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KRISTIAN LAUBJERG



II TIER MAINTENANCE SYSTEM

A. PRELIMINARY EVALUATION

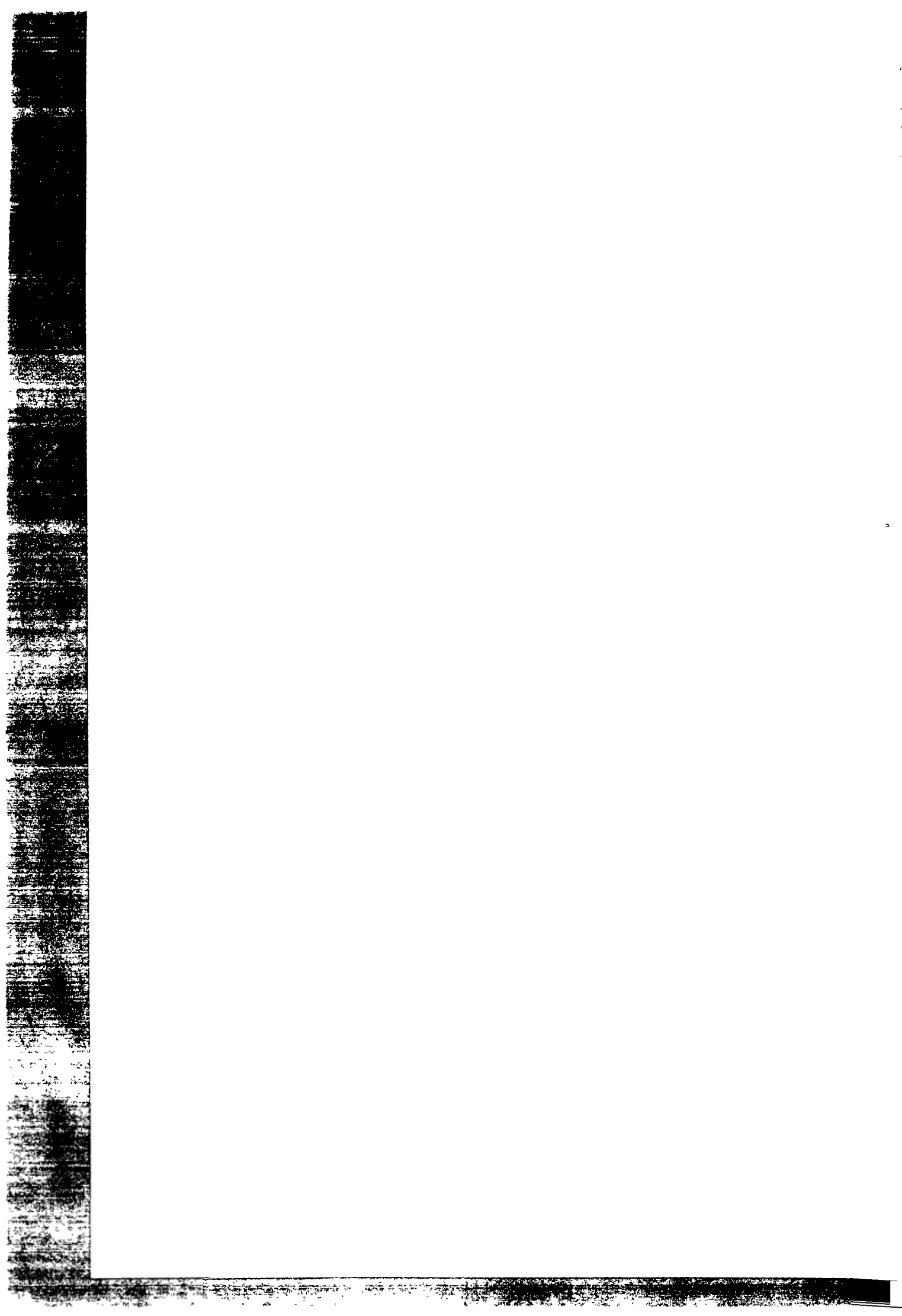
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August 1987

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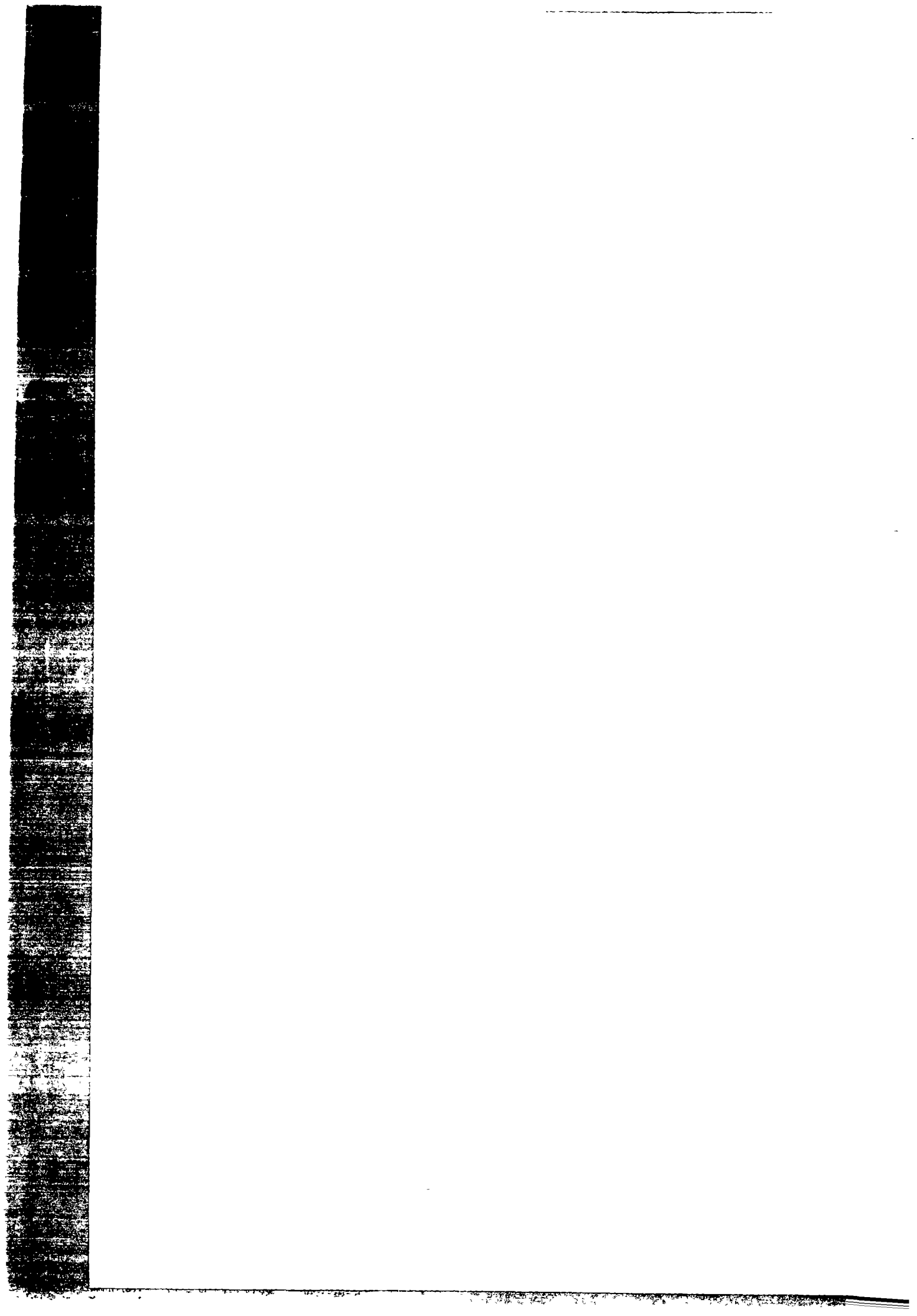




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A PRELIMINARY EVALUATION

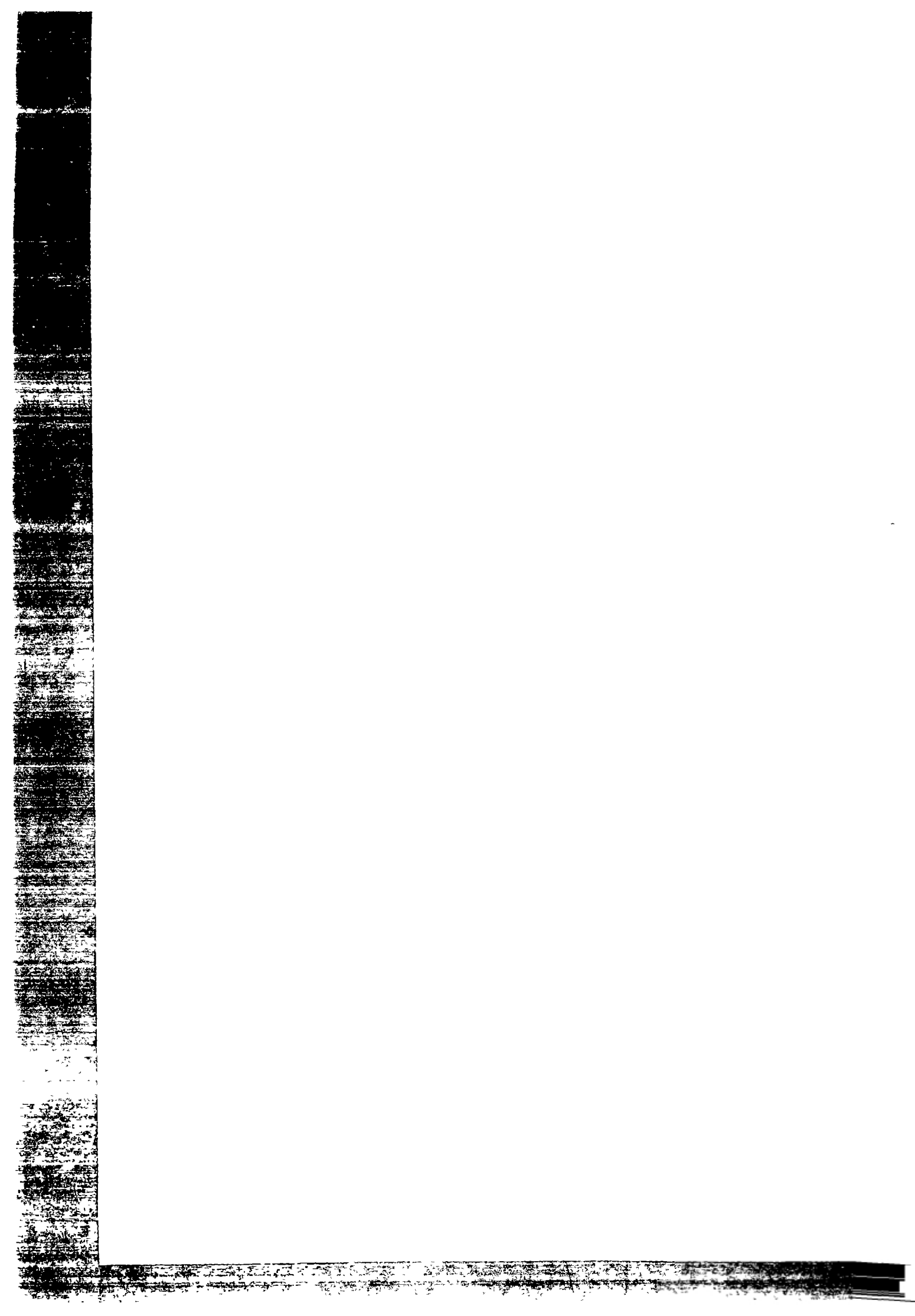
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II TIER MAINTENANCE SYSTEM
A PRELIMINARY EVALUATION

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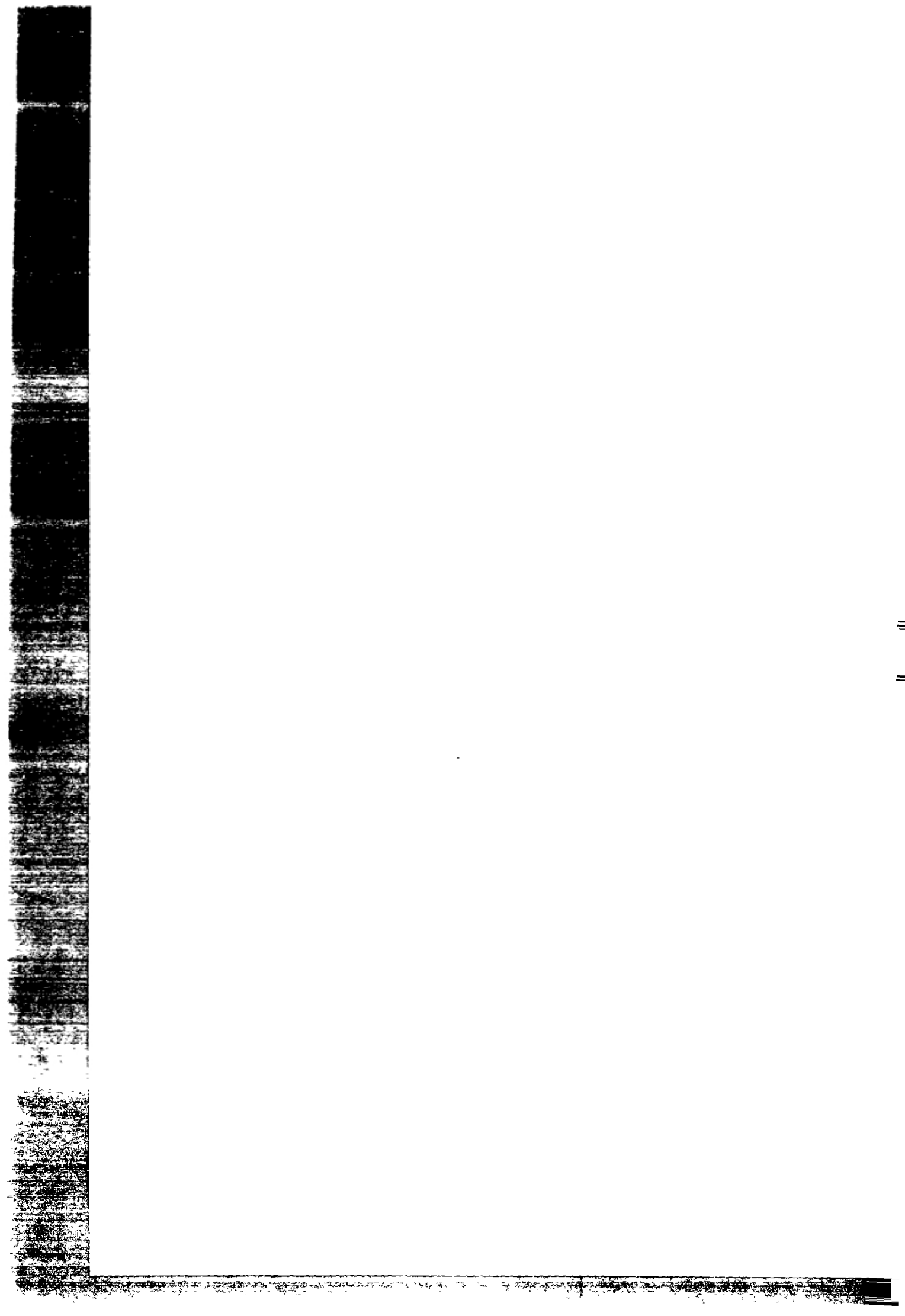


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PREFACE

During Phase-I of the DANIDA assisted Orissa Drinking Water Project, a II-tier Maintenance System has been established in two Blocks, Delang and Rajkanika in Puri and Cuttack districts, respectively. The system is currently under field testing as a Research & Development Programme. Being an innovative activity, with the potential of replacing the present III-tier Maintenance System practised by the PHED in Orissa, close monitoring and evaluation is an integral part of the II Tier Maintenance System.

Two Divisions of the Danida Project Directorate (DPD) have been jointly responsible for establishing and field testing the system: the Socio-Economic Division (SED) and the Training & Maintenance Division (TMD). The two divisions have also carried out the monitoring and evaluation of the system.

As per the Phase I Plan of Operation of DPD prepared in 1985, a preliminary evaluation report was to be produced by the end of Phase-I (March 1987). This was later postponed to June 1987.

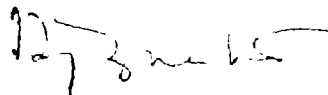
The II-tier Maintenance System has also been established in Chandbali Block, the third Block of the project in Phase I. This Block is not included in the present evaluation, since the process of establishing the system was started after March 1987. Data available upto June 1987 for Delang and Rajkanika Blocks, form the basis of this report.

The monitoring of the system has yielded very valuable information on the functioning and performance of the II Tier Maintenance System and on the functioning of the handpumps installed by the project.

The present preliminary evaluation report is the outcome of a joint effort by SED and TMD. The undersigned have compiled this report on the basis of data available to them, as well as field observations during establishment and operation of the system.



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SUMMARY

General findings

The following objectives, as laid down in the formulation of the II-tier Maintenance System, have been fulfilled so far :

- SEMs have been trained and equipped to undertake all maintenance and repair of handpumps in Delang and Rajkarnika Blocks.
- The SEM's routine preventive maintenance has been observed to contribute to a reduction in the incidences of breakdowns of India Mark II handpumps.
- There is no significant time lag between break downs of pumps and their repair. This is apparent from the lack of reports of pump break down over long periods, from the monitoring system.
- Villagers have been motivated to some degree in accepting a resident artisan in the new role as SEM.
- A viable system of remuneration for the SEMs service through local banks has been established.

The following objectives have not yet been fulfilled :

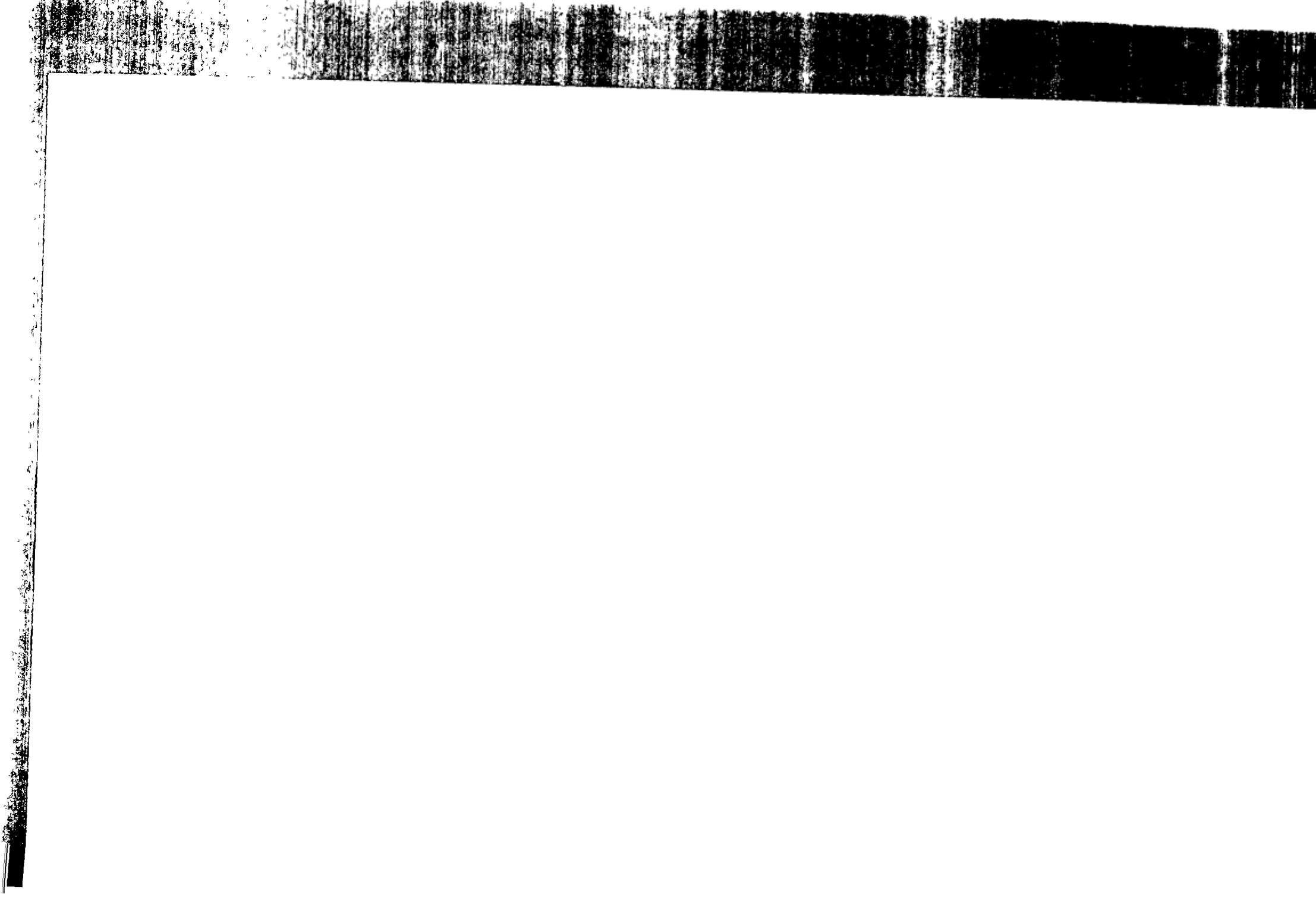
- Efficient maintenance of about 20 pumps by one trained, skilled artisan is not yet fully established since a large number of SEMs have not yet received their projected numbers of pumps. The pumps distributed so far are, however, being maintained efficiently, primarily due to a regular system of preventive maintenance and a low frequency of breakdowns of pumps.
- Bottlenecks in the supply of spareparts, administrative, and technical support from the 2nd tier (Junior Engineer at the Block level), are not yet fully removed in this system.
- Apart from reporting breakdowns to the SEM, villagers are not yet sufficiently motivated to actively assist the SEM in his maintenance and repair activities.

- The community has not yet been encouraged or do not yet feel motivated to contribute to the services rendered by the SEM through a regular payment system organized through water committees.
- It is not yet clearly known whether the community (i.e. handpump user group) has gained full confidence in the SEM as a technically qualified mechanic.

Specific findings

- The majority of artisans identified as SEMs by SED are village blacksmiths. The other artisans who have become SEMs are cycle mechanics.
- Initially a total of 70 artisans were identified in the two Blocks, 59 were selected for training and 48 finally commissioned as SEMs.
- Training of selected artisans was done in two phase, in groups of about 10 artisans at a time at field locations.
- A total of 12 training programmes were conducted in the two Blocks with Socio-economists and Junior Engineers acting as trainers.
- Training material and curricula, considering literacy and comprehension levels of artisans, were formulated specially for this purpose.
- The first phase of training prepared SEMs for undertaking preventive maintenance of pumps. The second phase taught them all aspects of major and minor repairs. Record keeping needs was an integral part both training phases.
- Commissioning of SEMs after training included execution of contracts between the Project and the SEMs, handover of bicycles and tools, and handover of pumps given to the SEMs for maintenance.
- Commissioning of SEMs in Delang was done in 3 batches during August to November 1986, and in 4 batches in Rajkaniika during August 1986 to January 1987.

- A system of direct transfer of remuneration from the Project to the SEM through local banks has been established.
- The 2nd Tier of the maintenance system comprised of a Junior Engineer and his maintenance crew. This tier has been reinforced by a Socio-economist.
- The 2nd Tier has been made responsible for technical checks of completed pumps and their handover for maintenance to the 1st Tier, the SEMs.
- The 2nd tier has also been made responsible for field monitoring of the performance of the SEM through monthly meetings and field visits for repair and monitoring, supply of spareparts, technical back-up to the 1st Tier and maintenance of records at Block level.
- The maintenance system has been monitored with the intention of creating a data base for the evaluation of all its components.
- Another purpose for monitoring the system was to continuously identify bottlenecks occurring and introduce consequent changes to improve the system.
- The monitoring methodology included interviews with SEMs, their responses to questionnaires, monthly meetings at block level with the Junior Engineer and Socio-Economist and recording of maintenance data in registers and log sheets.



CONCLUSION AND RECOMMENDATIONS

- The process of identifying and selecting artisans by Socio-economists have resulted in higher motivation and involvement of the artisans as SEMs.
- The identification and selection of individual SEMs demands a lot of time. In the future, initial information and motivation meetings should take place for a group of artisans at a central location at a time.
- The limitation of selecting blacksmiths and cycle mechanics only as SEMs, should in future be relaxed in Blocks where such artisans are fewer in number. In such cases the choice of potential SEMs should also include motivated, literate youth and other mechanics having a fixed work place.
- For training, the extra number of trainees should be fixed for a particular area. Evaluation of the trainees should be made during the course and the best selected as SEMs.
- The preparation of a training curriculum, emphasizing the use of Oriya terminology for pump components, standard and special tools and work procedures have proved to be advantageous in facilitating training, especially for the illiterate and semi-literate artisans.
- Selection of training venues in villages have made such venues easily accessible to trainees and provided proximity to the trainees with their actual work environment and facilitate demonstrations and field work
- A more systematic reporting of the follow-up action taken by the 2nd Tier after receiving reports of problems from the 1st Tier at Monthly Meeting needs to be established. It will then give an indication of the extent to which the 2nd Tier is able to fulfil its supportive role to the 1st Tier.

- Follow-up action on SEMs' reports about water quality problems to the 2nd Tier needs attention. This activity was not initially foreseen as the task of the 2nd Tier, and needs the direct attention of the DPD.
- At present the records maintained by the 2nd Tier do not give a clear picture of repairs carried out. Records need to be improved upon so that accurate timely data is available. The records of one Block (Rajkanika) was quite inadequate.
- The record keeping system for spare parts is very inadequate, and has not resulted in any conclusion.
- The record keeping needs at the 2nd Tier level is quite voluminous, and may need additional staff support.
- The monitoring and supervision of the 2nd Tier has so far been inadequate.
- SEMs have generally received only 67% of this projected number of pumps. About one third of the SEMs are working with less than half their number of pumps. This indicates the need to examine the implementation, technical check and handover sequence in detail to identify the bottle necks. This observation gains significance since it is an observation 3 months after completion of Phase-I implementation period.
- The frequency of major repairs for India Mark-II handpumps have been generally low. Minor repairs have generally been limited to replacements of nuts and bolts.
- Close attention should be given from DPD to support the functioning of the 2nd Tier in order to make the maintenance system as a whole, viable.
- Detailed data collection on the functioning of the 1st Tier has only been done once. For the future, detailed monitoring of the performance of the 1st Tier should be done

according to a fixed schedule. The interview technique has to be uniform for all SEMs in the two Blocks.

- Monitoring data on the SEMs performance show that regular, preventive maintenance is carried out by almost all SEMs.
- News about pump breakdowns reach the SEM through various channels of the "informal reporting system" and most repairs are attended to within the following day.
- SEMs are able to maintain their own records with few exceptions only. Illiterate SEMs seek assistance from literate family members or neighbours.
- Monthly meetings involving all SEMs in a Block, the Junior Engineer, the Socio-economist and the JEs crew have served the dual purpose of monitoring the performance of the II-Tier system, and monitoring the performance of handpump installations of the project.
- Monthly meetings should be given high priority in the monitoring of the system in the future. However, monitoring data emerging from Monthly Meetings need to be supplemented by periodical monitoring of each individual SEM's performance.
- The major responsibility of conducting the training was borne by SED with TMD sharing the responsibilities to a lesser degree. This had advantages in terms of close communication between the Socio-economists and the artisans and disadvantages in terms of a weak contribution by Junior Engineers in their unfamiliar role as trainers.
- Training and orientation of Junior Engineers in their new role as trainers is a necessary prerequisite for successful establishment of the system in future.

- Due to low populations of pumps in SEMs' operational areas and delayed procurement of tools and bicycles, commissioning of SEMs had to be postponed on many occasions.
- The system of monthly payment to the SEMs through bank pass books has functioned smoothly.
- If the present payment system is to continue, TMD has to take over the responsibility of its administration in order to demonstrate its viability within the normal funding frame work of PHED. Additionally, there is a need to further explore the possibility of mobilizing the handpump user groups to participate in the payment system.
- The 2nd Tier at the Block level has not yet fully developed the capability to take on the responsibility as the first line of administration of the maintenance system. Reporting and control of the maintenance system is therefore weak not yielding timely and accurate data.
- The frequency of breakdowns of Inalsa Suction pumps has been high. This has severely strained the supply of necessary spareparts, because of a high failure rate of one particular component.
- About 10% installation have indicated problems related to water quality and quantity. In comparison, incidence of unsatisfactory installation was low. Rusting of pump heads was a widely reported problem. Failure of tubewells occurred in 1.3% cases of pumps handed over to SEMs.

BACKGROUND

Project background for the II Tier Maintenance System

In early 1984, the Appraisal Report for the DANIDA assisted Drinking Water Supply Project in Orissa recommended the establishment of an intensive, village based maintenance system for hand pumps as a modification of the III-tier system. The feasibility of such a modified system was to be tested in Phase-I of Project.

The conceptual framework for the system was worked out by the Socio-Economic Division (SED) of the Danida Project Directorate (DPD) during 1985 and a manual for its implementation was subsequently produced in 1986.

In 1985 SED carried out a survey of existing village artisans (carpenters, blacksmiths and cycle mechanics) to gain insight into the employment status of these artisans, their levels of income and their willingness to work as a part of maintenance system. The survey showed that a sufficient number of skilled artisans were willing to undertake such work.

During implementation of Phase I of the Project, during (Aug. 1985 to March 1987), SED, in cooperation with the Training and Maintenance Division (TMD), were responsible for the establishment of the system, its organization, day-to-day management, monitoring and evaluation.

Initially the II-tier system was planned to be established as a Research & Development activity in only two blocks, Delang and Rajkanika. By the end of the Phase-I it was decided to also establish the system in Chandbali, the third project block, during the subsequent Interim Phase (April- Sept.87).

The present report is a preliminary evaluation of the II Tier Maintenance System, established and operating in Delang and Rajkanika Blocks of Puri & Cuttack Districts, respectively. It has been jointly prepared by the Socio-Economic and Training & Maintenance Divisions of the DANJDA Project Directorate.

Assumptions about the II-tier maintenance system

The framework for the II-tier maintenance system for hand-pumps evolved out of the identified weaknesses of the III-tier system, which was initially suggested by UNICEF and later adopted all over in India.

The assumptions behind the II-tier system are based on the need for a village based maintenance system in which the Self Employed Mechanic-SEM (or handpump mistri), who is a resident, an artisan of a particular locality, and would be trained to maintain and repair the handpump with close interaction with the users of the handpump. The SEMs would carry out preventive maintenance to ensure sustained performance of the pumps, and undertake repairs before break downs occurred. The users would directly inform the SEM about maintenance needs of pumps and the SEM would then attend to the problems without having to mobilize any other intermediary level.

To support the SEM with supply of spare parts, technical assistance in case of difficult repairs and payment for his service, a 2nd tier would have to be established at the Block level.

The system was assumed to be a feasible alternative to the III-tier system which never was seriously implemented in Orissa. The system would have a lower per unit maintenance cost as well as invite a higher degree of user involvement for maintenance.

The system would not suffer from the logistical drawbacks of the III-tier system since a single block in the Danida Project area, in 1990, would have the same number of pumps as a single district, in 1979, when the III-tier system was introduced in Orissa. The logistical support of the II-tier system would, to a large extent, rest on the SEM who would be able reach all pumps allotted to him, by bicycle.

In brief the system was to be established based on the following preconditions :

- the existence of a skilled residents in village who could become maintenance personnel, i.e. SEMs.
- the existence of an efficient reporting system, i.e. users directly reporting breakdowns to the SEM.
- the existence of a procedure which assured continuity and availability of SEMs, i.e. a close relatives of the SEM may be trained to replace the SEM, if the need arose.
- the existence of a high degree of direct involvement of the handpump users in the maintenance system, where they would not feel alienated from it.
- the existence of an efficient spare parts supply procedure, and technical and administrative backup system which would be the primary task of the 2nd tier (Junior Engineer).

General objectives

The II-tier system aims at fulfilling the following objectives :

- ensuring the efficient maintenance of about 20 handpumps by one trained, skilled artisan. As a

SEM he would be trained and equipped to undertake all maintenance and repairs of hand pumps.

- minimizing the time lag between reporting of breakdowns by involving users in reporting directly to the SEM thus enhancing community participation.
- reducing the bottlenecks in the administrative back-up including spare parts supply and technical support from the 2nd tier.
- motivating villagers to accept the resident artisan in his new role as an SEM and to assist him in his maintenance and repair activities.
- introducing a viable system of remuneration for the SEM through local banks.
- encouraging the community to contribute to the payment for the services rendered by the SEM through a water tariff system managed by water committees, when community confidence in the SEMs had been developed.

IDENTIFICATION & RECRUITMENT OF ARTISANS

A major objective of the II-tier Maintenance System is to make use of the skills available at the village level for handpump maintenance and repair.

Inventory of artisans

To make an assessment of the artisans and skills available and identify SEMs for training and subsequent recruitment, an inventory of rural artisans was made. The inventory yielded information on :

- name, age, education, profession of the artisans
- location of the workshop (if any)
- number of family members in the trade
- traditional operational area
- workload on the traditional occupation
- artisans willingness to work as an SEM

It was found that artisans willing to work as handpump mechanics exist in sufficient number as is evident from Table 1 . Detailed socio-economic data on SEMs is also provided in Table 1.

It was observed from the survey that all the categories of artisans, except few carpenters and cycle mechanics, were under-employed in their trades and their income from their professions was not so high (an average maximum of Rs. 600 p.m.) so as to dissuade them from adopting other trades to supplement their income.

It also showed that most of the artisans, especially from blacksmithy and carpentry trades, had one or more family members working in the trade.

In general the 'Inventory' findings supported the idea of involving local artisans in handpump maintenance and facilitated the planning and subsequent activities.

Criteria for Identification and final Selection :

For final selection of the required number of artisans, a set of selection criteria of potential artisans willing to work as SEMs was made. The major considerations were :

- artisan should be a permanent resident of a village within an operational area
- the artisan should have skill and experience in a traditional trade
- the artisan should have a fixed place of work or workshop and a delineated "service area" for his traditional trade
- the artisan should have other family members with experience in the trade

The other guideline to identify the potential artisan willing to work as an SEM was that he should have the responsibility of maintenance of 20 to 30 handpumps in a geographical area in a radius of 2.5 Km. In the case of blacksmiths this area should, as far as possible, be identical with their traditional 'service area'.

Final identification of potential artisans

The final identification was made by the Socio-economists through individual meetings with the artisans at their villages, at which time they were given a detailed idea about the maintenance system, its function, and the role of the artisans.

Though the number of artisans identified for training was little higher than the requirement (24 for each block), it was decided to consider all of them for training mainly to compensate for future drop-outs and trainees later found unsuitable.

Training and selection for recruitment as SEM

All the identified artisans underwent training. Out of them, 24 SEMs were selected for each Block. Weak trainees were dropped.

Observations and Recommendations

1. The involvement of socio-economists from the stage of surveying to selection of artisans resulted in better participation and involvement from the artisans. The initial briefing about the system helped artisans to make rational decisions about the participations in the maintenance system. This is evident since there have been no cases of dropouts so far.

It also helped SED and TMD to gain detailed insight in the artisans workload, willingness and expectations in becoming an SEM.

However, the identification and selection of artisans could have been done more systematically :

- Instead of meeting the artisans individually at their villages and getting their consent, they could be informed and motivated about the system at a central place.
- The maximum number of extra trainees should be fixed. It should also be decided from which specific area they should be taken.
- Evaluation of the performance of individual trainees should be made during training to facilitate recruitment of best trainees.

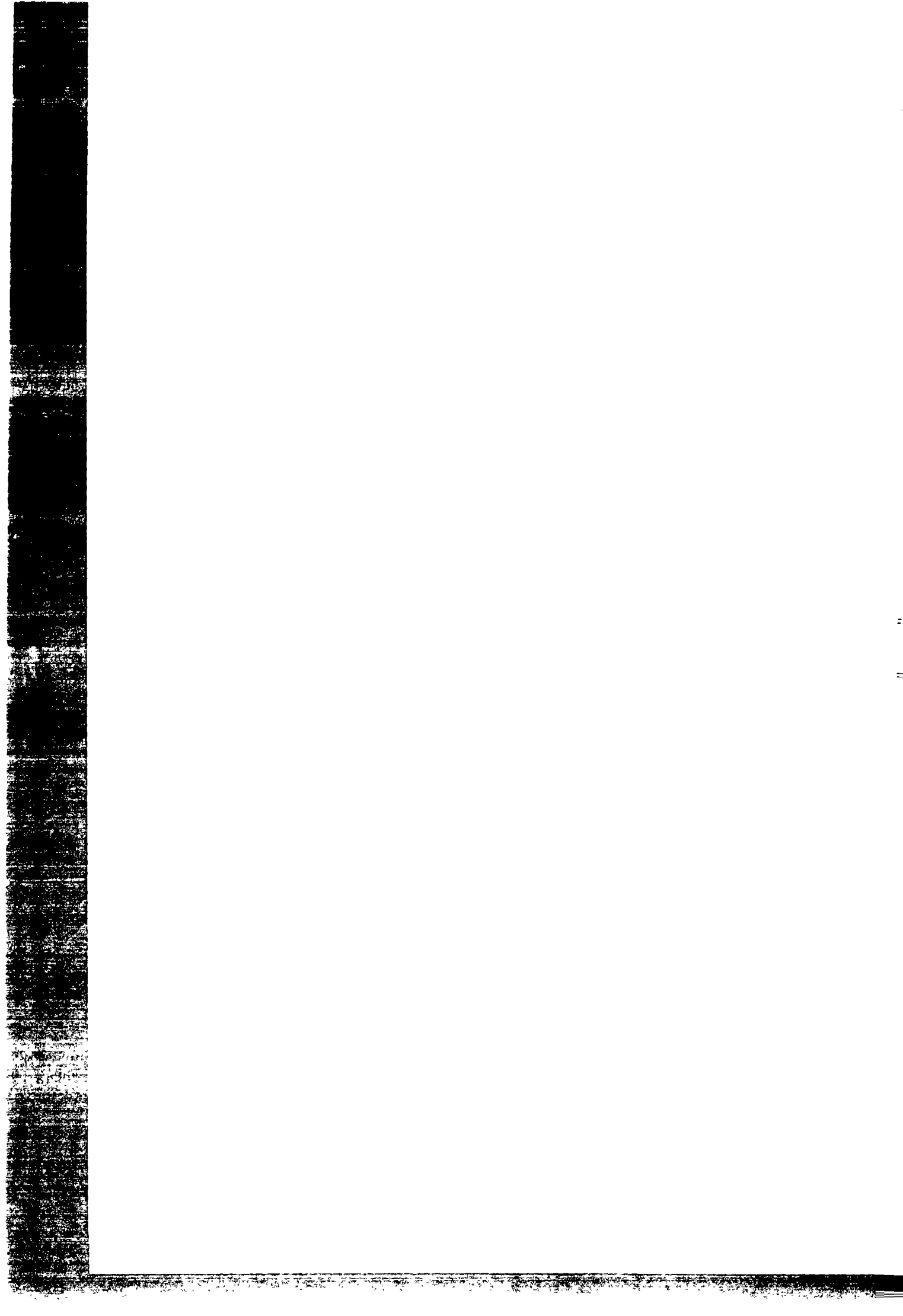
The assumptions to choose blacksmiths and cycle mechanics against carpenters and other artisans should not overrule geographical and logistical considerations of an SEM's operational area. In case blacksmiths and cycle mechanics are not found in an ideal operational area, efforts should be made to take other mechanics having a fixed workshop or job place.

In general, the possibility of taking other categories of people having technical aptitude and experience should be explored.

Table 1 : Identification & Selection of Artisans
and relevant Socio-economic Data on them

	<u>Delang</u>	<u>Rajkanika</u>	<u>Total</u>
<u>I Artisans Identified</u>			
Blacksmiths	30	23	53
Cycle Mechanics	3	10	13
Others	4	-	4
	-----	-----	-----
Total	37	33	70
	-----	-----	-----
<u>II Artisans Selected for Trng.</u>			
Blacksmiths	29	20	49
Cycle Mechanics	-	10	-
Others	-	-	-
	-----	-----	-----
	29	30	59
	-----	-----	-----
<u>III Operational Area Data</u>			
Avg. No.of villages/SEM	5	6	
Avg. No.of pumps/SEM	20	20	
Avg. distance of pumps from SEM's village	2.4 Km	1.8 Km	
Avg. distance of bank from SEM's village	8.5 Km	7.0 Km	
<u>IV Existing Occupations</u>			
Blacksmiths	2.4(100%)	14 (58%)	
Cycle mechanics	-	10 (42%)	
Total	24 (50%)	24 (50%)	48(100%)
<u>V Total Monthly Family Income</u>			
Less than Rs. 500	21%	54%	38%
Rs. 501 - Rs. 800	50%	33%	42%
Rs. 800 - Rs.1000	8%	4%	6%
Rs.1001 - Rs.1500	13%	8%	10%
Rs.1501 - Rs.2000	-	-	-
More than Rs.2000	8%	-	-
	-----	-----	-----
	100%	100%	100%
	-----	-----	-----

	<u>Delang</u>	<u>Rajkanika</u>	<u>Total</u>
VJ <u>Age Distribution of SEMS</u>			
20 years - 30 years	59%	62%	60%
31 years - 40 years	21%	29%	26%
41 years - 50 years	16%	8%	12%
Above 50 years	4%	-	2%
	-----	-----	-----
	100%	100%	100%
	-----	-----	-----
VII <u>Level of Education</u>			
Illiterate	17%	-	8%
1st - 5th std	42%	63%	52%
6th - 7th std	25%	8%	17%
8th -10th std	17%	17%	17%
above 10th std	-	13%	6%
	-----	-----	-----
	100%	100%	100%
	-----	-----	-----
VIII <u>Monthly Income from Pump Maintenance</u>			
Rs. 100 - Rs. 150	33%	50%	42%
Rs. 151 - Rs. 200	59%	42%	50%
Rs. 201 - Rs. 250	4%	4%	4%
Over Rs.250	4%	4%	4%
	-----	-----	-----
	100%	100%	100%
	-----	-----	-----
IX <u>Working Days per year in existing occupation</u>			
Less than 50 days	4%	-	2%
51 - 100 days	8%	21%	15%
101 - 150 days	63%	17%	40%
151 - 200 days	25%	25%	25%
201 - 250 days	-	20%	10%
More than 250 days	-	17%	8%
	-----	-----	-----
	100%	100%	100%
	-----	-----	-----



TRAINING OF SEMS

The first tier of the II Tier Maintenance System is the Self Employed Mechanic - SEM, a resident of a village in the project Blocks, an artisan servicing a particular locality or group of villages or hamlets . The SEM would undergo training so as to be able to maintain handpumps. Within the frame-work of identifying the SEM, and establishing the 1st Tier, training of SEMs was the precondition for a well functioning maintenance system and therefore an important activity.

The aims of training, in one of the early documents in DPD on this subject, were to pass on :

1. Knowledge of basic tools used on hand pumps
2. Knowledge of hand pump mechanisms
3. Knowledge of the organisational framework of PHED, and the SEM's role in it.

In keeping with the above aims, the training content was initially forseen as :

1. Materials used for manufacture of hand pumps
2. Mechanisms of hand pumps
3. Installation of hand pumps
4. Trouble shooting and Check Lists.
5. Iron content in water & Iron Removal Units
6. Filtration of water

Detailed Training Schedules were drawn up after discussions between SED and TMD and the above aims underout some changes. The strategy agreed to was that training would be conducted in two parts for each batch of trainees.

The first part of training lasting 6 to 7 days was intended to equip the SEM to undertake preventive maintenance. After this training the SEMs were supposed to be given 5 pumps each to carry out preventive maintenance for a 'familiarisation period' of about 2 months.

The second part of training was for 12 to 15 days. This training prepared the SEMs for below-ground repairs of India Mark II pumps, and other maintenance needs of pumps.

Annexure 1 contains an excerpt of a report that highlight the main considerations for planning of the SEMs' training programmes. By the end of January 1986, the general planning for the training courses was completed. By March 86, SED had completed the detailed planning. Detailed training schedules formulated on the basis of the plan are also included in the Annexure.

Table 2 below gives the details of the training programmes conducted, their dates and locations.

Table 2: Training Locations & Dates in 1986

<u>Location</u>	<u>Part I Training</u>		<u>Part II Training</u>	
	<u>Date & Place</u>	<u>No. of SEMs</u>	<u>Date & Place</u>	<u>No. of SEMs</u>
<u>Delang</u>				
Batch I	10-15/Feb. at Berboi	10	5-17/May at Delang Stn.Bzr.	10
Batch II	03-08/March at Indipur Deuli	9	14-24/July at Indipur Deuli	9
Batch III	17-22/March at Harirajpur	7	14-24/July at Harirajpur	9
<u>Rajkanika</u>				
Batch I	17-22/March at Cherantapada	9	02-13/June at Cherantapada	9
Batch II	31/Mar-5/April at Ayatana	10	18-28/June at Ayatana	10
Batch III	31/Mar-5/April at Seopada	9	18-28/June at Seopada	11

As will be evident from a comparison of the planned and actual training dates, two out of the twelve training programmes were delayed by a week and the rest followed the planned schedule closely.

At the outset it was recognised that the training would be aimed at illiterate and semi-literate village artisans. Therefore a great deal of thought went into formulation of technical terminology and phraseology to be used by the trainers. A uniform set of terms were developed in Oriya for components of the pumps, standard and special tools, and work procedures.

Training material consistent with the above vocabulary, was developed in the form of two booklets, one for each part of the training. After these books were initially used, they were modified slightly in subsequent training programmes to enhance their usefulness.

Training venues were chosen in villages with the consideration that groups of 8 to 10 trainees would find it convenient to travel to the venue each day, during the training. A second consideration for selection of venues was the availability of hand pumps near the venue for demonstrations of maintenance and repairs. As Table 2 will indicate, generally each batch of trainees consisted of 10 artisans.

Part I of the training consisted of :

- Introductions to the Danida Project
- Importance of safe drinking water
- The need for a Community based Maintenance System
- Assessment of skills of trainees
- Descriptions of different types of pumps and their parts
- Descriptions of Tools needed for pump installation & maintenance
- Demonstrations of Repairs and Maintenance
- Demonstration of Pump Installation & Platform Construction
- Preventive Maintenance needs of pumps
- Maintenance of records
- Short term and Long term responsibilities

In the second part of the training, the course content covered :

- Retention of training content of Part I training
- Principles and theory of deep well and suction pumps
- Components of pumps and cylinders
- Familiarisation with tools needed for pump repairs & maintenance
- Demonstration of below-ground repairs of IM II pumps
- Supervised practicals of below-ground repairs and cylinder over-haul by trainees
- Need to work in groups and teams for major repairs
- Symptoms of problems of pumps and their remedies
- Maintenance of Records and the Reporting system
- Role of the 2nd Tier with reference to the SEM

As has been mentioned earlier, the training method used a vocabulary of simple terminology for technical descriptions. It also used illustrated training material, audio visual aids like slides and charts, full scale models of assemblies and components, demonstrations and supervised practicals in the field, role-plays and feed back discussions. Special emphasis was given on artisans showing lower levels of comprehension.

The major responsibility for conducting the training was borne by SED with TMD sharing the responsibilities to a lesser degree. This had both advantages and disadvantages.

The rapport between Socio-Economists and the Artisans was generally strong, since their mutual contact was older. The socio-economists were able to effectively practise the training approach outlined earlier, i.e., using simple Oriya language, being repetitive about important aspects, clearing doubts with patience and through discussions. The socio-economists were at a disadvantage due to their lack of practical experience with hand pump installation and maintenance, and initially spoke without the confidence that comes from personal experience of having repaired pumps.

Junior Engineers from TMD should have performed the function of technical trainers. This role was met by the JEs only to a limited extent partly because they had not conceptualised their role as trainers and partly because teaching technical matters to artisans who have little formal training was not something that JEs had done earlier. Also, the tendency to remain physically aloof from demonstrations and practicals reduced the effectiveness of the JEs as trainers.

Over the duration of the 12 training programmes these drawbacks were overcome to some extent as socio-economists developed more and more confidence with their training material and from their accumulated practical experience, and as JEs began to make some effort to communicate with and teach the SEMs.

As the post-training activity of II Tier Maintenance System will indicate, SEMs were able to put their training to use. Remaining areas of weakness, like maintenance of records, sequences of visits, working in groups when attempting below-ground repairs, were strengthened by post-training follow-up by Socio-Economists and Junior Engineers.

COMMISSIONING OF SEMs & THE PAYMENT SYSTEM

The responsibility of hand pump repair and maintenance was handed over to the SEM at the time of commissioning. At this stage two major things were done :

1. Signing of a contract between the project and the SEM (Annexure 2)
2. Providing the SEM with necessary tools and a bicycle

At the time of commissioning, the following materials were distributed to each SEM :

1. 1 set standard tools, with 2 tool bags
2. 1 set special tools and tools box
3. 1 bicycle with reinforced wheels and carrier
4. English copy of Contract, and its Oriya translation
5. Lists of handpumps given to the SEM, with identification and installation details
6. Identity Card

Commissioning phase

Soon after completion of Part-II Training, commissioning of the SEMs was supposed to be done in batches. But due to low population of the pumps and delayed procurement of tools and bicycles, commissioning had to be postponed on numerous occasions.

The final schedule of commissioning of SEMs is given below in Tables 3 & 4.

Table 3 : Commissioning sequence of SEMs in Delang

	20.08.86	21.09.86	18.11.86
No. of SEMs Commissioned	10	10	4
Max. no. of pumps given to an SEM	19	10	7
Min. no. of pumps given to an SEM	6	1	1
Total nos. of pumps given to <u>all SEMs</u>	141	32	16

Table 4 : Commissioning sequence of SEMs in Rajkanika

	25.08.86	01.10.86	20.11.86	28.01.87
No. of SEMs Commissioned	5	13	3	3
Max. No. of pumps given to an SEM	15	8	15	8
Min. no. of pumps given to an SEM	7	2	2	2
Total nos. of pumps given to <u>all SEMs</u>	47	49	23	16

Technical checks :

Before hand-over of pumps to the SEMs a physical check of the pumps was done to ascertain their condition. This was done jointly by the JEs of the field Divn. and TMD, and the SEM. Initially the Socio-Economists were also associated with the technical checks. In Delang Block, SEMs attended all technical checks, but in Rajkanika this practice was stopped after SEMs were commissioned. After commissioning, additional pumps were distributed to SEMs, as pumps were installed and technical checks completed.

Payment system

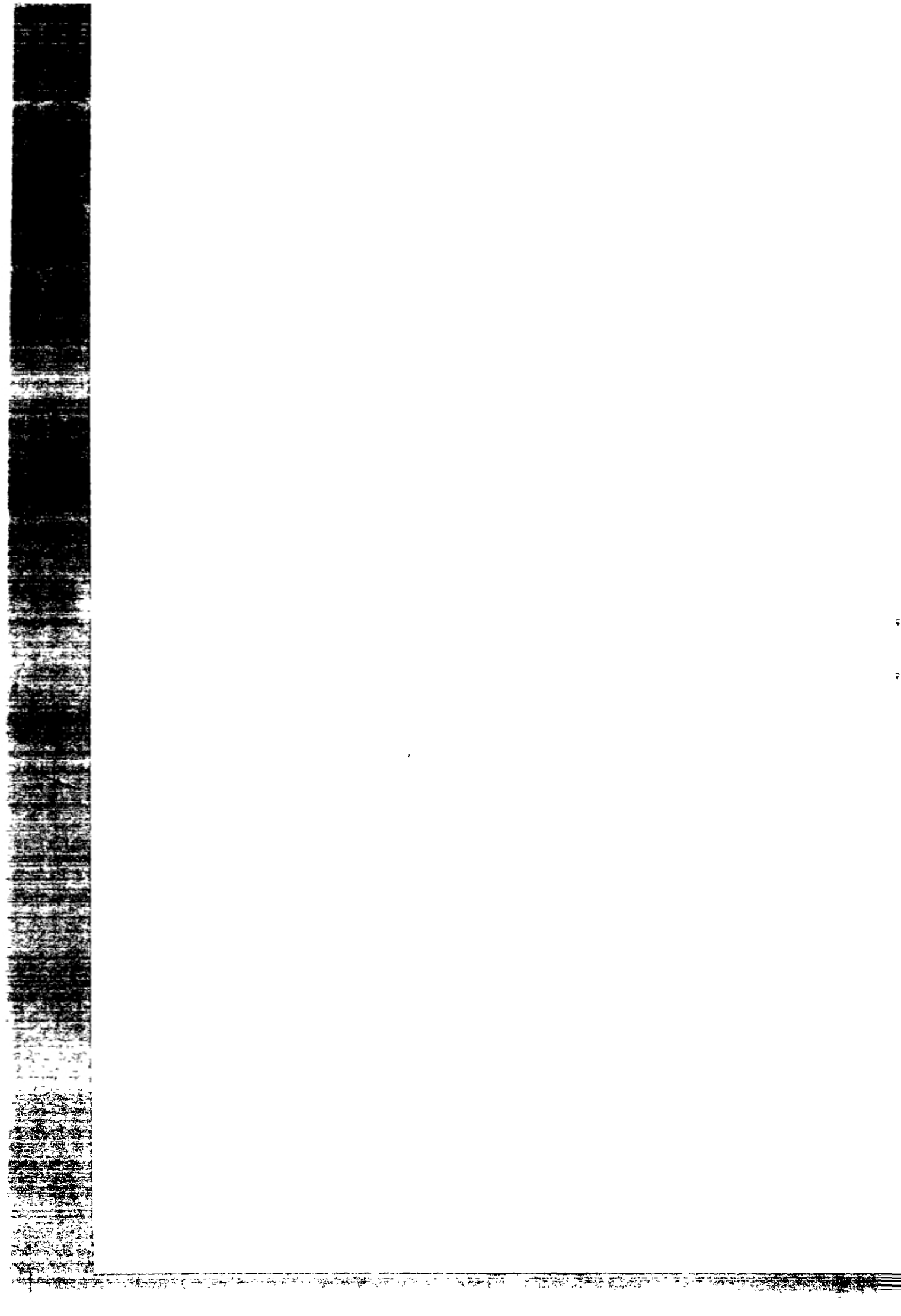
The manual of the II-tier maintenance system states that :
 "to avoid the SEM's inherent passive attitude towards complexities and also in order that an independent system grows for the possible future administration by the water committees, a payment system

through the local commercial bank pass books will be introduced".

Monthly payment to the SEMs through bank pass books was introduced in October 1986 in favour of the following major advantages :

- there would be scope for the community to eventually take over the system
- it would help in creating a feeling among the SEMs of not holding a Govt. job
- payment to the SEMs could be transferred directly from the project head quarter to the SEM without involving any intermediaries. It would be a convenient process, relatively free of bureaucratic drawbacks

Since its introduction, the formal transactions of finances have been going on smoothly. After monthly meetings the Socio-economists prepare a statement of dues to the SEMs. Money is deposited at the bank in Bhubaneswar through Chief Adviser's Office and it reaches the bank branch at the block level within seven days. The statement of dues is prepared in the last week of each month and the SEM gets credit in his account within the first week of the coming month. However, not all the advantages argued in favour of the system have been verified. In order to further test and develop the system, there is a need for consistent efforts in related areas like mobilizing the community to participate in the payment system, which needs to be explored further.



ESTABLISHMENT & OPERATION OF THE SECOND TIER

In the conceptual framework of the II Tier Maintenance System, the Second Tier was to be staffed at the Block level, by a JE, and a repair crew. The responsibilities of the 2nd Tier were :

1. Conducting Training Programmes
2. Completing Technical Checks prior to Commissioning of SEMs
3. Continuing Technical Checks as installation were completed
4. Continuing Hand over of pumps to SEMs, that had been checked, both in the field, and by completion of contractual formalities at monthly meetings
5. Obtaining spareparts from TMD and issuing spare parts to SEMs
6. Verifying SEMs' work records at monthly meetings
7. Maintaining records of Installation of Pumps, of Individual SEMs, and Maintenance of Pumps, at Block level
8. Conducting monthly meetings and preparing reports of monthly meetings for TMD
9. Visiting problem installation for verification, and rectification wherever possible
10. Monthly reporting to TMD on work done by the 2nd Tier, i.e., Technical checks completed, Repairs attended, pumps handed over, Spareparts used and required, etc.

Tables 5 & 6 give details of the establishment and accomplishments of the 2nd Tier in Delang and Rajkanika.

Table 5 : Chronology of Technical Checks and Handover

Sl. No.	Month	<u>Delang</u>		<u>Rajkanika</u>	
		<u>Checked</u>	<u>Handed over</u>	<u>Checked</u>	<u>Handed over</u>
1.	April 86	36	-	-	-
2.	May	65	-	28	-
3.	June	-	-	-	-
4.	July	21	-	-	-
5.	August	-	80	27	47
6.	September	65	34	46	
7.	October	-	16	-	46
8.	November	26	-	37	22
9.	December	68	-	35	65
10.	January 87	11	43	55	-
11.	February	25	32	11	42
12.	March	19	-	41	-
13.	April	23	-	26	-
14.	May	9	7	NK	79
15.	June	11	24	NK	-
	Totals:	379*	236	306	301

* Includes 55 Test pumps.

Table 6 : Establishment & Accomplishments of the 2nd Tier.Establishment

		<u>Delang</u>	<u>Rajkanika</u>
1.	JE appointed on	8.11.85	1.5.86
2.	JE's crew appointed on		
	a. Fitter	May 1986	Oct.'86
	b. Helper	1. May 86	1. Aug 86
		2. July 86	2. Aug 86
			3. Aug 86(terminated)

Observations:

1. Repairs attended : A clear recording of monthly repairs is not available at both Blocks. Detailed analysis of existing records (in diary form of the Fitter) is necessary.
2. Spare parts : Receipts of spare parts and issues to SEMs have been recorded, but reconciliation of receipts and usage is not available.
3. Reporting of SEM's Monthly Meetings : Joint reports prepared by JE and SE are available for all meetings, from December 86, when meetings were started upto June 87.
4. Monthly Work Reports : Work reports detailing location of pumps where technical checks were completed and where problem installation reports were verified and rectified, are mostly available for both Blocks. The maintenance information available does not distinguish between repairs done by the 1st and the 2nd Tier.
5. Analysis of Data : From the available records, some analysis has been attempted on the following aspects :
 - Work loads of SEMs
 - Nature and Frequency of Repairs done by SEMs
 - Individual details of work loads and sequence of Handover of pumps to SEMs
 - Individual details of Nature & Frequency of repairs by SEMs
 - Nature of Problem Installation

This data is presented in Annexure 3, and its implications are discussed elsewhere in this report.

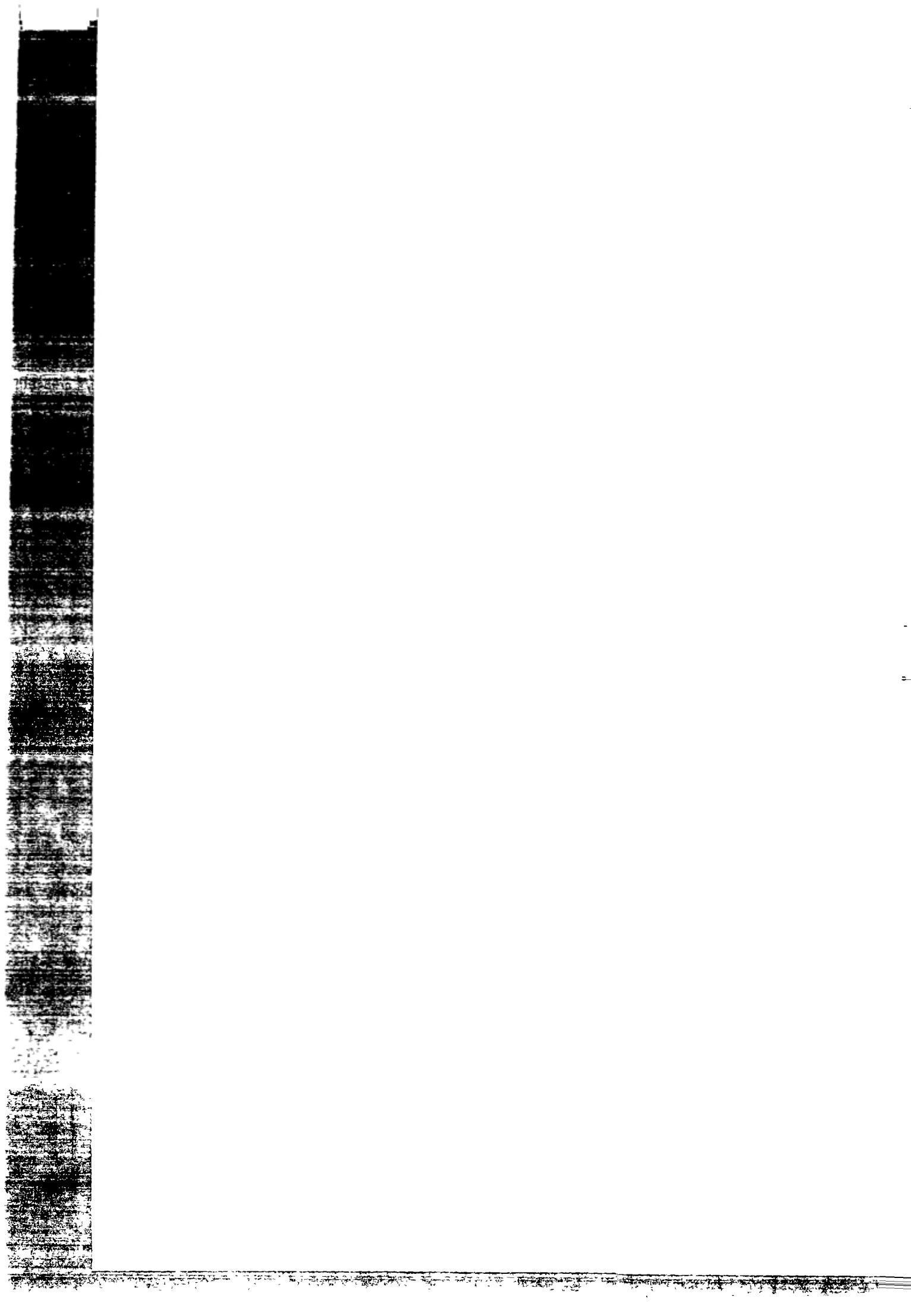
6. Functioning of the 2nd Tier :

As will be evident from the preceeding information, the following conclusions emerge :

- Unlike SEs, who were associated from the very beginning, at the planning stages, JEs came into system late. This had its obvious drawbacks. They were not able to understand their roles as trainers clearly. Similarly, they have not clearly understood their responsibility as the first line of administration of the Maintenance system.
- These problems have resulted in a reporting and control of the maintenance system that is not yielding accurate and timely data. Also it has not been possible to gradually bring about changes in the operation of the 2nd Tier based on field experience.
- The reasons for these drawback could be many. However, some of the main reasons are :
 - late induction of JEs into the system
 - dual responsibilities of JEs to the Field Division and to TMD
 - irregular reporting from the JE, and lack of follow-up from TMD
 - dependance of the JEs on SEs
 - heavy administrative work loads of record keeping at Block level on the JE
 - fragmentary patterns of pump installation
 - lack of support from TMD

In conclusion, it has to be noted that the role of the 2nd Tier was not very clearly conceived at the start. This was due to the pronounced preoccupation with the

establishment and operation of the 1st Tier. The consequent neglect faced by the 2nd Tier, and the assumptions that JEs know their responsibilities and so their functioning was of secondary importance, are probably the main reasons for the 2nd Tier's weaknesses. Therefore, the 2nd Tier now demands close attention since it represents the support-function level, without which the 1st Tier can easily collapse at any stage.



MONITORING OF THE SYSTEM

General

The status of the II-tier maintenance system as a research and development programme implied, among other things, that its performance, progress and results had to be closely monitored for two main reasons :

1. Detailed monitoring generated information about problems and bottlenecks occurring, which could be immediately rectified
2. Regular monitoring data would eventually contribute to an evaluation of the system

The types of monitoring of the II-tier system have been grouped in three categories :

1. Recorded observations from the establishment (training) stage of the system
2. Monitoring of certain aspects of the 1st tier of the system, after its establishment, through interviews and structured questionnaires
- 3 Maintenance records and reports from the monthly meetings of SEMs at the Block level, conducted by the Junior Engineer and Socio-Economist

Establishment :

After each training course an observation report was prepared by the Socio-economist involved. The reports gave an assessment of the course performance, including :

1. motivation of trainees, interest and capacity to learn
2. availability, contribution and aptitude of resource persons

These reports served a monitoring and documentation purpose and helped to identify problem areas, which were subsequently improved upon.

Monitoring through interviews and questionnaires :

This category of monitoring primarily had its focus on the 1st tier of the system, the SEM. The following aspects were monitored through interviews with structured questionnaires:

1. A one-time baseline survey of the professional, socio-economic and motivational background of the SEMs
2. A one-time assessment of the retention of the technical training imparted to the SEMs
3. Quarterly monitoring of the preventive maintenance and repair performance of the SEM
4. Quarterly monitoring of the handpump users' response and attitude towards the SEM .

Monthly meetings :

In Rajkanika, 7, and in Delang, 8 monthly meetings were held since December 1986.

Monthly meetings were held for one full day each month in the office of the Block Store. All SEMs in the Block assembled there to show their record books and log sheets to the JE and SE. The JE verified the data recorded (repairs, use of spareparts) by the SEM in his repair and maintenance log book. The SEMs submitted indents for new spareparts requirements at these meetings.

The data generated in these monthly meetings were valuable for the monitoring of the maintenance system. The following information was recorded in these meetings :

1. Major and minor repairs undertaken during the month
2. Use of spareparts during the month
3. Condition of the pumps as observed by the SEM during the month

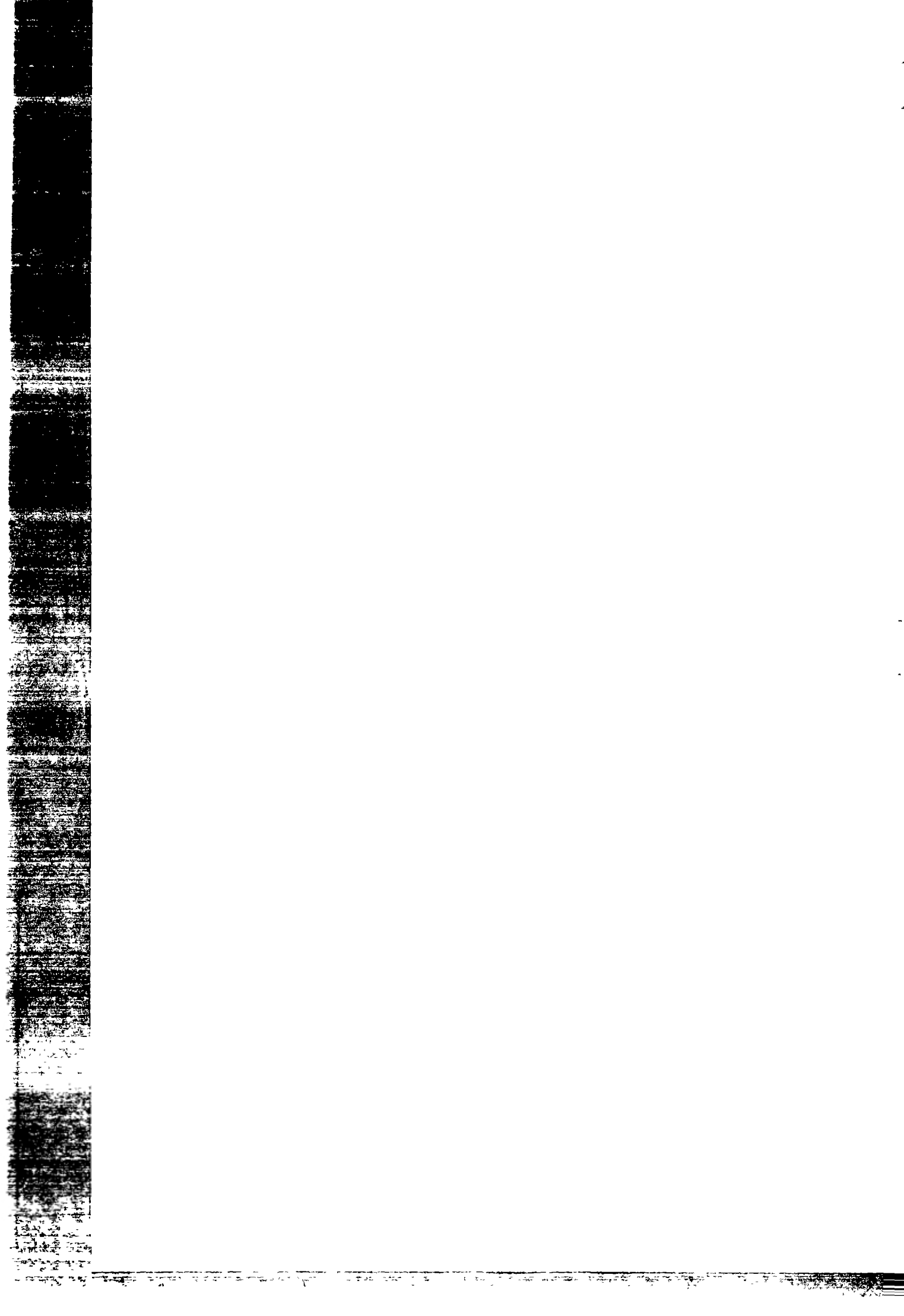
4. Water quality problems as reported by the beneficiaries and verified by the SEM
5. Condition of the platform, drainage and platform environment
6. Instances of internal collaboration between SEMs
7. Instances of SEMs taking the assistance of the JE

The following information was also gathered from discussions with the SEMs :

1. Ways of reporting breakdowns to the SEM
2. Time lag between users reporting breakdown and SEM's repair
3. Users' reaction towards the SEM

The data on water quality and handpump condition constitute valuable data for the project in terms of an ongoing evaluation of the performance of the project's main tangible activity - installation of hand pumps.

Annexure 4 contains the Log Sheets used by SEMs to report their monthly maintenance work to the JEs at Monthly Meetings.



ANALYSIS OF MONITORING DATA

Documentation from training courses held

Reports and documentation on SEMs training courses have served the purpose of modifying training techniques, and contents of specific sessions in later programmes. They also helped in gradually rectifying the organisational and resource personnel problems which occurred.

During the establishment of the II-tier Maintenance System in Phase-II Blocks such reporting after each training course should continue.

Monitoring data from Interviews and Questionnaires with the 1st Tier

Monitoring of the 1st Tier through interviews and with questionnaires was done only once, in February-March 87, although part of this category of monitoring was scheduled to be carried out once in a quarter. The Socio-economists responsible were not able to conduct subsequent rounds of monitoring, due to other preoccupations. The monitoring data collected so far, is therefore of limited value, since they only represent one round of interviews. The subsequent changes or improvement in the SEMs' performance is thereafter known only from their reporting in the monthly meetings.

The baseline data on SEMs are shown in brief in Table 1.

Two sets of data are especially important :

1. The SEM's level of income from his traditional trade vis-a-vis his income from maintenance of pumps
2. The SEM's level of education.

Although the additional income from maintenance cannot be said to be a substantial increase in income for most SEMs, it is nevertheless very much acknowledged to be at least a convenient addition to the household income. For the poorest SEMs however, the income directly supports the basic needs items in their household budgets.

For all SEMs the motivational element to perform as responsible and committed maintenance workers rests on the amount of remuneration earned. The better-off SEMs, who are already fully employed, calculate the efforts they have to give for the maintenance work in terms of time spent and subsequently whether the income earned can compete with the opportunity cost of not being active in their traditional trade during this period.

Level of education and literacy gains immediate relevance for the SEMs' task of maintaining sparepart log sheets and maintenance records of each pump. In cases of illiterate SEMs, help in maintaining records is taken from relatives and friends or neighbours. These cases have shown to be a little problematic at times, but have been repeatedly dealt with in the regular monthly meetings. A subsequent improvement has been observed.

The data produced from the first round of this type of monitoring are presented in Table 7.

There is a striking difference between some of the data from the SEMs' performance in the two blocks. As a general observation this difference cannot be said to accrue only from basic differences between SEMs, their workload, etc., in the two blocks. Data from the two blocks were collected by different Socio-economists using different interview techniques and having somewhat different approaches.

The interview technique has to be uniform for all SEMs in the two Blocks. This can only be rectified in future by letting the same team of two Socio-economist carry out all quarterly monitoring interviews.

The salient features of the SEMs performance are as follows :

- A majority of SEMs do not have a fixed itinerary for preventive maintenance.
- A majority of SEMs undertake preventive maintenance in the morning hours.

- A large majority of SEMs carry out preventive maintenance alone.
- In Delang reports about pump breakdowns reach the SEM through four different channels with almost the same frequency, viz. at the workshop or home of the SEM, at the market place, in the SEM's village or by regular visitors passing by the SEM's village. This shows that the so called "informal reporting system", one of the important assumptions behind the II-tier system as a village based maintenance system, is working in a satisfactory and flexible manner.

The data from Rajkanika show that all reports about pump breakdown reach the SEM in his workshop or house. This data may be questionable and need to be checked during the next round of monitoring interviews.

- In Delang most SEMs (80%) attend to reported breakdowns the following day. These data appears to be more reliable than the Rajkanika data which states that only 25% of the breakdowns are attended to the following day and 75% on the day the reports have been received.

The explanation for the Rajkanika SEMs attending to breakdowns immediately is : "Concern for the users". This may hardly reflect the true concern of the SEMs but rather that of the Socio-economists conducting the monitoring interview. This does not mean, however, that SEMs are not conscious about the necessity of satisfying the users need.

- In both Blocks the SEMs are by and large satisfied with the supply of spareparts at the time of interviewing. The initial smooth supply of spareparts, however, is observed to have deteriorated since then. This aspect of the 2nd Tier needs closer attention and monitoring in the future.

- In Delang 17% of the SEMs find that tools are insufficient. In this block almost half of the SEMs face difficulties in using the tools. This aspect needs to be looked into further.
- In Rajkanika neither are complaints nor difficulties in using tools reported. The reason for this needs to be looking into in the next round of monitoring, with reference to observations in Delang.
- In both Blocks most SEMs are maintaining their own records. Only totally illiterate ones seek the help of family members or others.
- Almost all SEMs in the two Blocks (94% & 98%) are satisfied with the present payment system.

For the future, it is recommended that data collection with the questionnaires on the SEMs performance be conducted in the following manner :

- One round in the beginning of Phase II (Oct.-Nov.1987)
- One round at the middle of Phase II (April-May 1988)
- One round at the end of Phase II (July-Aug. 1990)

The data generated will serve as input for the final evaluation of the II-Tier System in the three Blocks: Delang, Rajkanika and Chandbali.

Reporting from Monthly Meetings

Monthly Meetings have functioned well and proved to be a good monitoring tool. Provided reports and records are kept accurately at both the 1st and 2nd Tier, the data generated will serve the dual purpose of monitoring the performance of the II Tier System as well as monitoring the quality and durability of the handpump installation of the project.

As a follow-up action to reports from SEMs during Monthly Meetings that some users of handpumps were not familiar with the SEM in their area, SED distributed pamphlets to users introducing the

SEMs. An identification signboard for each SEM to be placed outside his house is presently being prepared by SuC.

Monthly meetings have to be supplemented by periodical monitoring of each SEM's performance through structured questionnaires and interviews as suggested above. A more detailed picture of the problems and condition of the pumps allotted to each SEM will then emerge at the particular time of monitoring. During the monthly meetings there has not been enough time to go into these details and as the number of pumps per SEM increase this will become increasingly difficult.

Monthly Meetings should be given high priority in the monitoring system in future. Regular meetings will also serve as a means to strengthen the 2nd Tier.

The Monthly Meetings resulted in joint reports each month from each Block prepared by the SE and JE. Apart from general comments on attendance, regularity of visits and spare parts needs of each SEM, each meeting resulted in a listing of installations with maintenance and quality problems. Such maintenance problems were to be rectified in the subsequent month by the 2nd Tier, and the reports on installation and water quality problems were to be verified by the JE or SE and reported again next month.

Generally maintenance problems recorded in monthly meetings were rectified by the JE, but the reporting system for this activity needs to be more systematic in future. The accuracy of records kept by the 2nd Tier will then reflect the extent to which they were able to fulfill their role as regards maintenance support to the 1st Tier.

The follow-up action on reported cases of installation and water quality problems also needs attention in future, especially since it goes outside the scope of activities originally foreseen for the 2nd Tier. This aspect of the monitoring data emerging from the Maintenance System needs the attention of a higher level of the Project organisation.

Table 7 : Summary of Monitoring Data through Interviews & Questionnaires

	<u>Delang</u>	<u>Rajkanika</u>
I <u>Itinerary of visits to Pumps</u>		
Fixed Internary (dates or routes)	39%	30%
Flexible	61%	70%
	-----	-----
	100%	100%
II <u>Time of the Day spent for Preventive Maint.</u>		
Morning	83%	65%
After-noon	6%	4%
No fixed time	11%	31%
III <u>Preventive Maintenance done with :</u>		
Along	94%	87%
with Relative	6%	4%
with Paid Help	-	9%
IV <u>Repair Information Recd. During</u>		
Preventive maint. Visit	29%	43%
Separate Request	71%	57%
V <u>Break down information received :</u>		
at Work Shop or home	30%	100%
at Market	30%	-
at Village thru. passer-by	20%	-
by regular visitor	20%	-
VI <u>Attendance to Break down intimation</u>		
Went immediately	20%	25%
Went same day	-	50%
Went next day	80%	25%

	<u>Delang</u>	<u>Rajkanika</u>
VII	<u>Reasons for going immediately</u>	
	Concern for users	50% 100%
	In the same village	50% -
VIII	<u>Opinion on Supply of Spare Parts</u>	
	Satisfied	83% 96%
	Not satisfied	17% 4%
IX	<u>Opinion on Tools</u>	
	Sufficient	83% 100%
	Insufficient	17% -
X	<u>Difficulties with Using Tools</u>	
	Yes	44% 4%
	No	56% 96%
XI	<u>Who maintain records</u>	
	Self	89% 91%
	Family member	5.5% 9%
	Other persons	5.5% -
XII	<u>Priorities of Work</u>	
	Maintaining Pump	38% 48%
	Maintaining Records	- -
	Attending monthly meetings	6% -
	First 2 of the above	17% -
	All 3 above	38% 52%
XIII	<u>Opinion on Payment System</u>	
	Satisfied	94% 98%
	Unsatisfied	6% 2%

Data Analysis from JEs' REcords, SEMs' Records and Monthly Meetings.

Data Base :

The following analysis is made from the recording system presently followed by the Maintenance System, and kept by the JEs at Block level. The records and reports used to complete this analysis are as follows :

1. Monthly Work Reports of JEs to TMD, detailing technical checks completed. Though this report also details maintenance of pumps during the month, this information has not been used since it does not distinguish between maintenance done by the 1st Tier and the 2nd Tier.
2. Monthly Meeting Reports of JEs & SEs with SEMs, where technically checked hand pumps are recorded when handed over to SEMs, and where SEMs report on the status of problem installations. This report also covers some other aspects of the Maintenance System which have been high-lighted at the appropriate place.
3. Master Record of Tube Wells, maintained by the JEs where-in they record the completion of the technical check of a pump installation. This record is maintained on the basis of projected number of tube wells in a village, against which actual completion details are recorded when technical checks are completed.
4. Master Record of hand over to SEMs, where details of each pump handed over are maintained against names of individual SEMs.
5. Individual SEM's Records; which are separate registers for each SEM, with separate records of maintenance of each pump, from the time of its hand over to the SEM.

The study of these records has yielded data on the Maintenance System in Delang and Rajkanika which is compiled in Annexure 3

The contents of this Annexure, tabulated separately for each Block are as follows :

1. Details of Hand over of pumps to SEMs, which is a tabulation of the initial projections of hand pumps to be given to each SEM, compared with the actual chronological sequence of hand overs, and the final numbers of pumps with each SEM by June 1987.
2. Details of Maintenance done by SEMs on their pumps, amplifying the frequency of repairs on both IM II and Inalsa Suction pumps, which are the two kinds of pumps under the maintenance system.
3. Summary of Monthly Meeting Reports on problem pumps, which analyses the type and extent of problems, that SEMs refer to the JEs for the attention (and action) of the 2nd Tier.

Technical Checks & Hand overs :

The analysis that emerges regarding Technical Checks and Hand over of pumps from the data, can be summarised as follows :

Table 8 : Hand over and Work Load Analysis

	Delang		Rajkanika		Total	
	Nos	%	Nos	%	Nos	%
I <u>Technical Checks & Handovers</u>						
Expected Nos. of pumps to be given	447	100%	444	100%	891	100%
Technical checks completed by June 87	324	73%	306	69%	630	71%
Pumps handed over to SEMs by June 87	296	66%	305*	69%	601	67%

*

* There may be a discrepancy of 4 pumps in this figure.

Table 8 (Contd.): Handovers & Work Load Analysis

II	<u>Work Load Analysis of SEMs</u>	Delang		Rajkanika		Total	
		Nos	%	Nos	%	Nos	%
	SEMs with more than 80% of projected number of pumps to be given	11	46%	6	25%	17	35%
	With more than 50% but less than 80% of projected no. pumps to be given	7	29%	9	37.5%	16	33%
	With less than 50% of projected no. of pumps to be given	6	25%	9	37.5%	15	32%
	Totals:	24	100%	24	100%	48	100%

The above Table whows that :

1. 67% of the projected number of pumps have been handed over to the 1st Tier of the maintenance system.
2. 71% of the projected number of pumps have been technically checked.
3. The above percentages will change favourably if the projected numbers of pump installations have gone down during actual construction of wells.
4. The distribution of SEMs, about one-third in each group, is equal in three groupings of percentages of pumps handed over, of above 80%, between 80% and 50%, and below 50%.
5. If weighted overages were taken of the work loads of individual SEM, then the system is currently functioning at 68% of the projected load on the maintenance system. This is consistant with the gross average of hand over of pumps in both Blocks.

Frequency & Nature of Repairs : A second important aspect emerging from the data concerns Frequency & Nature of Repairs.

Table 9 : Frequency & Nature of Repairs undertaken by SEMs.

	Delang				Rajkanika	
	IM II		Inalsa Suction		IM II	
Total No. of Pumps handed over to SEMs by June 87	271 (100%)		35 (100%)		305 Data available for 107 only (100%)	
Number of Pumps with no repairs since installation	225 (83%)		12 (34%)		48 (45%)	
Number of Times Repaired	Minor Rep	Major Rep	Minor	Major	Major	Minor
Once	19 (7%)	16 (6%)	-	9 (26%)	35 (33%)	8 (7%)
Twice	6 (2%)	1	-	7 (20%)	7 (7%)	6 (6%)
Thrice	2	-	-	5 (14%)	-	3 (3%)
Four times	1	-	-	2 (6%)	-	-
Five times	1	-	-	-	-	-

The above Table indicates the following :

1. 83% IM II pumps needed no repairs in Delang, but in Rajkanika this figure was 45%.
2. This difference was because there was a large group of 35% of one-time minor repairs in Rajkanika, which were mostly missing nuts and bolts.

3. In fact most "minor repairs" in both Blocks, whether "once" or more, were replacement of nuts & bolts.
4. This indicates that the maintenance system functioned effectively in replacing and recording the need for small components. Secondly, the frequency of routine visits of SEMs was fairly regular since such replacements did occur on multiple occasions.
5. There have been exceptional cases of one pump needing minor replacements four times and another five times.
6. The occurrence and frequency of major maintenance for IM II pumps in Delang was substantially lower than in Rajkanika. Almost all these cases were of replacement of leather cup washers of the cylinder, and occasionally, replacement of riser pipe sockets which failed during reinstallation.
7. Though a total of 305 pumps have been handed over to SEMs in Rajkanika, the JE's records yield data on only 107 installations. There were no records available for 8 out of 24 SEMs of Rajkanika. This is a serious lapse of the 2nd Tier. The data available for 107 pumps, were for IM II pumps only, and upto May 87 (and not June 87). These factors affect the reliability of the data base.
8. The maintenance history of Inalsa Suction pumps shows that 34% installations underwent no repairs and that 66% installations underwent "major" repairs. 40% of the installations recorded were than one "major" repair. Almost all the repairs to Inalsa Suction pumps were cases of plunger rod breakage, and this failure is consistent with observations on this pump elsewhere.

9. The absence of any record of installations of Inalsa Suction pumps in Rajkanika implies that the rejuvenation programme had not started by April 87, or that the JE's records are incomplete in this aspect also.

Problem Pumps from Monthly Reports

Data from Annexure 3 , regarding problem pumps is summarised in Table 10.

Table 10 : Summary of Reports of Problem Pumps.

Nature of Problem	Delang	Rajkanika	Total	
Low Yield/Depletion	11	7	18	74
Turbidity	32	2	34	
Saline to taste	7	2	9	
Fe to taste	11	2	13	
Pedestal Shaking	5	-	5	26
Damaged Drain	9	2	11	
Waste Water Disposal Problem	8	2	10	
Handle Hard/Shaking	8	-	8	11
Scoured Platform/Drain	3	-	3	
Rusting of Pump Head	52	-	52	60
Extended Breakdown	6	2	8	

From the above table, the conclusions are :

1. 74 cases of problem wells were recorded in the category of water quality and quantity. These reports consisted of Low Yield or Depletion in the wells, Turbidity and tongue taste of Salinity and Iron content. Most of these cases were positively verified by the JEs. However, no

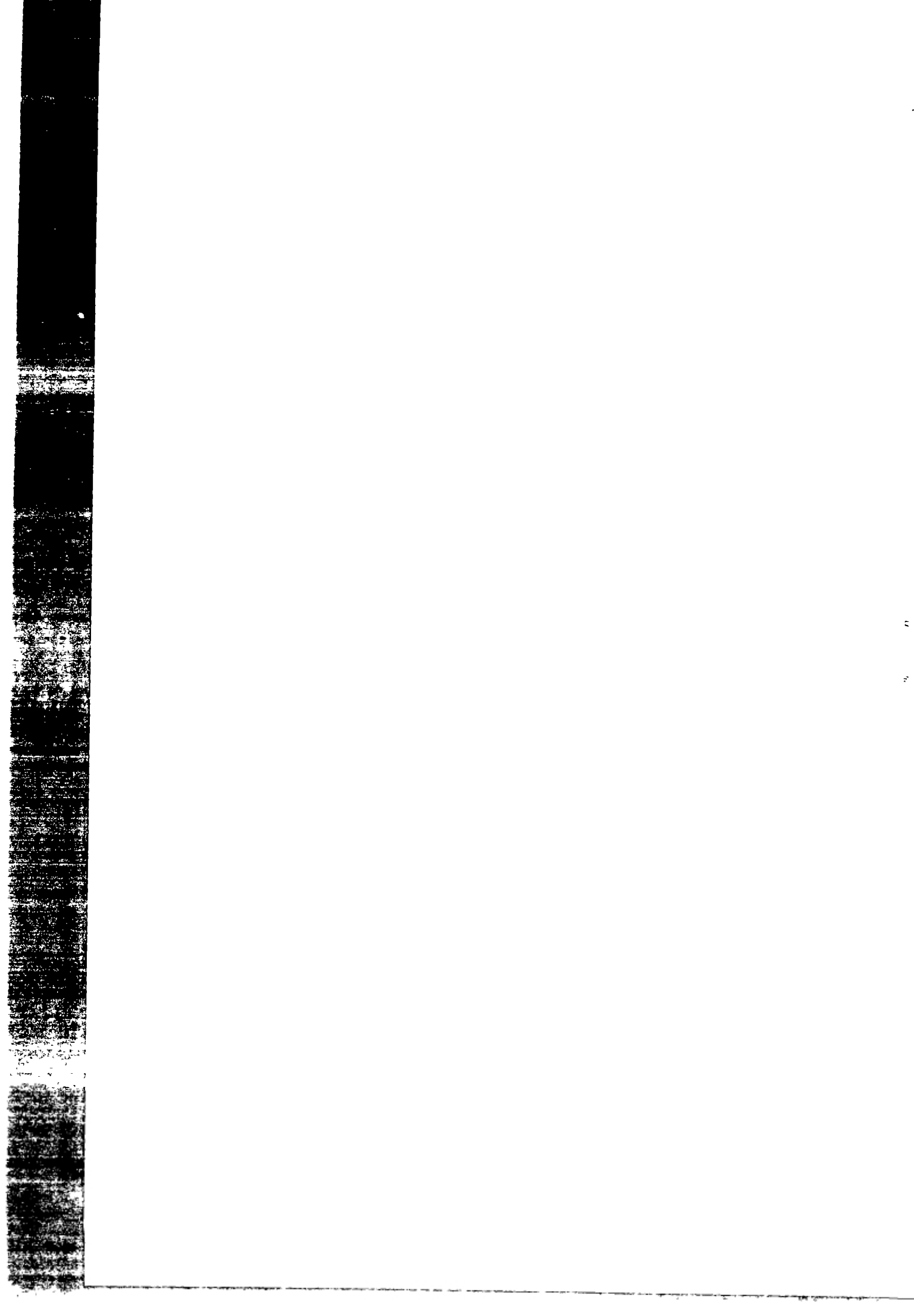
procedure has been formulated by which such cases can be quantitatively assessed and then decided upon for action. However, just the presence of this report indicates that water quality problems may occur in wells that were initially successful. In terms of the extent of the problem, it could be very roughly estimated that about 10% of the wells have deteriorated with water quality problems in an average time span of about 11 months pump life of about 600 pumps.

2. Under the category of unsatisfactory installations, a total of 26 cases were recorded, or about 4% of installations.
3. Rusting of pump heads were recorded in 52 cases in Delang, representing 19% of installations in Delang. It can be expected that the extent of the problem is similar in Rajkanika also, though no such observation is made.
4. Extended breakdowns have been recorded in 8 cases, or 1.3% of total installations. These actually represent "unrepairable" pumps, or tube wells that have become defunct. Generally, these are cases of rejuvenation wells, where the well has got choked.

ANNEXURE 1

TRAINING PLAN

& TRAINING SCHEDULES



Excerpt from Report on Training Activities of SED dated 31.3.86.

II-tier Maintenance System : SEM training

General content of the training course.

The training course is divided into two parts. The 1st part is of a 6 days and the 2nd part is of a 12 days duration. The training is arranged at a convenient site within a zone covering one third the Block. Each Block is divided into 3 zones. There will be 7-10 blacksmiths/bicycle mechanics in each course. T.A. and D.A. are given to the trainees during the course.

The 1st part covers general orientation, motivation and instruction in maintenance and repair of above-the-ground mechanisms of hand-pumps. Instruction in repair and maintenance is done at the field sites. Upon completion of the first part of the training the trainees get a standard tool kit.

A working contract is signed which will later be superceded by a final contract after the completion of the 2nd part of the training course and successful performance.

The 2nd part is arranged approximately 2 months after the completion of the 1st course.

During this interim period the performance of the trainees and community attitudes are monitored. Problems faced and issues dealt with will be items of discussion and follow-up training during the first 6 days of the 2nd part of the course. During the last 6 days of the course the trainees will be instructed in the below-the-ground mechanisms.

Training also includes overall management of the system including spare parts supply, keeping of log sheets, register and accounts of spare parts used. Upon completion of the course the trainees receive a bicycle with provision to carry special tools.

Schedule for the SEM training programme

Part 1 : 12/2 - 5/4, each course 6 days.

Part 2 : 5/5 -19/7, each course 12 days.

<u>B l o c k</u>	<u>V e n u e</u>	<u>Batch</u>	<u>Part 1</u>	<u>Part 2</u>	<u>No. of trainees</u>	<u>Coordinator</u>
Delang	Vill.Berboi (Berboi G.P.)	1	12-17/2	5-17/5	10	M.S.Sahoo
-do-	Vill.Indipur Deuli (Abhayamukhi Ramachandrapur G.P)	2	3- 8/3	7-19/7	9	M.S.Sahoo
-do-	Vill.Harirajpur (Singbhrampur G.P.)	3	17-23/3	7-19/7	9	B.N.Singh
Rajkanika	Vill. Charantupada (Jagulaipada G.P.)	1	17-23/3	1-12/6	9	M.S.Sahoo
-do-	Vill. Siopada(Siapada G.P.)	2	31/3-5/4	16-28/6	10	M.S.Sahoo
-do-	Vill. Ayatan (Trailokyapur G.P.)	3	31/3-5/4	16-28/6	8	B.N.Singh
(All)		(6)			(54)	

NB: A refresher training course will be arranged in November 1986, if found necessary. The course will be of 4 days duration.

Resource persons for each part 1 and 2 training courses:

- 1 Senior Socio-Economist, SED
- 1 Socio-Economist, SED
- 1 Executive Engineer, TMD
- 1 Asst. Engineer, TMD
- 1 Junior Engineer, TMD
- 1 Field Executive Engineer
- 1 Asst. Engineer, SDO
- 1 Junior Engineer, Field Sub-division

Other persons invited :

1. Inauguration of the Delang Part 1 course :
 - CCE-cum-PD
 - 3 G.P. Sarpanches
 - B.D.O
 - Panchayat Samiti Chairman
 - P.H.C Medical Officer
 - P.H.C. Doctor, Specialist on water-borne diseases.
2. Inauguration of the Rajkanika Part 1 course :
 - CCE-cum-PD
 - 1 G.P. Sarpanch
 - Panchayat Samiti Chairman
 - B.D.O.
 - P.H.C. Medical Officer

Monitoring

The interim period between Part 1 and Part 2 of the training course will be used for monitoring and further motivation of the trainees in the field. 1 Junior Engineer and 1 Socio-Economist will be in charge. Equal importance should be given to the monitoring of:

- the functioning of the system
- the performance of the SEMs
- the community's response
- other sources of income of the SEM's household

A status report of Delang and Rajkanika Part 1 courses will be submitted by 7th April 1986. Among other things the report will include :

1. Data on trainees (age, sources of income of the household, details on household occupation, education).
2. Full observational report on each course (with particular emphasis on trainees interest, motivation and participation)
3. Brief outline of important incidents and issues dealt with during the training period.

Training Schedule for Part I Training of SEMs

All the Artisans/Blacksmiths will be divided into three teams, in each team, it is assumed, that 15 persons can be trained. The training duration for each team would be one week. The detail programme is as follows :-

<u>Day & Time</u>	<u>S_u_b_j_e_c_t</u>	<u>Responsibility</u>
<u>1st day</u>		
11.00-12.00	Introduction of trainees & trainers	SED
12.00-13.00	Brief Description of DANIDA Project and its relation with the Tubewells	SED
13.00-14.30	L U N C H	
14.30-15.00	Importance of Safe Drinking Water	SED
15.00-15.45	Importance of Maintaining Tubewells	SED/AE Delang
15.45-16.00	TEA Break	
16.00-17.00	Generating the importance of blacksmiths in maintaining tube-wells	SED
<u>2nd Day.</u>		
10.00-11.00	Assessment of each trainee's skill, capacity	SED/TMD
11.00-13.00	Anatomy of HP, its functioning procedure for HP installations	TMD
13.00-14.00	L U N C H	

14.00-15.00	Exposure to different equipments special tools & standard tools.	TMD
15.00-15.45	The trainees will be asked to identify and name each parts, tools & special tools. They will be asked to describe its function.	TMD
15.45-16.00	TEA Break	
16.00-17.00	Slide show	TMD/SED
<u>3rd day</u>		
10.00-11.00	Description on different types of handpumps proposed to be installed in the Blocks	TMD
11.00-12.00	Providing adequate knowledge to handle tools and use spare parts for different types of HP repair	TMD
12.00-13.00	Assessment of individual blacksmiths' understanding on the use of tools and other technical aspects	TMD/SED
13.00-14.00	L U N C H	
14.00-17.00 (Tea Break at 15.45)	(Training Centre Demonstration) Servicing of different parts of a HP.	TMD
<u>4th Day</u>		
10.00-13.00	(Field Demonstration) Trainees will be taken into field visit to demonstrate different types of handpumps	TMD
13.00-14.00	L U N C H	
14.00-17.00	Continuation of the morning session's programme	TMD/SED
<u>5th Day</u>		
10.00-12.00	Assessment of the previous day's experience	TMD/SED
12.00-13.00	Providing necessary solutions and suggestions to the trainees - if there is any doubt or difficulties faced by them in the field	TMD/SED

13.00-14.00	L U N C H	
14.00-15.00	Description of long and short term responsibility in connection of their duties - (like timely check up, Lubrication, Reporting, etc.)	TMD/SED
15.00-15.45	Description of factors responsible for the Malfunctioning of handpump the duties of SEM to prevent them. Identification of defects and remedies	TMD
15.45-16.00	TEA Break	
16.00-17.00	Mode of getting information of Tubewells - formal and informal ways a getting information	SED
<u>6th Day</u>		
10.00-11.00	Introduction of Duty Manual of the SEM (About timely visit to the villages, list of tubewells)	SED
11.00-12.00	Reporting system of Major breakdowns (Definition of major and minor breakdown) to the mobile team and supply system of spare parts to the SEM according to their convenience	SED/TMD
12.00-13.00	Discussion about the maintenance of log sheets and other records.	SED/TMD
13.00-14.00	L U N C H	
14.00-15.00	Evaluation of the training programme by both the parties, trainers and trainees, clearance of doubts-if any	SED/TMD
15.00-15.45	Distribution of literature, Records, guidelines etc.	SED
15.45-16.00	TEA Break	
16.00-17.00	Valedictory meeting and closing	SED

Training Schedule for Part II Training of SEMs

<u>Day and Time</u>	<u>S u b j e c t</u>	<u>Resource person</u>
<u>1st day</u>		
10.30-10.45	Introductory remarks	CCE-cum-PD
10.45-11.30	Brief description on the necessity of Part II training with reference to the Part I training	SEE (SED)
11.30-13.00	The trainees will be asked to describe their experiences and feelings during the interim period between Part I and Part II training	JE (TMD)
13.00-14.00	L U N C H	
14.00-16.00	Assessment of each trainees technical knowledge at the training camp level	JE(TMD) & SEE(SED)
16.00-16.15	TEA Break	
16.15-17.00	Evaluation of the whole day's programme, with reference to the Part I training course	SEE(SED) & JE(TMD)
<u>2nd Day</u>		
10.00-13.00	Review of the Training centre demonstration of Part I training (servicing of different handpumps)	JE (TMD)
13.00-14.00	L U N C H	
14.00-17.00	Anatomy of handpump cylinder and its functions	JE (TMD)
<u>3rd Day</u>		
10.00-13.00	Review of field demonstration servicing the above ground parts of different handpumps with reference to Part I training.	JE (TMD)& JE(SDO)
13.00-14.00	L U N C H	
14.00-17.00	Continuation of the field demonstration.	-do-

4th Day

10.00-12.00	Description on drilling, lowering and the Saline Sealing of the tubewell	AE(TMD) & JE(TMD)
12.00-13.00	Description of the deep and shallow tubewells and the water level.	JE(SDO)
13.00-14.00	L U N C H	
14.00-15.00	Description on different parts of the handpump cylinder	JE(TMD) & JE(SDO)
15.00-17.00	Evaluation of the whole days Programme	JE(TMD) & SEE(SED)

5th Day9/5/86 (Friday)

10.00-13.00	Field demonstration (complete dismantling and reassembling of JM II handpump) Team I, II	JE(TMD) & JE(SDO)
13.00-14.00	L U N C H	
14.00-17.00	Continuation of field demonstration	JE(TMD) & JE(SDO)

6th Day

10.00-13.00	Field demonstration, (complete dismantling and reassembling of JM II handpump, Team III.	JE(TMD)
13.00-14.00	L U N C H	
14.00-17.00	Group discussion.	SE(SED)

7th Day Holiday8th Day

10.00-13.00	Field demonstration of Team I and II	JE(TMD) & JE(SDO)
13.00-14.00	L U N C H	
14.00-17.00	Continuation of field demonstration (Team III).	JE(TMD)

9th Day

10.00-11.30	Brief description on the common breakdowns in case of IM II hand-pumps and Inalsa-suction handpump etc.	JE(TMD)
11.30-13.00	Brief description on the tools (special and standard) useful maintenance and how to take care of these tools.	JE(TMD)
13.00-14.00	L U N C H	
14.00-15.00	Training game.	SE(SED)
15.00-17.00	Assessment of the whole topic covered in the field during last three days.	JE(TMD)
	Tea at 16.00	

10th Day

10.00-13.00	Field assessment of the Trainees in their respective operational area. (Team I) (changing of bucket, cylinder etc.)	JE(TMD) & SEE(SED)
13.00-14.00	L U N C H	
14.00-17.00	Continuation of the field assessment, (Team II).	JE(TMD) & SEE(SED)

11th Day

10.00-12.00	Description on the utility of additional helping hand (skilled) at the time of opening of the below ground mechanism of the handpump	TME(TMD) & SEE(SED)
12.00-13.00	Role play	SE(SED) & SE(SED)
13.00-14.00	L U N C H	
14.00-16.00	Slide Show	TMA(TMD) & AE(TMD)
16.00-17.00	Clearance of doubt	JE(TMD) & SEE(SED)

12th Day

- | | | |
|-------------|--|---------------------------|
| 10.00-11.00 | Brief description on the function of platform | AE(TMD) & SEE(SED) |
| 11.00-12.00 | Description on the quality of water available through the hand-pump. (Emphasis will be given to the Iron content and its advantages and disadvantages for human health). | Analyst
Palasuni, Lab. |
| 12.00-13.00 | Description on the technique involved in removing iron content (Iron removal plant). | AE (DD) |
| 13.00-14.00 | L U N C H | |
| 14.00-17.00 | Observational field visit to the Iron removal plant of Gop Block. | AE(DD) & SE(SED) |

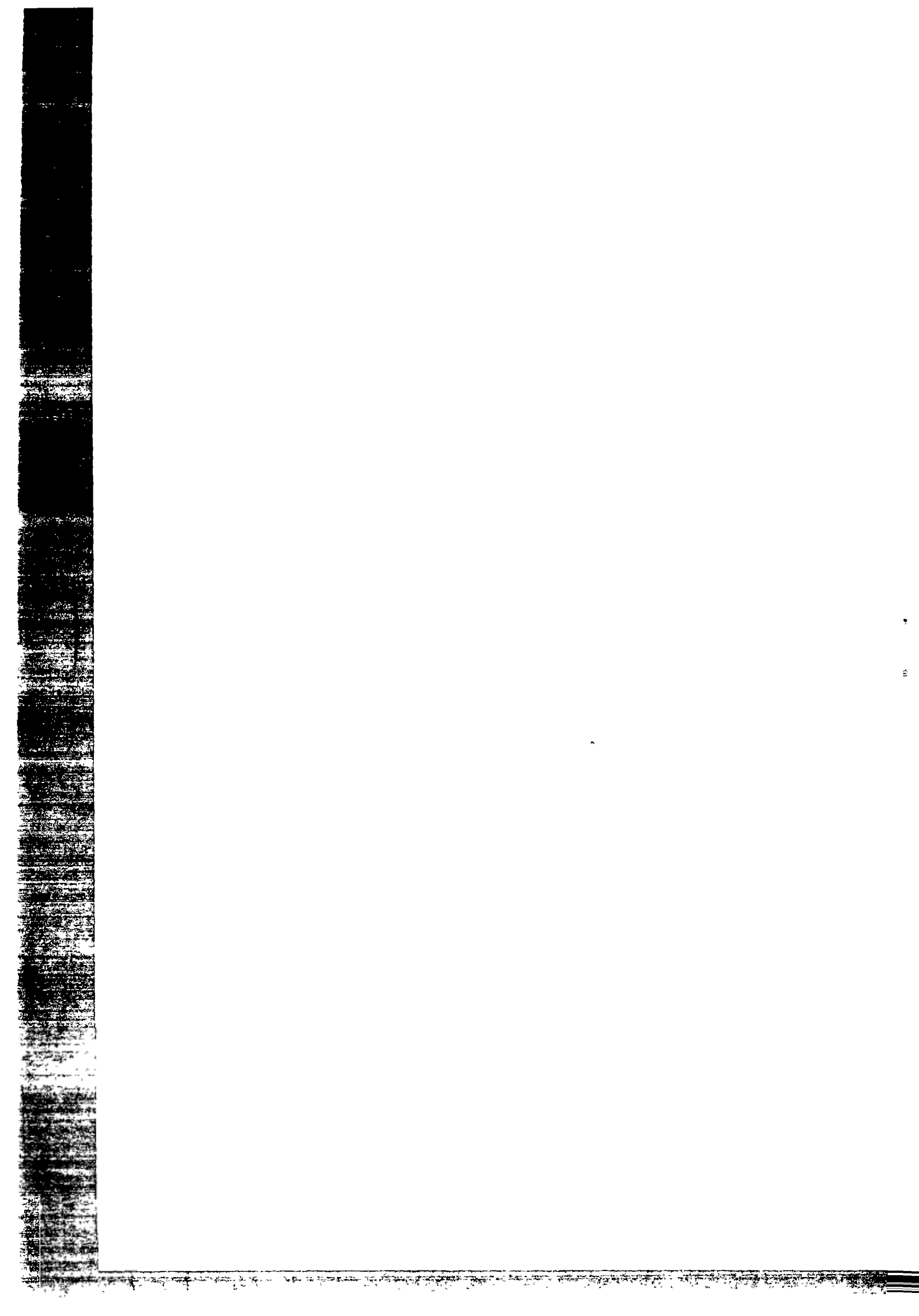
13th Day

- | | | |
|-------------|--|--------------------|
| 10.00-11.00 | Brief description on the acceptability of iron content and its effect on human health | SEE(SED) |
| 11.00-12.00 | Introduction of contract (Oriya version) to the SEMs. | SEE(SED) |
| 12.00-13.00 | Procedure of maintenance of different records, logsheets in connection with the SEMs activity. | SEE(SED) & JE(TMD) |
| 13.00-14.00 | L U N C H | |
| 14.00-14.45 | Distribution of materials and tools (special and standard) to the SEMs. | Chief Adviser |
| 14.45-15.00 | Valedictory address to the participants. | SEA |

ANNEXURE 2

CONTRACT OF

ASSIGNMENT



C O N T R A C T

Contract of Assignment between the Orissa Drinking Water Supply Project (hereinafter called as the Project) and the Self Employed Mechanic (SEM) Sri _____
S/O _____ Vill. _____ P.O. _____
Dist. _____ (herein after called as the Mechanic).

WHEREAS the Project envisages proper maintenance and supervision of the handpumps in all habitations in the villages as mentioned in the list attached (Annex. I) and wants to entrust the repair & maintenance works to a suitable person and has invited offers to do the same on contractual basis :

AND WHEREAS the Mechanic has given his offer and is willing to undertake the maintenance and repair works of handpumps as a Self Employed Mechanic in the villages as per attached list of handpumps to be maintain (Annex. I) on a yearly consolidated payment suitably divided into monthly instalments :

NOW THIS INDENTURE WITNESSETH and it is hereby agreed between Project and the Mechanic as to the following :

1. The Mechanic shall be in charge of maintenance and repair of handpumps assigned to him in the villages as in the list of handpumps to be maintained (Annex. I) and shall be called the "Self Employed Mechanic (SEM)". He shall keep the handpumps in proper working condition and report the same to the officer in charge as per the instructions given to him and in prescribed forms.
2. Upon mutual agreement between the Project and the Mechanic, the number of handpumps to be maintained as per the attached list may be increased or decreased.

3. The Mechanic shall be paid Rs.100.00(One hundred only) per handpump per year, assigned to him. The payment shall be made in monthly instalments and shall cover remuneration for his job and responsibilities detailed in the Duty Chart (Annex. II).
4. The Mechanic shall be supplied with a bicycle by the Project for carrying out the works assigned him as per Annex. II. An amount of Rs.100/- (One hundred only) will be paid to the Mechanic per annum for annual repair and maintenance of the bicycle during the contract period. The Mechanic shall return the bicycle to the Project after the expiry of the contract.
5. The Project shall supply a set of tools as listed in Annex. III. to the Mechanic free of cost for carrying out the job as assigned to him as per Annex. II.
6. The Project shall supply the necessary spareparts and consumables required by the Mechanic for carrying out the job, as per the projected requirement of the Mechanic.
7. The Mechanic shall show sufficient cause in the event of loss, breakage, damage etc. of the bicycle and tools supplied to him or shall indemnify the Project in appropriate terms.
8. The Mechanic shall keep up-to-date record of all the spareparts used in the prescribed monthly spareparts log-sheet and produce it before the officer in charge on prescribed dates, every month.
9. The Project and the Mechanic shall have the right to terminate the contract. The Project shall give seven days and Mechanic shall give thirty days advance notice to terminate the contract.

10. In the event of termination of contract by the Project or the Mechanic, the Mechanic shall return all the properties of the Project such as bicycle, tools, unused spareparts etc. supplied to the Mechanic in good condition excepting for natural wear and tear, within seven days proceeding the date of termination of contract failing which the Project shall be free to take appropriate action to recover the properties supplied to the Mechanic.
11. In the case of any damage to the tubewells or handpumps, the Mechanic in-charge of maintenance shall give sufficient reasons to prove that the damage occurred is not due to his negligence or carelessness. If the reasons are not sufficient to prove so, the Project shall be free to take appropriate action to make good of the loss.
12. In case of death of the Mechanic the contract shall automatically stand cancelled and the Project shall claim the return of its properties advanced to the Mechanic from the latter's legal heirs.
13. The duration of the agreement is from _____ to 31.12.87, after which period, the agreement may be renewed by the Project and the Mechanic with a fresh negotiation of the terms and conditions.

IN WITNESS WHERE OF the Project and the Mechanic sign in agreement on this day of 15th July 1987 after going through the same.

Orissa Drinking Water
Supply Project

Self Employed Mechanic

WITNESSES

1.

2.

SELF EMPLOYED MECHANIC DUTIES & RESPONSIBILITIESMONTHLY CHECKS

The SEM is to undertake and carry-out regular PREVENTIVE MAINTENANCE and REPAIR on every handpump allotted to him. This must be done at least once every month. The SEM has to draw a schedule so as to cover all the handpumps under his responsibility in time. The schedule has to be strictly followed.

Work will involve :

- i) Check all washers, bolts, nuts and check nuts for being there and ensure they are fully tight.
- ii) Handpump pedestal must be firm in its foundation. Repair using Cement slurry, if necessary.
- iii) Check handle for operation. It should have smooth and firm movement (no looseness or jerks).
- iv) Remove any rust and repaint with metal Primer-preferably do this during morning hours so that it will dry up during the day when the handpump is least used.
- v) Open Inspection cover :
 - a) Clean inside
 - b) Apply metal Primer on any rusty spots, after removing the rust.
 - c) Check alignment of connecting Rod in Bush, it must be centralised.
 - d) Ensure connecting Rod threaded portion is fully tight along with check nuts.
 - e) Ensure Chain's top bolt and Nylock Nut are tight . Do not overtighten Nyloc Nut.
 - f) See if Chain is adequately coated with Grease/Rust preventive and moves freely, otherwise replace by the spare chain and coupling, ensure the threaded portions

of connecting rod and coupling have clean and proper threads. If necessary cut off badly threaded portion of connecting rod and rethread.

- g) Grease the Chain. Do not use excessive lubricant or allow it to run down into the Bore hole/Riser Pipe.
- h) If the handle movement is heavy remove the handle and the bearing from it for cleaning and re-lubrication. Reassemble bearings with care.

Removal and re-assembly of Axle should not need heavy hammering.

Use (1) Axle pushout and (2) Bearing Setter Special tools for this work. Do not hammer the threaded end of the axle directly with a hammer.

- vi) See that the Handpump is clean - wash if needed.
- vii) See that the pumping operations provide water readily in adequate quantity. Lack of water coming out indicates that attention is needed to the below-ground assembly. This work should be undertaken at the very earliest to ensure continuity of water from the handpump.

Adequate preventive maintenance would reduce the chances of break-downs and emergency attention. Also the wear and tear on parts is reduced resulting in less expenses on spare parts.

YEARLY CHECKS

- i) Remove below-the-ground assembly i.e. riser pipe, connecting rod, cylinder assembly as per the standard procedure.
- ii) Check primarily the plunger bucket washers, sealing rings and rubber valve seats in the cylinder assembly.

GENERAL RESPONSIBILITIES

- i) Keep adequate stock of essential spares and have timely replacement of spares and consumables.
- ii) Maintain and submit monthly prescribed formats to Junior Engineers & Socio-economists on the status of the pumps under his-charge, covering :
 - details of repair and maintenance done during the month alongwith the use of spare parts.
 - anticipated requirement of spare parts for repair & maintenance for the subsequent months.
 - clearance of accounts.
- iii) Maintain the bicycle and tools in good condition.
- iv) Motivate the villagers to keep the surrounding of the handpump clean & ensure proper waste water disposal.
- v) Motivate villagers in correct operation of the handpumps.

List of Materials given to SEMs at the time of CommissioningSPECIAL TOOLSSTANDARD TOOLS

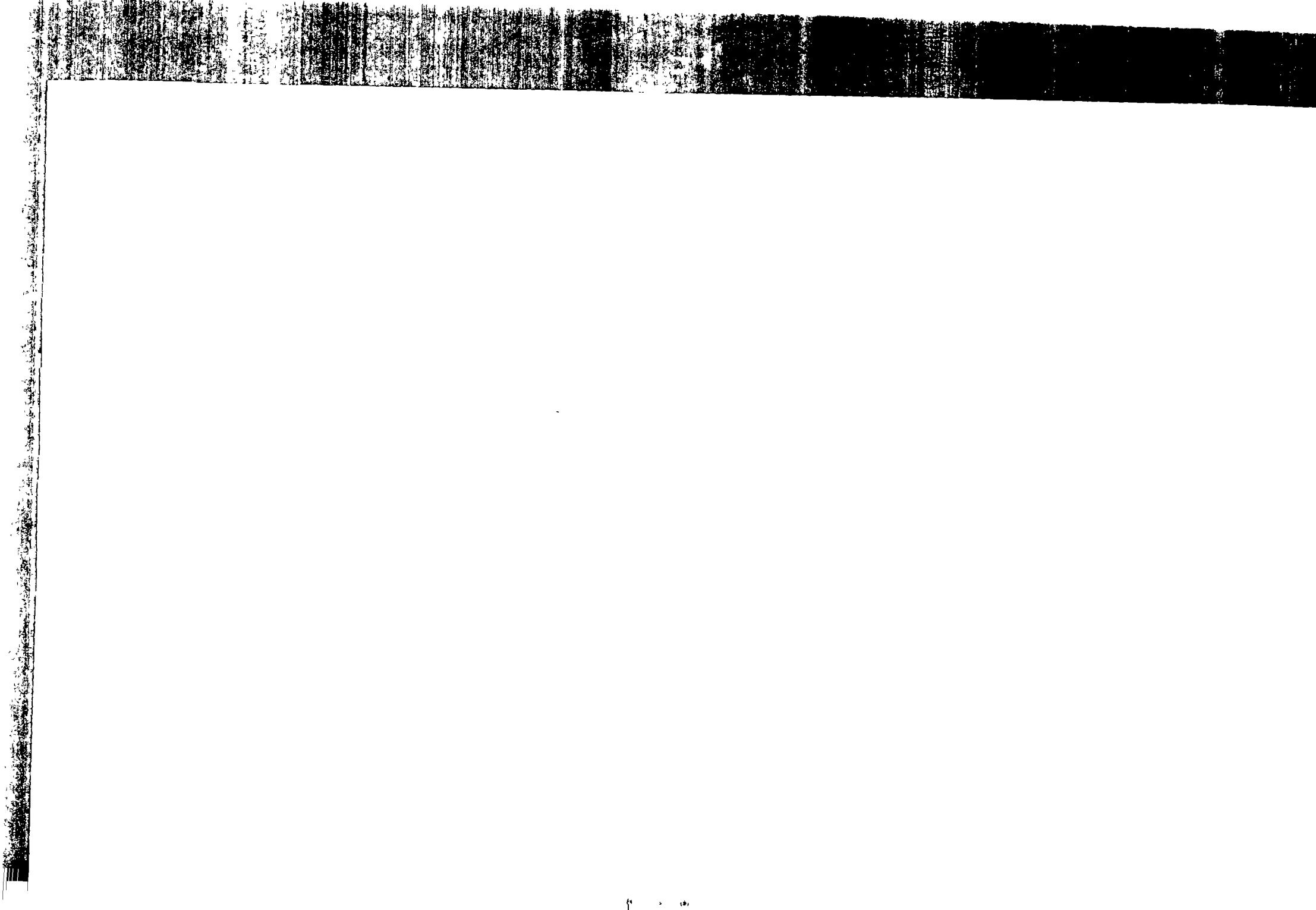
Sl. No.	Name	Qty.	Sl. No.	Name	Qty
1.	Water Tank Lifter	1	1.	Round Die M12 x 1.75	1
2.	Self Locking Clamp	1	2.	Pipe Die Set(32mm)	1
3.	Coupling Spanner	1	3.	Pipe Wrench(600mm)	2
4.	Connecting rod Lifter	1	4.	Pipe Wrench(450mm)	1
5.	Handle Axle Punch	1	5.	Double Ended Spanner	2
6.	Riser Pipe Lifting Spanner	3	6.	Screw Driver(300mm)	1
7.	Chain Coupling Supporter	1	7.	Hammer (1 kg.)	1
8.	Connecting Rod Vice	1	8.	Hack Saw(300 mm)	1
9.	Crank Spanner	1	9.	Oil Can	1
10.	Bearing Seater	1	10.	Wire Brush	1
			11.	Half Round File(10")	1
			12.	Flat File (10")	1
			13.	Adjustable Spanner	1

Cycle

1. One _____ Cycle (_____ colour) fitted with special tools carrier - Cycle No. _____.

Miscellaneous

1. Tool box for Special Tools 1 no.
 2. Measuring tape 1 no.
 3. Canvas bag to carry tools 2 nos.

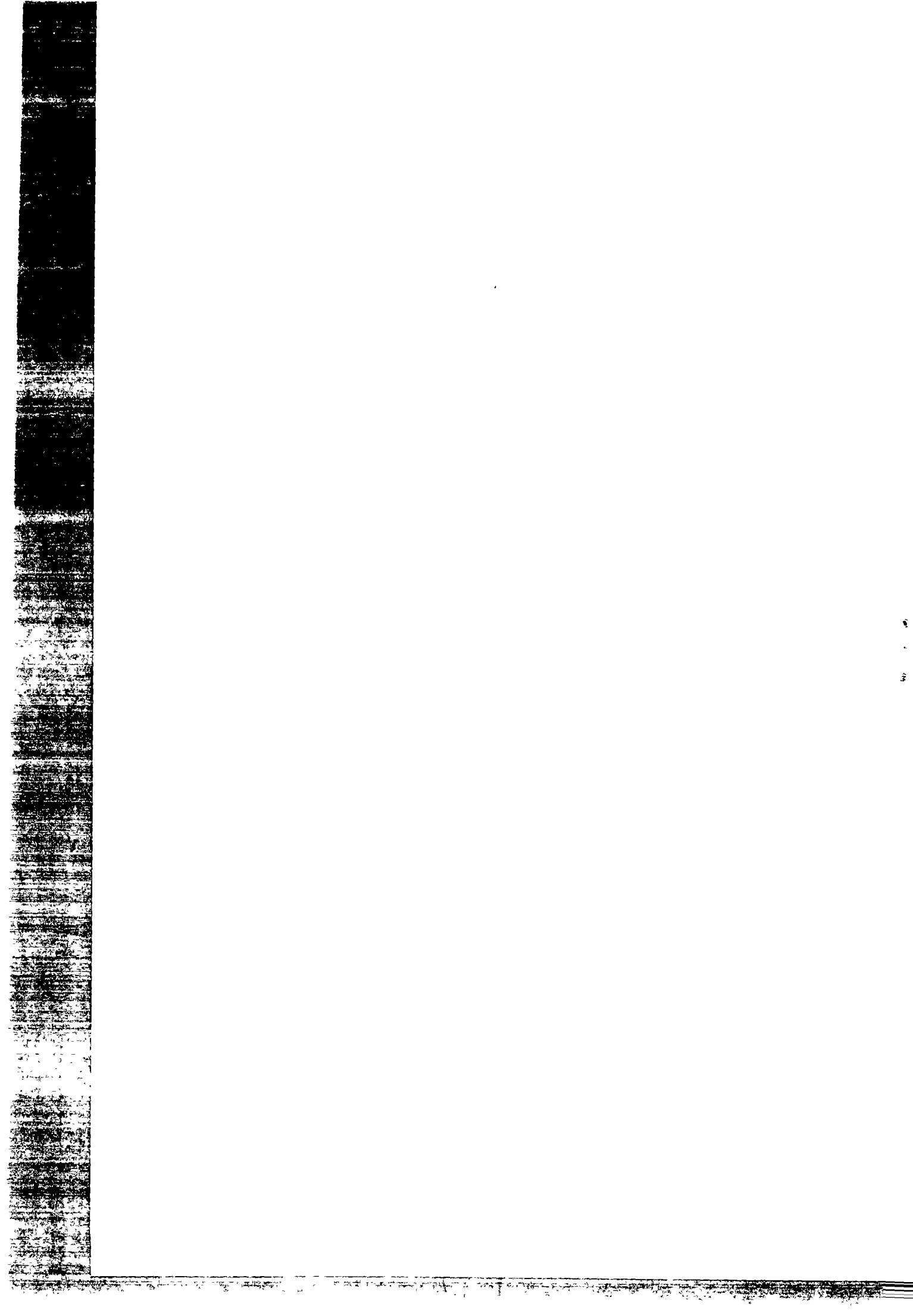


ANNEXURE 3

ANALYSIS OF

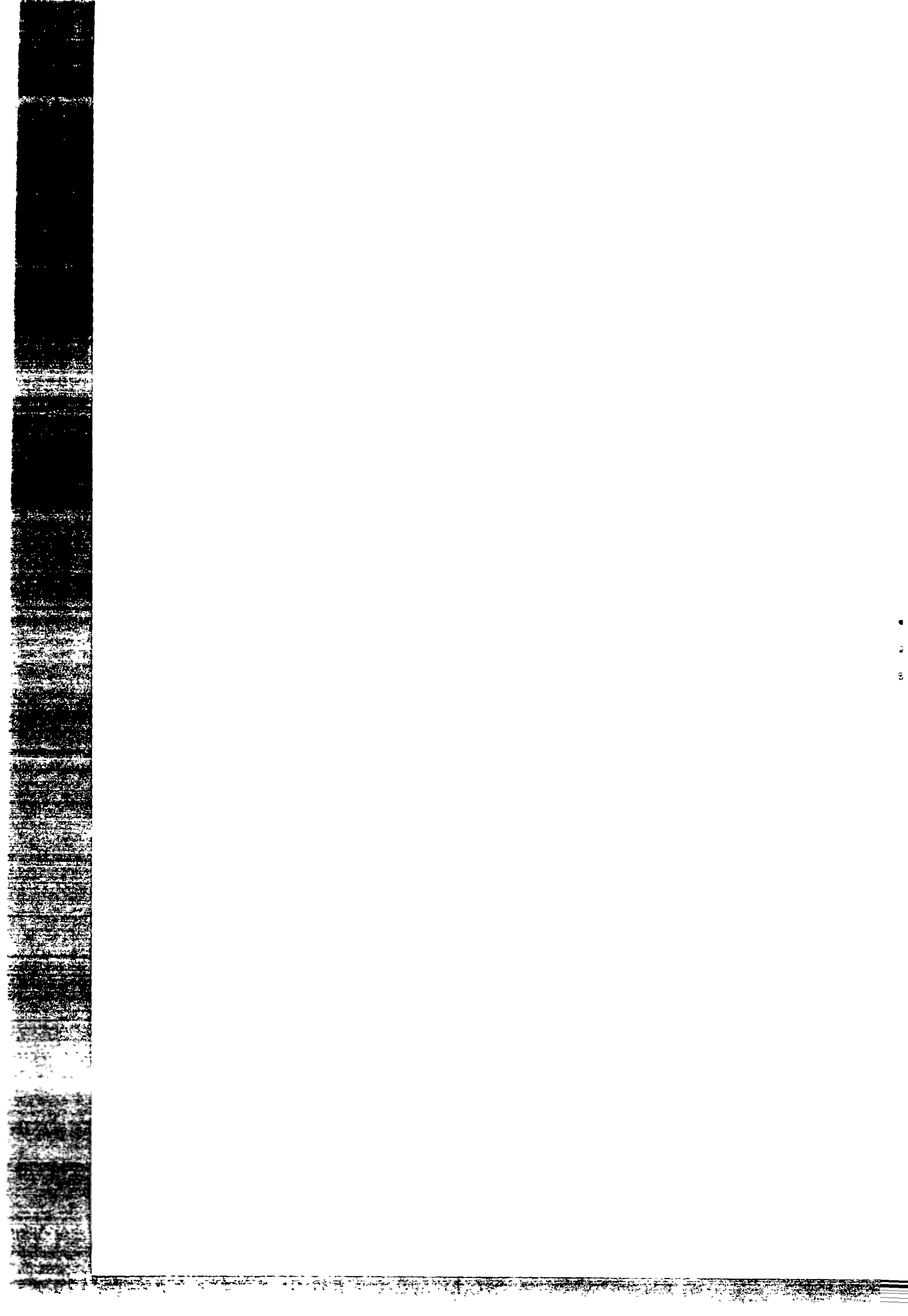
HAND OVER &

REPAIR DATA



Serial No.	Name of S E M	Total Numbers of Pumps				Pumps Hand over each Month											
		In Operational Area	To be Given	Given by June 87 Nos.	%	August 86	September	October	November	December	January 87	February	March	April	May	June	
1.	Krupasindhu Maharana	21	17	17	100	15										2	
2.	Kailash Ch. Maharana	18	18	18	100	16										2	
3.	Prahallad Maharana	21	15	14	93	18										-4	
4.	Nrusingha Maharana	19	12	10	83	14						1				-5	
5.	Susant Ch. Maharana	21	19	16	84	17					1					-2	
6.	Couranga Mahapatra	20	20	17	85	11					3	1				2	
7.	Madhusudan Maharana	21	15	13	87	13											
8.	Krishna Ch. Maharana	23	22	20	91	19										1	
9.	Ganesh Ch. Maharana	16	16	10	63	12					2	1				-5	
10.	Muralidhara Maharana	25	14	8	57	6					2						
11.	Dasarathi Maharana	19	18	9	50		1				2	4				2	
12.	Gobind Ch. Maharana	25	21	10	48		8				1					1	
13.	Raj Kishore Maharana	26	20	6	30		1				1	1				3	
14.	Prafulla Ku. Maharana	18	18	3	17		1										
15.	Bhikari Maharana	35	23	13	56		4					2			7		
16.	Jatadhari Maharana	14	14	12	86		4				6	2				2	
17.	Sudarsan Maharana	25	25	15	60		10					4				1	
18.	Anadi Maharana	19	18	6	33		2				2	1				1	
19.	Debaraj Maharana	23	12	11	92		2				8					1	
20.	Bairagi Maharana	20	20	15	75		1				4	6				4	
21.	Abhiram Maharana	28	23	14	61			7			7						
22.	Dhadu Maharana	25	24	18	75			6			4	4				4	
23.	Kelu Ch. Maharana	43	24	21	88			2				5				14	
24.	Prafulla Maharana	19	19	1*	0			1									
	Total	544	447	296*	66	80	34	16			43	32			7	24	

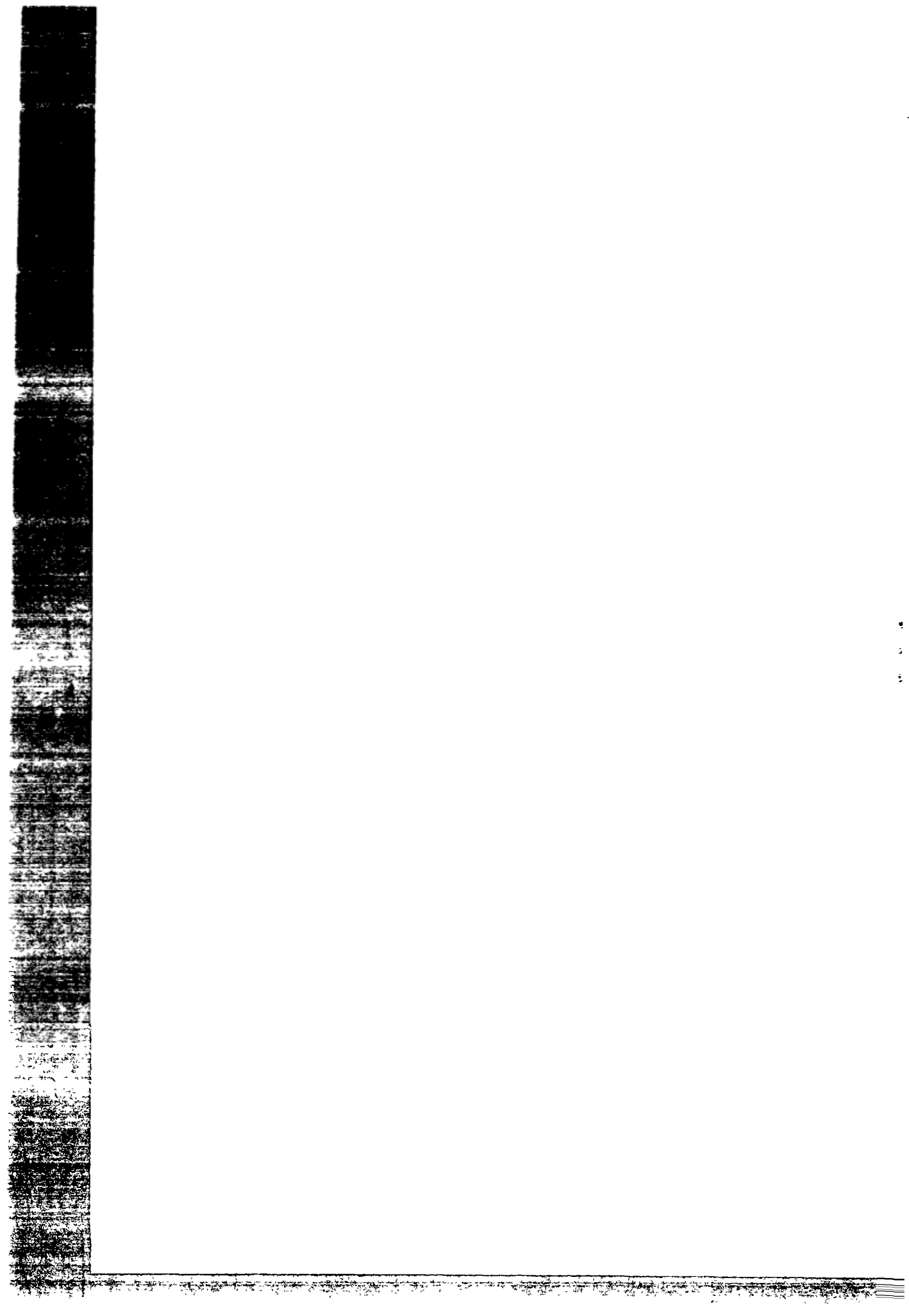
* Exploratory tube well, not included in the 19 pumps to be given.



Annex. 3 : Nature of Repairs in Delang Block - IM II & Inalsa Suction Pumps

Serial No.	Name of S E M	In Area	IM II Pumps Given	Pumps Not Needing Repair	Number of Pumps Repaired					Inalsa Suction Pumps Given	Pumps Not Repaired	Number of Pumps Repaired					
					Once	Twice	Three times	Four Times	Five Times			Once	Twice	Three times	Four times		
1.	Krupasindhu Maharana	17	17	12	4	1											
2.	Kailash Ch. Maharana	18	17	15	2					1							
3.	Prahallad Maharana	14*	15*	12	2	1				4		1	1	1	1		
4.	Nrusingha Maharana	10*	13*	12	1					1		1					
5.	Susant Ch. Maharana	16	14	14						2	1						1
6.	Gouranga Mahapatra	17	13	13						4	1	1	1	1			
7.	Madhusudan Maharana	13	10	9	1					3		1			2		
8.	Krishna Ch. Maharana	20	13	12	1					7	2	4	1				
9.	Ganesh Ch. Maharana	10	6	6						4	2		2				
10.	Muralidhara Maharana	8	8	7	1												
11.	Dasarathi Maharana	9	8	5	3					1	1						
12.	Gobind Ch. Maharana	10	9	8	1					1			1				
13.	Raj Kishore Maharana	6	6	6													
14.	Prafulla Ku. Maharana	3	3	2	1												
15.	Bhikari Maharana	13	13	13													
16.	Jatadhari Maharana	12	9	8	1					3	3						
17.	Sudarsan Maharana	15	15	4	3	4	2	1	1								
18.	Anadi Maharana	6	2	1	1					4	2	1	1				
19.	Debaraj Maharana	11	11	5	6												
20.	Bairagi Maharana	15	15	15													
21.	Abhiram Maharana	14	14	11	3												
22.	Dhadu Maharana	18	18	14	4												
23.	Kelu Ch. Maharana	21	21	20		1											
24.	Prafulla Maharana	1	1	1													
	Total	297	271	225	35	7	2	1	1	35	12	9	7	5	2		

* Pumps were taken from the SEMs and converted to Test Pumps



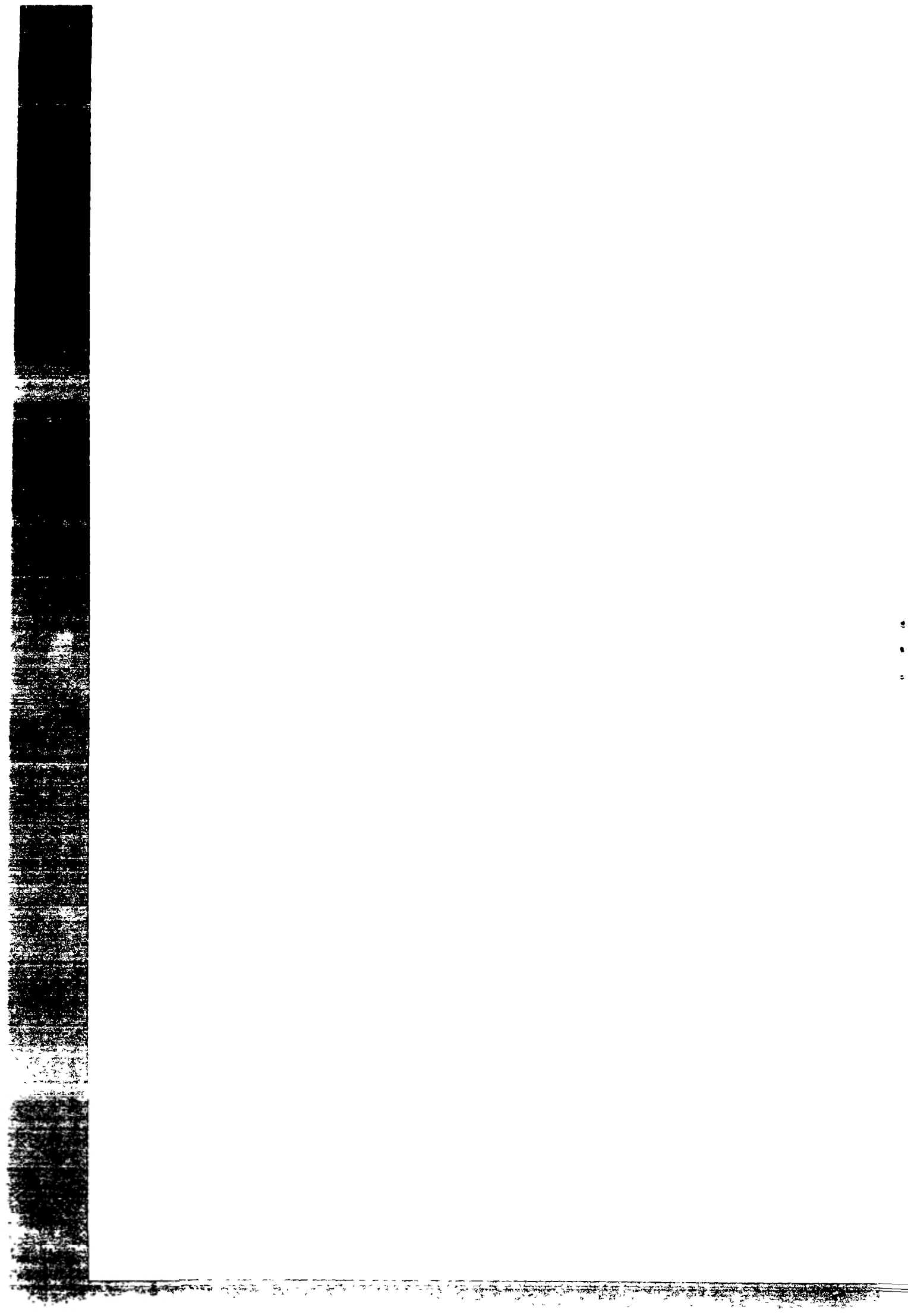
Annex 3.

Block: Delang

Summary of Monthly Meeting Reports of Problem Pumps - II Tier Maintenance

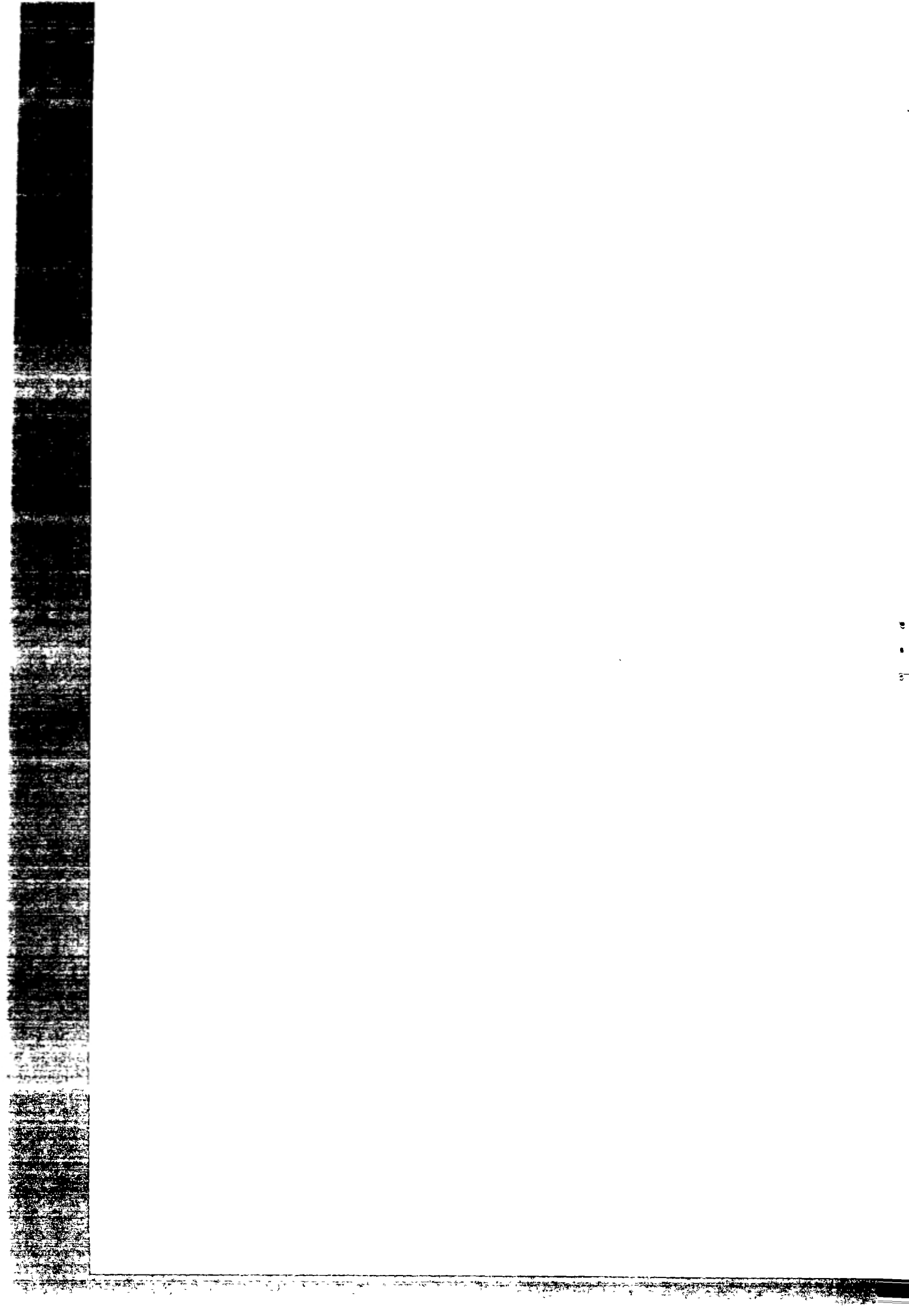
Month: upto June-87

Serial No.	Village/ Gram Panchayat	Error in Regn. No.	Low Yield/ Depletion	Turbidity	Salinity (taste)	Iron (taste)	Pedestal Shaking	Drain Broken/ Damaged	Waste Water Disposal Prob.	Handle Hard/ Shaking	Scoured Plat- form/Drain	Less than 8 Riser Pipes	Rusting	Extended Breakdown				
1.	Arisol			7		1	1	2					6	2				
2.	Gualipada			4					1	3			6					
3.	Jenapur			6	5	1		1					9					
4.	Berboi		2	4		1		3	2	2			5					
5.	Sripurusottampur		1	3		1					3		3					
6.	Singh Berhampur		2	1			1		1	2			5					
7.	Sujanpur		1	3		7		3					8	2				
8.	Chainpur	1	2	2			2		4				6					
9.	Munida				1								1					
10.	Godiput Matlapada		2	1			1					1						
11.	Dhankera				1					1			1					
12.	Suria												2	2				
13.	Abhaya Mukhi Ramchandrapur		1	1														
14.	Total:-	1	11	32	7	11	5	9	8	8	3	1	52	6				
15.																		



Annex. 3 : Sequence of Hand over of Pumps in Rajkanika

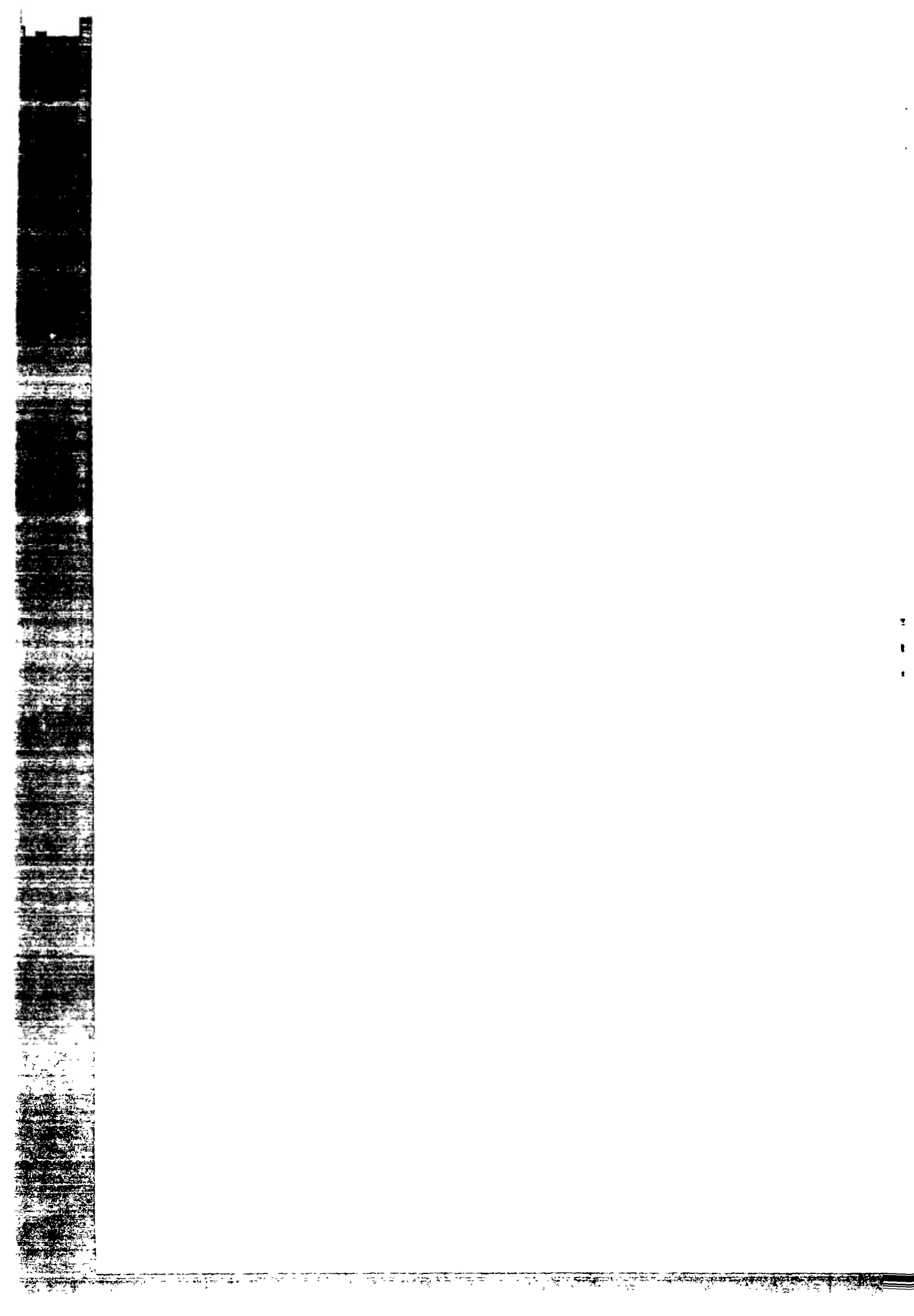
Serial No.	Name of S.E.M	Total Numbers of Pumps			Pumps Hand over each Month											
		In Operational Area	To be Given	Given by June 87	August 86	September	October	November	December	January 87	February	March	April	May	June	
1.	Rabindra Maharana	21	21	20	11					3	5			1		
2.	Biswanath Nayak	19	18	10	8					1	1					
3.	Prabhat Ojha	18	17	15	6					3	3			3		
4.	Sahadev Biswal	18	18	16												
5.	Damodar Ojha	17	17	14	7					4				3		
6.	Madhusudan Ojha	19	16	11			6	-1		1	1			4		
7.	Upendra Khuntia	21	19	10			4			1	3			2		
8.	Narottam Ojha	20	17	13			3			4	5			1		
9.	Biswanath Ojha	16	16	11			8			3						
10.	Rabindra Ku. Ojha	17	17	14			-2				3			9		
11.	Ramakanta Ojha	19	19	16			2			2	1			11		
12.	Umakanta Sahoo	19	17	8			2			2	4					
13.	Bipin Ch. Roy	16	16	12			5							7		
14.	Bidya Mahakul	17	17	15			8				2			5		
15.	Ganesh Sutar	16	16	5			2							3		
16.	Prafulla Sutar	25	25	12			4			4				4		
17.	Narahari Jena	19	19	21			2			8	5			6		
18.	Ganesh Ch. Ojha	18	18	16			2			8				6		
19.	Niranjan Ojha	31	31	23				15		4	4			±4		
20.	Khirod Khuntia	22	22	7				2						5		
21.	Krutibash Ojha	16	14	7				5		1	1					
22.	Ramesh Ch. Sahoo	18	17	11						8				3		
23.	Kamala Kanta Ojha	20	20	12						2	4			6		
24.	Sarat Ch. Ojha	19	17	6						6						
	Totals		444	305	47		46	22		65	42			79		



Annex. 3 : Nature of Repairs in Rajkanika Block

Serial No.	Name of S E M	Total No. of Pumps with SEMs by 6/87	Individual Records not available	No. of Pumps with Records	Total IM II Pumps	Pumps Not Repaired	Repaired Once		Repaired Twice		Repaired Three Times	
							Minor	Major	Minor	Major	Minor	Major
1.	Rabindra Maharana	20	*	-								
2.	Biswanath Nayak	10		10	10	4	5	1				
3.	Prabhat Ojha	15		12	12	7	3	1	1			
4.	Sahadev Biswal	16	*	-								
5.	Damodar Ojha	14		11	11	2	7	1	(1)	1		
6.	Madhusudan Ojha	11		7	7	4	2				1	
7.	Upendra Khuntia	10		8	8	3	3		(2)	2		
8.	Narottam Ojha	13	*	-								
9.	Biswanath Ojha	11	*	-								
10.	Rabindra Ku. Ojha	15		5	5	3	1	1				
11.	Ramakanta Ojha	16		5	5	3	2					
12.	Umakanta Sahoo	8		8	8		4	2	2			
13.	Bipin Ch. Roy	12		5	5		4					
14.	Bidya Mahakul	15		10	10	9	1					
15.	Ganesh Sutar	5		2	2	2						
16.	Prafulla Sutar	12		8	8	1	1		4(1)	1	1	
17.	Narahari Jena	21	*	-								
18.	Ganesh Ch. Ojha	16	*	-								
19.	Niranjn Ojha	23	*	-								
20.	Khirod Khuntia	7		2	2	2						
21.	Krutibash Ojha	7	*	-								
22.	Ramesh Ch. Sahoo	11		8	8	6		2				
23.	Kamala Kanta Ojha	12		3	3	1	2					
24.	Sarat Ch. Ojha	6		3	3	1			(2)	2		
	Totals	305		107	107	48	35	8	7(6)#	6	3	

Note : # 6 Pumps underwent repairs twice, once minor, and once major.



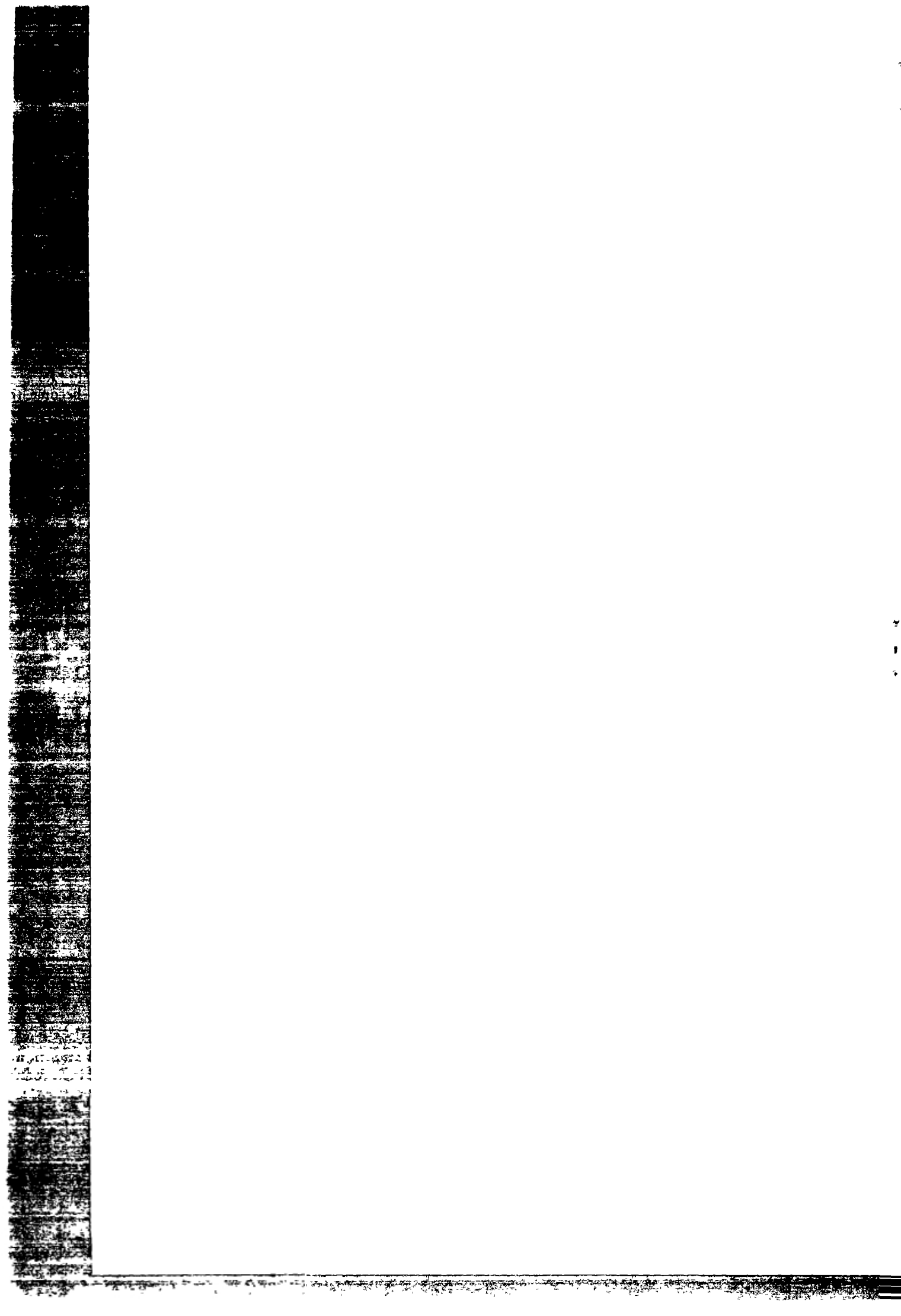
Annex. 3

Block: Rajkanika

Summary of Monthly Meeting Reports of Problem Pumps - II Tier Maintenance

Month: upto June-87

Serial No.	Village/ Gram Panchayat	Error in Regn. No.	Low Yield/ Depletion	Turbidity	Salinity (taste)	Iron (taste)	Pedestal Shaking	Drain Broken/ Damaged	Waste Water Disposal Prob.	Handle Hard/ Shaking	Scoured Plat- form/Drain	Less than 8 Riser Pipes	Rusting	Extended Breakdown				
1.	Slopada		2		1													
2.	Jagulaipada		1															
3.	Kantapada				1			1										
4.	Trailokyapur			2		1												
5.	Deulatara		1															
6.	Jaynagar		1															
7.	Olaver								2									
8.	Kantabania		1															
9.	Baradia													1				
10.	Bharigada		1															
11.	Baruna													1				
12.	Koranda					1		1										
13.	Pradhanpada																	
14.	Total:-		7	2	2	2		2	2					2				
15.																		



ANNEXURE 4

LOG SHEETS

FOR SEMs

MONTHLY REPORTS

