Comparing revenue demanded/received per KL with cost per KL.

(9) Analysis of costs into variable and fixed and deriving contribution per KL.

A similar MIS can be prepared for a 'block' of hand pumps.

7.5 An yearly analysis of these MIS can be done, which can be an important input to the budgeting exercise. These MIS can also point to major repairs that need to be carried out on schemes. Further inter-scheme comparison in the same division/circle can be attempted to decide on schemes where revenues have to improve or costs are to be controlled.

7.6 Circlewise, consolidated costs per KL of water produced, distributed and sold (for piped and hand pumps separately) should be sent to region and to Lucknow head quarters. These will be important pointers for tariff suggestions and for identifying problem locations for cost control.

8. CONCLUSION

8.1 The report so far has presented the background to the study, actual and real cost of O&M and an analysis of the problems in O&M of rural piped and hand pump schemes. Even though this study does not intend to project the results of the study to UPJN as a whole, the problems may be similar.

8.2 In the following paragraphs a few suggestions to correct some of the problems facing UPJN have been recommended. As told earlier, these are not based on a socio-economic survey and hence have to be read in that light.

OVERVIEW OF SUGGESTIONS

8.3 The suggestions are essentially aimed at

- proper evaluation of schemes at design stage
- critical importance to evaluation of O&M costs and revenues before scheme finalisation
- better revenues through taxes
- involving voluntary organisations / private contractors in O&M.

The objective should be to take up only those schemes which are financially viable and where O&M will be the responsibility of local bodies or voluntary organisations. These drastic steps are needed to make UPJN a self sustaining commercial organisation.

SUGGESTIONS

8.4 The suggestions for overcoming some of the identified problems are listed below. These have to studied more carefully and supported by field studies before a final decision can be taken.

(1) A comprehensive education effort to tell the population about the need for safe drinking water and the consequences if this is not available. The need to pay for water should also be emphasised.

(2) The decision to have a rural water supply scheme (either piped or hand pumps) should be made by the population represented by the local bodies. The local bodies should then approach the UPJN for taking up the scheme. UPJN should take up the scheme only after an undertaking that maintenance will be the responsibility of the local body concerned. The responsibility of UPJN will be to execute the scheme and hand it over for O&M.

(3) It may be essential to involve the people right from the planning and design stages of the project. This may be in identifying location of pumps, stand posts, hours of supply needed, area to be covered etc. A few persons identified at this stage from the population can later be involved in O&M.

(4) Conducting a socio-economic survey before a scheme is approved. This is essential to get a feel for need for water, ability to pay, intention to pay and other social factors which have a strong bearing on a sensitive issue like provision of water supply. The survey should be a prerequisite for approval of the scheme, say if the scheme value is above a certain limit.

(5) Due to lower cost recovery, lesser money will be spent on O&M of schemes, which will have a bearing on the quality of service and hence on the collection efficiency. The revenues and O&M costs of a scheme should be closely evaluated during the planning stage itself and the sensitivity of the same to critical parameters like inflation, tariffs, wastage factor etc. need to be studied. The results of the evaluation should justify taking up the scheme. Development of a O&M financial model may be taken up for the purpose.

(6) Voluntary organisations may be asked to take up O&M of rural water supply schemes. These organisations may be asked to make each scheme self sustaining. Some of these organisations are available at village/ district levels.

(7) The O&M of rural water supply schemes may be given to private contractors who will also have responsibility for revenue collection. It may also be worthwhile to include the private contractors in design and construction of the schemes.

(8) For existing schemes, there is a tariff fixed for public stand posts also. Efforts may be taken to recover these charges from the households, which may have a good bearing on the cost recovery. The responsibility of recovering the PSP charges may be given to the local bodies.

(9) Recovering a portion of the costs through a 'Tax' on all households in the village - both for handpump and piped schemes. Since there seems to be a basic lack of inclination in paying for water, this may be an indirect way of recovery. The modalities for this 'Tax' needs to be worked out.

(10) It is to be remembered that all assets have a life span. They need to be replaced or extended. It is important to recover depreciation charges also in order to ensure availability of funds for replacements/extensions.

(11) There is need for a closer monitoring of O&M costs at various levels through improved Management Information Systems (MIS).

(12) A periodic analysis of actual distribution at various points may be made for each piped scheme by installing bulk meters for a fixed number of days. This will also be useful in analysing wastage and the problems in the distribution lines.

CONCLUSION

8.4 It is near impossible for a commercial organisation like UPJN to achieve the twin objectives of providing service and also breakeven on costs. The situation on O&M is quite alarming and immediate steps are needed to ensure better recovery of costs. The experience gained in the past should become inputs for future planning through better evaluation of schemes and critical importance given to review O&M costs and revenues.

QUESTIONNAIRES

U.P.JAL NIGAM

REVIEW OF O&M COSTS OF SELECT SCHEMES (PIPED WATER SUPPLY) QUESTIONNAIRE

REVIEW OF O&M COST QUESTIONNAIRE

NAME OF WSB SCHEME :

DIVISION :

SUB DIVISION :

SECTION :

I. GENERAL:

1. Scheme completed in the year :
   Number of years for completion :

2. Source of Water for the scheme :
   (a) Tube well
   (b) River (Specify name)
   (c) Ponds
   (d) others (Specify)

3. If surface water, storage capacity. :

4. Final project parameters :
   (a) Supply areas to be covered.
   (b) Villages to be covered
   (c) Total population in the area
   (d) Population Coverage
   (e) Pumping stations and their capacity.
   (f) Overhead tanks and their storage capacity
   (g) Length of distribution lines.
   (h) Number of connections planned
       - metered
       - unmetered
   (i) Number of public stand posts planned.
   (j) Expected levels of water production (kld)

(k) Expected level of water distribution (kld)

(l) Wastage anticipated (kld)

(m) Lpcd assumed.

5. Final project cost particulars :

Cost component	Rs. (lacs)
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	
Total:	

6. Finding pattern for the scheme :

Financed By	Amount (Rs. lacs)

7. Anticipated O&M Cost
(at the time of project finalisation)

Head of account	Year 1	Year 2	Year 3	Year4	Yea

Cost per Kl. of production :

Cost per Kl of distribution:

8. Cost of expansion of the scheme : Total Rs.
(if any)

YEAR Rs. (Lacs)

Targetted benefits

(a) Population coverage :
(b) Villages coverage :
(c) Number of connection :
(d) Number of stand posts :

9. Manpower required for O&M of the scheme : Total

Sl. No.	Level of person	Number of persons	Desires Qualification

II. SCHEME/YEAR SPECIFIC

(details for the years 1989-90, 1990-91, 1991-92)

	1989-90	1990-91	1991-92
A. PHYSICAL PARAMETERS			
1. Villages covered :			
2. Population covered :			
3. Population net covered :			
4. Total number of connections			
(a) domestic metered			
(b) domestic unmetered			
(c) industrial/commercial (metered)			
(d) others - metered			
(e) others - unmetered			
5. Number of public stand posts. :			

	1989-90	1990-91	1991

6. Number of working meters

   (a) domestic

   (b) industrial/commercial

   (c) others.

7. Actual operating hours of the pumping station. :

8. Rate of pumping per hour(ltrs) :

9. Calculated production (kl)

   (mention the number of days on which pumping station was working ---- ---- ----)

10. Hours of supply maintained (or an average perday) :

11. Water distribution (kl)

   (a) domestic metered

   (b) domestic unmetered

   (c) industrial/commercial

   (d) others metered

   (e) others un-metered

   (f) Public stand posts

   NOTE: (Mention below the method of calculating the distribution)

12. Wastage of water (total Kl.)

   Reasons (with %)

   (a) Normal

   (b) leakages

   (c) Illegal tapping

   (d) others specify.

13. Estimation of lpcd.

B.	FINANCIAL PARAMETERS (in Rs.) REVENUES	1989-90	1990-91	1991-92
1.	Water charges demanded			
	(a) domestic metered			
	(b) domestic unmetered			
	(c) industrial/commercial			
	(d) others.			
	Total :			
2.	Tariff structure (Enclose for the three years)			
3.	Revenues collected			
	(a) domestic metered			
	(b) domestic unmetered			
	(c) industrial/commercial			
	(d) others.			
	Total :			
4.	What would have been the demand if all domestic/ industrial connections were metered?			
5.	Arrears of demand			
	(a) domestic metered			
	(b) domestic unmetered			
	(c) industrial/commercial			
	(d) others.			
	Total:			
	What % of total arrears will be greater than 3 years.			
6.	Other income collected (specify by name)			

C. OPERATION & MAINTENANCE COSTS — 1989-90 — 1990-91 — 1991-92

SALARIES/WAGES

1. Manpower employed on the scheme
   - Direct
   - Indirect
   - Total

Details

LEVEL	Direct/ Indirect	Skilled/ Unskilled	% Time on O & M
TOTAL			

Note: 1. For casual labourers, indicate no. of days for which used.

2. Skilled & unskilled particulars may be given only for WCE

2. Actual manpower cost at levels defined in (1)
   Total (in Rs.)

LEVEL	
Total:	

NOTE: 1. If for some levels the costs are directl included in some other head of account, kindly indicate actual cost and also the fact that the same is included in anothe head of account and specify the head of account.

1989-90 1990-91 1991-92

(3) Actual direct manpower cost by sub head of account

SUB HEAD	
Total-	

(4) Extent of manpower cost as paid in each year.

(C)

POWER	1989-90	1990-91	1991-92
(1) Horse power of the pumping station.			
(2) Rate charged by EB (enclose tariff for last 3 years)			
(3) Minimum amount chargeable by EB(Rs)per month			
(4) Value of Bills received from EB			
(5) Power charges paid			
(6) Calculated power consumption based on hours pumped & HP.			
(7) Calculated power charges.			

CHEMICALS

(1) Quantity of chemicals consumed:

Item	Unit of Measure	

(C)

CHEMICALS(CONTD) 1989-90 1990-91 1991-92

(2) Actual cost of chemicals consumed - Total(Rs)

ITEM

(3) Norms for usage per KL of production

ITEM

(4) Average prices of chemicals-~~each~~ year

Each

ITEM	1989-90	1990-91	1991-92

(5) Stock of major chemicals in quantity as at 30/9 every year.

ITEM	Unit of Measure	

REPAIRS AND MAINTENANCE COST

(1) Specify various kinds of maintenance and repair carriedout and for each.

- The material and quantity of the same required
- The time required to be spet by U.P.Jal Nigam.

	1989-90	1990-91	1991-92

(2) Actual cost of repairs and maintenance(Total(Rs)

SUB HEAD	MATERIAL/ LABOUR	
TOTAL;		

Number of direct labour actually involved in R & M.

(3) Number of repair job carried out.

	1989-90	1990-91	1991-92

SUB HEAD	TYPE OF JOB

(4) Number of days on which water not supplied and reasons therefore(in percentage terms).

(5) Estimate of repairs and maintenance cost as budgeted (what should have been the cost)

(b) Estimate of repair works to be carried out at value terms as a date.

EQUIPMENTS/VEHICLES	1989-90	1990-91	1991-92
(1) Equipments/Vehicles used in operation & maintenance and numbers used.			
(2) Year of procurement and cost of purchase of the above			
(3) % utilisation of the above for O & M.			

	1989-90	1990-91	1991-92

(4) Cost of maintenance of these equipments/cars.

- Total (Rs)

Cost per unit of usage (say hours for equipments and Kms.for cars).

GENERAL

(1) Difficulties faced by the scheme in O & M.

(List down the problems)

(2) Main reasons for the low cost recovery.

(3) Suggestions on methods to improve recovery.

(4) Other remarks.

RECORDS MAINTAINED

Give a list of records maintained at various offices alongwith purpose for the same.

Kindly enclose the following (for 1989-90, 1990-91, 1991-92.

(1) Budget document

(2) Annual maintenance budget

(3) Capital budget

(4) Annual accounting statements

- P & L
- B/S

(5) Report on pilot studies on O & M.

(6) Final project cost document

U. P. JAL NIGAM

REVIEW OF O & M COST

OF HAND PUMP SCHEME

NOVERMBER 1992

REVIEW OF O & M COST OF HAND PUMPS

GENERAL

(1) Location of the Hand Pump

(2) Type of Hand Pump

(3) MARK II/ MARK III

(4) Year of installation and month

(5) Original cost — Basic price Rs.

Installation cost Rs. _____

Total:Rs. _____

(6) Proposed life of the pump :

(7) Cost funded by :

AT THE TIME OF INSTALLATION

(1) Area to be covered

(2) Population to be covered

(3) Lpcd assumed

(4) Production assumed(KLD)

MAJOR REPLACEMENTS CARRIED OUT AFTER INSTALLATION

(1) Year of replacement

(2) Cost of replacement (Rs.)

MANPOWER ANTICIPATED AS REQUIRED FOR MAINTENANCE

Level of person Indirect/direct Time PER DAY IN HOURS

~~per day in hours.~~

SPARE PARTS REQUIRED FOR MAINTENANCE-NORMS

METERIAL/SPARE	HOW OFTEN REQUIRED TO BE RE-PLACED	TYPE OF REPAIR

TIME REQUIRED TO BE SPENT FOR REPAIRS (HOURS TOBE SPENT)

TYPE OF REPAIR	LEVEL OF PEOPLE	HOURS TO BE SPENT

(Preventive maintenance should be included as a type of repair)

	PHYSICAL PARAMETERS	1989-90	1990-91	1991-92
(1)	Population covered			
(2)	Lpcd assumed/expected			
(3)	Water production (KLD)			
(4)	Expected wastage of water as a % of production.			
(5)	Number of days on which handpump was not working.			
(6)	Reasons for non-working of the pump: (percentage of total above)			

REASONS

(7) Total number of handpump-

- within the division
- within the jurisdiction of the JE concerned.

	1989-90	1990-91	1991-92

O & M COST

MANPOWER

(1) Manpower employed on the pump :

LEVEL	DIRECT/ INDIRECT	SKILLED/ UNSKILLED

(2) Actual hours spent by the direct manpower for this handpump (from log book and job card) (HOURS SPENT)
(includes both repair and maintenance)

LEVEL *

(3) Total manhours available to the direct labour tobe spent on a group of hand pumps.

* For casual labour indicate mandays for which used in each year.

Manpower (.....)	1989-90	1990-91	1991-92
Cost of Manpower -Total Rs.			
LEVEL			
INDIRECT			
DIRECT			
MATERIALS			
Number/type of repair job carried out on the pump:		(Number of repairs)	
TYPE OF REPAIRS			

(2) Spareparts used in repair of the Hand pump :

SPARE PART	1989-90	1990-91	1991-92
	(Numbers used)		

(3) Cost of Spare parts used (Costs) Rs.

SPARE PART

(4) Average Prices of Spare Parts	1989-90	1990-91	1991-92
SPARE PART			

VEHICLES USED

(1) Extent of Kms run for maintenance of the pump

(2) Average cost per km of running the vehicle

(3) Cost of vehicle for hand pump maintenance

	INSPECTION	1989-90	1990-91	1991-92
(1)	Extent of time spent on inspection by various levels of people LEVEL		(hours spent)	

(2)	Total time spent by various levels of people in all hand pump maintenance LEVEL	

TOTAL MAINTENANCE COST FOR HAND PUMPS IN THE DIVISION

(1) Direct Cost of maintance	1989-90	1990-91	1991-92
DIRECT COST			
a)			
B)			
c)			
d)			

(2) Total value of spare parts purchased for hand pumps maintenance

CENERAL	1989-90	1990-91	1991-92
(1) Number and type of complaints received on the handpump TYPE OF COMPLAINT			
(2) Problems faced in maintenance of hand pumps.			
(3) Suggestions for improvement			
(4) Records maintained for hand pump maintenance at various offices (indicate name of record and purpose)			

LIST OF PEOPLE MET

ANNEXURE II

UP JAL NIGAM - O&M STUDY

LIST OF PEOPLE MET

1.	Mr. Robert Trietsch	Member, RSM
2.	Mr. R. S. Singh	Managing Director, UPJN
3.	Mr. Y.N. Chaturvedi	Chief Engineer, South + Dutch Co-ordinator
4.	Mr. V.P. Gupta	Chief Engineer at Lucknow
5.	Mr. S. K. Singh	SE, JJ, Circle, Allahabad
6.	Mr. R. K. Sharma	SE, VII Circle, Varanasi
7.	Mr. Mahendra Singh	EE, Construction Division, Allahabad
8.	Mr. N.C. Gupta	EE, Additional Construction Division, Allahabad
9.	Mr. J.B. Bats	EE, VI Construction Division, Allahabad
10.	Mr. S. K. Srivatsava	EE, Maintenance Division, Varanasi
11.	Mr. P. N. Shukla	AEE, Saidabad Scheme, Allahabad
12.	Mr. R.P. Sharma	JE, Saidabad plant Allahabad
13.	Mr. S.K. Verma	AE, Hand pumps, Allahabad
14.	Mr. D.M.P. Singh	JE, Tikri, Varanasi
15.	Mr. Panna Lal	Divisional Accountant, Tikri, Varanasi

SET OF OUTPUTS

ANNEXURE III

UP JAL NIGAM INDO DUTCH PROJECT
REVIEW OF OWM COSTS

PIPED SCHEME: SAIDABAD

PARTICULARS	TOTALS						COST PER KL OF WATER PRODUCED			COST PER KL OF WATER DISTRIBUTED			COST PER KL OF WATER SOLD			COMPOSITION OF TOTAL		
	1989-90	% INC	1990-91	% INC	1991-92	% INC	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92
SUMMARY OF ACTUALS																		
(1) Direct cost	220100		231100	5.00%	199400	-13.72%	0.24	0.21	0.21	0.44	0.44	0.36	1.46	1.50	1.25	45.32%	39.14%	40.50%
(2) Indirect cost	69450		163250	135.06%	96800	-40.70%	0.08	0.15	0.10	0.14	0.31	0.18	0.46	1.06	0.61	14.30%	27.65%	19.66%
(3) Depreciation	196133		196133		196133		0.22	0.18	0.21	0.39	0.37	0.36	1.30	1.27	1.23	40.38%	33.22%	39.84%
(4) Interest				ERR		ERR												
Total	485683		590483	21.58%	492333	-16.62%	0.53	0.53	0.52	0.96	1.12	0.89	3.22	3.84	3.10	100.00%	100.00%	100.00%
(4) Income demanded	92000		97000	5.43%	158000	62.89%	0.10	0.09	0.17	0.18	0.18	0.29	0.61	0.63	0.99			
(5) Income collected	106000		108000	1.89%	162600	50.56%	0.12	0.10	0.17	0.21	0.20	0.29	0.70	0.70	1.02			
(6) Other income				ERR		ERR												
Total demanded	92000		97000	5.43%	158000	62.89%	0.10	0.09	0.17	0.18	0.18	0.29	0.61	0.63	0.99			
Total received	106000		108000	1.89%	162600	50.56%	0.12	0.10	0.17	0.21	0.20	0.29	0.70	0.70	1.02			
(7) Surplus/(Deficit) on demand	-393683		-493483	25.35%	-334333	-32.25%	-0.43	-0.45	-0.35	-0.78	-0.93	-0.61	-2.61	-3.21	-2.10			
(8) Surplus/(Deficit) on received	-379683		-482483	27.08%	-329733	-31.66%	-0.42	-0.44	-0.35	-0.75	-0.91	-0.60	-2.52	-3.14	-2.07			
Cost recovery on received	21.82%		18.29%	-16.20%	33.03%	80.57%												
SUMMARY OF REAL COSTS																		
(1) Direct cost	436317		488969	12.07%	518785	6.10%	0.48	0.44	0.55	0.86	0.93	0.94	2.89	3.18	3.26	62.16%	57.64%	63.91%
(2) Indirect cost	69450		163250	135.06%	96800	-40.70%	0.08	0.15	0.10	0.14	0.31	0.18	0.46	1.06	0.61	9.89%	19.24%	11.93%
(3) Depreciation	196133		196133		196133		0.22	0.18	0.21	0.39	0.37	0.36	1.30	1.27	1.23	27.94%	23.12%	24.16%
(3) Interest				ERR		ERR												
Total	701901		848352	20.87%	811719	-4.32%	0.77	0.77	0.86	1.39	1.61	1.47	4.65	5.51	5.10	100.00%	100.00%	100.00%
(4) Income demanded	92000		97000	5.43%	158000	62.89%	0.10	0.09	0.17	0.18	0.18	0.29	0.61	0.63	0.99			
(5) Income received	106000		108000	1.89%	162600	50.56%	0.12	0.10	0.17	0.21	0.20	0.29	0.70	0.70	1.02			
(6) Other income				ERR		ERR												
Total demanded	92000		97000	5.43%	158000	62.89%	0.10	0.09	0.17	0.18	0.18	0.29	0.61	0.63	0.99			
Total received	106000		108000	1.89%	162600	50.56%	0.12	0.10	0.17	0.21	0.20	0.29	0.70	0.70	1.02			
(7) Surplus/(Deficit) on demand	-609901		-751352	23.19%	-653719	-12.99%	-0.67	-0.68	-0.69	-1.21	-1.42	-1.18	-4.04	-4.88	-4.11			
(8) Surplus/(Deficit) on received	-595901		-740352	24.24%	-649119	-12.32%	-0.65	-0.67	-0.69	-1.18	-1.40	-1.18	-3.95	-4.81	-4.08			
Cost recovery on received	15.10%		12.73%	-15.70%	20.03%	57.35%												

UP JAL NIGAM INDO DUTCH PROJECT
REVIEW OF OWM COSTS

PIPED SCHEME: SAIDABAD

PARTICULARS	TOTALS						COST PER KL OF WATER PRODUCED			COST PER KL OF WATER DISTRIBUTED			COST PER KL OF WATER SOLD			COMPOSITION OF TOTAL		
	1989-90	% INC	1990-91	% INC	1991-92	% INC	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92
COMPONENTS OF COST-ACTUAL																		
(1) Manpower costs	202150		325600	61.07%	242150	-25.63%	0.22	0.29	0.26	0.40	0.62	0.44	1.34	2.12	1.52	41.62%	55.14%	49.18%
(2) Power				ERR		ERR												
(3) Chemicals	3100		3100		3400	9.68%	0.00	0.00	0.00	0.01	0.01	0.01	0.02	0.02	0.02	0.64%	0.52%	0.69%
(4) R & M materials	76000		56000	-26.32%	40000	-28.57%	0.08	0.05	0.04	0.15	0.11	0.07	0.50	0.36	0.25	15.65%	9.48%	8.12%
(5) Others	8300		9650	16.27%	10650	10.36%	0.01	0.01	0.01	0.02	0.02	0.02	0.06	0.06	0.07	1.71%	1.63%	2.16%
(6) Depreciation	196133		196133		196133		0.22	0.18	0.21	0.39	0.37	0.36	1.30	1.27	1.23	40.38%	33.22%	39.84%
(7) Interest				ERR		ERR												
Total	485683		590483	21.58%	492333	-16.62%	0.53	0.53	0.52	0.96	1.12	0.89	3.22	3.84	3.10	100.00%	100.00%	100.00%
(8) Centage				ERR		ERR												
Total	485683		590483	21.58%	492333	-16.62%	0.53	0.53	0.52	0.96	1.12	0.89	3.22	3.84	3.10			
COMPONENTS OF COST-REAL																		
(1) Manpower costs	202150		325600	61.07%	242150	-25.63%	0.22	0.29	0.26	0.40	0.62	0.44	1.34	2.12	1.52	28.80%	38.38%	29.83%
(2) Power	215902		256650	18.87%	317932	23.88%	0.24	0.23	0.34	0.43	0.49	0.58	1.43	1.67	2.00	30.76%	30.25%	39.17%
(3) Chemicals	3416		4319	26.44%	4854	12.38%	0.00	0.00	0.01	0.01	0.01	0.01	0.02	0.03	0.03	0.49%	0.51%	0.60%
(4) R & M materials	76000		56000	-26.32%	40000	-28.57%	0.08	0.05	0.04	0.15	0.11	0.07	0.50	0.36	0.25	10.83%	6.60%	4.93%
(5) Others	8300		9650	16.27%	10650	10.36%	0.01	0.01	0.01	0.02	0.02	0.02	0.06	0.06	0.07	1.18%	1.14%	1.31%
(6) Depreciation	196133		196133		196133		0.22	0.18	0.21	0.39	0.37	0.36	1.30	1.27	1.23	27.94%	23.12%	24.16%
(7) Interest				ERR		ERR												
Total	701901		848352	20.87%	811719	-4.32%	0.77	0.77	0.86	1.39	1.61	1.47	4.65	5.51	5.10	100.00%	100.00%	100.00%
(8) Centage				ERR		ERR												
Total	701901		848352	20.87%	811719	-4.32%	0.77	0.77	0.86	1.39	1.61	1.47	4.65	5.51	5.10			
PHYSICAL PARAMETERS																		
(1) Population covered																		
(a) Domestic metered				ERR	1920	ERR												
(b) Domestic unmetered	6704		6840	2.03%	5200	-23.98%												
(c) Industrial/commel..				ERR		ERR												
(d) Others metered				ERR		ERR												
(e) Others unmetered				ERR		ERR												
(f) Public stand posts	24296		25660	5.61%	26931	4.95%												
TOTAL	31000		32500		34051													

UP JAL NIGAM INDO DUTCH PROJ

REVIEW OF O&M COSTS

PIPED SCHEME: SAIDABAD

PARTICULARS	TOTALS						COST PER KL OF WATER PRODUCED			COST PER KL OF WATER DISTRIBUTED			COST PER KL OF WATER SOLD			COMPOSITION OF TOTAL		
	1989-90	% INC	1990-91	% INC	1991-92	% INC	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92
(2) Total connections																		
(a) Domestic metered				ERR	240	ERR												
(b) Domestic unmetered	838		855	2.03%	650	-23.98%												
(c) Industrial/commel..				ERR		ERR												
(d) Others metered				ERR		ERR												
(e) Others unmetered				ERR		ERR												
(3) Public standposts	195		210	7.69%	238	13.33%												
PUMP 1																		
(4) Pumping hours p.a	4354		4354		3608	-17.13%												
(5) Rate pf pumping (lps)	2100		2100		2100													
(6) No. of days worked				ERR		ERR												
(7) Production (KL)	548604		548604		454608	-17.13%												
PUMP 2																		
(4) Pumping hours p.a	3096		4776	54.26%	4201	-12.04%												
(5) Rate pf pumping (lps)	1950		1950		1950													
(6) No. of days worked				ERR		ERR												
(7) Production (KL)	362232		358792	54.26%	491517	-12.04%												
(7a) TOTAL PUMPING HRS	7450		9130	22.55%	7809	-14.47%												
(7b) TOTAL PRODUCTION IN KL	910836		1107396	21.58%	946125	-14.56%												
(8) Average consumption(lpd																		
(a) Domestic metered				ERR		ERR												
(b) Domestic unmetered				ERR		ERR												
(c) Industrial/commel..				ERR		ERR												
(d) Others metered				ERR		ERR												
(e) Others unmetered				ERR		ERR												
(f) Public standposts				ERR		ERR												
(9) Water distribution(KL)																		
(a) Domestic metered				ERR	42048	ERR												
(b) Domestic unmetered	150840		153900	2.03%	117000	-23.98%												
(c) Industrial/commel..				ERR		ERR												
(d) Others metered				ERR		ERR												
(e) Others unmetered				ERR		ERR												
(f) Public standposts	354722		374636	5.61%	393193	4.95%												
TOTAL	505562		528536	4.54%	552241	4.48%												

UP JAL NIGAM INDO DUTCH PROJECT
REVIEW OF O&M COSTS

PIPED SCHEME: SAIDABAD

PARTICULARS	TOTALS						COST PER KL OF WATER PRODUCED			COST PER KL OF WATER DISTRIBUTED			COST PER KL OF WATER SOLD			COMPOSITION OF TOTAL		
	1989-90	% INC	1990-91	% INC	1991-92	% INC	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92
(10) Water wastage(KL)	405274		578860	42.83%	393884	-31.96%												
(11) %wastage on production	44.49%		52.27%	17.48%	41.63%	-20.36%												
(12) Water sold (KL)																		
(a) Domestic metered				ERR	92048	ERR												
(b) Domestic unmetered	150840		153900	2.03%	117000	-23.98%												
(c) Industrial/commel..				ERR		ERR												
(d) Others metered				ERR		ERR												
(e) Others unmetered				ERR		ERR												
(f) Public standposts				ERR		ERR												
TOTAL	150840		153900	2.03%	139048	3.33%												
(13) % sold on production	16.56%		13.90%		16.81%													
(14) Ipcd calculated																		
(a) Domestic metered	ERR		ERR	ERR	60	ERR												
(b) Domestic unmetered	62		62		62													
(c) Industrial/commel..	ERR		ERR	ERR	ERR	ERR												
(d) Others metered	ERR		ERR	ERR	ERR	ERR												
(e) Others unmetered	ERR		ERR	ERR	ERR	ERR												
(f) Public standposts	40		40		40													

UP JAL NIGAM INDO DUTCH PROJ

REVIEW OF O&M COSTS

PIPED SCHEME: SAIDABAD

PARTICULARS	TOTALS						COST PER KL OF WATER PRODUCED			COST PER KL OF WATER DISTRIBUTED			COST PER KL OF WATER SOLD			COMPOSITION OF TOTAL		
	1989-90	% INC	1990-91	% INC	1991-92	% INC	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92
FINANCIAL PARAMETERS																		
REVENUES																		
(1) Water charges demanded																		
(a) Domestic metered				ERR		ERR												
(b) Domestic unmetered	92000		97000	5.43%	158000	62.89%												
(c) Industrial/commel..				ERR		ERR												
(d) Others metered				ERR		ERR												
(e) Others unmetered				ERR		ERR												
TOTAL	92000		97000	5.43%	158000	62.89%												
(2) Charges collected																		
(a) Domestic metered				ERR	57600	ERR												
(b) Domestic unmetered	106000		108000	1.89%	105000	-2.78%												
(c) Industrial/commel..				ERR		ERR												
(d) Others metered				ERR		ERR												
(e) Others unmetered				ERR		ERR												
TOTAL	106000		108000	1.89%	162600	50.56%												
(3) Demand if all private connections were metered																		
(a) Domestic metered	151000		154000		159000													
(b) Domestic unmetered				ERR		ERR												
(c) Industrial/commel..				ERR		ERR												
(d) Others metered				ERR		ERR												
(e) Others unmetered				ERR		ERR												
TOTAL	151000		154000		159000													
(4) Arrears of demand																		
(a) Domestic metered				ERR		ERR												
(b) Domestic unmetered	132000		149000	12.88%	260000	74.50%												
(c) Industrial/commel..				ERR		ERR												
(d) Others metered				ERR		ERR												
(e) Others unmetered				ERR		ERR												
TOTAL	132000		149000	12.88%	260000	74.50%												
(5) Collection efficiency																		
(a) Domestic metered				ERR		ERR												
(b) Domestic unmetered				ERR		ERR												
(c) Industrial/commel..				ERR		ERR												
(d) Others metered				ERR		ERR												
(e) Others unmetered				ERR		ERR												
TOTAL EFFICIENCY	115.22%		111.34%	-3.37%	102.91%	-7.57%												

Demand if all private connections were metered is worked out as water distributed to private connections at Re.1/- per KL.

UP JAL NIGAM INDO DUTCH PROJECT
REVIEW OF O&M COSTS

PIPED SCHEME: SAIDABAD

PARTICULARS	TOTALS						COST PER KL OF WATER PRODUCED			COST PER KL OF WATER DISTRIBUTED			COST PER KL OF WATER SOLD			COMPOSITION OF TOTAL		
	1989-90	% INC	1990-91	% INC	1991-92	% INC	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92
(6) No. days arrears																		
(a) Domestic metered	ERR		ERR	ERR	ERR	ERR												
(b) Domestic unmetered	524		561	7.06%	601	7.13%												
(c) Industrial/commel..	ERR		ERR	ERR	ERR	ERR												
(d) Others metered	ERR		ERR	ERR	ERR	ERR												
(e) Others unmetered	ERR		ERR	ERR	ERR	ERR												
(7) Other income				ERR		ERR												
(8) Total cash income	106000		108000	1.89%	162600	50.56%												
(9) Total real income	92000		97000	5.43%	158000	62.89%												
COSTS																		
(1) MANPOWER COSTS																		
A. Direct labour																		
(a) Pumping station	96000		126000	31.25%	106000	-15.87%	0.11	0.11	0.11	0.19	0.24	0.19	0.64	0.82	0.67			
(b) Distribution system	34000		40000	17.65%	44000	10.00%	0.04	0.04	0.05	0.07	0.08	0.08	0.23	0.26	0.28			
(c) Others	11000		6000	-45.45%	6000		0.01	0.01	0.01	0.02	0.01	0.01	0.07	0.04	0.04			
TOTAL	141000		172000	21.99%	156000	-9.30%	0.15	0.16	0.16	0.28	0.33	0.28	0.93	1.12	0.98			
B. Indirect labour(Total)																		
(a) EE	66000		75000	13.64%	78000	4.00%	0.07	0.07	0.08	0.13	0.14	0.14	0.44	0.49	0.49			
(b) AE	43000		87000	102.33%	60000	-31.03%	0.05	0.08	0.06	0.09	0.16	0.11	0.29	0.57	0.38			
(c) JE	30000		61000	103.33%	44000	-27.87%	0.03	0.06	0.05	0.06	0.12	0.08	0.20	0.40	0.28			
(d) Adm staff	518000		1699000	227.99%	717000	-57.80%	0.57	1.53	0.76	1.02	3.21	1.30	3.43	11.04	4.51			
TOTAL	657000		1922000	192.54%	899000	-53.23%	0.72	2.11	0.99	1.30	3.64	1.63	4.36	12.49	5.65			

UP JAL NIGAM INDO DUTCH PROJECT
REVIEW OF OM. COSTS

PIPED SCHEME: SAIDABAD

PARTICULARS	TOTALS 1989-90	% INC	1990-91	% INC	1991-92	% INC	COST PER KL OF WATER PRODUCED 1989-90	1990-91	1991-92	COST PER KL OF WATER DISTRIBUTED 1989-90	1990-91	1991-92	COST PER KL OF WATER SOLD 1989-90	1990-91	1991-92	COMPOSITION OF TOTAL 1989-90	1990-91	1991-92
C. Time spent by ind. %																		
(a) EE	5.00%		5.00%		5.00%		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
(b) AE	15.00%		15.00%		15.00%		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
(c) JE	85.00%		85.00%		85.00%		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
(d) Adm staff	5.00%		5.00%		5.00%		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
D. Cost of indirect labour																		
(a) EE	3300		3750	13.64%	3900	4.00%	0.00	0.00	0.00	0.01	0.01	0.01	0.02	0.02	0.02			
(b) AE	6450		13050	102.33%	9000	-31.03%	0.01	0.01	0.01	0.01	0.02	0.02	0.04	0.08	0.06			
(c) JE	25500		51850	103.33%	37400	-27.87%	0.03	0.05	0.04	0.05	0.10	0.07	0.17	0.34	0.24			
(d) Aden staff	25900		84950	227.99%	35850	-57.80%	0.03	0.08	0.04	0.05	0.16	0.06	0.17	0.55	0.23			
TOTAL	61150		153600	151.19%	86150	-43.91%	0.07	0.14	0.09	0.12	0.29	0.16	0.41	1.00	0.54			
E. Casual labourers	3600		5000	38.89%		-100.00%	0.00	ERR		0.01	ERR		0.02	ERR				
F. Total manpower cost																		
(a) Direct	141000		172000	21.99%	156000	-9.30%	0.15	0.16	0.16	0.28	0.33	0.28	0.93	1.12	0.98			
(b) Indirect	61150		153600	151.19%	86150	-43.91%	0.07	0.14	0.09	0.12	0.29	0.16	0.41	1.00	0.54			
TOTAL	202150		325600	61.07%	242150	-25.63%	0.22	0.29	0.26	0.40	0.62	0.44	1.34	2.12	1.52			
G. Cost not paid																		
(a) Direct				ERR		ERR												
(b) Indirect				ERR		ERR												
H. Real cost of manpower																		
(a) Direct	141000		172000	21.99%	156000	-9.30%	0.15	0.16	0.16	0.28	0.33	0.28	0.93	1.12	0.98			
(b) Indirect	61150		153600	151.19%	86150	-43.91%	0.07	0.14	0.09	0.12	0.29	0.16	0.41	1.00	0.54			
TOTAL	202150		325600	61.07%	242150	-25.63%	0.22	0.29	0.26	0.40	0.62	0.44	1.34	2.12	1.52			
(2) POWER COSTS																		
HP RATING - PUMP 1 40																		
HP RATING - PUMP 2 30																		
A. Bills received	85000		91000	7.06%	97700	7.36%	0.09	0.08	0.10	0.17	0.17	0.18	0.56	0.59	0.61			
B. Bills paid				ERR		ERR												
C. Actual consumption																		
PUMP 1	128008		128008		106075	-17.13%	0.14	0.12	0.11	0.25	0.24	0.19	0.85	0.83	0.67			
PUMP 2	68267		105311	54.26%	92632	-12.04%	0.07	0.10	0.10	0.14	0.20	0.17	0.45	0.68	0.58			
C. Rate per unit	1.10		1.10		1.60	45.45%												

UP JAL NIGAM INDO DUTCH PROJECT
REVIEW OF O&M COSTS

PIPED SCHEME: SAIDABAD

PARTICULARS	TOTALS						COST PER KL OF WATER PRODUCED			COST PER KL OF WATER DISTRIBUTED			COST PER KL OF WATER SOLD			COMPOSITION OF TOTAL		
	1989-90	% INC	1990-91	% INC	1991-92	% INC	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92
D. Actual power charges																		
PUMP 1	140808		140808		169720	20.53%	0.15	0.13	0.18	0.28	0.27	0.31	0.93	0.91	1.07			
PUMP 2	75093		115842	54.26%	148211	27.94%	0.08	0.10	0.16	0.15	0.22	0.27	0.50	0.75	0.93			
TOTAL	215902		256650	18.87%	317932	23.88%	0.24	0.23	0.34	0.43	0.49	0.58	1.43	1.67	2.00			
(3) CHEMICALS COST																		
A. BLEACHING POWDER																		
a. Actual cost	3100		3100		3400	9.68%	0.00	0.00	0.00	0.01	0.01	0.01	0.02	0.02	0.02			
b. Norm in grams per KL	1		1		1													
c. Average price (KG)	3.75		3.90	4.00%	5.13	31.54%												
d. Real cost of chemicals	3416		4319	26.44%	4854	12.38%	0.00	0.00	0.01	0.01	0.01	0.01	0.02	0.03	0.03			
e. Stock (qty in Kgs)				ERR		ERR												
f. Number of days stock				ERR		ERR												
(4) REPAIRS & MAINTENANCE																		
A. Material cost																		
(a) Pumping station	26000		24000	-7.69%	19000	-20.83%	0.03	0.02	0.02	0.05	0.05	0.03	0.17	0.16	0.12			
(b) Distribution system	46000		32000	-30.43%	21000	-34.38%	0.05	0.03	0.02	0.09	0.06	0.04	0.30	0.21	0.13			
(c) Overhead tanks				ERR		ERR												
(d) Others	4000			-100.00%		ERR	0.00			0.01			0.03					
TOTAL	76000		56000	-26.32%	40000	-28.57%	0.08	0.05	0.04	0.15	0.11	0.07	0.50	0.36	0.25			
B. Labour cost																		
(a) Pumping station				ERR		ERR												
(b) Distribution system				ERR		ERR												
(c) Overhead tanks				ERR		ERR												
(d) Others				ERR		ERR												
TOTAL				ERR		ERR												
C. Total cost																		
(a) Pumping station	26000		24000	-7.69%	19000	-20.83%	0.03	0.02	0.02	0.05	0.05	0.03	0.17	0.16	0.12			
(b) Distribution system	46000		32000	-30.43%	21000	-34.38%	0.05	0.03	0.02	0.09	0.06	0.04	0.30	0.21	0.13			
(c) Overhead tanks				ERR		ERR												
(d) Others	4000			-100.00%		ERR	0.00			0.01			0.03					
TOTAL	76000		56000	-26.32%	40000	-28.57%	0.08	0.05	0.04	0.15	0.11	0.07	0.50	0.36	0.25			

UP JAL NIGAM INDO DUTCH PROJECT
REVIEW OF O&M COSTS

PIPED SCHEME: SAIDABAD

PARTICULARS	TOTALS						COST PER KL OF WATER PRODUCED			COST PER KL OF WATER DISTRIBUTED			COST PER KL OF WATER SOLD			COMPOSITION OF TOTAL		
	1989-90	% INC	1990-91	% INC	1991-92	% INC	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92
D. Maintenance budget																		
(a) Pumping station				ERR		ERR												
(b) Distribution system				ERR		ERR												
(c) Overhead tanks				ERR		ERR												
(d) Others				ERR		ERR												
TOTAL				ERR		ERR												
(4) OTHER COSTS																		
A. Equipments																		
(a) Total cost				ERR		ERR												
(b) % for O&M																		
(c) O&M cost				ERR		ERR												
B. Vehicles																		
(a) Total cost	3300		3900	18.18%	4400	12.82%	0.00	0.00	0.00	0.01	0.01	0.01	0.02	0.03	0.03			
(b) % for O&M	100.00%		100.00%		100.00%													
(c) O&M cost	3300		3900	18.18%	4400	12.82%	0.00	0.00	0.00	0.01	0.01	0.01	0.02	0.03	0.03			
C. Others	5000		5750	15.00%	6250	8.70%	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.04	0.04			
TOTAL	8300		9650	16.27%	10650	10.36%	0.01	0.01	0.01	0.02	0.02	0.02	0.06	0.06	0.07			
(6) DEPRECIATION	196133		196133		196133		0.22	0.18	0.21	0.39	0.37	0.36	1.30	1.27	1.23			
(7) INTEREST				ERR		ERR												

UP JAL NIGAM INDO DUTCH PROJECT
REVIEW OF O&M COSTS

PIPED SCHEME: SAIDABAD

PARTICULARS	TOTALS						COST PER KL OF WATER PRODUCED			COST PER KL OF WATER DISTRIBUTED			COST PER KL OF WATER SOLD			COMPOSITION OF TOTAL		
	1989-90	% INC	1990-91	% INC	1991-92	% INC	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92
REAL COST BASIS																		
TOTAL REVENUE	92000		97000	5.43%	158000	62.89%	0.10	0.09	0.17	0.18	0.18	0.29	0.61	0.63	0.99			
VARIABLE COST																		
(a) Power	215902		256650	18.87%	317932	23.88%	0.24	0.23	0.34	0.43	0.49	0.58	1.43	1.67	2.00	30.76%	30.25%	39.17%
(b) Chemicals	3416		4319	26.44%	4854	12.38%	0.00	0.00	0.01	0.01	0.01	0.01	0.02	0.03	0.03	0.49%	0.51%	0.60%
(c) Repair materials	76000		56000	-26.32%	40000	-28.57%	0.08	0.05	0.04	0.15	0.11	0.07	0.50	0.36	0.25	10.83%	6.60%	4.93%
(d) Casuals				ERR		ERR												
Total	295317		316969	7.33%	362785	14.45%	0.32	0.29	0.38	0.58	0.60	0.66	1.96	2.06	2.28	42.07%	37.36%	44.69%
CONTRIBUTION	-203317		-219969	8.19%	-204785	-6.90%	-0.22	-0.20	-0.22				-1.35	-1.43	-1.29			
FIXED COST																		
(a) Manpower	202150		325600	61.07%	242150	-25.63%	0.22	0.29	0.26	0.40	0.62	0.44	1.34	2.12	1.52	28.80%	38.38%	29.83%
(b) Others	8300		9650	16.27%	10650	10.36%	0.01	0.01	0.01	0.02	0.02	0.02	0.06	0.06	0.07	1.18%	1.14%	1.31%
(c) Depreciation	196133		196133		196133		0.22	0.18	0.21	0.39	0.37	0.36	1.30	1.27	1.23	27.94%	23.12%	24.16%
(d) Interest				ERR		ERR												
Total	406583		531383	30.69%	448933	-15.52%	0.45	0.48	0.47	0.80	1.01	0.81	2.70	3.45	2.82	57.93%	62.64%	55.31%
SURPLUS/DEFICIT	-609901		-751352	23.19%	-653719	-12.99%	-0.67	-0.68	-0.69	-1.21	-1.42	-1.18	-4.04	-4.88	-4.11			
TOTAL COST (FIXED COST+VC)	701901		848352	20.87%	811719	-4.32%	0.77	0.77	0.86	1.39	1.61	1.47	4.65	5.51	5.10	100.00%	100.00%	100.00%

UP JAL NIGAM INDO DUTCH PROJECT
REVIEW OF O&M COSTS

PIPED SCHEME: TIKRI

PARTICULARS	TOTALS						COST PER KL OF WATER PRODUCED			COST PER KL OF WATER DISTRIBUTED			COST PER KL OF WATER SOLD			COMPOSITION OF TOTAL		
	1989-90	% INC	1990-91	% INC	1991-92	% INC	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92
SUMMARY OF ACTUALS																		
(1) Direct cost	274550		352500	28.39%	424565	20.44%	0.20	0.25	0.30	0.26	0.36	0.44	1.68	2.23	2.02	42.44%	43.71%	51.94%
(2) Indirect cost	62345		144035	131.03%	82830	-42.49%	0.04	0.10	0.06	0.06	0.15	0.09	0.38	0.91	0.39	9.64%	17.86%	10.13%
(3) Depreciation	310000		310000		310000		0.22	0.22	0.22	0.29	0.31	0.32	1.90	1.96	1.47	47.92%	38.44%	37.93%
(4) Interest				ERR		ERR												
Total	646895		806535	24.68%	817395	1.35%	0.46	0.58	0.58	0.61	0.82	0.85	3.97	5.10	3.88	100.00%	100.00%	100.00%
(4) Income demanded	163000		158000	-3.07%	206000	30.38%	0.12	0.11	0.15	0.15	0.16	0.21	1.00	1.00	0.98			
(5) Income collected	94000		90000	-4.26%	124000	37.78%	0.07	0.06	0.09	0.09	0.09	0.13	0.58	0.57	0.59			
(6) Other income				ERR		ERR												
Total demanded	163000		158000	-3.07%	206000	30.38%	0.12	0.11	0.15	0.15	0.16	0.21	1.00	1.00	0.98			
Total received	94000		90000	-4.26%	124000	37.78%	0.07	0.06	0.09	0.09	0.09	0.13	0.58	0.57	0.59			
(7) Surplus/(Deficit) on demand	-483895		-648535	34.02%	-611395	-5.73%	-0.35	-0.47	-0.43	-0.46	-0.66	-0.63	-2.97	-4.10	-2.90			
(8) Surplus/(Deficit) on received	-552895		-716535	29.60%	-693395	-3.23%	-0.40	-0.51	-0.49	-0.53	-0.73	-0.72	-3.39	-4.54	-3.29			
Cost recovery on received	14.53%		11.16%	-23.21%	15.17%	35.95%												
SUMMARY OF REAL COSTS																		
(1) Direct cost	681333		754482	10.74%	1017538	34.87%	0.49	0.54	0.72	0.65	0.77	1.05	4.18	4.78	4.83	64.66%	62.43%	72.15%
(2) Indirect cost	62345		144035	131.03%	82830	-42.49%	0.04	0.10	0.06	0.06	0.15	0.09	0.38	0.91	0.39	5.92%	11.92%	5.87%
(3) Depreciation	310000		310000		310000		0.22	0.22	0.22	0.29	0.31	0.32	1.90	1.96	1.47	29.42%	25.65%	21.98%
(3) Interest				ERR		ERR												
Total	1053680		1208517	14.69%	1410368	16.70%	0.76	0.87	1.00	1.00	1.23	1.46	6.46	7.65	6.70	100.00%	100.00%	100.00%
(4) Income demanded	163000		158000	-3.07%	206000	30.38%	0.12	0.11	0.15	0.15	0.16	0.21	1.00	1.00	0.98			
(5) Income received	94000		90000	-4.26%	124000	37.78%	0.07	0.06	0.09	0.09	0.09	0.13	0.58	0.57	0.59			
(6) Other income				ERR		ERR												
Total demanded	163000		158000	-3.07%	206000	30.38%	0.12	0.11	0.15	0.15	0.16	0.21	1.00	1.00	0.98			
Total received	94000		90000	-4.26%	124000	37.78%	0.07	0.06	0.09	0.09	0.09	0.13	0.58	0.57	0.59			
(7) Surplus/(Deficit) on demand	-890680		-1050517	17.95%	-1204368	14.65%	-0.64	-0.75	-0.85	-0.85	-1.07	-1.25	-5.46	-6.65	-5.72			
(8) Surplus/(Deficit) on received	-959680		-1118517	16.55%	-1286368	15.01%	-0.69	-0.80	-0.91	-0.91	-1.13	-1.33	-5.89	-7.08	-6.11			
Cost recovery on received	8.92%		7.45%	-16.52%	8.79%	18.06%												

UP JAL NIGAM INDO DUTCH PROJECT
REVIEW OF O&M COSTS

PIPED SCHEME: TIKRI

PARTICULARS	TOTALS 1989-90	% INC	1990-91	% INC	1991-92	% INC	COST PER KL OF WATER PRODUCED 1989-90	1990-91	1991-92	COST PER KL OF WATER DISTRIBUTED 1989-90	1990-91	1991-92	COST PER KL OF WATER SOLD 1989-90	1990-91	1991-92	COMPOSITION OF TOTAL 1989-90	1990-91	1991-92
COMPONENTS OF COST-ACTUAL																		
(1) Manpower costs	227800		321600	41.18%	264750	-17.68%	0.16	0.23	0.19	0.22	0.33	0.27	1.40	2.04	1.26	35.21%	39.87%	32.39%
(2) Power				ERR		ERR												
(3) Chemicals	1000		6000	500.00%	7000	16.67%	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.04	0.03	0.15%	0.74%	0.86%
(4) R & M materials	98550		161500	63.88%	226565	40.29%	0.07	0.12	0.16	0.09	0.16	0.23	0.60	1.02	1.08	15.23%	20.02%	27.72%
(5) Others	9545		7435	-22.11%	9080	22.13%	0.01	0.01	0.01	0.01	0.01	0.01	0.06	0.05	0.04	1.48%	0.92%	1.11%
(6) Depreciation	310000		310000		310000		0.22	0.22	0.22	0.29	0.31	0.32	1.90	1.96	1.47	47.92%	38.44%	37.93%
(7) Interest				ERR		ERR												
Total	646895		806535	24.68%	817395	1.35%	0.46	0.58	0.58	0.61	0.82	0.85	3.97	5.10	3.88	100.00%	100.00%	100.00%
(8) Centage				ERR		ERR												
Total	646895		806535	24.68%	817395	1.35%	0.46	0.58	0.58	0.61	0.82	0.85	3.97	5.10	3.88			
COMPONENTS OF COST-REAL																		
(1) Manpower costs	227800		321600	41.18%	264750	-17.68%	0.16	0.23	0.19	0.22	0.33	0.27	1.40	2.04	1.26	21.62%	26.61%	18.77%
(2) Power	402557		402545	0.00%	592733	47.25%	0.29	0.29	0.42	0.38	0.41	0.61	2.47	2.55	2.81	38.20%	33.31%	42.03%
(3) Chemicals	5228		5437	4.00%	7240	33.16%	0.00	0.00	0.01	0.00	0.01	0.01	0.03	0.03	0.03	0.50%	0.45%	0.51%
(4) R & M materials	98550		161500	63.88%	226565	40.29%	0.07	0.12	0.16	0.09	0.16	0.23	0.60	1.02	1.08	9.35%	13.36%	16.06%
(5) Others	9545		7435	-22.11%	9080	22.13%	0.01	0.01	0.01	0.01	0.01	0.01	0.06	0.05	0.04	0.91%	0.62%	0.64%
(6) Depreciation	310000		310000		310000		0.22	0.22	0.22	0.29	0.31	0.32	1.90	1.96	1.47	29.42%	25.65%	21.98%
(7) Interest				ERR		ERR												
Total	1053680		1208517	14.69%	1410368	16.70%	0.76	0.87	1.00	1.00	1.23	1.46	6.46	7.65	6.70	100.00%	100.00%	100.00%
(8) Centage				ERR		ERR												
Total	1053680		1208517	14.69%	1410368	16.70%	0.76	0.87	1.00	1.00	1.23	1.46	6.46	7.65	6.70			
PHYSICAL PARAMETERS																		
(1) Population covered																		
(a) Domestic metered			10240	ERR	10416	1.72%												
(b) Domestic unmetered	8840			-100.00%	784	ERR												
(c) Industrial/commel..				ERR		ERR												
(d) Others metered				ERR		ERR												
(e) Others unmetered				ERR		ERR												
(f) Public stand posts	41500		47430	14.29%	47800	0.78%												
TOTAL	50340		57670	14.56%	59000	2.31%												

UP JAL NIGAM INDO DUTCH PROJECT
REVIEW OF O&M COSTS

PIPED SCHEME: TIKRI

PARTICULARS	TOTALS 1989-90	% INC	1990-91	% INC	1991-92	% INC	COST PER KL OF WATER PRODUCED 1989-90	1990-91	1991-92	COST PER KL OF WATER DISTRIBUTED 1989-90	1990-91	1991-92	COST PER KL OF WATER SOLD 1989-90	1990-91	1991-92	COMPOSITION OF TOTAL 1989-90	1990-91	1991-92
(2) Total connections																		
(a) Domestic metered	.		1280	ERR	1302	1.72%												
(b) Domestic unmetered	1105			-100.00%	98	ERR												
(c) Industrial/commel..				ERR		ERR												
(d) Others metered				ERR		ERR												
(e) Others unmetered				ERR		ERR												
(3) Public standposts	219		219		219													
PUMP 1																		
(4) Pumping hours p.a	5162		5163	0.02%	5884	13.95%												
(5) Rate pf pumping (lpm)	2100		2100		2100													
(6) No. of days worked	327		327		346	5.81%												
(7) Production (KL)	650444		650580	0.02%	741334	13.95%												
PUMP 2																		
(4) Pumping hours p.a	5902		5901	-0.02%	5317	-9.90%												
(5) Rate pf pumping (lpm)	2100		2100		2100													
(6) No. of days worked	349		349		319	-8.60%												
(7) Production (KL)	743695		743515	-0.02%	669936	-9.90%												
(7a) TOTAL PUMPING HRS	11065		11064	0.00%	11201	1.23%												
(7b) TOTAL PRODUCTION IN KL	1394138		1394094	0.00%	1411269	1.23%												
(8) Average consumption(lpd																		
(a) Domestic metered				ERR		ERR												
(b) Domestic unmetered				ERR		ERR												
(c) Industrial/commel..				ERR		ERR												
(d) Others metered				ERR		ERR												
(e) Others unmetered				ERR		ERR												
(f) Public standposts				ERR		ERR												
(9) Water distribution(KL)																		
(a) Domestic metered			158000	ERR	196000	24.05%												
(b) Domestic unmetered	163000			-100.00%	14394	ERR												
(c) Industrial/commel..				ERR		ERR												
(d) Others metered				ERR		ERR												
(e) Others unmetered				ERR		ERR												
(f) Public standposts	889164		827623	-6.92%	754597	-8.82%												
TOTAL	1052164		985623	-6.32%	965191	-2.07%												

UP JAL NIGAM INDO DUTCH PROJECT
REVIEW OF O&M COSTS

PIPED SCHEME: TIKRI

PARTICULARS	TOTALS						COST PER KL OF WATER PRODUCED			COST PER KL OF WATER DISTRIBUTED			COST PER KL OF WATER SOLD			COMPOSITION OF TOTAL		
	1989-90	% INC	1990-91	% INC	1991-92	% INC	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92
(10) Water wastage(KL)	341974		408471	19.44%	446078	9.21%												
(11) %Wastage on production	24.53%		29.30%	19.45%	31.61%	7.88%												
(12) Water sold (KL)																		
(a) Domestic metered			158000	ERR	196000	24.05%												
(b) Domestic unmetered	163000			-100.00%	14594	ERR												
(c) Industrial/commel..				ERR		ERR												
(d) Others metered				ERR		ERR												
(e) Others unmetered				ERR		ERR												
(f) Public standposts				ERR		ERR												
TOTAL	163000		158000	-3.07%	210594	33.29%												
(13) % sold on production	11.69%		11.33%		14.92%													
(14) Ipcd calculated																		
(a) Domestic metered	ERR		42	ERR	52	21.95%												
(b) Domestic unmetered	51		ERR	ERR	51	ERR												
(c) Industrial/commel..	ERR		ERR	ERR	ERR	ERR												
(d) Others metered	ERR		ERR	ERR	ERR	ERR												
(e) Others unmetered	ERR		ERR	ERR	ERR	ERR												
(f) Public standposts	59		48	-18.56%	43	-9.53%												

UP JAL NIGAM INDO DUTCH PROJECT

REVIEW OF O&M COSTS

PIPED SCHEME: TIKRI

PARTICULARS	TOTALS						COST PER KL OF WATER PRODUCED			COST PER KL OF WATER DISTRIBUTED			COST PER KL OF WATER SOLD			COMPOSITION OF TOTAL		
	1989-90	% INC	1990-91	% INC	1991-92	% INC	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92
FINANCIAL PARAMETERS																		
REVENUES																		
(1) Water charges demanded																		
(a) Domestic metered			103000	ERR	196000	90.29%												
(b) Domestic unmetered	163000		55000	-66.26%	10000	-81.82%												
(c) Industrial/commel..				ERR		ERR												
(d) Others metered				ERR		ERR												
(e) Others unmetered				ERR		ERR												
TOTAL	163000		158000	-3.07%	206000	30.38%												
(2) Charges collected																		
(a) Domestic metered			70000	ERR	116000	65.71%												
(b) Domestic unmetered	94000		20000	-78.72%	8000	-60.00%												
(c) Industrial/commel..				ERR		ERR												
(d) Others metered				ERR		ERR												
(e) Others unmetered				ERR		ERR												
TOTAL	94000		90000	-4.26%	124000	37.78%												
(3) Demand if all private connections were metered																		
(a) Domestic metered	163000		158000		210000													
(b) Domestic unmetered				ERR		ERR												
(c) Industrial/commel..				ERR		ERR												
(d) Others metered				ERR		ERR												
(e) Others unmetered				ERR		ERR												
TOTAL	163000		158000		210000													
(4) Arrears of demand																		
(a) Domestic metered			33000	ERR	80000	142.42%												
(b) Domestic unmetered	23000		35000	52.17%	2000	-94.29%												
(c) Industrial/commel..				ERR		ERR												
(d) Others metered				ERR		ERR												
(e) Others unmetered				ERR		ERR												
OP.BAL OF ARREARS	46000		69000		137000													
TOTAL	69000		137000	98.55%	219000	59.85%												
(5) Collection efficiency																		
(a) Domestic metered	ERR		67.96%	ERR	59.18%	-12.92%												
(b) Domestic unmetered	57.67%		36.36%	-36.94%	80.00%	120.00%												
(c) Industrial/commel..	ERR		ERR	ERR	ERR	ERR												
(d) Others metered	ERR		ERR	ERR	ERR	ERR												
(e) Others unmetered	ERR		ERR	ERR	ERR	ERR												
TOTAL EFFICIENCY	57.67%		56.96%	-1.23%	60.19%	5.67%												

UP JAL NIGAM INDO DUTCH PROJECT
REVIEW OF O&M COSTS

PIPED SCHEME: TIKRI

PARTICULARS	TOTALS 1989-90	% INC	1990-91	% INC	1991-92	% INC	COST PER KL OF WATER PRODUCED 1989-90	1990-91	1991-92	COST PER KL OF WATER DISTRIBUTED 1989-90	1990-91	1991-92	COST PER KL OF WATER SOLD 1989-90	1990-91	1991-92	COMPOSITION OF TOTAL 1989-90	1990-91	1991-92
(6) No. days arrears																		
(a) Domestic metered	ERR		117	ERR	149	27.40%												
(b) Domestic unmetered	52		232	350.99%	73	-68.57%												
(c) Industrial/commel..	ERR		ERR	ERR	ERR	ERR												
(d) Others metered	ERR		ERR	ERR	ERR	ERR												
(e) Others unmetered	ERR		ERR	ERR	ERR	ERR												
(7) Other income				ERR		ERR												
(8) Total cash income	94000		90000	-4.26%	124000	37.78%												
(9) Total real income	163000		158000	-3.07%	206000	30.38%												
COSTS																		
(1) MANPOWER COSTS																		
A. Direct labour																		
(a) Pumping station	101000		103000	1.98%	106000	2.91%	0.07	0.07	0.08	0.10	0.10	0.11	0.62	0.65	0.50			
(b) Distribution system	52000		56000	7.69%	39000	5.36%	0.04	0.04	0.04	0.05	0.06	0.06	0.32	0.35	0.28			
(c) Others	22000		26000	18.18%	26000		0.02	0.02	0.02	0.02	0.03	0.03	0.13	0.16	0.12			
TOTAL	175000		185000	5.71%	191000	3.24%	0.13	0.13	0.14	0.17	0.19	0.20	1.07	1.17	0.91			
B. Indirect labour(Total)																		
(a) EE	66000		75000	13.64%	78000	4.00%	0.05	0.05	0.06	0.06	0.08	0.08	0.40	0.47	0.37			
(b) AE	43000		87000	102.33%	60000	-31.03%	0.03	0.06	0.04	0.04	0.09	0.06	0.26	0.55	0.28			
(c) JE	30000		61000	103.33%	44000	-27.87%	0.02	0.04	0.03	0.03	0.06	0.05	0.18	0.39	0.21			
(d) Adm staff	518000		1699000	227.99%	717000	-57.80%	0.37	1.22	0.51	0.49	1.72	0.74	3.18	10.75	3.40			
TOTAL	657000		1922000	192.54%	899000	-53.23%	0.47	1.38	0.64	0.62	1.95	0.93	4.03	12.16	4.27			

UP JAL NIGAM INDO DUTCH PRO...
REVIEW OF O&M COSTS

PIPED SCHEME: TIKRI

PARTICULARS	TOTALS						COST PER KL OF WATER PRODUCED			COST PER KL OF WATER DISTRIBUTED			COST PER KL OF WATER SOLD			COMPOSITION OF TOTAL		
	1989-90	% INC	1990-91	% INC	1991-92	% INC	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92
C. Time spent by ind. %																		
(a) EE	5.00%		5.00%		5.00%		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
(b) AE	20.00%		20.00%		20.00%		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
(c) JE	50.00%		50.00%		50.00%		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
(d) Adm staff	5.00%		5.00%		5.00%		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
D. Cost of indirect labour																		
(a) EE	3300		3750	13.64%	3900	4.00%	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.02			
(b) AE	8600		17400	102.33%	12000	-31.03%	0.01	0.01	0.01	0.01	0.02	0.01	0.05	0.11	0.06			
(c) JE	15000		30500	103.33%	22000	-27.87%	0.01	0.02	0.02	0.01	0.03	0.02	0.09	0.19	0.10			
(d) Adm staff	25900		84950	227.99%	35850	-57.80%	0.02	0.06	0.03	0.02	0.09	0.04	0.16	0.54	0.17			
TOTAL	52800		136600	158.71%	73750	-46.01%	0.04	0.10	0.05	0.05	0.14	0.08	0.32	0.86	0.35			
E. Casual labourers				ERR		ERR												
F. Total manpower cost																		
(a) Direct	175000		185000	5.71%	191000	3.24%	0.13	0.13	0.14	0.17	0.19	0.20	1.07	1.17	0.91			
(b) Indirect	52800		136600	158.71%	73750	-46.01%	0.04	0.10	0.05	0.05	0.14	0.08	0.32	0.86	0.35			
TOTAL	227800		321600	41.18%	264750	-17.68%	0.16	0.23	0.19	0.22	0.33	0.27	1.40	2.04	1.26			
G. Cost not paid																		
(a) Direct				ERR		ERR												
(b) Indirect				ERR		ERR												
H. Real cost of manpower																		
(a) Direct	175000		185000	5.71%	191000	3.24%	0.13	0.13	0.14	0.17	0.19	0.20	1.07	1.17	0.91			
(b) Indirect	52800		136600	158.71%	73750	-46.01%	0.04	0.10	0.05	0.05	0.14	0.08	0.32	0.86	0.35			
TOTAL	227800		321600	41.18%	264750	-17.68%	0.16	0.23	0.19	0.22	0.33	0.27	1.40	2.04	1.26			
(2) POWER COSTS																		
HP RATING - PUMP 1 45																		
HP RATING - PUMP 2 45																		
A. Bills received	106800		134400	25.84%	198480	47.68%	0.08	0.10	0.14	0.10	0.14	0.21	0.66	0.85	0.9...			
B. Bills paid				ERR		ERR												
C. Actual consumption																		
PUMP 1	170741		170777	0.02%	194600	13.95%	0.12	0.12	0.14	0.16	0.17	0.20	1.05	1.08	0.92			
PUMP 2	195220		195173	-0.02%	175858	-9.90%	0.14	0.14	0.12	0.19	0.20	0.18	1.20	1.24	0.84			
Rate per unit	1.10		1.10		1.60	45.45%												

UP JAL NIGAM INDO DUTCH PROJECT
REVIEW OF O&M COSTS

PIPED SCHEME: TIKRI

PARTICULARS	TOTALS						COST PER KL OF WATER PRODUCED			COST PER KL OF WATER DISTRIBUTED			COST PER KL OF WATER SOLD			COMPOSITION OF TOTAL		
	1989-90	% INC	1990-91	% INC	1991-92	% INC	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92
D. Actual power charges																		
PUMP 1	187816		187855	0.02%	311360	65.75%	0.13	0.13	0.22	0.18	0.19	0.32	1.15	1.19	1.48			
PUMP 2	214742		214690	-0.02%	281373	31.06%	0.15	0.15	0.20	0.20	0.22	0.29	1.32	1.36	1.34			
TOTAL	402557		402545	0.00%	592733	47.25%	0.29	0.29	0.42	0.38	0.41	0.61	2.47	2.55	2.81			
(3) CHEMICALS COST																		
A. BLEACHING POWDER																		
a. Actual cost	1000		6000	500.00%	7000	16.67%	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.04	0.03			
b. Rate in grams per KL	1		1		1													
c. Average price (KG)	3.75		3.90	4.00%	5.13	31.54%												
d. Real cost of chemicals	5228		5437	4.00%	7240	33.16%	0.00	0.00	0.01	0.00	0.01	0.01	0.03	0.03	0.03			
e. Stock (qty in Kgs)	7		280	3900.00%		-100.00%												
f. Number of days stock	2		73	3900.13%		-100.00%												
(4) REPAIRS & MAINTENANCE																		
A. Material cost																		
(a) Pumping station	24300		76100	213.17%	89400	17.48%	0.02	0.05	0.06	0.02	0.08	0.09	0.15	0.48	0.42			
(b) Distribution system	56500		74700	32.21%	122700	64.26%	0.04	0.05	0.09	0.05	0.08	0.13	0.35	0.47	0.58			
(c) Overhead tanks	900		3300	266.67%	500	-84.85%	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.00			
(d) Others	16850		7400	-56.08%	13965	88.72%	0.01	0.01	0.01	0.02	0.01	0.01	0.10	0.05	0.07			
TOTAL	98550		161500	63.88%	226565	40.29%	0.07	0.12	0.16	0.09	0.16	0.23	0.60	1.02	1.08			
B. Labour cost																		
(a) Pumping station				ERR		ERR												
(b) Distribution system				ERR		ERR												
(c) Overhead tanks				ERR		ERR												
(d) Others				ERR		ERR												
TOTAL				ERR		ERR												
C. Total cost																		
(a) Pumping station	24300		76100	213.17%	89400	17.48%	0.02	0.05	0.06	0.02	0.08	0.09	0.15	0.48	0.42			
(b) Distribution system	56500		74700	32.21%	122700	64.26%	0.04	0.05	0.09	0.05	0.08	0.13	0.35	0.47	0.58			
(c) Overhead tanks	900		3300	266.67%	500	-84.85%	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.00			
(d) Others	16850		7400	-56.08%	13965	88.72%	0.01	0.01	0.01	0.02	0.01	0.01	0.10	0.05	0.07			
TOTAL	98550		161500	63.88%	226565	40.29%	0.07	0.12	0.16	0.09	0.16	0.23	0.60	1.02	1.08			

UP JAL NIGAM INDO DUTCH PROJECT
REVIEW OF O&M COSTS

PIPED SCHEME: TIKRI

PARTICULARS	TOTALS 1989-90	% INC	1990-91	% INC	1991-92	% INC	COST PER KL OF WATER PRODUCED 1989-90	1990-91	1991-92	COST PER KL OF WATER DISTRIBUTED 1989-90	1990-91	1991-92	COST PER KL OF WATER SOLD 1989-90	1990-91	1991-92	COMPOSITION OF TOTAL 1989-90	1990-91	1991-92
D. Maintenance budget																		
(a) Pumping station				ERR		ERR												
(b) Distribution system				ERR		ERR												
(c) Overhead tanks				ERR		ERR												
(d) Others				ERR		ERR												
TOTAL				ERR		ERR												
(4) OTHER COSTS																		
A. Equipments																		
(a) Total cost				ERR		ERR												
(b) % for O&M																		
(c) O&M cost				ERR		ERR												
B. Vehicles																		
(a) Total cost	36900		10700	-71.00%	11000	2.80%	0.03	0.01	0.01	0.04	0.01	0.01	0.23	0.07	0.05			
(b) % for O&M	5.00%		5.00%		5.00%													
(c) O&M cost	1845		535	-71.00%	550	2.80%	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00			
C. Others	7700		6900	-10.39%	8530	23.62%	0.01	0.00	0.01	0.01	0.01	0.01	0.05	0.04	0.04			
TOTAL	9545		7435	-22.11%	9080	22.13%	0.01	0.01	0.01	0.01	0.01	0.01	0.06	0.05	0.04			
(6) DEPRECIATION	310000		310000		310000		0.22	0.22	0.22	0.29	0.31	0.32	1.90	1.96	1.47			
(7) INTEREST				ERR		ERR												

UP JAL NIGAM INDO DUTCH PROJECT
REVIEW OF O&M COSTS

PIPED SCHEME: TIKRI

PARTICULARS	TOTALS						COST PER KL OF WATER PRODUCED			COST PER KL OF WATER DISTRIBUTED			COST PER KL OF WATER SOLD			COMPOSITION OF TOTAL		
	1989-90	% INC	1990-91	% INC	1991-92	% INC	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92
REAL COST BASIS																		
TOTAL REVENUE	163000		158000	-3.07%	206000	30.38%	0.12	0.11	0.15	0.15	0.16	0.21	1.00	1.00	0.98			
VARIABLE COST																		
(a) Power	402557		402545	0.00%	592733	47.25%	0.29	0.29	0.42	0.38	0.41	0.61	2.47	2.55	2.81	38.20%	33.31%	42.03%
(b) Chemicals	5228		5437	4.00%	7240	33.16%	0.00	0.00	0.01	0.00	0.01	0.01	0.03	0.03	0.03	0.50%	0.45%	0.51%
(c) Repair materials	98550		161500	63.88%	226565	40.29%	0.07	0.12	0.16	0.09	0.16	0.23	0.60	1.02	1.08	9.35%	13.36%	16.06%
(d) Casuals				ERR		ERR												
Total	506335		569482	12.47%	826538	45.14%	0.36	0.41	0.59	0.48	0.58	0.86	3.11	3.60	3.92	48.05%	47.12%	58.60%
CONTRIBUTION	-343335		-411482	19.85%	-620538	50.81%	-0.25	-0.30	-0.44	-0.33	-0.42	-0.64	-2.11	-2.60	-2.95			
FIXED COST																		
(a) Manpower	227800		321600	41.18%	264750	-17.68%	0.16	0.23	0.19	0.22	0.33	0.27	1.40	2.04	1.26	21.62%	26.61%	18.77%
(b) Others	9545		7435	-22.11%	9080	22.13%	0.01	0.01	0.01	0.01	0.01	0.01	0.06	0.05	0.04	0.91%	0.62%	0.64%
(c) Depreciation	310000		310000		310000		0.22	0.22	0.22	0.29	0.31	0.32	1.90	1.96	1.47	29.42%	25.65%	21.98%
(d) Interest				ERR		ERR												
Total	547345		639035	16.75%	583830	-8.64%	0.39	0.46	0.41	0.52	0.65	0.60	3.36	4.04	2.77	51.95%	52.88%	41.40%
SURPLUS/DEFICIT	-890680		-1050517	17.95%	-1204368	14.65%	-0.64	-0.75	-0.85	-0.85	-1.07	-1.25	-5.46	-6.65	-5.72			
TOTAL COST (FIXED+VC)	1053680		1208517	14.69%	1410368	16.70%										100.00%	100.00%	100.00%

ALLAHABAD HAND PUMP SCHEME

SCHEME	H P NUMBER	YEAR	DIRECT COST								INDIRECT COST							
			SAL-MSC	SAL-JE	CHEMICALS	TOTAL	R & M MATERIALS	R & M LABOUR	R & M TOTAL	TOTAL DIRECT COST	EXE SAL	VEHICLE	ADMN O/H	DEPR	TOTAL INDIRECT COST	GRAND TOTAL WITH DEP	GRD.TOTAL WITHOUT DEP
KAURIHAR	1	1989-90	141	102		243	19	105	124	367	20	31	53	900	1003	1370	470
		1990-91	133	96		229	77	105	182	411	19	36	51	900	1007	1418	518
		1991-92	124	89		213	138	240	378	591	19	40	50	900	1008	1599	699
		TOTAL	399	287		686	233	450	683	1369	58	107	153	2700	3018	4387	1687
KAURIHAR	2	1989-90	141	102		243	19	105	124	367	20	31	53	900	1003	1370	470
		1990-91	133	96		229	50	105	155	385	19	36	51	900	1007	1391	491
		1991-92	124	89		213	158	240	398	611	19	40	50	900	1008	1619	719
		TOTAL	399	287		686	227	450	677	1362	58	107	153	2700	3018	4380	1680
KAURIHAR	3	1989-90	141	102		243	19	105	124	367	20	31	53	900	1003	1370	470
		1990-91	133	96		229	50	210	260	490	19	36	51	900	1007	1496	596
		1991-92	124	89		213	201	120	321	535	19	40	50	900	1008	1543	643
		TOTAL	399	287		686	270	435	705	1391	58	107	153	2700	3018	4409	1709
KAURIHAR	4	1989-90	141	102		243	23	105	128	371	20	31	53	900	1003	1374	474
		1990-91	133	96		229	59	105	164	394	19	36	51	900	1007	1400	500
		1991-92	124	89		213	96	120	216	429	19	40	50	900	1008	1438	538
		TOTAL	399	287		686	178	330	508	1194	58	107	153	2700	3018	4212	1512
KAURIHAR	5	1989-90	141	102		243	19	105	124	367	20	31	53	900	1003	1370	470
		1990-91	133	96		229	50	105	155	385	19	36	51	900	1007	1391	491
		1991-92	124	89		213	196	240	436	649	19	40	50	900	1008	1657	757
		TOTAL	399	287		686	265	450	715	1400	58	107	153	2700	3018	4418	1718
KAURIHAR	6	1989-90	141	102		243	19	105	124	367	20	31	53	900	1003	1370	470
		1990-91	133	96		229	80	105	185	415	19	36	51	900	1007	1421	521
		1991-92	124	89		213	96	120	216	429	19	40	50	900	1008	1438	538
		TOTAL	399	287		686	195	330	525	1211	58	107	153	2700	3018	4229	1529
KAURIHAR	7	1989-90	141	102		243	19	105	124	367	20	31	53	900	1003	1370	470
		1990-91	133	96		229	103	210	313	543	19	36	51	900	1007	1549	649
		1991-92	124	89		213	128	120	248	461	19	40	50	900	1008	1470	570
		TOTAL	399	287		686	250	435	685	1371	58	107	153	2700	3018	4389	1689

ALLAHABAD HAND PUMP SCHEME

SCHEME	H P NUMBER	YEAR	DIRECT COST								INDIRECT COST							
			SAL-MSC	SAL-JE	CHEMICALS	TOTAL	R & M MATERIALS	R & M LABOUR	R & M TOTAL	TOTAL DIRECT COST	EXE SAL	VEHICLE	ADMN O/H	DEPR	TOTAL INDIRECT COST	GRAND TOTAL WITH DEP	GRD.TOTAL WITHOUT DEP
KAURIHAR	8	1989-90	141	102	243	19	105	124	367	20	31	53	900	1003	1370	470
		1990-91	133	96	229	50	105	155	385	19	36	51	900	1007	1391	491
		1991-92	124	89	213	118	120	238	452	19	40	50	900	1008	1460	560
		TOTAL	399	287	686	187	330	517	1203	58	107	153	2700	3018	4221	1521
KAURIHAR	9	1989-90	141	102	243	19	105	124	367	20	31	53	900	1003	1370	470
		1990-91	133	96	229	67	210	277	507	19	36	51	900	1007	1513	613
		1991-92	124	89	213	80	120	200	414	19	40	50	900	1008	1422	522
		TOTAL	399	287	686	166	435	601	1287	58	107	153	2700	3018	4305	1605
KAURIHAR	10	1989-90	141	102	243	27	105	132	375	20	31	53	900	1003	1378	478
		1990-91	133	96	229	74	210	284	514	19	36	51	900	1007	1520	620
		1991-92	124	89	213	80	120	200	414	19	40	50	900	1008	1422	522
		TOTAL	399	287	686	181	435	616	1302	58	107	153	2700	3018	4320	1620
KAURIHAR	11	1989-90	141	102	243	19	105	124	367	20	31	53	900	1003	1370	470
		1990-91	133	96	229	440	105	545	775	19	36	51	900	1007	1781	881
		1991-92	124	89	213	78	120	198	411	19	40	50	900	1008	1419	519
		TOTAL	399	287	686	536	330	866	1552	58	107	153	2700	3018	4570	1870
KAURIHAR	12	1989-90	141	102	243	18	105	123	365	20	31	53	900	1003	1369	469
		1990-91	133	96	229	138	210	348	575	19	36	51	900	1007	1581	681
		1991-92	124	89	213	482	120	602	815	19	40	50	900	1008	1824	924
		TOTAL	399	287	686	638	435	1070	1755	58	107	153	2700	3018	4774	2074
KAURIHAR	13	1989-90	141	102	243	19	105	124	367	20	31	53	900	1003	1370	470
		1990-91	133	96	229	92	210	302	531	19	36	51	900	1007	1538	638
		1991-92	124	89	213	96	120	216	429	19	40	50	900	1008	1438	538
		TOTAL	399	287	686	206	435	641	1327	58	107	153	2700	3018	4345	1645
KAURIHAR	14	1989-90	141	102	243	67	105	172	415	20	31	53	900	1003	1418	518
		1990-91	133	96	229	125	210	335	564	19	36	51	900	1007	1571	671
		1991-92	124	89	213	77	120	197	410	19	40	50	900	1008	1418	518
		TOTAL	399	287	686	268	435	703	1389	58	107	153	2700	3018	4407	1707
KAURIHAR	15	1989-90	141	102	243	51	210	261	503	20	31	53	900	1003	1506	606
		1990-91	133	96	229	70	210	280	509	19	36	51	900	1007	1516	616
		1991-92	124	89	213	27	120	147	360	19	40	50	900	1008	1368	468
		TOTAL	399	287	686	147	540	687	1372	58	107	153	2700	3018	4391	1691
TOTAL		1989-90	2119	1524	3643	372	1680	2052	5695	294	465	788	13500	15046	20741	7241
		1990-91	2002	1440	3442	1522	2415	3937	7379	290	540	770	13500	15100	22479	8979
		1991-92	1862	1339	3201	2049	2160	4209	7410	283	600	743	13500	15126	22536	9036
		TOTAL	5983	4302	10285	3944	6255	10199	20484	867	1605	2300	40500	45272	65756	25256

ALLAHABAD HAND PUMP SCHEME

SCHEME	H P NUMBER	YEAR	DIRECT COST								INDIRECT COST						
			SAL-WSC	SAL-JE	CHEMICALS	TOTAL	R & M MATERIALS	R & M LABOUR	R & M TOTAL	TOTAL DIRECT COST	EXE SAL	VEHICLE	ADMN O/H	DEPR	TOTAL INDIRECT COST	GRAND TOTAL WITH DEP	GRD.TOTAL WITHOUT DEP
CHAYAL	16	1989-90	100	36		135				135	20	31		961	1012	1147	186
		1990-91	101	36		137	9	105	114	251	19	36		961	1016	1267	306
		1991-92	101	36		137	73	240	313	450	19	40		961	1020	1470	509
		TOTAL	301	108		410	82	345	427	836	58	107		2883	3048	3884	1001
CHAYAL	17	1989-90	100	36		135				135	20	31		961	1012	1147	186
		1990-91	101	36		137	34	210	244	381	19	36		961	1016	1398	437
		1991-92	101	36		137	20	120	140	277	19	40		961	1020	1297	336
		TOTAL	301	108		410	54	330	384	793	58	107		2883	3048	3841	958
CHAYAL	18	1989-90	100	36		135				135	20	31		961	1012	1147	186
		1990-91	101	36		137	20	105	125	262	19	36		961	1016	1278	317
		1991-92	101	36		137	249	360	609	746	19	40		961	1020	1766	805
		TOTAL	301	108		410	269	465	734	1143	58	107		2883	3048	4191	1308
CHAYAL	19	1989-90	100	36		135				135	20	31		961	1012	1147	186
		1990-91	101	36		137	70	210	280	417	19	36		961	1016	1433	472
		1991-92	101	36		137	23	240	263	400	19	40		961	1020	1420	459
		TOTAL	301	108		410	93	450	543	952	58	107		2883	3048	4000	1117
CHAYAL	20	1989-90	100	36		135				135	20	31		961	1012	1147	186
		1990-91	101	36		137	605	105	710	847	19	36		961	1016	1864	903
		1991-92	101	36		137	3	120	123	260	19	40		961	1020	1280	319
		TOTAL	301	108		410	608	225	833	1243	58	107		2883	3048	4291	1408
CHAYAL	21	1989-90	100	36		135				135	20	31		961	1012	1147	186
		1990-91	101	36		137	208	315	523	660	19	36		961	1016	1677	716
		1991-92	101	36		137	62	240	302	439	19	40		961	1020	1459	498
		TOTAL	301	108		410	270	555	825	1235	58	107		2883	3048	4283	1400
CHAYAL	22	1989-90	100	36		135				135	20	31		961	1012	1147	186
		1990-91	101	36		137	62	315	377	514	19	36		961	1016	1530	569
		1991-92	101	36		137	56	240	296	434	19	40		961	1020	1453	492
		TOTAL	301	108		410	118	555	673	1083	58	107		2883	3048	4130	1247
CHAYAL	23	1989-90	100	36		135				135	20	31		961	1012	1147	186
		1990-91	101	36		137	20	105	125	262	19	36		961	1016	1279	318
		1991-92	101	36		137	35	120	155	292	19	40		961	1020	1312	351
		TOTAL	301	108		410	55	225	280	689	58	107		2883	3048	3737	854
CHAYAL	24	1989-90	100	36		135				135	20	31		961	1012	1147	186
		1990-91	101	36		137				137	19	36		961	1016	1153	192
		1991-92	101	36		137	21	120	141	278	19	40		961	1020	1298	337

ALLAHABAD HAND PUMP SCHEME

SCHEME	H P NUMBER	YEAR	DIRECT COST							INDIRECT COST						
			SAL-MSC	SAL-JE	CHEMICALS	TOTAL	R & M MATERIALS	R & M LABOUR	R & M TOTAL	TOTAL DIRECT COST	EXE SAL	VEHICLE	ADMN O/H	DEPR	TOTAL INDIRECT COST	GRAND TOTAL WITH DEP	GRD.TOTAL WITHOUT DEP
CHAYAL	25	1989-90	100	36	135				135	20	31	961	1012	1147	186
		1990-91	101	36	137				137	19	36	961	1016	1153	192
		1991-92	101	36	137	20	120	140	277	19	40	961	1020	1297	336
		TOTAL	301	108	410	20	120	140	549	58	107	2883	3048	3597	714
CHAYAL	26	1989-90	100	36	135				135	20	31	961	1012	1147	186
		1990-91	101	36	137	173	315	488	625	19	36	961	1016	1641	680
		1991-92	101	36	137	22	120	142	279	19	40	961	1020	1299	338
		TOTAL	301	108	410	195	435	630	1039	58	107	2883	3048	4087	1204
CHAYAL	27	1989-90	100	36	135				135	20	31	961	1012	1147	186
		1990-91	101	36	137	195	210	405	542	19	36	961	1016	1558	597
		1991-92	101	36	137	21	120	141	278	19	40	961	1020	1298	337
		TOTAL	301	108	410	215	330	545	955	58	107	2883	3048	4002	1119
TOTAL		1989-90	1195	430	1625				1625	235	372	11532	12139	13764	2232
		1990-91	1209	435	1644	1395	1995	3390	5034	232	432	11532	12196	17230	5698
		1991-92	1211	435	1646	603	2160	2763	4409	226	480	11532	12238	16647	5115
		TOTAL	3615	1300	4915	1998	4155	6153	11068	693	1284	34596	36573	47641	13045

IP JAL NIGAM ALLAHABAD HANDPUMP SCHEME

SUMMARY

AURIHAR

COST COMPONENTS	TOTAL 1989-90	TOTAL 1990-91	TOTAL 1991-92	% OF TOTAL COST 1989-90	% OF TOTAL COST 1990-91	% OF TOTAL COST 1991-92	PER PUMP 1989-90	PER PUMP 1990-91	PER PUMP 1991-92
MANPOWER									
- EMPLOYEES	3936	3732	3484	18.98%	16.60%	15.46%	262.43	248.78	232.26
- LABOUR (R&M)	1680	2415	2160	8.10%	10.74%	9.58%	112.00	161.00	144.00
R & M - MATERIALS	372	1522	2049	1.80%	6.77%	9.09%	24.82	101.47	136.62
OTHERS	1253	1310	1343	6.04%	5.83%	5.96%	83.50	87.32	89.51
DEPRECIATION	13500	13500	13500	65.09%	60.06%	59.90%	900.00	900.00	900.00
TOTAL	20741	22479	22536	100.00%	100.00%	100.00%	1382.76	1498.58	1502.40
TOT WITHOUT DEP	7241	8979	9036				482.76	598.58	602.40

PHYSICAL PARAMETERS

	WITH DEPRECIATION			WITHOUT DEPRECIATION		
NO OF HP's	15	15	15	15	15	15
-COST PER HP	1383	1499	1502	483	599	602
POPULATION	3750	3844	3940	3750	3844	3940
-COST PER PERSON	6	6	6	2	2	2
HOUSEHOLDS	750	750	750	750	750	750
-COST PER HOUSEHOLD	28	30	30	10	12	12
PRODUCTION(KL)	53950	53950	53840	53950	53950	53840
-COST PER KL	0.38	0.42	0.42	0.13	0.17	0.17
NO.NOT WORKING	80	80	91	80	80	91

UP JAL NIGAM ALLAHABAD HANDPUMP SCHEME

CHAYAL

COST COMPONENTS	TOTAL			% OF TOTAL COST			PER PUMP		
	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92
MANPOWER									
- EMPLOYEES	1860	1876	1872	13.51%	10.89%	11.25%	154.98	156.35	156.00
- LABOUR (R&M)		1995	2160		11.58%	12.98%		166.25	180.00
R & M - MATERIALS		1395	603		8.10%	3.62%		116.27	50.27
OTHERS	372	432	480	2.70%	2.51%	2.88%	31.00	36.00	40.00
DEPRECIATION	11532	11532	11532	83.79%	66.93%	69.27%	961.00	961.00	961.00
TOTAL	13764	17230	16647	100.00%	100.00%	100.00%	1146.98	1435.87	1387.27
TOT WITHOUT DEP	2232	5698	5115				185.98	474.87	426.27

PHYSICAL PARAMETERS	WITH DEPRECIATION			WITHOUT DEPRECIATION		
NO OF HP's	12	12	12	12	12	12
-COST PER HP	1147	1436	1387	186	475	426
POPULATION	3000	3075	3152	3000	3075	3152
-COST PER PERSON	5	6	5	1	2	2
HOUSEHOLDS	600	600	600	600	600	600
-COST PER HOUSEHOLD	23	29	28	4	9	9
PRODUCTION(KL)	43240	43240	43320	43240	43240	43320
-COST PER KL	0.32	0.40	0.38	0.05	0.13	0.12
NO.NOT WORKING II	56	56	48	56	56	48

UP JAL NIGAM ALLAHABAD HAND PUMP SCHEME

COMBINED

COST COMPONENTS	TOTAL 1989-90	TOTAL 1990-91	TOTAL 1991-92	% OF TOTAL COST 1989-90	% OF TOTAL COST 1990-91	% OF TOTAL COST 1991-92
MANPOWER						
- EMPLOYEES	5796	5608	5356	16.80%	14.12%	13.67%
- LABOUR (R&M)	1680	4410	4320	4.87%	11.11%	11.03%
R & M - MATERIALS	372	2917	2653	1.08%	7.35%	6.77%
OTHERS	1625	1742	1823	4.71%	4.39%	4.65%
DEPRECIATION	25032	25032	25032	72.55%	63.04%	63.88%
TOTAL	34505	39709	39183	100.00%	100.00%	100.00%
TOT WITHOUT DEP	9473	14677	14151			
PHYSICAL PARAMETERS						
	WITH DEPRECIATION			WITHOUT DEPRECIATION		
NO OF HP's	27	27	27	27	27	27
-COST PER HP	1278	1471	1451	351	544	524
POPULATION	6750	6919	7092	6750	6919	7092
-COST PER PERSON	5	6	6	1	2	2
HOUSEHOLDS	1350	1350	1350	1350	1350	1350
-COST PER HOUSEHOLD	26	29	29	7	11	10
PRODUCTION(KL)	97190	97190	97160	97190	97190	97160
-COST PER KL	0.36	0.41	0.40	0.10	0.15	0.15
NO.OF DAYS NOT WORKING	136	136	139	136	136	139

BEP

COST COMPONENTS	TOTAL 1989-90	TOTAL 1990-91	TOTAL 1991-92	COST PER PUMP (RS) 1989-90	COST PER PUMP (RS) 1990-91	COST PER PUMP (RS) 1991-92
VARIABLE COST						
R & M - Materials	372	2917	2653	13.79	108.05	98.24
R & M - Labour	1680	4410	4320	62.22	163.33	160.00
Total VC	2052	7327	6973	76.01	271.38	258.24
FIXED COST						
Man power - Employees	5796	5608	5356	214.67	207.70	198.37
Others	1625	1742	1823	60.17	64.51	67.51
Total FC	7421	7350	7179	274.84	272.21	265.88
Total VC+FC	9473	14677	14151	350.86	543.60	524.12
Depreciation	25032	25032	25032	927.11	927.11	927.11
GRAND TOTAL	34505	39709	39183	1277.97	1470.71	1451.23

AMBASSADE VAN HET KONINKRIJK DER NEDERLANDEN

ROYAL NETHERLANDS
EMBASSY

6/50F Shantipath, Chanakyapuri
New Delhi - 110.021
tel 688.49.51 - fax. 91.11.688.49.56
tlx. 31-82054

No. 450/PF/as

New Delhi, 5 January 1993

Subject: Ferguson Study, U.P.

01713

Dear Rob,

./. As discussed with you, please find enclosed the draft final report on the study of O&M costs concerning UP Jal Nigam, prepared by A.F. Ferguson & Co. under your supervision.

I find the report makes very interesting and quite disturbing reading.

Please scrutinize it. You can send your comments either directly to Ferguson with a copy to me or, if that is easier, send your comments to me and I will forward them.

Sincerely yours,

P.M. Flik
First Secretary
Sector Specialist Drinking Water and Sanitation

12 JAN 1993

DHV Consultants B.V.
Attn. Mr R. Trietsch
P.O. Box 1399
3800 BJ AMERSFOORT

Cc.: DAL/ZZ (one copy enclosed for information)

UTTAR PRADESH JAL NIGAM

INDO-DUTCH RURAL WATER SUPPLY AND

SANITATION PROGRAMME-INDIA/UTTAR PRADESH

DRAFT FINAL REPORT ON STUDY OF OPERATION AND MAINTENANCE COSTS

DECEMBER 1992

A. F. FERGUSON & CO.

INDIA

UTTAR PRADESH JAL NIGAM

INDO-DUTCH RURAL WATER SUPPLY AND

SANITATION PROGRAMME-INDIA/UTTAR PRADESH

DRAFT FINAL REPORT ON

STUDY OF OPERATION AND

MAINTENANCE COSTS

DECEMBER 1992

A. F. FERGUSON & CO.

INDIA

UTTAR PRADESH JAL NIGAM

INDO-DUTCH RURAL WATER SUPPLY AND SANITATION PROGRAMME INDIA/UTTAR PRADESH

REVIEW OF OPERATION AND MAINTENANCE COSTS

SL.NO.	CONTENTS	PAGE NO.
1.	INTRODUCTION	1
2.	EXECUTIVE SUMMARY	4
3.	BACKGROUND TO UP JAL NIGAM	17
4.	APPROACH TO THE STUDY	31
5.	O&M COST OF SCHEMES	39
6.	ANALYSIS OF O&M COSTS	56
7.	SYSTEMS AND PROCEDURES	67
8.	CONCLUSION	72

LIST OF TABLES

TABLE	TITLE	PAGE NO.
2.1	SCHEMES SELECTED FOR REVIEW	4
2.2	BASIC PARAMETERS OF SCHEMES SELECTED	5
2.3	ACTUAL O&M COSTS	7
2.4	REAL O&M COSTS - PIPED SCHEMES	8
2.5	REAL UNIT COST OF WATER	9
2.6	ANALYSIS OF COSTS - 1991-92	12
2.7	ANALYSIS OF COSTS (1991-92)	13
3.1	PER CAPITA INCOME	18
3.2	PROFILE OF DUTCH ASSISTANCE	21
3.3	O&M OF PIPED SCHEMES - UPJN [PLAINS]	22
3.4	KEY INDICATORS - PIPED SCHEMES - PLAINS - UPJN	23
3.5	KEY INDICATORS - HAND PUMPS - PLAINS - UPJN	25
3.6	UP JAL PLAN ALLOCATION	27
3.7	UPJN OVERALL FINANCIAL PERFORMANCE	28
3.8	SCHEMES SELECTED	30
5.1	DESIGN PARAMETERS - PIPED SCHEMES	39
5.2	KEY PARAMETERS - PIPED SCHEMES	41
5.3	ORGANISATION	42
5.4	ACTUAL O&M COSTS	44
5.5	REAL O&M COSTS	45
5.6	O&M COST OF WATER PER UNIT [1991-92]	47
5.7	COST PER CONNECTION/HOUSEHOLD - 1991-92	51

LIST OF TABLES (CONTD.)

TABLE	TITLE	PAGE NO.
5.8	CONTRIBUTION ANALYSIS	52
5.9	COST ANALYSIS [1991-92]	53
5.10	SCHEME SAIDABAD - PHYSICAL PARAMETERS	54
5.11	SCHEME - TIKRI - PHYSICAL PARAMETERS	55
6.1	REAL COST PER KL OF WATER PRODUCED - 1991-92	57
6.2	PIPED SCHEMES - COMPARISON WITH UPJN [PLAINS]	58
6.3	HAND PUMPS - COMPARISON - PLAINS - UPJN	59
6.4	COST - DEPRECIATION ONLY FOR PVT CONNECTIONS	61

LIST OF EXHIBITS

EXHIBIT	TITLE	PAGE NO.
2.1	UNIT COSTS OF WATER	6
2.2	COMPOSITION OF COST - SAIDABAD (1991-92)	10
2.3	COMPOSITION OF COST - TIKRI (1991-92)	10
2.4	COMPOSITION OF COST - HAND PUMPS	11
2.5	TREND IN COSTS - PIPED SCHEMES	11
3.1	ORGANISATION STRUCTURE	20
3.2	COMPONENTS OF O&M COST - PIPED - PLAINS - UPJN	24
3.3	COMPOSITION OF O&M COST - HAND PUMPS - PLAINS - UPJN	26
3.4	UPJN - O&M - FINANCIAL POSITION	29
4.1	OVERALL APPROACH TO THE STUDY	31
5.1	COST PER KL OF WATER PRODUCED - 1991-92	46
5.2	TREND IN COSTS	48
5.3	COMPOSITION OF COST - SAIDABAD (1991-92)	49
5.4	COMPOSITION OF COST - TIKRI (1991-92)	50
5.5	COMPOSITION OF COST - HAND PUMPS	50

LIST OF ANNEXURES

ANNEXURE	TITLE
I.	QUESTIONNAIRES
II.	LIST OF PEOPLE MET
III.	SET OF OUTPUTS

1. INTRODUCTION

BACKGROUND

1.1 The Public Health Engineering Department (PHED) has been responsible for provision of water supply in the state of Uttar Pradesh from the year 1927 onwards. The PHED was renamed as the Local Self Government Engineering Department (LSGED). In June 1975, an autonomous corporation in the name of Uttar Pradesh Jal Nigam (UPJN) was formed to take over the functions of LSGED. At the same time, Jal Sansthans were formed for provision of water supply to the major cities/towns in the state.

1.2 The Kingdom of the Netherlands has been financing water supply projects in Uttar Pradesh from 1978 onwards with the basic objective of 'improvement of the health situation and the general living conditions in the rural areas of Uttar Pradesh (UP) through better drinking water supply'. The first sub project (SPI) included 22 piped water supply schemes in 724 villages in 3 districts using ground water as the source. The project was completed in 1986.

OPERATION AND MAINTENANCE

1.3 The schemes completed under SPI have been maintained by UPJN. The evaluation mission of May 1992 looked at the operation and maintenance (O&M) costs and mentions substantial lack of funds for O&M. The mission also felt the need for more detailed knowledge of costs and of the various components of operation, maintenance and repair costs of both piped and hand pump schemes under Dutch assisted projects.

NEED FOR THE STUDY

1.4 Considering the criticality of operation and maintenance of water supply schemes in providing better drinking water supply, the evaluation mission felt the need for a better understanding of the actual costs of O&M. The results of the study was proposed to be useful for

(a) better financial justification of projects under preparation

(b) taking steps to improve cost recovery and

(c) better control over the cost elements.

Against this background the Review and Support Mission (RSM) approached A. F. Ferguson & Co. (AFF) to conduct the study to arrive at the actual cost of operation and maintenance of a few select schemes.

SCOPE OF WORK AND OBJECTIVES

1.5 The objective of the study is to arrive at the actual cost of O&M of two piped water supply schemes and of a group of hand pumps. The review and support mission to UP of Novermber 1992 had decided on

- one piped scheme each in Varanasi and Allahabad
- group of hand pumps in Allahabad

for review of the O&M costs for three years.

1.6 The scope of work can be broadly defined as :

(1) Determining the actual operating hours of the piped schemes for each of the three years

(2) Review of the actual revenues for each scheme

(3) Determining the direct costs of O&M towards manpower, chemicals, power, materials etc.

(4) Determining the indirect cost towards manpower, vehicle usage and allocating a portion of the same to the scheme

(5) Providing for depreciation based on the estimated technical life of the schemes / hand pumps

(6) Arriving at unit cost of water produced

(7) Advise on procedures for better information on O&M costs of dutch assisted projects.

EXCLUSIONS

1.7 The following are excluded from the scope of work :

(1) Socio-economic survey of the benefitted population to study water usage patterns, ability to pay, actual water distribution etc.

(2) Development of an O&M model to provide for sensitivity analysis on critical factors like power tariff, inflation etc.

PURPOSE OF THE REPORT

1.8 AFF commenced the study on 12th November 1992 at Lucknow, after an initial meeting with Mr. Robert Trietsch, member RSM to UP. Field visits were made to Varanasi and Allahabad. The preliminary findings of the study was presented to RSM on 23 November 1992 and to UPJN on 25 November 1992. A brief meeting was also held with the Secretary, Ministry of Urban Development on 25 November 1992.

1.9 The report presents the results of the study carried out and does not intend to generalise the results of the study to evaluate applicability of the same to the whole of UP. The sample size of 2 piped schemes and a group of hand pumps is too small to do this generalisation.

1.10 This report presents AFF's findings and analysis of the O&M costs and is organised on the following lines :

Chapter	2	Executive Summary
Chapter	3	Background to UP Jal Nigam
Chapter	4	Approach to the study
Chapter	5	O & M Costs
Chapter	6	Analysis of O&M Costs
Chapter	7	Systems and procedures
Chapter	8	Conclusions.

2. EXECUTIVE SUMMARY

BACKGROUND

2.1 The Government of Netherlands has been financing water supply projects in UP from 1978 onwards. The first sub project aimed at providing piped drinking water supply to 724 villages in 3 districts. This project was completed in 1986 and have been since maintained by UPJN. The Review and Support Mission [RSM] to UP felt the need for a better understanding of actual costs of Operation and Maintenance [O&M] of two piped water supply schemes and one group of hand pumps. A. F. Ferguson & Co. (AFF) were retained to conduct the study on review of O&M costs.

SCHEMES SELECTED AND CRITERIA

2.2 Based on the broad criteria defined by RSM, the schemes selected and reasons for the same are presented in the table below :

TABLE 2.1

SCHEMES SELECTED FOR REVIEW

SL. NO.	SCHEME	TYPE	REASON FOR SELECTION
1.	Saidabad, Allahabad	Piped	Smaller population 25 kms from city [rural]
2.	Tikri, Varanasi	Piped	Larger population 5-6 kms from city [semi-urban]
3.	Group of hand pumps in Division VI, Allahabad	Hand pumps	Both Mark II/Mark III type of pumps maintained

BASIC PARAMETERS OF SCHEMES

2.3 The basic parameters of the schemes selected as originally envisaged and as of 1991-92 is presented in the table below :

TABLE 2.2

BASIC PARAMETERS OF SCHEMES SELECTED

PARAMETERS	SAIDABAD		TIKRI		HAND PUMPS [NORM PER PUMP]
	AS ENVISAGED	1991-92	AS ENVISAGED	1991-92	
1. Source of water	Ground 2 Tube wells	Ground 2 Tube wells	Ground 2 Tube wells	Ground 2 Tube wells	Ground -
2. Villages covered	19	19	27	27	-
3. Population covered	35360 (2011)	34051	61560 (2011)	59000	250@
4. Number of connections	1458 (2011)	890	1310 (2011)	1400	-
5. Public stand posts	212	238	219	219	-
6. Production (KLD)	3888	2592	3504	3866	10
7. LPCD	70 & 90*	45	70 & 90*	45	40
8. Pumping Hours	16 hours	(10.70 x 2)	16 hours	(15.34 x 2)	-
9. Service Hours	8	6	8	6	-

NOTE : @ 50 families at 5 members per family

* 70 lpcd for villages with less than 4000 inhabitants and 90 lpcd for villages with more than 4000 inhabitants

ACTUAL O&M COSTS

2.4 The actual cost of O&M for each scheme for each year for which data was made available is presented in Table 2.3.

REAL O&M COSTS

2.5 UPJN is presently not paying the power charges at the division level but the same is getting adjusted at the Government level. But power constitutes an important component of direct costs and hence to arrive at the real cost of O&M, power charges based on actual consumption and ruling tariff has been calculated and included. Table 2.4 shows the real cost of O&M for the piped schemes.

UNIT COST OF WATER

2.6 The total real O&M cost of water was analysed into the unit cost per kilo litre (KL) of production as well as per KL of water sold. The water sold is defined as the water billed to the private connections. The Exhibit 2.1 depicts the unit cost per KL of water produced/sold for the two piped schemes in 1991-92 and the unit cost per KL of water produced for the hand pumps in 1991-92.

EXHIBIT 2.1

UNIT COSTS OF WATER

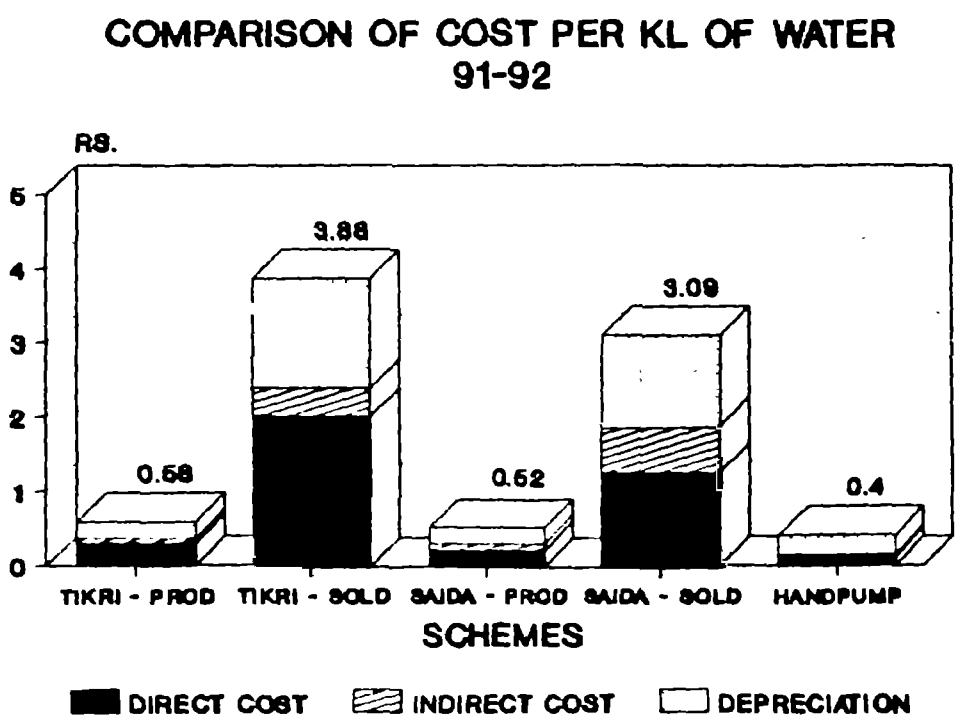


TABLE 2.3

ACTUAL O&M COSTS

(VALUE IN RS.)

PARTICULARS	SAIDABAD			TIKRI			27 HAND PUMPS	
	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1990-91	1991-92
1. Direct cost	220100	231100	199400	274550	352500	424565	7327	6973
2. Indirect cost	69450	163250	96800	62345	144035	82830	7350	7179
3. Depreciation	196133	196133	196133	310000	310000	310000	25032	25032
Total	485683	590483	492333	646895	806535	817395	39709	39183
4. Income collected	106000	108000	162600	94000	90000	124000	-	-
5. Deficit	(379683)	(482483)	(329733)	(552895)	(716535)	(693395)	(39709)	(39183)
6. Cost recovery	21.82%	18.29%	33.03%	14.53%	11.16%	15.17%	-	-

NOTE : In the year 1990-91, arrears of salary were paid to staff and officers and that explains the reason for the large increase in indirect costs.

TABLE 2.4

REAL O&M COSTS - PIPED SCHEMES

(VALUE IN RS.)

PARTICULARS	SAIDABAD			TIKRI		
	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92
Direct cost	436318	488969	518786	681335	754482	1017538
Indirect cost	69450	163250	96800	62345	144035	82830
Depreciation	196133	196133	196133	310000	310000	310000
TOTAL	701901	848352	811719	1053680	1208517	1410368
Income Collected	106000	108000	162600	94000	90000	124000
Deficit	(595901)	(740352)	(649119)	(959680)	(1118517)	(1286368)
Cost recovery	15.10%	12.73%	20.03%	8.92%	7.45%	8.79%

2.7 As can be seen from the table below the unit cost of water sold increases 5 to 6 times as compared to the cost per KL of water produced. This is due to the fact that a very small percentage of the population has private connections and this is the only available avenue for revenue generation.

TABLE 2.5

REAL UNIT COST OF WATER - 1991-92

(RS. PER KL)

	WATER PRODUCED	WATER SOLD	DEFICIT ON WATER PRODUCED	DEFICIT ON WATER SOLD
1. Saidabad	Ø.86	5.1Ø	(Ø.69)	(4.Ø8)
2. Tikri	1.ØØ	6.7Ø	(Ø.91)	(6.11)
3. Handpumps	Ø.4Ø	Ø.4Ø	(Ø.4Ø)	(Ø.4Ø)

NOTE : Cost includes depreciation

COMPOSITION OF COSTS

2.8 On a review of the real costs of water it can be seen that power charges account for 4Ø-42% of the total cost in 1991-92 for the piped schemes. Manpower and depreciation costs together account for 41% in Tikri and 54% in Saidabad. The exhibits below present the composition of costs in 1991-92 for both actual and real costs.

EXHIBIT 2.2

COMPOSITION OF COST - SAIDABAD (1991-92)

COMPOSITION OF COST (%)
SAIDABAD PIPED SCHEME 91-92

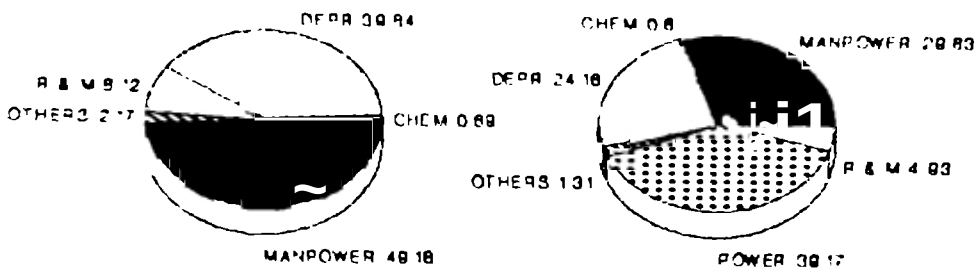


EXHIBIT 2.3

COMPOSITION OF COST - TIKRI (1991-92)

COMPOSITION OF COST (%)
TIKRI PIPED SCHEME 91-92

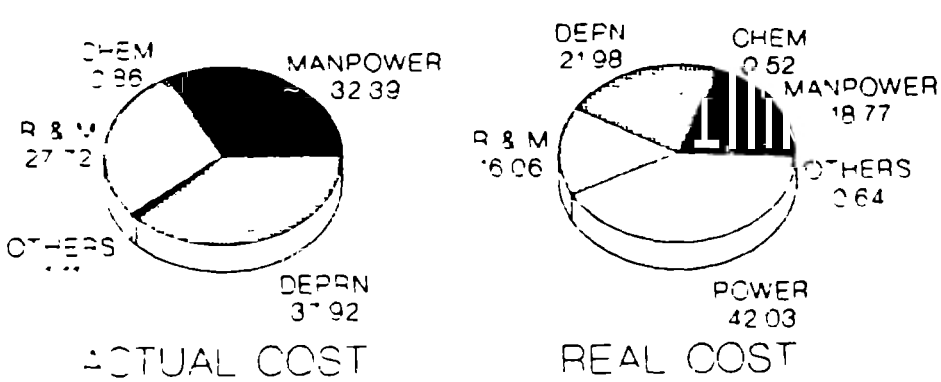
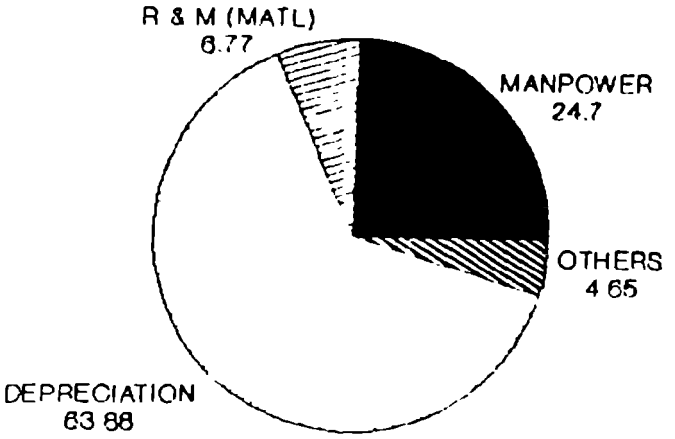


EXHIBIT 2.4

COMPOSITION OF COST (%)
KAURIHAR/CHAYAL HAND PUMP SCHEMES 91-92



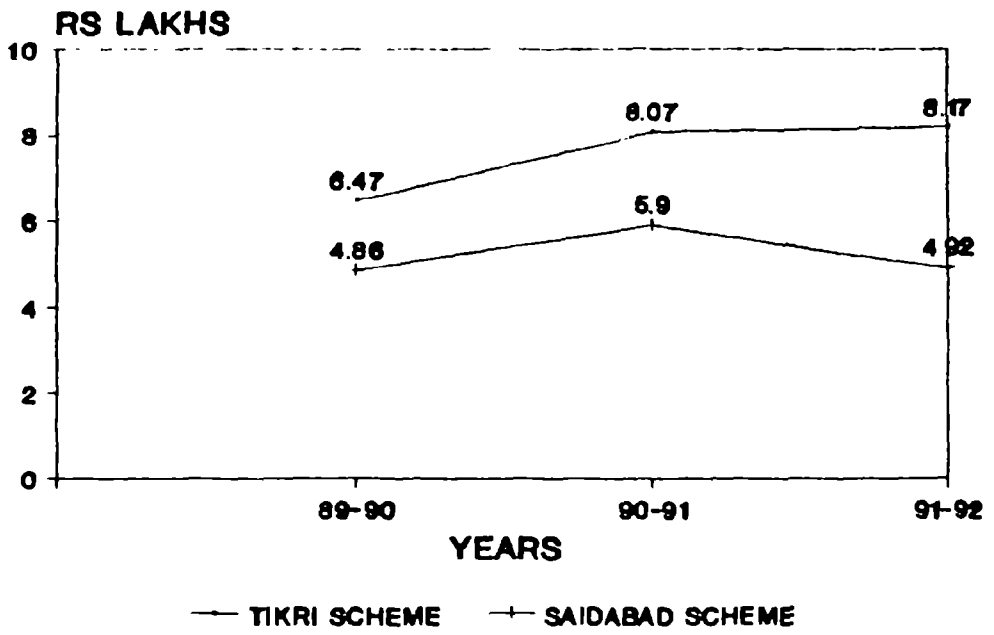
TREND IN REAL COSTS

2.9 The total real costs of O&M in the piped schemes are showing an increasing trend essentially due to inflation, higher power costs and the revised tariff for power from 1991-92 onwards. In the year 1990-91, arrears of salary were paid to officers and staff, resulting in steep increase in costs. Exhibit 2.5 below shows the trend of costs for the piped schemes.

EXHIBIT 2.5

TREND IN COSTS- PIPED SCHEMES

TREND IN O & M COST (ACTUAL)



ANALYSIS OF COSTS/REVENUES

2.10 Real costs derived were further analysed into fixed and variable, in order to arrive at the contribution per KL of water produced/sold. It is interesting to note that operation of both the piped schemes results in a negative contribution meaning that for every KL of water produced UPJN is loosing money. The analysis further shows that the real O&M cost per KL of water produced is ranging from Rs.0.86/KL to Rs.1.00/KL while the tariff fixed by the UP Government is Rs.1.00/KL. But due to a very small percentage of water produced being actually sold, the cost recovery fall downs drastically. Table 2.6 below presents the analysis of costs.

TABLE 2.6

ANALYSIS OF COSTS - 1991-92

(VALUE IN RS. PER KL)

ELEMENTS	TIKRI		SAIDABAD		HAND-PUMPS
	PRO-DUCT-ION	SALES	PRO-DUCT-ION	SALES	
1. Revenue demanded	0.15	0.98	0.17	0.99	-
2. Variable cost	0.59	3.92	0.38	2.28	0.07
3. Contribution	(0.44)	(2.95)	(0.21)	(1.29)	(0.07)
4. Fixed cost	0.41	2.77	0.47	2.82	0.33
5. Surplus/ (Deficit)	(0.85)	(5.72)	(0.68)	(4.11)	(0.40)

2.11 As can be seen from the above table the variable cost per KL of production in hand pumps is comparitively lower as compared to the piped schemes. This is based on the assumption of 250 people using the handpump at the rate of 40 lpcd. But according to available indications the average number of peóple using the handpump is around 150. In this case the variable cost per KL will go upto Rs.0.12, which is still much lower than piped schemes.

2.12 The costs were further analysed into cost per person covered and cost per household and the following results were obtained from the same.

TABLE 2.7

ANALYSIS OF COSTS (1991-92)

(VALUE IN RS.)

	SAIDABAD	TIKRI	HANDPUMPS
REAL COSTS			
1. Total cost per person p.a.	23.84	23.90	6.00
2. Total cost per connection p.m.	76.00	83.95	2.42 (Household)
3. Variable cost per connection p.m.	33.97	49.20	0.43 (Household)
4. Fixed cost per connection p.m.	42.03	34.75	1.99 (Household)
ACTUAL COSTS			
1. Total cost per person p.a.	14.46	13.85	-
2. Total cost per connection p.m.	46.10	48.65	-
3. Variable cost per connection p.m.	4.06	13.90	-
4. Fixed cost per connection p.m.	42.03	34.75	-

The UPJN is charging Rs.15/- per month as the flat rate for unmetered connections, which does not even cover the variable real cost of O&M. The costs indicated above are total costs spread over the private connections including depreciation for the total scheme/handpump.

PROCEDURAL CHANGES NEEDED

2.13 The procedural changes proposed are essentially in the nature of better information generation from available records. It is important that the persons to whom information is made available have adequate authority to take decisions to remedy the pointers from the information.

SUGGESTIONS

2.14 It is clear from the analysis of costs and revenues that cost recovery is very low and for every KL of water produced the UPJN is incurring losses. It is pertinent to note that even in the scheme design [as informed to us] only about 20% of the population are to be covered by private connections, implying an assumed cross subsidy if the scheme is to breakeven. The possible methods to improve the situation are given below but these are not based on a field survey and hence would have to be studied in that light.

(1) Educating the population on the need for 'safe' water and the need to pay for it.

(2) Involving the population right from planning of the scheme and eventually handing over the same for maintenance to the local bodies. The decision whether to take up a scheme should be made by the local bodies and there should be a undertaking that maintenance will be their responsibility. UPJN should just execute the scheme.

(3) Recovering a portion of the costs through a 'Tax' on all households in the village - both for handpump and piped schemes. Since there seems to be a basic lack of inclination in paying for water, this may be an indirect way of recovery. The modalities for this 'Tax' needs to be worked out.

(4) Conducting a socio-economic survey before a scheme is approved. This is essential to get a feel for need for water, ability to pay, intention to pay and other social factors which have a strong bearing on a sensitive issue like provision of water supply. The survey should be a pre-requisite for approval of the scheme, say if the scheme value is above a certain limit.

(5) Due to lower cost recovery, lesser money will be spent on O&M of schemes, which will have a bearing on the quality of service and hence on the collection efficiency. The revenues and O&M costs of a scheme should be closely evaluated during the planning stage itself and the sensitivity of the same to critical parameters like inflation, tariffs, wastage factor etc. need to be studied. The results of the evaluation should justify taking up the scheme. Development of a O&M financial model may be taken up for the purpose.

(6) Involving private contractors / voluntary agencies in maintenance of piped as well as hand pump schemes.

(7) For existing schemes, there is a tariff fixed for public stand posts also. Efforts may be taken to recover these charges from the households, which may have a good bearing on the cost recovery. The responsibility of recovering the PSP charges may be given to the local bodies / voluntary organisation.

(8) It is to be remembered that all assets have a life span. They need to be replaced or extended. It is important to recover depreciation charges also in order to ensure availability of funds for replace-ments/extensions. This has a long term impact on the efficiency of the organisation.

(9) There is need for a closer monitoring of O&M costs at various levels through improved Management Information Systems (MIS).

CONCLUSION

2.15 It is near impossible for a commercial organisation like UPJN to achieve the twin objectives of providing service and also breakeven on costs. The situation on O&M is quite alarming and immediate steps are needed to ensure better recovery of costs. The experience gained in the past should become inputs for future planning through better evaluation of schemes and critical importance given to review O&M costs and revenues.

3. BACKGROUND TO UP JAL NIGAM

STATE OF UP

3.1 Uttar Pradesh (UP) had population of 139 million in 1991 constituting 16.5% of India's population but with only 9% of India's total area. The population growth in UP during the period 1981-1991 is slightly higher as compared to the All India average (ie)

1981-1991	UP	2.29% p.a.
	All India	2.14% p.a.

[Source : Report of the 1992 Evaluation Mission - June 1992]

71% of the population is said to be agriculture based as compared to 60% All India average, indicating a higher component of rural population.

3.2 The state is organised on the following lines :

DIVISIONS	13
DISTRICTS	63
TEHSILS	262
DEVELOPMENT BLOCKS	859
VILLAGES	112566

The population in each village is said to be relatively small as shown below :

(a)	villages with less than 500 population	47% of total villages	14% of total population
		Average population per village	370
(b)	villages with between 500-1999 population	44% of total villages	55% of total population
		Average population per village	1545

[Source : Report of the 1992 Evaluation Mission - June 1992]

3.3 The state can further be clalssified as

- Plains (55 out of 63 districts)
- Hills Himalayas
- Rocky Bundelkand

ECONOMIC PROGRESS OF UP

3.4 The state of UP had a per capita income of Rs.3072 in 1989-90 which is lower than the All India figure by Rs.1180. The growth in per capita income has been lower than the All India growth as shown below :

TABLE 3.1

PER CAPITA INCOME

YEAR	UP	ALL INDIA	DIFFERENCE	% OF DIFFERENCE
1980-81	1286	1630	344	27%
1984-85	1812	NA	NA	NA
1989-90	3072	4252	1180	38%

[Source : Report of the 1992 Evaluation Mission - June 1992]

INTRODUCTION TO UPJN

3.5 Provision of water supply in the state of Uttar Pradesh (UP) was the responsibility of the Public Health Engineering Department (PHED) from the year 1927 onwards. The PHED was subsequently renamed as the Local Self Government Engineering Department (LSGED). Considering the importance of providing water supply, an autonomous corporation in the name of Uttar Pradesh Jal Nigam (UPJN) was formed in 1975 to take over the functions of LSGED. For the provision and maintenance of water supply in major towns, Jal Sansthans were also formed.

ROLE OF UPJN

3.6 UPJN is responsible for the following functions :

- Provision and maintenance of water supply in the whole of UP except the major towns
- Provision and maintenance of sewerage treatment facilities (except in major towns)
- Provision of sanitation facilities (except in major towns)

The state of UP is said to possess a higher level of surface and ground water as compared to the All India figures.

3.7 Inspite of the higher levels of water availability and the Government's thrust towards provision of safe drinking water, specially in the rural areas, many problems have been encountered in terms of

- large area of the state as well as higher population growth
- wide disbursement of the population (small villages)
- different types of terrains (hilly, rocky, plains)
- lower economic status of the population

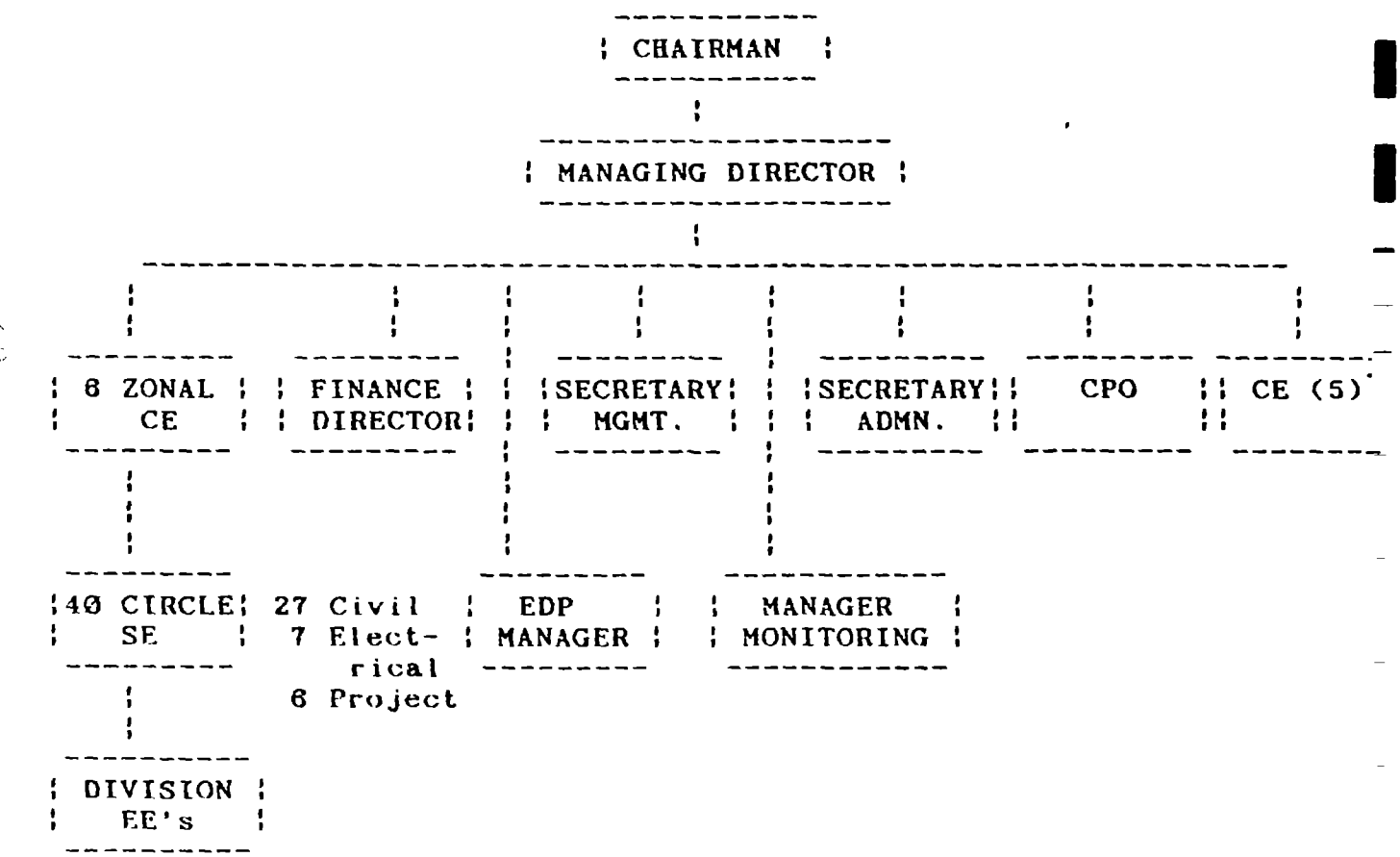
But still a lot of work in creation of water supply assets have been done and the focus is now on better utilisation of created assets and resources.

ORGANISATION OF UPJN

3.8 UPJN is managed by a Board and is headed by a Chairman. It also has a Managing Director and a Finance Director. UPJN employs around 15000 staff in addition to work charge and non-muster roll employees. It has its head quarters at Lucknow and is organised into 6 geographical areas headed by Chief Engineers (CE). The organisation structure is as depicted below :

EXHIBIT 3.1

ORGANISATION STRUCTURE



135 construction, 25 electrical and mechanical, 19 project and addition special divisions.

NOTE : (1) Organisation structure as given by UP Jal Nigam

(2) Do not necessarily indicate grades/levels.

INDO-DUCTH CO-OPERATION

3.9 As part of the bilateral co-operation between Government of India and Kingdom of the Netherlands, UP has been getting assistance for water supply projects from the year 1978 onwards. At the time of commencement the objectives for the Dutch assistance were

> "The improvement of the health situation and the general living conditions in the rural areas of UP through better drinking water supply."
>
> The assistance is for the creation of the scheme and the responsibility for operation and maintenance is with UPJN and the State Government.

3.10 The Dutch Government has so far financed 6 schemes [SPI and SP III to SP VII] covering various districts and types of schemes. The profile of the projects financed by the Dutch Government are given below :

TABLE 3.2

PROFILE OF DUTCH ASSISTANCE

SL. NO.	PROJECT	TYPE OF SCHEME	COVERAGE	NUMBER OF SCHEMES	ALLOCATION IN DG ('000)
1.	Sub Project (SP) I	Piped	724 villages in 3 dists.	22	22140
2.	SP III	Hand pumps	960 villages in 6 dists.	5830 pumps	11100
3.	SP IV	Piped	237 villages in 2 dists.	13	17000
4.	SP V	Sanitation	13000 house-holds 32 schools	-	5210
5.	SP VI	a. Hand pumps	1638 villages in 7 dists.	13599	25000
		b. Commun-ity parti-cipation	-	-	968
6.	SP VII	Piped	3605 villages	10	81400

DG = Dutch Guilders

Source : Report of the 1992 Evaluation Mission - June 1992

PROFILE OF OPERATION AND MAINTENANCE (RURAL)

3.11 The UPJN operates and maintains 817 piped water supply schemes and about 295000 hand pumps in rural areas as at the beginning of 1991-92. The overall profile of O&M in rural areas and some of the key ratios are presented below. These are essential to present so as to compare the same with results from the study.

TABLE 3.3

O&M OF PIPED SCHEMES - UPJN (PLAINS)

(1)	Total schemes	817
(2)	Estimated cost at the time of construction [Rs.lacs]	19385
(3)	Total number of tube wells	1375
(4)	Total number of overhead tanks	1020
(5)	Length of pipeline in KMS	25820
(6)	Number of private connections	205519
(7)	Number of villages benefitted	9942
(8)	Population benefitted	10595449

NOTE : Source : (1) Report on the recommendations of the committee constituted for working out norms

(2) Figures are approximate

TABLE 3.1

KEY INDICATORS - PIPED SCHEMES - PLAINS - UPJN

PARTICULARS	VALUE (RS.LACS)			AS A% OF PROJECT COST			PER PRIVATE CONNECTION P.M.			PER PERSON BENEFITTED P.M.		
	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92
1. Receipts	165	205	240	0.85%	1.06%	1.24%	6.69	8.31	9.73	0.11	0.16	0.19
2. Total expenditure on O&M without centage	866	1116	2252	4 58%	5.76%	11.62%	36.00	45.25	91.31	0.70	0.88	1.77
3. Cost recovery	19%	18%	11%									

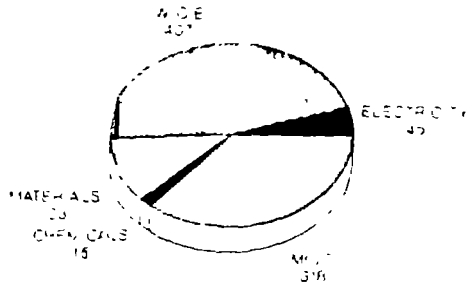
NOTE : SOURCE . (1) Report on the recommendations of the committee constituted for working out norms

(2) 1989-90 and 90-91 are actuals while 91-92 is anticipated. costs exclude depreciation.

EXHIBIT 3.2

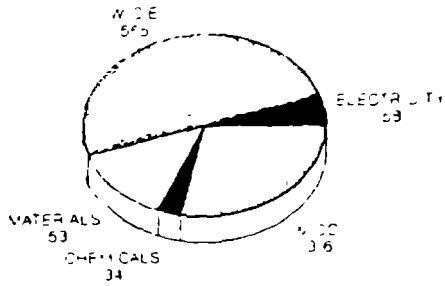
COMPONENTS OF O&M COST - PIPED - PLAINS - UPJN

COMPONENTS OF O & M COST (RS.LAKHS)
PIPED SCHEME - PLAINS - UPJN - 89-90



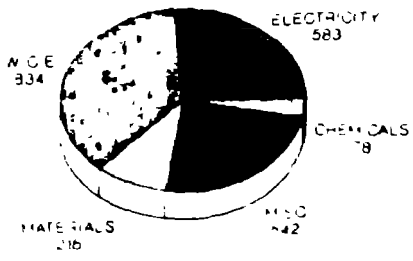
TOTAL Rs. 888 Lakhs

COMPONENTS OF O & M COST (RS.LAKHS)
PIPED SCHEME - PLAINS - UPJN - 90-91



TOTAL Rs.1116 Lakhs

COMPONENTS OF O & M COST (RS.LAKHS)
PIPED SCHEME - PLAINS - UPJN - 91-92



TOTAL Rs.2252 Lakhs

3.12 The overall profile of O&M of hand pumps in rural areas by UPJN is given below :

TABLE 3.5

KEY INDICATORS - HAND PUMPS - PLAINS - UPJN

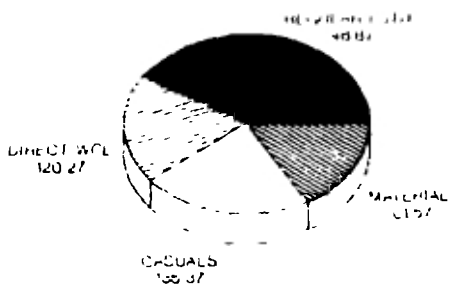
	1989-90	1990-91	1991-92
1. Number of hand pumps maintained [approx.]	219310	252325	296880
2. Total cost of O&M [Rs. lakhs]	604.10	806.88	945.39
3. Norms			
a. Families [50 per pump]	10965500	12616250	14844000
b. Population [250 per pump]	54827500	63081250	74220000
c. KL production [40 lpcd]	800481500	920986250	1083612000
4. Key Ratios			
a. Cost per household per month	0.46	0.53	0.53
b. Cost per person per month	0.09	0.11	0.11
c. Cost per KL of production	0.08	0.09	0.09
d. Cost per pump p.a.	275.45	319.78	318.44

NOTE : Source : (1) Report on the recommendations of the committee constituted for working out norms

(2) Cost excludes depreciation.

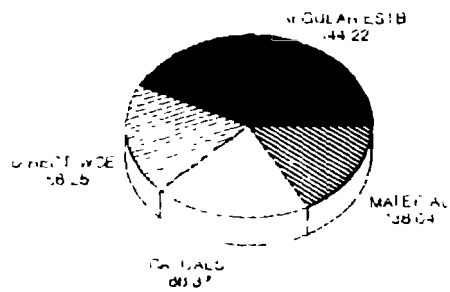
EXHIBIT 3.3

COMPOSITION OF O & M COST (RS.LAKHS)
HAND PUMP SCHEME - PLAINS - UPJN - 89-90



TOTAL Rs.604.08 Lakhs

COMPOSITION OF O & M COST (RS LAKHS)
HAND PUMP SCHEME - PLAINS - UPJN - 90-91



TOTAL Rs. 806.88

COMPOSITION OF O & M COST (RS LAKHS)
HAND PUMP SCHEME - PLAINS - UPJN - 91-92

TOTAL Rs. 946 39 Lakhs

UP JAL NIGAM FINANCES

3.13 A sum of Rs.7000 million was spent during the seventh plan for water supply and sanitation in UP. Against this a provision of Rs.14500 million has been made for the eighth plan. The details are as given below, which indicate the importance being given to rural water supply.

TABLE 3.6

UP JAL PLAN ALLOCATION

(RS. MILLION)

HEADS	VII PLAN ACTUALS	%	VIII PLAN BUDGET	%
(1) Rural water supply	5570	80	10250	71
(2) Rural sanitation	230	3	150	1
Total	5800	83	10400	72
(3) Urban water supply	1090	16	3200	22
(4) Urban sanitation	110	1	900	6
Total	1200	17	4100	28
GRAND TOTAL	7000	100	14500	100

Source : (1) Indo-Dutch rural water supply and sanitation projects - UP - India - Report of 1992 Evaluation Mission - June 1992

(2) Includes assistance under Netherlands Assisted Projects (NAP)

FINANCIAL POSITION OF UP JAL

3.14 The UP Jal Nigam essentially depends on the State Government through the Minimum Needs Programme (MNP) and the Central Government through the Accelarated Rural Water Supply Programme (ARWSP) for financing new projects. In addition funds are obtained under the NAP. For maintenance of schemes and hand pumps funds are received from

- water charges recovery
- percentage of plan funds allotted by government for O&M and
- government subsidy

3.15 UPJN has been continously incurring deficits which essentially means that the cost of supervision of projects and maintenance is much more than the centage being charged. The following table presents the overall financial performance :-

TABLE 3.7

UPJN OVERALL FINANCIAL PERFORMANCE

(RS. MILLION)

YEARS	INCOME	% INC.	EXPENDITURE	% INC.	DEFICIT	% OF INCOME
1984-85	193		338		145	75
1985-86	305	58	395	17	90	29
1986-87	316	4	447	13	131	41
1987-88	352	11	525	17	173	49
1988-89	407	16	664	26	257	63
1989-90	391	(4)	724	9	333	85
1990-91	326	(17)	948	31	622	191
Average p.a.		11		30		

NOTE : Source : (1) Report of the 1992 evaluation mission June 1992

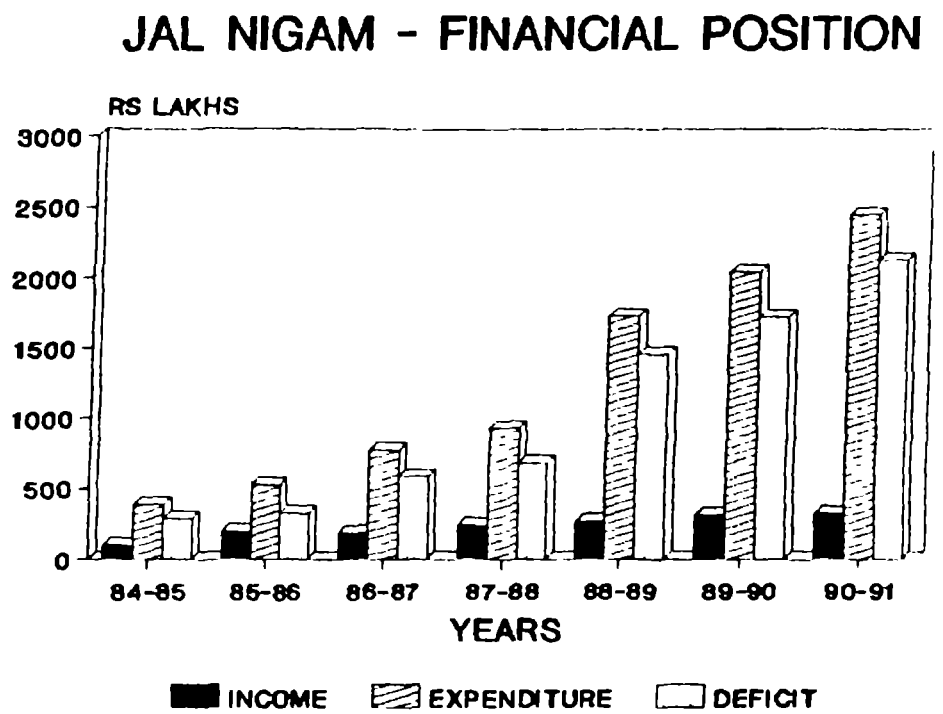
(2) Income excludes state government grants but includes centage.

As can be seen the rate of increase in expenditure is almost thrice that of increase in income resulting in higher percentage of deficits.

O&M - FINANCIAL POSITION

3.16 The financial position on operation and maintenance is no different, with increasing deficits each year. The following exhibit presents the income, expenditure and deficit on O&M account.

EXHIBIT 3.4



3.17 On an analysis of the costs the following are indicated :

- deficit as a % of income has been growing consistently in the last 4-5 years to stand at 657% in 1990-91
- the average increase in income is 37% during 1984-85 to 1990-91 as compared to a 88% increase in expenditure thus contributing to the growing deficits
- the cost recovery has fallen from about 26% in 1984 85 to 13% in 1990-91.

STUDY ON O&M COSTS

3.18 Considering the alarming situation of UPJN finances on O&M, the RSM felt the need for a clearer understanding of the actual costs of O&M. This is essential to ensure that the resources created over a period of time are actually used effectively and the objectives set out for the assistance is met. As already indicated SPI provided 22 piped schemes in the districts of Rai Bareli, Varanasi and Allahabad. The RSM decided on a review of O&M costs of SPI schemes, since they have been in operation from 1986 onwards.

SCHEMES SELECTED AND CRITERIA

3.19 The RSM decided on one piped scheme each in Varanasi and Allahabad and a group of hand pumps in Allahabad for review of O&M costs. It was decided to take only dutch assisted piped schemes, though it would have been difficult to adopt that for hand pumps. The final selection of schemes was based on population coverage and the distance of the scheme from the nearest city. Table 3.8 below shows the selection of schemes and the criteria adopted for the same.

TABLE 3.8

SCHEMES SELECTED

SL. NO.	SCHEME	TYPE	REASON FOR SELECTION
1.	Saidabad, Allahabad	Piped	Smaller population 25 kms from city [rural]
2.	Tikri, Varanasi	Piped	Larger population 5-6 kms from city [semi-urban]
3.	Group of hand pumps in Division VI	Hand pumps	Both Mark II/Mark III type of pumps maintained

3.20 The schemes selected were discussed with RSM and agreed upon. Subsequent to this a detailed plan for conduct of the study was drawn up. The approach to the study, data collected and analysis of the same aare presented in the subsequent chapters.

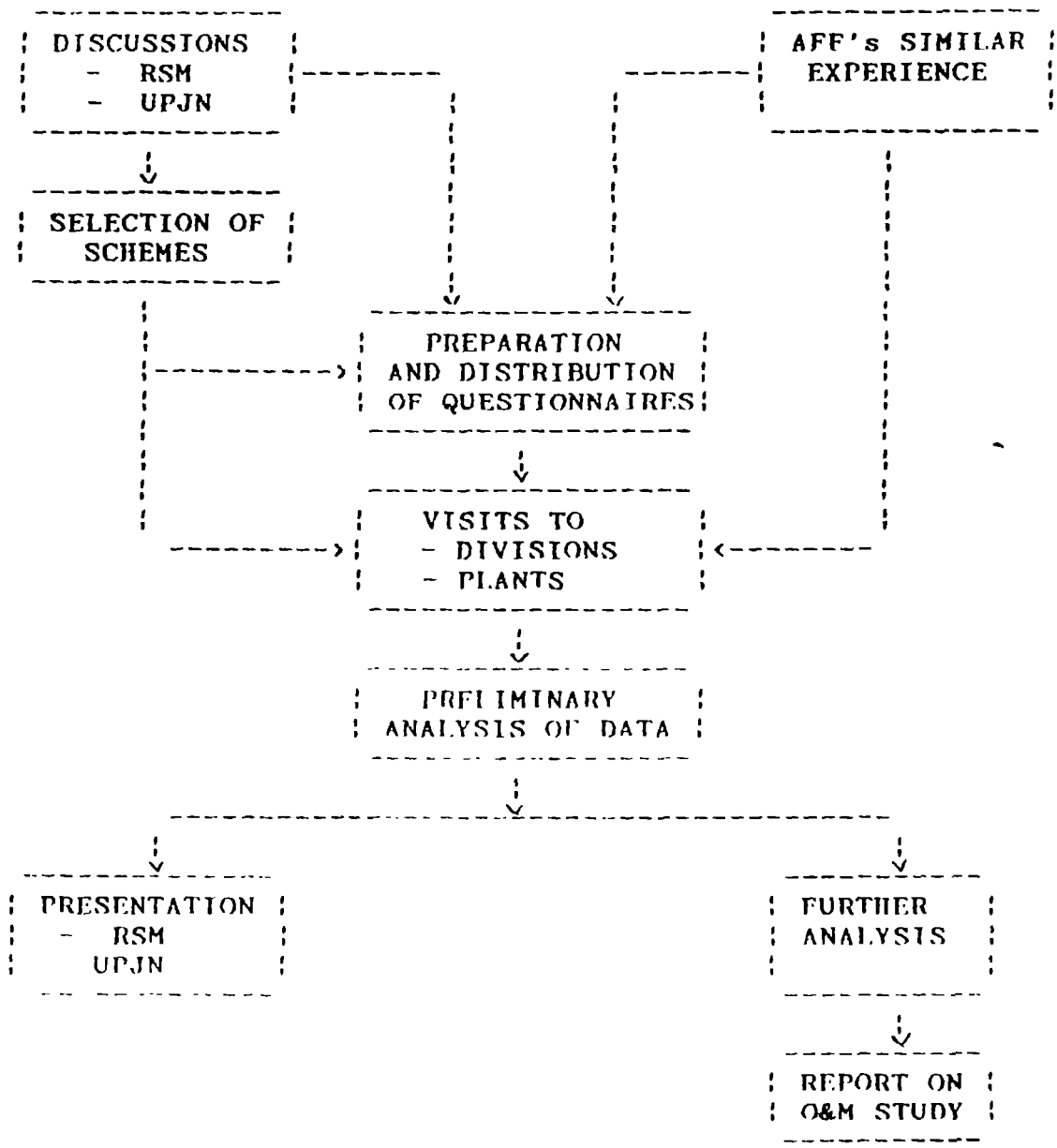
4. APPROACH TO THE STUDY

BASIC APPROACH

4.1 The study was commenced on 12 November 1992 with discussions on the objectives of the study and the schemes to be selected with Mr. Robert Trietsch of the RSM. The overall approach to the study was based on the combination of our experience in conducting similar studies and actual field visits to divisions/plants to get a first hand feel of the operation and maintenance aspects. Exhibit 4.1 depicts the overall approach to the study.

EXHIBIT 4.1

OVERALL APPROACH TO THE STUDY



4.2 Some of the critical steps in the approach are discussed in detail in the subsequent paragraphs. The critical assumptions in analysing the costs and revenues are also indicated under 'Analysis'.

QUESTIONNAIRE

4.3 After discussions with RSM and UPJN, detailed questionnaire, one each for piped schemes and hand pumps, was prepared and sent to the divisions concerned for updation. The questionnaire is broadly organised as follows :

Piped

(1) Schemes detail at project completion time

(2) Scheme/yearwise details [1989-90 to 1991-92]

- (a) physical parameters
- (b) financial parameters
- (c) operation and maintenance costs

- various heads

(3) General [problems faced, suggestions]

(4) List of records maintained

(5) Enclosures, if any

Hand pumps

(1) General [location, Make, Cost of purchase etc.]

(2) Norms for maintenance [manpower, materials]

(3) Physical parameters

(4) O&M Costs [headwise] for the pump

(5) Division O&M costs on hand pumps

(6) General

(7) Records maintained

(8) Enclosures, if any

Copies of the questionnaire are enclosed as Annexure I.

VISITS TO DIVISION/PLANTS

4.4 Visits were made to the divisions responsible for O&M of the piped schemes and the group of hand pumps and in addition the pumping plants at Tikri, Varanasi and Saidabad, Allahabad were also visited. The focus of the visit, apart from helping UPJN divisions to update the questionnaire, was to get a first hand feel of O&M by talking to the people at the plant and division office. The visits were aimed at

(a) review of the log books / sheets maintained at the plant to derive / judge

- service hours
- number of hours of pumping for each tube well per day for each year
- chemicals consumption per day
- days on which plant/(s) not working

(b) review of other records to look at

- type of complaints recieved & quickness of action taken
- availabilrty of chemicals

(c) getting a feel of the time spent by each category of labour / staff on various activities of O&M by talking to them

(d) talking to the people in the nearest village, very briefly, on water availability, hours of supply, whether meters available, why not paying for water etc.

4.5 The Executive Engineer (EE) in charge of the division and the Assistant Executive Engineer (AEE) in charge of the scheme were also met to understand the problems in O&M and to estimate the time spent by each of them on O&M of the scheme concerned. Records maintained at the division for expenditure was also briefly reviewed.

4.6 For hand pumps, details were essentially obtained through the questionnaires but whereever made available the cards maintained to record the repairs carried out and the cost of materials and casual labourers reviewed. In addition details on number of hand pumps maintained by the JE/AE/EE concerned were obtained to help in allocation of indirect manpower cost.

4.7 To the extent available, the annual balance sheet of the division, at least for the year 1991-92 was obtained to get an overall view of the total cost of O&M for that division.

4.8 The list of people met during the study is enclosed as Annexure II.

ANALYSIS

4.9 The data obtained from the field visit and from the questionnaires was critically reviewed and analysed with a view to derive :

(a) Total cost of operation and maintenance [split into direct and indirect] as well as the revenues demanded and collected

(b) Composition of total cost in to manpower, power, chemicals, other expenses and depreciation

(c) Cost per Kl of water produced, distributed and sold for piped schemes and cost per Kl of water and per pump for hand pumps

(d) Contribution in total and per Kl after splitting costs into fixed and variable elements

(e) Cost per connection and person covered.

The power charges that would have been due based on actual pumping hours was added to the actual costs to derive the real costs. The detailed analysis mentioned above was also carried out on the real costs.

4.10 The analysis of the data was carried out by using a financial model developed for this purpose on Lotus 1-2-3.

ASSUMPTIONS

4.11 The assumptions made in working out the actual O&M costs are listed below :

Piped Schemes

(1) To arrive at the population covered by private connections, the average household size was taken as 8 for Tikri and Saidabad schemes. The balance population was persumed to be covered by Public Stand Posts (PSP).

(2) The actual pumping hours were compiled from the log books available at the plant. If particular year's log book were not made available the previous years average was considered. Wherever log books were not made available for a month, the average pumping hours per month in each season was assumed to derive year / monthwise pumping hours. For this purpose the year was split into two seasons [ie.] summer and winter [April to September and October to March]. Most of the data for the year 1991-92 was available for both the schemes.

(3) Water distribution was difficult to assess due to lack of records in this regard. This was esssentially picked up from the questionnaire but suitably adjusted for

- lpcd in each category
- revenue demand from private connections

For eg. - in the Tikri scheme while distribution to metered connections was given as 370679 Kl., the actual revenue demand was only Rs.2.06 lakhs. In this case, the revenue demand was taken as the basis for arriving at water distribution. It has been assumed that water demand has been at Rs.1/- per Kl (ie.) without the rebate for early payment.

(4) Water sold excludes distribution through public stand posts.

(5) The indirect manpower cost was arrived at on the following basis :

LEVEL	TIKRI % ASSUMED	SAIDABAD % ASSUMED
EE	5	5
AE	2Ø	15
JE	5Ø	85
Admn. staff	5	5

These were based on discussions with respective level of people as well as indications in the questionnaire. The EE's % was also assumed for administration staff.

(6) The real power charges (which are not based on bills received or on the flat rate) were arrived at based on the following formula :

Number of hours of pumping x HP x Ø.735 x rate per unit

The power tariff assumed are

1989-9Ø	Rs.1.1Ø/unit
1990-91	Rs.1.1Ø/unit
1991-92	Rs.1.6Ø/unit

Since proper data on the efficiency factor of the pump was not made available, the same has been assumed as 1. But in most cases the efficiency factor may be less than 1 and hence the power charges may be lower. The power charges worked out are as if for metered power connections. But meters have not been installed for both the schemes visited. The electricity board is charging only a flat rate per month, which also are not being paid.

(7) The price for bleaching powder was assumed at :

1989-90	Rs.3.75/kg.
1990-91	Rs.3.90/kg.
1991-92	Rs.5.13/kg.

(8) Cost of O&M of vehicles was as mentioned in the questionnaire

(9) Other administration overheads was allocated at 5%

(10) Depreciation was provided on straightline method based on 30 years life.

Hand pumps (HP)

(1) 27 hand pumps were chosen for a detailed analysis

15 in Kaurihar
12 in Chayal

(2) Data for 1989-90 was not available in full and hence results are presented only for 1990-91 and 1991-92.

(3) The salary of the work charged establishment (WCE) directly involved in hand pumps maintenance was equally distributed over the handpumps maintained by the group of WCE.

(4) 33% of the JE's time was presumed to be spent on hand pumps maintenance and the proportional salary thus derived was distributed equally over the number of hand pumps maintained. Similarly 11% of AE's salary and 16% of EE's salary were assumed.

(5) The average number of hand pumps maintained in each year was arrived at based on the formula

$$\frac{\text{HP at beginning of year} + \text{HP at closing of year}}{\quad}$$

(6) Cost per KM of vehicle was indicated in the questionnaire along with estimated number of kms run for each hand pump; which was the basis for vehicle expenditure per pump.

(7) The administrative overheads were distributed along the same basis as the EE's salary.

(8) Depreciation was arrived at based on straightline method with 15 years life.

PRESENTATION

4.12 The detailed analysis of the data based on assumptions mentioned above was carried out and the preliminary results presented to RSM and the UPJN.

REPORT

4.13 Further analysis, essentially in the nature of different assumptions on distribution, revenues from PSP's, proportional depreciation on private connections were carried out and the results are presented in this report. The detailed findings from the study are presented in the subsequent chapters.

5. O&M COST OF SCHEMES

BACKGROUND

5.1 The data collected on the piped schemes and the group of hand pumps was analysed to arrive at the total cost and unit cost per KL. As explained in the previous chapter, further analysis on the components of costs and the nature of costs [ie.] fixed/variable was also carried out. This chapter presents the results of this analysis.

SCHEME SPECIFIC INFORMATION

5.2 At the time of design of the piped schemes, various parameters were decided and the same are presented below :

TABLE 5.1

DESIGN PARAMETERS - PIPED SCHEMES

PARAMETERS	SAIDABAD	TIKRI
1. Scheme completed in	1983	1983
2. Source of water	2 tube wells	2 tube wells
3. Villages to be covered	19	27
4. Population in design year(2011)	35360	61560
5. Pumping station and capacity	30 HP and 40 HP 1950 lpm and 2100 plm resp.	45 HP and 40 HP 2100 lpm each
6. Capacity of over-head tank	650 KL	1200 KL
7. Length of distri-bution lines	59 kms	80 kms
8. Number of metered connections(2011)	1458	1312

TABLE 5.1 (CONTD.)

PARAMETERS	SAIDABAD	TIKRI
9. Number of PSP's planned	212	219
10. LPCD assumed *	70/90	70/90
11. Anticipated O&M cost per KL of water production	Rs.0.24	Rs.0.19
12. Total actualscheme cost (Rs. lakhs)	58.84	92.78

* 70 lpcd for villages with less than 4000 inhabitants and 90 for villages with more than 4000 inhabitants.

NOTE : Information as provided in the questionnaire. Actual design records not made available and hence not verified.

5.3 The hand pumps were planned with the following norms :

Number of persons per pump	250
lpcd	40
Number of families per pump	50 @ 5 per family.

5.4 The key physical parameters of the piped schemes as of 1991-92 as compared to the design parameters are presented below to enable evaluation of certain parameters like population and service hours, which seem to have undergone drastic changes.

TABLE 5.2

KEY PARAMETERS PIPED SCHEMES

PARAMETERS	SAIDABAD		TIKRI	
	AS ENVISAGED	1991-92	AS ENVISAGED	1991-92
1. Source of water	Ground 2 Tube wells	Ground 2 Tube wells	Ground 2 Tube wells	Ground 2 Tube wells
2. Villages covered	19	19	27	27
3. Population covered	35360 (2011)	34051	61560 (2011)	59000
4. Number of connections	1458 (2011)	890	1310 (2011)	1400
5. Public stand posts	212	238	219	219
6. Production (KLD)	3888	2592	3504	3866
7. LPCD	70 & 90*	45	70 & 90*	45
8. Pumping Hours	16 hours	(10.70 x 2)	16 hours	(15.34 x 2)
9. Service Hours	8	6	8	6

* 70 lpcd for villages with less than 4000 inhabitants and 90 lpcd for villages with more than 4000 inhabitants

ORGANISATION OF THE SCHEMES

5.5 The organisation structure for operation and maintenance of the schemes as of 1991-92 is shown below. The salary cost of these people have been allocated to the scheme based on the assumptions given in chapter 4.

TABLE 5.3

ORGANISATION

LEVEL OF PEOPLE	SAIDABAD	TIKRI	KAURIHAR HPS	CHAYAL HPS
INDIRECT				
1. Executive Engineer	1	1	1	1
2. Assistant Engineer	1	1	1	1
3. Junior Engineer	1	1	1	1
TOTAL	3	3	3	3
DIRECT			2*	4*
4. Pump operators	2	5@		
5. Tax collector	1	1		
6. Fitter	1	2		
7. Beldar	1	2		
8. Sweeper [part time]	1	-		
9. Pump attendants	5	-		
TOTAL	11	10	2	4
GRAND TOTAL	14	13	5	7

@ May include attendants also

* Levels not available.

5.6 It is pertinent to note that inspite of Tikri being a bigger scheme with more private connections and distribution lines it has lesser number of direct labour as of 1991-92.

ACTUAL COST OF O&M

5.7 The actual cost of O&M of the piped schemes and of the group of hand pumps is presented in Table 5.4. As can be seen the cost recovery is very low in the piped schemes and nil for the hand pumps. While the Tikri scheme is showing consistent increase in costs, Saidabad scheme is showing lower direct cost in 91-92, compared to 89-90. This is due to lower repairs cost even in absolute terms which may not be healthy for maintenance of the system.

TABLE 5.4

ACTUAL O&M COSTS

(VALUE IN RS.)

PARTICULARS	SAIDABAD			TIKRI			27 HAND PUMPS	
	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1990-91	1991-92
1. Direct cost	220100	231100	199400	274550	352500	424565	7327	6973
2. Indirect cost	69450	163250	96800	62345	144035	82830	7350	7179
3. Depreciation	196133	196133	196133	310000	310000	310000	25032	25032
Total	485683	590483	492333	646895	806535	817395	39709	39183
4. Income collected	106000	108000	162800	94000	90000	124000	-	-
5. Deficit	(379683)	(482483)	(329733)	(552895)	(716535)	(693395)	(39709)	(39183)
6. Cost recovery	21.82%	18.29%	33.03%	14.53%	11.16%	15.17%	-	-

NOTE : In the year 1990-91, arrears of salary were paid to staff and officers and that explains the reason for the large increase in indirect costs of piped schemes.

REAL COST OF O&M

5.8 The real cost of O&M includes the actual cost and in addition the power charges calculated based on actual operating hours of the pumping station. In the real costs, power charges become a very important component as is evident from the increased direct costs. The real costs of O&M of the piped schemes are presented in Table 5.5 below :

TABLE 5.5

REAL O&M COSTS

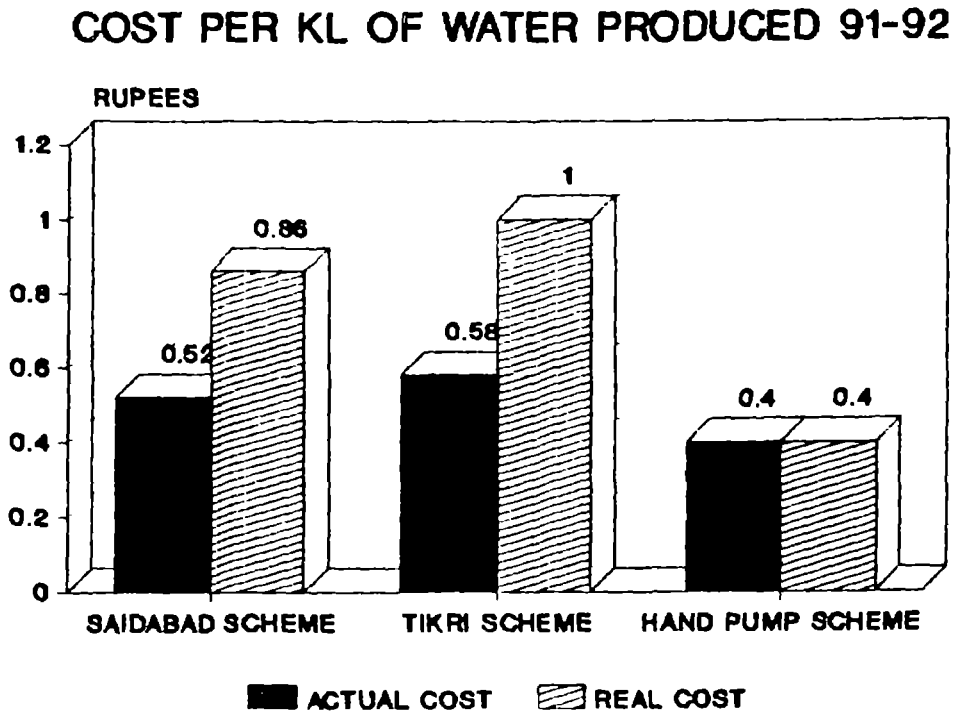
(VALUE IN RS.)

PARTICULARS	SAIDABAD			TIKRI		
	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92
Direct cost	436318	488969	518786	681335	754482	1017538
Indirect cost	69450	183250	96800	62345	144035	82830
Depreciation	196133	196133	196133	310000	310000	310000
TOTAL	701901	848352	811719	1053680	1208517	1410368
Income Collected	106000	108000	162600	94000	90000	124000
Deficit	(595901)	(740352)	(649119)	(959680)	(1118517)	(1286368)
Cost recovery	15.10%	12.73%	20.03%	8.92%	7.45%	8.79%

COST PER KL OF WATER

5.9 The actual and real cost of water was distributed over the extent of water produced, distributed and sold to arrive at the unit cost of water. Since 1991-92 is a representative year, because of revised pay scales from 1990-91, the cost per KL of water produced in 1991-92 will be a good indicator of the costs. The following exhibit presents the cost per KL of water produced in 1991-92.

EXHIBIT 5.1



5.10 Table 5.6 gives the actual and real cost per KL of water produced and sold. Two interesting inferences can be made from this table [ie.]

(1) The cost per KL of water sold in piped schemes goes up 5 to 6 times as compared to the cost per KL of water produced

(2) The deficit of Rs.0.40 in O&M of hand pumps is comparable with the actual cost deficit in piped schemes in terms of KL of water produced (Rs.0.35 and Rs.0.49). But the real cost of O&M in piped schemes per KL of water produced is much higher.

TABLE 5.6

O&M COST OF WATER PER UNIT (1991-92)

O & M COS. OF WATER

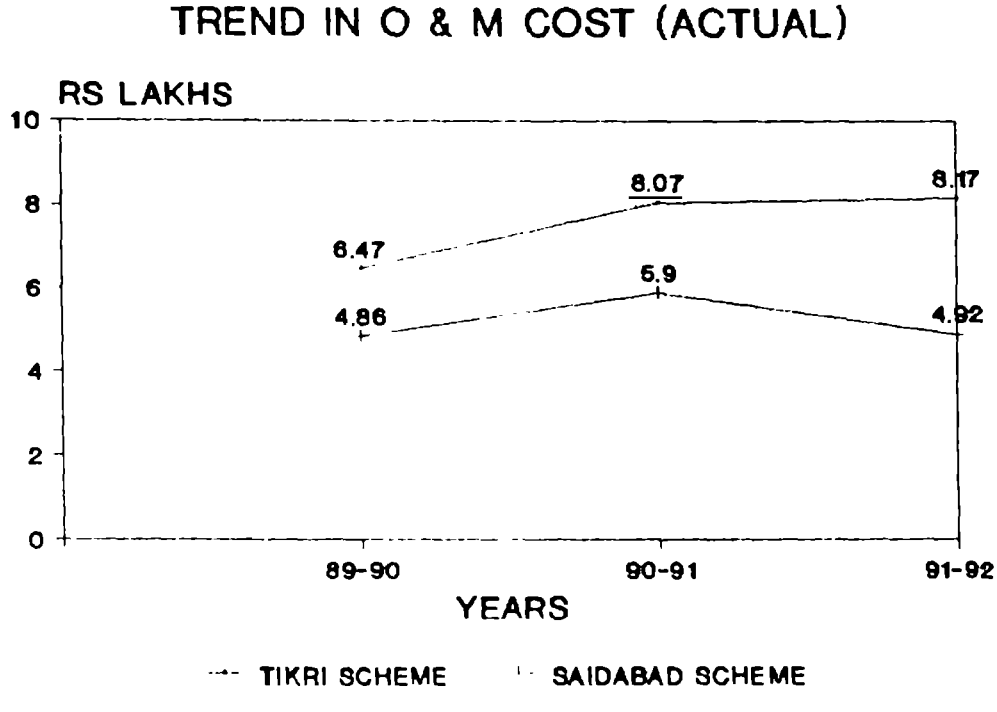
YEAR 1991-92	(COST PER KL) PIPED SCHEMES TIKRI		SAIDABAD		(COST PER PUMP) HANDPUMPS 27 HANDPUMPS		(COST PER KL) 27 HANDPUMPS	
	PRODUCED	SOLD	PRODUCED	SOLD	WITH DEP	WITHOUT DEP	WITH DEP	WITHOUT DEP
ACTUAL COST								
BROAD COST ELEMENTS								
(1) DIRECT COST	0.30	2.02	0.21	1.25	258.00	258.00	0.12	0.12
(2) INDIRECT COST	0.06	0.39	0.10	0.61	266.00	266.00	0.03	0.03
(3) DEPRECIATION	0.22	1.47	0.21	1.23	927.00		0.26	
TOTAL	0.58	3.88	0.52	3.09	1451.00	524.00	0.40	0.15
(4) INCOME RECEIVED	0.09	0.59	0.17	1.02			0	0
(5) SURPLUS/(DEFICIT)	-0.49	-3.29	-0.35	-2.07			-0.40	-0.15
(6) RECOVERY % ON TOTAL COST	15.52%	15.21%	32.69%	33.01%			0.00%	0.00%
REAL COST								
BROAD COST ELEMENTS								
(1) DIRECT COST	0.72	4.84	0.55	3.26				
(2) INDIRECT COST	0.06	0.39	0.10	0.61				
(3) DEPRECIATION	0.22	1.47	0.21	1.23				
TOTAL	1.00	6.70	0.86	5.10				
(4) INCOME RECEIVED	0.09	0.59	0.17	1.02				
(5) SURPLUS/(DEFICIT)	-0.91	-6.11	-0.69	-4.08				
(6) RECOVERY % ON TOTAL COST	9.00%	8.81%	19.77%	20.00%				

TREND IN COSTS

5.11 The real costs have been showing an increasing trend essentially due to inflation, increase in manpower costs and the revised tariff for power from 1991-92 onwards. The salary scales were revised from 1990-91, arrears of salary were also paid and hence the steep increase in cost, during that year. Exhibit 5.2 below shows the trend in costs.

EXHIBIT 5.2

TREND IN COSTS



COMPOSITION OF COSTS

5.12 The major components of actual cost of O&M of piped schemes are

- manpower
- repairs and maintenance and
- depreciation.

These three account for more than 95% of the total costs. These three components also account for about 95% of O&M of hand pumps. In the components of real cost power charges make about 40% of the total cost. The components of actual and real costs for 1991-92 are presented diagramatically in Exhibit 5.3 to Exhibit 5.5.

EXHIBIT 5.3

COMPOSITION OF COST (%)
SAIDABAD PIPED SCHEME 91-92

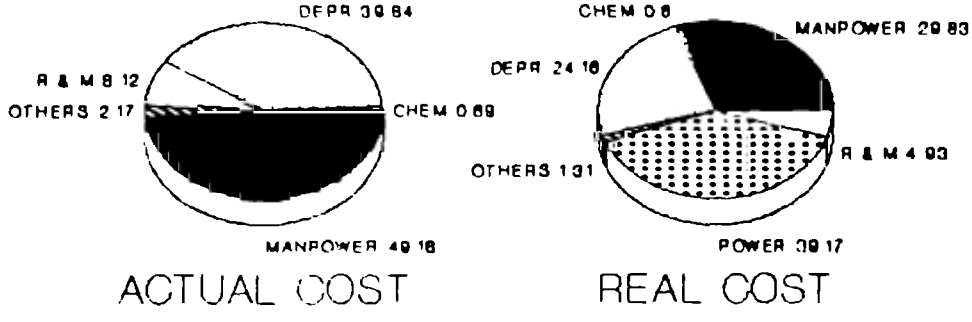


EXHIBIT 5.4

COMPOSITION OF COST (%)
TIKRI PIPED SCHEME 91-92

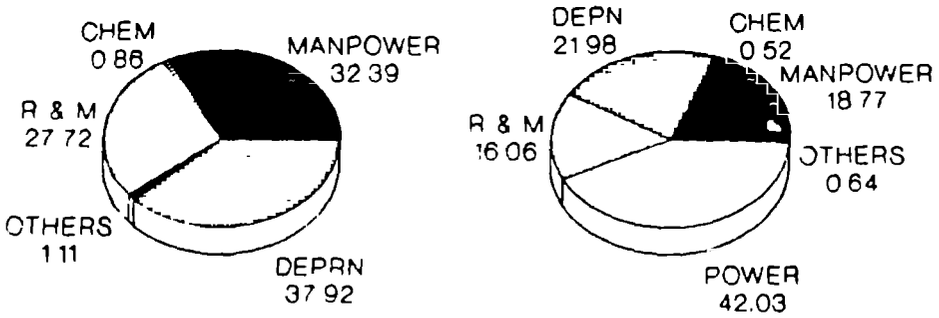
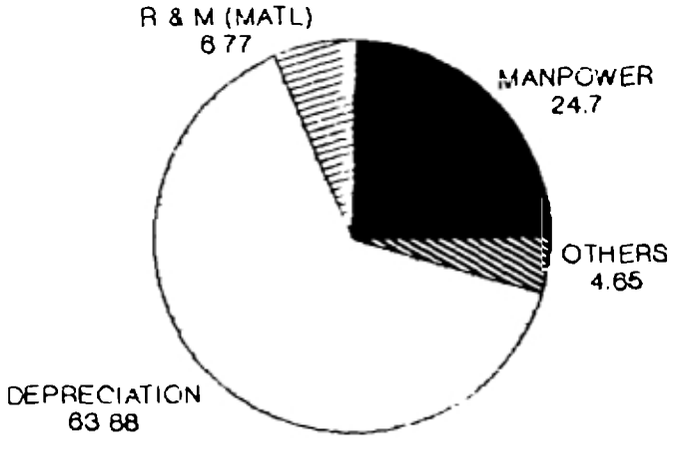


EXHIBIT 5.5

COMPOSITION OF COST (%)
KAURIHAR/CHAYAL HAND PUMP SCHEMES 91-92



ANALYSIS OF COSTS

5.13 The costs derived were further analysed into cost per private connection and cost per person covered by the scheme in both piped as well as hand pumps. The real cost per connection for the year 1991-92 comes in the region of Rs.77/- to Rs.84/- per month, which is about 5.5 times the minimum charge of Rs.15/- being levied today. This difference explains the cost recovery being as low as 15-20%. Table 5.7 gives an idea of the cost per person/connection for both types of schemes. As can be seen the cost per household in hand pumps (assuming 50 families per pump) works out to less than Rs.3 per month.

TABLE 5.7

COST PER CONNECTION/HOUSEHOLD - 1991-92

(VALUE IN RS.)

	SAIDABAD		TIKRI		
	ACTUAL COST	REAL COST	ACTUAL COST	REAL COST	HAND PUMPS COSTS
1. Cost per person pa	14.46	23.84	13.85	23.90	6
2. Cost per connection pa	553.18	912.04	583.85	1007.41	29
3. Cost per connection pm	46.10	76.00	48.65	83.95	2.42

5.14 The above figures have been worked out after considering the entire cost of O&M, including depreciation, being paid for by the private connections in piped schemes and by all households to be covered by the hand pumps. Even if a recovery of Rs.3/- per household per month is made for hand pumps, an attempt can be made to recover the entire cost of O&M of hand pumps.

CONTRIBUTION ANALYSIS

5.15 The costs were further analysed into fixed and variable, in order to arrive at the contribution per KL of water produced/sold. It is interesting to note that operation of both the piped schemes results in a negative contribution meaning that for every KL of water produced UPJN is loosing money. The analysis further shows that the real O&M cost per KL of water produced is ranging from Rs.0.86/KL to Rs.1.00/KL while the tariff fixed by the UP Government is Rs.1.00/KL. But due to a very small percentage of water produced being actually sold, the cost recovery fall downs drastically. Table 5.8 below presents the analysis of costs.

TABLE 5.8

CONTRIBUTION ANALYSIS

(VALUE IN RS. PER KL)

ELEMENTS	TIKRI		SAIDABAD		HAND-PUMPS
	PRO-DUCT-ION	SALES	PRO-DUCT-ION	SALES	
1. Revenue demanded	Ø.15	Ø.98	Ø.17	Ø.99	-
2. Variable cost	Ø.59	3.92	Ø.38	2.28	Ø.Ø7
3. Contribution	(Ø.44)	(2.95)	(Ø.21)	(1.29)	(Ø.Ø7)
4. Fixed cost	Ø.41	2.77	Ø.47	2.82	Ø.33
5. Surplus/ (Deficit)	(Ø.85)	(5.72)	(Ø.68)	(4.11)	(Ø.4Ø)

5.16 As can be seen from the above table the variable cost per KL of production in hand pumps is comparitively lower as compared to the piped schemes. This is based on the assumption of 25Ø people using the handpump at the rate of 4Ø lpcd. But accordig to available indications the average number of people using the handpump is around 15Ø. In this case the variable cost per KL will go upto Rs.Ø.12, which is still much lower than piped schemes.

5.17 The costs were further analysed into cost per person covered and cost per household and the following results were obtained from the same.

TABLE 5.9

COST ANALYSIS (1991-92)

(VALUE IN RS.)

	SAIDABAD	TIKRI	HANDPUMPS
REAL COSTS			
1. Total cost per person p.a.	23.84	23.90	6.00
2. Total cost per connection p.m.	76.00	83.95	2.42 (Household)
3. Variable cost per connection p.m.	33.97	49.20	0.43 (Household)
4. Fixed cost per connection p.m.	42.03	34.75	1.99 (Household)
ACTUAL COSTS			
1. Total cost per person p.a.	14.46	13.85	-
2. Total cost per connection p.m.	46.10	48.65	-
3. Variable cost per connection p.m.	4.06	13.90	-
4. Fixed cost per connection p.m.	42.03	34.75	-

PHYSICAL RESULTS

5.18 The analysis of costs was done based on the appraoch and assumptions indicated in chapter 4. The analysis also indicated certain key physical parameters, which are shown below. These resultant parameters have to be studied in relation to the assumptions. Further these are derived from the records available and hence may not reflect the actual situation on the ground in terms of water distribution, wastage, actual lpcd etc.

WORKINGS

5.19 A set of outputs from the model showing the calculations and workings are enclosed as Annexure III.

TABLE 5.10

SCHEME SAIDABAD - PHYSICAL PARAMETERS

	1989-90	1990-91	1991-92
1. Pumping hours			
- Pump 1	4354	4354@	3608
- Pump 2	3096	4776	4201
2. No.of days not worked			
- Pump 1	- (1)	- (1)	47/305
- Pump 2	- (1)	- (1)	51/274
3. Production KL (Total)	910836	1107396	946125
4. Ipcd calculated			
- domestic metered	NA	NA	60
- domestic unmetered	62	62	62
- PSP	40	40	40
5. Average production per day in KL	2495	3034	2592
6. Chemicals			
Number of days not treated			Full of March 92 no treatment was done
Average per day			2.75 kg/day
Per KL of production			1.06 gm/KL
7. Composition of repairs			
- Pumping station	34%	43%	48%
- Distribution system	61%	57%	52%
- Others	5%	-	-
8. Revenues (Rs.lacs)			
- Demand	0.92	0.97	1.58
- Collection (incl) arrears	1.06	1.08	1.63

NOTE : @ Since 1990-91 log books not made available, 1989-90 figures assumed

(1) Full details of daily pumping not made available.

TABLE 5.11

SCHEME = TIKRI = PHYSICAL PARAMETERS

	1989-90	1990-91	1991-92
1. Pumping hours			
- Pump 1	5162	5163	5884
- Pump 2	5902	5901	5317
2. No.of days not worked			
- Pump 1	-	-	18/335
- Pump 2	-	-	43/335
3. Production Kl	1394138	1394094	1411269
4. lpcd calculated			
- domestic metered	-	42	52
- domestic unmetered	51	-	51
- PSP	59	48	43
5. Average production per day in KL	3820	3819	3866
6. Chemicals			
Number of days not treated			Full of April, October and November 91 not treated
Average per day		8.19 kg	2.83 kg.
Per KL of production		2.14 gms	0.73 gms
7. Composition of repairs			
- Pumping station	25%	47%	40%
- Distribution system	57%	46%	54%
- Overhead tank	1%	2%	- (<1%)
- Others	17%	5%	6%
8. Revenues (Rs.lacs)			
- Demand	1.63	1.58	2.06
- Collection	0.94	0.90	1.24
- Efficiency	58%	57%	60%

6. ANALYSIS OF O&M COSTS

6.1 The costs derived, as indicated in chapter 5, were further reviewed with a view to

- compare the same across schemes and with UPJN as a whole
- do sensitivity analysis on certain key parameters.

The results of this review are described in the subsequent paragraphs.

COMPARISON ACROSS SCHEMES - PIPED

6.2 On a comparison of the real cost per KL of water produced in 1991-92 the conclusions that may be drawn are :

(a) Saidabad scheme has been spending less each year on repairs resulting in lower repair cost per KL

(b) Tikri scheme has been operating at a higher capacity resulting in higher power charges and lower manpower cost per KL of water produced

(c) In other aspects of revenues/costs they present almost a similar picture.

Table 6.1 below presents the comparison.

TABLE 6.1

REAL COST PER KL OF WATER PRODUCED - 1991-92

	SAIDABAD	TIKRI
1. Income demanded	Ø.17	Ø.15
COSTS		
2. Manpower	Ø.26	Ø.19
3. Power	Ø.34	Ø.42
4. Chemicals	Ø.Ø1	Ø.Ø1
5. Repairs	Ø.Ø4	Ø.16
6. Others	Ø.Ø1	Ø.Ø1
7. Depreciation	Ø.21	Ø.22
TOTAL	Ø.86	1.Ø1
SURPLUS/ (DEFICIT)	(Ø.69)	(Ø.85)

COMPARISON WITH UPJN

6.3 The overall profile of O&M of piped and hand pumps schemes in UPJN has been presented in chapter 3. Some of the key parameters are compared here. Table 6.2 depicts the cost anaysis of piped schemes in comparison to O&M of piped schemes in UPJN (plains).

TABLE 6.2

PIPED SCHEMES - COMPARISON WITH UPJN (PLAINS)

PARAMETERS	1989-93			1990-91			1991-92		
	UPJN (ACTUALS)	SAIDABAD	TIKRI	UPJN (ACTUALS)	SAIDABAD	TIKRI	UPJN (EST)	SAIDABAD	TIKRI
1. Revenue receipts									
a. % of project cost	0.85	1.80	1.01	1.06	1.84	0.97	1.24	2.77	1.34
b. Per connection (Rs.pm)	6.69	10.54	7.09	8.31	10.53	5.86	9.73	15.22	7.38
c. Per person (Rs.pm)	0.13	0.28	0.16	0.16	0.28	0.13	0.19	0.40	0.18
2. O&M Cost [without centage and depreciation]									
a. % of project cost	4.58	8.60	8.02	5.76	11.08	9.69	11.62	10.47	11.86
b. Per connection (Rs.pm)	36.00	50.30	56.08	45.25	83.57	58.50	91.31	57.64	65.50
c. Per person (Rs.pm)	0.70	1.36	1.23	0.88	1.67	1.30	1.77	1.51	1.55
3. Cost recovery %	19	21	13	18	17	10	11	26	11

The O&M cost as a % of project cost for Tikri and Saidabad (ie) 11.86 and 10.47% compares favourably with the UPJN average of 11.62%.

6.4 A similar review for hand pumps was also done and the results are as shown below :

TABLE 6.3

HAND PUMPS - COMPARISON - PLANS - UPJN

PARAMETERS	1990-91		1991-92	
	UPJN	27 HPS	UPJN	27 HPS
(1) Cost per household per month	Ø.53	1	Ø.53	1
(2) Cost per person per per month	Ø.11	Ø.17	Ø.11	Ø.17
(3) Cost per KL of production	Ø.Ø9	Ø.15	Ø.Ø9	Ø.15
(4) Cost per pump p.a.	319.78	545	318.44	524

Unlike in piped schemes, the cost for the 27 handpumps looks to be higher then that for UPJN as a whole which can be explained by the fact that a greater percentage of pumps may not undergo any repair or limited number of repairs. Further UPJN costs do not seem to include vehicle expenditure and allocated administrative overheads.

SENSITIVITY ANALYSIS

Recovery of PSP charges

6.5 As per the tariff fixed by the State Government an amount of Rs.3/5Ø per month per household is to be collected for usage of public stand posts. This rate is effective from 1/7/91. Earlier the rate was Rs.2/5Ø per month per household. Due to various reasons this charge is not being 'demanded' from households.

6.6 Sensitivity analysis was done on the working based on the following assumptions :

- demand will be net rate (ie) after discount

89-90	Rs.2 per household/month
90-91	Rs.2 per household/month
91-92	Rs.2.50 per household/month

- collecton efficiency of 50% of current demand.

The results obtained from the analysis are :

Tikri — Cost recovery improves to 26% in 1991-92 on actual cost basis and to 15% on real cost basis

Saidabad — Cost recovery improves to 43% in 1991-92 on actual cost basis and to 26% on real cost basis.

6.7 There is almost a doubling of the cost recovery if PSP charges are recovered at 50% collection efficiency. If depreciation is not considered the recovery would be much higher.

Tikri
42% on actual costs
19% on real costs

Saidabad
72% on actual costs
35% on real costs

Normal lpcd distribution

6.8 The water distributed in the workings was based on the revenue demanded/ruling tariff for the private connections. A sensitivity of the workings assuming the lpcd as below was attempted :

- dometic metered - 70
- domestic unmetered - 100
- PSP - 40

Accordingly the water revenue demanded was also suitably adjusted at the ruling tariff.

6.9 The cost recovery in Tikri on income demanded/real costs goes up from 15% to 20% in such a situation in the year 1991-92. Similarly in Saidabad the cost recovery goes up to 19%. Further this brings down the wastage in Tikri and Saidabad to around 30%.

Depreciation only on private connections

6.10 The depreciation charge relevant for the private connections only based on the population coverage was allocated and costs worked out. The results are as shown below :

TABLE 6.4

COST - DEPRECIATION ONLY FOR PVT CONNECTIONS

(1991-92)
(VALUE IN RS.)

SCHEME	PRODUCED		SOLD		DISTRIBUTED	
	ACT-UAL	REAL	ACT-UAL	REAL	ACT-UAL	REAL
Cost per KL						
Tikri	0.40	0.82	2.69	5.50	0.59	1.20
Saidabad	0.36	0.69	2.12	4.13	0.61	1.19
Cost per connection pm						
Tikri	33.70	69.00				
Saidabad	31.57	61.48				

6.11 Ever with proportional depreciation for private connections the real cost per KL of water distributed is Rs.1.20 in Tikri and Rs.1.19 in Saidabad against a tariff of Rs.1/- per KL. The real cost per connection is around Rs.69 in Tikri and Rs.61.48 in Saidabad.

CRITICAL PROBLEMS

6.14 From the review of costs and revenues an attempt has been made to derive the critical problems which need to be addressed by UPJN. This list is not to be taken as an exhaustive one but only indicative. Further, a detailed analysis of the problems can be done only after a socio-economic survey of the population is carried out.

Design related

(1) The design provides only for 20-25% of households being provided private connections. The rest are to be supplied by PSP's. It is very difficult to justify the scheme based on revenues from only 25% of the population, unless a large cross subsidy had been assumed.

(2) The decision on taking up the scheme seems to have been made by UPJN without a detailed analysis of the socio-economic conditions in the rural area concerned (ie) need for drinking water, water quality today, inclination and ability to pay for water, other sources of water, need for water for other purposes etc. In effect the decision has been made without a request and hence the non-participation of the people concerned. This results in a feeling that the system is being owned by UPJN and not by the people/society.

(3) The location of the plant itself is not sometimes central to the area to be covered, say for eg. in Tikri. This effects distribution to the tail end areas resulting in poor service. This observation is based on the drawing of the scheme and no further technical analysis has been carried out.

(4) The population projections in both the schemes has been grossly underestimated, with the design population being reached halfway through the scheme itself.

O&M related

(1) It is observed from the log books that one of the two pumping plants are not functioning sometimes for long periods of say a month. During the visit to Saidabad scheme, one of the plants was undergoing repair. For eg. : in Tikri, one of the pumps was not used from 5-12-91 to 1-1-92. Similarly in Saidabad the plant with 40 BHP was not used for the whole of October 1991. It is essential that preventive maintenance of these plants are done at regular intervals so as to avoid long breakdowns.

(2) It is also clear from the log books that for days at a stretch treatment with bleaching powder is not being done due to non-availability of stock. This has a critical effect on the quality of the water and subsequently on quality of service to the consumers.

(3) In Saidabad scheme, it was mentioned that no documents / records are kept of the chemical analysis or tests, if any, being conducted. This is also absolutely essential to ensure quality of water being distributed.

(4) On the discusssion with division officers and staff there is a feeling that due to non-availability of sufficient funds many repairs and maintenance jobs are getting postponed. In fact in Saidabad scheme we can see a fall in the absolute amounts being spent on repairs and maintenance. Even though it is difficult to estimate the extent of repairs to be carried out, the feeling is we are a year behind in repairs. The lessser importance to repairs will have long term consequences in terms of quality of service, collection efficiency etc.

(5) The collection efficiency is in the region of 55-60% resulting in a reasonably huge accumulation of arrears. This might be related to the poor service levels and even delays in carrying out repair jobs.

(6) By not providing for power charges and depreciation, the expenditure on O&M is being understated with resultant implications on incorrect figures being reported. It is to be remembered that all assets have a life span and hence need to be replaced at some future date. It is very important that depreciation charge is provided for in the accounts.

(7) The most difficult part of the study was to 'estimate' the distribution of water in total and to individual category of consumers. No records are available for the purpose. For private connections the income demanded might be a good indication. A study on water distribution was done at Tikri scheme by installing bulk meters at certain villages. This can give important pointers on water distribution, wastage and the problem locations.

(8) There is very little of analytical reporting on O&M costs on a regular basis to divisions and other administrative offices. The reporting today is restricted to copies of log books being sent to the divisions by the plants. Further, very little information was made available to us from the head quarters at Lucknow either due to non-availability of records or difficulty in consolidation / analysing the available records. Timely information reporting is very critical for control of O&M aspects and costs.

HANDPUMPS

6.15 The critical problems on hand pumps, as analysed from the questionnaires and records made available to us are :

(1) It is told to us that the hand pumps are actually used by around 125-150 people which is only 50% of the deisgn population. This implies that

(a) either the distance to be covered for reaching the hand pump is much longer than envisaged or

(b) the average household size is bigger than 5 [the average in Saidabad, Tikri seem to be in the region of 7-8].

It may not be right to assume the common norm for all pumps. This may have to be revised based on the location concerned, dispersement of population etc.

(2) Similar to piped schemes, there is very little information on actual usage of hand-pumps, water wastage, quality of water etc. An analysis of these aspects is critical for a comparison with piped schemes and for future decision making.

(3) It is observed that for all most any kind of repair a team of 4-5 people are engaged on a daily basis. It is informed to us that for most repairs the time required will be in the region of 4-5 hours. This means that 4-5 people are engaged for 5 hours but get paid for eight hours. The wages for the 5 people was Rs.120/- day of 8 hours and hence, on an average, Rs. 45/- is wages for which labourers may not be working. It is told to us that from 92-93 onwards the practice of engaging daily labour has been stopped.

(4) Depreciation on hand pumps is not being provided, even for analysis sake. As indicated earlier this is essential to get the real picture on O&M costs.

(5) It is observed that the 27 hand pumps put together were not working for 139 days, in 1991-92. This works out to 5 days on an average per pump per year.

6.15 The problems highlighted above may be known by people at various levels in UPJN. But the problem is quite alarming. In a few years, if the same trend continues, it would be difficult to operate and maintain many schemes without a huge subsidy from the government. The thinking now should be to make UPJN, over a period of time, a self sustaining institution at least as far as O&M is concerned. It is difficult for a commercial organisation like UPJN to meet the twin objectives of providing service as well as breaking even on costs.

6.16 Some suggestions to rectify some of the problems listed above are discussed in chapter 8. These suggestions have been made based on discussions with UPJN staff, review of records made available to us and our experience in conducting similar studies. As indicated earlier these are not made after a socio-economic survey and hence have to be studied in that light.

7. SYSTEMS AND PROCEDURES

BACKGROUND

7.1 One of the components of the study is to look at existing records maintained for O&M and to recommend changes, if any, for improved reporting on O&M costs and revenues. It is to be remembered that information availability is not an end in itself but a beginning for better decision making. Hence it is essential that people reviewing the information have adequate authority to take decisions.

7.2 A brief review of records maintained at divisions and at the plants was made and brief recommendations on information that needs to be captured is presented in this chapter. A much more detailed study needs to be done covering more schemes/divisions before recommendation on formats for the records/MIS can be made.

INFORMATION CAPTURE

7.3 The information that needs to be captured and source for the same are mentioned below :

Information	Source
1. Number of days on which each pumping plant not working	Log book/sheet
2. Actual operating hours of plant and service hours. Power availability	Log book/sheet
3. Results of chemical analysis	Needs to be recorded in the log book itself
4. Number of days on which bleaching powder not available	Stock register
5. Extent of bleaching powder used on a daily basis	Log book/sheet

Information	Source
6. Complaints received classified into categories such as - taps broken - tap missing - water not flowing - chockages/leakage in pipelines - water quality not good (blackish etc.)	Complaints register to be modified to include such a classification
7. Days within which each complaint was repaired and if delayed reasons therefor such as - material not available - labour not available etc	Complaints register to be modified
8. Other repairs carried out with details of - when problem detected - nature of problem - reason for the problem (old equipment, lack of maintenance etc.) - when repair completed - cost (material and labour - days on which service could not be provided	Repair register to be introduced, wherever not existing
9. Villagewise and assesseewise demand raised, collected and arrears	Demand register
10. Cost of labour directly involved in scheme maintenance	Work register of scheme
11. Cost of casual labourers involved in repair and maintenance	To be separately recorded in works register

Information	Source
12. Record of inspections carried out by - JE - AEE - EE with time spent for each scheme and purpose of inspection	To be introduced wherever not available
13. Usage of vehicles to be identified to schemes	Log book to include this in a form such that compilation becomes easier

NOTE : (1) List may not be exhaustive

(2) Where ever applicable similar records to be maintained for hand pumps also

(3) Existing records should be continued.

RECOMMENDED MIS

7.4 The MIS that needs to be generated are essentially from the records to be maintained at the plant and at the divisions.

MIS

7.5 (1) Schemewise/plantwise number of days on which plant not working and % of total number of days in a period. The same compared with % in last 2 years for the same period.

(2) Actual average operating hours per day of the plant pumpwise for a particular period and average service hours per day. Same compared with data for last two years.

(3) Production in total KL per pump and in total for the scheme for a period as compared with production during the same period in the last 2 years.

(4) Periodic reporting of actual distribution in KL to various points arrived at by installation of bulk meters and calculation of wastage in total and as a %. Result to be compared with last two similar studies.

(5) Schemewise number of days on which chemical tests not carried out and corresponding chlorine content in those days.

(6) Analysis of complaints received and arriving at % for each category in relation to the total number of complaints.

(7) Arriving at cost per KL of water produced, distributed and sold split into direct costs, indirect costs and depreciation.

(8) Comparing revenue demanded/received per KL with cost per KL.

(9) Analysis of costs into variable and fixed and deriving contribution per KL.

A similar MIS can be prepared for a 'block' of hand pumps.

7.5 An yearly analysis of these MIS can be done, which can be an important input to the budgeting exercise. These MIS can also point to major repairs that need to be carried out on schemes. Further inter-scheme comparison in the same division/circle can be attempted to decide on schemes where revenues have to improve or costs are to be controlled.

7.6 Circlewise, consolidated costs per KL of water produced, distributed and sold (for piped and hand pumps separately) should be sent to region and to Lucknow head quarters. These will be important pointers for tariff suggestions and for identifying problem locations for cost control.

8. CONCLUSION

8.1 The report so far has presented the background to the study, actual and real cost of O&M and an analysis of the problems in O&M of rural piped and hand pump schemes. Even thgouh this study does not intend to project the results of the study to UPJN as a whole, the problems may be similar.

8.2 In the following paragraphs a few suggestions to correct some of the problems facing UPJN have been recommended. As told earlier, these are not based on a socio-economic survey and hence have to be read in that light.

OVERVIEW OF SUGGESTIONS

8.3 The suggestions are essentially aimed at

- proper evaluation of schemes at design stage
- critical importance to evaluation of O&M costs and revenues before scheme finalisation
- better revenues through taxes
- involving voluntary organisations / private contractors in O&M.

The objective should be to take up only those schemes which are financially viable and where O&M will be the responsibility of local bodies or voluntary organisations. These drastic steps are needed to make UPJN a self sustaining commercial organisation.

SUGGESTIONS

8.4 The suggestions for overcoming some of the identified problems are listed below. These have to studied more carefully and supported by field studies before a final decision can be taken.

(1) A comprehensive education effort to tell the population about the need for safe drinking water and the consequences if this is not available. The need to pay for water should also be emphasised.

(2) The decision to have a rural water supply scheme (either piped or hand pumps) should be made by the population represented by the local bodies. The local bodies should then approach the UPJN for taking up the scheme. UPJN should take up the scheme only after an undertaking that maintenance will be the responsibility of the local body concerned. The responsibility of UPJN will be to execute the scheme and hand it over for O&M.

(3) It may be essential to involve the people right from the planning and design stages of the project. This may be in identifying location of pumps, stand posts, hours of supply needed, area to be covered etc. A few persons identified at this stage from the population can later be involved in O&M.

(4) Conducting a socio-economic survey before a scheme is approved. This is essential to get a feel for need for water, ability to pay, intention to pay and other social factors which have a strong bearing on a sensitive issue like provision of water supply. The survey should be a prerequisite for approval of the scheme, say if the scheme value is above a certain limit.

(5) Due to lower cost recovery, lesser money will be spent on O&M of schemes, which will have a bearing on the quality of service and hence on the collection efficiency. The revenues and O&M costs of a scheme should be closely evaluated during the planning stage itself and the sensitivity of the same to critical parameters like inflation, tariffs, wastage factor etc. need to be studied. The results of the evaluation should justify taking up the scheme. Development of a O&M financial model may be taken up for the purpose.

(6) Voluntary organisations may be asked to take up O&M of rural water supply schemes. These organisations may be asked to make each scheme self sustaining. Some of these organisations are available at village/ district levels.

(7) The O&M of rural water supply schemes may be given to private contractors who will also have responsibility for revenue collection. It may also be worthwhile to include the private contractors in design and construction of the schemes.

(8) For existing schemes, there is a tariff fixed for public stand posts also. Efforts may be taken to recover these charges from the households, which may have a good bearing on the cost recovery. The responsibility of recovering the PSP charges may be given to the local bodies.

(9) Recovering a portion of the costs through a 'Tax' on all households in the village - both for handpump and piped schemes. Since there seems to be a basic lack of inclination in paying for water, this may be an indirect way of recovery. The modalities for this 'Tax' needs to be worked out.

(10) It is to be remembered that all assets have a life span. They need to be replaced or extended. It is important to recover depreciation charges also in order to ensure availability of funds for replacements/extensions.

(11) There is need for a closer monitoring of O&M costs at various levels through improved Management Information Systems (MIS).

(12) A periodic analysis of actual distribution at various points may be made for each piped scheme by installing bulk meters for a fixed number of days. This will also be useful in analysing wastage and the problems in the distribution lines.

CONCLUSION

8.4 It is near impossible for a commercial organisation like UPJN to achieve the twin objectives of providing service and also breakeven on costs. The situation on O&M is quite alarming and immediate steps are needed to ensure better recovery of costs. The experience gained in the past should become inputs for future planning through better evaluation of schemes and critical importance given to review O&M costs and revenues.

QUESTIONNAIRES

U.P.JAL NIGAM

REVIEW OF O&M COSTS OF SELECT SCHEMES (PIPED WATER SUPPLY) QUESTIONNAIRE

REVIEW OF O&M COST QUESTIONNAIRE

NAME OF THE SCHEME :

DIVISION :

SUB DIVISION :

SECTION :

I. GENERAL:

1. Scheme completed in the year :
   Number of years for completion :

2. Source of Water for the scheme :
   (a) Tube well
   (b) River (Specify name)
   (c) Ponds
   (d) others (Specify)

3. If surface water, storage capacity. :

4. Final project parameters :
   (a) Supply areas to be covered.
   (b) Villages to be covered
   (c) Total population in the area
   (d) Population coverage
   (e) Pumping stations and their capacity.
   (f) Overhead tanks and their storage capacity
   (g) Length of distribution lines.
   (h) Number of connections planned
       - metered
       - unmetered
   (i) Number of public stand posts planned.
   (j) Expected levelled water production (kld)

(k) Expected leveled water distribution (kld)

(l) Wastage anticipated (kld)

(m) Lpcd assumed.

5. Final project cost particulars :

Cost component	Rs. (lacs)
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	
Total:	

6. Finding pattern for the scheme :

Financed By	Amount (Rs. lacs)

7. Anticipated O&M Cost
(at the time of project finalisation)

Head of account	Year 1	Year 2	Year 3	Year4	Year5

Cost per Kl. of production :

Cost per Kl of distribution:

8. Cost of expansion of the scheme (if any) : Total Rs.

YEAR	Rs. (Lacs)

Targetted benefits

(a) Population coverage :

(b) Villages coverage :

(c) Number of connection :

(d) Number of stand posts :

9. Manpower required for O&M of the scheme : Total

Sl. No.	Level of person	Number of persons	Desires Qualification

II. SCHEME/YEAR SPECIFIC

(details for the years 1989-90, 1990-91, 1991-92)

	1989-90	1990-91	1991-92
A. PHYSICAL PARAMETERS			
1. Villages covered	:		
2. Population covered	:		
3. Population not covered	:		
4. Total number of connections			
(a) domestic metered			
(b) domestic unmetered			
(c) industrial/commercial (metered)			
(d) others - metered			
(e) others - unmetered			
5. Number of public stand posts.	:		

1989-90 1990-91 1991-92

6. Number of working meters
   (a) domestic
   (b) industrial/commercial
   (c) others.

7. Actual operating hours of the pumping station. :

8. Rate of pumping per hour(ltrs) :

9. Calculated production (kl)
   (mention the number of days on which pumping station was working ---- ---- ----)

10. Hours of supply maintained (or an average perday) :

11. Water distribution (kl)
   (a) domestic metered
   (b) domestic unmetered
   (c) industrial/commercial
   (d) others metered
   (e) others un-metered
   (f) Public stand posts

   NOTE: (Mention below the method of calculating the distribution)

12. Wastage of water (total Kl.)

   Reasons (with %)
   (a) Normal
   (b) leakages
   (c) Illegal tapping
   (d) others specify.

13. Estimation of lpcd.

B.	FINANCIAL PARAMETERS (in Rs.) REVENUES	1989-90	1990-91	1991-92
1.	Water charges demanded			
	(a) domestic metered			
	(b) domestic unmetered			
	(c) industrial/commercial			
	(d) others.			
	Total :			
2.	Tariff structure (Enclose for the three years)			
3.	Revenues collected			
	(a) domestic metered			
	(b) domestic unmetered			
	(c) industrial/commercial			
	(d) others.			
	Total :			
4.	What would have been the demand if all domestic/ industrial connections were metered?			
5.	Arrears of demand			
	(a) domestic metered			
	(b) domestic unmetered			
	(c) industrial/commercial			
	(d) others.			
	Total:			
	What % of total arrears will be greater than 3 years.			
6.	Other income collected (specify by name)			

C. OPERATION & MAINTENANCE COSTS — 1989-90 | 1990-91 | 1991-92

SALARIES/WAGES

1. Manpower employed on the scheme

- Direct
- Indirect
- Total

Details

LEVEL	Direct/ Indirect	Skilled/ Unskilled	% Time on O & M
TOTAL			

Note: 1. For casual labourers, indicate no. of days for which used.

2. Skilled & unskilled particulars may be given only for WCE.

2. Actual manpower cost at levels defined in (1)

LEVEL	Total (in Rs.)
Total:	

NOTE: 1. If for some levels the costs are directly included in some other head of account, kindly indicate actual cost and also the fact that the same is included in another head of account and specify the head of account.

1989-90 1990-91 1991-92

(3) Actual direct manpowercost by sub head of account

SUB HEAD	
Total-	

(4) Extent of manpower cost as paid in each year.

(C)

POWER	1989-90	1990-91	1991-92
(1) House power of the pumping station.			
(2) Rate charged by EB (enclose tariff for last 3 years)			
(3) Minimum amount chargeable by EB(Rs)per month			
(4) Value of Bills received from EB			
(5) Power charges paid			
(6) Calculated power consumption based on hours pumped & HP.			
(7) Calculated power charges.			

CHEMICALS

(1) Quantity of chemicals consumed:

Item	Unit of Measure	

(C)

CHEMICALS(CONTD) 1989-90 1990-91 1991-92

(2) Actual cost of chemicals consumed - Total(Rs)

ITEM			

(3) Norms for usage per KL of production

ITEM			

(4) Average prices of chemicals-~~east~~ each year

ITEM	1989-90	1990-91	1991-92

(5) Stock of major chemicals in quantity as at 30/9 every year.

ITEM	Unit of Measure	

REPAIRS AND MAINTENANCE COST

(1) Specify various kinds of maintenance and repair carriedout and for each.

- The material and quantity of the same required
- The time required to be spat by U.P.Jal Nigam.

	1989-90	1990-91	1991-92

(2) Actual cost of repairs and maintenance(Total(Rs)

SUB HEAD	A METERIAL/ LABOUR	
TOTAL;		

Number of direct labour actually involved in R & M.

(3) Number of repair job carried out.

SUB HEAD	TYPE OF JOB	1989-90	1990-91	1991-92

(4) Number of days on which water not supplied and reasons therefore(in percentage terms).

(5) Estimate of repairs and maintenance cost as budgeted (what should have been the cost)

(b) Estimate of repair works to be carried out & value terms as a date.

EQUIPMENTS/VEHICLES	1989-90	1990-91	1991-92
(1) Equipments/Vehicles used in operation & maintenance and numbers used.			
(2) Year of procurement and cost of purchase of the above			
(3) % utilisation of the above for O & M.			

	1989-90	1990-91	1991-92

(4) Cost of maintenance of these equipments/cars.

- Total (Rs)

Cost per unit of usage (say hours for equipments and Kms. for cars).

GENERAL

(1) Difficulties faced by the scheme in O & M.

(List down the problems)

(2) Main resources for the low cost recovery.

(3) Suggestions on methods to improve recovery.

(4) Other remarks.

RECORDS MAINTAINED

Give a list of records maintained at various offices alongwith purpose for the same.

Kindly enclose the following(for 1989-90,1990-91, 1991-92

(1) Budget document

(2) Annual maintenance budget

(3) Capital budget

(4) Annual accounting statements

- P & L
- B/S

(5) Report on pilot studies on O & M.

(6) Find project cost document

U. P. JAL NIGAM

REVIEW OF O & M COST

OF HAND PUMP SCHEME

NOVERMBER 1992

REVIEW OF O & M COST OF HAND PUMPS

GENERAL

(1) Location of the Hand Pump

(2) Type of Hand Pump

(3) MARK II/ MARK III

(4) Year of installation and month

(5) Original cost — Basic price Rs.

Installation cost Rs. _____

Total:Rs. _____

(6) Proposed life of the pump :

(7) Cost funded by :

AT THE TIME OF INSTALLATION

(1) Area to be covered

(2) Population to be covered

(3) Lpcd assumed

(4) Production assumed(KLD)

MAJOR REPLACEMENTS CARRIED OUT AFTER INSTALLATION

(1) Year of replacement

(2) Cost of replacement

MANPOWER ANTICIPATED AS REQUIRED FOR MAINTENANCE

Level of person Indirect/direct Time per day in hours

~~per day in hours.~~

SPARE PARTS REQUIRED FOR MAINTENANCE-NORMS

METERIAL/SPARE	HOW OFTEN REQUIRED TO BE RE-PLACED	TYPE OF REPAIR

TIME REQUIRED TO BE SPENT FOR REPAIRS (HOURS TOBE SPENT)

TYPE OF REPAIR	LEVEL OF PEOPLE	HOURS TO BE SPEN

(Preventive maintenance should be included as a type of repair)

PHYSICAL PARAMETERS	1989-90	1990-91	1991-92
(1) Population covered			
(2) Lpcd assumed/expected			
(3) Water production (KLD)			
(4) Expected wastage of water as a % of production.			
(5) Number of days on which handpump was not working.			
(6) Reasons for non-working of the pump:	(percentage of total (5) above)		

REASONS

(7) Total number of handpump

- within the division
- within the jurisdiction of the JE concerned.

1989-90 1990-91 1991-92

O & M COST

MANPOWER

(1) Manpower employed on the pump :

LEVEL	DIRECT/ INDIRECT	SKILLED/ UNSKILLED

(2) Actual hours spent by the direct manpower for this handpump (from log book and job card) (includes both repair and maintenance)

(HOURS SPENT)

LEVEL *

(3) Total manhours available to the direct labour tobe spent on a group of hand pumps.

* For casual labour indicate mandays for which used in each year.

Manpower ( )	1989-90	1990-91	1991-92
Cost of Manpower -Total Rs.			
LEVEL			
INDIRECT			
DIRECT			

MATERIALS

Number/type of repair job carried out on the pump: TYPE OF REPAIRS	(Number of repairs)

(2) Spareparts used in repair of the Hand pump :

SPARE PART	1989-90	1990-91	1991-92
	(Numbers used)		

(3) Cost of Spare parts used

SPARE PART	(Costs)

(4)	Average Prices of Spare Parts	1989-90	1990-91	1991-92
	SPARE PART			

VEHICLES USED

(1) Extent of Kms run for maintenance of the pump

(2) Average cost per km of running the vehicle

(3) Cost of vehicle for hand pump maintenance

	INSPECTION	1989-90	1990-91	1991-92
(1)	Extent of time spent on inspection by various levels of people LEVEL		(hours spent)	
(2)	Total time spent by various levels of people in all hand pump maintenance LEVEL			

TOTAL MAINTENANCE COST FOR HAND PUMPS IN THE DIVISION

(1) Direct Cost of maintance

	1989-90	1990-91	1991-92
DIRECT COST			
a)			
B)			
c)			
d)			

(2) Total value of spare parts purchased for hand pumps maintenance

GENERAL	1989-90	1990-91	1991-92
(1) Number and type of complaints received on the handpump			
TYPE OF COMPLAINT			
(2) Problems faced in maintenance of hand pumps.			
(3) Suggestions for improvement			
(4) Records maintained for hand pump maintenance at various offices (indicate name of record and purpose)			

Kindly enclose Reports prepared by the division on
specific studies on cost on Hand Pumps
Yearly statement on cost of hand pumps
(last 3 years)

ANNEXURE II

LIST OF PEOPLE MET

ANNEXURE II

UP JAL NIGAM - O&M STUDY

LIST OF PEOPLE MET

1.	Mr. Robert Treitsch	Member, RSM
2.	Mr. R. S. Singh	Managing Director, UPJN
3.	Mr. Y.N. Chaturvedi	Chief Engineer, South + Dutch Co-ordinator
4.	Mr. V.P. Gupta	Chief Engineer at Lucknow
5.	Mr. S. K. Singh	SE, II, Circle, Allahabad
6.	Mr. R. K. Sharma	SE, VII Circle, Varanasi
7.	Mr. Mahendra Singh	EE, Construction Division, Allahabad
8.	Mr. N.C. Gupta	EE, Additional Construction Division, Allahabad
9.	Mr. J.B. Bats	EE, VI Construction Division, Allahabad
10.	Mr. S. K. Srivatsava	EE, Maiantenance Division, Varanasi
11.	Mr. P. N. Shukla	AEE, Saidabad Scheme, Allahabad
12.	Mr. R.P. Sharma	JE, Saidabad plant Allahabad
13.	Mr. S.K. Verma	AE, Hand pumps, Allabahad
14.	Mr. D.M.P. Singh	JE, Tikri, Varanasi
15.	Mr. Panna Lal	Divisional Accountant, Tikri, Varanasi

SET OF OUTPUTS

ANNEXURE III

UP JAL NIGAM INDO DUTCH PROJECT
REVIEW OF O&M COSTS

PIPED SCHEME: SAIDABAD

PARTICULARS	TOTALS						COST PER KL OF WATER PRODUCED			COST PER KL OF WATER DISTRIBUTED			COST PER KL OF WATER SOLD			COMPOSITION OF TOTAL		
	1989-90	% INC	1990-91	% INC	1991-92	% INC	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92
SUMMARY OF ACTUALS																		
(1) Direct cost	220100		231100	5.00%	199400	-13.72%	0.24	0.21	0.21	0.44	0.44	0.36	1.46	1.50	1.25	45.32%	39.14%	40.50%
(2) Indirect cost	69450		163250	135.06%	96800	-40.70%	0.08	0.15	0.10	0.14	0.31	0.18	0.46	1.06	0.61	14.30%	27.65%	19.66%
(3) Depreciation	196133		196133		196133		0.22	0.18	0.21	0.39	0.37	0.36	1.30	1.27	1.23	40.38%	33.22%	39.84%
(4) Interest				ERR		ERR												
Total	485683		590483	21.58%	492333	-16.62%	0.53	0.53	0.52	0.96	1.12	0.89	3.22	3.84	3.10	100.00%	100.00%	100.00%
(4) Income demanded	92000		97000	5.43%	158000	62.89%	0.10	0.09	0.17	0.18	0.18	0.29	0.61	0.63	0.99			
(5) Income collected	106000		108000	1.89%	162600	50.56%	0.12	0.10	0.17	0.21	0.20	0.29	0.70	0.70	1.02			
(6) Other income				ERR		ERR												
Total demanded	92000		97000	5.43%	158000	62.89%	0.10	0.09	0.17	0.18	0.18	0.29	0.61	0.63	0.99			
Total received	106000		108000	1.89%	162600	50.56%	0.12	0.10	0.17	0.21	0.20	0.29	0.70	0.70	1.02			
(7) Surplus/(Deficit) on demand	-393683		-493483	25.35%	-334333	-32.25%	-0.43	-0.45	-0.35	-0.78	-0.93	-0.61	-2.61	-3.21	-2.10			
(8) Surplus/(Deficit) on received	-379683		-482483	27.08%	-329733	-31.66%	-0.42	-0.44	-0.35	-0.75	-0.91	-0.60	-2.52	-3.14	-2.07			
Cost recovery on received	21.82%		18.29%	-16.20%	33.03%	80.57%												
SUMMARY OF REAL COSTS																		
(1) Direct cost	436317		488969	12.07%	518785	6.10%	0.48	0.44	0.55	0.86	0.93	0.94	2.89	3.18	3.26	62.16%	57.64%	63.91%
(2) Indirect cost	69450		163250	135.06%	96800	-40.70%	0.08	0.15	0.10	0.14	0.31	0.18	0.46	1.06	0.61	9.89%	19.24%	11.93%
(3) Depreciation	196133		196133		196133		0.22	0.18	0.21	0.39	0.37	0.36	1.30	1.27	1.23	27.94%	23.12%	24.16%
(3) Interest				ERR		ERR												
Total	701901		848352	20.87%	811719	-4.32%	0.77	0.77	0.86	1.39	1.61	1.47	4.65	5.51	5.10	100.00%	100.00%	100.00%
(4) Income demanded	92000		97000	5.43%	158000	62.89%	0.10	0.09	0.17	0.18	0.18	0.29	0.61	0.63	0.99			
(5) Income received	106000		108000	1.89%	162600	50.56%	0.12	0.10	0.17	0.21	0.20	0.29	0.70	0.70	1.02			
(6) Other income				ERR		ERR												
Total demanded	92000		97000	5.43%	158000	62.89%	0.10	0.09	0.17	0.18	0.18	0.29	0.61	0.63	0.99			
Total received	106000		108000	1.89%	162600	50.56%	0.12	0.10	0.17	0.21	0.20	0.29	0.70	0.70	1.02			
(7) Surplus/(Deficit) on demand	-609901		-751352	23.19%	-653719	-12.99%	-0.67	-0.68	-0.69	-1.21	-1.42	-1.18	-4.04	-4.88	-4.11			
(8) Surplus/(Deficit) on received	-595901		-740352	24.24%	-649119	-12.32%	-0.65	-0.67	-0.69	-1.18	-1.40	-1.18	-3.95	-4.81	-4.08			
Cost recovery on received	15.10%		12.73%	-15.70%	20.03%	57.33%												

UP JAL NIGAM INDO DUTCH PROJECT
REVIEW OF O&M COSTS

PIPED SCHEME: SAIDABAD

	TOTALS						COST PER KL OF WATER PRODUCED			COST PER KL OF WATER DISTRIBUTED			COST PER KL OF WATER SOLD			COMPOSITION OF TOTAL		
PARTICULARS	1989-90	% INC	1990-91	% INC	1991-92	% INC	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92
COMPONENTS OF COST-ACTUAL																		
(1) Manpower costs	202150		325600	61.07%	242150	-25.63%	0.22	0.29	0.26	0.40	0.62	0.44	1.34	2.12	1.52	41.62%	55.14%	49.18%
(2) Power				ERR		ERR												
(3) Chemicals	3100		3100		3400	9.68%	0.00	0.00	0.00	0.01	0.01	0.01	0.02	0.02	0.02	0.64%	0.52%	0.69%
(4) R & M materials	76000		56000	-26.32%	40000	-28.57%	0.08	0.05	0.04	0.15	0.11	0.07	0.50	0.36	0.25	15.65%	9.48%	8.12%
(5) Others	8300		9650	16.27%	10650	10.36%	0.01	0.01	0.01	0.02	0.02	0.02	0.06	0.06	0.07	1.71%	1.63%	2.16%
(6) Depreciation	196133		196133		196133		0.22	0.18	0.21	0.39	0.37	0.36	1.30	1.27	1.23	40.38%	33.22%	39.84%
(7) Interest				ERR		ERR												
Total	485683		590483	21.58%	492333	-16.62%	0.53	0.53	0.52	0.96	1.12	0.89	3.22	3.84	3.10	100.00%	100.00%	100.00%
(8) Centage				ERR		ERR												
Total	485683		590483	21.58%	492333	-16.62%	0.53	0.53	0.52	0.96	1.12	0.89	3.22	3.84	3.10			
COMPONENTS OF COST-REAL																		
(1) Manpower costs	202150		325600	61.07%	242150	-25.63%	0.22	0.29	0.26	0.40	0.62	0.44	1.34	2.12	1.52	28.80%	38.38%	29.83%
(2) Power	215902		256650	18.87%	317932	23.88%	0.24	0.23	0.34	0.43	0.49	0.58	1.43	1.67	2.00	30.76%	30.25%	39.17%
(3) Chemicals	3416		4319	26.44%	4854	12.38%	0.00	0.00	0.01	0.01	0.01	0.01	0.02	0.03	0.03	0.49%	0.51%	0.60%
(4) R & M materials	76000		56000	-26.32%	40000	-28.57%	0.08	0.05	0.04	0.15	0.11	0.07	0.50	0.36	0.25	10.83%	6.60%	4.93%
(5) Others	8300		9650	16.27%	10650	10.36%	0.01	0.01	0.01	0.02	0.02	0.02	0.06	0.06	0.07	1.18%	1.14%	1.31%
(6) Depreciation	196133		196133		196133		0.22	0.18	0.21	0.39	0.37	0.36	1.30	1.27	1.23	27.94%	23.12%	24.16%
(7) Interest				ERR		ERR												
Total	701901		848352	20.87%	811719	-4.32%	0.77	0.77	0.86	1.39	1.61	1.47	4.65	5.51	5.10	100.00%	100.00%	100.00%
(8) Centage				ERR		ERR												
Total	701901		848352	20.87%	811719	-4.32%	0.77	0.77	0.86	1.39	1.61	1.47	4.65	5.51	5.10			
PHYSICAL PARAMETERS																		
(1) Population covered																		
(a) Domestic metered				ERR	1920	ERR												
(b) Domestic unmetered	6704		6840	2.03%	5200	-23.98%												
(c) Industrial/comme..				ERR		ERR												
(d) Others metered				ERR		ERR												
(e) Others unmetered				ERR		ERR												
(f) Public stand posts	24296		25660	5.61%	26931	4.95%												
TOTAL	31000		32500		34051													

UP IAL NIGAM INDO DUTCH PROJECT
REVIEW OF O&M COSTS

PIPED SCHEME: SAIDABAD

PARTICULARS	TOTALS 1989-90	% INC	1990-91	% INC	1991-92	% INC	COST PER KL OF WATER PRODUCED 1989-90	1990-91	1991-92	COST PER KL OF WATER DISTRIBUTED 1989-90	1990-91	1991-92	COST PER KL OF WATER SOLD 1989-90	1990-91	1991-92	COMPOSITION OF TOTAL 1989-90	1990-91	1991-92
(2) Total connections																		
(a) Domestic metered				ERR	240	ERR												
(b) Domestic unmetered	838		855	2.03%	650	-23.98%												
(c) Industrial/commel..				ERR		ERR												
(d) Others metered				ERR		ERR												
(e) Others unmetered				ERR		ERR												
(3) Public standposts	195		210	7.69%	238	13.33%												
PUMP 1																		
(4) Pumping hours p.a	4354		4354		3608	-17.13%												
(5) Rate of pumping (lps)	2100		2100		2100													
(6) No. of days worked				ERR		ERR												
(7) Production (KL)	548604		548604		454608	-17.13%												
PUMP 2																		
(4) Pumping hours p.a	3096		4776	54.26%	4201	-12.04%												
(5) Rate of pumping (lps)	1950		1950		1950													
(6) No. of days worked				ERR		ERR												
(7) Production (KL)	362232		558792	54.26%	491517	-12.04%												
(7a) TOTAL PUMPING HRS	7450		9130	22.55%	7809	-14.47%												
(7b) TOTAL PRODUCTION IN KL	910836		1107396	21.58%	946125	-14.56%												
(8) Average consumption(lpd)																		
(a) Domestic metered				ERR		ERR												
(b) Domestic unmetered				ERR		ERR												
(c) Industrial/commel..				ERR		ERR												
(d) Others metered				ERR		ERR												
(e) Others unmetered				ERR		ERR												
(f) Public standposts				ERR		ERR												
(9) Water distribution(KL)																		
(a) Domestic metered				ERR	42048	ERR												
(b) Domestic unmetered	150840		153900	2.03%	117000	-23.98%												
(c) Industrial/commel..				ERR		ERR												
(d) Others metered				ERR		ERR												
(e) Others unmetered				ERR		ERR												
(f) Public standposts	354722		374636	5.61%	393193	4.95%												
TOTAL	505562		528536	4.54%	552241	4.48%												

UP JAL NIGAM INDO DUTCH PROJECT
REVIEW OF O&M COSTS

PIPED SCHEME: SAIDABAD

PARTICULARS	TOTALS 1989-90	% INC	1990-91	% INC	1991-92	% INC	COST PER KL OF WATER PRODUCED 1989-90	1990-91	1991-92	COST PER KL OF WATER DISTRIBUTED 1989-90	1990-91	1991-92	COST PER KL OF WATER SOLD 1989-90	1990-91	1991-92	COMPOSITION OF TOTAL 1989-90	1990-91	1991-92
(10) Water wastage(KL)	405274		578860	42.83%	393864	-31.96%												
(11) %Wastage on production	44.49%		52.27%	17.48%	41.62%	-20.36%												
(12) Water sold (KL)																		
(a) Domestic metered				ERR	42048	ERR												
(b) Domestic unmetered	150840		153900	2.03%	117000	-23.98%												
(c) Industrial/commel..				ERR		ERR												
(d) Others metered				ERR		ERR												
(e) Others unmetered				ERR		ERR												
(f) Public standposts				ERR		ERR												
TOTAL	150840		153900	2.03%	159048	3.35%												
(13) % sold on production	16.56%		13.90%		16.81%													
(14) Ipcd calculated																		
(a) Domestic metered	ERR		ERR	ERR	60	ERR												
(b) Domestic unmetered	62		62		62													
(c) Industrial/commel..	ERR		ERR	ERR	ERR	ERR												
(d) Others metered	ERR		ERR	ERR	ERR	ERR												
(e) Others unmetered	ERR		ERR	ERR	ERR	ERR												
(f) Public standposts	40		40		40													

UP JAL NIGAM INDO DUTCH PROJECT
REVIEW OF O&M COSTS

PIPED SCHEME: SAIDABAD

PARTICULARS	TOTALS 1989-90	% INC	1990-91	% INC	1991-92	% INC	COST PER KL OF WATER PRODUCED 1989-90	1990-91	1991-92	COST PER KL OF WATER DISTRIBUTED 1989-90	1990-91	1991-92	COST PER KL OF WATER SOLD 1989-90	1990-91	1991-92	COMPOSITION OF TOTAL 1989-90	1990-91	1991-92
FINANCIAL PARAMETERS																		
REVENUES																		
(1) Water charges demanded																		
(a) Domestic metered				ERR		ERR												
(b) Domestic unmetered	92000		97000	5.43%	158000	62.89%												
(c) Industrial/commel..				ERR		ERR												
(d) Others metered				ERR		ERR												
(e) Others unmetered				ERR		ERR												
TOTAL	92000		97000	5.43%	158000	62.89%												
(2) Charges collected																		
(a) Domestic metered				ERR	57600	ERR												
(b) Domestic unmetered	106000		108000	1.89%	105000	-2.78%												
(c) Industrial/commel..				ERR		ERR												
(d) Others metered				ERR		ERR												
(e) Others unmetered				ERR		ERR												
TOTAL	106000		108000	1.89%	162600	50.56%												
(3) Demand if all private connections were metered																		
(a) Domestic metered	151000		154000	1.99%	200000	29.87%												
(b) Domestic unmetered				ERR		ERR												
(c) Industrial/commel..				ERR		ERR												
(d) Others metered				ERR		ERR												
(e) Others unmetered				ERR		ERR												
TOTAL	151000		154000	1.99%	200000	29.87%												
(4) Arrears of demand																		
(a) Domestic metered				ERR		ERR												
(b) Domestic unmetered	132000		149000	12.88%	260000	74.50%												
(c) Industrial/commel..				ERR		ERR												
(d) Others metered				ERR		ERR												
(e) Others unmetered				ERR		ERR												
TOTAL	132000		149000	12.88%	260000	74.50%												
(5) Collection efficiency																		
(a) Domestic metered				ERR		ERR												
(b) Domestic unmetered				ERR		ERR												
(c) Industrial/commel..				ERR		ERR												
(d) Others metered				ERR		ERR												
(e) Others unmetered				ERR		ERR												
TOTAL EFFICIENCY	115.22%		111.34%	-3.37%	102.91%	-7.57%												

UP JAL NIGAM INDO DUTCH PROJECT
REVIEW OF O&M COSTS

PIPED SCHEME: SAIDABAD

PARTICULARS	TOTALS 1989-90	% INC	1990-91	% INC	1991-92	% INC	COST PER KL OF WATER PRODUCED 1989-90	1990-91	1991-92	COST PER KL OF WATER DISTRIBUTED 1989-90	1990-91	1991-92	COST PER KL OF WATER SOLD 1989-90	1990-91	1991-92	COMPOSITION OF TOTAL 1989-90	1990-91	1991-92
(6) No. days arrears																		
(a) Domestic metered	ERR		ERR	ERR	ERR	ERR												
(b) Domestic unmetered	524		561	7.06%	601	7.13%												
(c) Industrial/commel..	ERR		ERR	ERR	ERR	ERR												
(d) Others metered	ERR		ERR	ERR	ERR	ERR												
(e) Others unmetered	ERR		ERR	ERR	ERR	ERR												
(7) Other income				ERR		ERR												
(8) Total cash income	106000		108000	1.89%	162600	50.56%												
(9) Total real income	92000		97000	5.43%	158000	62.89%												
COSTS																		
(1) MANPOWER COSTS																		
A. Direct labour																		
(a) Pumping station	96000		126000	31.25%	106000	-15.87%	0.11	0.11	0.11	0.19	0.24	0.19	0.64	0.82	0.67			
(b) Distribution system	34000		40000	17.65%	44000	10.00%	0.04	0.04	0.05	0.07	0.08	0.08	0.23	0.26	0.28			
(c) Others	11000		6000	-45.45%	6000		0.01	0.01	0.01	0.02	0.01	0.01	0.07	0.04	0.04			
TOTAL	141000		172000	21.99%	156000	-9.30%	0.15	0.16	0.16	0.28	0.33	0.28	0.93	1.12	0.98			
B. Indirect labour(Total)																		
(a) EE	66000		75000	13.64%	78000	4.00%	0.07	0.07	0.08	0.13	0.14	0.14	0.44	0.49	0.49			
(b) AE	43000		87000	102.33%	60000	-31.03%	0.05	0.08	0.06	0.09	0.16	0.11	0.29	0.57	0.38			
(c) JE	30000		61000	103.33%	44000	-27.87%	0.03	0.06	0.05	0.06	0.12	0.08	0.20	0.40	0.28			
(d) Adm staff	518000		1699000	227.99%	717000	-57.80%	0.57	1.53	0.76	1.02	3.21	1.30	3.43	11.04	4.51			
TOTAL	657000		1922000	192.54%	899000	-53.23%	0.72	2.11	0.99	1.30	3.64	1.63	4.36	12.49	5.65			

UP JAL NIGAM INDO DUTCH PROJECT
REVIEW OF OWM COSTS

PIPED SCHEME: SAIDABAD

PARTICULARS	TOTALS 1989-90	% INC	1990-91	% INC	1991-92	% INC	COST PER KL OF WATER PRODUCED 1989-90	1990-91	1991-92	COST PER KL OF WATER DISTRIBUTED 1989-90	1990-91	1991-92	COST PER KL OF WATER SOLD 1989-90	1990-91	1991-92	COMPOSITION OF TOTAL 1989-90	1990-91	1991-92
C. Time spent by ind. %																		
(a) EE	5.00%		5.00%		5.00%		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
(b) AE	15.00%		15.00%		15.00%		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
(c) JE	85.00%		85.00%		85.00%		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
(d) Adm staff	5.00%		5.00%		5.00%		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
D. Cost of indirect labour																		
(a) EE	3300		3750	13.64%	3900	4.00%	0.00	0.00	0.00	0.01	0.01	0.01	0.02	0.02	0.02			
(b) AE	6450		13050	102.33%	9000	-31.03%	0.01	0.01	0.01	0.01	0.02	0.02	0.04	0.08	0.06			
(c) JE	25500		51850	103.33%	37400	-27.87%	0.03	0.05	0.04	0.05	0.10	0.07	0.17	0.34	0.24			
(d) Adm staff	25900		84950	227.99%	35850	-57.80%	0.03	0.08	0.04	0.05	0.16	0.06	0.17	0.55	0.23			
TOTAL	61150		153600	151.19%	86150	-43.91%	0.07	0.14	0.09	0.12	0.29	0.16	0.41	1.00	0.54			
E. Casual labourers	3600		5000	38.89%		-100.00%	0.00	ERR		0.01	ERR		0.02	ERR				
F. Total manpower cost																		
(a) Direct	141000		172000	21.99%	156000	-9.30%	0.15	0.16	0.16	0.28	0.33	0.28	0.93	1.12	0.98			
(b) Indirect	61150		153600	151.19%	86150	-43.91%	0.07	0.14	0.09	0.12	0.29	0.16	0.41	1.00	0.54			
TOTAL	202150		325600	61.07%	242150	-25.63%	0.22	0.29	0.26	0.40	0.62	0.44	1.34	2.12	1.52			
G. Cost not paid																		
(a) Direct				ERR		ERR												
(b) Indirect				ERR		ERR												
H. Real cost of manpower																		
(a) Direct	141000		172000	21.99%	156000	-9.30%	0.15	0.16	0.16	0.28	0.33	0.28	0.93	1.12	0.98			
(b) Indirect	61150		153600	151.19%	86150	-43.91%	0.07	0.14	0.09	0.12	0.29	0.16	0.41	1.00	0.54			
TOTAL	202150		325600	61.07%	242150	-25.63%	0.22	0.29	0.26	0.40	0.62	0.44	1.34	2.12	1.52			
(2) POWER COSTS																		
HP RATING - PUMP 1 40																		
HP RATING - PUMP 2 30																		
A. Bills received	85000		91000	7.06%	97700	7.36%	0.09	0.08	0.10	0.17	0.17	0.18	0.56	0.59	0.61			
B. Bills paid				ERR		ERR												
C. Actual consumption																		
PUMP 1	128008		128008		106075	-17.13%	0.14	0.12	0.11	0.25	0.24	0.19	0.85	0.83	0.67			
PUMP 2	68267		105311	54.26%	92632	-12.04%	0.07	0.10	0.10	0.14	0.20	0.17	0.45	0.68	0.58			
C. Rate per unit	1.10		1.10		1.60	45.45%												

UP JAL NIGAM INDO DUTCH PROJECT
REVIEW OF O&M COSTS

PIPED SCHEME: SAIDABAD

PARTICULARS	TOTALS 1989-90	% INC	1990-91	% INC	1991-92	% INC	COST PER KL OF WATER PRODUCED 1989-90	1990-91	1991-92	COST PER KL OF WATER DISTRIBUTED 1989-90	1990-91	1991-92	COST PER KL OF WATER SOLD 1989-90	1990-91	1991-92	COMPOSITION OF TOTAL 1989-90	1990-91	1991-92
D. Actual power charges																		
PUMP 1	140808		140808		169720	20.53%	0.15	0.13	0.18	0.28	0.27	0.31	0.93	0.91	1.07			
PUMP 2	75093		115842	54.26%	148211	27.94%	0.08	0.10	0.16	0.15	0.22	0.27	0.50	0.75	0.93			
TOTAL	215902		256650	18.87%	317932	23.88%	0.24	0.23	0.34	0.43	0.49	0.58	1.43	1.67	2.00			
(3) CHEMICALS COST																		
A. BLEACHING POWDER																		
a. Actual cost	3100		3100		3400	9.68%	0.00	0.00	0.00	0.01	0.01	0.01	0.02	0.02	0.02			
b. Nore in grams per KL	1		1		1													
c. Average price (KG)	3.75		3.90	4.00%	5.13	31.54%												
d. Real cost of chemicals	3416		4319	26.44%	4854	12.38%	0.00	0.00	0.01	0.01	0.01	0.01	0.02	0.03	0.03			
e. Stock (qty in Kgs)				ERR		ERR												
f. Number of days stock				ERR		ERR												
(4) REPAIRS & MAINTENANCE																		
A. Material cost																		
(a) Pumping station	26000		24000	-7.69%	19000	-20.83%	0.03	0.02	0.02	0.05	0.05	0.03	0.17	0.16	0.12			
(b) Distribution system	46000		32000	-30.43%	21000	-34.38%	0.05	0.03	0.02	0.09	0.06	0.04	0.30	0.21	0.13			
(c) Overhead tanks				ERR		ERR												
(d) Others	4000			-100.00%		ERR	0.00			0.01			0.03					
TOTAL	76000		56000	-26.32%	40000	-28.57%	0.08	0.05	0.04	0.15	0.11	0.07	0.50	0.36	0.25			
B. Labour cost																		
(a) Pumping station				ERR		ERR												
(b) Distribution system				ERR		ERR												
(c) Overhead tanks				ERR		ERR												
(d) Others				ERR		ERR												
TOTAL				ERR		ERR												
C. Total cost																		
(a) Pumping station	26000		24000	-7.69%	19000	-20.83%	0.03	0.02	0.02	0.05	0.05	0.03	0.17	0.16	0.12			
(b) Distribution system	46000		32000	-30.43%	21000	-34.38%	0.05	0.03	0.02	0.09	0.06	0.04	0.30	0.21	0.13			
(c) Overhead tanks				ERR		ERR												
(d) Others	4000			-100.00%		ERR	0.00			0.01			0.03					
TOTAL	76000		56000	-26.32%	40000	-28.57%	0.08	0.05	0.04	0.15	0.11	0.07	0.50	0.36	0.25			

UP JAL NIGAM INDO DUTCH PROJECT
REVIEW OF O&M COSTS

PIPED SCHEME: SAIDABAD

PARTICULARS	TOTALS						COST PER KL OF WATER PRODUCED			COST PER KL OF WATER DISTRIBUTED			COST PER KL OF WATER SOLD			COMPOSITION OF TOTAL		
	1989-90	% INC	1990-91	% INC	1991-92	% INC	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92
D. Maintenance budget																		
(a) Pumping station				ERR		ERR												
(b) Distribution system				ERR		ERR												
(c) Overhead tanks				ERR		ERR												
(d) Others				ERR		ERR												
TOTAL				ERR		ERR												
(4) OTHER COSTS																		
A. Equipments																		
(a) Total cost				ERR		ERR												
(b) % for O&M																		
(c) O&M cost				ERR		ERR												
B. Vehicles																		
(a) Total cost	3300		3900	18.18%	4400	12.82%	0.00	0.00	0.00	0.01	0.01	0.01	0.02	0.03	0.03			
(b) % for O&M	100.00%		100.00%		100.00%													
(c) O&M cost	3300		3900	18.18%	4400	12.82%	0.00	0.00	0.00	0.01	0.01	0.01	0.02	0.03	0.03			
C. Others	5000		5750	15.00%	6250	8.70%	0.01	0.01	0.01	0.01	0.01	0.01	0.03	0.04	0.04			
TOTAL	8300		9650	16.27%	10650	10.36%	0.01	0.01	0.01	0.02	0.02	0.02	0.06	0.06	0.07			
(6) DEPRECIATION	196133		196133		196133		0.22	0.18	0.21	0.39	0.37	0.36	1.30	1.27	1.23			
(7) INTEREST				ERR		ERR												

UP JAL NIGAM INDO DUTCH PROJECT
REVIEW OF O&M COSTS

PIPED SCHEME: SAIDABAD

PARTICULARS	TOTALS						COST PER KL OF WATER PRODUCED			COST PER KL OF WATER DISTRIBUTED			COST PER KL OF WATER SOLD			COMPOSITION OF TOTAL		
	1989-90	% INC	1990-91	% INC	1991-92	% INC	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92
REAL COST BASIS																		
TOTAL REVENUE	92000		97000	5.43%	158000	62.89%	0.10	0.09	0.17	0.18	0.18	0.29	0.61	0.63	0.99			
VARIABLE COST																		
(a) Power	215902		256650	18.87%	317932	23.88%	0.24	0.23	0.34	0.43	0.49	0.58	1.43	1.67	2.00	30.76%	30.25%	39.17%
(b) Chemicals	3416		4319	26.44%	4854	12.38%	0.00	0.00	0.01	0.01	0.01	0.01	0.02	0.03	0.03	0.49%	0.51%	0.60%
(c) Repair materials	76000		56000	-26.32%	40000	-28.57%	0.08	0.05	0.04	0.15	0.11	0.07	0.50	0.36	0.25	10.83%	6.60%	4.93%
(d) Casuals				ERR		ERR												
Total	295317		316969	7.33%	362785	14.45%	0.32	0.29	0.38	0.58	0.60	0.66	1.96	2.06	2.28	42.07%	37.36%	44.69%
CONTRIBUTION	-203317		-219969	8.19%	-204785	-6.90%	-0.22	-0.20	-0.22				-1.35	-1.43	-1.29			
FIXED COST																		
(a) Manpower	202150		325600	61.07%	242150	-25.63%	0.22	0.29	0.26	0.40	0.62	0.44	1.34	2.12	1.52	28.80%	38.38%	29.83%
(b) Others	8300		9650	16.27%	10650	10.36%	0.01	0.01	0.01	0.02	0.02	0.02	0.06	0.06	0.07	1.18%	1.14%	1.31%
(c) Depreciation	196133		196133		196133		0.22	0.18	0.21	0.39	0.37	0.36	1.30	1.27	1.23	27.94%	23.12%	24.16%
(d) Interest				ERR		ERR												
Total	406583		531383	30.69%	448933	-15.52%	0.45	0.48	0.47	0.80	1.01	0.81	2.70	3.45	2.82	57.93%	62.64%	55.31%
SURPLUS/DEFICIT	-609901		-751352	23.19%	-653719	-12.99%	-0.67	-0.68	-0.69	-1.21	-1.42	-1.18	-4.04	-4.88	-4.11			
TOTAL COST (FIXED COST+WC)	701901		848352	20.87%	811719	-4.32%	0.77	0.77	0.86	1.39	1.61	1.47	4.65	5.51	5.10	100.00%	100.00%	100.00%

UP JAL NIGAM INDO DUTCH PROJECT
REVIEW OF O&M COSTS

PIPED SCHEME: TIKRI

PARTICULARS	TOTALS						COST PER KL OF WATER PRODUCED			COST PER KL OF WATER DISTRIBUTED			COST PER KL OF WATER SOLD			COMPOSITION OF TOTAL		
	1989-90	% INC	1990-91	% INC	1991-92	% INC	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-9	1990-9.	199.-92
SUMMARY OF ACTUALS																		
(1) Direct cost	274550		352500	28.39%	424565	20.44%	0.20	0.25	0.30	0.26	0.36	0.44	1.68	2.22	2.02	42.44%	43.71%	51.94%
(2) Indirect cost	62345		144035	131.03%	82830	-42.49%	0.04	0.10	0.06	0.06	0.15	0.09	0.38	0.91	0.39	9.64%	17.86%	10.13%
(3) Depreciation	310000		310000		310000		0.22	0.22	0.22	0.29	0.31	0.32	1.90	1.96	1.47	47.92%	38.44%	37.93%
(4) Interest				ERR		ERR												
Total	646895		806535	24.68%	817395	1.35%	0.46	0.58	0.58	0.61	0.82	0.85	3.97	5.10	3.88	100.00%	100.00%	100.00%
(4) Income demanded	163000		158000	-3.07%	206000	30.38%	0.12	0.11	0.15	0.15	0.16	0.21	1.00	1.00	0.98			
(5) Income collected	94000		90000	-4.26%	124000	37.78%	0.07	0.06	0.09	0.09	0.09	0.13	0.58	0.57	0.59			
(6) Other income				ERR		ERR												
Total demanded	163000		158000	-3.07%	206000	30.38%	0.12	0.11	0.15	0.15	0.16	0.21	1.00	1.00	0.98			
Total received	94000		90000	-4.26%	124000	37.78%	0.07	0.06	0.09	0.09	0.09	0.13	0.58	0.57	0.59			
(7) Surplus/(Deficit) on demand	-483895		-648535	34.02%	-611395	-5.73%	-0.35	-0.47	-0.43	-0.46	-0.66	-0.63	-2.97	-4.10	-2.90			
(8) Surplus/(Deficit) on received	-552895		-716535	29.60%	-693395	-3.23%	-0.40	-0.51	-0.49	-0.52	-0.73	-0.72	-3.39	-4.54	-3.29			
Cost recovery on received	14.53%		11.16%	-23.21%	15.17%	35.95%												
SUMMARY OF REAL COSTS																		
(1) Direct cost	681335		754482	10.74%	1017338	34.87%	0.49	0.54	0.72	0.65	0.77	1.05	4.18	4.78	4.83	64.66%	62.43%	72.15%
(2) Indirect cost	62345		144035	131.03%	82830	-42.49%	0.04	0.10	0.06	0.06	0.15	0.09	0.38	0.91	0.39	5.92%	11.92%	5.87%
(3) Depreciation	310000		310000		310000		0.22	0.22	0.22	0.29	0.31	0.32	1.90	1.96	1.47	29.42%	25.65%	21.98%
(3) Interest				ERR		ERR												
Total	1053680		1208517	14.69%	1410368	16.70%	0.76	0.87	1.00	1.00	1.23	1.46	6.46	7.65	6.70	100.00%	100.00%	100.00%
(4) Income demanded	163000		158000	-3.07%	206000	30.38%	0.12	0.11	0.15	0.15	0.16	0.21	1.00	1.00	0.98			
(5) Income received	94000		90000	-4.26%	124000	37.78%	0.07	0.06	0.09	0.09	0.09	0.13	0.58	0.57	0.59			
(6) Other income				ERR		ERR												
Total demanded	163000		158000	-3.07%	206000	30.38%	0.12	0.11	0.15	0.15	0.16	0.21	1.00	1.00	0.98			
Total received	94000		90000	-4.26%	124000	37.78%	0.07	0.06	0.09	0.09	0.09	0.13	0.58	0.57	0.59			
(7) Surplus/(Deficit) on demand	-890680		-1050517	17.93%	-1204368	14.65%	-0.64	-0.75	-0.85	-0.85	-1.07	-1.25	-5.46	-6.65	-5.72			
(8) Surplus/(Deficit) on received	-959680		-1118517	16.55%	-1286368	15.01%	-0.69	-0.80	-0.91	-0.91	-1.13	-1.33	-5.89	-7.08	-6.11			
Cost recovery on received	8.92%		7.45%	-16.52%	8.79%	18.06%												

UP JAL NIGAM INDO DUTCH PROJECT
REVIEW OF O&M COSTS

PIPED SCHEME: TIKRI

PARTICULARS	TOTALS					COST PER KL OF WATER PRODUCED			COST PER KL OF WATER DISTRIBUTED			COST PER KL OF WATER SOLD			COMPOSITION OF TOTAL		
	1989-90	% INC	1990-91	% INC	1991-92	% INC	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92
COMPONENTS OF COST-ACTUAL																		
(1) Manpower costs	227800		321600	41.18%	264750	-17.68%	0.16	0.23	0.19	0.22	0.33	0.27	1.40	2.04	1.26	35.21%	39.87%	32.39%
(2) Power				ERR		ERR												
(3) Chemicals	1000		6000	500.00%	7000	16.67%	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.04	0.03	0.15%	0.74%	0.86%
(4) R & M materials	98550		161500	63.88%	226565	40.29%	0.07	0.12	0.16	0.09	0.16	0.23	0.60	1.02	1.08	15.23%	20.02%	27.72%
(5) Others	9545		7435	-22.11%	9080	22.13%	0.01	0.01	0.01	0.01	0.01	0.01	0.06	0.05	0.04	1.48%	0.92%	1.11%
(6) Depreciation	310000		310000		310000		0.22	0.22	0.22	0.29	0.31	0.32	1.90	1.96	1.47	47.92%	38.44%	37.93%
(7) Interest				ERR		ERR												
Total	646895		806535	24.68%	817395	1.35%	0.46	0.58	0.58	0.61	0.82	0.85	3.97	5.10	3.88	100.00%	100.00%	100.00%
(8) Centage				ERR		ERR												
Total	646895		806535	24.68%	817395	1.35%	0.46	0.58	0.58	0.61	0.82	0.85	3.97	5.10	3.88			
COMPONENTS OF COST-REAL																		
(1) Manpower costs	227800		321600	41.18%	264750	-17.68%	0.16	0.23	0.19	0.22	0.33	0.27	1.40	2.04	1.26	21.62%	26.61%	18.77%
(2) Power	402557		402545	0.00%	592733	47.25%	0.29	0.29	0.42	0.38	0.41	0.61	2.47	2.55	2.81	38.20%	33.31%	42.03%
(3) Chemicals	5228		5437	4.00%	7240	33.16%	0.00	0.00	0.01	0.00	0.01	0.01	0.03	0.03	0.03	0.50%	0.45%	0.51%
(4) R & M materials	98550		161500	63.88%	226565	40.29%	0.07	0.12	0.16	0.09	0.16	0.23	0.60	1.02	1.08	9.35%	13.36%	16.06%
(5) Others	9545		7435	-22.11%	9080	22.13%	0.01	0.01	0.01	0.01	0.01	0.01	0.06	0.05	0.04	0.91%	0.62%	0.64%
(6) Depreciation	310000		310000		310000		0.22	0.22	0.22	0.29	0.31	0.32	1.90	1.96	1.47	29.42%	25.65%	21.9%
(7) Interest				ERR		ERR												
Total	1053680		1208517	14.69%	1410368	16.70%	0.76	0.87	1.00	1.00	1.23	1.46	6.46	7.65	6.70	100.00%	100.00%	100.00%
(8) Centage				ERR		ERR												
Total	1053680		1208517	14.69%	1410368	16.70%	0.76	0.87	1.00	1.00	1.23	1.46	6.46	7.65	6.70			
PHYSICAL PARAMETERS																		
(1) Population covered																		
(a) Domestic metered			10240	ERR	10416	1.72%												
(b) Domestic unmetered	8840			-100.00%	784	ERR												
(c) Industrial/commel..				ERR		ERR												
(d) Others metered				ERR		ERR												
(e) Others unmetered				ERR		ERR												
(f) Public stand posts	41500		47430	14.29%	47800	0.78%												
TOTAL	50340		57670	14.56%	59000	2.31%												

UP JAL NIGAM INDO DUTCH PROJECT
REVIEW OF O&M COSTS

PIPED SCHEME: TIKRI

PARTICULARS	TOTALS						COST PER KL OF WATER PRODUCED			COST PER KL OF WATER DISTRIBUTED			COST PER KL OF WATER SOLD			COMPOSITION OF TOTAL		
	1989-90	% INC	1990-91	% INC	1991-92	% INC	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92
(2) Total connections																		
(a) Domestic metered			1280	ERR	1302	1.72%												
(b) Domestic unmetered	1105			-100.00%	98	ERR												
(c) Industrial/commel..				ERR		ERR												
(d) Others metered				ERR		ERR												
(e) Others unmetered				ERR		ERR												
(3) Public standposts	219		219		219													
PUMP 1																		
(4) Pumping hours p.a	5162		5163	0.02%	5884	13.95%												
(5) Rate pf pumping (lps)	2100		2100		2100													
(6) No. of days worked	327		327		346	5.81%												
(7) Production (KL)	650444		650580	0.02%	741334	13.95%												
PUMP 2																		
(4) Pumping hours p.a	5902		5901	-0.02%	5317	-9.90%												
(5) Rate pf pumping (lps)	2100		2100		2100													
(6) No. of days worked	349		349		319	-8.60%												
(7) Production (KL)	743695		743515	-0.02%	669936	-9.90%												
(7a) TOTAL PUMPING HRS	11065		11064	0.00%	11201	1.23%												
(7b) TOTAL PRODUCTION IN KL	1394138		1394094	0.00%	1411269	1.23%												
(8) Average consumption(lpd)																		
(a) Domestic metered				ERR		ERR												
(b) Domestic unmetered				ERR		ERR												
(c) Industrial/commel..				ERR		ERR												
(d) Others metered				ERR		ERR												
(e) Others unmetered				ERR		ERR												
(f) Public standposts				ERR		ERR												
(9) Water distribution(KL)																		
(a) Domestic metered			158000	ERR	196000	24.05%												
(b) Domestic unmetered	163000			-100.00%	14594	ERR												
(c) Industrial/commel..				ERR		ERR												
(d) Others metered				ERR		ERR												
(e) Others unmetered				ERR		ERR												
(f) Public standposts	889164		827623	-6.92%	754597	-8.82%												
TOTAL	1052164		985623	-6.32%	965191	-2.07%												

UP JAL NIGAM INDO DUTCH PROJECT
REVIEW OF O&M COSTS

PIPED SCHEME: TIKRI

PARTICULARS	TOTALS						COST PER KL OF WATER PRODUCED			COST PER KL OF WATER DISTRIBUTED			COST PER KL OF WATER SOLD			COMPOSITION OF TOTAL		
	1989-90	% INC	1990-91	% INC	1991-92	% INC	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92
(10) Water wastage(KL)	341974		408471	19.44%	446078	9.21%												
(11) %Wastage on production	24.53%		29.30%	19.45%	31.61%	7.88%												
(12) Water sold (KL)																		
(a) Domestic metered			158000	ERR	196000	24.05%												
(b) Domestic unmetered	163000			-100.00%	14594	ERR												
(c) Industrial/commel..				ERR		ERR												
(d) Others metered				ERR		ERR												
(e) Others unmetered				ERR		ERR												
(f) Public standposts				ERR		ERR												
TOTAL	163000		158000	-3.07%	210594	33.29%												
(13) % sold on production	11.69%		11.33%		14.92%													
(14) lpcd calculated																		
(a) Domestic metered	ERR		42	ERR	52	21.95%												
(b) Domestic unmetered	51		ERR	ERR	51	ERR												
(c) Industrial/commel..	ERR		ERR	ERR	ERR	ERR												
(d) Others metered	ERR		ERR	ERR	ERR	ERR												
(e) Others unmetered	ERR		ERR	ERR	ERR	ERR												
(f) Public standposts	59		48	-18.56%	43	-9.53%												

UP JAL NIGAM INDO DUTCH PROJECT
REVIEW OF O&M COSTS

PIPED SCHEME: TIKRI

PARTICULARS	TOTALS 1989-90	% INC	1990-91	% INC	1991-92	% INC	COST PER KL OF WATER PRODUCED 1989-90	1990-91	1991-92	COST PER KL OF WATER DISTRIBUTED 1989-90	1990-91	1991-92	COST PER KL OF WATER SOLD 1989-90	1990-91	1991-92	COMPOSITION OF TOTAL 1989-90	1990-91	1991-92
FINANCIAL PARAMETERS																		
REVENUES																		
(1) Water Charges demanded																		
(a) Domestic metered			103000	ERR	196000	90.29%												
(b) Domestic unmetered	163000		55000	-66.26%	10000	-81.82%												
(c) Industrial/commel..				ERR		ERR												
(d) Others metered				ERR		ERR												
(e) Others unmetered				ERR		ERR												
TOTAL	163000		158000	-3.07%	206000	30.38%												
(2) Charges collected																		
(a) Domestic metered			70000	ERR	116000	65.71%												
(b) Domestic unmetered	94000		20000	-78.72%	8000	-60.00%												
(c) Industrial/commel..				ERR		ERR												
(d) Others metered				ERR		ERR												
(e) Others unmetered				ERR		ERR												
TOTAL	94000		90000	-4.26%	124000	37.78%												
(3) Demand if all private connections were metered																		
(a) Domestic metered	163000		187000	14.72%	206000	10.16%												
(b) Domestic unmetered				ERR		ERR												
(c) Industrial/commel..				ERR		ERR												
(d) Others metered				ERR		ERR												
(e) Others unmetered				ERR		ERR												
TOTAL	163000		187000	14.72%	206000	10.16%												
(4) Arrears of demand																		
(a) Domestic metered			33000	ERR	80000	142.42%												
(b) Domestic unmetered	23000		35000	52.17%	2000	-94.29%												
(c) Industrial/commel..				ERR		ERR												
(d) Others metered				ERR		ERR												
(e) Others unmetered				ERR		ERR												
OP.BAL OF ARREARS	46000		69000		137000													
TOTAL	69000		137000	98.55%	219000	59.85%												
(5) Collection efficiency																		
(a) Domestic metered	ERR		67.96%	ERR	59.18%	-12.92%												
(b) Domestic unmetered	57.67%		36.36%	-36.94%	80.00%	120.00%												
(c) Industrial/commel..	ERR		ERR	ERR	ERR	ERR												
(d) Others metered	ERR		ERR	ERR	ERR	ERR												
(e) Others unmetered	ERR		ERR	ERR	ERR	ERR												
TOTAL EFFICIENCY	57.67%		56.96%	-1.23%	60.19%	5.67%												

UP JAL NIGAM INDO DUTCH PROJECT
REVIEW OF O&M COSTS

PIPED SCHEME: TIKRI

PARTICULARS	TOTALS						COST PER KL OF WATER PRODUCED			COST PER KL OF WATER DISTRIBUTED			COST PER KL OF WATER SOLD			COMPOSITION OF TOTAL		
	1989-90	% INC	1990-91	% INC	1991-92	% INC	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92
(6) No. days arrears																		
(a) Domestic metered	ERR		117	ERR	149	27.40%												
(b) Domestic unmetered	52		232	350.99%	72	-68.57%												
(c) Industrial/commel..	ERR		ERR	ERR	ERR	ERR												
(d) Others metered	ERR		ERR	ERR	ERR	ERR												
(e) Others unmetered	ERR		ERR	ERR	ERR	ERR												
(7) Other income				ERR		ERR												
(8) Total cash income	94000		90000	-4.26%	124000	37.78%												
(9) Total real income	163000		158000	-3.07%	206000	30.38%												
COSTS																		
(1) MANPOWER COSTS																		
A. Direct labour																		
(a) Pumping station	101000		103000	1.98%	106000	2.91%	0.07	0.07	0.08	0.10	0.10	0.11	0.62	0.65	0.50			
(b) Distribution systea	52000		56000	7.69%	59000	5.36%	0.04	0.04	0.04	0.05	0.06	0.06	0.32	0.35	0.28			
(c) Others	22000		26000	18.18%	26000		0.02	0.02	0.02	0.02	0.03	0.03	0.13	0.16	0.12			
TOTAL	175000		185000	5.71%	191000	3.24%	0.13	0.13	0.14	0.17	0.19	0.20	1.07	1.17	0.91			
B. Indirect labour(Total)																		
(a) EE	66000		75000	13.64%	78000	4.00%	0.05	0.05	0.06	0.08	0.08	0.08	0.40	0.47	0.37			
(b) AE	43000		87000	102.33%	60000	-31.03%	0.03	0.06	0.04	0.04	0.09	0.06	0.26	0.55	0.28			
(c) JE	30000		61000	103.33%	44000	-27.87%	0.02	0.04	0.02	0.03	0.06	0.05	0.18	0.39	0.21			
(d) Adm staff	518000		1699000	227.99%	717000	-57.80%	0.37	1.22	0.51	0.49	1.72	0.74	3.18	10.75	3.40			
TOTAL	657000		1922000	192.54%	899000	-53.23%	0.47	1.38	0.64	0.62	1.95	0.93	4.03	12.16	4.27			

UP JAL NIGAM INDO DUTCH PROJECT
REVIEW OF O&M COSTS

PIPED SCHEME: TIKRI

PARTICULARS	TOTALS 1989-90	% INC	1990-91	% INC	1991-92	% INC	COST PER KL OF WATER PRODUCED 1989-90	1990-91	1991-92	COST PER KL OF WATER DISTRIBUTED 1989-90	1990-91	1991-92	COST PER KL OF WATER SOLD 1989-90	1990-91	1991-92	COMPOSITION OF TOTAL 1989-90	1990-91	1991-92
C. Time spent by ind. %																		
(a) EE	5.00%		5.00%		5.00%		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
(b) AE	20.00%		20.00%		20.00%		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
(c) JE	50.00%		50.00%		50.00%		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
(d) Adm staff	5.00%		5.00%		5.00%		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
D. Cost of indirect labour																		
(a) EE	3300		3750	13.64%	3900	4.00%	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.02			
(b) AE	8600		17400	102.33%	12000	-31.03%	0.01	0.01	0.01	0.01	0.02	0.01	0.05	0.11	0.06			
(c) JE	15000		30500	103.33%	22000	-27.87%	0.01	0.02	0.02	0.01	0.03	0.02	0.09	0.19	0.10			
(d) Adm staff	25900		84950	227.99%	35850	-57.80%	0.02	0.06	0.03	0.02	0.09	0.04	0.16	0.54	0.17			
TOTAL	52800		136600	158.71%	73750	-46.01%	0.04	0.10	0.05	0.05	0.14	0.08	0.32	0.86	0.35			
E. Casual labourers				ERR		ERR												
F. Total manpower cost																		
(a) Direct	175000		185000	5.71%	191000	3.24%	0.13	0.13	0.14	0.17	0.19	0.20	1.07	1.17	0.91			
(b) Indirect	52800		136600	158.71%	73750	-46.01%	0.04	0.10	0.05	0.05	0.14	0.08	0.32	0.86	0.35			
TOTAL	227800		321600	41.18%	264750	-17.68%	0.16	0.23	0.19	0.22	0.33	0.27	1.40	2.04	1.26			
G. Cost not paid																		
(a) Direct				ERR		ERR												
(b) Indirect				ERR		ERR												
H. Real cost of manpower																		
(a) Direct	175000		185000	5.71%	191000	3.24%	0.13	0.13	0.14	0.17	0.19	0.20	1.07	1.17	0.91			
(b) Indirect	52800		136600	158.71%	73750	-46.01%	0.04	0.10	0.05	0.05	0.14	0.08	0.32	0.86	0.35			
TOTAL	227800		321600	41.18%	264750	-17.68%	0.16	0.23	0.19	0.22	0.33	0.27	1.40	2.04	1.26			
(2) POWER COSTS																		
HP RATING - PUMP 1 45																		
HP RATING - PUMP 2 45																		
A. Bills received	106800		134400	25.84%	198480	47.68%	0.08	0.10	0.14	0.10	0.14	0.21	0.66	0.85	0.94			
B. Bills paid				ERR		ERR												
C. Actual consumption																		
PUMP 1	170741		170777	0.02%	194600	13.95%	0.12	0.12	0.14	0.16	0.17	0.20	1.05	1.08	0.92			
PUMP 2	195220		195173	-0.02%	175858	-9.90%	0.14	0.14	0.12	0.19	0.20	0.18	1.20	1.24	0.84			
C. Rate per unit	1.10		1.10		1.60	45.45%												

UP JAL NIGAM INDO DUTCH PROJECT
REVIEW OF O&M COSTS

PIPED SCHEME: TIKRI

PARTICULARS	TOTALS 1989-90	% INC	1990-91	% INC	1991-92	% INC	COST PER KL OF WATER PRODUCED 1989-90	1990-91	1991-92	COST PER KL OF WATER DISTRIBUTED 1989-90	1990-91	1991-92	COST PER KL OF WATER SOLD 1989-90	1990-91	1991-92	COMPOSITION OF TOTAL 1989-90	1990-91	1991-92
D. Actual power charges																		
PUMP 1	187816		187855	0.02%	311360	65.75%	0.13	0.13	0.22	0.18	0.19	0.32	1.15	1.19	1.48			
PUMP 2	214742		214690	-0.02%	281373	31.06%	0.15	0.15	0.20	0.20	0.22	0.29	1.32	1.36	1.34			
TOTAL	402557		402545	0.00%	592733	47.25%	0.29	0.29	0.42	0.38	0.41	0.61	2.47	2.55	2.81			
(3) CHEMICALS COST																		
A. BLEACHING POWDER																		
a. Actual cost	1000		6000	500.00%	7000	16.67%	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.04	0.03			
b. Norm in grams per KL	1		1		1													
c. Average price (KG)	3.75		3.90	4.00%	5.13	31.54%												
d. Real cost of chemicals	5228		5437	4.00%	7240	33.16%	0.00	0.00	0.01	0.00	0.01	0.01	0.03	0.03	0.03			
e. Stock (qty in Kgs)	7		280	3900.00%		-100.00%												
f. Number of days stock	2		73	3900.13%		-100.00%												
(4) REPAIRS & MAINTENANCE																		
A. Material cost																		
(a) Pumping station	24300		76100	213.17%	89400	17.48%	0.02	0.05	0.06	0.02	0.08	0.09	0.15	0.48	0.42			
(b) Distribution system	56500		74700	32.21%	122700	64.26%	0.04	0.05	0.09	0.05	0.08	0.13	0.35	0.47	0.58			
(c) Overhead tanks	900		3300	266.67%	500	-84.85%	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.00			
(d) Others	16850		7400	-56.08%	13965	88.72%	0.01	0.01	0.01	0.02	0.01	0.01	0.10	0.05	0.07			
TOTAL	98550		161500	63.88%	226565	40.29%	0.07	0.12	0.16	0.09	0.16	0.23	0.60	1.02	1.08			
B. Labour cost																		
(a) Pumping station				ERR		ERR												
(b) Distribution system				ERR		ERR												
(c) Overhead tanks				ERR		ERR												
(d) Others				ERR		ERR												
TOTAL				ERR		ERR												
C. Total cost																		
(a) Pumping station	24300		76100	213.17%	89400	17.48%	0.02	0.05	0.06	0.02	0.08	0.09	0.15	0.48	0.42			
(b) Distribution system	56500		74700	32.21%	122700	64.26%	0.04	0.05	0.09	0.05	0.08	0.13	0.35	0.47	0.58			
(c) Overhead tanks	900		3300	266.67%	500	-84.85%	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.00			
(d) Others	16850		7400	-56.08%	13965	88.72%	0.01	0.01	0.01	0.02	0.01	0.01	0.10	0.05	0.07			
TOTAL	98550		161500	63.88%	226565	40.29%	0.07	0.12	0.16	0.09	0.16	0.23	0.60	1.02	1.08			

UP JAL NIGAM INDO DUTCH PROJECT
REVIEW OF O&M COSTS

PIPED SCHEME: TIKRI

PARTICULARS	TOTALS 1989-90	% INC	1990-91	% INC	1991-92	% INC	COST PER KL OF WATER PRODUCED 1989-90	1990-91	1991-92	COST PER KL OF WATER DISTRIBUTED 1989-90	1990-91	1991-92	COST PER KL OF WATER SOLD 1989-90	1990-91	1991-92	COMPOSITION OF TOTAL 1989-90	1990-91	1991-92
D. Maintenance budget																		
(a) Pumping station				ERR		ERR												
(b) Distribution system				ERR		ERR												
(c) Overhead tanks				ERR		ERR												
(d) Others				ERR		ERR												
TOTAL				ERR		ERR												
(4) OTHER COSTS																		
A. Equipments																		
(a) Total cost				ERR		ERR												
(b) % for O&M																		
(c) O&M cost				ERR		ERR												
B. Vehicles																		
(a) Total cost	36900		10700	-71.00%	11000	2.80%	0.03	0.01	0.01	0.04	0.01	0.01	0.23	0.07	0.05			
(b) % for O&M	5.00%		5.00%		5.00%													
(c) O&M cost	1845		535	-71.00%	550	2.80%	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00			
C. Others	7700		6900	-10.39%	8530	23.62%	0.01	0.00	0.01	0.01	0.01	0.01	0.05	0.04	0.04			
TOTAL	9545		7435	-22.11%	9080	22.12%	0.01	0.01	0.01	0.01	0.01	0.01	0.06	0.05	0.04			
(6) DEPRECIATION	310000		310000		310000		0.22	0.22	0.22	0.29	0.31	0.32	1.90	1.96	1.47			
(7) INTEREST				ERR		ERR												

UP JAL NIGAM INDO DUTCH PROJECT
REVIEW OF O&M COSTS

PIPED SCHEME: TIKRI

PARTICULARS	TOTALS					COST PER KL OF WATER PRODUCED			COST PER KL OF WATER DISTRIBUTED			COST PER KL OF WATER SOLD			COMPOSITION OF TOTAL		
	1989-90	% INC	1990-91	% INC	1991-92	% INC	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92	1989-90	1990-91	1991-92
REAL COST BASIS																		
TOTAL REVENUE	163000		158000	-3.07%	206000	30.38%	0.12	0.11	0.15	0.15	0.16	0.21	1.00	1.00	0.98			
VARIABLE COST																		
(a) Power	402557		402545	0.00%	592733	47.25%	0.29	0.29	0.42	0.38	0.41	0.61	2.47	2.55	2.81	38.20%	33.31%	42.03%
(b) Chemicals	5228		5437	4.00%	7240	33.16%	0.00	0.00	0.01	0.00	0.01	0.01	0.03	0.03	0.03	0.50%	0.45%	0.51%
(c) Repair materials	98550		161500	63.88%	226565	40.29%	0.07	0.12	0.16	0.09	0.16	0.23	0.60	1.02	1.08	9.35%	13.36%	16.06%
(d) Casuals				ERR		ERR												
Total	506335		569482	12.47%	826538	45.14%	0.36	0.41	0.59	0.48	0.58	0.86	3.11	3.60	3.92	48.05%	47.12%	58.60%
CONTRIBUTION	-343335		-411482	19.85%	-620538	50.81%	-0.25	-0.30	-0.44	-0.33	-0.42	-0.64	-2.11	-2.60	-2.95			
FIXED COST																		
(a) Manpower	227800		321600	41.18%	264750	-17.68%	0.16	0.23	0.19	0.22	0.33	0.27	1.40	2.04	1.26	21.62%	26.61%	18.77%
(b) Others	9545		7435	-22.11%	9080	22.13%	0.01	0.01	0.01	0.01	0.01	0.01	0.06	0.05	0.04	0.91%	0.62%	0.64%
(c) Depreciation	310000		310000		310000		0.22	0.22	0.22	0.29	0.31	0.32	1.90	1.96	1.47	29.42%	25.65%	21.98%
(d) Interest				ERR		ERR												
Total	547345		639035	16.75%	583830	-8.64%	0.39	0.46	0.41	0.52	0.65	0.60	3.36	4.04	2.77	51.95%	52.88%	41.40%
SURPLUS/DEFICIT	-890680		-1050517	17.95%	-1204368	14.65%	-0.64	-0.75	-0.85	-0.85	-1.07	-1.25	-5.46	-6.65	-5.72			
TOTAL COST (FIXED+VC)	1053680		1208517	14.69%	1410368	16.70%										100.00%	100.00%	100.00%

ALLAHABAD HAND PUMP SCHEME

SCHEME	H P NUMBER	YEAR	DIRECT COST: SAL-MSC	SAL-JE	CHEMICALS	TOTAL	R & M MATERIALS	R & M LABOUR	R & M TOTAL	TOTAL DIRECT COST	INDIRECT COST: EXE SAL	VEHICLE	ADMN O/H	DEPR	TOTAL INDIRECT COST	GRAND TOTAL WITH DEP	GRD.TOTAL WITHOUT DEP
KAURIHAR	1	1989-90	141	102		243	19	105	124	367	20	31	53	900	1003	1370	470
		1990-91	133	96		229	77	105	182	411	19	36	51	900	1007	1418	518
		1991-92	124	89		213	138	240	378	591	19	40	50	900	1008	1599	699
		TOTAL	399	287		686	233	450	683	1369	58	107	153	2700	3018	4387	1687
KAURIHAR	2	1989-90	141	102		243	19	105	124	367	20	31	53	900	1003	1370	470
		1990-91	133	96		229	50	105	155	385	19	36	51	900	1007	1391	491
		1991-92	124	89		213	158	240	398	611	19	40	50	900	1008	1619	719
		TOTAL	399	287		686	227	450	677	1362	58	107	153	2700	3018	4380	1680
KAURIHAR	3	1989-90	141	102		243	19	105	124	367	20	31	53	900	1003	1370	470
		1990-91	133	96		229	50	210	260	490	19	36	51	900	1007	1496	596
		1991-92	124	89		213	201	120	321	535	19	40	50	900	1008	1543	643
		TOTAL	399	287		686	270	435	705	1391	58	107	153	2700	3018	4409	1709
KAURIHAR	4	1989-90	141	102		243	23	105	128	371	20	31	53	900	1003	1374	474
		1990-91	133	96		229	59	105	164	394	19	36	51	900	1007	1400	500
		1991-92	124	89		213	96	120	216	429	19	40	50	900	1008	1438	538
		TOTAL	399	287		686	178	330	508	1194	58	107	153	2700	3018	4212	1512
KAURIHAR	5	1989-90	141	102		243	19	105	124	367	20	31	53	900	1003	1370	470
		1990-91	133	96		229	50	105	155	385	19	36	51	900	1007	1391	491
		1991-92	124	89		213	196	240	436	649	19	40	50	900	1008	1657	757
		TOTAL	399	287		686	265	450	715	1400	58	107	153	2700	3018	4418	1718
KAURIHAR	6	1989-90	141	102		243	19	105	124	367	20	31	53	900	1003	1370	470
		1990-91	133	96		229	80	105	185	415	19	36	51	900	1007	1421	521
		1991-92	124	89		213	96	120	216	429	19	40	50	900	1008	1438	538
		TOTAL	399	287		686	195	330	525	1211	58	107	153	2700	3018	4229	1529
KAURIHAR	7	1989-90	141	102		243	19	105	124	367	20	31	53	900	1003	1370	470
		1990-91	133	96		229	103	210	313	543	19	36	51	900	1007	1549	649
		1991-92	124	89		213	128	120	248	461	19	40	50	900	1008	1470	570
		TOTAL	399	287		686	250	435	685	1371	58	107	153	2700	3018	4389	1689

ALLAHABAD HAND PUMP SCHEME

SCHEME	H P NUMBER	YEAR	DIRECT COST								INDIRECT COST						
			SAL-MSC	SAL-JE	CHEMICALS	TOTAL	R & M MATERIALS	R & M LABOUR	TOTAL	TOTAL DIRECT COST	EXE SAL	VEHICLE	ADMN O/H	DEPR	TOTAL INDIRECT COST	GRAND TOTAL WITH DEP	GRD.TOTAL WITHOUT DEP
KAURIHAR	8	1989-90	141	102		243	19	105	124	367	20	31	53	900	1003	1370	470
		1990-91	133	96		229	50	105	155	385	19	36	51	900	1007	1391	491
		1991-92	124	89		213	118	120	238	452	19	40	50	900	1008	1460	560
		TOTAL	399	287		686	187	330	517	1203	58	107	153	2700	3018	4221	1521
KAURIHAR	9	1989-90	141	102		243	19	105	124	367	20	31	53	900	1003	1370	470
		1990-91	133	96		229	67	210	277	507	19	36	51	900	1007	1513	613
		1991-92	124	89		213	80	120	200	414	19	40	50	900	1008	1422	522
		TOTAL	399	287		686	166	435	601	1287	58	107	153	2700	3018	4305	1605
KAURIHAR	10	1989-90	141	102		243	27	105	132	375	20	31	53	900	1003	1378	478
		1990-91	133	96		229	74	210	284	514	19	36	51	900	1007	1520	620
		1991-92	124	89		213	80	120	200	414	19	40	50	900	1008	1422	522
		TOTAL	399	287		686	181	435	616	1302	58	107	153	2700	3018	4320	1620
KAURIHAR	11	1989-90	141	102		243	19	105	124	367	20	31	53	900	1003	1370	470
		1990-91	133	96		229	440	105	545	775	19	36	51	900	1007	1781	881
		1991-92	124	89		213	78	120	198	411	19	40	50	900	1008	1419	519
		TOTAL	399	287		686	536	330	866	1552	58	107	153	2700	3018	4570	1870
KAURIHAR	12	1989-90	141	102		243	18	105	123	365	20	31	53	900	1003	1369	469
		1990-91	133	96		229	133	210	345	575	19	36	51	900	1007	1581	681
		1991-92	124	89		213	482	120	602	815	19	40	50	900	1008	1824	924
		TOTAL	399	287		686	633	435	1070	1755	58	107	153	2700	3018	4774	2074
KAURIHAR	13	1989-90	141	102		243	19	105	124	367	20	31	53	900	1003	1370	470
		1990-91	133	96		229	92	210	302	531	19	36	51	900	1007	1538	638
		1991-92	124	89		213	96	120	216	429	19	40	50	900	1008	1438	538
		TOTAL	399	287		686	206	435	641	1327	58	107	153	2700	3018	4345	1645
KAURIHAR	14	1989-90	141	102		243	67	105	172	415	20	31	53	900	1003	1418	518
		1990-91	133	96		229	125	210	335	564	19	36	51	900	1007	1571	671
		1991-92	124	89		213	77	120	197	410	19	40	50	900	1008	1418	518
		TOTAL	399	287		686	268	435	703	1389	58	107	153	2700	3018	4407	1707
KAURIHAR	15	1989-90	141	102		243	51	210	261	503	20	31	53	900	1003	1506	606
		1990-91	133	96		229	70	210	280	509	19	36	51	900	1007	1516	616
		1991-92	124	89		213	27	120	147	360	19	40	50	900	1008	1368	468
		TOTAL	399	287		686	147	540	687	1372	58	107	153	2700	3018	4391	1691
TOTAL		1989-90	2119	1524		3643	372	1680	2052	5695	294	465	788	13500	15046	20741	7241
		1990-91	2002	1440		3442	1522	2415	3937	7379	290	540	770	13500	15100	22479	8979
		1991-92	1862	1339		3201	2049	2160	4209	7410	283	600	743	13500	15126	22536	9036
		TOTAL	5983	4302		10285	3944	6255	10199	20484	867	1605	2300	40500	45272	65756	25256

ALLAHABAD HAND PUMP SCHEME

SCHEME	H P NUMBER	YEAR	DIRECT COST: SAL-NSC	SAL-JE	CHEMICALS	TOTAL	R & M: MATERIALS	R & M: LABOUR	R & M: TOTAL	TOTAL DIRECT COST	INDIRECT COST: EXE SAL	VEHICLE	ADMN O/H	DEPR	TOTAL INDIRECT COST	GRAND TOTAL WITH DEP	GRD.TOTAL WITHOUT DEP
CHAYAL	16	1989-90	100	36		135				135	20	31		961	1012	1147	186
		1990-91	101	36		137	9	105	114	251	19	36		961	1016	1267	306
		1991-92	101	36		137	73	240	313	450	19	40		961	1020	1470	509
		TOTAL	301	108		410	82	345	427	836	58	107		2883	3048	3884	1001
CHAYAL	17	1989-90	100	36		135				135	20	31		961	1012	1147	186
		1990-91	101	36		137	34	210	244	381	19	36		961	1016	1398	437
		1991-92	101	36		137	20	120	140	277	19	40		961	1020	1297	336
		TOTAL	301	108		410	54	330	384	793	58	107		2883	3048	3841	958
CHAYAL	18	1989-90	100	36		135				135	20	31		961	1012	1147	186
		1990-91	101	36		137	20	105	125	262	19	36		961	1016	1278	317
		1991-92	101	36		137	249	360	609	746	19	40		961	1020	1766	805
		TOTAL	301	108		410	269	465	734	1143	58	107		2883	3048	4191	1308
CHAYAL	19	1989-90	100	36		135				135	20	31		961	1012	1147	186
		1990-91	101	36		137	70	210	280	417	19	36		961	1016	1433	472
		1991-92	101	36		137	23	240	263	400	19	40		961	1020	1420	459
		TOTAL	301	108		410	93	450	543	952	58	107		2883	3048	4000	1117
CHAYAL	20	1989-90	100	36		135				135	20	31		961	1012	1147	186
		1990-91	101	36		137	605	105	710	847	19	36		961	1016	1864	903
		1991-92	101	36		137	3	120	123	260	19	40		961	1020	1280	319
		TOTAL	301	108		410	608	225	833	1243	58	107		2883	3048	4291	1408
CHAYAL	21	1989-90	100	36		135				135	20	31		961	1012	1147	186
		1990-91	101	36		137	208	315	523	660	19	36		961	1016	1677	716
		1991-92	101	36		137	62	240	302	439	19	40		961	1020	1459	498
		TOTAL	301	108		410	270	555	825	1235	58	107		2883	3048	4283	1400
CHAYAL	22	1989-90	100	36		135				135	20	31		961	1012	1147	186
		1990-91	101	36		137	62	315	377	514	19	36		961	1016	1530	569
		1991-92	101	36		137	56	240	296	434	19	40		961	1020	1453	492
		TOTAL	301	108		410	118	555	673	1083	58	107		2883	3048	4130	1247
CHAYAL	23	1989-90	100	36		135				135	20	31		961	1012	1147	186
		1990-91	101	36		137	20	105	125	262	19	36		961	1016	1279	318
		1991-92	101	36		137	35	120	155	292	19	40		961	1020	1312	351
		TOTAL	301	108		410	55	225	280	689	58	107		2883	3048	3737	854
CHAYAL	24	1989-90	100	36		135				135	20	31		961	1012	1147	186
		1990-91	101	36		137				137	19	36		961	1016	1153	192
		1991	101					120		275	19				11	1298	7

ALLAHABAD HAND PUMP SCHEME

SCHEME	H P NUMBER	YEAR	DIRECT COST								INDIRECT COST						GRD.TOTAL WITHOUT DEP
			SAL-MSC	SAL-JE	CHEMICALS	TOTAL	R & M MATERIALS	R & M LABOUR	TOTAL	TOTAL DIRECT COST	EXE SAL	VEHICLE	ADMN O/H	DEPR	TOTAL INDIRECT COST	GRAND TOTAL WITH DEP	
CHAYAL	25	1989-90	100	36		135				135	20	31		961	1012	1147	186
		1990-91	101	36		137				137	19	36		961	1016	1153	192
		1991-92	101	36		137	20	120	140	277	19	40		961	1020	1297	336
		TOTAL	301	108		410	20	120	140	549	58	107		2883	3048	3597	714
CHAYAL	26	1989-90	100	36		135				135	20	31		961	1012	1147	186
		1990-91	101	36		137	173	315	488	625	19	36		961	1016	1641	680
		1991-92	101	36		137	22	120	142	279	19	40		961	1020	1299	338
		TOTAL	301	108		410	195	435	630	1039	58	107		2883	3048	4087	1204
CHAYAL	27	1989-90	100	36		135				135	20	31		961	1012	1147	186
		1990-91	101	36		137	195	210	405	542	19	36		961	1016	1558	597
		1991-92	101	36		137	21	120	141	278	19	40		961	1020	1298	337
		TOTAL	301	108		410	215	330	545	955	58	107		2883	3048	4002	1119
TOTAL		1989-90	1195	430		1625				1625	235	372		11532	12139	13764	2232
		1990-91	1209	435		1644	1395	1995	3390	5034	232	432		11532	12196	17230	5698
		1991-92	1211	435		1646	603	2160	2763	4409	226	480		11532	12238	16647	5115
		TOTAL	3615	1300		4915	1998	4155	6153	11068	693	1284		34596	36573	47641	13043

UP JAL NIGAM ALLAHABAD HANDPUMP SCHEME

SUMMARY

YAURIHAR

COST COMPONENTS	TOTAL 1989-90	TOTAL 1990-91	TOTAL 1991-92	% OF TOTAL COST 1989-90	% OF TOTAL COST 1990-91	% OF TOTAL COST 1991-92	PER PUMP 1989-90	PER PUMP 1990-91	PER PUMP 1991-92
MANPOWER									
- EMPLOYEES	3936	3732	3484	18.98%	16.60%	15.46%	262.43	248.78	232.26
- LABOUR (R&M)	1680	2415	2160	8.10%	10.74%	9.58%	112.00	161.00	144.00
R & M - MATERIALS	372	1522	2049	1.80%	6.77%	9.09%	24.82	101.47	136.62
OTHERS	1253	1310	1343	6.04%	5.83%	5.96%	83.50	87.32	89.51
DEPRECIATION	13500	13500	13500	65.09%	60.06%	59.90%	900.00	900.00	900.00
TOTAL	20741	22479	22536	100.00%	100.00%	100.00%	1382.76	1498.58	1502.40
TOT WITHOUT DEP	7241	8979	9036				482.76	598.58	602.40

PHYSICAL PARAMETERS

	WITH DEPRECIATION			WITHOUT DEPRECIATION		
NO OF HP's	15	15	15	15	15	15
-COST PER HP	1383	1499	1502	483	599	602
POPULATION	3750	3844	3940	3750	3844	3940
-COST PER PERSON	6	6	6	2	2	2
HOUSEHOLDS	750	750	750	750	750	750
-COST PER HOUSEHOLD	28	30	30	10	12	12
PRODUCTION(KL)	53950	53950	53840	53950	53950	53840
-COST PER KL	0.38	0.42	0.42	0.13	0.17	0.17
NO.NOT WORKING	80	80	91	80	80	91

UP JAL NIGAM ALLAHABAD HANDPUMP SCHEME

CHAYAL

COST COMPONENTS	TOTAL 1989-90	TOTAL 1990-91	TOTAL 1991-92	% OF TOTAL COST 1989-90	% OF TOTAL COST 1990-91	% OF TOTAL COST 1991-92	PER PUMP 1989-90	PER PUMP 1990-91	PER PUMP 1991-92
MANPOWER									
- EMPLOYEES	1860	1876	1872	13.51%	10.89%	11.25%	154.98	156.35	156.00
- LABOUR (R&M)		1995	2160		11.58%	12.98%		166.25	180.00
R & M - MATERIALS		1395	603		8.10%	3.62%		116.27	50.27
OTHERS	372	432	480	2.70%	2.51%	2.88%	31.00	36.00	40.00
DEPRECIATION	11532	11532	11532	83.79%	66.93%	69.27%	961.00	961.00	961.00
TOTAL	13764	17230	16647	100.00%	100.00%	100.00%	1146.98	1435.87	1387.27
TOT WITHOUT DEP	2232	5698	5115				185.98	474.87	426.27

PHYSICAL PARAMETERS	WITH DEPRECIATION 1989-90	WITH DEPRECIATION 1990-91	WITH DEPRECIATION 1991-92	WITHOUT DEPRECIATION 1989-90	WITHOUT DEPRECIATION 1990-91	WITHOUT DEPRECIATION 1991-92
NO OF HP's	12	12	12	12	12	12
-COST PER HP	1147	1436	1387	186	475	426
POPULATION	3000	3075	3152	3000	3075	3152
-COST PER PERSON	5	6	5	1	2	2
HOUSEHOLDS	600	600	600	600	600	600
-COST PER HOUSEHOLD	23	29	28	4	9	9
PRODUCTION(LL)	43240	43240	43320	43240	43240	43320
-COST PER LL	0.32	0.40	0.38	0.05	0.13	0.12
NO.NOT WORKING II	56	56	48	56	56	48

UP JAL NIGAM ALLAHABAD HANDPUMP SCHEME

COMBINED

COST COMPONENTS	TOTAL 1989-90	TOTAL 1990-91	TOTAL 1991-92	% OF TOTAL COST 1989-90	% OF TOTAL COST 1990-91	% OF TOTAL COST 1991-92
MANPOWER						
- EMPLOYEES	5796	5608	5356	16.80%	14.12%	13.67%
- LABOUR (R&M)	1680	4410	4320	4.87%	11.11%	11.03%
R & M - MATERIALS	372	2917	2653	1.08%	7.35%	6.77%
OTHERS	1625	1742	1823	4.71%	4.39%	4.65%
DEPRECIATION	25032	25032	25032	72.55%	63.04%	63.88%
TOTAL	34505	39709	39183	100.00%	100.00%	100.00%
TOT WITHOUT DEP	9473	14677	14151			
PHYSICAL PARAMETERS						
	WITH DEPRECIATION			WITHOUT DEPRECIATION		
NO OF HP's	27	27	27	27	27	27
-COST PER HP	1278	1471	1451	351	544	524
POPULATION	6750	6919	7092	6750	6919	7092
-COST PER PERSON	5	6	6	1	2	2
HOUSEHOLDS	1350	1350	1350	1350	1350	1350
-COST PER HOUSEHOLD	26	29	29	7	11	10
PRODUCTION(KL)	97190	97190	97160	97190	97190	97160
-COST PER KL	0.36	0.41	0.40	0.10	0.15	0.15
NO.OF DAYS NOT WORKING	136	136	139	136	136	139

BEP

COST COMPONENTS	TOTAL 1989-90	TOTAL 1990-91	TOTAL 1991-92	COST PER PUMP (RS) 1989-90	COST PER PUMP (RS) 1990-91	COST PER PUMP (RS) 1991-92
VARIABLE COST						
R & M - Materials	372	2917	2653	13.79	108.05	98.24
R & M - Labour	1680	4410	4320	62.22	163.33	160.00
Total VC	2052	7327	6973	76.01	271.38	258.24
FIXED COST						
Man power - Employees	5796	5608	5356	214.67	207.70	198.37
Others	1625	1742	1823	60.17	64.51	67.51
Total FC	7421	7350	7179	274.84	272.21	265.88
Total VC+FC	9473	14677	14151	350.86	543.60	524.12
Depreciation	25032	25032	25032	927.11	927.11	927.11
GRAND TOTAL	34505	39709	39183	1277.97	1470.71	1451.23