

No.

**BASIC DESIGN STUDY REPORT
ON
THE PROJECT FOR DEVELOPMENT OF GROUND WATER
IN
THE STATE OF UTTAR PRADESH
IN
INDIA**

DECEMBER 2005

JAPAN INTERNATIONAL COOPERATION AGENCY

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PREFACE

In response to a request from the Government of India, the Government of Japan decided to conduct a basic design study on The Project for Development of Ground Water in the State of Uttar Pradesh and entrusted the study to the Japan International Cooperation Agency (JICA). For the first field survey, JICA sent to India a study team from March 16 to March 30, 2005 and for the second field survey, from May 1 to May 21, 2005.

The team held discussions with the concerned officials of the Government of India, and conducted a field study at the study area. After the team returned to Japan, further studies were made. –Subsequently, a mission was sent to India in order to discuss a draft basic design. Based on the discussions on the above studies and data collected , the present report was finalized. It is hoped that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the concerned officials of the Government of India for evincing keen interest in the proposed project and for their assistance and close cooperation extended to the team.

December, 2005.

Seiji KOJIMA
Vice-President
Japan International Cooperation Agency

December, 2005

LETTER OF TRANSMITTAL

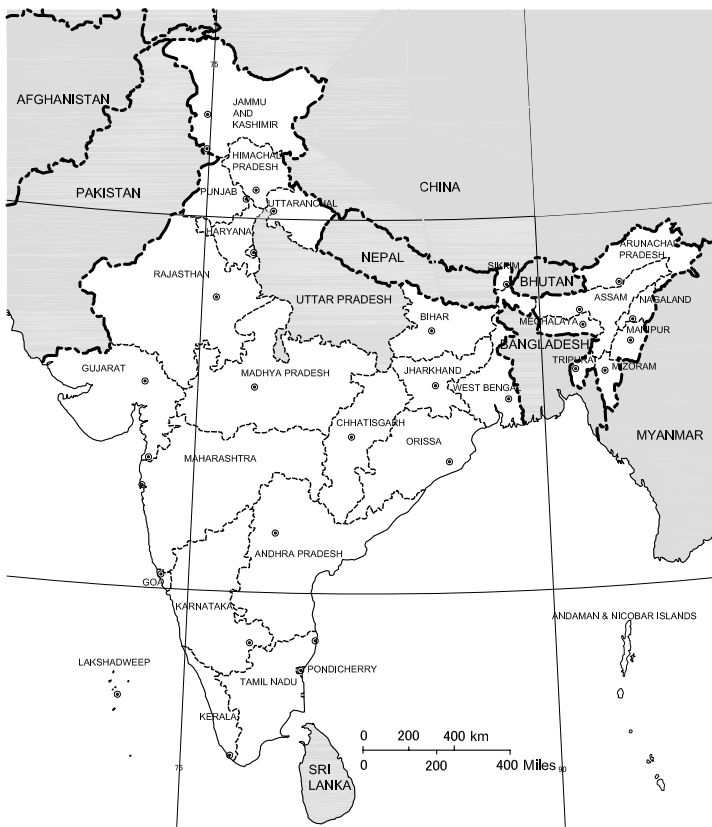
We are pleased to submit to you the basic design study report on the Project for Development of Ground Water in the State of Uttar Pradesh in India.

This study was conducted by Japan Techno Co., Ltd., under a contract to JICA, during the period from March, 2005 to December, 2005. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of India and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

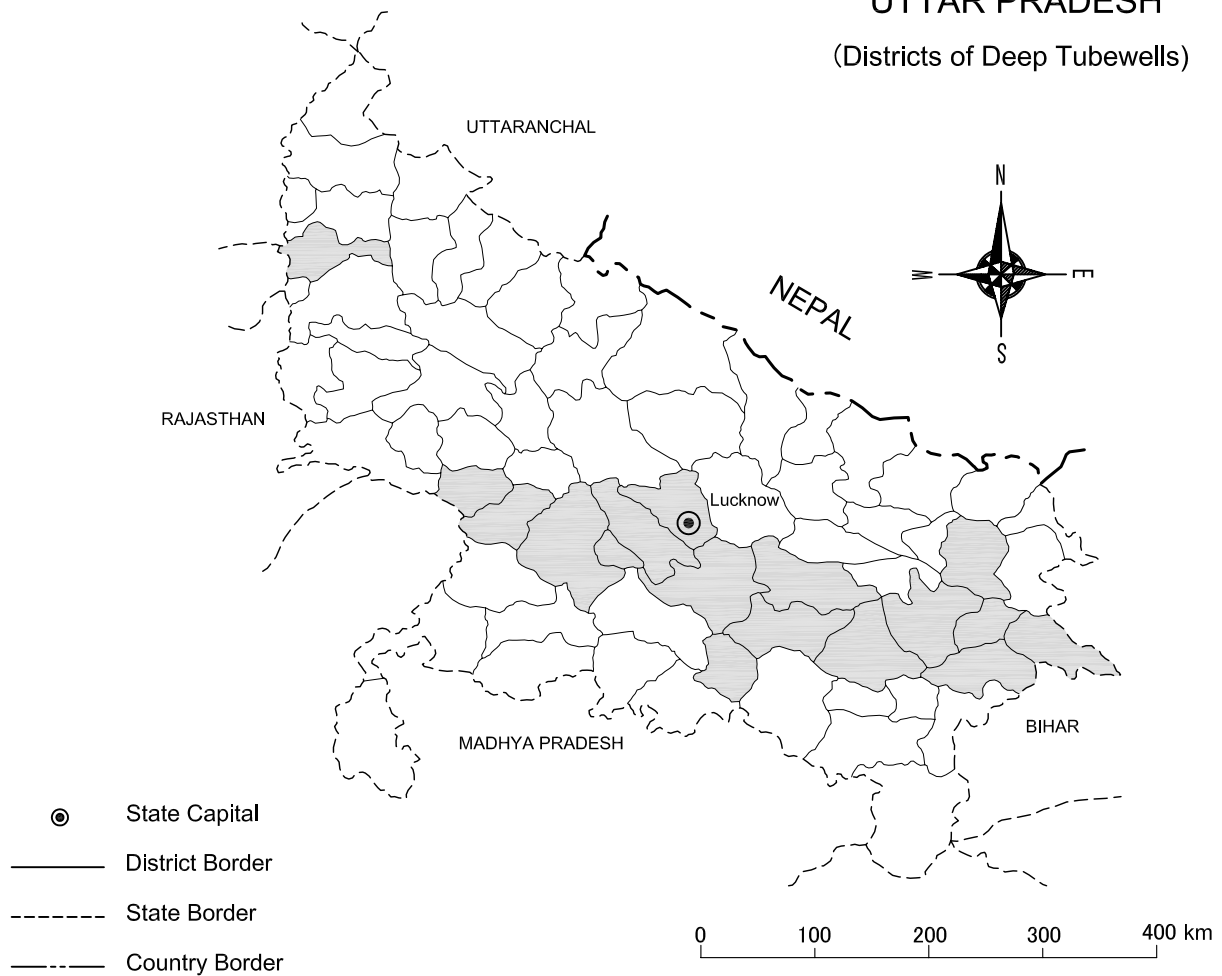
While expressing our appreciation for the support you gave us we hope that this report will contribute to further promotion of the Project.

Very truly yours,

Shoichi YOKOGI
Project manager,
Basic design study team on
The Project for Development of
Ground Water in the State of Uttar
Pradesh in India
Japan Techno Co., Ltd.



UTTAR PRADESH (Districts of Deep Tubewells)



The Project for Development of Groundwater in the state of Uttar Pradesh, India
Basic Design Study,
Project Area

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Abbreviations

A/P	Authorization to Pay
ARWSP	Accelerated Rural Water Supply Programme
AUWSP	Accelerated Urban Water Supply Programme
B/A	Banking Arrangement
BHN	Basic Human Needs
CGWB	Central Ground Water Board
CIA	Central Intelligence Agency
DTH	Down the Hole Hammer
E/N	Exchange of Notes
ETO	Exploratory Tube wells Organization
GDP	Gross Domestic Product
GNI	Gross National Income
INR	Indian Rupee
JICA	Japan International Cooperation Agency
NURM	National Urban Renewal Mission
OJT	On-the-Job Training
ONGC	Oil and Natural Gas Commission
PDM	Project Design Matrix
UNICEF	United Nations International Children's Fund
UP	The State of Uttar Pradesh
UPJN	Uttar Pradesh Jal Nigam
WHO	World Health Organization

Summary

Summary

India in South Asia is bound by Arabian Sea and border with Pakistan to the west, Bay of Bengal to the east and Nepal to the north. Within an area of about 3.287 million km² live 1,027,020 thousand inhabitants (2001 statistics) that are the second largest in the world. Although the GNI per capita is still low of 530 US dollars (2001), the economy is steadily growing since the mid 1990s following several policy reforms including economic liberation, which started to take measures for the exchange crisis in 1991. However, on the other hand, the poor was left behind from the economic growth, and accordingly, the economic disparity widened even further, which, together with the other issues in this nation, namely the population growth, language and religion and the caste system, is causing social instability. Therefore, eradication of poverty program is one the important socio-political agenda of this country. The target area of this project, the State of Uttar Pradesh (hereinafter referred to as "U.P. State"), lies along the Ganga River to the east of the capital city of New Delhi, and borders with Nepal to the northeast. The area sprawls for 241 thousand km² and the population is 166 million, with the average annual population growth being 2.3% for the 10 years since 1991. 60 – 80 % of the drinking water supply is dependant on groundwater, but the aquifer between 40m – 350 m depth, which is presently being over utilized, is facing problems such as pollution from the surface and falling water level due to over pumping. The inhabitants in the target area get a supply of 75 liters per capita per day in the urban area. But this rate of supply drops to 35 liters / capita / day in the rural cities, which means only half of the target supply quantity of 150 and 70 liters per capita per day for the respective areas, is supplied. The weaker sections of the society are affected largely by this short supply. The Government is taking care for conservation of groundwater in the long view, as such measures taken to artificial recharge the shallow aquifers by collecting and diverting the rain water and exploration of the aquifer

from the shallow layer to deep layer located at 350 – 500m deep.

The Indian Government stipulates in the 10th Five year plan, which is the upper plan of this project aims at “Social development and improvement of standard of living” as a major issue. The U.P. State has a higher poverty ratio over 30% in the urban area compared to other states in India. So constructing infrastructure is a critical matter to level up the standard of living of the economically weaker section of society. Also, the plan sets targets for water supply in the urban area and rural cities as below:

Goals of Water Supply in the Cities and Urban Area

Cities (*1) with piped water supply system	70 lit / capita / day
Cities (*1) with piped water system and have plans for sewerage system	135 lit / capita / day
Urban (Metropolitan) area(*2)	150 lit / capita / day

(*1) City : Population of 25,000 to 1 million

(*2) Metropolitan : Population of 1 million to 2.5 million

The Uttar Pradesh State Jal Nigam (Hereinafter referred to as UPJN), which is the drinking water supply institute of the U.P. State, is planning to develop the unutilized aquifers at depth 350 – 500m, which will augment the present water supply. However, because the UPJN does not have drilling equipment capable of drilling 500m class borehole, these deep aquifers cannot be developed. Hence, in March 2001 the Indian Government requested the Japanese Government, 2 (two) sets of borehole drilling equipment with accessories, to develop aquifers at 350 – 500m depth.

As a follow up to this request and scrutinize the proposal, the Japanese Government decided

to conduct the Basic Design Study. The Japan International Cooperation Agency (JICA) dispatched a Basic Design Study team to India twice, first from 16 March to 30 March 2005 and secondly from 1 May to 21 May 2005. Apart from the survey discussions with the concerned Indian Government official both at National and State level, the survey on the natural conditions of the target area was conducted. After the team returned to Japan, the survey results were analyzed, then the draft final report was explained to the Indian Government from 23 October to 1 November, 2005, and finally this report was prepared.

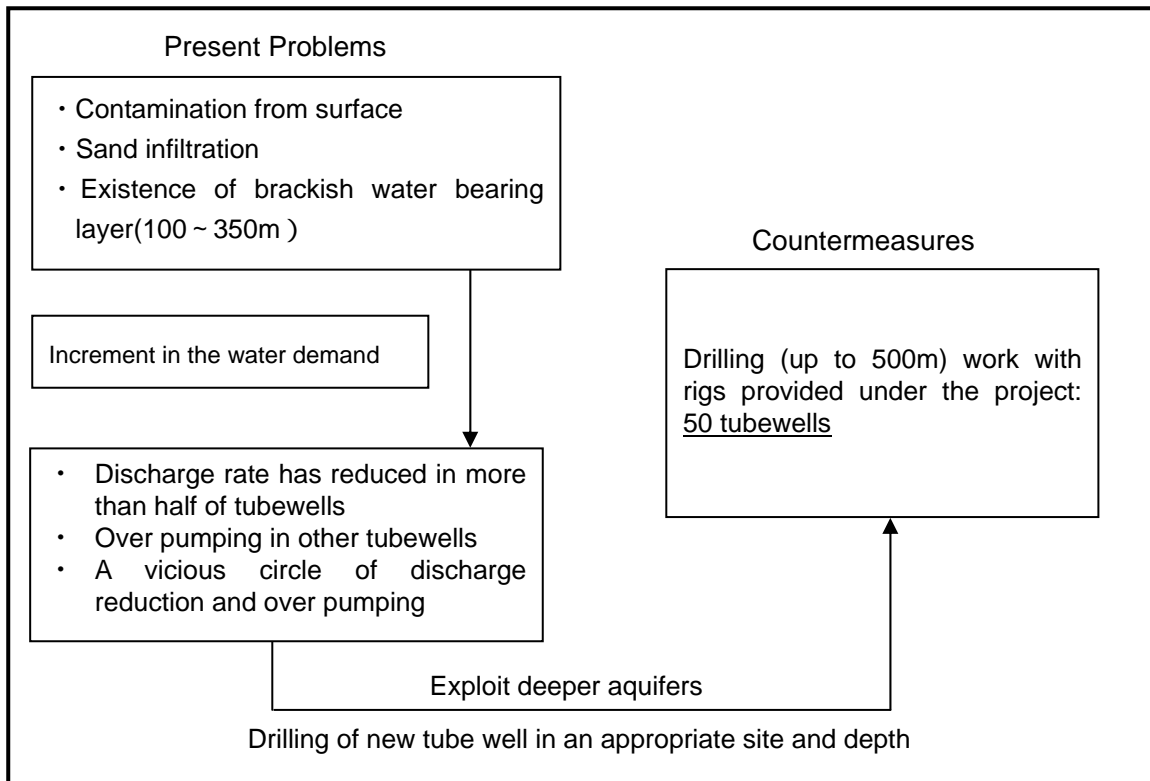
This project aims to establish the capability in UP Jal Nigam to develop the targeted aquifers at depth 350 – 500m, by providing borehole drilling equipment. With this view rigs that can drill down to 500m, shall be procured. As a result, water supply with good quality and appropriate quantity can be made available and, consequently the water supply condition be improved. This cooperation project will be procurement of borehole drilling equipment as given below:

Procurement of Equipment

· Borehole drilling rig, accessories and tools	2 sets
· Borehole development machine (vehicle mounted type)	2 sets
· Trucks to transport borehole drilling related materials	2 units
· Trucks to transport construction water	2 units
· Tubewell logging equipment (vehicle mounted type)	1 set
· Equipment for pump testing	1 set

By 2012, the UPJN is planning to construct 216 boreholes to improve the water supply conditions of the target area. Of these, 50 boreholes are sited in the area where the shallow aquifers above 350m depth due to pollution from the surface and over pumping. The survey

conducted by CGWB in 2000 confirmed that the aquifer at depth 350 – 500m was suitable in both quality and quantity, thus boreholes up to 500m targeted at this aquifer shall be constructed.



The UPJN is planning to raise the supply rate against the water supply demand up to 100% to the estimated population of 6.9 million at 2012 (11 cities 1.14 million, 2 metropolitan cities 5.76 million). Therefore, total of 216 boreholes are planned by 2012.

- By the drilling rig procured through this project (500m class) : 50 boreholes
- By the existing drilling rig owned by the UPJN : 166 boreholes

The Indian side, as a standard procedure for ordinary procurement of equipments, operates and checks the performance of each equipment. Therefore, 500m boreholes shall be actually

drilled with each of the procured drilling rig within this project and simultaneously, OJT, which is the most effective training, shall be applied to the concerned personnel. This initial operation training shall be conducted by the manufacturers of different equipments under the supervision of a Japanese Consultant. This project shall need about 14 (fourteen) months after the Exchange of Notes (E/N). The breakdown of the duration is: detail design and tendering 3.2 months, procurement of equipment is 10.5 months. The approximate project cost is 604.76 million Yen (The Japanese side share 598.60 million Yen, the Indian side share 6.16 million Yen).

Through the implementation of this project, the following effects can be expected:

- The capability of groundwater development of the UPJN will be improved, and 500m class borehole can be constructed, and thus 50 boreholes utilizing aquifer which have safe and appropriate quantity can be constructed.
- Over pumping from the shallow aquifer which is causing falling of groundwater level can be relieved.
- Water supply conditions of 6.9 million people can be improved.
- Utilization of unsanitary shallow wells shall be reduced in the target area.

As a result of procurement of the groundwater development equipment as well as technology transfer, it shall be possible to construct 50 (fifty) 500m class boreholes by 2012, the target year of this project. Consequently, water supply facilities having groundwater as the source shall be developed in the urban area where many weaker section of the society live, and thus many people including the weaker section shall benefit. Thus implementation of this cooperation project through the Japanese Grant Aid can be assessed as valid.

This project is to be implemented to deal with the pollution of shallow groundwater caused by

wastewater, lowering of water levels due over pumping and occurrence of saline aquifers. Periodic monitoring of the tubewell water quality is continuously needed. For UPJN to enjoy a sustainable groundwater development with the procured equipment, there is need to take continuous effort in establishing the structure and technology for both development and conservation.

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Chapter1

Background of the project

Chapter 1 Background of the Project

1-1 Current Situation and Issues of This Sector

1-1-1 Current Situation and Issues

India, has a population of 1,027,020,000 (2001 statistics), which is the second largest in the world, inhabiting an area of about 3.287 million km². Although the GNI per capita is low (530 US dollars, 2001), the economy is steadily growing since the mid 1990s as a result of several political reforms, including the economic liberation, which were taken to overcome the exchange crisis. However, the economically weaker section of society was left out of this economic growth, thus the economic disparity widened even further. These factors together with the other issues in this nation, such as the population growth and language- religion- caste related divides are causing social instability. Therefore, poverty eradication program is one the important political issues of this country.

The U.P. State, the target area of this project, lies along the Ganga River to the east of the capital city of New Delhi, and borders with Nepal to the northeast. The area sprawls for 241,000km², and according to the 2001 statistics the state holds a population of 166,000,000, with the annual population growth of 2.3 % for the ten years since 1991.

60 – 80 % of the drinking water supply in this state is dependant on groundwater resources, although the main aquifer utilized (40m – 350m) is facing serious quality and quantity problems, such as pollution from the surface and falling of groundwater level due to over pumping. Therefore, the UPJN is planning to develop the aquifer from 350 – 500m deep since the aquifers above are being over utilized. The potential of the deeper aquifers both in quality and quantity had been confirmed by earlier studies. However, because the UPJN does not have drilling rigs that area capable of drilling to this depth, the development of

these deeper aquifers is difficult.

Over-pumping of shallow aquifers had resulted in the lowering of groundwater, which also causes reduction in the yield of the many shallow wells and tubewells tapping these aquifers. Consequently, the water supply situation in the urban area is worsening day by day with the increase of population and subsequent demand. The water supply in the urban area is 75lit / capita / day, and in the rural cities is lower than 35 lit / capita / day, making it hard for the people to find enough water for their daily needs. Therefore, the economically weaker can only drink water that has quality below the standard, causing widespread waterborne diseases such as diarrhea, dysentery and jaundice. The government is taking care for the groundwater conservation in the long-term point of view, in restricting on pumping water from the shallow aquifers and encouraging artificial recharge of aquifers_(transition of aquifer to 350m -500m depth). Artificial recharge project implemented nation-wide is being implemented in 7,000 places in 16 states. In the U.P. State, artificial ground water recharge is carried out on all public facilities by collecting rainwater from the roof and diverting the collected water into specially designed shallow wells and tubewells.

Besides the problem of reduced yields mentioned above, the shallow aquifers are polluted by the industrial and domestic wastewater from urbanization. Thus water from more than half of the shallow wells in the U.P. State fail to comply with the WHO drinking water standards. The pollution is the main reason for water borne diseases and the infant mortality from the waterborne diseases in this state is 16 per 1,000 persons, which is much above the rate of infant mortality in other states and in the neighbouring countries.

1-1-2 Development Plan

The “10th 5 year development plan (April 2002 to March 2007)” sets, not only high economic

growth as its goal, but also sets improvement of social infrastructure. The main goals are as follows:

- 1) Reduction of poverty ratio by 5% points by 2007 and by 15% points by 2012.
- 2) Increase of employment
- 3) All children to complete 5 years of schooling by 2007.
- 4) Reduction in gender gaps in literacy and wage rate by 50% by 2007
- 5) Population control (within 16.2% in the 10 years)
- 6) Improvement of literacy within the planned period (up to 75%)
- 7) Improvement of maternal and child health
- 8) Increase of forest area (25% coverage of the national land by 2007, 33% by 2012)

9) Securing safe water

- 10) Cleaning up of major rivers

After the procurement of the equipment, the Indian side will construct 50 tubewells (350 – 500m) by themselves, and these shall be using the budget from the National Urban Renewal Mission, which is planned to be conducted nation wide by the Central Government, including the U.P. State.

1-1-3 Social Economic Situation

In 1991, India suffered serious exchange crisis, related to the Gulf War and collapse of the Soviet Union which had strong economic ties with India. Since the crisis, the Government implemented economic stability policy, economic liberation and regulation relaxation, and as a result, although the economy temporarily worsened in 1992 due to the stabilization policy, the balance of payments and other economic factors improved in 1993. In particular, the activation of the private sector resulted to raise the average annual economic growth to 7% from 1994 to 1996, and since then, the growth rate was 6.6% in 1998, 6.4% in 1999, 4.4% in

2000 and 5.6% in 2001, thus the Indian economy smoothly progressed in the next 10 years. In 2002, although there were some effects of the drought, the growth reached 4.3% as a whole, and, in 2003, the growth rate reached to 8.2%, and this high growth rate is forecasted for several years to come. The GNI in 2002 is 494,817 million dollars as a whole and 470 dollars per capita. The structural proportion of GDP is: Agriculture 23.6%, Industry 28.4%, Services 48% (2002 estimation: CIA). In spite of the rapid expansion of IT service industry etc. As a result of progress in the economic liberation, the rural economy and the socially vulnerable is still left out from the economic growth. Since the United Progressive Alliance led by the Congress Party took hold of the power as a result of the May 2004 lower house elections, the Government is trying to emphasize on social sector policies such as employment security or education and health.

1-2 Background and Summary of Request for Grant-Aid

The Indian Government is holding “Social development and improvement of level of living” as one of the most important issues to be solved in the 10th Five year plan. The U.P. State has high poverty ratio compared to other states, in particular the poverty ratio is 30% in the urban area, and thus improvement of infrastructure for the improvement of level of living is an urgent need in this state. The 10th Five year plan, which is an overall plan of the project, sets the following goals for the water supply in the urban areas and rural cities.

Table 1-1 Goals of Water Supply in the Cities and Urban Area

Cities (*1) with piped water supply system	70 L/capita/day
Cities (*1) with piped water system and have plans for sewerage system	135 L/capita/day
Urban(Metropolitan) area(*2)	150 L/capita/day

(*1) City : Population of 25,000 to 1 million

(*2) Metropolitan : Population of 1 million to 2.5 million

30 to 40 % of the population of the U.P. State get below the Indian standard of 70 lit / capita / day for water supply, for rural areas and rural cities without sewerage system. The mortality for water-borne diseases is high because of the usage of unsanitary surface waters or shallow wells. Moreover, in the U.P. State 60 – 80 % of the drinking water is supplied from groundwater, but the actual exploited aquifers are located between 40 to 350m depths. They face problems of pollution from the industrial and domestic sewerage and over pumping caused falling of groundwater levels. The hydro geological survey of the existing water sources conducted by the Central Groundwater Board (CGWB) and the UPJN and monitoring of the exploitation and projected water demands reveal that there will be shortage in water to supply for the increasing population in future. Therefore, UPJN, the organization responsible for drinking water development in the U.P. State is planning to develop deeper aquifer 350 – 500 m depths, which had not been exploited so far. But the existing equipment cannot effectively develop aquifers at these depths. Hence the Indian Government requested the Japanese Government the procurement of 2 (two) sets of tubewell drilling equipment and related equipments that can develop the aquifer existing at 350m – 500m. Thereby achieving the goal of “Securing safe water”, and improve the living standards of the poor rural populations which is one of the main policy to fight poverty. The contents of the request are given on the table below.

Table 1-2 Contents of Request

No.	Item	Request
1.	Tubewell drilling equipment	
1)	Drilling rig	2 units
	Truck mounted top head drive drilling rig: -Capacity: Maximum 500m (using 4-3/4" drill pipe) -Truck: 6x4	
2)	Accessories and Tools for the above	2 sets
3)	Drilling tools	2 sets
4)	Casing tools	2 sets
5)	Fishing tools	2 sets
6)	Other accessories	2 sets
7)	High pressure compressor and accessories for tubewell development	2 sets
8)	Spare parts for the above	2 sets
2.	Supplementary equipment	
1)	Cargo truck for transport drilling related equipment and materials 6 x 4, 6t crane	2 units
2)	Water tank truck for construction water, 6m ³ capacity tank	2 units
3)	Pumping test equipment	2 sets
4)	Vehicle mounted tubewell logging equipment	2 sets
5)	Borehole camera	1 set
6)	Spare parts for the above	2 sets
3.	Commissioning	
	Initial operation training of the equipment to the drillers and mechanics through OJT (3 months)	1 set

1-3 Japanese Assistance Trends

In India, three projects, starting from the “Groundwater development plan” in 1980 to “Water quality management equipments installation plan” in 1993, were implemented as Japanese Grant-aid assistance in the groundwater development sector.

Table 1-3 Japanese Grant Aids (Groundwater Development Sector)

Implementation Year	Project Name	Limited Cost (million Yen)	Summary
1989 1990	Groundwater development plan	901	Granted 4 sets of drilling and survey equipments to the Ministry of Water and Resources
1992	Groundwater development plan (Second phase)	1,005	Granted 3 sets of drilling equipment and survey equipment to the Ministry of Water and resources
1993	Water quality management equipment installation plan	244	Procurement of water quality analysis equipment for groundwater management to the Ministry of Water and Resources

1-4 Assistance Trends of Other Donors

UNICEF has procured 300 units of small drilling rigs from 1967 to 1997 as part of rural water supply plan to cover whole of India. Most of them are small type rigs, with small diameter (100mm) and were used for construction of tubewells with hand pumps. Presently, UNICEF is implementing improvement of safe utilization of water, which includes identification of arsenic polluted area.

Table 1-4 Assistance of Other Donors and International Organizations
(Groundwater Development Sector, recent years)

Implementation year	Organization	Project name	Cost	Assistance type	Summary
2004 ~ 2008	UNICEF	Water Supply and Sanitation plan	4.768 million US dollars	Grant Aid	Improvement and promotion of utilization of safe water

Chapter2

Contents of the project

Chapter 2 Contents of the Project

2-1 Basic Concept of the Project

2-1-1 Development Objectives and Project Objectives

Uttar Pradesh Jal Nigam (UPJN), a parastatal organization of the State of Uttar Pradesh, is responsible for construction and rehabilitation of water supply facilities. Nearly 80% of the water source is groundwater. In recent years, due to problems associated with over-pumping, contamination and industrial pollution of shallow groundwater and brackish water lenses, many of the tubewells with depths from 40 to 350m are now faced with pumping rate reduction, water level lowering and water quality degradation. The hydrogeological surveys carried out by Central Ground Water Board (CGWB) had confirmed that deeper aquifers, at depths between 350 and 500m are suitable for development. As a countermeasure against the difficult supply situation of existing water supply facilities, UPJN is preparing a plan to secure the required water supply rate by using equipment procured in this project to develop these deep aquifers to tap ground water with improved quality and also add to the quantity. The objective of this envisaged project is the procurement of drilling rigs and supporting equipment to enable the stable supply of good quality water by developing aquifers at depths of 350 to 500m. On-the-Job Training (OJT) during commissioning is an integral part of this plan.

In the 10th Five Year Plan of the Indian government, importance is given to “social development and quality of life”. Within the country, the State of Uttar Pradesh has a high percentage of the poverty group and the urban areas; they cover over 30% of the population giving urgency to improvement of infrastructures to raise the living standard of the poverty group. In the 10th Five Year Plan, which is the national development plan for this project, as the objective of water supply in metropolitan areas as well as towns

and cities, the following is given as the Goals of Water Supply in the Cities and Urban Area.

Table 2-1 Goals of Water Supply in the Cities and Urban Area

Cities (*1) with piped water supply system	70 lit / capita / day
Cities (*1) with piped water system and have plans for sewerage system	135 lit / capita / day
Urban (Metropolitan) area(*2)	150 lit / capita / day

(*1) City : Population of 25,000 to 1 million

(*2) Metropolitan : Population of 1 million to 2.5 million

However, presently, the water shortage of the target area of Uttar Pradesh (UP) is, in average, 50% of the above minimum standard. Especially in large urban areas, along with the increase in population, water supply conditions are deteriorating on a daily basis. In the state of UP, there are 70,000 units tubewell with handpumps, where in Kanpur alone there 7,952 units and in Lucknow about 5,000 units. Even in such metropolitan area, handpump type water source in the water supply coverage ratio is a crucial factor. A considerable number of such tubewells fitted with handpumps are polluted and are unsafe.

The objective of UPJN is to have 100% coverage by the year 2012 in the project area. Therefore, UPJN is planning tubewell drillings through the National Urban Renewal Mission (NURM) which the central government is promoting on a national level, with an objective of drilling 216 new tubewells by 2012 in urban portions of the project area. Of this number, 50 tubewells are for existing water supply facilities where sufficient water supply is difficult due to contamination and groundwater level lowering, and therefore

require drilling down to depths of 350 to 500m. However, since UPJN does not possess drilling rigs and related equipment capable of drilling deeper than 350m, for these 50 tubewells, UPJN is planning to drill these tubewells using equipment having the required capacity procured through Japan's grant assistance.

Moreover, plans for after the drilling of the 50 tubewells scheduled until 2012 will be prepared upon completion of the survey which UPJN is presently conducting in areas suspected of having problems in the future. The actual estimated number according to the survey is 54 tubewells.

2-1-2 Project Brief

In this project, to achieve the above mentioned UPJN objective of development capacity improvement of aquifers at depths from 350 to 500m, rigs capable of drilling down to a maximum of 500m will be procured. As a consequence, a stable amount of good quality water can be supplied and an improvement in the present water supply condition can be anticipated. This project will procure the following tubewell drilling equipment.

Equipment to be procured :

- Drilling rigs, accessories and tools
- Tubewell development equipment (truck mounted)
- Vehicles to transport drilling related equipment
- Water tank trucks
- Tubewell logger (truck mounted)
- Pumping test equipment

The project objectives, overall goal, outputs as well as verifiable indicators and means of verification of these outputs are listed in the PDM shown in the next page, and the project concept diagram is shown in the following page.

Table 2-2 PDM

Project Title: The Project for Groundwater Development
in the State of Uttar Pradesh
Target Area : State of Uttar Pradesh

Target Group :
【Direct】 UPJN staff(102 persons)
Drilling site residents(6.39million inhabitants)
【Indirect】 Project Area residents(106.6million
inhabitants)

Period : March, 2005 to 2012
Ver. 2.2
Developed on : Sep/2005

Narrative Summary	Verifiable Indicators	Means of Verification	Important Assumption
<p>Overall Goal In the UP state, a stable amount of water with good quality will be supplied from the deep aquifers. This will supplement the existing water supply facilities. Many such facilities are not working properly, due to problems of over pumping contamination and influence of salt water lens in shallow groundwater. The implementing agency will continue to develop a groundwater using the equipment provided by the Project.</p>	<p><input type="checkbox"/> Water supply amount will increase in the target area. <input type="checkbox"/> The number of water borne disease will decrease in the target area. <input type="checkbox"/> The water quality of developed groundwater will satisfy the Indian Standard.</p>	<p><input type="checkbox"/> Statistical data records <input type="checkbox"/> Finalization of the Project Implementation</p>	
<p>Project Objective Tubewells targeting the deep aquifers situated in 350 to 500m are constructed in the state of UP.</p>	<p><input type="checkbox"/> Numbers of tubewells between 350 to 500m depth will increase by fifty (50) in the Project area by the year 2012.</p>	<p><input type="checkbox"/> Final Report on Project Implementation <input type="checkbox"/> Periodical monitoring reports on drilling record (every six month) to be submitted to Japanese side.</p>	<p><input type="checkbox"/> Groundwater development strategy in urban area will not change (including budget). <input type="checkbox"/> Groundwater potential will not get worse significantly. <input type="checkbox"/> Water quality from the sources in the target area will not become worse. <input type="checkbox"/> Rapid expansion of population due to deterioration of socio-economic condition will not happen.</p>
<p>Outputs 1. Drilling equipment to construct tubewells exploiting deep aquifers are provided to the Implementing Agency. 2. Technology for the operation of the supplied equipment will be transferred through on-the-job training (OJT) to the Implementing Agency.</p>	<p>1. After the implementation of the Project, two (2) sets of drilling equipments will be operational, spare parts procurement and servicing will be done appropriately. 2. By the time of completion of the Project, as compared to the initial stage, the Implementing Agency will have the capacity to construct the same tubewell themselves.</p>	<p><input type="checkbox"/> Project completion report <input type="checkbox"/> Report on the record of performance submitted from the Implementing Agency to JICA India Office each six (6) month after the completion of the Cooperation from Japanese side.</p>	<p><input type="checkbox"/> The drilling staff who received OJT will not retire significantly.</p>
<p>Activities 【Procurement of Equipment】 1. To procure drilling machine and related equipment. 【Initial operation guidance】 2. To conduct an initial operation guidance of the drilling machine and related equipment to the staff of the Implementing Agency through on-the-job training.</p>	<p>Inputs 【Japanese side】 Human resources : Basic Design Study Team, Detailed Design Study Team, Supplier for procurement of equipment. Equipment : Drilling machine and accessories, tubewell development equipment (truck -mounted compressor, water tank truck: 2 set each. Vehicle mounted logging equipment, pumping test equipment, and spare parts for above: 1 set each. Fund: Grant Aid Cooperation. 【Indian side】 Human resources : Personnel for the drilling teams Construction・Materials : Materials for tubewell construction, pumps for the tubewell and pipe connection to the existing system. Fund : Counterpart fund for the tubewell construction and local costs.</p>	<p>Precondition <input type="checkbox"/> Import and custom clearance of the procured equipment and materials will not be delayed seriously.</p>	

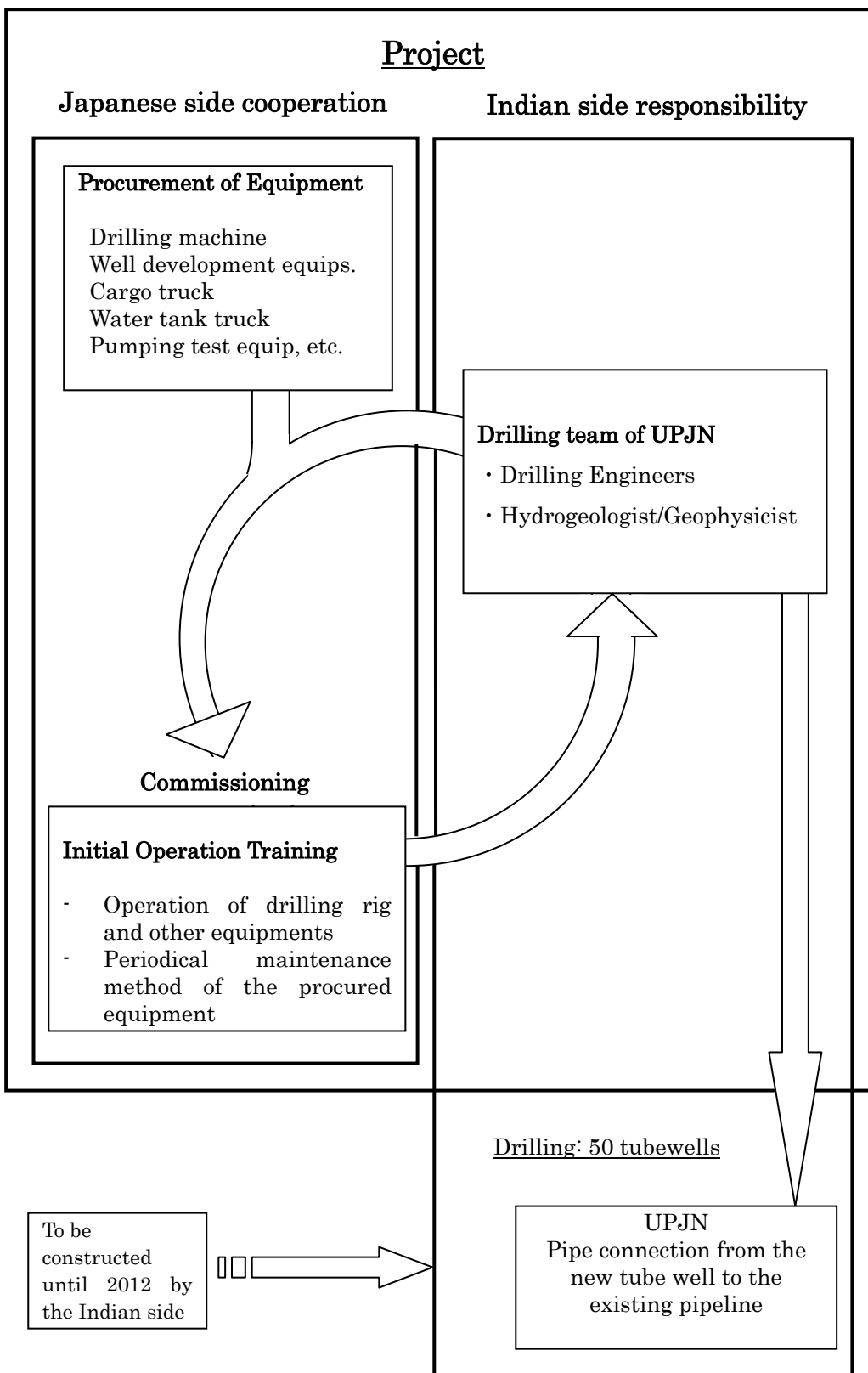


Fig. 2-1 Structure of the Project

2-2 Basic Design of the Requested Japanese Assistance

2-2-1 Design Policy

Presently in the project area of Uttar Pradesh, 30 to 40% of the population is not supplied with the Indian government standard supply rate of 70 lit / capita / day (for rural areas and towns/cities without sewerage). Due to the non-availability of adequate water, the economically weaker residents rely on unsanitary surface waters and shallow wells, which is the reason for the prevalence of waterborne disease. Although 60 to 80% of drinking water in Uttar Pradesh is supplied from groundwater, the targeted aquifers at depths from 40 to 350m have problems of contamination from surface layers or groundwater level lowering due to over pumping. Furthermore, supply shortage due to population increase in the future is evident from monitoring of existing water sources and other surveys of CGWB and UPJN. Therefore, as the drinking water development agency for Uttar Pradesh, UPJN is planning to develop aquifers at depths deeper, 350 to 500m that have not been tapped as yet. An effective groundwater development to reach this targeted depth is difficult with the existing equipment. So it is proposed to procure adequate equipment in this project so that UPJN can develop deep groundwater independently. To accomplish the above objective, tubewell drilling rigs, accessories and tools, tubewell development equipment, and vehicles to transport drilling related equipment will be procured. Since the Indian side possesses a certain level of competence in groundwater development, only initial operation guidance of the newly procured equipment will be conducted during the commissioning.

2-2-1-1 Basic Policy

To improve the water supply condition of the project area by 2012, UPJN is planning to construct 216 tubewells. Within this plan, 50 tubewells are located in areas where new groundwater development is inappropriate at depths shallower than 350m due to surface contamination and over pumping. Therefore, based on the findings of the

hydrogeological survey conducted by CGWB and UPJN in 2000 it is planned to target aquifers at depths between 350 and 500m. It proposed to construct tubewells to maximum depths of 500m so that they will produce more water with better quality. However, since drilling rigs owned by UPJN are not capable of drilling down to 500m depths, procurement of drilling rigs was requested through Japan's grant aid. The Present Problems and Countermeasures are shown in the following figure.

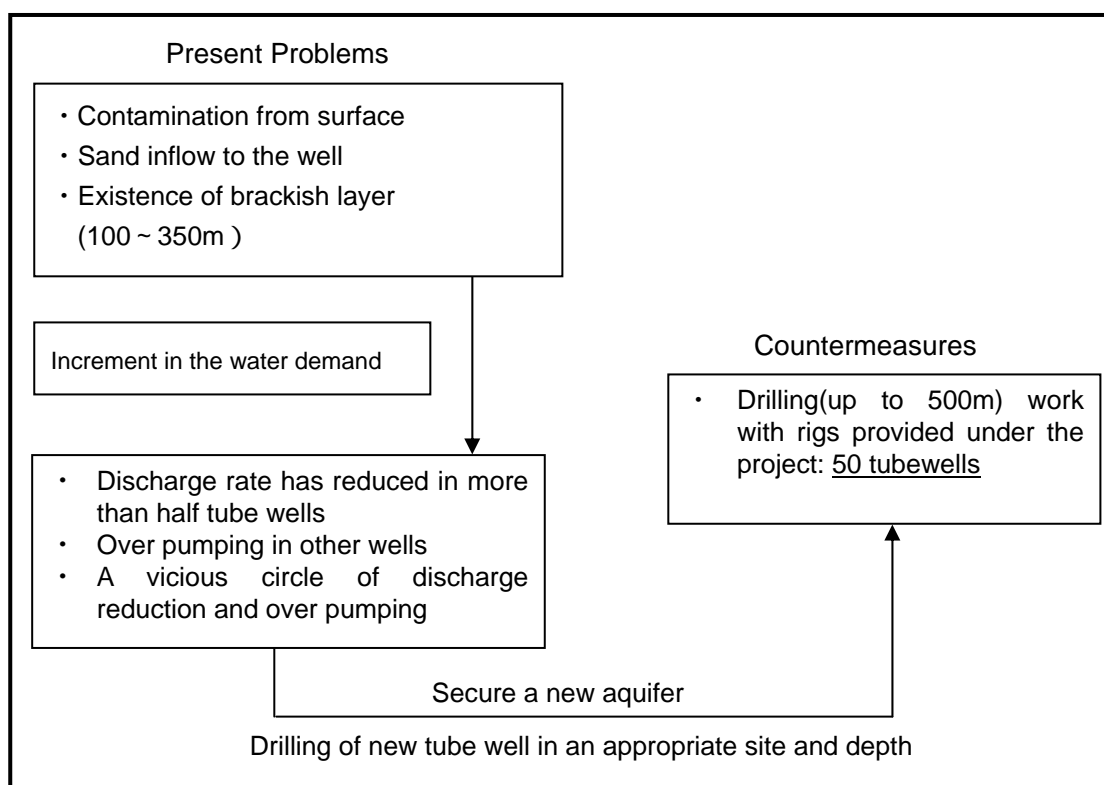


Fig. 2-2 Present Problems and Countermeasures

UPJN is planning to raise the water supply demand for the 6.9 million persons. (1.14 million in towns/cities and 5.76 million in 2 urban centers) forecasted for 2012 to 100%. As a result, drilling of 216 tubewells until 2012 is planned, but the breakdown of this number is as follows.

Drilling rig to be procured in this project (500m class):	50 tubewells
Drilling rig presently owned by UPJN (350m class):	166 tubewells

The type and model of the requested truck mounted drilling rig will be selected in accordance with the hydrogeological conditions of the target area.

In order to drill 50 of the requested 500m class tubewells in 6 years, since one tubewell is assumed to take 2.5 months and with 10 workable months (about 2 months is rainy season when work is not possible, and equipment can be serviced), one rig can drill 4 tubewells per year, which means that 2 rigs must be procured. Furthermore, the number of rigs can be increased to shorten the horizon year, but in consideration of the personnel, budget and other factors of the executing agency, 2 rigs is judged to be feasible.

- Number of drillings/rig:

$$\text{Workable months } 10 \text{ months/yr} \div 2.5 \text{ months/rig} = 4 \text{ tubewells/yr/rig}$$

(About 2 months is nonworkable due to rainy season)

- Required number of rigs for drilling 50 tubewells in 6 years:

$$50 \text{ tubewells} / 4 \text{ tubewells/6 yr} = 2 \text{ rigs}$$

The population and site list for the above 50 tubewells is shown in the table 2-3 and 2-4.

Table 2-3 Population of the Project Target Area

District	Town or Area Name	No. of Tube wells	Population (2001)	Population (2012)
Lucknow	Lucknow	24	2,207,340	3,077,823
Kanpur	Kanpur	17	2,532,138	2,683,030
Jaunpur	Jaunpur	2	159,996	194,476
Pratapgarh	Kunda	1	22,331	27,143
Unnao	Purwa	1	21,195	25,763
Raebarelli	Raebarelli	2	169,285	205,766
Unnao	Unnao	3	144,917	176,147
		50	5,257,202	6,390,148

Source: Census 2001.

Since the staffs of the executing agency has a certain level of skill for constructing tubewells, in this project, only initial operation training required to operate the procured equipment will be conducted before the hand over.

Normally, when equipment is procured in India, confirmation on performance of each equipment is standard, and therefore for this project, 500m tubewells will actually be drilled using the procured equipment and practical training, which is most effective for training of this type of work, will also conducted. It is being proposed that the manufacturer under the supervision of the Consultant will hold the initial operation training.

Table 2-4 Project Sites

District	Town or Area Name	Programmed Drilling Year	No. of Tubewells	Priority (by year wise)
Lucknow	Lucknow	2007	4	1
Raebarelli	Raebarelli	2007	2	2
Kanpur	Kanpur	2007	2	3
Lucknow	Lucknow	2008	3	1
Pratapgarh	Kunda	2008	1	2
Jaunpur	Jaunpur	2008	2	3
Kanpur	Kanpur	2008	2	4
Unnao	Unnao	2009	3	1
Unnao	Purwa	2009	1	2
Lucknow	Lucknow	2009	3	3
Kanpur	Kanpur	2009	1	4
Lucknow	Lucknow	2010	4	1
Kanpur	Kanpur	2010	4	2
Kanpur	Kanpur	2011	4	1
Lucknow	Lucknow	2011	5	2
Kanpur	Kanpur	2012	4	1
Lucknow	Lucknow	2012	5	2
Total			50	-

Note:

- 1) The number of tubewells to be constructed per year may vary in accordance to the ground condition encountered and other unforeseen incidence during drilling related work.
- 2) The depth of tubewell may vary depending upon the strata encountered during drilling and logging of the tubewell and their yield. The depth of proposed tubewells may range from 350 to 500m.
- 3) The priority of drilling of tubewells is likely to change depending upon:
 - a) incidence of failed existing tubewells
 - b) drought situation and the like emergency situations

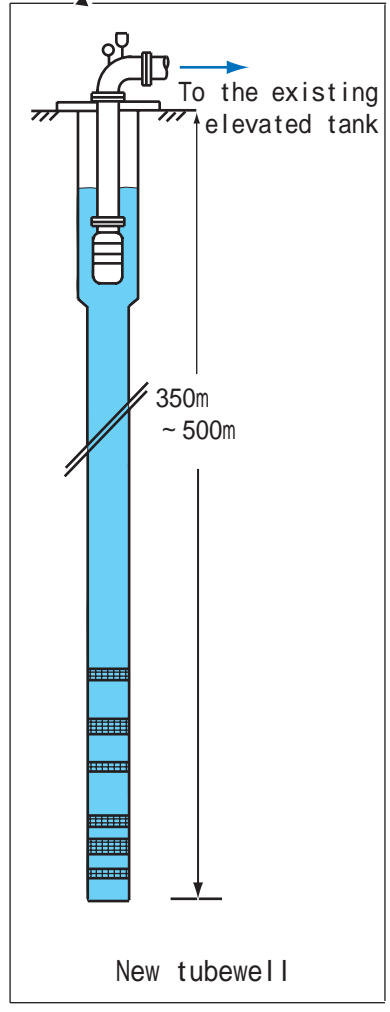
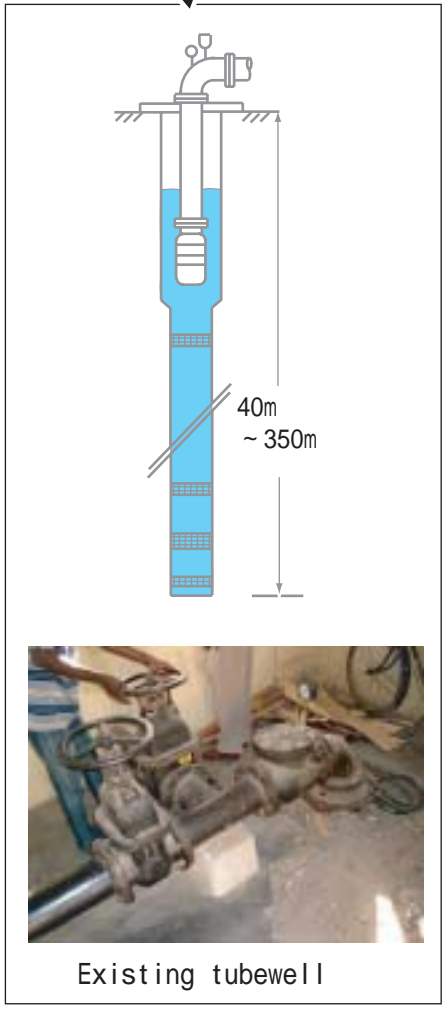
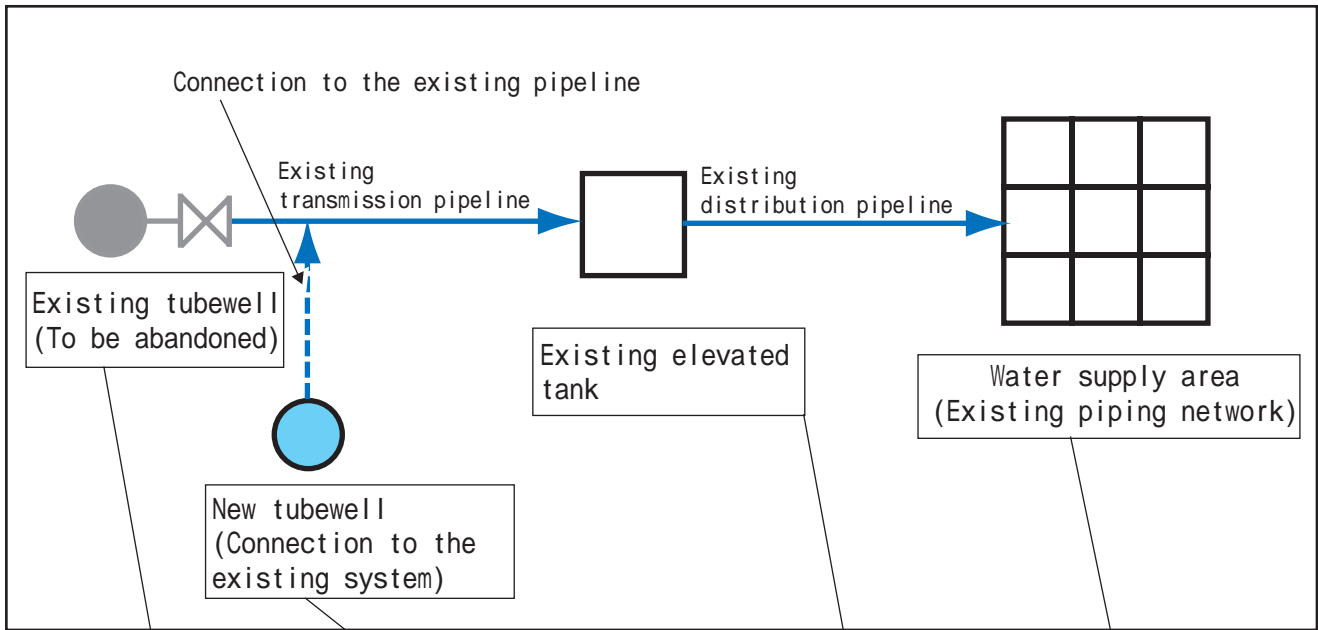
Based on the above considerations, the scope of assistance for this project is determined according to the following basic policy.

- 1) Procurement of tubewell drilling equipment will be limited to two rigs of mud circulation rotary type, which is suitable for the type of geological condition of the project area. In the original request, a high pressure compressor essential for tubewell development was not clearly listed, but since proper performance of the drilling equipment cannot be realized if operated without this equipment, an appropriate quantity will be procured. For the tubewell logging, the original request was 2units, but as it will be a vehicle-mounted, the work can be shared with one unit because of the mobility.

- 2) The responsibilities to be shared for this project by the Japanese and the Indian sides are shown in the table 2-5. And the water supply system concept diagram is shown in the Fig. 2-3.

Table 2-5 Responsibilities of Japanese and Indian Sides

Responsibilities of Japanese Side	Responsibilities of Recipient Side
<ul style="list-style-type: none"> • Procurement of equipment necessary for water resources development (tubewell drilling) 	<ul style="list-style-type: none"> • Securing and clearing land for construction works • Construction of tubewells • Installation of intake facilities such as pumps • Laying of supply pipelines to the existing facilities



House connection supply



Existing elevated tank

Fig. 2-3 Water supply system diagram

2-2-1-2 Policy towards Natural Conditions

The topography of India can be divided into four main areas, namely- the Himalayan Mountains, Indus-Ganges-Brahmaputra Plains, desert region and peninsula area. The project area of the state of Uttar Pradesh is located in the central part of the Indus-Ganges-Brahmaputra Plains. This Plain extends to the south of the Himalayan Mountains having 240-320km width and 2,400km length, and is composed of alluvial deposits of the 3 large river systems of Indus, Ganges and Brahmaputra. This region is one of the world's largest alluvial plains and the most densely populated area in the world. This area is flat and has an altitude difference of only about 200m within the 1,600km distance between Delhi located along the Jamuna River and Bay of Bengal.

The climate of India can be categorized along the topographical divisions: the Himalayan Mountains area has high mountain climate; the Indus-Ganges-Brahmaputra Plains is in the temperate monsoon climate zone; the desert region has dry weather; and the peninsula is located in the tropical monsoon climate zone. Other than the Himalayan Mountain area and desert area (dry climate zone), the monsoons have strong influence, and from June to September, south-westerly winds dominates, but when they pass over the Indian Ocean, Arabian Sea and Bengal Bay, the highly moist monsoons brings heavy rains to the west coast along the Indian Ocean and the base of the Himalayan Mountains. When the south-westerly monsoons end, then the post monsoons or the so-called north-easterly monsoons at the southern part of the Indian peninsula begins (from October to December). During this season, winds blow from inland to the ocean. Then, winter from January to February, and summer from March to May. May has the highest temperature at about 45 degrees Celsius.

Concerning the equipment to be procured under the Project, the natural condition that

can affect are the temperature and hydrogeological condition. Also, for the drilling work scheduling, the rainfall can affect. The rain and dry season are very clear in the Project area and the rainfall data are shown in the following table.

Table 2-6 Monthly Rainfall of Target Area

Unit: mm

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Jaunpur	15.4	16.9	7.6	3.9	10.5	89.1	297.6	286.3	204.8	42.2	7.0	5.1	986.4
Kanpur	16.6	13.2	7.0	4.8	7.8	62.2	234.1	265.8	159.5	40.0	3.9	7.0	821.9
Lucknow	19.1	14.9	7.7	5.8	14.3	86.0	283.2	286.8	180.8	44.6	3.6	6.3	953.1
Allahabad	17.4	17.1	8.7	4.8	7.5	78.5	295.1	302.2	176.3	37.1	7.8	6.3	958.8
Azamgarh	16.2	16.8	8.7	5.6	13.8	110.2	297.9	305.0	208.2	48.6	6.1	4.8	1,041.9
Ballia	14.9	13.3	8.6	5.2	17.3	110.2	278.6	288.2	187.8	49.2	6.3	3.3	982.9
Etawah	15.9	11.5	8.4	5.9	10.1	56.8	224.7	262.3	151.6	33.7	4.0	6.7	791.6
Ghaziabad	23.9	20.0	17.6	8.0	10.6	56.6	204.9	211.7	138.2	28.9	2.4	8.7	731.5
Ghazipur	17.1	18.2	8.8	4.7	13.6	114.2	289.8	308.7	198.8	46.7	8.3	5.0	1,033.9
Gorakhpur	17.2	15.1	12.4	12.2	34.9	195.0	398.9	370.9	238.1	76.7	4.1	3.7	1,379.2
Pratapgarh	15.7	16.8	8.7	5.1	9.5	83.9	306.7	297.8	182.2	38.0	5.6	6.6	976.6
Raebarelli	17.0	17.0	8.5	5.4	8.5	78.8	286.1	282.8	171.9	36.6	3.7	6.7	923.0
Sultanpur	15.5	14.3	6.9	5.0	16.0	84.3	313.0	297.4	193.2	50.2	3.3	6.0	1,005.2
Unnao	16.4	15.2	8.3	5.6	9.8	69.3	260.2	257.0	160.7	39.5	3.9	6.1	852.0

Source: "State Report on Hydrogeology & Groundwater Resources in UP, CGWB-2000"

Since the temperature can rise as high as 45 degrees Celsius in summer, the equipment to be procured must be able to tolerate this condition. Many of the target sites and construction points are located in remote areas and are approached through narrow and unpaved roads winding through crowded residential areas. Hence the accessibility to these sites and manoeuvrability of the equipment to be procured need to be given adequate consideration.

Consideration on the hydrogeology will be mentioned in “2-2-1-6 Policy on setting the grade of equipments”.

Also, the siting of the drilling point and the drilling work using the procured equipment will be done by the Indian side. Consequently, the judgment of the water quality and capacity of the tubewell drilled with the procured equipment, will be under the responsibility of Indian side.

2-2-1-3 Policy towards Socio-Economic Conditions

In the project area, historically apart from Hinduism other religious beliefs such as Islam, Buddhism, Jainism, and Sikhism and to a smaller extent Christianity are being practiced. Geographically, U.P have a border with Uttaranchal and Himachal Pradesh in the North, Haryana and Delhi in the West, Madhya Pradesh in the South, Bihar in the East and the northeastern area borders Nepal. Hence, since diversity in traditions and lifestyles are present in the target area, their differing conditions will be sufficiently respected and considered when drilling work is planned.

Since this project concerns procurement of equipment, the Indian side will carry out construction, but the following points need to be considered for selection of the equipment. The target sites are mostly urban areas and to avoid disturbance to the life of the residents during mobilization and demobilization of equipment, vehicles and equipment should be compact as much as possible. Especially since the required capacity of the drilling rig is of the 500m class, the main body will be large-sized and care need to be taken in mobilisation. Considering the conditions of the access road, the drilling rig will be a truck-mounted type instead of the trailer type where the main body must be towed.

2-2-1-4 Policy on Procurement of Equipment

(1) Policy on Procurement of Equipment

The type and model of the requested truck mounted drilling rig and related equipment will be those models that are suitable for drilling in the target area marked by sediments such as sand and clay, which are the main geological formations.

Due to the concern about the availability procurement of spare parts for the equipment, the executing agency has strongly requested procurement from India or Japan. After detailed study and considerations it was noticed that the requested truck mounted type drilling rig having the required specifications cannot be procured locally, procurement from Japan considered. The tubewell development equipment (truck mounted high pressure compressor), vehicle mounted tubewell logging equipment and pumping test equipment can be procured locally. From the viewpoint of cost and maintenance after procurement, these should be procured from India.

(1) Responsibilities of the Indian Government Agencies on drilling related Equipment

CGWB as a central government organization is drilling tubewells around India, the concerned officials were met in Delhi and in Lucknow and discussions were held about their work and their responsibilities. CGWB are basically the body in charge of groundwater surveys and implement independent programs more on research and development basis. Their exploration tubewells are sometimes sold to an agency that is implementing ground water resources development program in the same area. They do not respond to requests for tubewells for water supply from other organization. However, although normally they do not drill tubewells for irrigation or domestic water supply, in an emergency or in areas having special geological conditions such as

abundance of boulders where private drillers or state government cannot easily drill, there are cases where they do drill tubewells for domestic water supply or irrigation parallel to their surveys. Previously, drilling rigs procured by Japanese grant aid project were used for this special case, and presently, all of these rigs are allocated to drill tubewells in the foot of the Himalayas which is marked by boulder formations. Therefore, it is impossible to use CGWB's machine to drill a tubewell in this project. The executing agency for this project, UPJN, is in principle constructing tubewells for water supply purpose only.

Indian Standards for tubewell construction such as IS-2800 (Code of Practice for Construction and Testing of Tubewells, 1979), IS-8110 (Requirements for tubewell screen and slotted pipes, 1985), and IS-11189 (Method of tubewell development, 1985) are followed on principles by the executing agency.

2-2-1-5 Policy on Capacity of Executing Agency for Operation and Maintenance

(1) Operation and maintenance of water supply facilities

In the state of Uttar Pradesh, UPJN is in charge of construction of all water supply facilities including the ones that use tubewells as their source of water. After completion of a water supply facility, a 6-months training on operation and maintenance of the facility is conducted and then the facility is handed over to the target site (local government). The state government organization is in charge of operation and maintenance of water supplies and is looked after by different local bodies categorized according to the size of the urban population as follows:

- Jal Sansthan (Water and Sewerage Department):

Metropolitan areas of over 500,000 persons

(Uttar Pradesh state has 6 areas with Jal Sansthan)

- Nagar Palika (water and sewerage department):

Cities with 10,000 to 50,000 persons

- Nagar Panchayat (Water and Sewerage Department):

Towns with less than 10,000 persons

From the financial situation view point, over half of the above sites are financially deficit. Since most are receiving subsidies for expenditure towards power consumption from the state government, the management are done. This situation will likely to continue in future. The oldest water supply system in the project area is managed by Jal Sansthan – Lucknow as one of the several system managed for long time.

(2) Operation and Maintenance of Equipment

Some of the old drilling rigs and support equipment such as compressors owned by UPJN are in use even after 20 years since procurement. In spite of such handicaps UPJN had drilled 1,461 tubewells were in the past five years (refer to the table 2-7). Further, as we observed at a site, a rig was being maintained even during operation and the construction site was well organized which confirm that routine operation and maintenance is being carried out satisfactorily. Moreover, at another site, during tubewell development, operation had to be discontinued due a breakdown of the high-pressure compressor, but the damaged part was dismantled. And within after a week spare parts were procured and damage was repaired to restart the operation without much delay. Based on these observations it is evident that the equipment to be procured will be operated and maintained properly. Also, if the important spare parts could be procured in the local market, repairs can be made promptly. Therefore, the procurement situation of spare parts in the local market needs to be considered.

Table 2-7 Drilling Record of UPJN for the past 5 Years (Unit: number of tubewells)

Year	2000/01	2001/02	2002/03	2003/04	2004/05	Total
Urban	256	216	222	96	65	855
Rural	53	86	256	143	68	606
Total	309	302	478	239	133	1461

(3) Drilling rigs presently owned by UPJN

The drilling related equipment of UPJN are allocated to different zones in the state. Some of the older ones procured in 1977 are still being used. However they are capable of drilling down to depths of 300 to 350m. Rigs allocated to each zone are listed below.

Table 2-8 Allocation of UPJN owned Equipment

Zone Name	Allocated Number
1) Allahabad	12
2) Gazhiabad	4
3) Agra	4
4) Lucknow	8
5) Kanpur	2
6) Jhansi	17
7) Lucknow Nalkoop Wing	5
Total	52

(4) Initial Operation Training of Procured Equipment

To confirm the performance of each equipment, as normally done in India when equipment is procured, practical training will be conducted along with actual drilling of 500m tubewells. Since the staffs of the executing agency has a certain level of skills for construction of tubewells, in the present project, a training mainly on initial operation of

the procured equipment will be conducted before handing over. An engineer dispatched from the manufacturer will conduct this operation training. After procurement of the equipment, since the Indian side is to operate and maintain the equipment, they must acquire enough skills on operation and maintenance. Especially if the drilling rig is to be procured from Japan, one tubewell will be constructed as OJT under the initiative of a Japanese engineer and a second tubewell will be constructed under initiative of the Indian side with a Japanese supervisor. However, since this must be completed within the implementation schedule, and since tubewell development equipment and pumping test equipment are expected to be those manufactured in India, the Indian side will conduct them independently for the second tubewell.

2-2-1-6 Policy on Quality of Equipment

(1) Procured Equipment

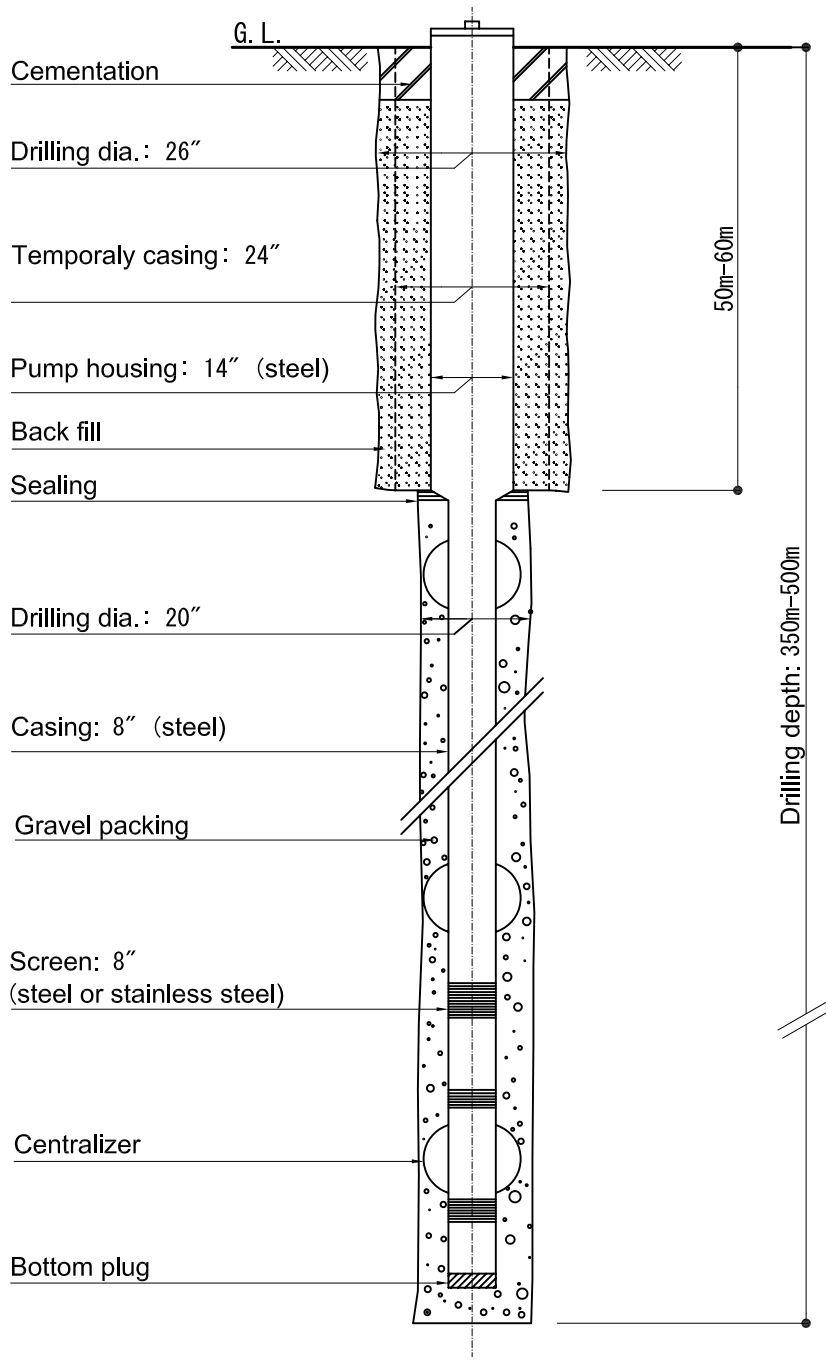
The project area of Uttar Pradesh state is located in the central part of the Indus-Ganges-Brahmaputra Plains and is composed of alluvial sediments of the three large river systems. Also, this area is flat and is the most densely populated area in the world.

The most reliable groundwater survey data of the project area is the “Study Report on Hydrogeology and Ground Water Resources of Uttar Pradesh” of 2000 by CGWB. This report covers detailed surveys were conducted including test drillings done in the entire state of Uttar Pradesh. According to the results of this study, the geology of the project area is composed mainly of alternating alluvial sedimentary layers of sand, clay and silt.

The results of drilling down to depths between 40 and 350m and CGWB surveys reveal that the target geological formations are mainly composed of sand, clay and silt.

Especially around Lucknow, the capital of Uttar Pradesh state the sand particles in the water bearing formations are fine (0.1 to 2mm). Hence attention is needed to select proper screen slot size and packing gravel size when constructing tubewells, to prevent sand inflow into the tubewell. Consequently, the standard tubewell structure of UPJN is to drill lower depths with 20" (500mm), install 8" (200mm) casing and screen, and place gravel packing more than normal tubewells. Also, since the pump housing is 14" (nominal 355mm) for the top 60m, the final drilling diameter of 20" (nominal 508mm) to 26" (nominal 660mm) is required. Since drilling will not be done in rock formation zones of the project area, a drilling rig to handle the mud circulation method is required. The structure of tubewells constructed by UPJN is shown in the next page (Fig. 2-4).

Since temperatures are high at about 45 Degrees Celsius in summer, the procured equipment must be able to withstand severe natural conditions such the heat and cold.



○	THE PROJECT FOR DEVELOPMENT OF GROUND WATER IN THE STATE OF UTTAR PRADESH
○	
○	Fig. 2-4 Tubewell structure
○	
○	JAT JAPAN TECHNO
○	

(2) Basic Concept for Selection of Equipment

1) Drilling Rig and Accessories

The minimum requirement of this equipment is that it should drill 20” diameter hole down to 500m. However, the following are the basic concepts.

- The drilling time should be determined through the drilling program and the equipment must be capable of drilling 20” tubewell down to 500m with reaming thrice to a maximum.
- Since many of the drilling points are located in urban areas with access through crowded places, the equipment must be highly manoeuvrable.
- In consideration of operation and maintenance, the after-care service of the equipment must be fully available.
- The equipment must perform efficiently.
- In accordance with the geology of the target area, the equipment will be a mud drilling type, and tools for DTH will not be attached.
- Vehicles conforming to the standards and regulations of India will be considered.

Since the capacity of those manufactured in India or third countries do not comply with the above requirements, procurement from Japan will be considered.

2) Tubewell Development Equipment

This equipment must be capable of cleaning and developing the completed tubewell drilled by the above-mentioned rig. The equipment must be able to develop the tubewell by the airlift method presently adopted by the executing agency. Procurement from either India or Japan is possible.

3) Transport Vehicle for Tubewell Drilling Related Equipment and Water Tanker

The following are the basics:

- The equipment must be highly manoeuvrable because the drilling points are located in crowded residential areas.
- After-care service for the equipment must be fully available in consideration of operation and maintenance.
- The equipment must perform tubewell.
- The manufacturers of body must be able to give a guarantee the body portion (crane and water tank) they would build on the procured vehicles
- Vehicles conforming to the standards and regulations of India will be considered.

Indian products which meet the above requirements are not available, and so procurement from Japan is considered.

4) Vehicle Mounted Tubewell Logger

The basic policy with procurement of this is as follows.

- Logging down to 500m must be possible with 1 truck mounted equipment.
- Manoeuvrability must be excellent because most of the drilling points are located in urban areas.
- In consideration of operation and maintenance, after-care service for the equipment must be fully available.
- The equipment must perform in an efficient manner.
- Vehicles conforming to the standards and regulations of India will be considered.

To meet the above requirements, procurement from both India and Japan is possible.

5) Pumping Test Equipment

The basic policy is as follows.

- The pump type will be the one which is easily maintained and UPJN has to operate. So, the pump will be the vertical turbine pump type.
- This must be an engine-driven.
- Since many of the drilling points are located in urban areas, the equipment must be highly manoeuvrable.
- In consideration of operation and maintenance, the after-care service of the equipment must be fully available.
- The equipment must have good performance.

Procurement only from India is possible in order to meet the above requirements.

2-2-1-7 Policy on Schedule

This project involves mainly procurement of equipment and the schedule will include manufacturing, shipping, customs clearance, inland transportation and initial operation training.

After procurement of the equipment, since the Indian side will independently operate and maintain the equipment, they must acquire enough skills on operation and periodic maintenance. Especially, with the drilling rigs expected to be procured from Japan, the first tubewell will be drilled through OJT initiated by a Japanese engineer and the second tubewell will be drilled by the Indian side to test performance of the second rig with supervision by the Japanese side to prevent accidents during the drilling.

The period of commissioning including OJT is assumed to be about 3 months. The

tentative OJT schedule is showing in appendices 5-3.

2-2-2 Basic Plan

The requested equipment and project considerations are listed below.

Table 2-9 Contents of the Project Equipment

No.	Item	Request	Project
1	Drilling Rig Truck mounted top head drive drilling rig: -Capacity: Maximum 500m(using 4-3/4" drill pipe) -Truck: 6x4, right side steering	2 units	2 units
2	Accessories and Tools for above	2 sets	2 sets
3	Tubewell Development equipment (Truck mounted high pressure compressor)	2 units	2 units
4	Cargo truck for transport drilling related equipment and materials 6x4, 6t crane, right side steering	2 units	2 units
5	Water tanker truck 4x2, 6m ³ capacity tank, right side steering	2 units	2 units
6	Vehicle mounted tubewell logging equipment	2 sets	1 set
7	Pumping test equipment	2 sets	1 set
8	Borehole camera	1 set	Out of the Project
9	Spare parts for above	1 set	1 set

2-2-2-1 Equipment Plan

(1) Overall Plan

1) Drilling Rig

In order to drill 50 tubewells of 500m class in 6 years by 2012, 2 units of truck-mounted drilling rigs will be procured.

2) Accessories and Tools for above

Two sets of accessories and tools necessary for the above 2 rigs for 500m drilling will be procured.

3) Tubewell Development Equipment

After installation of casing and screen, and gravel packing and before mud used for drilling hardens, the mud needs to be removed promptly. If mud solidifies, the flow of water into the tubewell can decrease drastically. For this, the tubewell is cleaned by air-lifting using a high-pressure compressor. Since tubewell cleaning needs to be started quickly after packing gravel, one unit of tubewell development equipment will be complemented to each drilling rig, and therefore, 2 units will be procured.

4) Support Vehicles for Construction Works

To effectively carry out the drilling works using the rigs to be procured, a minimum number of support vehicles to transport drilling tools and trucks to carry water for construction use will be procured. The volume of drilling related equipment to be carried is large and they are also needed for transportation of pumping test equipment. Since one set of support vehicles are required for each drilling rig is needed two sets will be procured

5) Tubewell Logger and Pumping Test Equipment

The tubewell logger is essential for preparing the tubewell design and casing program. The pumping test equipment is needed to determine the yield of the tubewell after the drilling. So request was made for two sets of loggers and pump test units. Since these can be shared between two drilling units, it was decided

that only one set of each equipment will be procured.

6) Tube well Camera (Borehole Camera)

UPJN uses a borehole camera to confirm the tubewell interior when rehabilitating deteriorated existing tubewells. With the objective of preparing an optimum rehabilitation program, request for a borehole camera was made additionally during the basic design survey. However, since the main objective of this project is the procurement of drilling related equipment to construct new tubewells, it was felt that a borehole camera is not required at this stage. Hence camera was excluded from the list of equipment to be procured under this project.

(2) Equipment Plan

To determine the specifications of equipment after review of the request, based on the results of the basic design field survey and analysis in Japan, the basic policy is to assist UPJN which is planning develop groundwater of 500m class in the sedimentary layer. Equipment specifications, usage and reason for selection are shown below.

Table 2-10 Main Specifications of Equipment to be procured

Item	Specification	Objective of use
Truck mounted drilling rig	Type: Top head drive mud drilling rig Basic capacity: 500m Diameter: 508mm(20") Truck: 6×4, approx. 300PS, right steering	Equipment for drilling a 500m range tubewell. Drilling targets unconsolidated quaternary formation such as sand, clay, silt and gravel. As they are unconsolidated, mud circulation drilling will be required. The maximum drilling depth will be 500m with diameter of 508mm (20").
Compressor for tubewell development	Air delivery: 14m ³ /min (500cfm) Pressure: 4.1Mpa (600psi) Truck: 4×2, right steering	For development of the above drilled tubewell with suitable capacity.
Truck for transportation of equipment and material related to drilling work	6×4, with 6t crane Payload: approx. 14,000kg, Engine: approx. 400PS	For transportation of standard drilling accessories, tools, casing, screen. Also, will be used to transport the pumping test equipment.
Water tank truck	4×2, right steering 6,000 litre tank with pump Engine: approx. 200PS	To transport water for the drilling work and drilling team
Vehicle mounted logging equipment	Measuring depth: 500m Item: Resistivity, SP, Gamma ray, temperature, etc. Vehicle: 4x2, right steering Engine: approx. 100PS	To prepare a casing programme (tubewell design) during the tubewell construction.
Pumping test equipment	Vertical turbine pump: 5000litre/min×50mH Engine: approx. 90PS	To determine the capacity of the drilled tubewell (discharge, pumping water level, etc.)

1) Selection of Drilling Rig

The requested drilling related equipment are truck-mounted drilling rig (maximum depth 500m, mud pump not less than 1,500lit/min×20kg/cm²), tubewell development equipment (truck-mounted high-pressure compressor) 600psi×500cfm. Determination of the specifications is explained below.

a) Determination from hoisting power

If a drilling diameter of 20" and maximum drilling depth of 500m is assumed, the total weight of tools to be lowered from the rig down to the maximum depth is 17,980 t (see the table below). Therefore, the drilling rig requires at least the hoist capacity shown below.

Table 2-11 Weight of Tools

Item	Q'ty	Unit	Weight per unit (kg)	Total weight (kg)
Drill head, sub, etc.	1	set	Approx. 1,600	Approx.1,600
Drill pipe O.D.4-3/4", 6m/no.	80	nos	165	13,200
Drill collar 5" 6m/no.	4	nos	480	1,920
Stabilizer 20" 1.5m/no.	2	nos	480	960
Drill bit 20"	1	unit	300	300
Total				Approx. 17,980

Remarks: The above weight can vary according to manufacturer or combination of tools.

b) Determination of Drill Pipe Length and Mast Length

The length of drill pipes is mainly 3m or 6m. Using either size will not hamper the quality of tubewell drilling. However, if 3m drill pipe is used, in comparison to using 6m pipe, the connection frequency will be double. Therefore, as drilling depths become deeper, drilling time increases even more. In this respect, the equipment to be procured will be a type capable of handling 6m drill pipes with corresponding mast length.

c) Determination of Mud Pump

The grain size of sand in the water bearing layers of the project area are mostly 0.4 to 2mm, and seldom exceed 2mm. The mud volume Q_m that will pass through a drilling diameter of 20"[508mm] (D_1) and drill pipe(rod) of 4-3/4"[120.65mm] (D_2), is calculated by the following equation.

$$Q_m = A \times V_m$$

where A = (Area of drilling cross-section) - (Area of rod cross-section) [m²]

and, V_m =Velocity of the mud [m/s]

$$Q_m = \pi \cdot (D_1^2 - D_2^2) / 4 \times V_m$$

For the drilling work in this Project, it is recommended to ream at least thrice after drilling the pilot hole in 8" (203mm) and then log the well. Then carry out drilling with 10-5/8" (269.9mm), 14-3/4" (374.65mm) and finally 20" (508mm) bit. According to the above equation, larger V_m means that more slime can be extracted easily. But, larger V_m will result in bigger capacity of mud pump.

However, as the size of mudpump that can be mounted in a drilling rig is limited, it is necessary to consider the capacity of the mudpump according to the drilling method, geology condition of the target area, its efficiency and possibility to mount in the drilling rig. As the maximum capacity of the mudpump that can be mounted on the truck is 1,500 to 1,700lit/min, the final velocity of the mud will be as follow:

i. Drilling with 8-1/2" (215.9mm) bit:

$$\text{Drilling section of 215.9mm bit: } A_8 = 365.91\text{cm}^2$$

$$\text{Mud velocity from the pump} = (1500\text{lit}/\text{min} \times 1000\text{cc}) / 60\text{sec} = 25000\text{cc}/\text{sec}$$

$$\text{As, } V_m = Q_m / A;$$

$$\text{Mud velocity} = 25000\text{cc}/\text{sec} \div (365.91\text{cm}^2 - 114.27\text{cm}^2) = 99.35\text{cm}/\text{sec}$$

ii. Next, drilling with 10-5/8" (269.9mm) bit:

$$\text{Drilling section of 269.9mm bit: } A_{10} = 571.84\text{cm}^2$$

$$\text{Actual drilling section: } A_{10} - A_8 = 205.93\text{cm}^2$$

$$\text{Mud velocity} = 25000\text{cc}/\text{sec} \div (571.84\text{cm}^2 - 114.27\text{cm}^2) = 54.64\text{cm}/\text{sec}$$

iii. Next, drilling with 14-3/4" (374.65mm) bit:

Drilling section of 374.65mm bit: $A_{14}=1101.85\text{cm}^2$

Actual drilling section: $A_{14} - A_{10} = 530.01\text{cm}^2$

Mud velocity= $25000\text{cc}/\text{sec} \div (1101.85\text{cm}^2 - 114.27\text{cm}^2) = 25.31\text{cm}/\text{sec}$

iv. Finally, drilling with 20" (508mm) bit:

Drilling section of 508.0mm bit: $A_{20}=2025.80\text{cm}^2$

Actual drilling section: $A_{20} - A_{14} = 924.0\text{cm}^2$

Mud velocity= $25000\text{cc}/\text{sec} \div (2025.80\text{cm}^2 - 114.27\text{cm}^2) = 13.08\text{cm}/\text{sec}$

According to the above result, the minimum velocity of the mud is 13.08cm/sec.

With 13.08cm/sec of mud velocity, it is possible to remove fine sand slime during drilling. Therefore, the capacity of mudpump shall be more than 1,500lit/min.

2) Selection of Tubewell Development Equipment

After installation of casings/screens and packing gravel, tubewell cleaning (the tubewell development) will be done. In India, the air-lift method using a high-pressure compress is normally used for tubewell development, and UPJN also uses this method as a standard procedure. Using only compressor for cleaning and developing a tubewell, long time is required and its efficiency is low. Therefore, jetting will be carried out before air-lifting. A tubewell development equipment suited for the tubewell structure planned for this project will be considered as follow.

a) Development by Jetting

After installation of casings/screens and packing gravel, a high pressure water is jetted into the screen and mud and other formation material inside and outside of the screen can be removed. A nozzle head jet velocity of 45 to 50m/sec, flow rate of 100 lit/min (per nozzle) are needed. Jetting tools include the nozzle installed at the tip of the drill pipe and water will be pressurized with the mud pump (1,500 lit/min) mounted on the drilling rig.

b) Development by Air-lift

The above jetting alone cannot completely remove drilling mud and fine sand attached to the interior walls of the tubewell and formation material adjoining the tubewell. Therefore, air-lifting with a high-pressure compressor will be carried out. Generally, 1.45psi (0.01MPa) of air pressure is necessary for each 1m of water length.

Since water from depths down to $600\text{psi} \div 1.45\text{psi/m} = 414\text{m}$ can be discharged with the above compressor, this is sufficient to clean out the deep tubewells proposed under this project.

3) Determination of Transport Vehicle for Tubewell Drilling Related Equipment

This truck will transport standard drilling accessories, tools as well as field gear for the drilling crew. Since the drilling accessories and tools to be transported weigh about 25.7t, if we consider the payload of the truck as 14.0t, two round of trip will be needed during the mobilization, as shown in the following table.

Table 2-12 Weight of Accessories and Tools

Item	Q'ty	Unit	Weight/ unit (kg)	Total Weight (kg)	Remarks
Drill pipe O.D.4-3/4", 6m/no.	83+2	no	165.0	14,025	Extra 2 nos
Drill collar O.D.5", 6m/no.	4	no	480.0	1,920	
Stabilizer 8", 14", 20"	6	no	1,000.0	6,000	
Bits Tricone rock roller bit	6	no	Appr.300	Appr.1,800	
Engine welder	1	set	Appr.200	Appr.200	
Other accessories	1	set	Appr.1,000	Appr.1,000	
General tools	1	set	Appr.300	Appr.300	
Workers goods Tent, beds, etc.	1	set	Appr.500	Appr.500	
Total				Appr.25,745	2 rounds

Until completion of drilling, two rounds of trip is needed for transporting 8 inch casing/screen pipes to the construction site, and one round in case of 14 or 24 inch casing/screen pipes(total three trip), as shown in the following table.

Table 2-13 Weight of Casing Pipes (Steel)

Item	Q'ty	Unit	Weight/ unit (kg)	Total weight (kg)	Remarks
Casing pipe, Screen 8"(216.3mm) 6m/no	74	no	171	12,654	
Sub-total	Because of the volume, the maximum number of pipe that can be carried is 40 pipes. So, 2 rounds of trip are needed.				2 rounds
Casing pipe 14"(355.6mm) 6m/no	10	no	411	4,110	
Temporary casing 24"(609.6mm) 6m/no	4	no	701	2,804	
Sub-total	14	no		6,914	1 round
Total					3 rounds

Table 2-14 Weight of Packing Gravel

Item	Q'ty	Unit	Weight/ unit (kg/m ³)	Total Weight (kg)	Remarks
Packing gravel Drilling dia.: 500mm Casing: 200mm (0.166m ² ×440m)	73.0	m ³	1,930	140,890	
Total					10 rounds

Other than the above, one round of trip is needed for carrying the tubewell development equipment and another for transportation of the pumping test equipment for a total of 2 rounds.

Furthermore, since the drill pipes, casings and screens are 6m long, the loading platform must be a minimum 6.0m to transport these materials.

4) Determination of Water Tanker

This vehicle will be used to transport water required for mud drilling, flushing and development and domestic use by crew members.

As for the volume of the tank, assuming mud drilling of a maximum 20" hole at 20m/day, the mud volume in the tubewell is as follows.

$$V_m = \{(\text{Area of drilling cross-section}) - (\text{Area of rod cross-section})\} \times (\text{drilling depth})$$

$$= \pi \cdot (D_1^2 - D_2^2) / 4 \times 20 = \pi \cdot (0.508^2 - 0.12^2) / 4 \times 20 = 3.8 \text{ m}^3$$

Moreover, at least the same mud volume of 3.8m³ is required to be filled in the mud pit on the surface for mud circulation. In addition, another 3.8m³ is needed in

consideration of losses in the process of mud circulation and drilling. Therefore, the total required amount of mud is 11.4m³, and about 12m³ of water is needed for mud preparation. Thereafter, 7.6 m³ is required daily for each drilling day, and therefore, a water tanker having a 6m³ volume tank will need to make two round trips daily.

5) Determination of Truck Mounted Tubewell Logger

To determine the locations of aquifers and screen installation depths, following parameters of the formations drilled through in the tubewell, such as resistivity, self-potential, and gamma ray are measured with the tubewell logger. The measurement depth is 500m. Since this is a precision equipment and that the winch is large to handle 500m cable to lower the sonde, a vehicle mounted type is selected.

6) Determination of Pumping Test Equipment

After placing the screens and casings, a pumping test is conducted to determine the yield of the drilled tubewell. According to existing data, the pumping rate varies from 1,000 lit/min to 5,000 lit/min. The pump will be a vertical turbine type familiar to UPJN, which is easier to repair as compared to the submersible motor pump. The pump capacity will be 5,000 lit/min with a total head of 50m, and the diesel engine will be over 90PS to operate the pump. The standard accessories include riser pipes, water level measurement pipes and flow measurement triangular weir.

7) Determination of Spare Parts and Consumables

Concerning the provision of spare parts in this Project, to avoid delays in the work of UPJN because of breakdown of equipment, a minimum necessary amount for the first year of work will be procured under the Project and from the second year, Indian side will be responsible. Spare parts for the following equipment will be procured according to recommendation from the manufacturers. Their particulars are shown below.

Table 2-15 Determination of Spare Parts and Consumables

Equipment and usage condition	Base for determination
Drilling rig (3000 hours of operation)	Drilling: 32days x 24h/day x 4 no/year = 3072hours (approx. 3000 hours)
Tubewell development equipment (1300 hours of operation)	Air-lift: 14days x 24 hours/day x 4 no/year = 1344hours (approx. 1300 hours)
Cargo truck for transportation of drilling related tools (20000 km of mileage)	Mileage: 100km/day x 22 days/month x 10 month/year = 22000km (Two month/year will be out of operation because of the rain season)
Water tank truck (20,000km of mileage)	Same as above
Pumping test equipment (1,000 hours of operation)	Pumping Test: 11 days x 24 hours/day x 4 no/year = 1056 hours (approx. 1000 hours)
Tubewell logging equipment	Because it is expected to be procured locally and the operation time is relatively short, spare parts will not be procured under the Project.

2-2-3 Procurement Plan

2-2-3-1 Procurement Policy

This project will be implemented based on the guidelines for Japan's grant assistance with proper organization and schedule. The Project Implementation Structure is shown in the Fig. 2-5.

UPJN is the main executing body and has responsibilities for detailed design, procurement of equipment, tubewell construction, and connection to the existing pipelines and operation/maintenance of the procured equipment.

On the other hand, after conclusion of the exchange of notes (E/N) between both countries, the Japanese Consultant for this project, upon contracting with the executing agency, will prepare tender documents, support the tendering procedures, as well as supervise procurement and the initial operation training. As a result of the tendering, the supplier will be contracted. The prime contractor for this project will be a Japanese company according to grant aid guidelines. The Japanese company as prime contractor will complete the equipment procurement and initial operation training within the period of the grant in accordance with the contract.

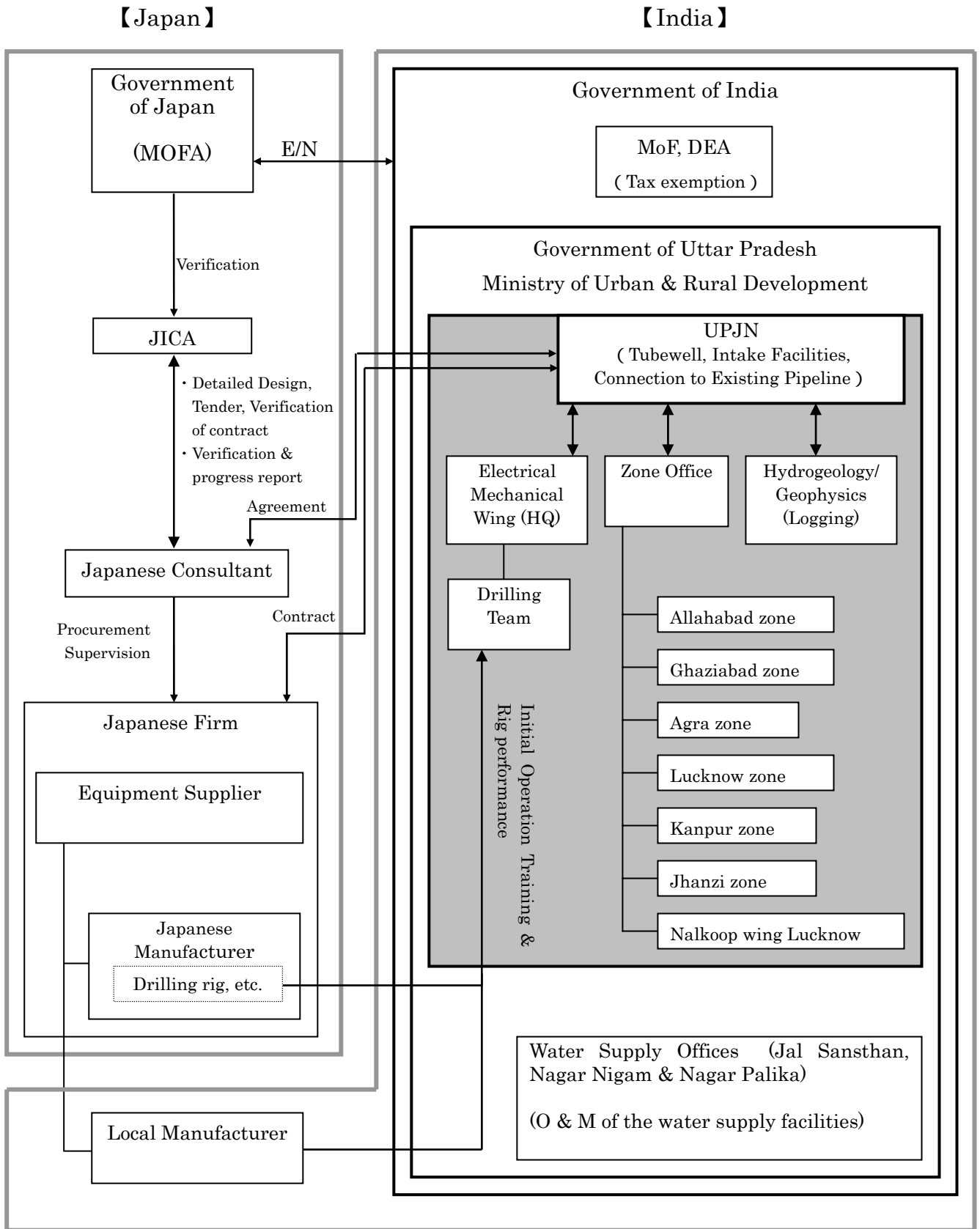


Fig. 2-5 Project Implementation Structure

2-2-3-2 Considerations for Procurement

The considerations needed for procurement of equipment in this project are as follows.

(1) Procurement of Drilling Rig and Related Equipment

The procurement of drilling rigs and related equipment to be used in this project are essential for construction of tubewells to be carried out by the Indian side. UPJN is preparing a plan to complete 50 tubewells by 2012 if these equipment are procured through this project. In this respect, considerations are needed for proper scheduling at each stage of procurement, transportation and delivery.

(2) Inland Transportation

As for the equipment to be procured from Japan, ocean transportation to the port of disembarkation and inland transportation from the port of disembarkation to Lucknow where UPJN headquarters is located is required. The supplier will be the responsible for this. During initial operation training, the inland transportation from Lucknow to each target site will be the responsibility of UPJN.

(3) Formation of Tubewell Drilling Crew and Commissioning

UPJN is experienced in tubewell drilling, and therefore, personnel having sufficient competence are to be allocated for the procured equipment of this project. However, in order for this drilling crew to function effectively, they must acquire sufficient operation skills pertaining to the equipment to be procured. Therefore, training on initial operation will be conducted. Although many have basic drilling skills, they should take advantage of this opportunity to acquire knowledge to properly operate the newly procured equipment.

After the arrival of the equipments, inspection and check of operation will be done, and after registration of vehicles will handed-over (preliminary) to the implementing agency.

The commissioning will be finalized after completion of the initial operation training and verification of the capacity of the equipments.

2-2-3-3 Scope of Works

The responsibilities of the Indian and Japanese sides for procurement in this project are as follows.

(1) Responsibilities of Indian Side

- 1) To secure space, yard and storehouse for the storage and control of the equipment to be procured.
- 2) To allocate necessary budget and personnel for the operation and maintenance of the procured equipment.
- 3) To make necessary arrangements for the land acquisition and access where the on-the-job training would be held (for 2 tubewells).
- 4) To make necessary arrangements for the tax exemption, insurance and registration of the vehicles and equipment procured under the Project.
- 5) To prepare and bear all expenses, other than those to be borne by the Japanese Grant Aid. Also, the expenses by the Indian side shall include personnel, provision of necessary quantity of materials and consumables such as fuel, bentonite, casing pipe, screen pipe, gravel pack, cement, etc., to be used during the commissioning and on-the-job training.

(2) Responsibilities of Japanese Side

Procurement of the following equipments:

- 1) Drilling rigs (2 units), related accessories and tools (2 sets)
- 2) Tubewell development equipment (truck mounted high compressor) (2 units)
- 3) Cargo truck for the transportation of the equipment and materials related to drilling work (2 units)
- 4) Water tank truck to carry water for the drilling work (2 units)
- 5) Vehicle mounted tubewell logging equipment (1 unit)
- 6) Pumping test equipment (1 set)

2-2-3-4 Consultant Supervision

The Consultant will be a Japanese firm under the Japanese Grant Aid Scheme. The Consultant will execute the Detailed Design and procurement supervision work. The work of the Consultant will be as follow:

Table 2-16 Scope of Work of the Consultant

	Procurement of Equipment	
1.	Before Procurement	<ul style="list-style-type: none">• Final confirmation of the contents of the Project• Preparation of the Tender Documents• Assist the tendering process• Evaluation of the result of the tender• Assist the Implementing Agency during the procurement contract negotiations
2.	During Procurement	<ul style="list-style-type: none">• Supervision during the equipment procurement• Inspection and supervision of initial operation training• Preparation of reports

Upon final confirmation of the project details, the specifications of equipment, the

storage conditions of the procured equipment and requirements for initial operation training will be confirmed with the executing agency, and after confirming that problems will not occur during procurement, the tender documents will be prepared and tender scheduling will be determined upon discussions with relevant authorities. On behalf of the executing agency, the consultant will conduct the tendering; evaluate the tender results and support contracting procedures to be held between the executing agency and the supplier.

The members for Detailed Design and Procurement Supervision will be as follows.

Table 2-17 Assignment for Detailed Design and Supervision

Function	Assignment
Project Manager	Management of entire Project. Detailed design, preparation of tender documents, supervision of tender and procurement.
Equipment planner	Detailed design, preparation of tender documents, supervision of tender, factory inspection during the procurement, pre-shipment inspection, supervision of hand-over of the equipment.
Cost Estimation/ Procurement Planner	Confirmation of cost estimation and procurement plan, preparation of tender documents.

2-2-3-5 Plan for Equipment Procurement

In this project, in consideration of easiness in procurement of spare parts, a market survey was conducted to determine local procurement of parts as long as there is no problem in their use and quality. As a result, the procurement allocation is listed below.

Table 2-18 Division of Equipment to be procured

Equipment	Japan	India
1) Truck mounted drilling rig, Standard accessories and tools	○	
2) Tubewell development equipment (Truck mounted high compressor)	○	○
3) Cargo truck for transportation of drilling related materials and tools	○	
4) Water tank truck	○	
5) Vehicle mounted logging equipment	○	○
6) Pumping test equipment		○

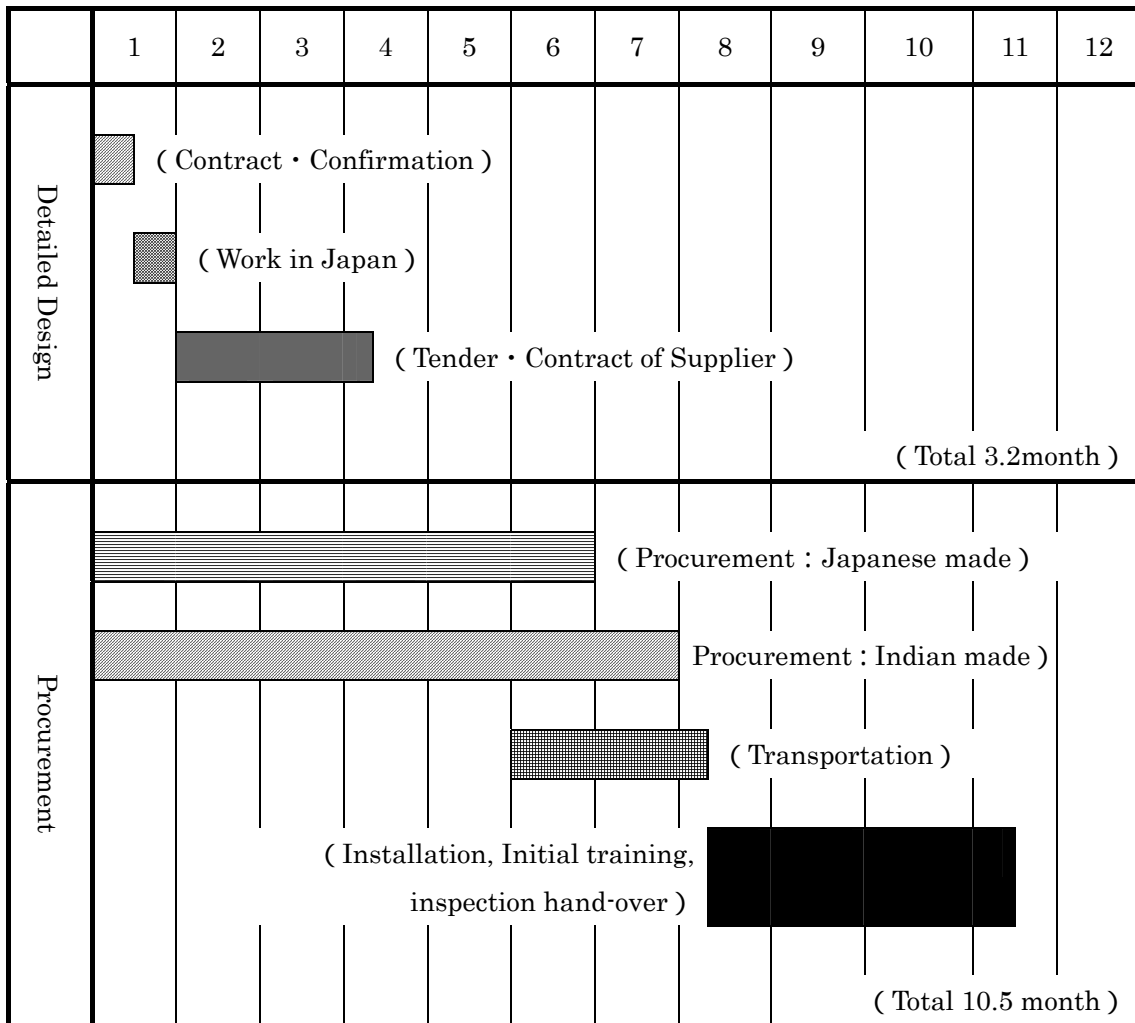
2-2-3-6 Implementation Schedule

The implementation schedule for this project as a grant aid is as follows.

- 1) Exchange of Notes (E/N)
- 2) Consultant Agreement
- 3) Final Confirmation at Site
- 4) Preparation of Tender Documents
- 5) Tender, Supplier Contract
- 6) Equipment Procurement/Manufacture
- 7) Equipment Transportation/Customs Clearance
- 8) Commissioning, Initial Operation Training, Hand Over

The overall implementation schedule for this project based on Japanese grant aid guidelines is shown in the following table.

Table 2-19 Project Implementation Schedule



Description of the undertakings of the project is shown below.

Table2-20 Description of Project Works

	Consultant	Supplier
Works	Final confirmation at site, preparation of tender documents, supervision of tender, supervision of procurement	Equipment procurement, initial operation training

2-3 Obligations of Recipient Country

2-3-1 Obligations of Recipient Country

If the project is approved for implementation, in order for the project to proceed in a smooth manner, the Indian side must carry out the required obligations listed below.

(1) Responsibilities of the Recipient Side

- To allocate the necessary personnel and prepare the drilling crew required for implementation of this project.
- To provide storage areas, warehouses and equipment yards necessary to safe keep equipment and materials during the implementation period of this project.
- To allocate counterpart engineers to participate in the initial operation training.
- To secure and clear land of the 2 sites to be used for drilling during commissioning.
- To provide information and data necessary for project execution.
- To properly and effectively maintain and manage the equipment procured under the Grant Aid.
- To continuously report twice a year to JICA India office by UPJN on the progress of drilling using the equipment to be procured under the Project. The required items for reporting are shown in the Annex for reference.

(2) Required Arrangements

- To acquire necessary permits and authorizations from relevant organizations.
- To arrange and coordinate with central government bodies, state authorities and other necessary organizations.
- To promptly execute unloading and customs clearance at the port of disembarkation and inland transportation of equipment to be procured.
- To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies

which will be imposed in India with respect to the supply of the products and services under the verified contracts.

- To accord Japans nationals, whose services may be required in connection with the supply of products and services under the verified contracts, such facilities as may be necessary for their entry into India and stay therein for the performance of their work.
- To bear the advising commission for an Authorization to Pay (A/P) and the payment commissions to the Japanese foreign exchange bank for the banking services based upon the banking arrangement (B/A).
- To bear expenses for registration and insurance of the procured vehicles.
- To bear all the expenses other than those covered by the Grant Aid but necessary to implement the project, and give consideration for any necessary arrangements for the smooth implementation of the project.

The above listed responsibilities of the Indian side were explained to and discussed with the executing agency, and due to the high capacity and project awareness of the executing agency, these items are determined to be feasible.

2-4 Project Operation Plan

2-4-1 Operation and Maintenance of Procured Equipment

The management of the 2 drilling rigs and related equipment to be procured by this project will be the responsibility of the Groundwater Team of UPJN headquarters scheduled to be reorganized. The Groundwater Team will be placed under the Electrical/Mechanical Wing and Hydrogeology/Geophysical Survey department of UPJN headquarters. The drilling method to be adopted is mud circulation method which is being adopted by UPJN, and therefore, we confirm that they have a certain level of competence in using this method. Hence, they will receive training, through OJT, required to operate the new equipment rather than training on drilling techniques. The OJT will include equipment structure,

routine check-up, periodic inspection, maintenance and other necessary training.

As mentioned previously, UPJN possesses 52 drilling rigs and some have been in operation for over 20 years since manufacture. Therefore, it is our opinion that problems in operation and maintenance will not arise with appropriate OJT. Also, UPJN can carry out simple repairs and servicing on their own. However major repairs are being carried out contracting with the local garages. In most cases, the repair/service man goes to the field to make the repairs.

2-5 Project Cost Estimation

2-5-1 Project Cost Estimation

If the project is to be implemented, the cost estimate is approx. 604.7 million Japanese Yen. In accordance with the responsibilities of the Japanese and Indian governments as explained in following 2-5-1-3, and using the conditions for estimation mentioned below, the cost estimates for both sides are as follows. This cost estimate is provisional and would be further examined by the Government of Japan for the approval of the Grant.

2-5-1-1 Cost Estimation Borne by the Japanese Government

Total Project Cost Estimate: Approx. 598.6 million Japanese Yen

Table 2-21 Cost Estimate of the Project (Equipment Procurement)

Item		Cost Estimate (million Yen)
Equipment	<ul style="list-style-type: none">• Drilling rig, Related tools• Tubewell development equipment (truck mounted high compressor)• Cargo truck for transport material/equipment for drilling• Water tank truck• Vehicle mounted tubewell logging equipment• Pumping test equipment	582.0
Detailed design • Supervision of Procurement		16.6

2-5-1-2 Cost Estimation Borne by the Indian Side

Cost borne during commissioning (2 Tubewells)

- | | |
|---|-------------------------------------|
| (1) Total Cost to be Borne | INR2.29million (6.16 million Yen) |
| 1) Tubewell Drilling Cost,
(Mainly fuel, oil,
material for tubewell | : INR2.08million (5.60 million Yen) |
| 2) Others | : INR0.21million (0.56 million Yen) |

2-5-1-3 Conditions for Estimation

- | | |
|---------------------------|---|
| (1) Estimation Base Date: | May 2005 |
| (2) Exchange Rate: | US\$1.0 = 105.98Yen
US\$1.0 = 44.18INR
INR1.0 = 2.69Yen |
| (3) Procurement Period: | Single fiscal year procurement

Final confirmation survey and procurement period are shown in the procurement schedule. |
| (4) Others: | This project is to be implemented in accordance with the guidelines for grant aid assistance of the Japanese government. |

2-5-2 Operation and Maintenance Costs

2-5-2-1 UPJN Drilling Work

If the annual budget for drilling work is calculated, an annual operation and maintenance cost of about 19.91 million INR is required as shown in the table 2-21. This cost will be budgeted every year in the NURM program. For the personnel, of the 470 persons of UPJN presently engaged in drilling, those with much experience will be

allocated to the rig to be procured in this project. Since UPJN has no plans to recruit new staff for this purpose, additional budget is not required. The actual annual budget for drilling crew is estimated as 4.62 million INR.

The required budget is not even 1% of the UPJN annual budget of 3.39 billion INR (April to December 2004), and is within a sufficiently budgetable range.

The life spans of the procured drilling rigs and vehicles are 9 to 11.5 years according to the depletion expense calculation table for construction machinery and others (Japan, 2004), but there are cases where drilling rigs owned by UPJN are being used over 20 years and vehicles are used over 16 years. Therefore, from the use situation of rigs and vehicles of UPJN, with proper operation and maintenance, the procured drilling rigs and support vehicles can last for over 15 years.

Table 2-22 Annual Budget of the Drilling Team (only for the New Rigs)

Personnel: 3 shiftx2 team(2 rigs)				(estimate 8 tubewell/year)			
Item	Q'ty	Unit	Working day	Unit	Unit Amount (INR)	Total amount (INR)	Amount (JYen)
Drilling Engineer	1	pers.	12	Month	20,000	240,000	645,600
Hydrogeologist/Geophysicist	1	pers.	12	Month	20,000	240,000	645,600
Driller (1personx2 team)	2	pers.	12	Month	10,000	240,000	645,600
Welder (1personx2 team)	2	pers.	12	Month	10,000	240,000	645,600
Mechanic (1personx2 team)	2	pers.	12	Month	8,000	192,000	516,480
Assistant driller (1personx2 team)	6	pers.	12	Month	7,000	504,000	1,355,760
Driller helper (2personx3shiftx2team)	12	pers.	12	Month	6,000	864,000	2,324,160
Casual labor (10personx3shiftx2team)	60	pers.	10	Month	3,000	1,800,000	4,842,000
Guard (1personx3shiftx2team)	6	pers.	10	Month	5,000	300,000	807,000
Total	92					4,620,000	12,427,800

CONSUMABLE									
Item	Fuel/day (litre)	Q'ty	Unit	Working day	Unit	Unit Amount	Total amount (INR)	Amount (JYen)	
Fuel for drilling rig	264	2	nos	240	day	30.0	3,801,600	10,226,304	
Fuel for trucks	20	4	nos	180	day	30.0	432,000	1,162,080	
Fuel for compressor	240	2	nos	80	day	30.0	1,152,000	3,098,880	
Maintenance		1	set	1	set	570,240	570,240	1,533,946	
Consumables, materials , etc.		1	set	1	set	13,952,000	13,952,000	37,530,880	
Total							19,907,840	53,552,090	

Grand Total							24,527,840	65,979,890	
-------------	--	--	--	--	--	--	------------	------------	--

() In this project, present staff will be reallocated, and so additional budget for personnel will not occur. The above personnel cost is not an additional budget, but is listed as a reference value for calculation of construction cost for drilling.

2-5-2-2 Considerations for Project Implementation

(1) Organization for Tubewell Drilling

The objective of tubewell drilling of this project is the appropriate supply of the required quantity of water having good quality through the development of aquifers at depths between 350 and 500m, as a countermeasure to the existing water supply facilities which have problems with water supply due to contamination and groundwater level lowering. However, since operation training to UPJN on the newly procured equipment is essential, sufficient schedule management consistent with the overall construction schedule is also required by the contractor while conducting the training

through OJT.

(2) Report on the drilling performance

UPJN shall report to JICA India Office every six (6) month on the usage conditions of the procured rigs and support equipment as well as progress of the proposed drilling programme giving details of the number of tubewells completed and the number communities served and the percentage of coverage increased by this measure. The required items for reporting are shown in appendices for reference.

Chapter3

Project Evaluation and Recommendations

Chapter 3 PROJECT EVALUATION and RECOMMENDATIONS

3-1 Project Effect

The effects of the Project and anticipated improvements in the present situation are listed below.

Present State and Problems	Measures to be Taken in the Project	Effects and Improvements
The rate of pumping of groundwater used as source for water supply from depths 40 to 350m is drastically decreasing due to over pumping and resultant fall in water level. The available resources are polluted. Therefore, development of deeper aquifers (down to 500m) is urgently needed. The drilling rigs presently owned by the executing agency are capable of drilling down to 350m depths. Since supply rates of water supply facilities in the target area are half of the required amount, the residents rely on other unsanitary shallow wells and other water sources.	Two sets of drilling rigs possible of developing groundwater from deep aquifers (500m class) and related equipment will be procured.	The executing agency will construct 50 tubewells of 500m depth by 2012. In addition, 166 tubewells will be drilled with rigs presently owned by the Indian side. As a result, the water demand of approx. 6.9 million persons can be covered by 100%.

3-2 Issues and Recommendations

In order to realize and sustain the project effects, issues to be considered by the Indian side are as follows.

- (1) The operator who has received training must continue to work as operator in UPJN. In order to maintain this situation, the work conditions need to be improved by internal coordination with the executing agency.

- (2) The present water supply rate in the target area is calculated from the number of existing water supply facilities (including handpump equipped shallow wells), which is not a practical method. Presently, UPJN is promoting the supply of safe water at proper amount in accordance with set criteria. The objective set for 2012 can be met at the project sites, but insufficiency in water cannot be solved at non-project areas. Plans for after the projects are now being formulated, but water supply planning to cope with the rate of population growth is needed.
- (3) Fall in groundwater level is a serious problem. Therefore, in the envisaged project when implemented will be remedy to this present problem. However, periodic monitoring of tubewell pumping rates and water levels is essential.
- (4) Pollution of shallow groundwater due to wastewater and contamination of saltwater pockets in the aquifers caused by over-pumping are other problems that require immediate attention. With this view the proposed project is to be implemented with periodic monitoring of the quality of groundwater.
- (5) To facilitate the percolation and infiltration of ground water to augment the resources and storage of rainwater, the Indian government is implementing artificial recharge through shallow wells. The results of the proposed groundwater level and water quality monitoring will greatly supplement and benefit the artificial recharge activities embarked in the State.

Appendices

Appendices 1 Member List of the Study Team

(1) First Field Survey

Name	Title	Occupation
Kozo ITO	Team Leader	Deputy Resident Representative JICA India Office
Chiharu MORITA	Coordinator	Project Management Group III Grant Aid Management Department JICA
Shoichi YOKOGI	Chief Consultant/ Groundwater Development Planning/ Equipment Planner	Japan Techno Co., Ltd.
Christopher JAYAKARAN	Drilling Technique / Operation & Maintenance	Japan Techno Co., Ltd.
Kanji TAKAMATSU	Water Supply Adviser	Japan Techno Co., Ltd.

(2) Second Field Survey

Name	Title	Occupation
Kozo Ito	Team Leader	Deputy Resident Representative JICA India Office
Shoichi YOKOGI	Chief Consultant/ Groundwater Development Planning/Equipment Planner	Japan Techno Co., Ltd.
Christopher JAYAKARAN	Drilling Technique/ Operation & Maintenance	Japan Techno Co., Ltd.

(3) Explanation of Draft Basic Design Study Report

Name	Title	Occupation
Kozo Ito	Team Leader	Deputy Resident Representative JICA India Office
Shoichi YOKOGI	Chief Consultant/ Groundwater Development Planning/ Equipment Planner	Japan Techno Co., Ltd.
Christopher JAYAKARAN	Drilling Technique/ Operation & Maintenance	Japan Techno Co., Ltd.

Appendices 2 Itinerary of Field Survey

(1) First Field Survey

No.	Date		Team Leader	Coordinator	Chief Consultant/ Groundwater Planner	Water Supply Advisor	Drilling Technique/ O & M
			Kozo ITO	Chiharu MORITA	Shoichi YOKOGI	Kanji TAKAMATSU	Christopher JAYAKARAN
1	3/16	Wed		Tokyo New Delhi			Bangalore New Delhi
2	3/17	Thu	Courtesy call: JICA, EOJ, Ministry of Water Resources, Ministry of Finance-DEA. Move to Lucknow.				
3	3/18	Fri	Explanation of Inception Report, Courtesy call to UP State Government.				
4	3/19	Sat	Site visit: water supply facilities at Mahona Village and Lucknow water treatment plant.				
5	3/20	Sun	Data analysis				
6	3/21	Mon	Meeting: Minutes of Discussion, visit to UP Jal Sansthan-Lucknow				
7	3/22	Tue	Meeting on Minutes of Discussion, Signing of Minutes of Discussion. Coordinator move to Delhi.				
8	3/23	Wed		Visit to JICA	Visit to CGWB-Lucknow, Meeting with UPJN		
9	3/24	Thu		Arrive at Tokyo	Meeting with UPJN, visit to existing water supply system		
10	3/25	Fri			Meeting with UPJN, data analysis		
11	3/26	Sat			Data analysis, internal meeting		
12	3/27	Sun			Visit to existing water supply system		
13	3/28	Mon			am: meeting with UPJN, pm: move to New Delhi		
14	3/29	Tue			Report to JICA and EOJ, visit to UNICEF		
15	3/30	Wed			New Delhi Tokyo		New Delhi Bangalore

JICA: Japan International Cooperation Agency

EOJ: Embassy of Japan in India

UP: Uttar Pradesh

UPJN: Uttar Pradesh Jal Nigam

CGWB: Central Ground Water Board

DEA: Department of Economic Affairs(Ministry of Finance)

(2) Second Field Survey

No.	Date		Tem Leader	First Secretary, Embassy of Japan in India	Chief Consultant/Groundwater Development Planner	Drilling Technique/O & M
			Kozo ITO	Tomoyuki NAKANO	Shoichi YOKOGI	Christopher JAYAKARAN
1	5/1	Sun			Tokyo New Delhi	Bangalore New Delhi
2	5/2	Mon			Courtesy call: JICA, EOJ, Ministry of Water Resources, DEA	
3	5/3	Tue			Visit to CGWB, Move to Lucknow	
4	5/4	Wed			Meeting: UPJN	
5	5/5	Thu			Survey in Kanpur area (Existing water supply system, drilling rig, related equipment, etc.)	
6	5/6	Fri			Survey in Allahabad area (Existing water supply facilities. Equipments, drilling sites, etc..)	
7	5/7	Sat			Survey in Raebarelli area, move to Lucknow	
8	5/8	Sun			Data analysis	
9	5/9	Mon			Meeting: UPJN	
10	5/10	Tue		Move to Lucknow, Visit to UPJN, drilling site, water supply facilities	Meeting: UPJN	
11	5/11	Wed	Move to Lucknow	Visit to water supply facilities	Meeting: UPJN	
12	5/12	Thu	Signing of Minutes of Discussion	Move to New Delhi	Minutes of Meeting	
13	5/13	Fri	Move to New Delhi		Meeting: UPJN	
14	5/14	Sat			Survey on existing equipments, visit to drilling site	
15	5/15	Sun			Move to Bangalore, data analysis	
16	5/16	Mon			Survey on drilling rig manufacturer and related equipments	
17	5/17	Tue			Move to Coimbatore, survey on drilling related equipment manufacturer	
18	5/18	Wed			Survey on drilling related equipment manufacturer, move to New Delhi	
19	5/19	Thu			Market survey, data analysis	
20	5/20	Fri			Report to JICA, EOJ, Ministry of Water Resources, Ministry of Finance(DEA)	
21	5/21	Sat			New Delhi Tokyo	New Delhi Bangalore

UP: Uttar Pradesh

UPJN: Uttar Pradesh Jal Nigam

CGWB: Central Groundwater Board

DEA: Department of Economic Affairs(Ministry of Finance)

(3) Explanation on Draft Basic Design Study Report

No.	Date		Team Leader	Chief Consultant/ Groundwater development	Drilling Technique/ O & M
			Kozo ITO	Shoichi YOKOGI	Christopher JAYAKARAN
1	10/23	Sun		Tokyo New Delhi	Bangalore New Delhi
2	10/24	Mon	Courtesy call: JICA, EOJ, Ministry of Water Resources, DEA		
				Move to Lucknow	
3	10/25	Tue	Move to Lucknow		
			UPJN: Explanation on Draft Basic Design Report		
4	10/26	Wed	UPJN: Explanation on Draft Basic Design Report and Technical Specification of Equipment		
5	10/27	Thu	Discussion of Minutes of Meeting		
6	10/28	Fri	Discussion of Minutes of Meeting, signing of the Minutes		
			Move to New Delhi	Market survey	
7	10/29	Sat		Market survey, data analysis	
8	10/30	Sun		Move to New Delhi, data analysis	
9	10/31	Mon		Visit to JICA, EOJ, Ministry of Water Resources, DEA	
10	11/1	Tue		New Delhi Tokyo	New Delhi Bangalore

JICA: Japan International Cooperation Agency

EOJ: Embassy of Japan

UPJN: Uttar Pradesh Jal Nigam

DEA: Department of Economic Affairs (Ministry of Finance)

O&M: Operation and Maintenance

Appendices 3

List of Partes Concerned in the Recipient Country

Ministry of Finance, Department of Economic Affairs

S. Chaudhuri Under Secretary

Ministry of Water Resources Development

Aruna Jain Director

Dinesh Kapila Deputy Secretary

Ministry of Urban and Rural Development (Uttar Pradesh State)

R. Ramani Principal Secretary

D. C. Mishra Secretary

Uttar Pradesh Jal Nigam

K. K. Agarwal Managing Director (Draft Explanation)

Atul Krishna Managing Director (Basic Design)

C.M. Srivastava Chief Engineer

P. K. Jain Chief Engineer

S.P. Kureel Superintending Engineer

Virendra Agarwal Superintending Engineer

G. G. Gupta Superintending Engineer

U.S. Pandey Project Manager

M.T. Anwar Executing Engineer

R.A. Yadar Sr. Geophysicist

S.H. Ahmad Assistant Engineer

V.N. Pandey Project Engineer

Lucknow Jal Sansthan

R.K. Tripathi General Manager

R.K. Bajpai Executing Engineer

A.N. Srivastava Executing Engineer

Central Groundwater Board, Lucknow Office

V. Sharma	Superintending Hydrogeologist
M.M. Gauma	Superintending Chemist
A. Husain	Technical Secretary Scientist "D"
B.B. Trivedi	Scientist "C"
M.M. Srivastava	Scientist "B"

Geological Survey of India, Lucknow Office

Anil Mehrotra	Director
Sumant Gupta	Director

Unites Nations Children's Fund-UNICEF

Sumita C. Ganguly	Project Officer & Coordinator
Paul Deverill	Project Officer
Raj Kumar Daw	Project Officer
Joan Howe	External Relations Officer
Ross Nickson	Consultant, Lucknow Office

Embassy of Japan in India

Tomoyuki Nakano	First Secretary
-----------------	-----------------

Japan International Cooperation Agency-JICA, India Office

Toshifumi Sakai	Resident Representative
Kozo Ito	Deputy Resident Representative
Daisuke Iijima	Assistant Resident Representative
Takashi Kurauchi	Project Formulation Advisor
Minoru Hiramoto	Project Formulation Advisor
Takashi Matsumoto	Assistant Resident Representative
R. Dinakar	Senior Programme Officer
S. Talukdar	Senior Programme Officer

Appendices 4 Minutes of Discussion

- (1) MINUTES OF DISCUSSION ON THE FIRST FIELD SURVEY**
- (2) MINUTES OF DISCUSSION ON THE SECOND FIELD SURVEY**
- (3) MINUTES OF DISCUSSION ON THE EXPLANATION OF THE
DRAFT BASIC DESIGN STUDY REPORT**

(1) MINUTES OF DISCUSSION ON THE FIRST FIELD SURVEY

MINUTES OF DISCUSSIONS
ON THE BASIC DESIGN STUDY
ON THE PROJECT FOR DEVELOPMENT OF GROUND WATER
IN THE STATE OF UTTAR PRADESH

In response to a request from the Government of India (hereinafter referred to as "India"), the Government of Japan decided to conduct a Basic Design Study on the Project for Development of Ground Water in the State of Uttar Pradesh (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent the Basic Design Study Team (hereinafter referred to as "the Team") to India headed by Kozo ITO, Deputy Resident Representative, JICA India Office, and is scheduled to stay in the country from March 16 to March 30, 2005.

The Team held discussions with the officials concerned of the Government of India and conducted a field survey of the study area.

In the course of discussions and field survey, both parties confirmed the main items described on the attached sheets. The Team will proceed to work further and prepare the Basic Design Study Report.

Lucknow, 2005
New Delhi, 9th Aug, 2005

伊藤 耕三

Mr. Kozo ITO
Leader
Basic Design Study Team
Japan International Cooperation Agency (JICA)

Mr. C.M. Srivastava

Mr. C.M. Srivastava
Chief Engineer
U. P. Jal Nigam (UPIN), Lucknow

Ms. Sreyasi Chaudhuri

Ms. Sreyasi Chaudhuri
Department of Economic Affairs (DEA)
Ministry of Finance, GoI

Mr. R. Ramani

Mr. R. Ramani
Principal Secretary
Urban Development Department
Government of Uttar Pradesh

Ms. Aruna Jain

Ms. Aruna Jain
Director (External Assistance)
Ministry of Water Resources Development, GoI

ATTACHMENT

1. Objective of the Project

The objective of the Project is to supply adequate quantity of good quality drinking water in the state of Uttar Pradesh in India.

2. Study Area

The proposed sites are located in deep alluvial aquifer areas of state of Uttar Pradesh

3. Responsible and Implementing Agency

The Responsible Agency is Urban Development Department of Government of Uttar Pradesh Annex-1

The Implementing Agency is U.P. Jal Nigam, Lucknow Annex-2

4. Items requested by the Government of India

After discussions with the Team, the items described in Annex-3 were finally requested by the Indian side. Indian side had requested to add some items, and the Team took note of it.

JICA will assess the appropriateness of the request through further study and will recommend them to the Government of Japan for approval.

5. Japan's Grant Aid Scheme

5-1 Indian side understood the Japan's Grant Aid Scheme explained by the Team, as described in Annex-4 and Annex-5.

5-2 Indian side will take the necessary precautions and measures, as described in Annex-6, for smooth implementation of the Project, as a condition for the Japanese Grant Aid to be implemented.

6. Schedule of the Study

6-1. JICA will dispatch the Team in April 2005 in order to conduct a further field survey in the study area.

6-2. JICA will prepare the draft report in English and dispatch a mission in order to explain its contents in July 2005.

6-3. In case that the contents of the report is accepted in principle by India, JICA will complete the final report and send it to India by November 2005.

7. Other relevant issues

7-1 Indian side explained that the requested items would be utilized mainly to construct deeper tube wells near the existing ones, based on the actual demand of water supply.

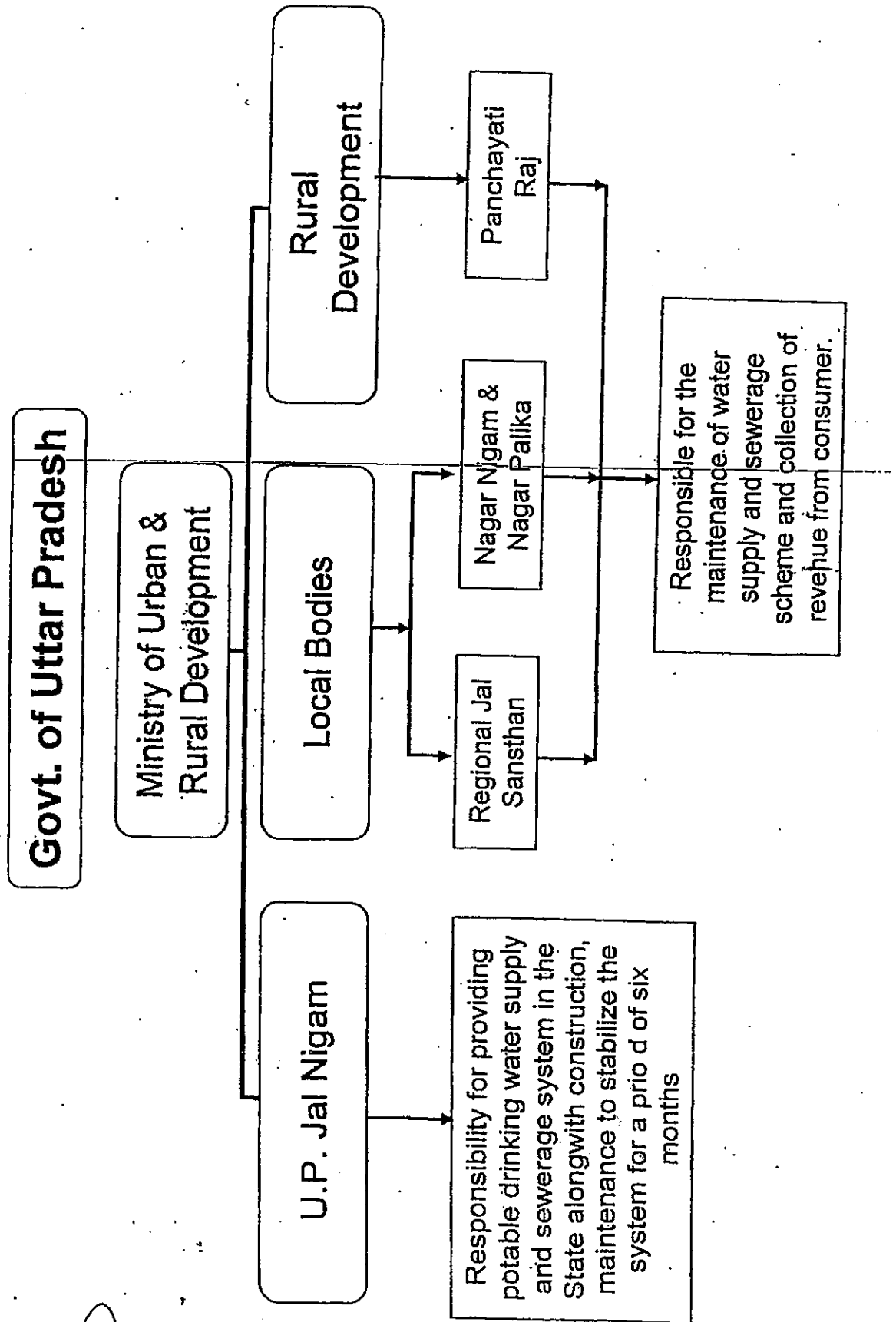
7-2 Indian side shall point out clearly the drilling plan utilizing the requested items, with consultation of the Team by second site survey in April.

7-3 Both sides agreed that the Project would focus not only on drilling new deeper tube wells, but also on improvement of actual water supply, by supplying adequate quantity of good quality drinking water.

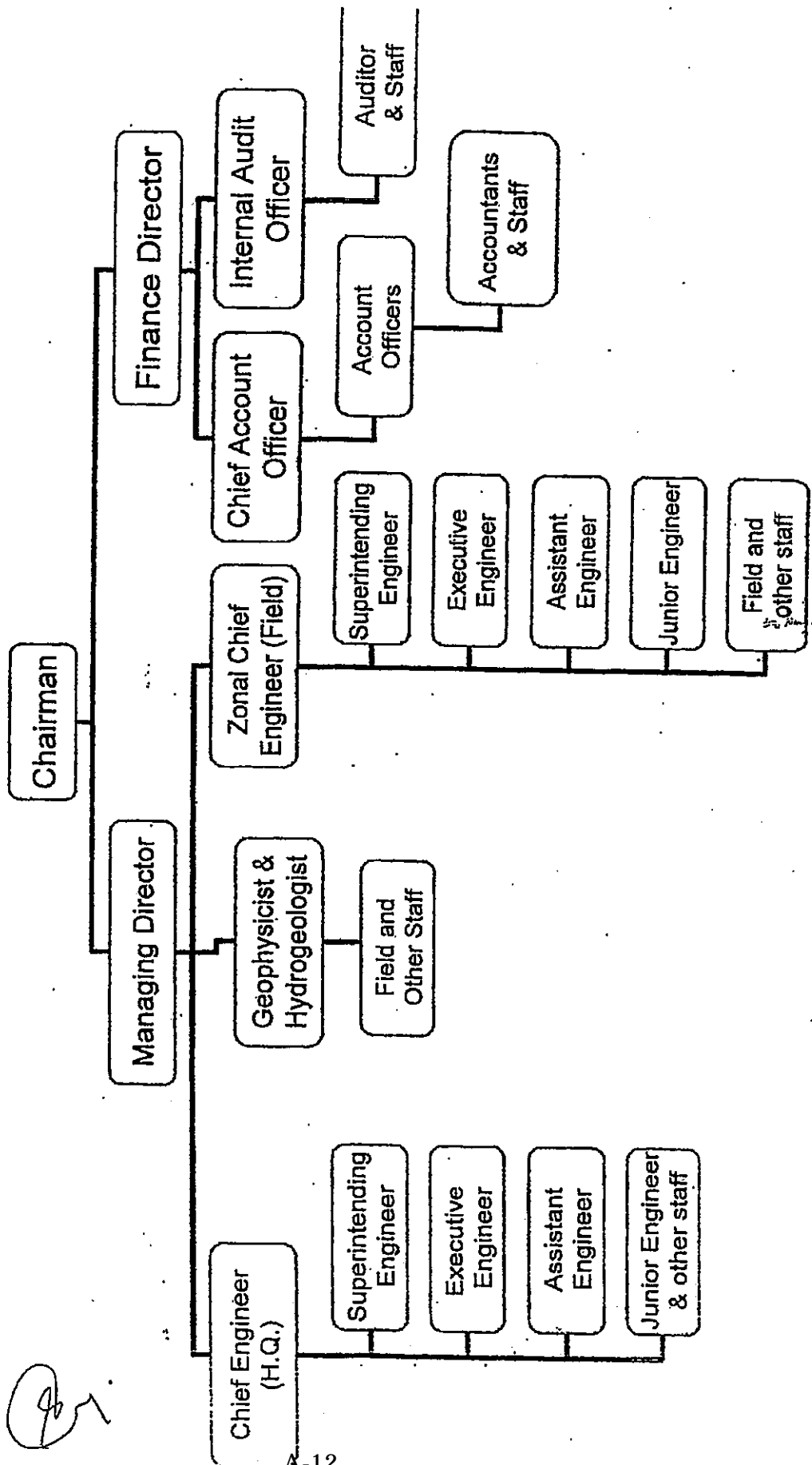
7-4 Commissioning and On the job training for drilling deeper tube wells were requested by Indian side.

7-5 Indian sides shall take necessary measures at suitable time for customs duties, internal taxes, and any other charges.

Organisation Chart of U.P. Government



Organisation Chart of U.P. Jal Nigam

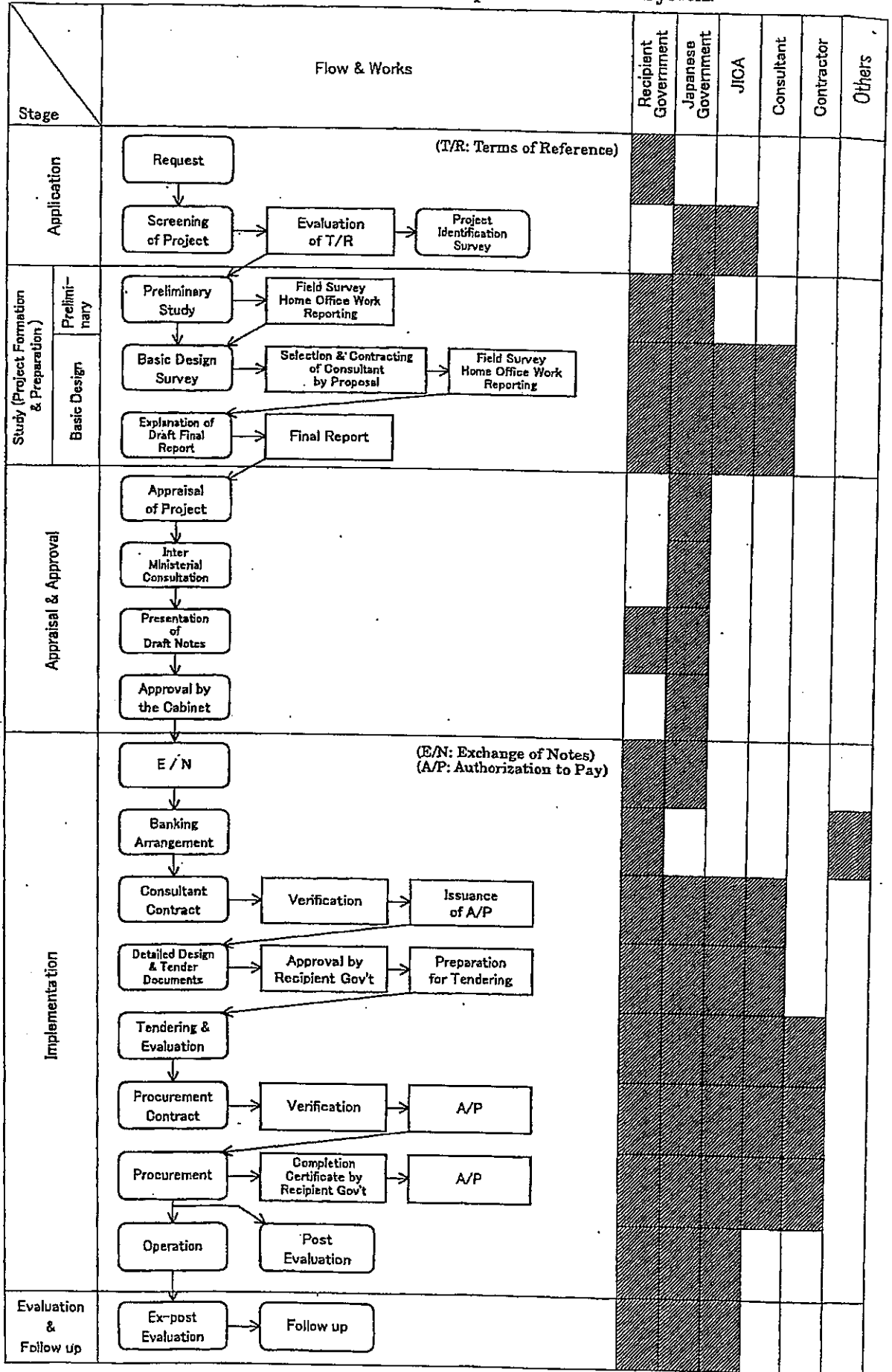


ANNEX -3 List of Requested Equipment and Materials

No.	Item	Quantity
1.	DIRECT MUD CIRCULATION ROTARY DRILLING EQUIPMENT	
1)	Drilling Rig Top head drive mud circulation direct rotary drilling rig, powered by truck engine power take-off (PTO), mounted on heavy duty 6x4 drive, right hand steering water-cooled diesel engine truck. The rig shall be complete with a steel constructed mast hydraulic driven head cylinder hoist/pulldown system, hoisting reel sand reel, piston type pump and other sectional components with standard accessories. Capacity: The rig shall have a capacity of drilling boreholes with diameter up to 20" and depth of maximum 500m using approx. 5" O.D. flush API with 3-1/2" IF joints drill pipe	2 lots
2)	Operating Accessories	2 sets
3)	Drilling Tools for Mud Circulation Drilling	2 sets
4)	Casing tools	2 sets
5)	Fishing tools	2 sets
6)	Miscellaneous Ancillary Equipment	2 sets
*7)	Compressor for well development, 800PSI, 600cfm and accessories	2 sets
8)	Spare Parts for Above Equipment	2 lots
2.	SUPPORT EQUIPMENT	
1)	Cab-back Crane Cargo Truck	2 units
2)	Water Tank truck	2 units
3)	Pumping Test Equipment	2 sets
4)	Well Logging Equipment * (Vehicle mounted)	2 sets
5)	Spare Parts for Above Equipment	2 lots
* 6)	Borehole camera	1 set
3.	COMMISSIONING	L.S
	On the job training for drilling engineer and mechanic for three (3) months	

* Added requests on 21/03/05

ANNEX - 4 Flow Chart of Procedures of Japan's Grant Aid System



Handwritten notes and signatures:
 [Signature]
 [Signature]
 [Signature]

ANNEX – 5 Japan's Grant Aid System

1. Procedures of Grant Aid

- 1) Japan's Grant Aid Programme is executed through the following procedures.

Application: (Request made by a recipient country)

Study: (Basic Design Study conducted by JICA)

Appraisal & Approval: (Appraisal by the Government of Japan and
Approval by Cabinet)

Determination of Implementation:

(The Notes exchanged between the Governments
of Japan and the recipient country)

- 2) Firstly, the application or request for a Grant Aid project submitted by a recipient country is examined by the Government of Japan (the Ministry of Foreign Affairs) to determine whether or not it is eligible for Grant Aid. If the request is deemed appropriate, the Government of Japan assigns JICA (Japan International Cooperation Agency) to conduct a study on the request.

Secondly, JICA conducts the study (Basic Design Study), using (a) Japanese consulting firm(s).

Thirdly, the Government of Japan appraises the project to see whether or not it is suitable for Japan's Grant Aid Program, based on the Basic Design Study report prepared by JICA, and the result is then submitted to the Cabinet for approval.

Fourthly, the Project, once approved by the Cabinet, is proceeded with the Exchange of Notes signed by the Governments of Japan and the recipient country.

Finally, for the implementation of the Project, JICA assists the recipient country in such matters as preparing tenders, contracts and so on.

2. Basic Design Study

- 1) Contents of the Study

The aim of the Basic Design Study, conducted by JICA on a requested project is to provide basic document necessary for the appraisal of the project by the Japanese Government. The contents of the Study are as follows:

- a) Confirmation of items agreed on by both parties concerning the basic

concept of the project.

- b) Evaluation of the appropriateness of the project to be implemented under the Grant Aid Scheme from a technical, social and economic point of view.
- c) Confirmation of items agreed on by both parties concerning the basic concept of the project.
- d) Preparation of a basic design of the Project.
- e) Estimation of the costs of the Project.

The contents of the original request are not necessarily approved in their initial form as the contents of the Grant Aid Project. The Basic Design of the Project is confirmed considering the guidelines of Japan's Grant Aid Scheme.

The Government of Japan requests the Government of the recipient country to take whatever measures are necessary to ensure its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside the jurisdiction of the organization in the recipient country actually implementing the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations in the recipient country through the Minutes of Discussions.

2) Selection of Consultants

For the smooth implementation of the study, JICA uses (a) registered consultant firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms. The firm(s) selected carry(ies) out the Basic Design Study and write(s) a report, based upon terms of reference set by JICA.

The consulting firm(s) used for the study is (are) recommended by JICA to the recipient country to also work on the project's implementation after the Exchange of Notes, in order to maintain technical consistency and also to avoid any undue delay in implementation should the selection process be repeated.

3. Japan's Grant Aid Scheme

1) What is Grant Aid ?

The Grant Aid Program provides a recipient country with non-reimbursable funds needed to procure the facilities, equipment, services (engineering services and transportation of the products, etc.) for economic and social development the country under the principals in accordance with the relevant laws and regulations of Japan. Grant Aid is not supplied through the donation of materials as such.

2) Exchange of Notes (E/N)

Japan's Grant Aid is extended in accordance with the Notes Exchanged by the two

Governments concerned, in which the objectives of the project, period of execution, conditions and amount of the Grant, etc., are confirmed.

- 3) "The period of the Grant" means the one fiscal year in which the Cabinet approves the project for. Within the fiscal year, all procedures such as exchanging of Notes, concluding contracts with (a) consultant firm(s) and (a) contractor(s) and final payment to them must be completed.

However in case of delays in delivery, installation or construction due to unforeseen factors such as weather, the period of the Grant Aid can be further extended for a maximum of one fiscal year at most by mutual agreement between the two Government.

- 4) Under the Grant, in principle, Japanese products and services including transport or those of the recipient country are to be purchased.

When both Governments deem it necessary, the Grant may be used for the purchase of the products or services of the third country.

However the prime contractors, namely, consulting, contracting and procurement firms, are limited to "Japanese nationals". (The term "Japanese nationals" means persons of Japanese nationality or Japanese corporations controlled by persons of Japanese nationality.)

5) Necessity of "Verification"

The Government of the recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by the Government of Japan. This "Verification" is deemed necessary to secure accountability to Japanese taxpayers.

6) Undertakings required of the Government of recipient country

In the implementation of the Grant Aid Project, the recipient country is required to undertake such necessary measures as the follows:

- a) To secure land necessary for the sites of the Project and to clear, level and reclaim the land prior to commencement of the construction.
- b) To provide facilities for the distribution of electricity, water supply and drainage and other incidental facilities in and around the sites.
- c) To secure buildings prior to the procurement in case of installation of the equipment.
- d) To ensure all the expenses and prompt execution for unloading, customs clearance at the port of disembarkation and internal transportation of products purchased under the Grant.

- e) To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which will be imposed in the recipient country with respect to the supply of the products and services under the Verified Contracts.
- f) To accord Japanese nationals whose services may be required in connection with the supply of the products and services under the Verified Contracts, such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their works.

7) "Proper Use"

The recipient country is required to maintain and use the facilities constructed and equipment purchased under the Grant Aid properly and effectively and to assign the necessary staff for operation and maintenance of them as well as to bear all the expenses other than those covered by the Grant Aid.

8) "Re-export"

The products purchased under the Grant Aid shall not be re-exported from the recipient country.

9) Banking Arrangements (B/A)

- a) The Government of the recipient country or its designated authority should open an account in the name of the Government of the recipient country in an authorized foreign exchange bank in Japan (hereinafter referred to as "the Bank"). The Government of Japan will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.
- b) The payments will be made when payment requests are presented by the Bank to the Government of Japan under an authorization to pay issued by the Government of the recipient country or its designated authority.

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Annex-6

Major Undertakings to be taken by Each Government

NO	Items	To be covered by Grant Aid	To be covered by Recipient side
1	To bear the following commissions to a bank of Japan for the banking services based upon the R/A		
	1) Advising commission of A/P		●
	2) Payment commission		●
2	To ensure prompt unloading and customs clearance at the port of disembarkation in recipient country		
	1) Marine(Air) transportation of the products from Japan to the recipient country	●	
	2) Tax exemption and custom clearance of the products at the port of disembarkation		●
	3) Internal transportation from the port of disembarkation to the project site	(●)	(●)
3	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		●
4	To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contract		●
5	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid		●
6	To bear all the expenses, other than those to be borne by the Grant Aid, necessary for the transportation and installation of the equipment		●

K. C. M.
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(2) MINUTES OF DISCUSSION ON THE SECOND FIELD SURVEY

MINUTES OF DISCUSSIONS
ON THE BASIC DESIGN STUDY
ON THE PROJECT FOR DEVELOPMENT OF GROUNDWATER
IN THE STATE OF UTTAR PRADESH
(THE SECOND SITE SURVEY)

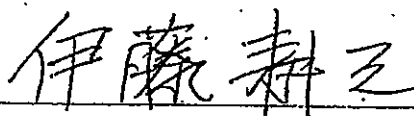
In response to a request from the Government of India (hereinafter referred to as "India"), the Government of Japan decided to conduct a Basic Design Study on the Project for Development of Groundwater in the State of Uttar Pradesh (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent the Basic Design Study Team (hereinafter referred to as "the Team") to India headed by Kozo ITO, Deputy Resident Representative, JICA India Office, and is scheduled to stay in the country from May 1st to May 21st, 2005.

The Team held discussions with the officials concerned of the Government of India and conducted a second site survey of the study area.

In the course of discussions and field survey, both parties confirmed the main items described on the attached sheets. The team will proceed to work further and prepare the Basic Design Study Report.

Lucknow, , 2005.
New Delhi, 9th August, 2005.



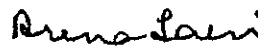
Mr. Kozo ITO
Leader
Basic Design Study Team
Japan International Cooperation Agency
(JICA)



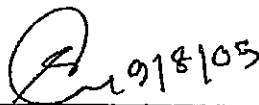
Mr. R. Ramani
Principal Secretary
Urban Development Department
Government of Uttar Pradesh



Mr. A. K. Seth
Chief Engineer
U.P. Jal Nigam(UPJN)



Ms. Aruna Jain
Director (External Assistance)
Ministry of Water Resources Development
Government of India



Ms. Sreyasi Chaudhuri
Department of Economic Affairs(DEA)
Ministry of Finance, Government of India

ATTACHMENT

1. Contents of the Minutes of Discussions signed on March and May, 2005

The Indian side and the Japanese side confirmed the contents of the Minutes of Discussions signed on March and May, 2005.

2. Responsible and Implementing Agency

The Responsible Agency is Urban Development Department of Government of Uttar Pradesh (annex-1).

The Implementing Agency is U.P. Jal Nigam, Lucknow (Annex-2)

3. Items requested by the Indian side

After discussions with the Team, the components of the equipment and materials described in Annex-3 requested by Indian side were finalized. JICA will assess the appropriateness of the request and will recommend for approval to the Government. However, the final components of the Project will be decided eventually after further review in Japan.

4. Japan's Grant Aid Scheme

4-1. Indian side understood the Japan's Grant Aid Scheme explained by the Team, as described in Annex-5 and Annex-6.

4-2. Indian side will take the necessary precautions and measures, as described in Annex-7, for smooth implementation of the Project, as a condition for the Japanese Grant Aid to be implemented.

5. Schedule of the Study

5-1. JICA will prepare the draft report in English and dispatch a mission to India in order to explain its contents by the end of July, 2005.

5-2. In the event of acceptance the contents of the report on principle by India, JICA will complete the Final Report and submit it to India by November, 2005.

6. Other relevant issues

6-1. Drilling plan for the requested equipment

The list of tentative tubewells proposed to be constructed during the coming six(6) years after the drilling rigs arrive in India, is provided in Annex-4.

6-2. Requested Commissioning and On the Job Training (OJT)

Indian side requested that 500 meters deep tube well shall be drilled by each drilling rig during the Commissioning for more effective on-the-job-training of the Indian counterparts.

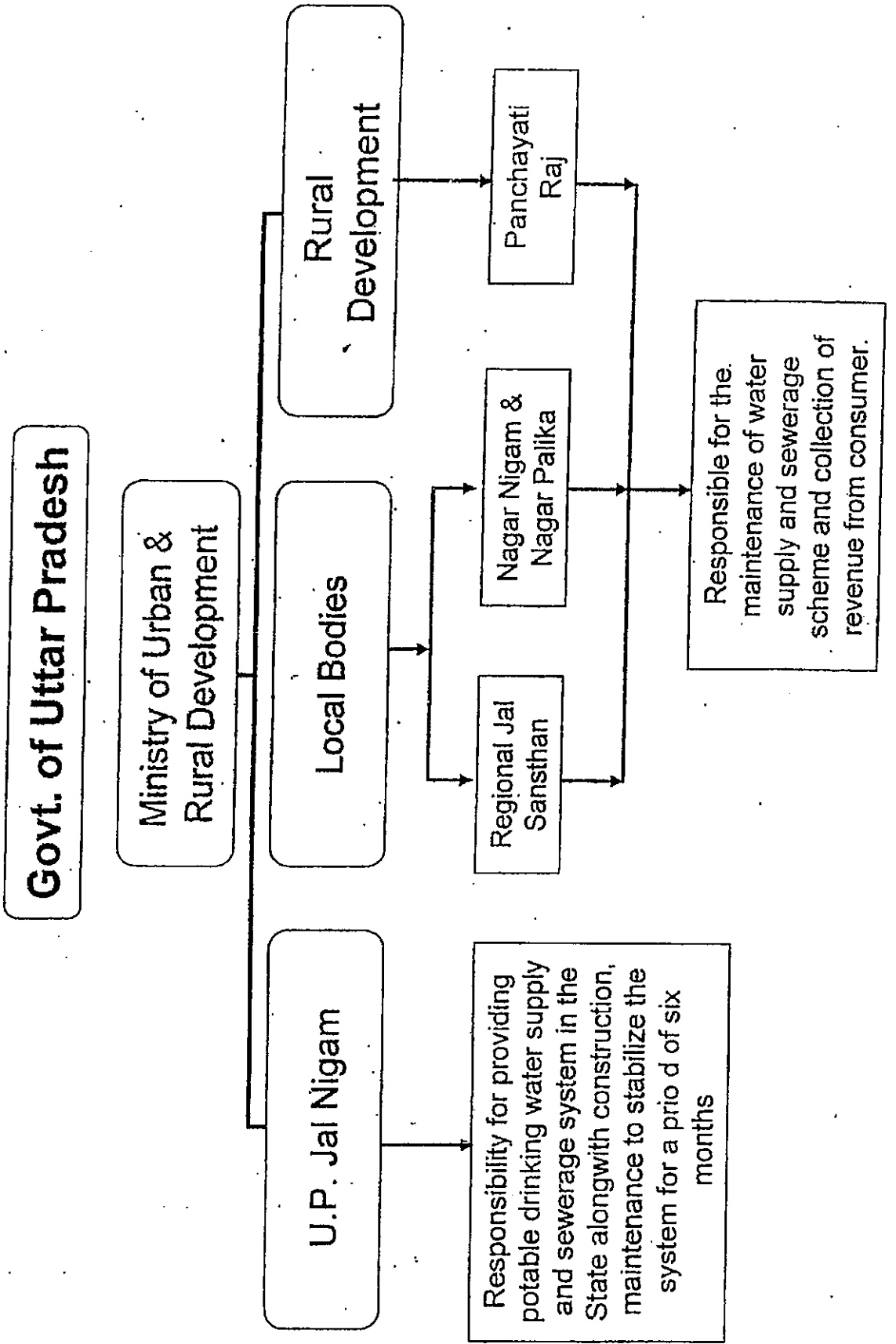
6-3. Expenditure on the part of Indian side

Indian side agreed to bear all expenses, other than those to be borne by the Grant Aid. The expenses by the Indian side will include the provision of necessary quantity of materials and consumables such as fuel, casing pipe, screen, gravel, cement, etc., to be used during the commissioning and on-the-job-training.

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Annex-1

Organisation Chart of U.P. Government

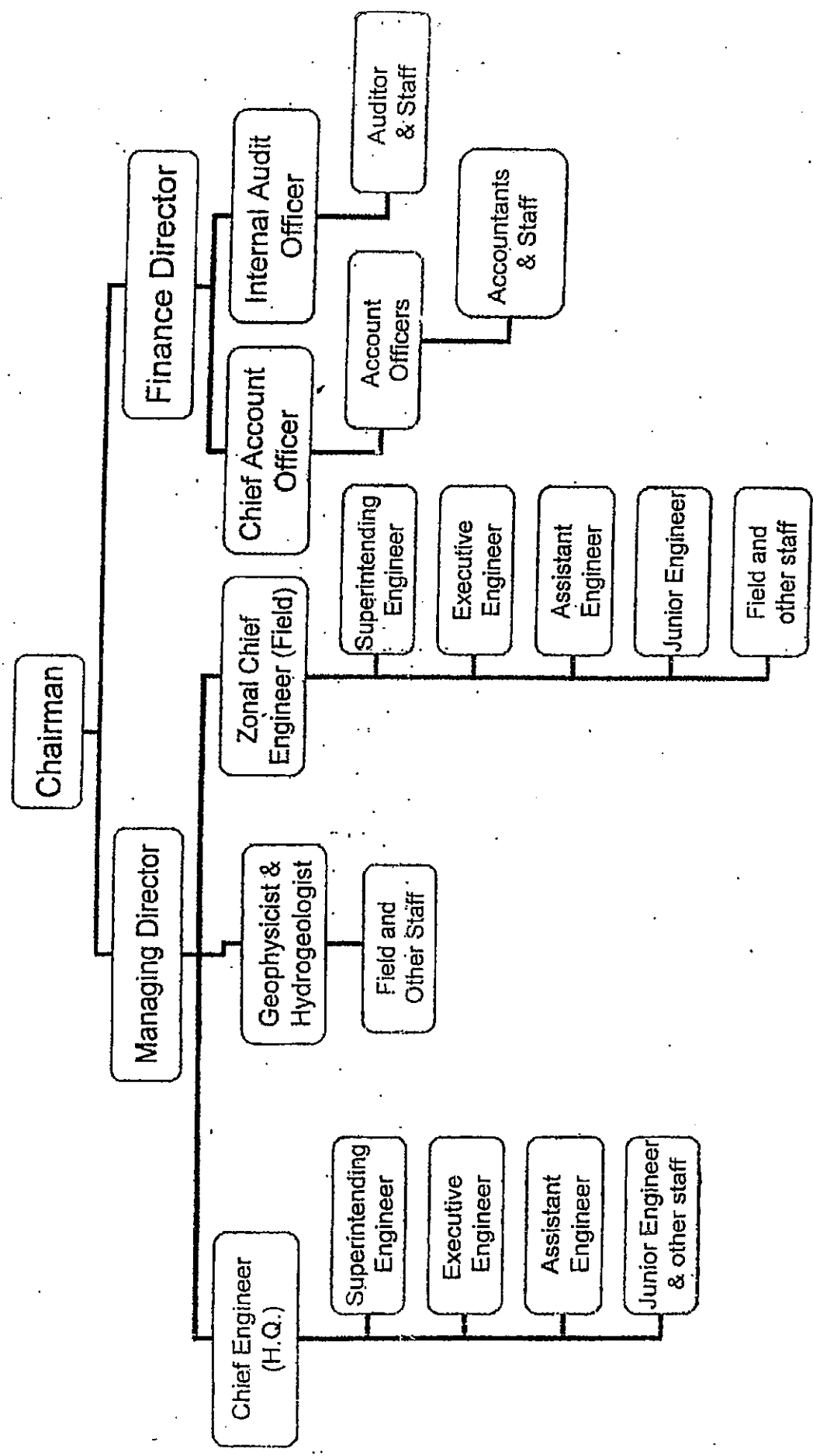


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Annex-2

Organisation Chart of U.P. Jal Nigam



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No.	Item	Quantity
1.	DIRECT MUD CIRCULATION ROTARY DRILLING EQUIPMENT	
1)	Drilling Rig Top head drive mud circulation direct rotary drilling rig, powered by truck engine power take-off (PTO), mounted on heavy duty 6x4 drive, right hand steering water-cooled diesel engine truck. The rig shall be complete with a steel constructed mast hydraulic driven head cylinder hoist/pulldown system, hoisting reel sand reel, piston type pump and other sectional components with standard accessories. Capacity: The rig shall have a capacity of drilling boreholes with diameter up to 20" and depth of maximum 500m using 4-3/4" O.D. flush API with 3-1/2" IF joints drill pipe	2 lots
2)	Operating Accessories	2 sets
3)	Drilling Tools for Mud Circulation Drilling	2 sets
4)	Casing tools	2 sets
5)	Fishing tools	2 sets
6)	Miscellaneous Ancillary Equipment	2 set
* 7)	Compressor for well development, 800PSI, 600cfm and accessories	2 sets
8)	Spare Parts for Above Equipment	2 lots
2.	SUPPORT EQUIPMENT	
1)	Cab-back Crane Cargo Truck	2 units
2)	Water Tank truck	2 units
3)	Pumping Test Equipment	2 sets
4)	Well Logging Equipment *(Vehicle mounted)	2 sets
5)	Spare Parts for Above Equipment	2 lots
* 6)	Borehole Camera	1 set
3.	COMMISSIONING	L.S
	One (1) each of Drilling engineer and Mechanic on the job training for three (3) months	

* Added requests on 21st March, 2005.

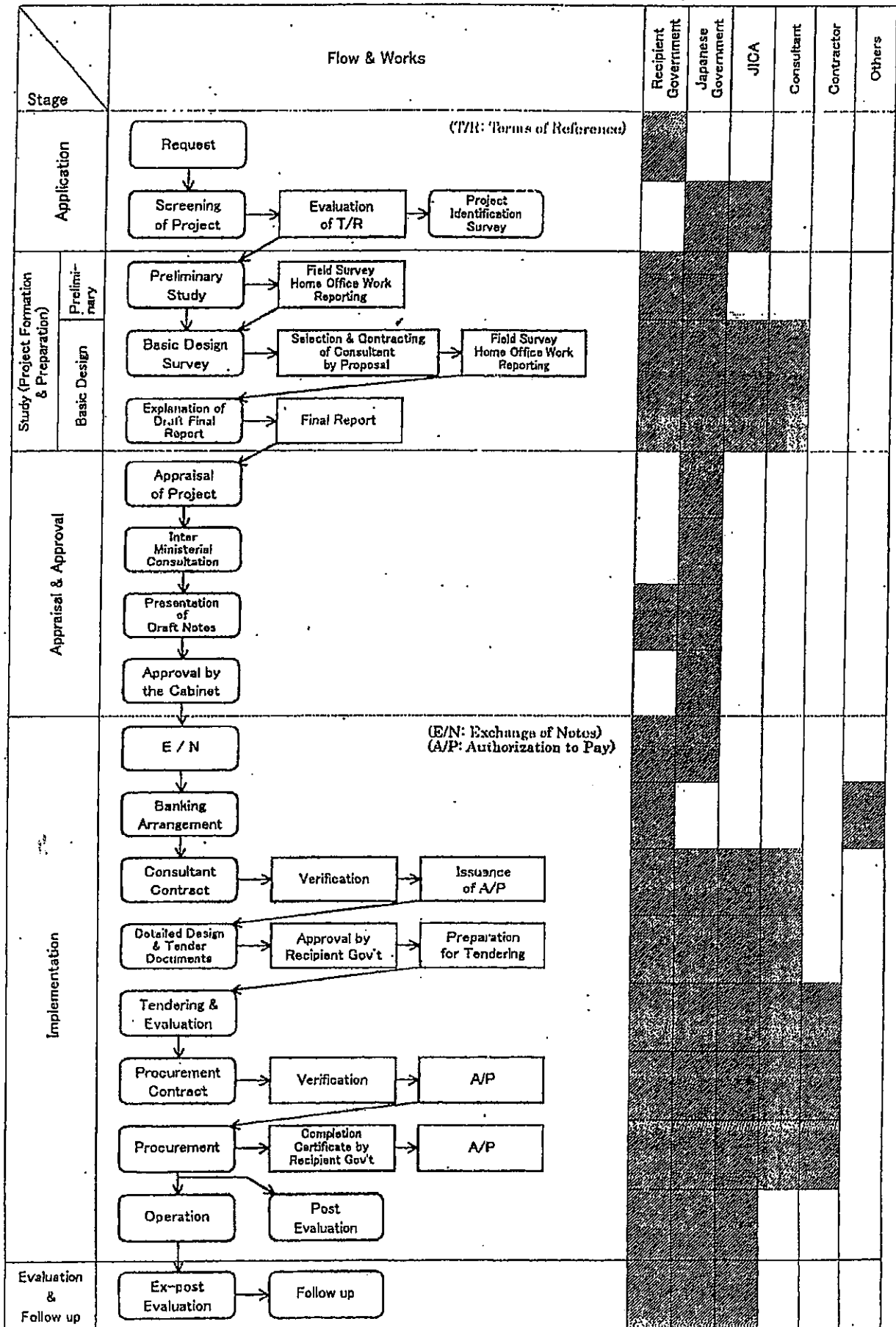
Tentative list of proposed tubewells sites in the coming six(6) years, to be constructed by the drilling rigs after they are provided.

District	Town or Area name	Proposed year of Construction	No. of Tube Well	Year wise priority
Lucknow	Lucknow	2007	4	1
Raebarelli	Raebarelli	2007	2	2
Kanpur	Kanpur	2007	2	3
Lucknow	Lucknow	2008	3	1
Pratapgarh	Kunda	2008	1	2
Jaunpur	Jaunpur	2008	2	3
Kanpur	Kanpur	2008	2	4
Unnao	Unnao	2009	3	1
Unnao	Purwa	2009	1	2
Lucknow	Lucknow	2009	3	3
Kanpur	Kanpur	2009	1	4
Lucknow	Lucknow	2010	4	1
Kanpur	Kanpur	2010	4	2
Kanpur	Kanpur	2011	4	1
Lucknow	Lucknow	2011	5	2
kanpur	Kanpur	2012	4	1
Lucknow	Lucknow	2012	5	2

Note:

- (1) The number of tube wells to be constructed per year may vary in accordance to the ground condition encountered and other unforeseen incidence during drilling related work.
- (2) The depth of tube well may vary depending upon the strata encountered during drilling and logging of the tube well and their yield. The depth of proposed tubewells may range from 350 to 500m.
- (3) The priority of drilling of tubewells is likely to change depending on:
 - a) incidence of failed existing tubewells
 - b) drought situation and the like emergency situations

Annex - 5 Flow Chart of Procedures of Japan's Grant Aid System



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1. Procedures of Grant Aid

- 1) Japan's Grant Aid Programme is executed through the following procedures.

Application: (Request made by a recipient country)
Study: (Basic Design Study conducted by JICA)
Appraisal & Approval: (Appraisal by the Government of Japan and Approval by Cabinet)
Determination of Implementation: (The Notes exchanged between the Governments of Japan and the recipient country)

- 2) Firstly, the application or request for a Grant Aid project submitted by a recipient country is examined by the Government of Japan (the Ministry of Foreign Affairs) to determine whether or not it is eligible for Grant Aid. If the request is deemed appropriate, the Government of Japan assigns JICA (Japan International Cooperation Agency) to conduct a study on the request.

Secondly, JICA conducts the study (Basic Design Study), using (a) Japanese consulting firm(s).

Thirdly, the Government of Japan appraises the project to see whether or not it is suitable for Japan's Grant Aid Program, based on the Basic Design Study report prepared by JICA, and the result is then submitted to the Cabinet for approval.

Fourthly, the Project, once approved by the Cabinet, is proceeded with the Exchange of Notes signed by the Governments of Japan and the recipient country.

Finally, for the implementation of the Project, JICA assists the recipient country in such matters as preparing tenders, contracts and so on.

2. Basic Design Study

- 1) Contents of the Study

The aim of the Basic Design Study, conducted by JICA on a requested project is to provide basic document necessary for the appraisal of the project by the Japanese Government. The contents of the Study are as follows:

- a) Confirmation of items agreed on by both parties concerning the basic concept of the project.
b) Evaluation of the appropriateness of the project to be implemented under the Grant Aid Scheme from a technical, social and economic point of view.



- c) Confirmation of items agreed on by both parties concerning the basic concept of the project.
- d) Preparation of a basic design of the Project.
- e) Estimation of the costs of the Project.

The contents of the original request are not necessarily approved in their initial form as the contents of the Grant Aid Project. The Basic Design of the Project is confirmed considering the guidelines of Japan's Grant Aid Scheme.

The Government of Japan requests the Government of the recipient country to take whatever measures are necessary to ensure its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside the jurisdiction of the organization in the recipient country actually implementing the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations in the recipient country through the Minutes of Discussions.

2) Selection of Consultants

For the smooth implementation of the study, JICA uses (a) registered consultant firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms. The firm(s) selected carry(ies) out the Basic Design Study and write(s) a report, based upon terms of reference set by JICA.

The consulting firm(s) used for the study is (are) recommended by JICA to the recipient country to also work on the project's implementation after the Exchange of Notes, in order to maintain technical consistency and also to avoid any undue delay in implementation should the selection process be repeated.

3. Japan's Grant Aid Scheme

1) What is Grant Aid ?

The Grant Aid Program provides a recipient country with non-reimbursable funds needed to procure the facilities, equipment, services (engineering services and transportation of the products, etc.) for economic and social development the country under the principals in accordance with the relevant laws and regulations of Japan. Grant Aid is not supplied through the donation of materials as such.

2) Exchange of Notes (E/N)

Japan's Grant Aid is extended in accordance with the Notes Exchanged by the two Governments concerned, in which the objectives of the project, period of execution, conditions and amount of the Grant, etc., are confirmed.

- 3) "The period of the Grant" means the one fiscal year in which the Cabinet approves the project for. Within the fiscal year, all procedures such as exchanging of Notes, concluding contracts with (a) consultant firm(s) and (a) contractor(s) and final payment to them must be completed.

However in case of delays in delivery, installation or construction due to unforeseen factors such as weather, the period of the Grant Aid can be further extended for a maximum of one fiscal year at most by mutual agreement between the two Government.

- 4) Under the Grant, in principle, Japanese products and services including transport or those of the recipient country are to be purchased.

When both Governments deem it necessary, the Grant may be used for the purchase of the products or services of the third country.

However the prime contractors, namely, consulting, contracting and procurement firms, are limited to "Japanese nationals". (The term "Japanese nationals" means persons of Japanese nationality or Japanese corporations controlled by persons of Japanese nationality).

- 5) Necessity of "Verification"

The Government of the recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by the Government of Japan. This "Verification" is deemed necessary to secure accountability to Japanese taxpayers.

- 6) Undertakings required of the Government of recipient country

In the implementation of the Grant Aid Project, the recipient country is required to undertake such necessary measures as the follows:

- a) To secure land necessary for the sites of the Project and to clear, level and reclaim the land prior to commencement of the construction.
- b) To provide facilities for the distribution of electricity, water supply and drainage and other incidental facilities in and around the sites.
- c) To secure buildings prior to the procurement in case of installation of the equipment.
- d) To ensure all the expenses and prompt execution for unloading, customs clearance at the port of disembarkation and internal transportation of products purchased under the Grant.
- e) To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which will be imposed in the recipient country with respect to the supply of the products and services under the Verified Contracts.
- f) To accord Japanese nationals whose services may be required in connection with

the supply of the products and services under the Verified Contracts, such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their works.

- 7) "Proper Use"
The recipient country is required to maintain and use the facilities constructed and equipment purchased under the Grant Aid properly and effectively and to assign the necessary staff for operation and maintenance of them as well as to bear all the expenses other than those covered by the Grant Aid.
- 8) "Re-export"
The products purchased under the Grant Aid shall not be re-exported from the recipient country.
- 9) Banking Arrangements (B/A)
 - a) The Government of the recipient country or its designated authority should open an account in the name of the Government of the recipient country in an authorized foreign exchange bank in Japan (hereinafter referred to as "the Bank"). The Government of Japan will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.
 - b) The payments will be made when payment requests are presented by the Bank to the Government of Japan under an authorization to pay issued by the Government of the recipient country or its designated authority.

Annex - 7 Major Undertakings to be Taken by Each Government

No.	Items	To be covered by Grant Aid	To be covered by Recipient Side
1	To bear the following commissions to the Japanese bank for banking services based upon the Banking Arrangement(B/A)		
	1) Advising commission of Authorization to Pay(A/P)		●
	2) Payment Commission		●
2.	To ensure prompt unloading and customs clearance at the port of disembarkation in recipient country		
	1) Marine (Air) transportation of the products from Japan to the recipient country	●	
	2) Tax exemption and custom clearance of the products at the port of disembarkation		●
	3) Internal transportation from the port of disembarkation to the project site	(●)	(●)
3	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work.		●
4	To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contracts.		●
5	To maintain and use properly and effectively the equipment provided under the Grant Aid.		●
6	To bear all the expenses, other than those to be borne by the Grant Aid, necessary for the transportation and installation of the equipment.		●

**(3) MINUTES OF DISCUSSION ON THE EXPLANATION OF THE
DRAFT BASIC DESIGN STUDY REPORT**

MINUTES OF DISCUSSIONS
ON
THE BASIC DESIGN STUDY
ON
THE PROJECT FOR DEVELOPMENT OF GROUNDWATER
IN THE STATE OF UTTAR PRADESH
(EXPLANATION OF DRAFT FINAL REPORT)

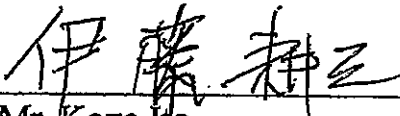
In March and May 2005, the Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched the Basic Design Study Team on the Project for Development of Groundwater in the State of Uttar Pradesh (hereinafter referred to as "the Project") to India (hereinafter referred to as "India"), and through discussions, field survey, and technical examination of the results in Japan, JICA prepared a draft report of the study.

In order to explain and to consult with the Government of India on the components of the draft report, JICA sent the Draft Report Explanation Team (hereinafter referred to as "the Team") to India, which is headed by Mr. Kozo Ito, Deputy Resident Representative, JICA India Office, from October 24 to November 1, 2005.

As a result of discussions, both parties confirmed the main items described on the attached sheets.

Lucknow, 28th Oct, 2005

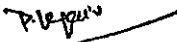
New Delhi, 31st Oct, 2005



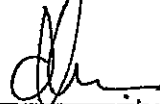
Mr. Kozo Ito
Leader of Draft Report Explanation Team,
India Office, Japan International Cooperation
Agency (JICA)



Mr. D. C. Mishra
Secretary
Urban Development Department
Government of Uttar Pradesh



Mr. P. K. Jain
Chief Engineer
U.P. Jal Nigam



Mr. Dinesh Kapila
Deputy Secretary
Ministry of Water Resources Development
Government of India



Ms. Sreyasi Chaudhuri
Under Secretary
Department of Economic Affairs (DEA)
Ministry of Finance, Government of India

4-4) Commissioning and On-the-Job Training

The Indian side agreed that they will take necessary measures for Commissioning and On-the-Job training as follows.

- (1) To make necessary arrangements for the land acquisition and access to the site where Commissioning of the rig and On-the-Job training would be held. The sites for the same are proposed in the following places:
1st Tubewell: Gomti Nagar, Lucknow
2nd Tubewell: Rajaji Puram, Lucknow
- (2) To allocate necessary number of personnel for Commissioning and On-the-Job training.
- (3) To prepare and bear all expenses, other than those to be borne by the Japanese Grant Aid. The expenses by the Indian side shall include provision of necessary quantity of materials and consumables such as fuel, casing pipe, screen, gravel pack, cement, etc., to be used during the Commissioning and the On-the-Job training.
- (4) To prepare all the above items (1 to 3) before the date of shipment of the equipments to be procured under the Project. The Indian side will be informed by the Japanese side the proposed date of shipment from Japan to Kolkata during the Implementation stage of the Project.

4-5 UPIN had requested the equipment to be procured under the Project to be transported to Lucknow by the Japanese side.

4-6) Project sites and Drilling Report

Both sides confirmed the proposed project sites described in Annex-2 which will be constructed with the equipment to be procured under the Project. The Indian side promised periodical drilling report about these project sites to JICA India Office every six months. The format of drilling report is described in Annex-3 and Annex-4.

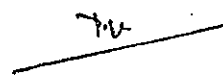
4-7 Draft detailed specification of the equipment

The Team handed one copy of the draft detailed specification of the equipment to UP Jal Nigam. Both sides agreed on principles that this draft specification is confidential and will not be duplicated or released to any outside parties.



ANNEX-1 List of Equipment

No.	Item	Requested	Included in the Project
1	Drilling Machine Truck mounted top head drive, direct circulation drilling machine	2 sets	2 sets
2	Accessories and tools for above	2 sets	2 sets
3	Equipment for tube well development (Truck mounted high pressure compressor)	2 sets	2 sets
4	Cargo truck with 6t crane for transportation of drilling related tools and materials	2 units	2 units
5	Water tank truck for drilling work	2 units	2 units
6	Vehicle mounted logging equipment	2 sets	1 set
7	Pumping Test Equipment	2 sets	1 set
8	Borehole Camera	1 set	Excluded
9	Spare parts for above	1 set	1 set




ANNEX-2 Project Site List


District	Town or Area Name	No. of Tube wells	Population (2012)
Lucknow	Lucknow	24	3,077,823
Kanpur	Kanpur	17	2,683,030
Jaunpur	Jaunpur	2	194,476
Pratapgarh	Kunda	1	27,143
Unnao	Purwa	1	25,763
Raebarelli	Raebarelli	2	205,766
Unnao	Unnao	3	176,147
		50	6,390,148

(1) The drilling depths will differ depending on geological formation, well log and pumping rate.

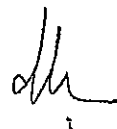
The scheduled depths are 350 to 500m.

(2) The priority of drilling sites can change due to the following.

- a) When a problem arises at an existing well of another area.
- b) When an emergency such as drought arises.

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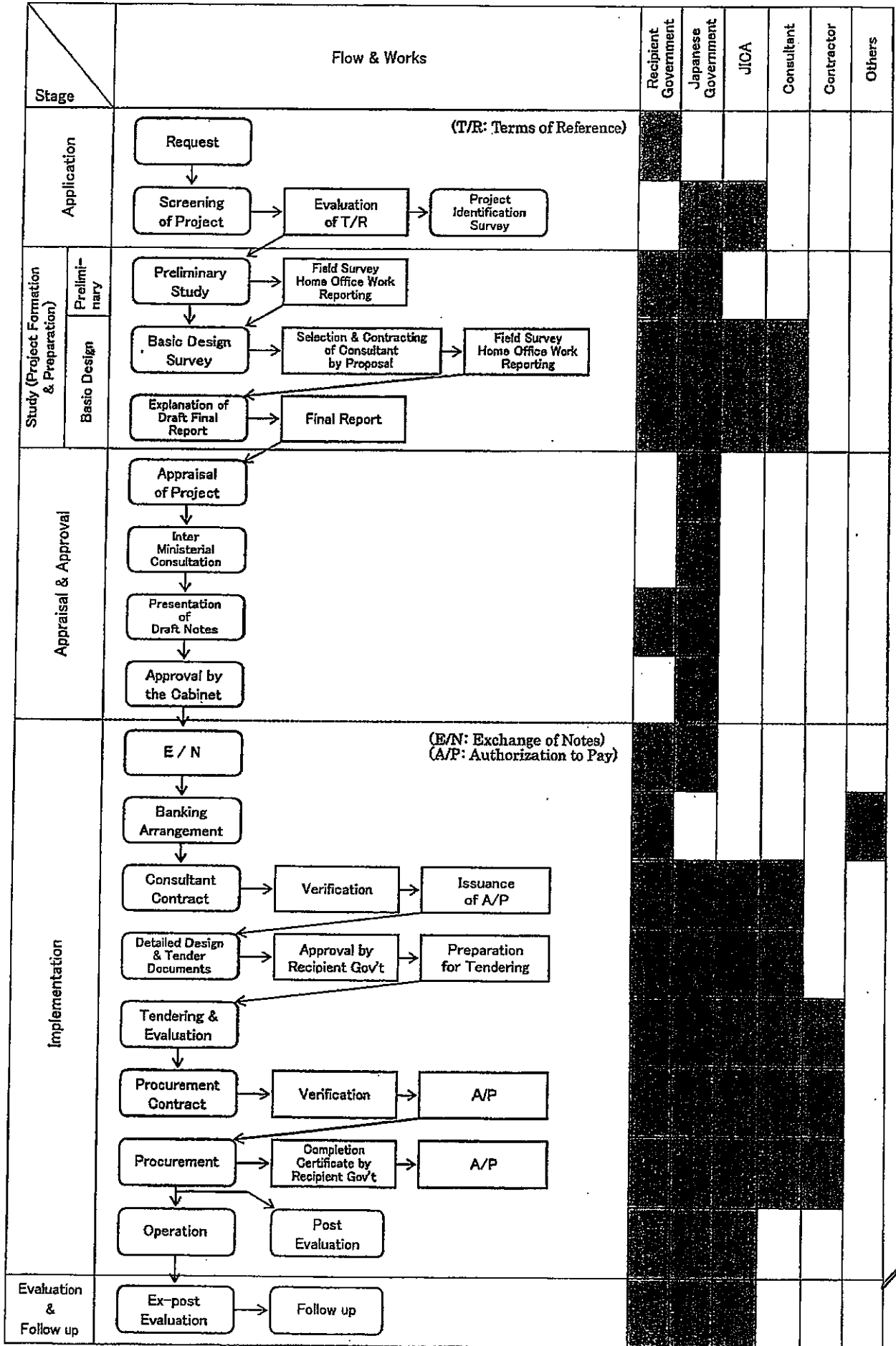




ANNEX-3 Format of drilling record

The Project for Development of Ground Water in the State of Uttar Pradesh	
Information to be included in the periodical report to JICA-India Office (New Delhi)	
Date:	
1	District :
2	Town :
3	Location/Name (Site) of tubewell :
4	Coordinate:
5	Purpose of the tube well :
6	Drilling Machine No. :
7	Financed by : GoI() / GoUP()
8	Estimated population to be served with the tubewell :
9	Type of Well : Rebore()/New system()
10	Drilling work details :
a)	Drilling start date :
b)	Completion date :
c)	Drilling depth (m) :
d)	Casing depth (m) :
e)	Tube Well Assembly Diameter. : _____ mm x _____ mm
f)	Discharge (LPM) :
g)	Yield Tested on (yy/mm/dd); :
h)	Static Water Level (m) :
i)	Pumping Water Level (m) :
j)	Quality of Water: Potable? : Yes(), No()
k)	If NO, what item is out of standard :
11	Logging done : Yes(), No() : Date:
12	Pumping Test done : Yes(), No() : Date:
13	Problems presented during the drilling work? If any, please describe in detail.

Annex - 5 Flow Chart of Procedures of Japan's Grant Aid System



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Annex - 6 Japan's Grant Aid System

1. Procedures of Grant Aid

- 1) Japan's Grant Aid Programme is executed through the following procedures.

Application: (Request made by a recipient country)

Study: (Basic Design Study conducted by JICA)

Appraisal & Approval: (Appraisal by the Government of Japan and
Approval by Cabinet)

Determination of Implementation:

(The Notes exchanged between the Governments
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- 2) Firstly, the application or request for a Grant Aid project submitted by a recipient country is examined by the Government of Japan (the Ministry of Foreign Affairs) to determine whether or not it is eligible for Grant Aid. If the request is deemed appropriate, the Government of Japan assigns JICA (Japan International Cooperation Agency) to conduct a study on the request.

Secondly, JICA conducts the study (Basic Design Study), using (a) Japanese consulting firm(s).

Thirdly, the Government of Japan appraises the project to see whether or not it is suitable for Japan's Grant Aid Program, based on the Basic Design Study report prepared by JICA, and the result is then submitted to the Cabinet for approval.

Fourthly, the Project, once approved by the Cabinet, is proceeded with the Exchange of Notes signed by the Governments of Japan and the recipient country.


Finally, for the implementation of the Project, JICA assists the recipient country in such matters as preparing tenders, contracts and so on.

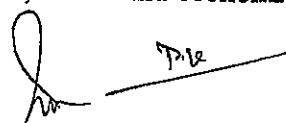
2. Basic Design Study

- 1) Contents of the Study

The aim of the Basic Design Study, conducted by JICA on a requested project is to provide basic document necessary for the appraisal of the project by the Japanese Government. The contents of the Study are as follows:

- a) Confirmation of items agreed on by both parties concerning the basic concept of the project.
- b) Evaluation of the appropriateness of the project to be implemented under the Grant Aid Scheme from a technical, social and economic point of view.

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- c) Confirmation of items agreed on by both parties concerning the basic concept of the project.
- d) Preparation of a basic design of the Project.
- e) Estimation of the costs of the Project.

The contents of the original request are not necessarily approved in their initial form as the contents of the Grant Aid Project. The Basic Design of the Project is confirmed considering the guidelines of Japan's Grant Aid Scheme.

The Government of Japan requests the Government of the recipient country to take whatever measures are necessary to ensure its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside the jurisdiction of the organization in the recipient country actually implementing the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations in the recipient country through the Minutes of Discussions.

2) Selection of Consultants

For the smooth implementation of the study, JICA uses (a) registered consultant firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms. The firm(s) selected carry(ies) out the Basic Design Study and write(s) a report, based upon terms of reference set by JICA.

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1) What is Grant Aid ?


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2) Exchange of Notes (E/N)

Japan's Grant Aid is extended in accordance with the Notes Exchanged by the two Governments concerned, in which the objectives of the project, period of execution, conditions and amount of the Grant, etc., are confirmed.

- 3) "The period of the Grant" means the one fiscal year in which the Cabinet approves the project for. Within the fiscal year, all procedures such as exchanging of Notes, concluding contracts with (a) consultant firm(s) and (a) contractor(s) and final

 A-43

 P-12





payment to them must be completed.

However in case of delays in delivery, installation or construction due to unforeseen factors such as weather, the period of the Grant Aid can be further extended for a maximum of one fiscal year at most by mutual agreement between the two Government.

- 4) Under the Grant, in principle, Japanese products and services including transport or those of the recipient country are to be purchased.

When both Governments deem it necessary, the Grant may be used for the purchase of the products or services of the third country.

However the prime contractors, namely, consulting, contracting and procurement firms, are limited to "Japanese nationals". (The term "Japanese nationals" means persons of Japanese nationality or Japanese corporations controlled by persons of Japanese nationality).

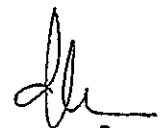
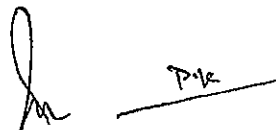
- 5) Necessity of "Verification"

The Government of the recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by the Government of Japan. This "Verification" is deemed necessary to secure accountability to Japanese taxpayers.

- 6) Undertakings required of the Government of recipient country

In the implementation of the Grant Aid Project, the recipient country is required to undertake such necessary measures as the follows:

- a) To secure land necessary for the sites of the Project and to clear, level and reclaim the land prior to commencement of the construction.
- b) To provide facilities for the distribution of electricity, water supply and drainage and other incidental facilities in and around the sites.
- c) To secure buildings prior to the procurement in case of installation of the equipment.
- d) To ensure all the expenses and prompt execution for unloading, customs clearance at the port of disembarkation and internal transportation of products purchased under the Grant.
- e) To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which will be imposed in the recipient country with respect to the supply of the products and services under the Verified Contracts.
- f) To accord Japanese nationals whose services may be required in connection with the supply of the products and services under the Verified Contracts, such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their works.



7) "Proper Use"

The recipient country is required to maintain and use the facilities constructed and equipment purchased under the Grant Aid properly and effectively and to assign the necessary staff for operation and maintenance of them as well as to bear all the expenses other than those covered by the Grant Aid.

8) "Re-export"

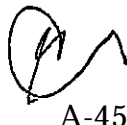
The products purchased under the Grant Aid shall not be re-exported from the recipient country.

9) Banking Arrangements (B/A)

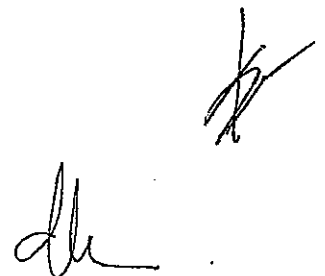
- a) The Government of the recipient country or its designated authority should open an account in the name of the Government of the recipient country in an authorized foreign exchange bank in Japan (hereinafter referred to as "the Bank"). The Government of Japan will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.
- b) The payments will be made when payment requests are presented by the Bank to the Government of Japan under an authorization to pay issued by the Government of the recipient country or its designated authority.



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Annex - 7 Major Undertakings to be Taken by Each Government

No.	Items	To be covered by Grant Aid	To be covered by Recipient Side
1	To bear the following commissions to the Japanese bank for banking services based upon the Banking Arrangement(B/A)		
	1) Advising commission of Authorization to Pay(A/P)		●
	2) Payment Commission		●
2	To ensure prompt unloading and customs clearance at the port of disembarkation in recipient country		
	1) Marine (Air) transportation of the products from Japan to the recipient country	●	
	2) Tax exemption and custom clearance of the products at the port of disembarkation		●
	3) Internal transportation from the port of disembarkation to the project site	(●)	(●)
3	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work.		●
4	To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contracts.		●
5	To maintain and use properly and effectively the equipment provided under the Grant Aid.		●
6	To bear all the expenses, other than those to be borne by the Grant Aid, necessary for the transportation and installation of the equipment.		●

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Appendices 5 Other Relevant Data / Information

5-1 Result of Water Quality Analysis

5-2 Drilling Performance Record Sheet

5-3 Schedule of Initial Operation Training (Tentative)

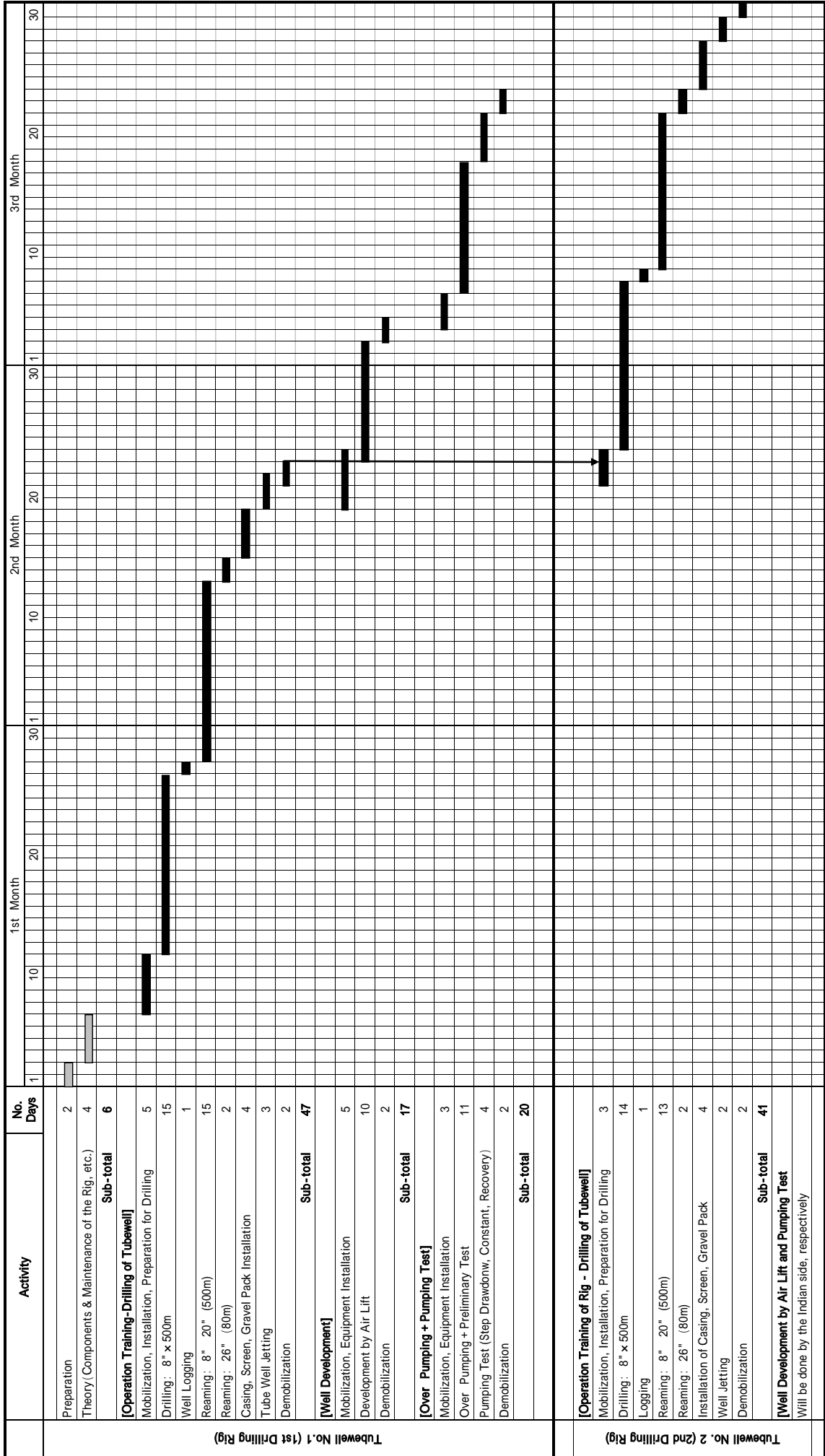
Appendices 5-1 Result of Water Quality Analysis

No.	Site Name	District	Sample Source	Well depth	pH	EC (mS/m)	Ammonia -NH ₄ (mg/l)	Fluoride -F (mg/l)	P- Alkalinity (mg/l)	M- Alkalinity (mg/l)	Chloride -Cl (mg/l)	E. Coli	Arsenic -As (mg/l)	Mercury -Hg (mg/l)	Lead -Pb (mg/l)	Chromium -Cr (mg/l)
					(*)	(*)	(*)	(*)	(*)	(*)	(*)	(*)				
1	Kanpur Town-1	KANPUR	Hand pump well	42m	7.5	67.0	ND	0.3	ND	370.0	50.0	ND	ND	ND	ND	ND
2	Kanpur Town-2	KANPUR	Hand pump well	50m	7.1	179.1	ND	ND	ND	525.0	300.0	Trace	ND	ND	ND	ND
3	Kanpur Town-3	KANPUR	Abandoned	50m	7.4	515.9	0.5	0.5	ND	1,300.0	525.0	Trace	ND	ND	ND	14.3
4	Handia	ALLAHABAD	Tubewell	100m	7.1	214.7	ND	ND	ND	530.0	425.0	ND	ND	ND	ND	ND
5	Jain	RAEBARELLI	Tubewell	330m	7.7	116.7	0.5	0.8	ND	415.0	150.0	ND	ND	ND	ND	ND
6	Ganga river	ALLAHABAD	Surface water	-	7.4	53.8	1.0	ND	ND	225.0	500.0	Trace	0.013	ND	ND	ND
7	Mahona	LUCKNOW	Tubewell	120m	7.6	68.8	ND	0.4	ND	480.0	425.0	ND	ND	ND	ND	ND
8	Kadra	LUCKNOW	Tubewell	350m	7.4	130.6	ND	ND	ND	335.0	150.0	ND	ND	ND	ND	ND
9	Talkatora (Lucknow)	LUCKNOW	Tubewell(by CGWB)	500m	8.0	102.3	ND	1.0	ND	450.0	225.0	ND	ND	ND	ND	ND
10	Jiamau (Lucknow)	LUCKNOW	Tubewell	200m	7.4	136.3	ND	ND	ND	640.0	250.0	ND	ND	ND	ND	ND
Japanese Standard					5.8 ~ 8.6	-	-	<0.8	-	-	< 200	Not Detected	0.01	0.0005	0.01	0.05
WHO Guideline					-	-	-	1.5	-	-	-	Not Detected in 100ml	0.01	0.001	0.01	0.05
Indian Standard					6.5 ~ 8.5	-	-	0.6 ~ 1.2	-	-	250.0	-	0.05	0.001	0.10	0.05

(*) Measured in the field with simplified pack test.

Appendices 5-3 Schedule of Initial Operation Training (Tentative)

Initial Operation Training of the Drilling Machine and Related Equipment Through On-the-Job Training (Tentative)



The above number of days and work activity may vary in accordance to the ground condition encountered during drilling related work.

Appendices 6 References

No.	Title	Publisher	Published Year
1	Five Year Plan(2002-2007). Volume I, II, III	Planning Commission, Go India	2002
2	Census of India, 2001 (State level)	Registrar General and Census Commissioner, India	2001
3	Census of India, 2001 (District Level)	Registrar General and Census Commissioner, India	2001
4	Census of India, 2001 Uttar Pradesh State, Volume-I	Director of Census Operation, Uttar Pradesh	2001
5	Census of India, 2001 Uttar Pradesh State, Volume-II	Director of Census Operation, Uttar Pradesh	2001
6	Map Profile 2001, States and Union Territories	Office of the Registrar General, India	2001
7	India, 2005 A Reference Annual	Ministry of Information and Broadcasting, Gol	2005
8	National Water Policy of India	Ministry of Water Resources	2002
9	Status and Policy Framework of Ground Water in India	VIKSAT, Nehru Foundation for Development. Srinivas Mudrakartha	1999
10	Indian Standard for Tube Well Construction	Indian Standards Institution	1979
11	Design Criteria for Water Supply Schemes	UP Jal Nigam	1979
12	Manual on Water Supply and Treatment	Central Public Health and Environmental Engineering Organisation, Min. of Urban Development	1999 Revised & Update
13	State Report on Hydrogeology & Groundwater Resources in UP	Central Groundwater Board, Ministry of Water Resources	2000
14	Basic Data Report of the Exploratory Tubewell		
15	Status of Water Supply in all the 623 TOWNS of Uttar Pradesh as on 2003	UP Jal Nigam	2004
16	Status of RURAL Drinking Water Supply schemes of Uttar Pradesh an on 2003	UP Jal Nigam	2004
17	Proposal for deep Groundwater exploration in Ganga Basin, Uttar Pradesh	Central Groundwater Board (CGWB)	
18	Status of Arsenic in Phreatic Aquifer in Parts of Uttar Pradesh	Central Groundwater Board (CGWB)	2004

19	Arsenic Hazards and its mitigation In ground water in parts of Belhari and Baria Blocks of Ballia District, Uttar Pradesh	Central Groundwater Board (CGWB) , Ministry of Water Resources	2005
20	Hydrochemistry of phreatic zone of West-Central part of Uttar Pradesh	Central Groundwater Board (CGWB) , Ministry of Water Resources	2000
21	Status of Water Quality of Phreatic Zone in Uttar Pradesh	Central Groundwater Board (CGWB) , Ministry of Water Resources	1998
22	The Atlas of Indian States	TTK Healthcare Limited	2004
23	Sanitation, Hygiene and Water Supply Project, 2004-2008	UNICEF	2004
24	District Resource Map, Agra, Uttar Pradesh	Geological Survey of India, Northern Region	2001
25	District Resource Map, Allahabad, Uttar Pradesh	Geological Survey of India, Northern Region	2001
26	District Resource Map, Azamgarh, Uttar Pradesh	Geological Survey of India, Northern Region	2001
27	District Resource Map, Ballia, Uttar Pradesh	Geological Survey of India, Northern Region	2001
28	District Resource Map, Etawah, Uttar Pradesh	Geological Survey of India, Northern Region	2001
29	District Resource Map, Ghazipur, Uttar Pradesh	Geological Survey of India, Northern Region	2001
30	District Resource Map, Jaunpur, Uttar Pradesh	Geological Survey of India, Northern Region	2001
31	District Resource Map, Kanpur, Uttar Pradesh	Geological Survey of India, Northern Region	2001
32	District Resource Map, Lucknow, Uttar Pradesh	Geological Survey of India, Northern Region	2001
33	District Resource Map, Pratapgarh, Uttar Pradesh	Geological Survey of India, Northern Region	2001
34	District Resource Map, Rae Bareli, Uttar Pradesh	Geological Survey of India, Northern Region	2001
35	District Resource Map, Sultanpur, Uttar Pradesh	Geological Survey of India, Northern Region	2001
36	District Resource Map, Unnao, Uttar Pradesh	Geological Survey of India, Northern Region	2001
37	District Resource Map, Meerut, Uttar Pradesh	Geological Survey of India, Northern Region	2001