PART V RECOMMENDATIONS

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Chapter 1 Approach to Information, Education and Communication (IEC)

1.1 IEC and Hygiene Promotion

This section recommends activities for information, education, and communication activities (IEC) to encourage an increased demand for safe and clean water and hygienic latrines, and to increase the number of participants in the water supply systems as much as possible. IEC is the key to the financial sustainability of the proposed water supply systems. If people rely too much on subsidies, their self-dependence will not mature.

Inhabitants of the rural areas of the Central Highlands have lacked experience in paying for centralized water supply systems and in maintaining and operating them.. The use of these systems has resulted in improvements in health conditions of the local people, a reduction in time spent for water fetching and an increase in time for productive activities, especially, for women. IEC has been identified as the best method to promote the use of safe and clean water.

Formal networks, i.e. formal meetings, and home visits will be used for IEC. Promoters should be appointed by WSU to implement IEC activities for the promotion of piped water supply.

1.2 Parties Responsible for IEC

The parties responsible for IEC include:

Management Unit of CERWASS/PCERWASS,

CPC,

WSU, and

Promoters.

CERWASS/PCERWASS have decided to establish a Management Unit within the organization to train the local staff for rural water supply systems. The CERWASS/PCERWASS have decided to establish a Management Unit within the organization to train the local staff for rural water supply systems. The Management Unit should be responsible for the financial and technical support for IEC in the rural areas of the Central Highlands. The necessary finance should be earmarked for IEC.

External support (i.e. international cooperation) may be necessary to formulate a model program of IEC and to train the IEC staff of the Unit for the initial stage. It is recommended that the materials developed by DANIDA for IEC be utilized and revised to formulate the model program.

In each commune, promoters should be appointed by the WSU to promote additional connections to the water supply systems. WSU should pay for the promoters with financial support from the CPC/TPC.

Promoters will also co-operate with IEC activities at the commune. Villagers, including health workers, women's union, and teachers may be appointed as promoters if appropriate. People selected as promoters must have the respect of the local people, be able to communicate in the local languages, and know the benefits of safe and clean water. The Management Unit of PCERWASS should train promoters in the model program to become familiar with IEC.

1.2.1 Necessary Information for IEC

Necessary information to be distributed includes the following:

1) **Objectives** of the town meeting
2) The **water supply plan** including the drawings, project cost, maintenance cost and its implementation schedule
3) The **water quality data of the present water sources** and the benefits of safe and clean water
4) **Benefits** of safe and clean water should be emphasized using pictures and drawings
5) **Costs** for house connections and the water charge
6) **Self support of the water supply system by** the local people
7) **Operation and maintenance procedures for public taps**

Objectives of town meeting

The most important information for meetings is to explain the objectives of the water supply schemes. These will be outlined to the local participants in the local languages by the promoters. It is necessary to explain: 1) that local people will benefit from the water supply system, and 2) the local people will be responsible for the management of the piped water supply system. The objectives should be repeated often during meetings.

The water supply plan

The second of type information to be provided is about the water supply plan itself. The information in the plan includes:

- CERWASS/PCERWASS has to be executed the plan;
- the locations of the explored wells and the main and secondary pipes;
- the amount of construction cost and O&M cost;
- the method of providing house connections;
- the time schedule of construction; and
- the safe well yield of the explored wells.

The structure of the explored well will be visually shown to the local users using pictures and drawings because it will further encourage the promotion of safe and clean water. The 10 m concrete and/or clay sealing at the top of the explored well will protect the water source from contamination by surface water.

Water quality

Health hazards, for example, diarrhea, trachoma, etc, from contaminated water will be explained. The importance of hygienic education such as appropriate latrine arrangement and cleaning of hands will also be explained.

The water quality of the present water sources will be explained to show the improved health benefits of using piped water (safe and clean). A simple table showing the water quality of the existing shallow dug wells (or surface water) compared to that of the explored (deep) well will be presented. Understanding the difference between the water quality in the deep well and the existing dug wells (or springs) encourages the promotion of safe and clean water. The comparison of **coliform** (an indicator of micro-organism contamination) between different water sources makes a difference to the local users. The effect of iron and/or manganese removal will also be explained.

Benefits of safe and clean water

The benefits of providing safe and clean water will be explained, including of the positive effects on health and reduction in workload and time, especially for women and children who currently fetch water from springs or dug wells. This information should be emphasized in the ethnic minority communes.

The explanation shall be modified to suit the social and natural condition of each commune.

Costs of the Project

Promoters need to explain the costs for the project, including construction cost, O&M cost and house connection cost. They also need to explain who shall pay each part of the project cost.

After explaining this information, the local people will have a much better understanding about the costs of a house connection and ongoing water charges.

Responsibilities of the local users

It is necessary to explain that the water charge will include the costs for operation and maintenance, and reinvestment. To minimize O&M costs, the following activities are necessary:

- Protection of the groundwater sources by keeping the environment of the wells clean;
- Maintain in good condition for their water meter or taps
- Regularly payment of bills for water used

Public taps

Public taps have been adopted in the design for many of the target ethnic minority villages during phase 1 (up to 2010). However, the operation and maintenance of public taps is complicated, because the tariff collection for public taps is more difficult than that for house connections. Information on how to collect water tariffs among users should be provided if necessary.

1.3 IEC Campaigns

Promoters appointed by WSU will implement IEC campaigns. These include the formal networks, town meetings, face-to-face communication such as home visit, and also local information media such as radio network and loudspeaker.

1.3.1 Formal Meeting

Formal meetings include regular town/commune meetings, meetings at health centers, meetings held by farmer's union, women's union and youth union. In particular, a **town meeting of the people's committee is the most common and easiest to organise**. The key points to follow for formal meetings are as follows:

1) A formal meeting is the starting point for IEC. IEC activities should start **4-5 months before the completion of construction works**.
2) Necessary information should be clearly identified and given to participants.
3) The **health center** (CHC) should be invited to the meeting and asked to co-operate.
4) **Tell simple and clear messages**.
5) A polite, and friendly **attitude** towards the local people is essential.
6) **Leaflets** and simple questionnaires should be provided after the meeting.

Most of the anticipated users of the piped water supply systems will be farmers. They would pay for a house connection by the income from a harvesting. IEC activities should be initiated (4 to 5 months) before the harvest season.

Cooperation from the health center is essential. The objective of the piped systems should be explained to the local people. In most cases, health workers are respected, and the local people follow their advice.

A gentle and polite attitude of promoters makes the local people comfortable and encourages the use of safe and clean water. As informal communication networks among family members, peers, and neighbours are essential for IEC, the attitude of promoters, whether friendly or arrogant, will quickly become known to all members of the communities.

As it is difficult to remember all details of spoken information at the meeting, simple leaflets will be prepared and distributed after the meeting. All the necessary information at the meeting will be printed in the Kinh and/or minority languages, as

UNICEF emphasizes the importance of the combination of printed materials such as leaflets together with the formal communication networks.

1.3.2 Face-to-face Communication

Home visits of exceptional case when it is required will follow the formal meeting. To promote house connections, promoters need to visit users' houses. Usually, home visits will be undertaken by community leaders (e.g. women's union, farmers' union, youth union), and it is recommended they accompany promoters to explain the necessary information.

In addition to the information elaborated above, the benefits of the provision of safe and clean water should be emphasized during the home visits. The most notable benefits of the use of safe and clean water are the promotion of health and the reduction in workload and time for water transportation. Illustrating with examples will help the local people more easily understand the benefits.

1.3.3 Local media

The local radio network and loud speakers are also useful if available. In the rural areas, communes/towns usually have access to the local radio network and loud speakers. The necessary information mentioned above can be broadcast on the radio in the local languages (Kinh and ethnic minorities' languages). Promoters need to contact CPC/TPC to provide the information outlined above.

1.4 Schedule of IEC and Promotors' Work

In order to ensure the effective IEC activities by promotors, a tentative schedule is shown in Table 1.1. The arrangements for staffing and their salaries should be discussed with PCERWASS and CPC/TPC or international donors if available. IEC activities are estimated as longer for the difficult communes by the construction stages. It is recommended to take a counter measurement such as long and periodical promoting to the difficult communes, and demonstrating the successful pilot model to the users.

Table 1.1 Tentative schedule for Soft Component activities

	Descriptions	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	M/M
A	**Overall Management Team**											
1	Team Leader											96
2	Capacity building specialist											36
3	Administrator											96
B	**Provincial and Commune Team**											
B1	Implementation Period of 5-system											
	(K2-3, G3-1, G2, D1, D2)					(construction)						
1	Capacity building specialist											12
2	IEC activities by Promoters											24
B2	Implementation Period of 4-system											
	(K4-1, G1, G4-1, D3-1, D6)							(construction)				
1	Capacity building specialist											12
2	IEC activities by Promoters											48
B3	Implementation Period of 5-system											
	(K3-1, G5-1, G6-1, D4-1)									(construction)		
1	Capacity building specialist											12
2	IEC activities by Promoters											72
B4	Implementation Period of 7-system											
	(K1-1, K2-1, G7-1, D3-2, D4-2, D5-1, D7)									(construction)		
1	Capacity building specialist											12
2	IEC activities by Promoters											96

Table 1.2 Necessary Activities for Target Communes

K-1, Bo Y commune, Ngoc Hoi district		
Weaknesses	**Strengths**	**Necessary Activities**
▪ Living standard is very low. ▪ About 20% suffer from typhoid. ▪ 1/4 believes that springs are cleaner than groundwater, and about 43% drink surface water. ▪ The quantity of water is insufficient in the dry season (60%). ▪ 2/3 do not use a latrine, and 20% rarely collect garbage.	▪ The influence of CPC and village chiefs is strong. ▪ The Ca Dong and Kinh live together in the villages.	▪ Overall IEC campaigns are necessary with the help of CHC, including the promotion of the use of deep groundwater, hygienic latrines, hand washing, and garbage collection. ▪ CHC has to hold village meetings with the help of village chiefs for minority communities. ▪ Intensive home visits by health workers and WU will be necessary.
▪ **K-2, Dak Su commune, Ngoc Hoi district**	▪	
Weaknesses	**Strengths**	
▪ Living standard is very low, and villages are very scattered and difficult to access. ▪ More than 40% suffer from typhoid. ▪ WU is not active at all. ▪ The quantity of water is insufficient in the both seasons (83%, 47%). ▪ More than 80% do not use a latrine, and 27% rarely collect garbage. ▪ Hand washing is not well practiced.	▪ The influence of CPC and village chiefs is strong.	
K-3, Dak Ui commune, Dac Ha district	▪	
Weaknesses	**Strengths**	
▪ Living standard is very low. ▪ About 36% suffer from typhoid, and 18% suffer from cholera. ▪ The quantity of water is insufficient in the dry season (54%). ▪ Only 7% use a latrine, and about 18% rarely collect garbage. ▪ Latrines are located close to dug wells.	▪ IEC activities have been carried out through the pilot model project. ▪ The influence of CPC and village chiefs is strong. ▪ CHC' awareness is relatively high, and minority-oriented health care is carried out.	
▪ **K-4, Dak Hiring commune, Dac Ha district**	▪	
Weaknesses	**Strengths**	
▪ About 24% suffer from typhoid, and 48% suffer from diarrhea. ▪ 1/3 still believes that surface water is cleaner than groundwater. ▪ The quantity of water is insufficient in the dry season (31%). ▪ Only 10% use a latrine, and about 1/3 rarely collect garbage. ▪ Hand washing is not well practiced.	▪ The influence of CPC and village chiefs is strong. ▪ CHC' awareness is relatively high, and a map is prepared to show the health conditions of the local people.	
K-5, Sa Nghia commune, Sa Thay district		
Weaknesses	**Strengths**	**Necessary Activities**
▪ About 53% suffer from typhoid. ▪ The quantity of water is insufficient in the dry season (63%). ▪ Only 15% use a latrine for defecation.	▪ The influence of CPC is very strong. ▪ The commune is Kinh-dominated.	▪ Deep groundwater development, and improvement of dug wells are urgent. ▪ IEC campaigns for appropriate environment of dug wells, and latrine promotion are necessary.
▪ K-6, Chu Hreng commune, Kon Tum city	▪	
Weaknesses	**Strengths**	
▪ About 27% suffer from typhoid. ▪ The quantity of water is insufficient in the dry season (53%). ▪ Only 20% use a latrine for defecation.	▪ Health workers are influential in the Ba Na communities. ▪ The Ba Na people live together with the Kinh people in the same villages.	

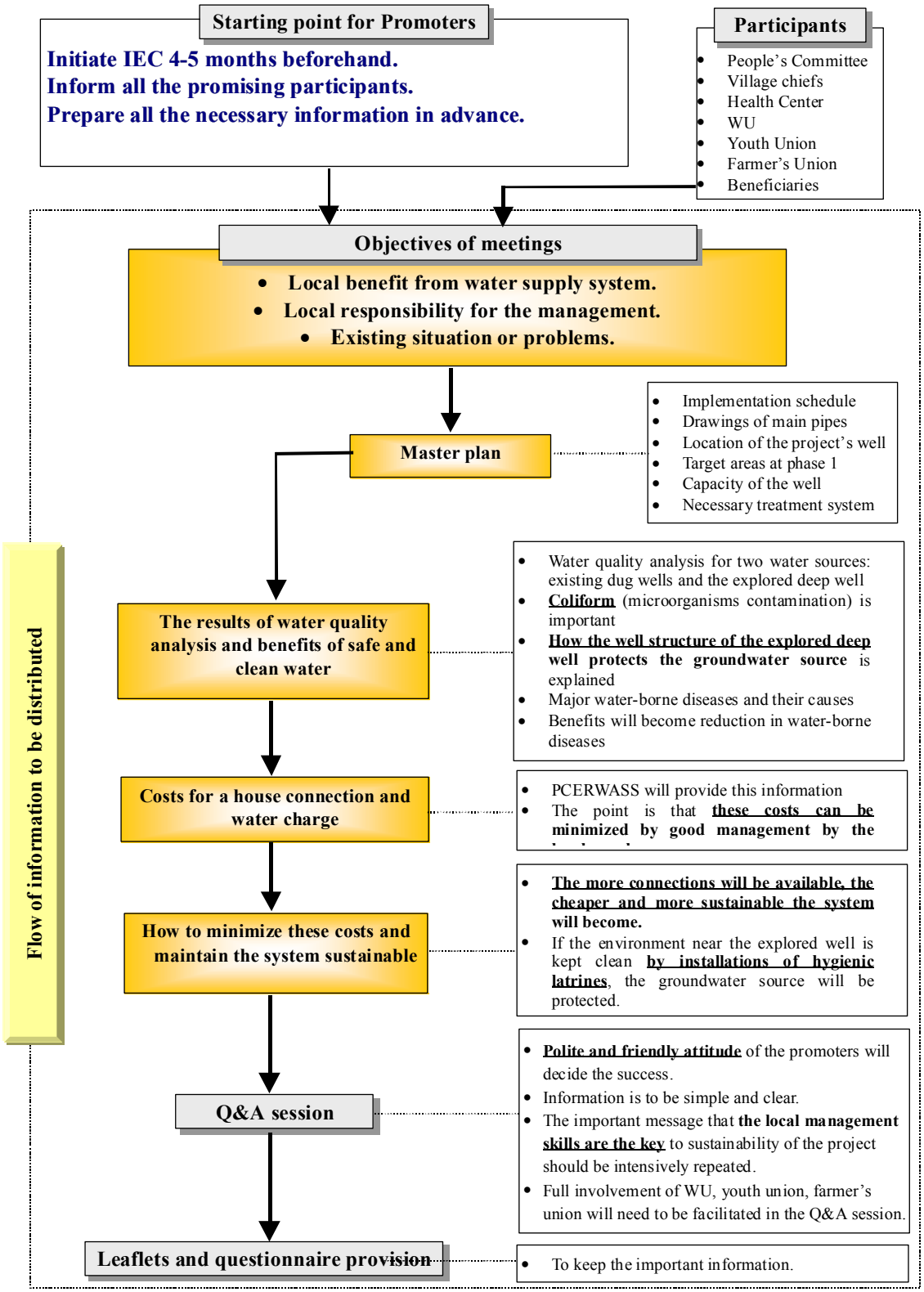


Figure 1.1 Information Flow at Town Meeting for Well-off Communities

Chapter 2 Other Recommendations

2.1 Short-term Measures

It would be very important to have the WSUs properly established through general regulations adopted by the respective CPCs. The articles should include provisions on the institutional structure of the WSU, rights and responsibilities of the WSU, its staff members and clients, management of public taps, and the implications of violating regulations. The regulations would clarify the roles of various parties and authorize the WSU to take measures in case of non-payment and vandalism K3-1 would need closer follow-up and support than G2, but Kon Tum PCERWASS itself would need considerable capacity building. There is no easy solution. The support should come from a higher level of the government hierarchy.

Much of the necessary IEC could not be carried out in the short time prior to and during the construction of the schemes. There is a great need to promote IEC.

2.2 Long-term Measures

One of the most important aspects of successful implementation will be to give time for the communes to be ready for the investment. In practice this can take place by phasing the implementation such that the first stage of physical implementation will commence in about five of the communes (those with the most potential). Simultaneously, extensive IEC activities will need to be carried out in the other communes to build their capacity to implement the project in later stages.

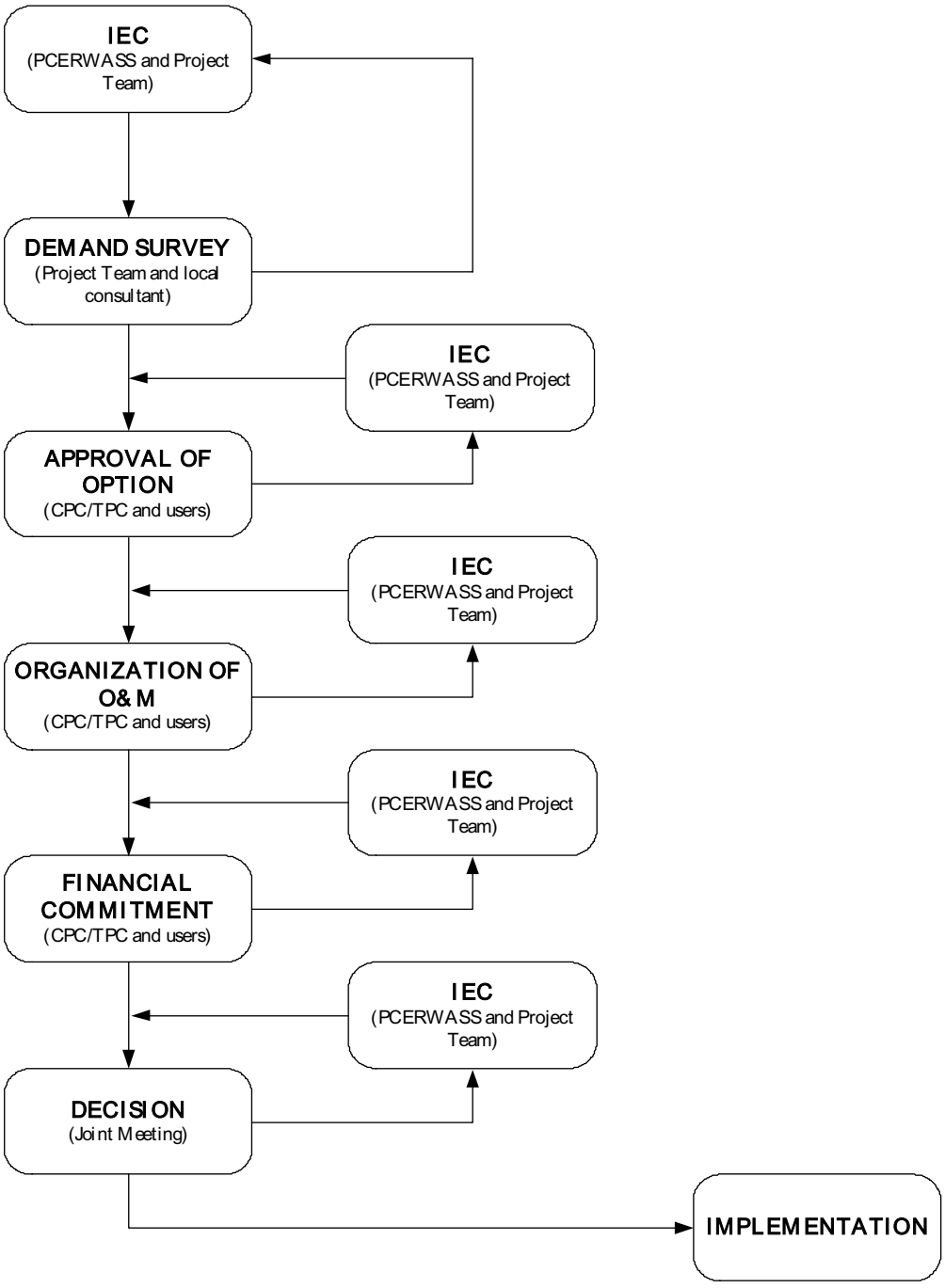


Figure 2.1 Flowchart of Community Sensitivity for Project Implementation

2.3 Preconditions for Construction

2.3.1 Central Level

Objectives:

- Adequate capacity of all relevant PCERWASS to assume responsibilities in accordance with NRWSS and the Project; and
- Assurance of timely and efficient IEC and support to be provided by PCERWASS.

Preconditions for decision on scheme construction:

- Proven capacity of PCERWASS to coordinate and support IEC, training, follow-up and long-term support;
- Secure budget allocations to relevant PCERWASS for IEC activities, training, follow-up and long-term support; and
- Appropriate IEC and training materials and management and O&M manuals made available by PCERWASS for distribution to Project communes

2.3.2 Provincial level

Objectives:

- Capacity to coordinate and support IEC; and
- Capacity to provide training (courses and on-the-job) to WSUs and board members, to follow-up their performance and provide them with long-term support.

Preconditions for the decision on scheme construction:

- Adoption of and commitment to NRWSS;
- Secured budget for IEC activities, training, follow-up and long-term support (from CERWASS/PCP); and
- Proven capacity to provide support to CPC/TPCs, and WSUs.

2.3.3 Commune Level

Objectives:

- Generation of demand for improved water supply (health, convenience, status,) through education and "social marketing";
- Introduction of option(s) available, their impacts and related costs, rights and duties; and
- Introduction of Project concept: conditions, procedures, and contribution requirements

Preconditions for decision on scheme construction:

- Adequate demand for improved water supply: at least 35% of households to be willing (and able) to pay for water on a monthly basis that initially covers the cost of one cubic meter *per capita* per month at a tariff calculated to cover all costs in the long term;
- Acceptance of the option(s) provided by the Project: the location of facilities accepted by the community members, the service level and costs known and accepted by the users, and the decision on inclusion/exclusion of public taps made in consultation with the users;
- Management and operation of the system organized: WSU and its board established (the latter includes user representation), regulations adopted, rights and responsibilities of WSU and users defined and accepted by both parties, relevant documentation formats adopted, user groups of possible public taps established; and
- Measurable commitment to sustain the system[1]: households to be connected to have deposited at least 50% of the connection cost, user groups of public taps to have deposited at least 10% of the public tap cost, and CPC/TPC to have deposited sufficient amount to cover i) at least the salaries/wages of two WSU staff members for their participation in construction for the entire construction period, and ii) to cover the cost of necessary O&M tools.

[1] On the other hand, the Project has to assure the community of the quality of the improved water supply. If the service level (including water quality) does not comply with what has been advertised, deposits shall be returned.

2.4 Necessity of Subsidy from Government

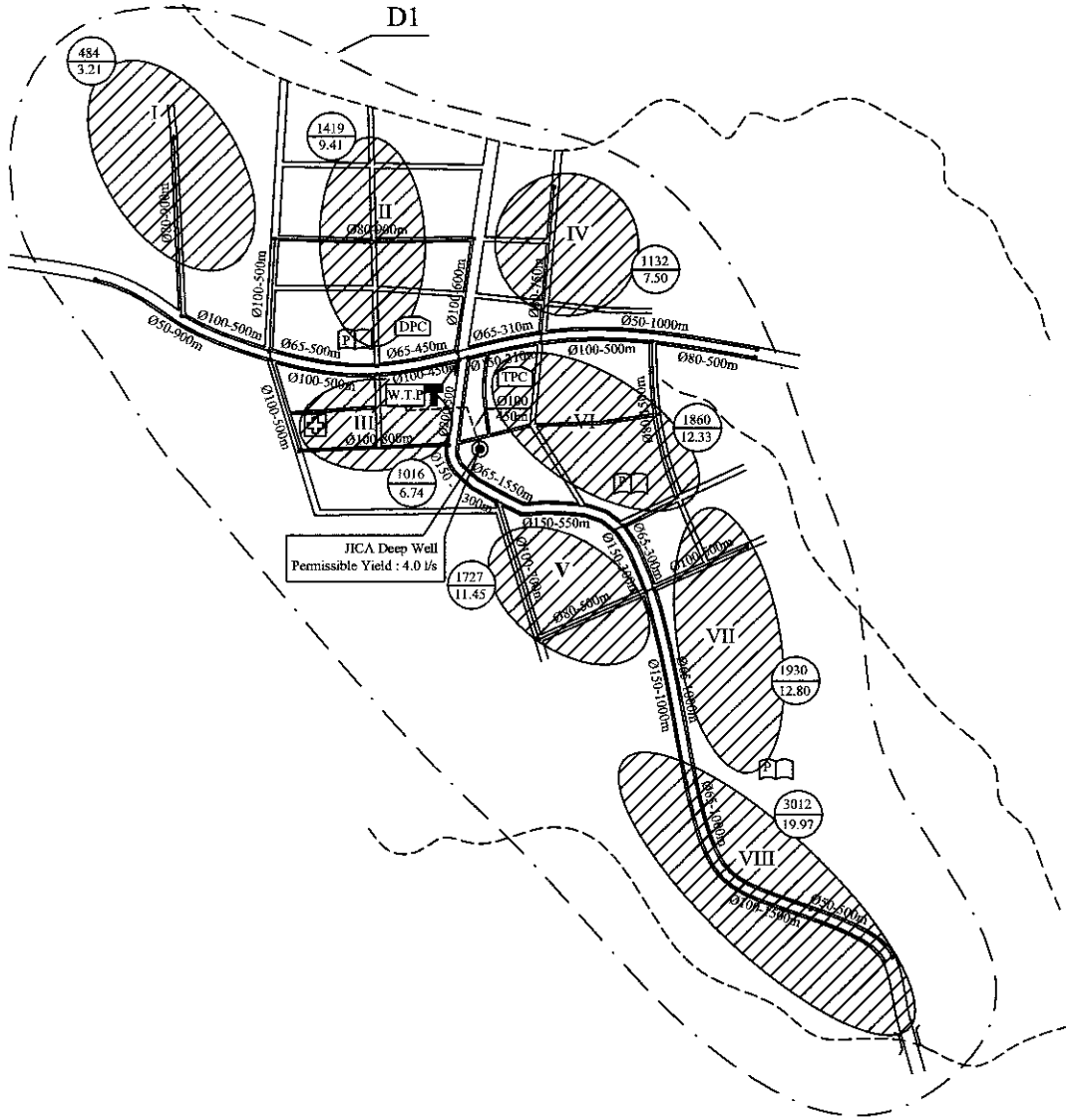
Because of the rather unstable and difficult management of the small sized rural water supplies, it is recommended that support, by way of subsidy, be provided by the Vietnam government.

2.5 Sustainable Operation of Two Pilot Models

It is recommended that the two pilot models constructed by JICA study team should be properly and sustainably operated as a model case in the rural area in the central highlands and also as a model for the entire rural area of Vietnam.

Appendix 1

Water Supply Systems in the 9 Systems (Tables of Facilities in Each System)



OPTION 1

- Distance between the deep well and existing electric power line is approx. 100m
- Some elevations and pipe lengths are preliminary
- Secondary pipes are not shown in drawing

No.	DIAMETER (mm)	LENGTH (m) 2010	LENGTH (m) 2020	REMARK
1	150 - 200	3500		* Secondary pipes : - 3200m along main road - 3800 along road to VIII - 6000 (1000/districts)
2	80 - 125	12500	1100	
3	25 - 65	21000	1900	
	Total	37000	3000	

LEGEND:

- Reservoir with Elevated Tower
- Well Pumping Station
- W.T.P Water Treatment Plan
- Booster Pumping Station
- Supplied Area under 2010
- Supplied Area under 2020
- a/b Population in 2010 / Max. Hourly Water Demand
- Raw Water Pipeline
- Reuse Existing Pipeline
- Pipeline under 2010
- Pipeline under 2020

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Draw.Name

KRONG NANG NETWORK DIAGRAM _ D1 - OPTION 1

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JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

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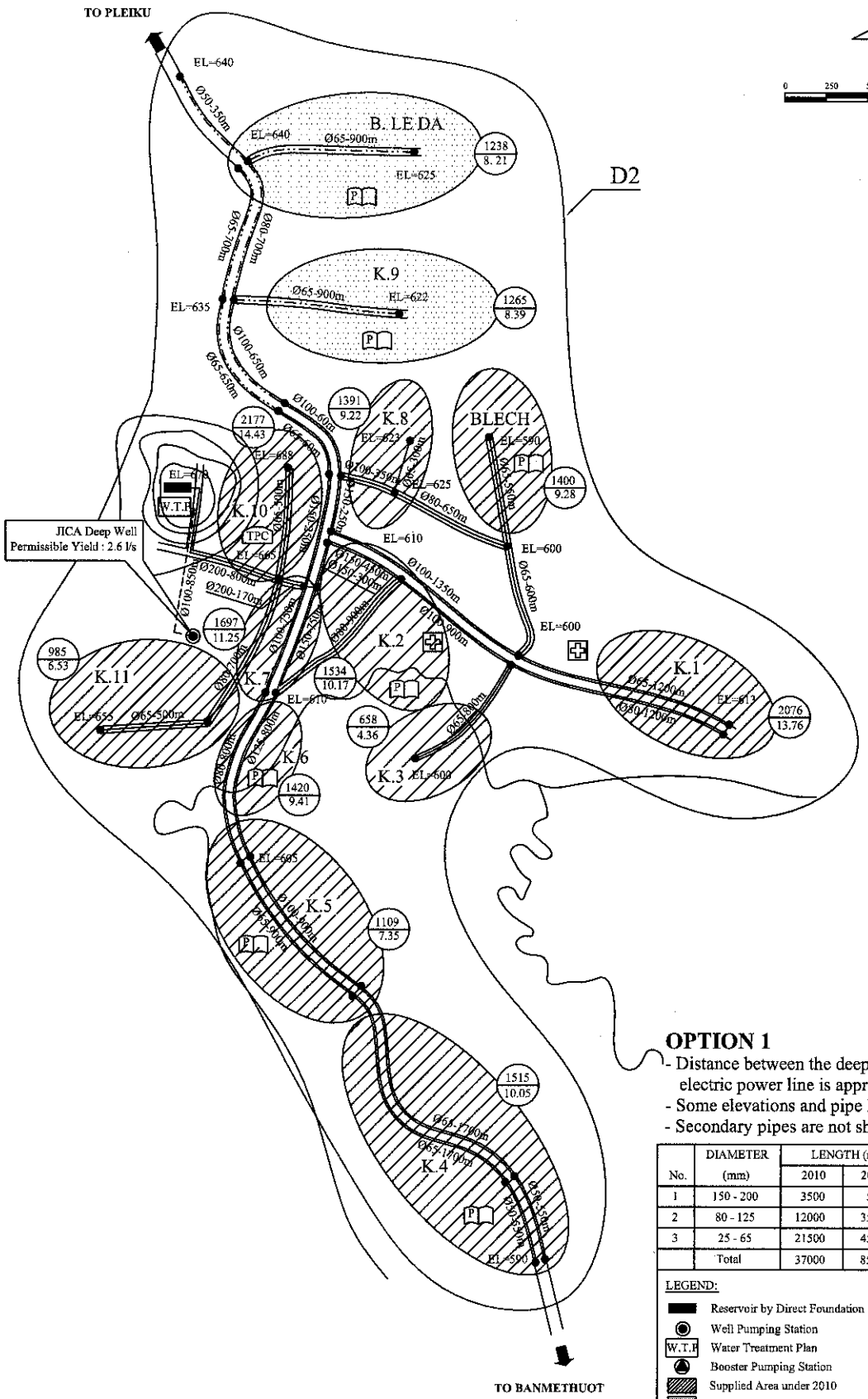

OPTION 1

- Distance between the deep well and existing electric power line is approx. 300m
- Some elevations and pipe lengths are preliminary
- Secondary pipes are not shown in drawing

No.	DIAMETER (mm)	LENGTH (m) 2010	LENGTH (m) 2020	REMARK
1	150 - 200	3500	500	Secondary pipes : - 4000m along road - 6000m (1000m/Village)
2	80 - 125	12000	3500	
3	25 - 65	21500	4500	
	Total	37000	8500	

LEGEND:

- Reservoir by Direct Foundation
- Well Pumping Station
- W.T.P Water Treatment Plan
- Booster Pumping Station
- Supplied Area under 2010
- Supplied Area under 2020
- a / b Population in 2010 / Max. Hourly Water Demand
- Raw Water Pipeline
- Reuse Existing Pipeline
- Pipeline under 2010
- Pipeline under 2020

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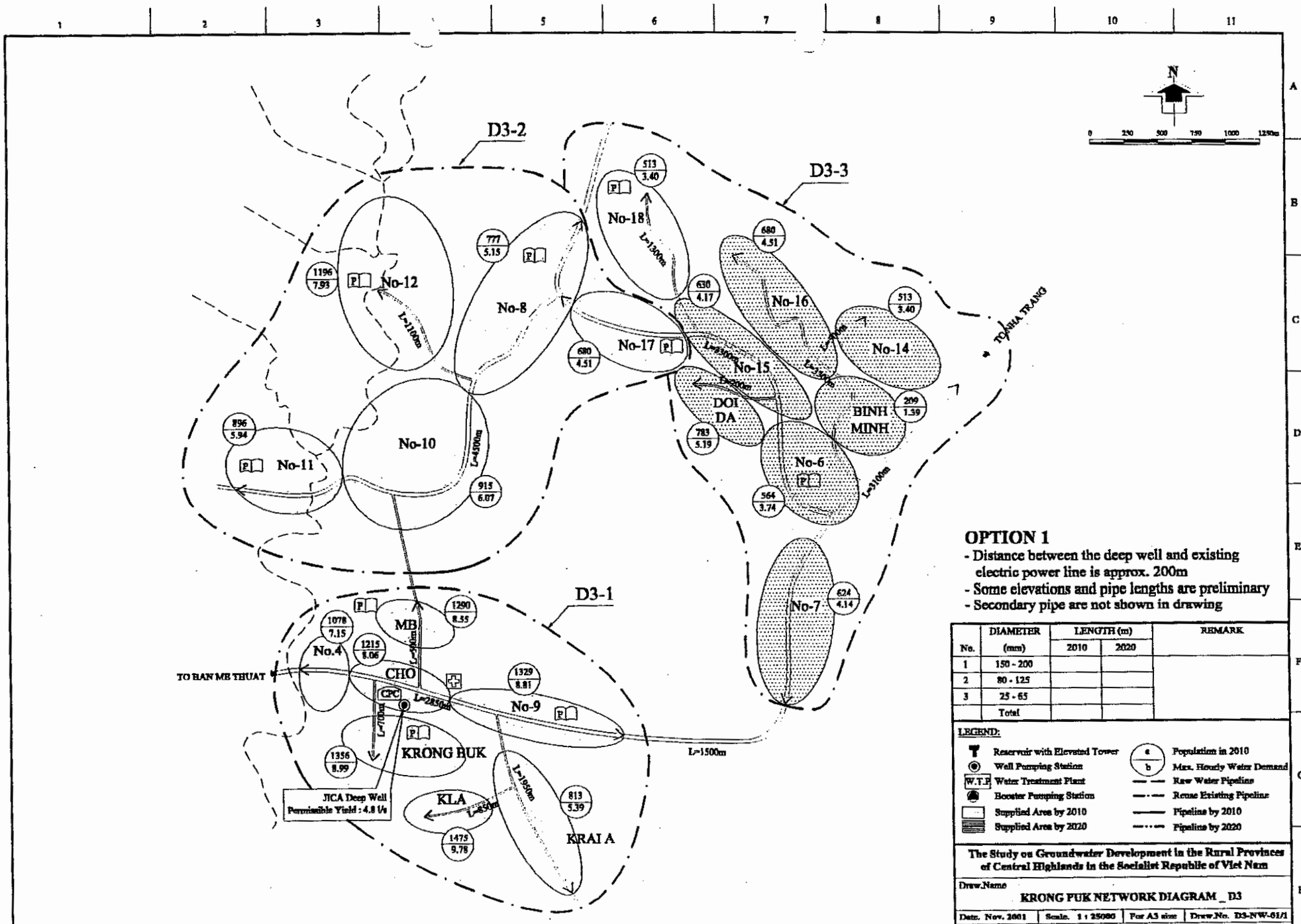

OPTION 1

- Distance between the deep well and existing electric power line is approx. 200m
- Some elevations and pipe lengths are preliminary
- Secondary pipe are not shown in drawing

No.	DIAMETER (mm)	LENGTH (m) 2010	LENGTH (m) 2020	REMARK
1	150 - 200			
2	80 - 125			
3	25 - 65			
	Total			

LEGEND:

- Reservoir with Elevated Tower
- Well Pumping Station
- W.T.P Water Treatment Plant
- Booster Pumping Station
- Supplied Area by 2010
- Supplied Area by 2020
- a / b — Population in 2010 / Max. Hourly Water Demand
- Raw Water Pipeline
- Reuse Existing Pipeline
- Pipeline by 2010
- Pipeline by 2020

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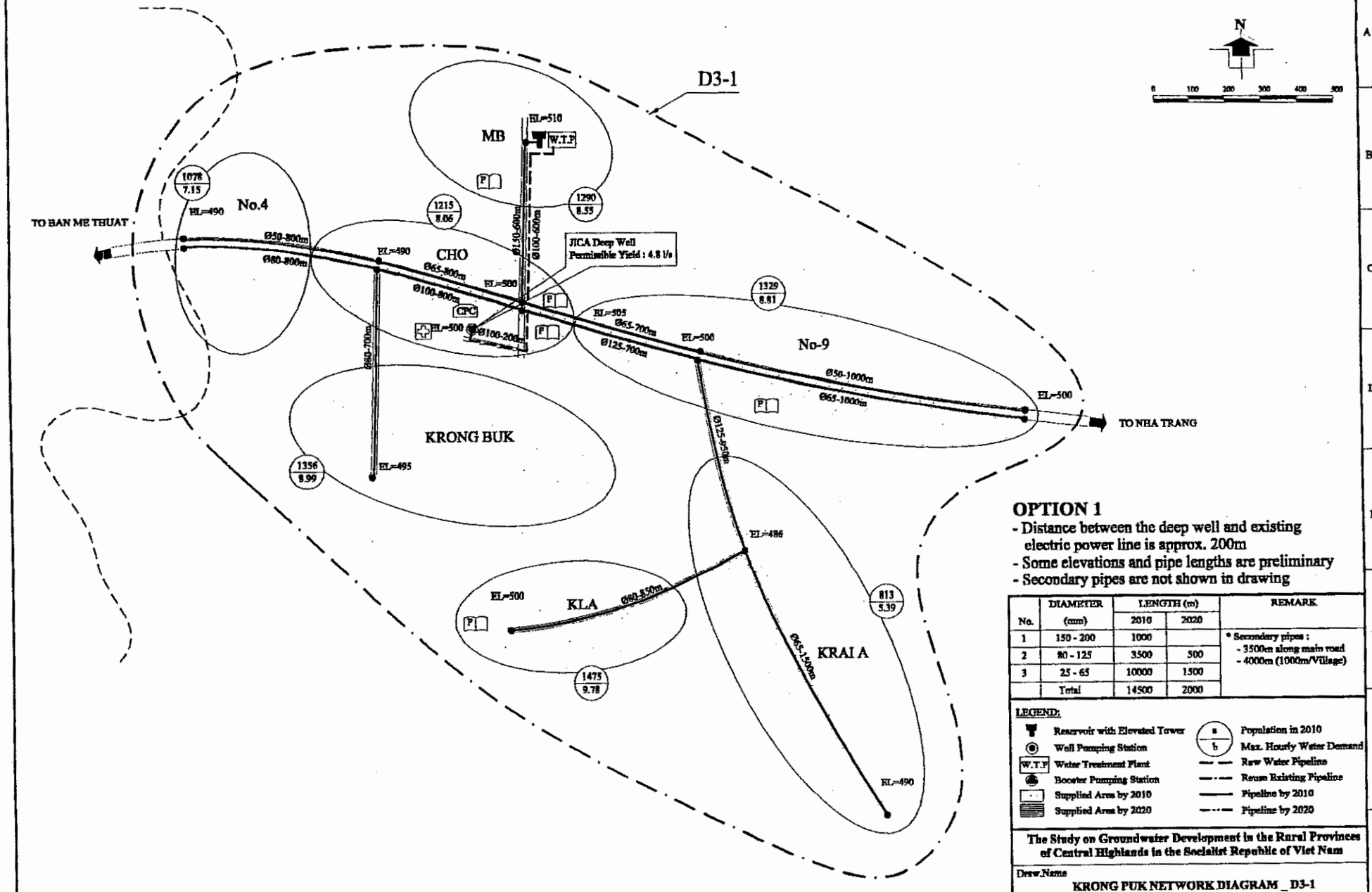

OPTION 1

- Distance between the deep well and existing electric power line is approx. 200m
- Some elevations and pipe lengths are preliminary
- Secondary pipes are not shown in drawing

No.	DIAMETER (mm)	LENGTH (m) 2010	LENGTH (m) 2020	REMARK
1	150 - 200	1000		* Secondary pipes : - 3500m along main road - 4000m (1000m/Village)
2	80 - 125	3500	500	
3	25 - 65	10000	1500	
	Total	14500	2000	

LEGEND:

- Reservoir with Elevated Tower
- Well Pumping Station
- W.T.F Water Treatment Plant
- Booster Pumping Station
- Supplied Area by 2010
- Supplied Area by 2020
- a / b Population in 2010 / Max. Hourly Water Demand
- Raw Water Pipeline
- Reuse Existing Pipeline
- Pipeline by 2010
- Pipeline by 2020

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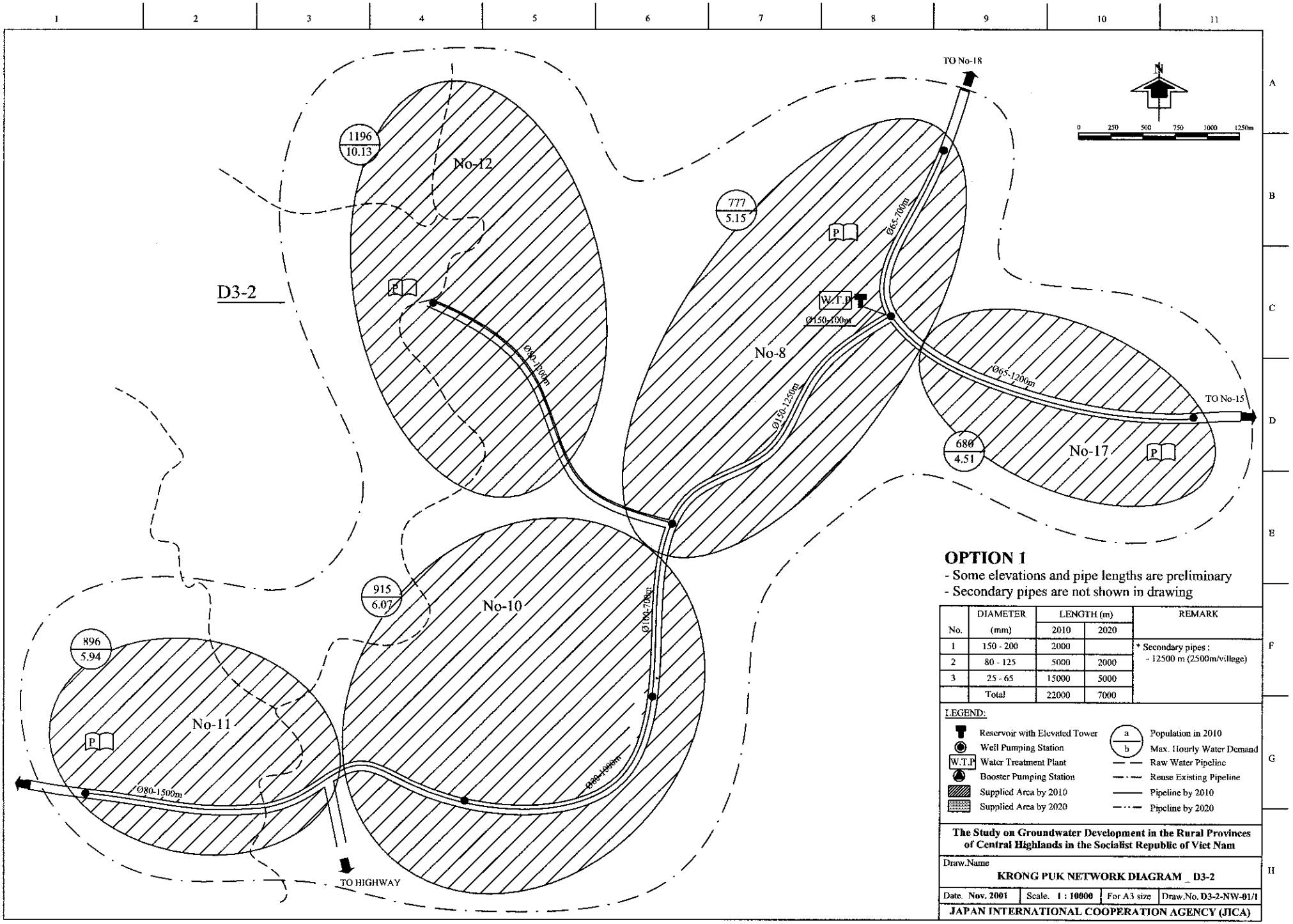

OPTION 1

- Some elevations and pipe lengths are preliminary
- Secondary pipes are not shown in drawing

No.	DIAMETER (mm)	LENGTH (m) 2010	LENGTH (m) 2020	REMARK
1	150 - 200	2000		* Secondary pipes : - 12500 m (2500m/village)
2	80 - 125	5000	2000	
3	25 - 65	15000	5000	
	Total	22000	7000	

LEGEND:

- Reservoir with Elevated Tower
- Well Pumping Station
- W.T.P Water Treatment Plant
- Booster Pumping Station
- Supplied Area by 2010
- Supplied Area by 2020
- a / b Population in 2010 / Max. Hourly Water Demand
- Raw Water Pipeline
- Reuse Existing Pipeline
- Pipeline by 2010
- Pipeline by 2020

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Draw.Name

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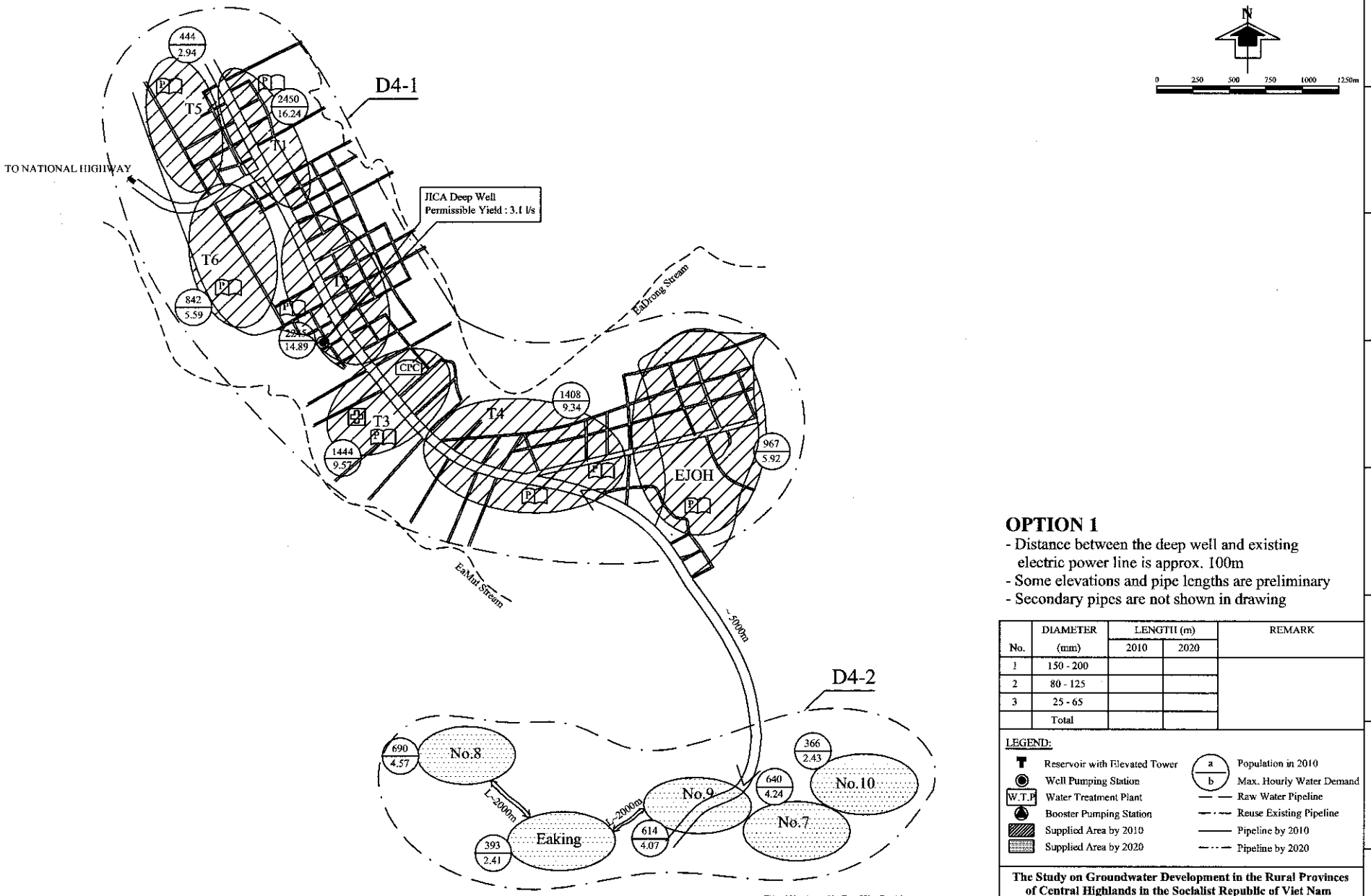

T1= KlatA + KlatB + KlatC +Alc
T2= H'Nc + Trap + Phico
T3= TungKrak + Dbu
T4= EajohA + EajohB + SingA + SingB +SingC

OPTION 1

- Distance between the deep well and existing electric power line is approx. 100m
- Some elevations and pipe lengths are preliminary
- Secondary pipes are not shown in drawing

No.	DIAMETER (mm)	LENGTH (m) 2010	LENGTH (m) 2020	REMARK
1	150 - 200			
2	80 - 125			
3	25 - 65			
	Total			

LEGEND:

- Reservoir with Elevated Tower
- Well Pumping Station
- W.T.P Water Treatment Plant
- Booster Pumping Station
- Supplied Area by 2010
- Supplied Area by 2020
- a / b Population in 2010 / Max. Hourly Water Demand
- Raw Water Pipeline
- Reuse Existing Pipeline
- Pipeline by 2010
- Pipeline by 2020

The Study on Groundwater Development in the Rural Provinces of Central Highlands in the Socialist Republic of Viet Nam

Draw.Name

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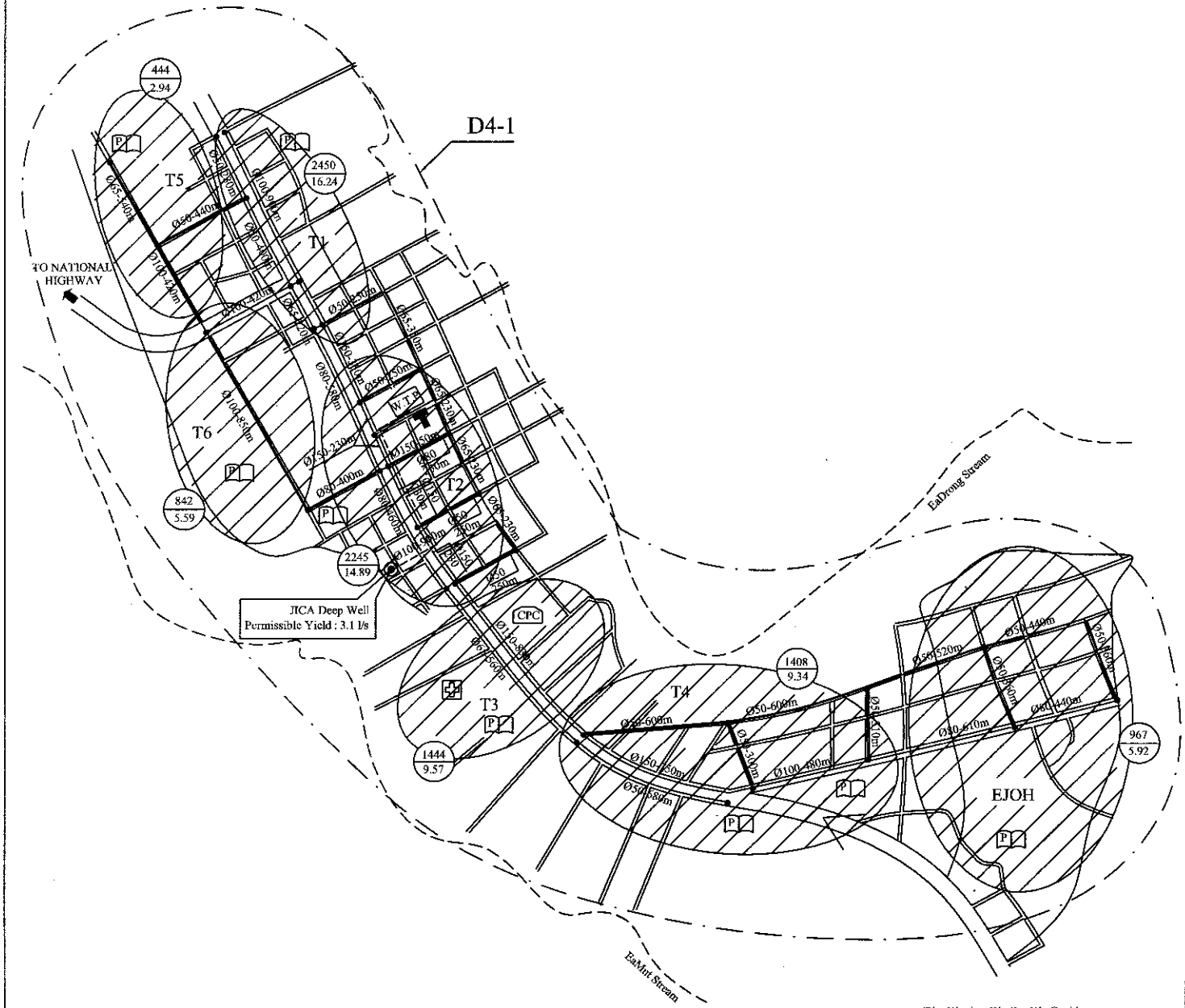
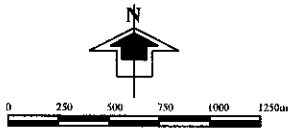




OPTION 1

- Distance between the deep well and existing electric power line is approx. 100m
- Some elevations and pipe lengths are preliminary
- Secondary pipes are not shown in drawing

No.	DIAMETER (mm)	LENGTH (m) 2010	LENGTH (m) 2020	REMARK
1	150 - 200	3000		* Secondary pipes : - 5000m along main road - 3000m (1000m/community)
2	80 - 125	6500	1000	
3	25 - 65	17000	2000	
	Total	26500	3000	

LEGEND:

- Reservoir with Elevated Tower
- Well Pumping Station
- W.T.P Water Treatment Plant
- Booster Pumping Station
- Supplied Area by 2010
- Supplied Area by 2020
- a/b Population in 2010 / Max. Hourly Water Demand
- Raw Water Pipeline
- Reuse Existing Pipeline
- Pipeline by 2010
- Pipeline by 2020

The Study on Groundwater Development in the Rural Provinces of Central Highlands in the Socialist Republic of Viet Nam

Draw.Name

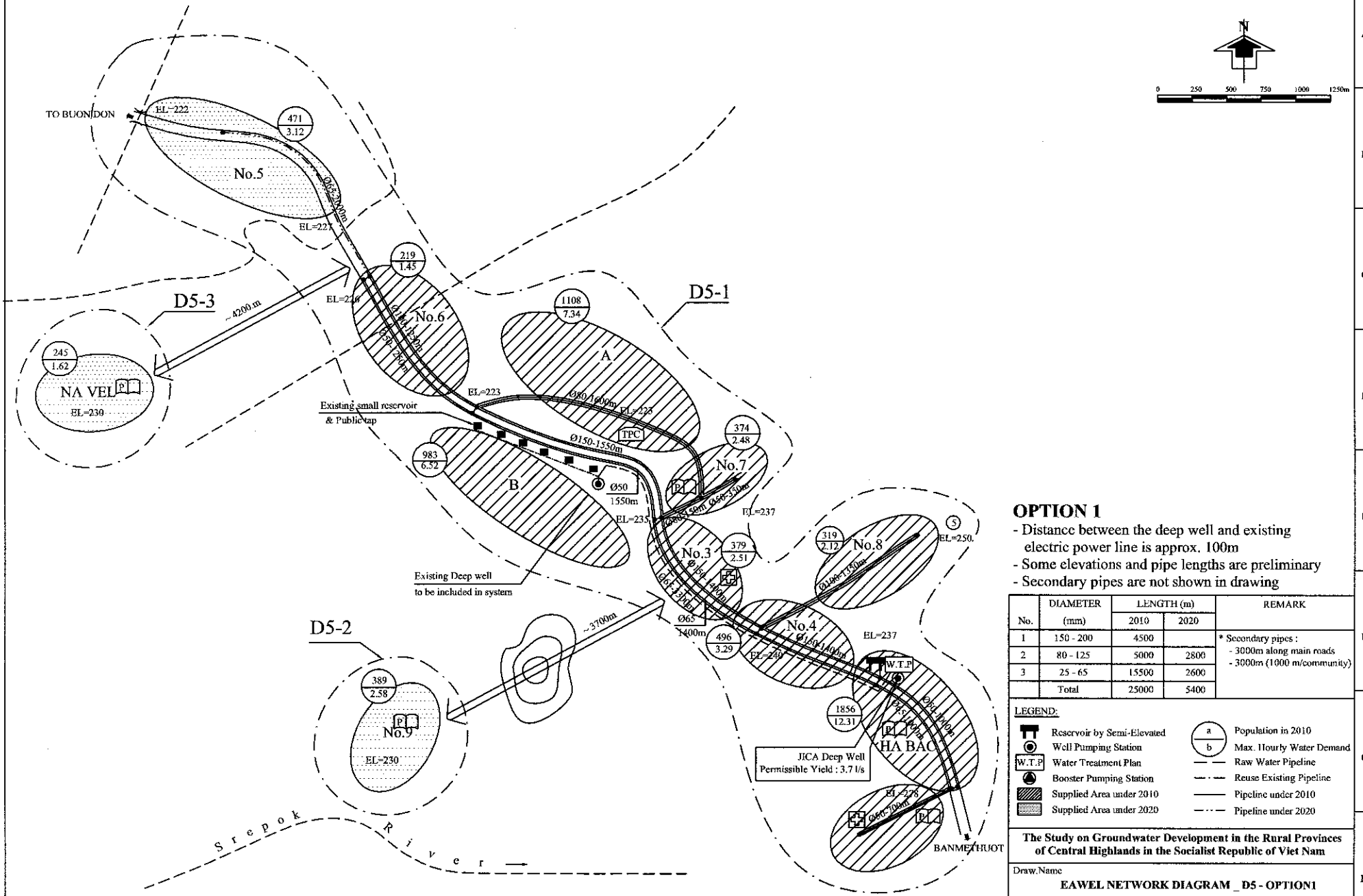
EA DRONG NETWORK DIAGRAM _ D4-1 - OPTION1

Date. Nov. 2001	Scale. 1 : 20000	For A3 size	Draw.No.D4-1-NW-01/1

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

CAD File : D4-1-NW-01-1.DWG

Format A3



OPTION 1

- Distance between the deep well and existing electric power line is approx. 100m
- Some elevations and pipe lengths are preliminary
- Secondary pipes are not shown in drawing

No.	DIAMETER (mm)	LENGTH (m) 2010	LENGTH (m) 2020	REMARK
1	150 - 200	4500		* Secondary pipes : - 3000m along main roads - 3000m (1000 m/community)
2	80 - 125	5000	2800	
3	25 - 65	15500	2600	
	Total	25000	5400	

LEGEND:

- Reservoir by Semi-Elevated
- Well Pumping Station
- W.T.P Water Treatment Plan
- Booster Pumping Station
- Supplied Area under 2010
- Supplied Area under 2020
- a / b Population in 2010 / Max. Hourly Water Demand
- Raw Water Pipeline
- Reuse Existing Pipeline
- Pipeline under 2010
- Pipeline under 2020

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Draw.Name

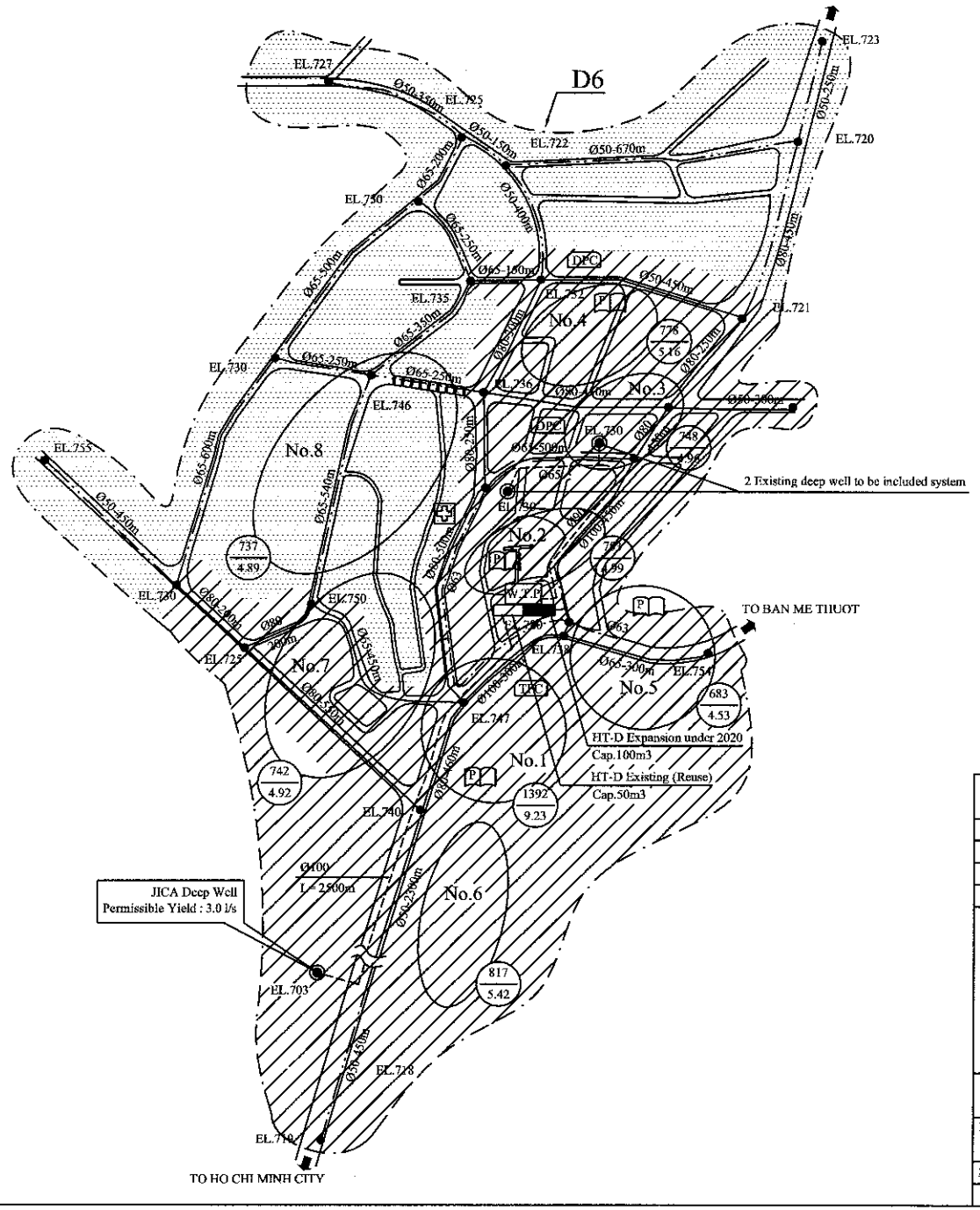
EAWEL NETWORK DIAGRAM _ D5 - OPTION1

Date. Nov. 2001	Scale. 1 : 25000	For A3 size	Draw.No. D5-NW-01/1

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

CAD File : D5-NW-01-1.DWG

Format A3



OPTION 1

- Distance between the deep well and existing electric power line is approx. 50m
- Some elevations and pipe lengths are preliminary
- Secondary pipes are not shown in drawing

No.	DIAMETER (mm)	LENGTH (m) 2010	LENGTH (m) 2020	REMARK
1	150 - 200	500		* Secondary pipes : - 7000m along main roads - 3000m other districts
2	80 - 125	8500	1500	
3	25 - 65	15500	8500	
	Total	24500	10000	

LEGEND:

- Reservoir by Direct Foundation
- Well Pumping Station
- W.T.P Water Treatment Plan
- Booster Pumping Station
- Supplied Area under 2010
- Supplied Area under 2020
- a/b Population in 2010 / Max. Hourly Water Demand
- Raw Water Pipeline
- Reuse Existing Pipeline
- Pipeline under 2010
- Pipeline under 2020

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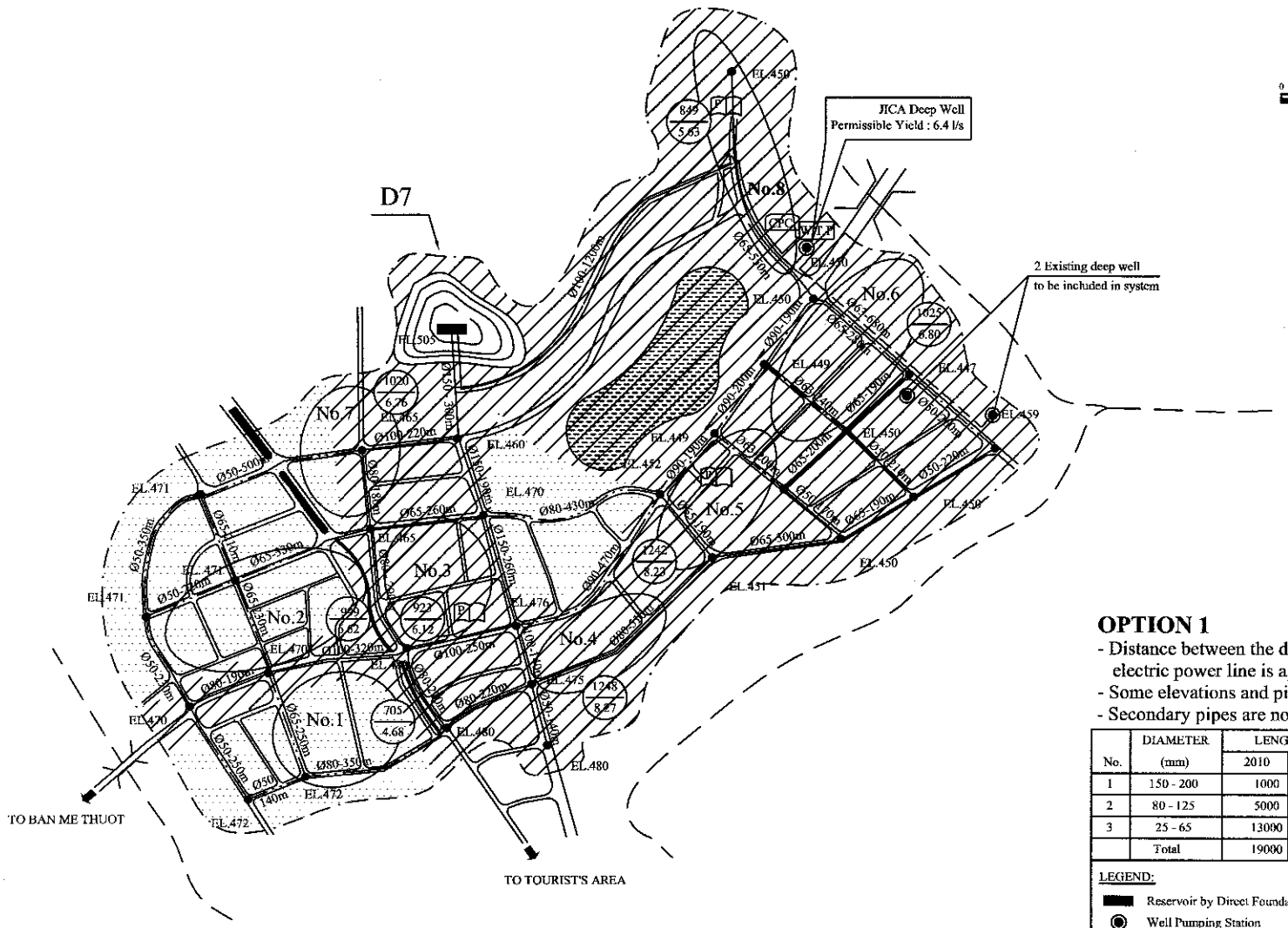
Draw.Name: **KIEN DUC NETWORK DIAGRAM _ D6 - OPTION 1**

Date. Nov. 2001	Scale. 1 : 10000	For A3 size	Draw.No. D6-NW-01/1

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

CAD File : D6-NW-01-01.DWG

Format A3



OPTION 1

- Distance between the deep well and existing electric power line is approx. 50m
- Some elevations and pipe lengths are preliminary
- Secondary pipes are not shown in drawing

No.	DIAMETER (mm)	LENGTH (m) 2010	LENGTH (m) 2020	REMARK
1	150 - 200	1000		* Secondary pipes : - 2000m main road* both sides - 8000m (1000-2000/village)
2	80 - 125	5000	3000	
3	25 - 65	13000	5000	
	Total	19000	8000	

LEGEND:

- Reservoir by Direct Foundation
- Well Pumping Station
- W.T.P Water Treatment Plan
- Booster Pumping Station
- Supplied Area under 2010
- Supplied Area under 2020
- a / b Population in 2010 / Max. Hourly Water Demand
- Raw Water Pipeline
- Reuse Existing Pipeline
- Pipeline under 2010
- Pipeline under 2020

The Study on Groundwater Development in the Rural Provinces of Central Highlands in the Socialist Republic of Viet Nam

Draw.Name

KRONGKMAR NETWORK DIAGRAM _ D7 - OPTION1

Date. Nov. 2001	Scale. 1 : 10000	For A3 size	Draw.No. D7-NW-01/1

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

CAD File : D7-NW-01-01.DWG

Format A3

Appendix 2

Cost Estimation in Priority Communes

Cost estimates for feasibility study, krong nang town _ d1 **option 1**

Nos		Description	Unit	Quantity		Cost Amount (US$)				Cost amount (Mil. VND)	
				2,010	*2,020*	*2010*		*2020*		*2010*	*2020*
A	**Structural Facilities**					Material	Installation	Materials	Installation		
	1	Well Pumping Station									
		Drilling Well	well	2	2	76,000	4,000	76,000	4,000		
		Well head	Set	3	2	5,100	600	3,400	400		
		Submersible,MotorProtection,Pipe and Acessories	set	3	2	15,000	3,000	10,000	2,000		
		Power Suppy System	set	3	2	12,000	900	8,000	600		
		Well House	m2	36	24	5,400	1,080	3,600	720		
	2	Treament Plant									
		Access road, Management house, Fence	Set	1	1	33,000	3,300	16,500	1,650		
		Reservoir	m3	300	122	23,100	9,000	9,394	3,660		
		Elevated Tower	m3	43	17	9,890	4,300	3,910	1,700		
		Booster Pumping Station : Pumps, Pipes and Acessories	m3/hour	86	34	34,240	10,272	13,600	4,080		
		Chlorinator	item	1		4,200	200				
		Power Supply System	item	1		4,000	800				
		Sub-Total				221,930	37,452	144,404	18,810		
B	**Pipeline Network**										
	1	Rawwater Pipeline	km	4.5	3.0	54,000	18,000	36,000	12,000		
		80-100									
		150-200									
	2	Distribution Pipeline	km								
		25-65		21.0	1.9	52,500	73,500	4,750	6,650		
		80-125		12.5	1.1	75,000	43,750	6,600	3,850		
		150-200		3.5	0.0	40,250	19,250	0	0		
	3	Public taps		10		4,500	500				
		Sub-Total				226,250	155,000	47,350	22,500		
C	**Construction cots (A+B)**					448,180	192,452	191,754	41,310		
D	**Land cost**										
E	**Engineering Service (15%C)**					67,227	28,868	28,763	6,197		
	(Incl. Soil investigation, field serve, detailed design and construction supervisor										
F	**Base cost (C+D+E)**					515,407	221,320	220,517	47,507		
G	**Physical contingency (10%F)**					51,541	22,132	22,052	4,751		
H	**Project cost (F+G)**					566,948	243,452	242,569	52,257		
I	**Price contingency (10%H)**					56,695	24,345	24,257	5,226		
J	**Total financing required (H+I)**					**623,642**	**267,797**	**266,826**	**57,483**		

Note : Cost 2001 year level
Exchange rate US$ 1.00 = 15,000 VND

Cost estimates for feasibility study, ea drang town _ d2 **option 1**

Nos		Description	Unit	Quantity		Cost Amount (US$)				Cost amount (Mil. VND)	
				2,010	*2,020*	*2010*		*2020*		*2010*	*2020*
A	**Structural Facilities**					Material	Installation	Materials	Installation		
	1	Well Pumping Station									
		Drilling Well	well	6	3	228,000	12,000	114,000	6,000		
		Well head	Set	7	3	11,900	1,400	5,100	600		
		Submersible,MotorProtection,Pipe and Acessories	set	7	3	35,000	7,000	15,000	3,000		
		Power Suppy System	set	7	3	28,000	2,100	12,000	900		
		Well House	m2	84	36	12,600	2,520	5,400	1,080		
	2	Treament Plant									
		Access road, Management house, Fence	Set	1	1	42,000	4,200	21,000	2,100		
		Reservoir	m3	490	227	37,730	14,700	17,479	6,810		
		Elevated Tower	m3	None	None						
		Booster Pumping Station : Pumps, Pipes and Acessories	item	None	None						
		Chlorinator	item	1		4,200	200				
		Power Supply System	item	1		4,000	800				
		Sub-Total				403,430	44,920	189,979	20,490		
B	**Pipeline Network**										
	1	Rawwater Pipeline	km	10.5	4.5	126,000	42,000	54,000	18,000		
		80-100									
		150-200									
	2	Distribution Pipeline	km								
		25-65		21.5	8.5	53,750	75,250	21,250	29,750		
		65-125		12.0	3.5	72,000	42,000	21,000	12,250		
		150-200		3.5	0.5	40,250	19,250	5,750	2,750		
	3	Public tap		16		7,200	800				
		Sub-Total				299,200	179,300	102,000	62,750		
C	**Construction cots (A+B)**					702,630	224,220	291,979	83,240		
D	**Land cost**										
E	**Engineering Service (15%C)**					105,395	33,633	43,797	12,486		
	(Incl. Soil investigation, field serve, detailed design and construction supervisor										
F	**Base cost (C+D+E)**					808,025	257,853	335,776	95,726		
G	**Physical contingency (10%F)**					80,802	25,785	33,578	9,573		
H	**Project cost (F+G)**					888,827	283,638	369,353	105,299		
I	**Price contingency (10%H)**					88,883	28,364	36,935	10,530		
J	**Total financing required (H+I)**					**977,710**	**312,002**	**406,289**	**115,828**		

Note : Cost 2001 year level
Exchange rate US$ 1.00 = 15,000 VND

Cost estimates for feasibility study, krong puk commune _ d3-1 **option 1**

Nos		Description	Unit	Quantity		Cost Amount (US$)				Cost amount (Mil. VND)	
				2,010	*2,020*	*2010*		*2020*		*2010*	*2020*
A	**Structural Facilities**					Material	Installation	Materials	Installation		
	1	Well Pumping Station									
		Drilling Well	well	1	1	38,000	2,000	38,000	2,000		
		Well head	Set	2	1	3,400	400	1,700	200		
		Submersible,MotorProtection,Pipe and Acessories	set	2	1	10,000	2,000	5,000	1,000		
		Power Suppy System	set	2	1	8,000	600	4,000	300		
		Well House	m2	24	12	3,600	720	1,800	360		
	2	Treament Plant									
		Access road, Management house, Fence	Set	1	1	33,000	3,300	16,500	1,650		
		Reservoir	m3	199	103	15,323	5,970	7,931	3,090		
		Elevated Tower	m3	28	15	6,440	2,800	3,450	1,500		
		Booster Pumping Station : Pumps, Pipes and Acessories	m3/hour	57	29	22,720	6,816	11,600	3,480		
		Chlorinator	item	1		4,200	200				
		Power Supply System	item	1		4,000	800				
		Sub-Total				148,683	25,606	89,981	13,580		
B	**Pipeline Network**										
	1	Rawwater Pipeline	km	3.0	1.5	36,000	12,000	18,000	6,000		
		80-100									
		150-200									
	2	Distribution Pipeline	km								
		25-65		10.0	1.5	25,000	35,000	3,750	5,250		
		65-125		3.5	0.5	21,000	12,250	3,000	1,750		
		150-200		1.0	0.0	11,500	5,500	0	0		
	3	Public taps		9		4,050	450				
		Sub-Total				97,550	65,200	24,750	13,000		
C	**Construction cots (A+B)**					246,233	90,806	114,731	26,580		
D	**Land cost**										
E	**Engineering Service (15%C)**					36,935	13,621	17,210	3,987		
	(Incl. Soil investigation, field serve, detailed design and construction supervisor										
F	**Base cost (C+D+E)**					283,168	104,427	131,941	30,567		
G	**Physical contingency (10%F)**					28,317	10,443	13,194	3,057		
H	**Project cost (F+G)**					311,485	114,870	145,135	33,624		
I	**Price contingency (10%H)**					31,148	11,487	14,513	3,362		
J	**Total financing required (H+I)**					**342,633**	**126,357**	**159,648**	**36,986**		

Note : Cost 2001 year level
Exchange rate US$ 1.00 = 15,000 VND

Cost estimates for feasibility study, krong puk commune _ d3-2 **option 1**

Nos		Description	Unit	Quantity		Cost Amount (US$)				Cost amount (Mil. VND)	
				2,010	*2,020*	*2010*		*2020*		*2010*	*2020*
A	**Structural Facilities**					Material	Installation	Materials	Installation		
	1	Well Pumping Station									
		Drilling Well	well	1	1	38,000	2,000	38,000	2,000		
		Well head	Set	1	1	1,700	200	1,700	200		
		Submersible,MotorProtection,Pipe and Acessories	set	1	1	5,000	1,000	5,000	1,000		
		Power Suppy System	set	1	1	4,000	300	4,000	300		
		Well House	m2	12	12	1,800	360	1,800	360		
	2	Treament Plant									
		Access road, Management house, Fence	Set	1	1	25,000	2,500	12,500	1,250		
		Reservoir	m3	104	54	8,008	3,120	4,158	1,620		
		Elevated Tower	m3	15	8	3,450	1,500	1,840	800		
		Booster Pumping Station : Pumps, Pipes and Acessories	m3/hour	30	15	11,840	3,552	6,000	1,800		
		Chlorinator	item	1		4,200	200				
		Power Supply System	item	1		4,000	800				
		Sub-Total				106,998	15,532	74,998	9,330		
B	**Pipeline Network**										
	1	Rawwater Pipeline	km	1.5	1.5	18,000	6,000	18,000	6,000		
		80-100									
		150-200									
	2	Distribution Pipeline	km								
		25-65		15.0	5.0	37,500	52,500	12,500	17,500		
		65-125		5.0	2.0	30,000	17,500	12,000	7,000		
		150-200		2.0	0.0	23,000	11,000	0	0		
	3	Public taps		7		3,150	350				
		Sub-Total				111,650	87,350	42,500	30,500		
C	**Construction cots (A+B)**					218,648	102,882	117,498	39,830		
D	**Land cost**										
E	**Engineering Service (15%C)**					32,797	15,432	17,625	5,975		
	(Incl. Soil investigation, field serve, detailed design										
	and construction supervisor										
F	**Base cost (C+D+E)**					251,445	118,314	135,123	45,805		
G	**Physical contingency (10%F)**					25,145	11,831	13,512	4,580		
H	**Project cost (F+G)**					276,590	130,146	148,635	50,385		
I	**Price contingency (10%H)**					27,659	13,015	14,863	5,038		
J	**Total financing required (H+I)**					**304,249**	**143,160**	**163,498**	**55,423**		

Note : Cost 2001 year level
Exchange rate US$ 1.00 = 15,000 VND

Cost estimates for feasibility study, ea drong commune _ d4-1 **option 1**

Nos		Description	Unit	Quantity		Cost Amount (US$)				Cost amount (Mil. VND)	
				2,010	*2,020*	*2010*		*2020*		*2010*	*2020*
A	**Structural Facilities**					Material	Installation	Materials	Installation		
	1	Well Pumping Station									
		Drilling Well	well	2	1	76,000	4,000	38,000	2,000		
		Well head	Set	3	1	5,100	600	1,700	200		
		Submersible,MotorProtection,Pipe and Acessories	set	3	1	15,000	3,000	5,000	1,000		
		Power Suppy System	set	3	1	12,000	900	4,000	300		
		Well House	m2	36	12	5,400	1,080	1,800	360		
	2	Treament Plant									
		Access road, Management house, Fence	Set	1	1	33,000	3,300	16,500	1,650		
		Aeration Tower	m2	5	2	500	150	150	45		
		Reaction Tank	m3	26	9	5,200	1,820	1,700	595		
		Rapid Filter Basin	m2	11	3	18,700	3,300	5,100	900		
		Reservoir	m3	181	59	13,937	5,430	4,543	1,770		
		Elevated Tower	m3	26	9	5,980	2,600	2,070	900		
		Booster Pumping Station : Pumps, Pipes and Acessories	m3/hour	52	16	20,640	6,192	6,400	1,920		
		Chlorinator	item	1		4,200	200				
		Power Supply System	item	1		4,000	800				
		Sub-Total				219,657	33,372	86,963	11,640		
B	**Pipeline Network**										
	1	Rawwater Pipeline	km	4.5	1.5	54,000	18,000	18,000	6,000		
		80-100									
		150-200									
	2	Distribution Pipeline	km								
		25-65		17.0	2.0	42,500	59,500	5,000	7,000		
		80-125		6.5	1.0	39,000	22,750	6,000	3,500		
		150-200		3.0	0.0	34,500	16,500	0	0		
	3	Public taps		9		4,050	450				
		Sub-Total				174,050	117,200	29,000	16,500		
C	**Construction cots (A+B)**					393,707	150,572	115,963	28,140		
D	**Land cost**										
E	**Engineering Service (15%C)**					59,056	22,586	17,394	4,221		
		(Incl. Soil investigation, field serve, detailed design and construction supervisor									
F	**Base cost (C+D+E)**					452,763	173,158	133,357	32,361		
G	**Physical contingency (10%F)**					45,276	17,316	13,336	3,236		
H	**Project cost (F+G)**					498,039	190,474	146,693	35,597		
I	**Price contingency (10%H)**					49,804	19,047	14,669	3,560		
J	**Total financing required (H+I)**					**547,843**	**209,521**	**161,363**	**39,157**		

Note : Cost 2001 year level
Exchange rate US$ 1.00 = 15,000 VND

Cost estimates for feasibility study, ea drong commune _ d4-2 **option 1**

Nos		Description	Unit	Quantity		Cost Amount (US$)				Cost amount (Mil. VND)	
				2,010	*2,020*	*2010*		*2020*		*2010*	*2020*
A	**Structural Facilities**					Material	Installation	Materials	Installation		
	1	Well Pumping Station									
		Drilling Well	well	1	0	38,000	2,000	0	0		
		Well head	Set	1	0	1,700	200	0	0		
		Submersible,MotorProtection,Pipe and Acessories	set	1	0	5,000	1,000	0	0		
		Power Suppy System	set	1	0	4,000	300	0	0		
		Well House	m2	12	0	1,800	360	0	0		
	2	Treament Plant									
		Access road, Management house, Fence	Set	1	1	25,000	2,500	12,500	1,250		
		Aeration Tower	m2	1	1	100	30	50	15		
		Reaction Tank	m3	7	2	1,400	490	400	140		
		Rapid Filter Basin	m2	2	2	3,400	600	3,400	600		
		Reservoir	m3	48	15	3,696	1,440	1,155	450		
		Elevated Tower	m3	7	2	1,610	700	460	200		
		Booster Pumping Station : Pumps, Pipes and Acessories	m3/hour	14	4	5,440	1,632	1,600	480		
		Chlorinator	item	1		4,200	200				
		Power Supply System	item	1		4,000	800				
		Sub-Total				99,346	12,252	19,565	3,135		
B	**Pipeline Network**										
	1	Rawwater Pipeline	km	1.5	0.0	18,000	6,000	0	0		
		80-100									
		150-200									
	2	Distribution Pipeline									
		25-65	km	10.0	3.0	25,000	35,000	7,500	10,500		
		80-125	km	5.0	0.5	30,000	17,500	3,000	1,750		
		150-200	km	0.0	0.0	0	0	0	0		
	3	Public tap		6		2,700	300				
		Sub-Total				75,700	58,800	10,500	12,250		
C	**Construction cots (A+B)**					175,046	71,052	30,065	15,385		
D	**Land cost**										
E	**Engineering Service (15%C)**					26,257	10,658	4,510	2,308		
	(Incl. Soil investigation, field serve, detailed design and construction supervisor										
F	**Base cost (C+D+E)**					201,303	81,710	34,575	17,693		
G	**Physical contingency (10%F)**					20,130	8,171	3,457	1,769		
H	**Project cost (F+G)**					221,433	89,881	38,032	19,462		
I	**Price contingency (10%H)**					22,143	8,988	3,803	1,946		
J	**Total financing required (H+I)**					**243,577**	**98,869**	**41,835**	**21,408**		

Note : Cost 2001 year level
Exchange rate US$ 1.00 = 15,000 VND

Cost estimates for feasibility study, ea wel _ d5-1 **option 1**

Nos		Description	Unit	Quantity		Cost Amount (US$)				Cost amount (Mil. VND)	
				2,010	*2,020*	*2010*		*2020*		*2010*	*2020*
A	**Structural Facilities**					Material	Installation	Materials	Installation		
	1	Well Pumping Station									
		Drilling Well	well	2	1	76,000	4,000	38,000	2,000		
		Well head	Set	3	1	5,100	600	1,700	200		
		Submersible,MotorProtection,Pipe and Acessories	set	3	1	15,000	3,000	5,000	1,000		
		Power Suppy System	set	3	1	12,000	900	4,000	300		
		Well House	m2	36	12	5,400	1,080	1,800	360		
	2	Treament Plant									
		Access road, Management house, Fence	Set	1	1	42,000	4,200	21,000	2,100		
		Aeration Tower	m2	6	3	550	165	300	90		
		Reaction Tank	m3	30	13	6,000	2,100	2,600	910		
		Rapid Filter Basin	m2	11	7	18,700	3,300	11,900	2,100		
		Reservoir	m3	207	93	15,939	6,210	7,161	2,790		
		Semi-Elevated Tower	m3	30	13	6,900	3,000	2,990	1,300		
		Booster Pumping Station : Pumps, Pipes and Acessories	m3/hour	59	27	23,680	7,104	10,640	3,192		
		Chlorinator	item	1		4,200	200				
		Power Supply System	item	1		4,000	800				
		Sub-Total				235,469	36,659	107,091	16,342		
B	**Pipeline Network**										
	1	Rawwater Pipeline	km	4.5	1.5	54,000	18,000	18,000	6,000		
		80-100									
		150-200									
	2	Distribution Pipeline	km								
		25-65		15.5	2.8	38,750	54,250	7,000	9,800		
		80-125		5.0	2.6	30,000	17,500	15,600	9,100		
		150-200		4.5	0.0	51,750	24,750	0	0		
	3	Public taps		11		4,950	550				
		Sub-Total				179,450	115,050	40,600	24,900		
C	**Construction cots (A+B)**					414,919	151,709	147,691	41,242		
D	**Land cost**										
E	**Engineering Service (15%C)**					62,238	22,756	22,154	6,186		
	(Incl. Soil investigation, field serve, detailed design and construction supervisor										
F	**Base cost (C+D+E)**					477,157	174,465	169,845	47,428		
G	**Physical contingency (10%F)**					47,716	17,447	16,984	4,743		
H	**Project cost (F+G)**					524,873	191,912	186,829	52,171		
I	**Price contingency (10%H)**					52,487	19,191	18,683	5,217		
J	**Total financing required (H+I)**					**577,360**	**211,103**	**205,512**	**57,388**		

Note : Cost 2001 year level
Exchange rate US$ 1.00 = 15,000 VND

Cost estimates for feasibility study, kien duc town _ d6 **option 1**

Nos		Description	Unit	Quantity		Cost Amount (US$)				Cost amount (Mil. VND)	
				2,010	*2,020*	*2010*		*2020*		*2010*	*2020*
A	**Structural Facilities**					Material	Installation	Materials	Installation		
	1	Well Pumping Station									
		Drilling Well	well	3	1	114,000	6,000	38,000	2,000		
		Well head	Set	4	1	6,800	800	1,700	200		
		Submersible,MotorProtection,Pipe and Acessories	set	4	1	20,000	4,000	5,000	1,000		
		Power Suppy System	set	4	1	16,000	1,200	4,000	300		
		Well House	m2	48	12	7,200	1,440	1,800	360		
	2	Treament Plant									
		Access road, Management house, Fence	Set	1	1	33,000	3,300	16,500	1,650		
		Aeration Tower	m2	7	3	700	210	300	90		
		Reaction Tank	m3	35	16	7,000	2,450	3,200	1,120		
		Rapid Filter Basin	m2	14	7	23,800	4,200	11,900	2,100		
		Reservoir	m3	282	126	21,714	8,460	9,702	3,780		
		Elevated Tower	m3	None	None						
		Booster Pumping Station : Pumps, Pipes and Acessories	item	None	None						
		Chlorinator	item	1		4,200	200				
		Power Supply System	item	1		4,000	800				
		Sub-Total				258,414	33,060	92,102	12,600		
B	**Pipeline Network**										
	1	Rawwater Pipeline	km	6.0	1.5	72,000	24,000	18,000	6,000		
		80-100									
		150-200									
	2	Distribution Pipeline	km								
		25-65		15.5	8.5	38,750	54,250	21,250	29,750		
		80-125		8.5	1.5	51,000	29,750	9,000	5,250		
		150-200		0.5	0.0	5,750	2,750	0	0		
	3	Public taps		10		4,500	500				
		Sub-Total				172,000	111,250	48,250	41,000		
C	**Construction cots (A+B)**					430,414	144,310	140,352	53,600		
D	**Land cost**										
E	**Engineering Service (15%C)**					64,562	21,647	21,053	8,040		
		(Incl. Soil investigation, field serve, detailed design and construction supervisor									
F	**Base cost (C+D+E)**					494,976	165,957	161,405	61,640		
G	**Physical contingency (10%F)**					49,498	16,596	16,140	6,164		
H	**Project cost (F+G)**					544,474	182,552	177,545	67,804		
I	**Price contingency (10%H)**					54,447	18,255	17,755	6,780		
J	**Total financing required (H+I)**					**598,921**	**200,807**	**195,300**	**74,584**		

Note : Cost 2001 year level
Exchange rate US$ 1.00 = 15,000 VND

Cost estimates for feasibility study, krong kmar town _ d7 **option 1**

Nos		Description	Unit	Quantity		Cost Amount (US$)				Cost amount (Mil. VND)	
				2,010	*2,020*	*2010*		*2020*		*2010*	*2020*
A	**Structural Facilities**					Material	Installation	Materials	Installation		
	1	Well Pumping Station									
		Drilling Well	well	1	0	38,000	2,000	0	0		
		Well head	Set	2	0	3,400	400	0	0		
		Submersible,MotorProtection,Pipe and Acessories	set	2	0	10,000	2,000	0	0		
		Power Suppy System	set	2	0	8,000	600	0	0		
		Well House	m2	24	0	3,600	720	0	0		
	2	Treament Plant									
		Access road, Management house, Fence	Set	1	1	33,000	3,300	16,500	1,650		
		Aeration Tower	m2	5	3	450	135	250	75		
		Reaction Tank	m3	25	11	4,900	1,715	2,200	770		
		Rapid Filter Basin	m2	9	6	15,300	2,700	10,200	1,800		
		Reservoir	m3	199	86	15,323	5,970	6,622	2,580		
		Elevated Tower	m3	None	None						
		Booster Pumping Station : Pumps, Pipes and Acessories	m3/h	50	21	19,920	5,976	8,560	2,568		
		Chlorinator	item	1		4,200	200				
		Power Supply System	item	1		4,000	800				
		Sub-Total				160,093	26,516	44,332	9,443		
B	**Pipeline Network**										
	1	Rawwater Pipeline	km	1.5		18,000	6,000	0	0		
		80-100									
		150-200									
	2	Distribution Pipeline	km								
		25-65		13.0	5.0	32,500	45,500	12,500	17,500		
		80-125		5.0	3.0	30,000	17,500	18,000	10,500		
		150-200		1.0	0.0	11,500	5,500	0	0		
	3	Public taps		10		4,500	500				
		Sub-Total				96,500	75,000	30,500	28,000		
C	**Construction cots (A+B)**					256,593	101,516	74,832	37,443		
D	**Land cost**										
E	**Engineering Service (15%C)**					38,489	15,227	11,225	5,616		
		(Incl. Soil investigation, field serve, detailed design and construction supervisor									
F	**Base cost (C+D+E)**					295,082	116,743	86,057	43,059		
G	**Physical contingency (10%F)**					29,508	11,674	8,606	4,306		
H	**Project cost (F+G)**					324,590	128,418	94,662	47,365		
I	**Price contingency (10%H)**					32,459	12,842	9,466	4,737		
J	**Total financing required (H+I)**					**357,049**	**141,260**	**104,129**	**52,102**		

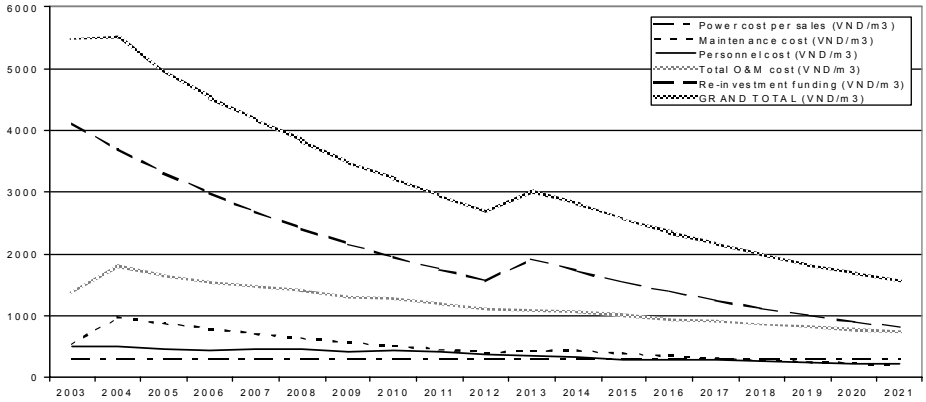
Note : Cost 2001 year level
Exchange rate US$ 1.00 = 15,000 VND

Appendix 3

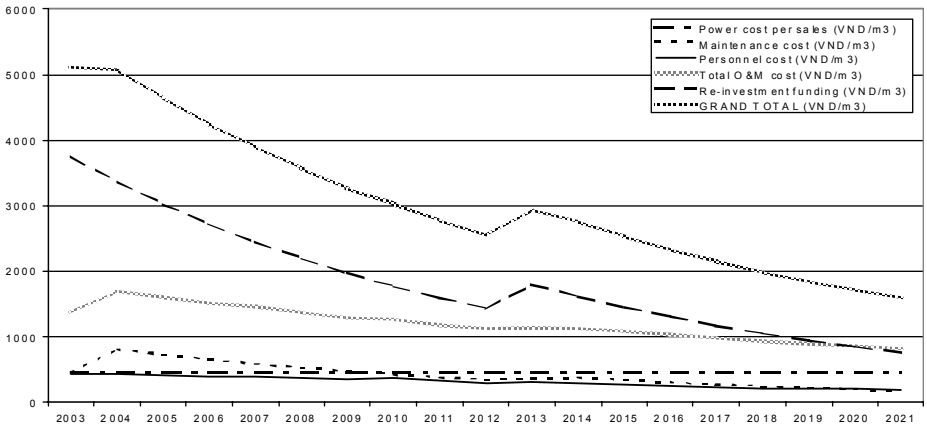
O&M Costs for Each Target Communes

Appendix 3

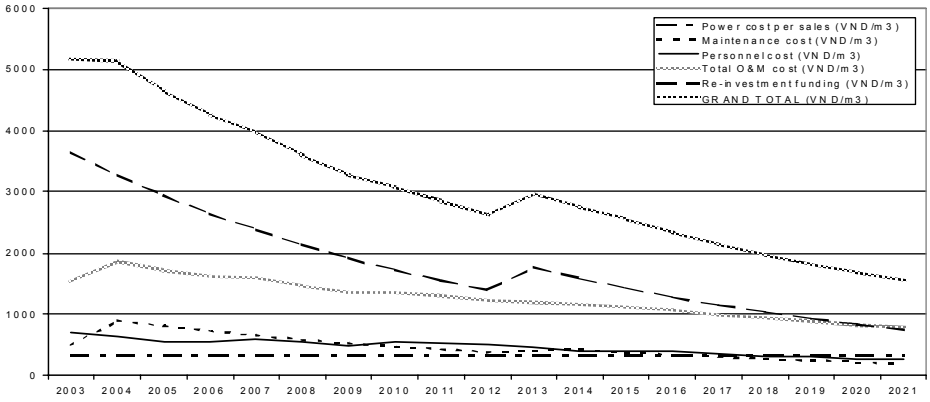
O&M costs of Krong Nang scheme D1



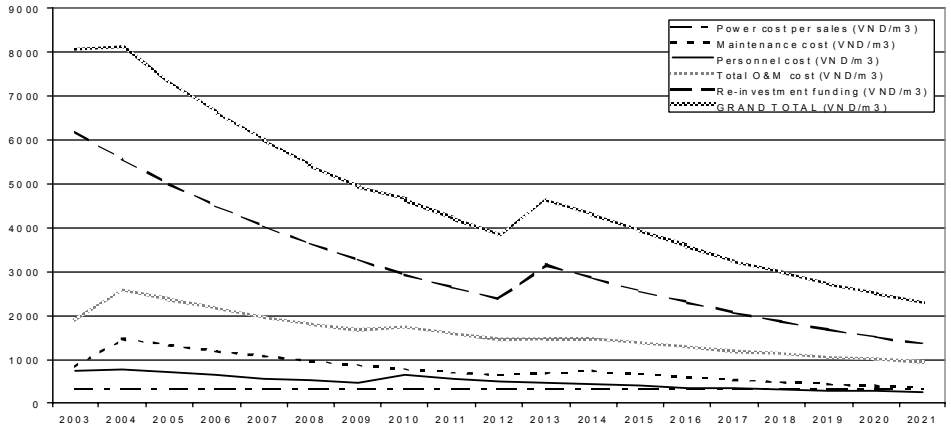
O&M costs of Ea Hleo scheme D2



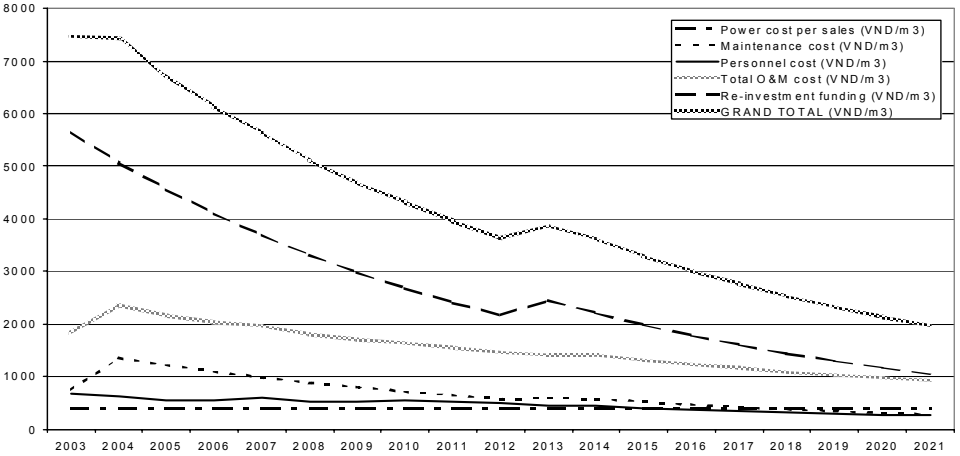
O&M costs of Krong Puk scheme (D3-1)



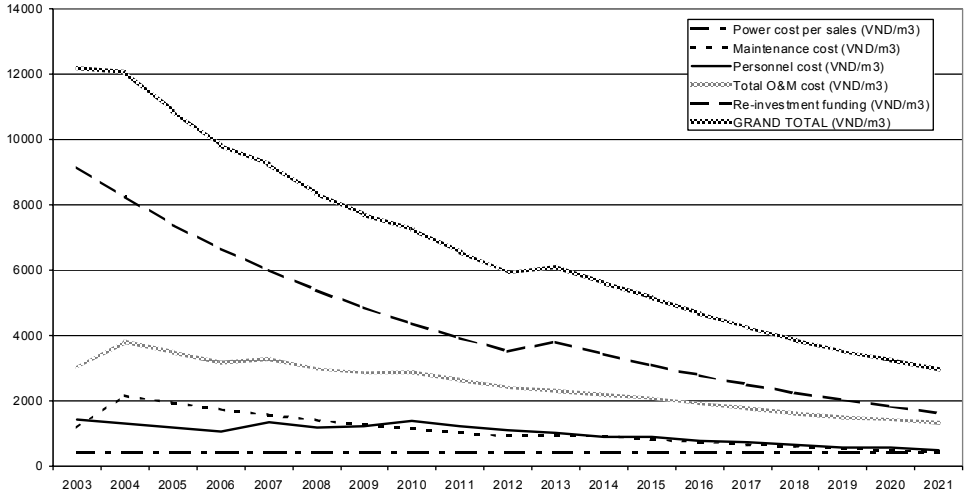
O&M costs of Krong Puk scheme (D3-2)



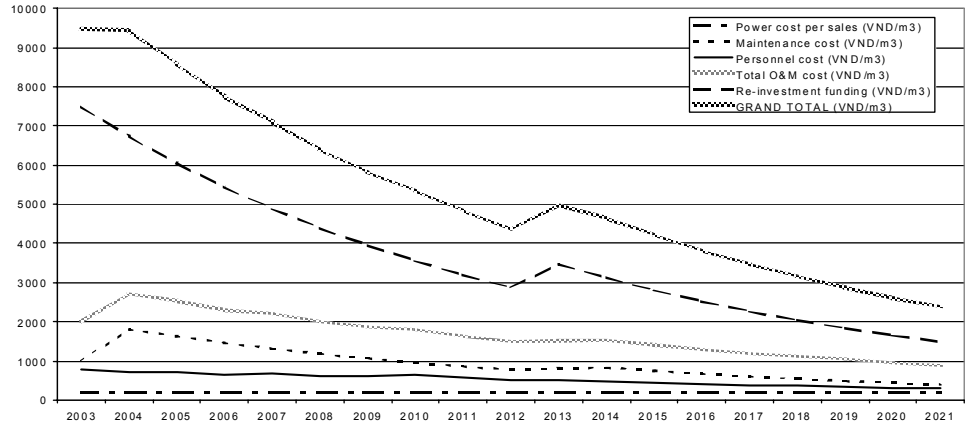
O&M costs of Ea Drong scheme (D4-1)



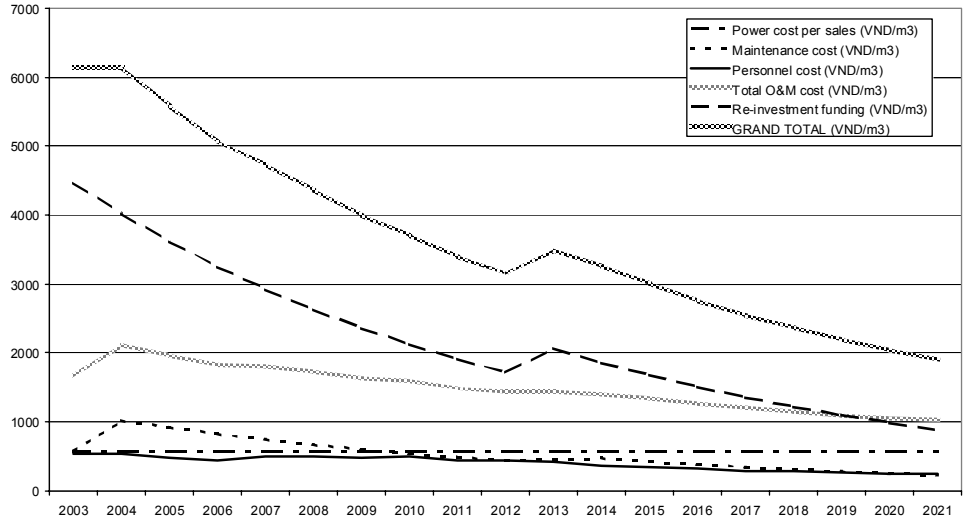
O&M costs of Ea Drong scheme (D4-2)



O&M costs of Ea Wer scheme D5



O&M costs of Kien Duc scheme D6



O&M costs of Krong Kmar scheme D7