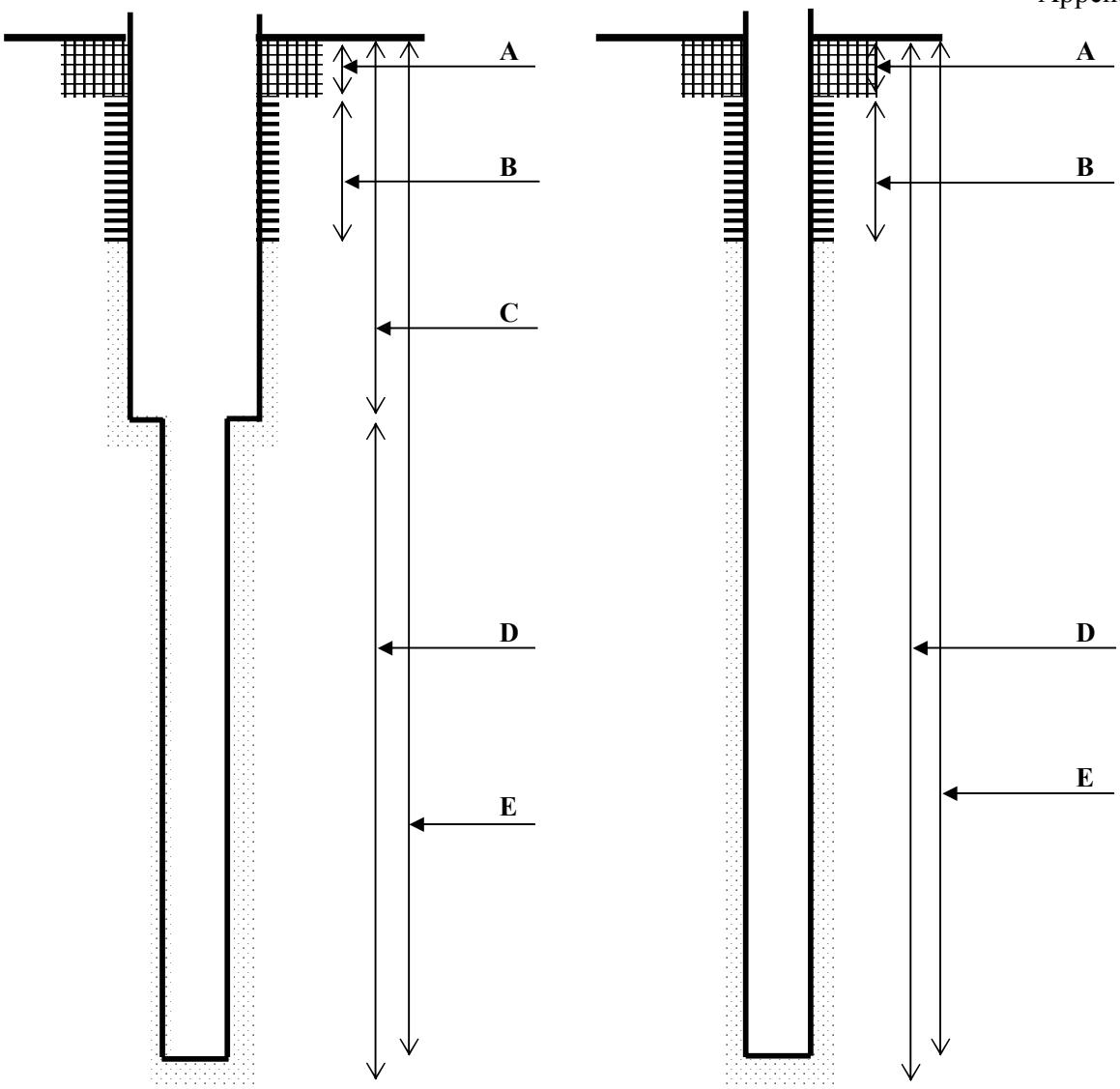
Appendix 1

Standard Well Design (type-1 and type-2)



Type-1 **(Solar pump + Generator pump system)**

Type-2 **(Public power pump system only)**

Example of Wells	Well Dimension				
	A: concrete base (size)	**B: Clay packing (m)**	**C: Installation depth of 12" pipes for pump chamber of 2 pumps**	**D: Installation depth of 6" casing/screen pipes**	**E: Drilling depth (m)**
K1-1	L x W x D = 1.5 x 1.5 x 1.0	Average depth: around 10m in general. Below the clay packing, gravel pack will be done	42	120	125
K2-3			32	120	125
G-3			67	150	155
D4-1			58	150	155
D4-2			58	150	155
Others			40 - 60	50 - 150	55 - 155

Note: 1 Exploratory wells of 17 of the first investigation shall be used for production wells of stage-1 implementation

2 Remaining casing/screnn pipes in the first investigation stage will be used

Standard Well Design (type-1 and type-2)

Appendix 2

Spread Sheet on Plan and Design for Rural Water Supply

Appendix 2

SPREAD SHEET ON PLAN AND DESIGN FOR RURAL WATER SUPPLY

I	**GENERAL INFORMATION**			
1	**Province**		:	Gia Lai
2	**Name of Commune/Town**		:	Kong Tang (Nos. 1, 2, 3, 4, 5, 6, 7, 8, De Doul, De Kop, De Ktu, De H´Rel))
3	**System Number**		:	G-1
4	**Water Resource**		:	Deep Well (present number of wells 1)

II	**WATER SUPPLY PLAN**								
A	**Plan Parameter (1)**								
1	**Water resource**			Deep well					
1)	**Altitude of JICA deep well**	El m	:	736					
2)	**Latitude**	N	:	1554896		Longitude	E 202592		
3)	**Permissible yield /well**	m3/day (l/sec)	:	320	(3.7)				
4)	**Static water surface level (S.W.L)**	m	:	34					
5)	**Dynamic water level (D.W.L)**	m	:	55					
6)	**Well diameter**	mm	:	150/110					
2	**Water demand**			2001	2010		2020		
1)	**Number of household**	Numbers	:	1111					
2)	**Population**	Numbers	:	5695	6988		8773		
3)	**Per capita consumption**	l/s/d	:	30	60		60		
4)	**Maximum daily water demand**	m3/day	:	67	556		821		
5)	**Maximum hourly water demand**	m3/hour	:	6	46		69		
3	**Required number of well**	no.	:	1	1		1	Total	3
B	**Plan Parameter (2)**								
1	**Water intake**		:	Deep Well					
2	**Raw water transmission**		:	GI Pipes					
3	**Reservoir**		:	Ground Reservoir and elevated tower					
4	**Water treatment**		:	Aeration, Slow filtration. Chlorination					
5	**Water distribution**		:	PVC, PE, Public taps, house connection					
6	**Power supply**		:	Public Net					

III	**WATER SUPPLY FACILITY DESIGN**											
A	**Source**	**Deep Wells**										
		Numbers needed in addition to existing Jica well										
		2002-2010	1									
		2010-2020	1									
B	**Pump**	**Submersible pump**						**Booster pumps**				
		Yield:	3.7 l/s		Lift	80 m			Yield		Lift	
		2002-2010	2	nos				2002-2010	46	m3/hr	15	m
		2010-2020	1	nos				2010-2020	22	m3/hr	15	m
C	**Power**	**Public net**										
D	**Reservoir**	**Ground reservoir**						**Elevated Tower**				
		2002-2010	163	m3				2002-2010	24	m3		
		2010-2020	77	m3				2010-2020	11	m3		
		Total	240	m3				Total	35	m3		
E	**Treatment**	**Aeration, Slow sand filtration and chlorination.**										
		Aeration area:			**Reaction tank, volume:**			**Filter area**	:			
		2002-2010	5	m2	2002-2010	24	m3	2002-2010	:	10	m2	
		2010-2020	2	m2	2010-2020	11	m3	2010-2020	:	4	m2	
		Total	7	m2	Total	35	m3	Total		14	m2	
F	**Pipeline, raw water**											
		Diameter	100	mm								
		2002-2010	3	km								
		2010-2020	1.5	km								
G	**Distribution pipes**											
		Diameter		2002-2010		2010-2020			:			
		25-65	mm	31	km	3	km					
		75-125	mm	14	km	1.5	km					
		150-200	mm	2.5	km	0.5	km					
I	**Public taps**	Type	: 1		Numbers	: 15						

IV Notes

SPREAD SHEET ON PLAN AND DESIGN FOR RURAL WATER SUPPLY

I	**GENERAL INFORMATION**			
1	**Province**		:	Gia Lai
2	**Name of Commune/Town**		:	Nhon Hoa (Ia Tung, Thong A, Tong Wil, Ia Riet, Hoa Binh, Hoa Tin, Hoa Phu, Plei Phum, Plei Kia, Plei lao, Hoa An, Hoa Hiep, Tho Ga A, Tho Ga B)
3	**System Number**		:	G-2
4	**Water Resource**		:	Deep Well (present number of wells 1)

II	**WATER SUPPLY PLAN**								
A	**Plan Parameter (1)**								
1	**Water resource**			Deep well					
1)	**Altitude of JICA deep well**	El m	:	421					
2)	**Latitude**	N	:	1499742		Longitude	E 185766		
3)	**Permissible yield /well**	m3/day (l/sec)	:	173	(2 l/s)				
4)	**Static water surface level (S.W.L)**	m	:	21					
5)	**Dynamic water level (D.W.L)**	m	:	61					
6)	**Well diameter**	mm	:	150/130					
2	**Water demand**			2001	2010		2020		
1)	**Number of household**	Numbers	:	1763					
2)	**Population**	Numbers	:	11339	13914		17466.6		
3)	**Per capita consumption**	l/s/d	:	30	60		60		
4)	**Maximum daily water demand**	m3/day	:	133	1107		1635		
5)	**Maximum hourly water demand**	m3/hour		11	92		136		
3	**Required number of well**	no.	:	1	6		3	Total	10
B	**Plan Parameter (2)**								
1	**Water intake**		:	Deep Well					
2	**Raw water transmission**		:	GI Pipes					
3	**Reservoir**		:	Ground Reservoir and elevated tower					
4	**Water treatment**		:	Chlorination					
5	**Water distribution**		:	PVC, PE, Public taps, house connection					
6	**Power supply**		:	Public Net					

III WATER SUPPLY FACILITY DESIGN

A Source — **Deep Wells**

Numbers needed in addition to existing Jica well

2002-2010	:	6
2010-2020	:	3

B Pump — **Submersible pump**

Yield: 2 l/s Lift. 80 m

2002-2010	:	7	nos
2010-2020	:	3	nos

Booster pumps

	Yield		Lift	
2002-2010	92	m3/hr	15	m
2010-2020	44	m3/hr	15	m

C Power — **Public net**

D Reservoir

Ground reservoir			**Elevated Tower**		
2002-2010	323	m3	2002-2010	47	m3
2010-2020	154	m3	2010-2020	22	m3
Total	477	m3	Total	69	m3

E Treatment — **Aeration, Slow sand filtration and chlorination.**

Aeration area:			**Reaction tank, volume:**			**Filter area** :		
2002-2010	9	m2	2002-2010	47	m3	2002-2010 :	19	m2
2010-2020	5	m2	2010-2020	22	m3	2010-2020 :	9	m2
Total	14	m2	Total	69	m3	Total	28	m2

F Pipeline, raw water

Diameter	100	mm
2002-2010	10.5	km
2010-2020	4.5	km

G Distribution pipes

Diameter		2002-2010		2010-2020	
25-65	mm	29.7	km	3.5	km
75-125	mm	11	km	1.5	km
150-200	mm	3.5	km		km

I Public taps Type : 1 Numbers : 18

IV Notes

G2: Nhon Hoa is one of the model communes. The communities Plei Kia and Hoa An will be implemented during the model stage.

Treatment should be confirmed by new analysis

SPREAD SHEET ON PLAN AND DESIGN FOR RURAL WATER SUPPLY

I	**GENERAL INFORMATION**							
1	**Province**		:	Gia Lai				
2	**Name of Commune/Town**		:	Chu Ty (Nos. 1, 2, 3, 4, 5, 6, 7)				
3	**System Number**		:	G-3				
4	**Water Resource**		:	Deep Well	(present number of wells	1	)	

II	**WATER SUPPLY PLAN**							
A	**Plan Parameter (1)**							
1	**Water resource**			Deep well				
1)	**Altitude of JICA deep well**	El m	:	417				
2)	**Latitude**	N	:	1528374			Longitude	E 791729
3)	**Permissible yield /well**	m3/day (l/sec)	:	320	(3.7)			
4)	**Static water surface level (S.W.L)**	m	:	21				
5)	**Dynamic water level (D.W.L)**	m	:	56				
6)	**Well diameter**	mm	:	150/110				
2	**Water demand**			2001	2010	2020		
1)	**Number of household**	Numbers	:	1583				
2)	**Population**	Numbers	:	6524	8005	10049		
3)	**Per capita consumption**	l/s/d	:	30	60	60		
4)	**Maximum daily water demand**	m3/day	:	76	637	941		
5)	**Maximum hourly water demand**	m3/hour		6	53	78		
3	**Required number of well**	no.	:	1	1	1	Total	3
B	**Plan Parameter (2)**							
1	**Water intake**		:	Deep Well				
2	**Raw water transmission**		:	GI Pipes				
3	**Reservoir**		:	Ground Reservoir and semi elevated tower				
4	**Water treatment**		:	Chlorination				
5	**Water distribution**		:	PVC, PE, Public taps, house connection				
6	**Power supply**		:	Public Net				

III	**WATER SUPPLY FACILITY DESIGN**									
A	**Source**	**Deep Wells**								
		Numbers needed in addition to existing Jica well								
		2002-2010	:	1						
		2010-2020	:	1						
B	**Pump**	**Submersible pump**					**Booster pumps**			
		Yield:	3.7 l/s	Lift.	112	m		Yield		Lift
		2002-2010	:	2	nos		2002-2010	53	m3/hr	15 m
		2010-2020	:	1	nos		2010-2020	25	m3/hr	15 m
C	**Power**	**Public net**								
D	**Reservoir**	**Ground reservoir**					**Elevated Tower**			
		2002-2010	186	m3			2002-2010	27	m3	
		2010-2020	89	m3			2010-2020	13	m3	
		Total	275	m3			Total	40	m3	
E	**Treatment**	**Chlorination.**								
								:		
		Chlorination with concrete mixing tank								
F	**Pipeline, raw water**									
		Diameter	100	mm						
		2002-2010	3	km						
		2010-2020	1.5	km						
G	**Distribution pipes**									
		Diameter		2002-2010		2010-2020			:	
		25-65	mm	25	km	4	km			
		75-125	mm	12.5	km	1.5	km			
		150-200	mm	6	km	0.5	km			
I	**Public taps**	Type	:	1	Numbers	: 9				

IV Notes

SPREAD SHEET ON PLAN AND DESIGN FOR RURAL WATER SUPPLY

I	**GENERAL INFORMATION**			
1	**Province**	**:**	Gia Lai	
2	**Name of Commune/Town**	**:**	Thang Hung (Nos. 1, 2, 3, 4, 5)	
3	**System Number**	**:**	G-4	
4	**Water Resource**	**:**	Deep Well	(present number of wells 1)

II	**WATER SUPPLY PLAN**										
A	**Plan Parameter (1)**										
1	**Water resource**			Deep well							
1)	**Altitude of JICA deep well**	El m	**:**	633							
2)	**Latitude**	N	**:**	1630373			Longitude	E	813129		
3)	**Permissible yield /well**	m3/day (l/sec)	**:**	259	(3.0)						
4)	**Static water surface level (S.W.L)**	m	**:**	34							
5)	**Dynamic water level (D.W.L)**	m	**:**	39							
6)	**Well diameter**	mm	**:**	150/110							
2	**Water demand**			2001		2010			2020		
1)	**Number of household**	Numbers	**:**	858							
2)	**Population**	Numbers	**:**	4391		5388			6764		
3)	**Per capita consumption**	l/s/d	**:**	30		60			60		
4)	**Maximum daily water demand**	m3/day	**:**	51		429			633		
5)	**Maximum hourly water demand**	m3/hour		4		36			53		
3	**Required number of well**	no.	**:**	1		1			1	Total	3
B	**Plan Parameter (2)**										
1	**Water intake**		**:**	Deep Well							
2	**Raw water transmission**		**:**	GI Pipes							
3	**Reservoir**		**:**	Ground Reservoir and elevated tower							
4	**Water treatment**		**:**	Chlorination							
5	**Water distribution**		**:**	PVC, PE, Public taps, house connection							
6	**Power supply**		**:**	Public Net							

III	**WATER SUPPLY FACILITY DESIGN**										
A	**Source**	**Deep Wells**									
		Numbers needed in addition to existing Jica well									
		2002-2010	:	1							
		2010-2020	:	1							
B	**Pump**	**Submersible pump**					**Booster pumps**				
		Yield:	3.0 l/s	Lift.	65 m			Yield		Lift	
		2002-2010	:	2	nos		2002-2010	36	m3/hr	15	m
		2010-2020	:	1	nos		2010-2020	17	m3/hr	15	m
C	**Power**	**Public net**									
D	**Reservoir**	**Ground reservoir**					**Elevated Tower**				
		2002-2010	126	m3			2002-2010	18	m3		
		2010-2020	59	m3			2010-2020	9	m3		
		Total	185	m3			Total	27	m3		
E	**Treatment**	**Aeration, Slow sand filtration and chlorination.**									
		Aeration area:			**Reaction tank, volume:**			**Filter area**	:		
		2002-2010	4	m2	2002-2010	18	m3	2002-2010	:	8	m2
		2010-2020	2	m2	2010-2020	9	m3	2010-2020	:	3	m2
		Total	6	m2	Total	27	m3	Total		11	m2
		Chlorination vis concrete mixing tank									
F	**Pipeline, raw water**										
		Diameter	100	mm							
		2002-2010	3	km							
		2010-2020	1.5	km							
G	**Distribution pipes**										
		Diameter		2002-2010		2010-2020			:		
		25-65	mm	10.5	km	2.5	km				
		75-125	mm	2.5	km	0.5	km				
		150-200	mm	2.5	km		km				
I	**Public taps**	Type	**:**	1	Numbers	:	7				

IV Notes

SPREAD SHEET ON PLAN AND DESIGN FOR RURAL WATER SUPPLY

I	**GENERAL INFORMATION**			
1	**Province**	**:**	Gia Lai	
2	**Name of Commune/Town**	**:**	Ngia Hoa (Nos. 1, 2, 3, 4, 5)	
3	**System Number**	**:**	G-5	
4	**Water Resource**	**:**	Deep Well	(present number of wells 1)

II	**WATER SUPPLY PLAN**									
A	**Plan Parameter (1)**									
1	**Water resource**			Deep well						
1)	**Altitude of JICA deep well**	El m	**:**	682						
2)	**Latitude**	N	**:**	1562211			Longitude	E 814529		
3)	**Permissible yield /well**	m3/day (l/sec)	**:**	173	(2.0)					
4)	**Static water surface level (S.W.L)**	m	**:**	32.5						
5)	**Dynamic water level (D.W.L)**	m	**:**	56						
6)	**Well diameter**	mm	**:**	150/110						
2	**Water demand**			2001		2010		2020		
1)	**Number of household**	Numbers	**:**	623						
2)	**Population**	Numbers	**:**	3364		4128		5181		
3)	**Per capita consumption**	l/s/d	**:**	30		60		60		
4)	**Maximum daily water demand**	m3/day	**:**	39		328		485		
5)	**Maximum hourly water demand**	m3/hour		3		27		41		
3	**Required number of well**	no.	**:**	1		1		1	Total	3
B	**Plan Parameter (2)**									
1	**Water intake**		**:**	Deep Well						
2	**Raw water transmission**		**:**	GI Pipes						
3	**Reservoir**		**:**	Ground Reservoir and elevated tower						
4	**Water treatment**		**:**	Chlorination						
5	**Water distribution**		**:**	PVC, PE, Public taps, house connection						
6	**Power supply**		**:**	Public Net						

III	**WATER SUPPLY FACILITY DESIGN**										
A	**Source**	**Deep Wells**									
		Numbers needed in addition to existing Jica well									
		2002-2010	:	1							
		2010-2020	:	1							
B	**Pump**	**Submersible pump**					**Booster pumps**				
		Yield:	2.0	l/s	Lift.	90 m		Yield		Lift	
		2002-2010	:	2	nos		2002-2010	27	m3/hr	15	m
		2010-2020	:	1	nos		2010-2020	13	m3/hr	15	m
C	**Power**	**Public net**									
D	**Reservoir**	**Ground reservoir**					**Elevated Tower**				
		2002-2010	96	m3			2002-2010	14	m3		
		2010-2020	46	m3			2010-2020	7	m3		
		Total	142	m3			Total	21	m3		
E	**Treatment**	**Chlorination**									
								:			
		Chlorination via concrete mixing tank									
F	**Pipeline, raw water**										
		Diameter	100	mm							
		2002-2010	3	km							
		2010-2020	1.5	km							
G	**Distribution pipes**										
		Diameter		2002-2010		2010-2020			:		
		25-65	mm	13	km	1.2	km				
		75-125	mm	8	km	0.7	km				
		150-200	mm		km		km				
I	**Public taps**	Type	:	1	Numbers :	8					

IV Notes

SPREAD SHEET ON PLAN AND DESIGN FOR RURAL WATER SUPPLY

I	**GENERAL INFORMATION**			
1	**Province**	:	Gia Lai	
2	**Name of Commune/Town**	:	Ia Rsion (Nu A, Nu B, Cho, Toat, Hung Phu 1, Hung Phu 2, Quynh Phu))	
3	**System Number**	:	G-6	
4	**Water Resource**	:	Deep Well	(present number of wells 1)

II	**WATER SUPPLY PLAN**								
A	**Plan Parameter (1)**								
1	**Water resource**			Deep well					
1)	**Altitude of JICA deep well**	El m	:	140					
2)	**Latitude**	N	:	1474169		Longitude	E	238141	
3)	**Permissible yield /well**	m3/day (l/sec)	:	406	(4.7)				
4)	**Static water surface level (S.W.L)**	m	:	24					
5)	**Dynamic water level (D.W.L)**	m	:	50					
6)	**Well diameter**	mm	:	150/110					
2	**Water demand**			2001	2010			2020	
1)	**Number of household**	Numbers	:	769					
2)	**Population**	Numbers	:	3931	4824			6056	
3)	**Per capita consumption**	l/s/d	:	30	60			60	
4)	**Maximum daily water demand**	m3/day	:	46	384			567	
5)	**Maximum hourly water demand**	m3/hour		4	32			47	
3	**Required number of well**	no.	:	1	0			1	Total 2
B	**Plan Parameter (2)**								
1	**Water intake**		:	Deep Well					
2	**Raw water transmission**		:	GI Pipes					
3	**Reservoir**		:	Ground Reservoir and elevated tower					
4	**Water treatment**		:	Aeration, Slow Sand filtration and Chlorination					
5	**Water distribution**		:	PVC, PE, Public taps, house connection					
6	**Power supply**		:	Public Net and/or generator					

III WATER SUPPLY FACILITY DESIGN

A Source — **Deep Wells**

Numbers needed in addition to existing Jica well

2002-2010	:	0
2010-2020	:	1

B Pump

Submersible pump					**Booster pumps**				
Yield:	4.7 l/s	Lift.	55 m			Yield		Lift	
2002-2010	:	1	nos		2002-2010	32	m3/hr	15	m
2010-2020	:	1	nos		2010-2020	15	m3/hr	15	m

C Power — **Public net, alternatively**
Diesel Generator

D Reservoir

Ground reservoir			**Elevated Tower**		
2002-2010	112	m3	2002-2010	16	m3
2010-2020	54	m3	2010-2020	8	m3
Total	166	m3	Total	24	m3

E Treatment — **Aeration, Slow sand filtration and chlorination.**

Aeration area:			**Reaction tank, volume:**			**Filter area**	:		
2002-2010	3	m2	2002-2010	16	m3	2002-2010	:	7	m2
2010-2020	2	m2	2010-2020	8	m3	2010-2020	:	3	m2
Total	5	m2	Total	24	m3	Total		10	m2

Chlorination vis concrete mixing tank

F Pipeline, raw water

Diameter	100	mm
2002-2010	1.5	km
2010-2020	1.5	km

G Distribution pipes

Diameter		2002-2010		2010-2020	
25-65	mm	7.4	km	0.7	km
75-125	mm	1.9	km	0.2	km
150-200	mm	0.6	km	0.1	km

I Public taps Type : 1 Numbers : 7

IV Notes

SPREAD SHEET ON PLAN AND DESIGN FOR RURAL WATER SUPPLY

I	**GENERAL INFORMATION**				
1	**Province**		:	Gia Lai	
2	**Name of Commune/Town**		:	Kong Yang (nos1, 2, 3, 4, Ba Ba)	
3	**System Number**		:	G-7	
4	**Water Resource**		:	Deep Well (present number of wells 1)	

II	**WATER SUPPLY PLAN**						
A	**Plan Parameter (1)**						
1	**Water resource**			Deep well			
1)	**Altitude of JICA deep well**	El m	:	472			
2)	**Latitude**	N	:	1531378		Longitude E	234391
3)	**Permissible yield /well**	m3/day (l/sec)	:	432 (5.0)			
4)	**Static water surface level (S.W.L)**	m	:	11			
5)	**Dynamic water level (D.W.L)**	m	:	34			
6)	**Well diameter**	mm	:	150/110			
2	**Water demand**			2001	2010		2020
1)	**Number of household**	Numbers	:	374			
2)	**Population**	Numbers	:	1542	1892		2375
3)	**Per capita consumption**	l/s/d	:	30	60		60
4)	**Maximum daily water demand**	m3/day	:	18	151		222
5)	**Maximum hourly water demand**	m3/hour		2	13		19
3	**Required number of well**	no.	:	1	0		0 Total 1
B	**Plan Parameter (2)**						
1	**Water intake**		:	Deep Well			
2	**Raw water transmission**		:	GI Pipes			
3	**Reservoir**		:	Ground Reservoir and elevated tower			
4	**Water treatment**		:	Aeration, Slow Sand filtration and Chlorination			
5	**Water distribution**		:	PVC, PE, Public taps, house connection			
6	**Power supply**		:	Public Net and/or generator/Solar systems			

III WATER SUPPLY FACILITY DESIGN

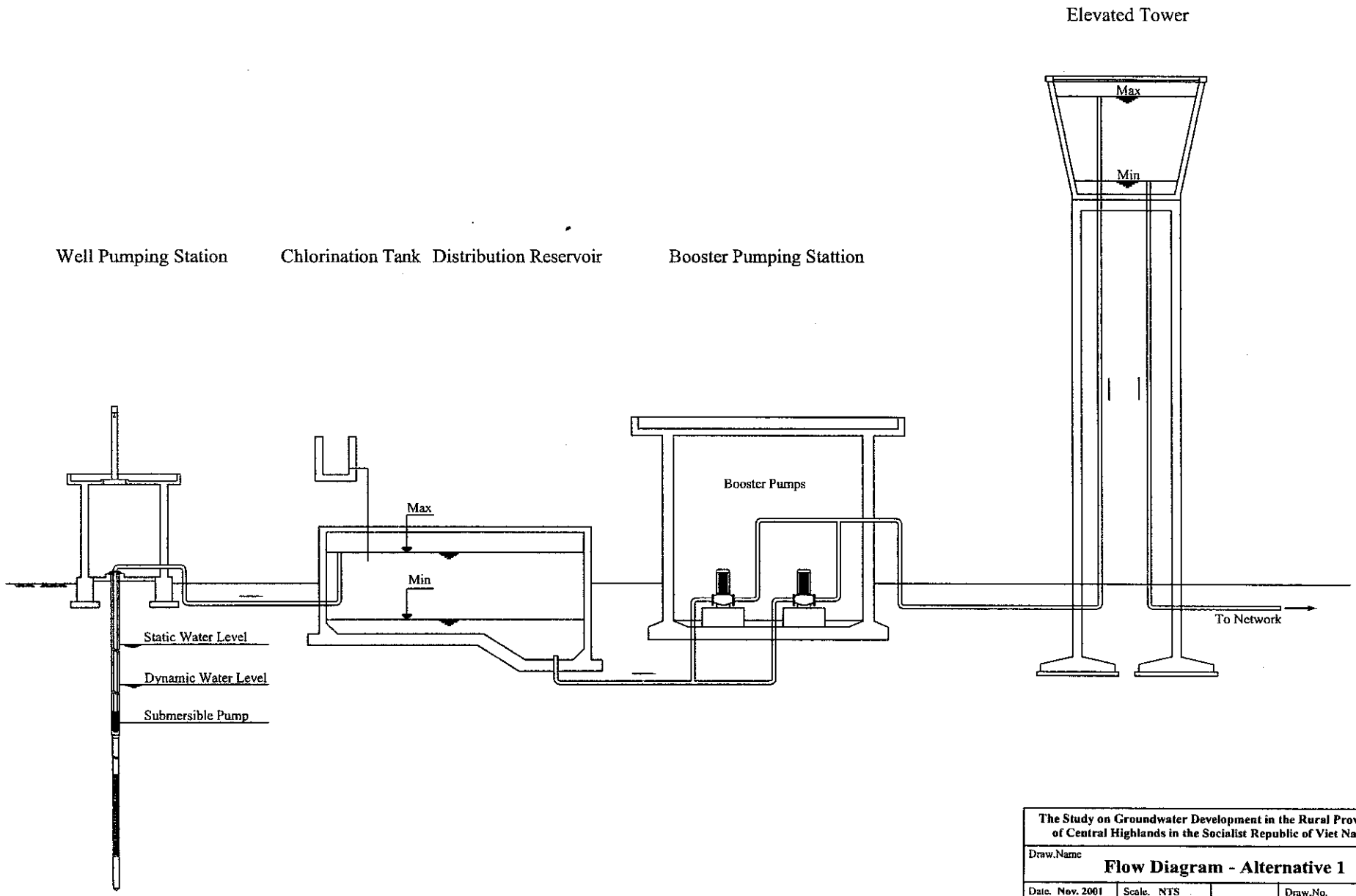
A	**Source**	**Deep Wells**								
		Numbers needed in addition to existing Jica well								
		2002-2010	:	0						
		2010-2020	:	0						
B	**Pump**	**Submersible pump**					**Booster pumps**			
		Yield:	5.0 l/s	Lift.	75 m			Yield		Lift
		2002-2010	:	1 nos			2002-2010	13	m3/hr	15 m
		2010-2020	:	0 nos			2010-2020	6	m3/hr	15 m
C	**Power**	**Public net, alternatively**								
		Diesel Generator								
		Solar systems								
D	**Reservoir**	**Ground reservoir**					**Elevated Tower**			
		2002-2010		44 m3			2002-2010	7 m3		
		2010-2020		21 m3			2010-2020	3 m3		
		Total		65 m3			Total	10 m3		
E	**Treatment**	**Aeration, Slow sand filtration and chlorination.**								
		Aeration area:			**Reaction tank, volume:**		**Filter area**	:		
		2002-2010		2 m2	2002-2010	9 m3	2002-2010	:	4 m2	
		2010-2020		1 m2	2010-2020	0 m3	2010-2020	:	0 m2	
		Total		2 m2	Total	10 m3	Total		4 m2	
F	**Pipeline, raw water**									
		Diameter		100 mm						
		2002-2010		1.5 km						
		2010-2020		0 km						
G	**Distribution pipes**									
		Diameter		2002-2010	2010-2020				:	
		25-65	mm	12 km	0.7 km					
		75-125	mm	1.9 km	0.2 km					
		150-200	mm	1.5 km	km					
I	**Public taps**	Type	:	1	Numbers :	7				

IV Notes

Appendix 3

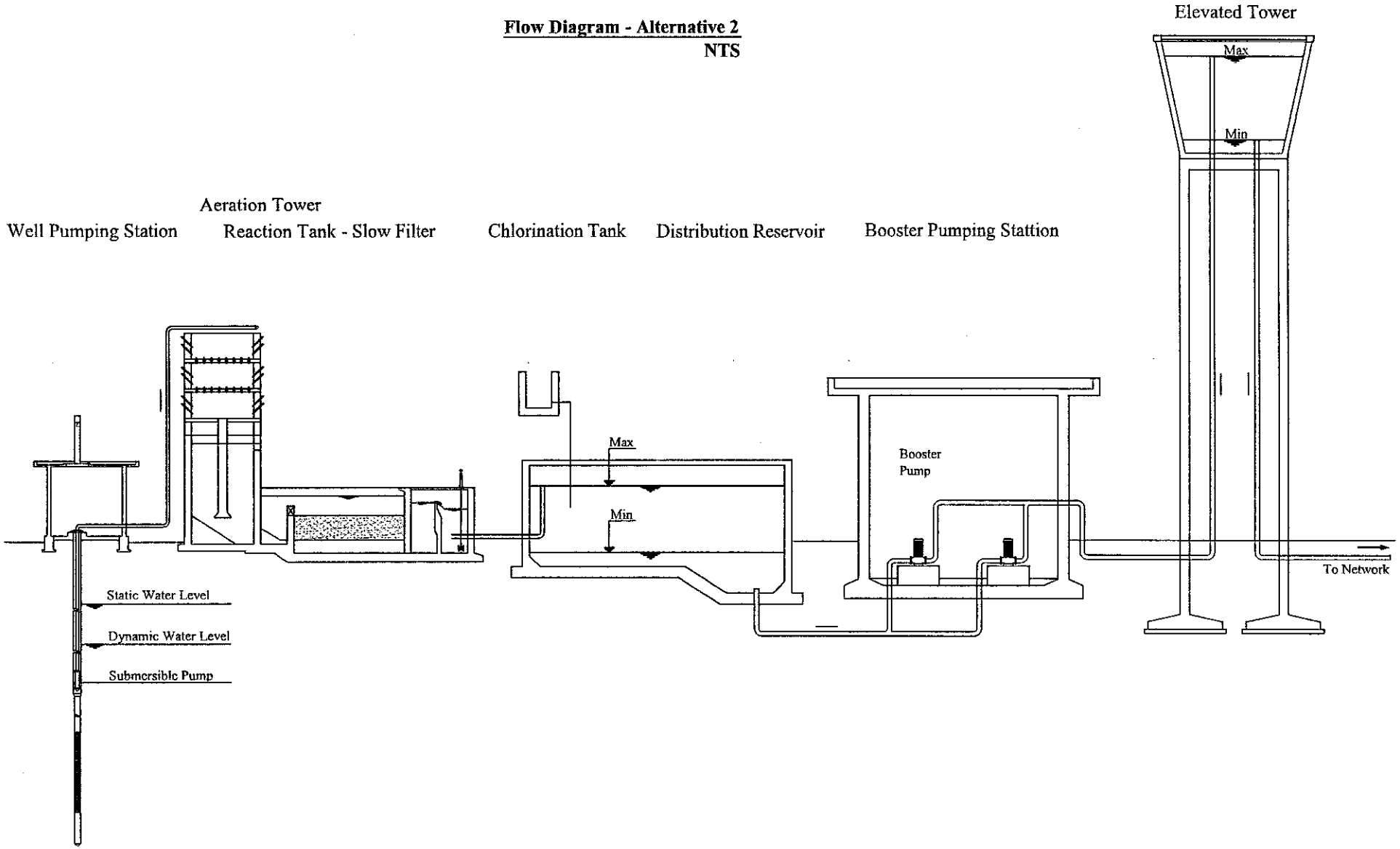
Standard Designs of Water Supply Facilities

Flow Diagram - Alternative 1
NTS



The Study on Groundwater Development in the Rural Provinces of Central Highlands in the Socialist Republic of Viet Nam			
Draw.Name	Flow Diagram - Alternative 1		
Date. Nov. 2001	Scale. NTS		Draw.No.
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)			

Flow Diagram - Alternative 2
NTS



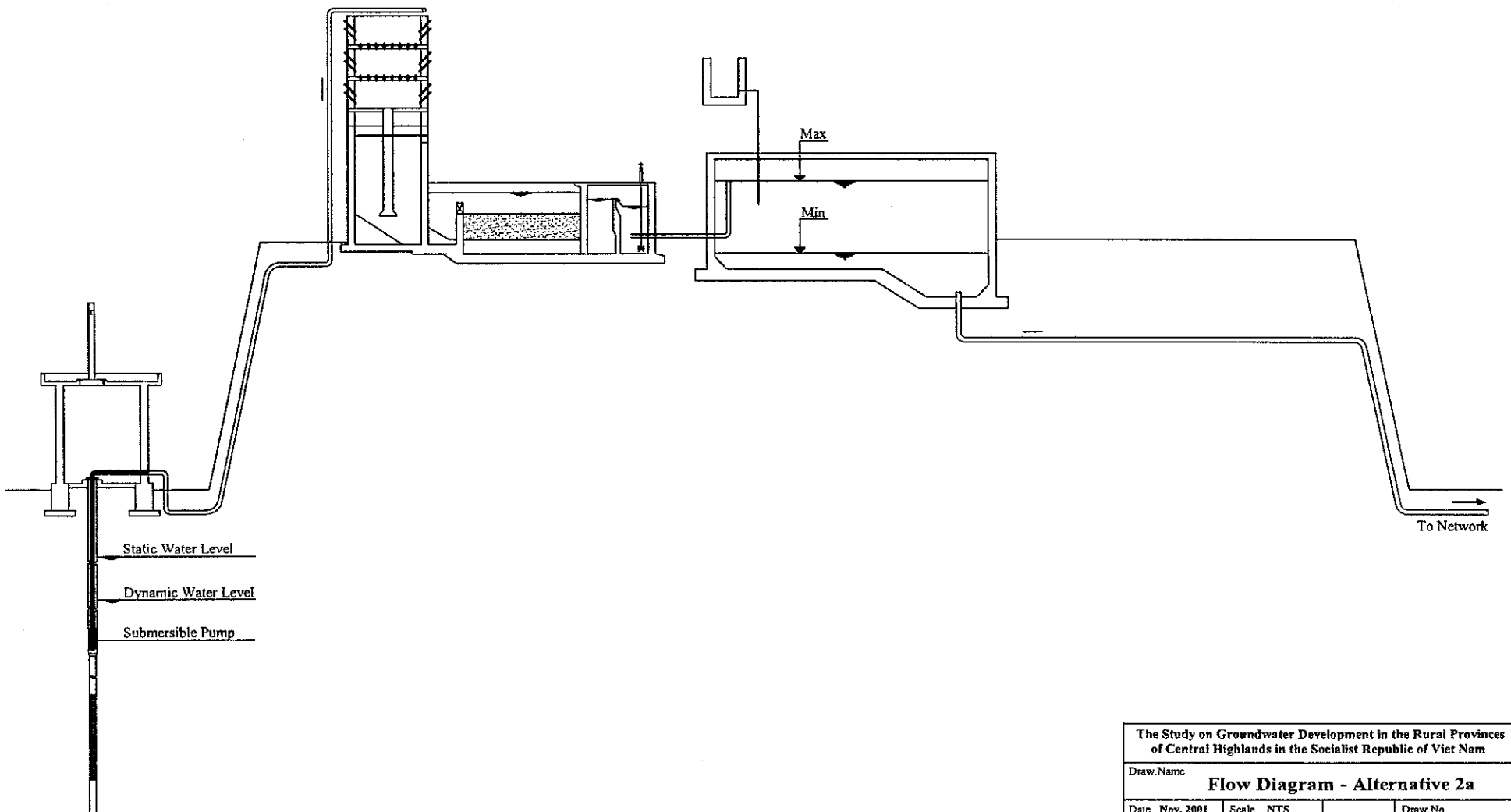
The Study on Groundwater Development in the Rural Provinces of Central Highlands in the Socialist Republic of Viet Nam			
Draw.Name: Flow Diagram - Alternative 2			
Date. Nov. 2001	Scale. NTS		Draw.No.
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)			

Format A3

Flow Diagram - Alternative 2a
NTS

Aeration Tower

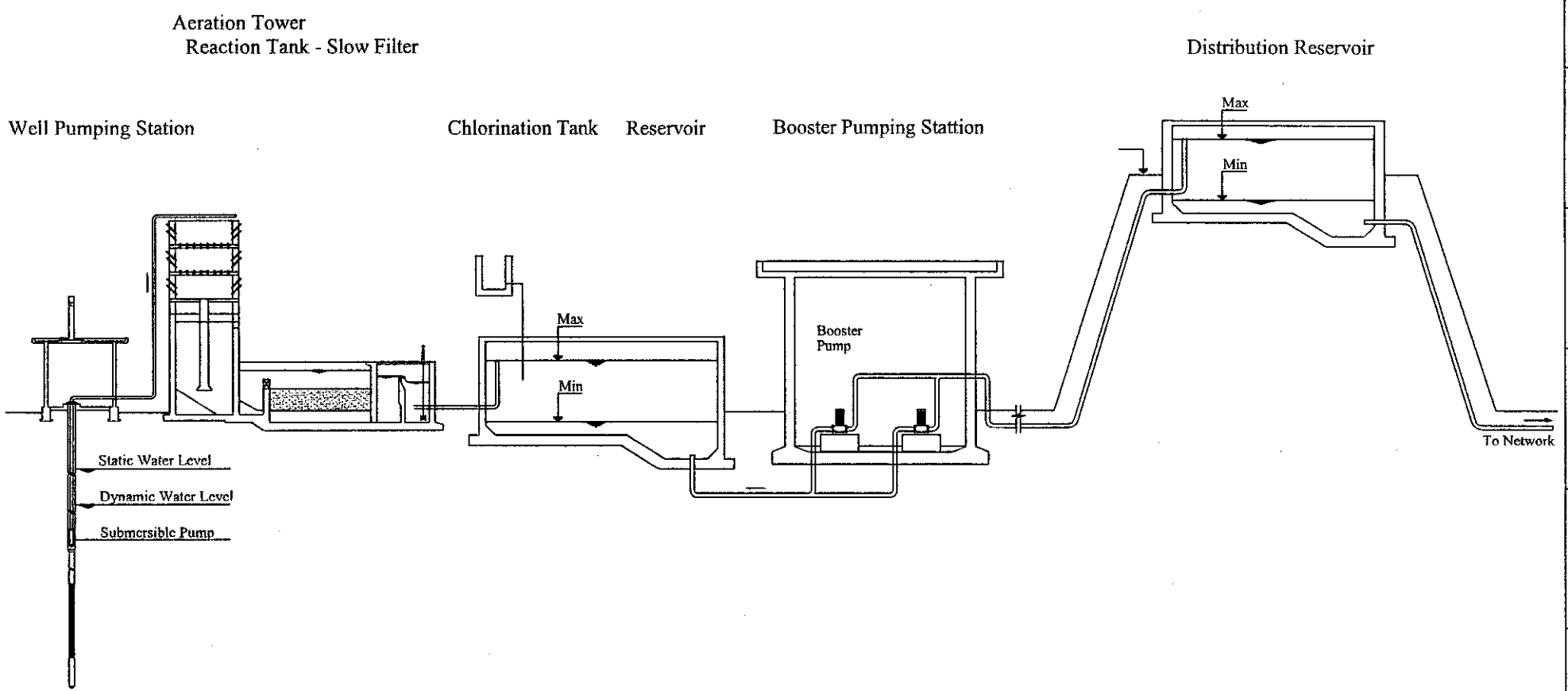
Well Pumping Station | Reaction Tank - Slow Filter | Chlorination Tank | Distribution Reservoir | Booster Pumping Stattion



The Study on Groundwater Development in the Rural Provinces of Central Highlands in the Socialist Republic of Viet Nam			
Draw.Name: Flow Diagram - Alternative 2a			
Date. Nov. 2001	Scale. NTS		Draw.No.
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)			

Format A3

Flow Diagram - Alternative 2b
NTS

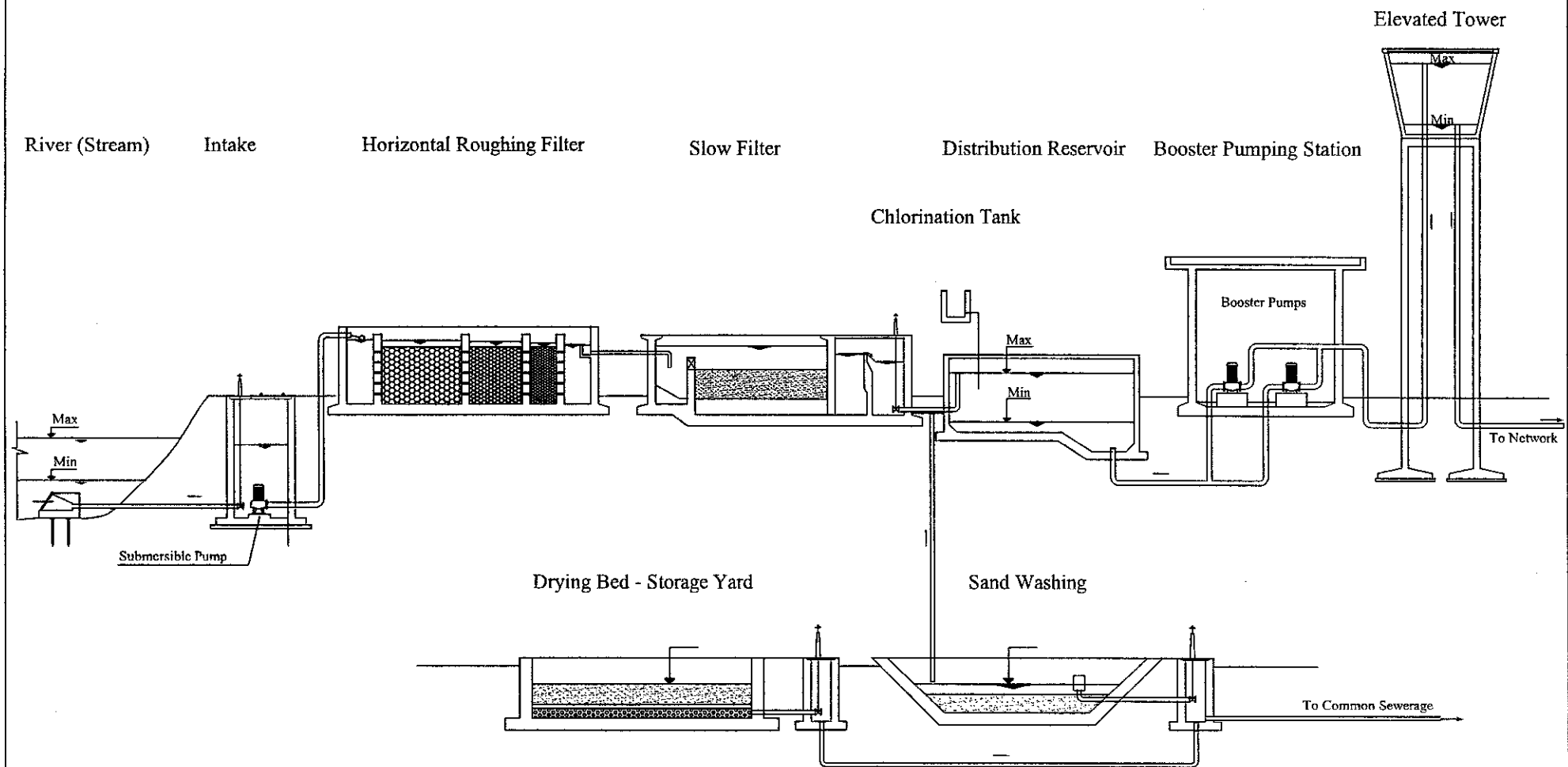


The Study on Groundwater Development in the Rural Provinces of Central Highlands in the Socialist Republic of Viet Nam			
Draw.Name: Flow Diagram - Alternative 2b			
Date. Nov. 2001	Scale. NTS		Draw.No.
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)			

Format A3

Flow Diagram - Alternative 3

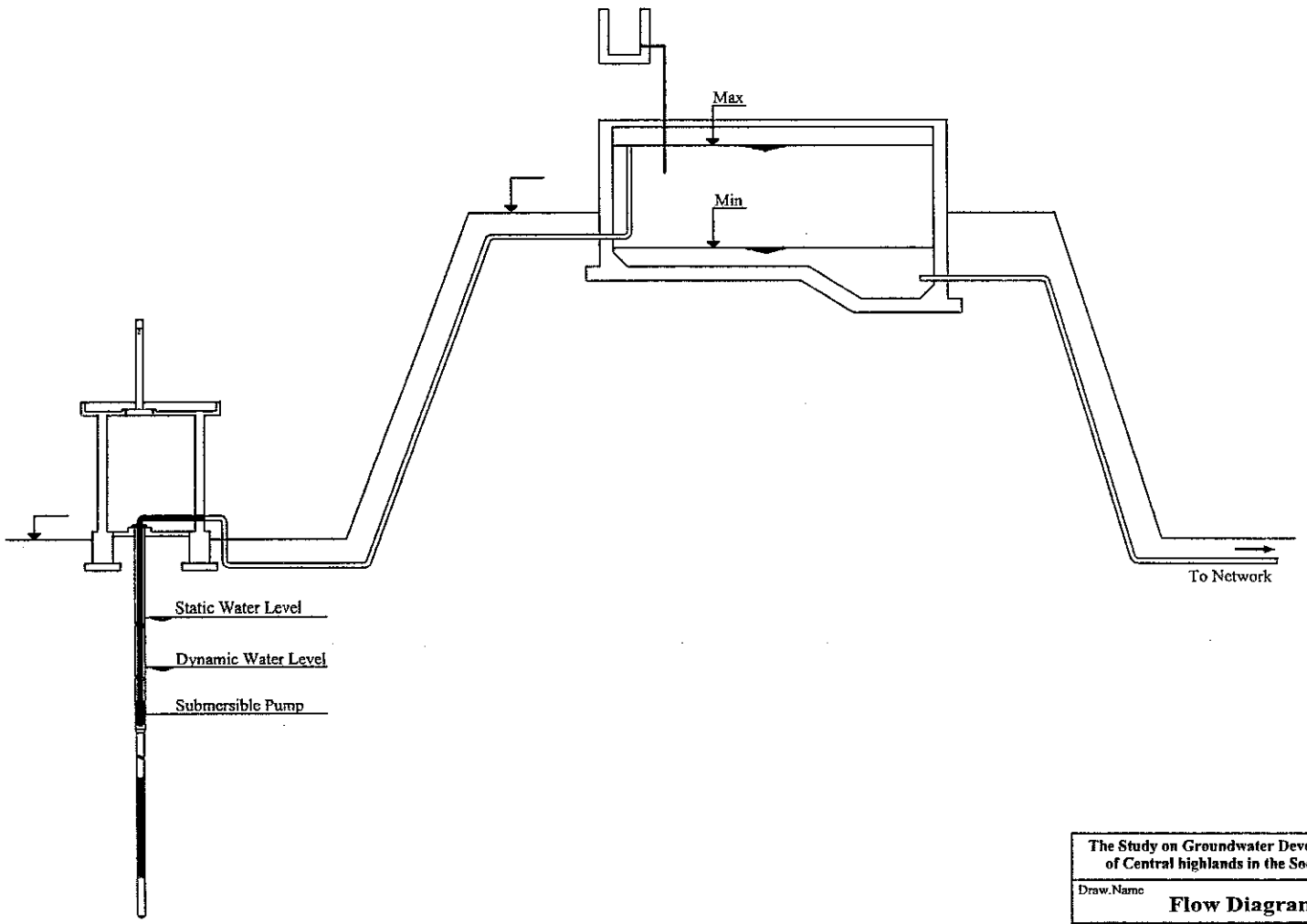
NTS



The Study on Groundwater Development in the Rural Provinces of Central Highlands in the Socialist Republic of Viet Nam			
Draw.Name	Flow Diagram - Alternative 3		
Date. Nov. 2001	Scale. NTS		Draw.No. A
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)			

Flow Diagram - Aternative 4

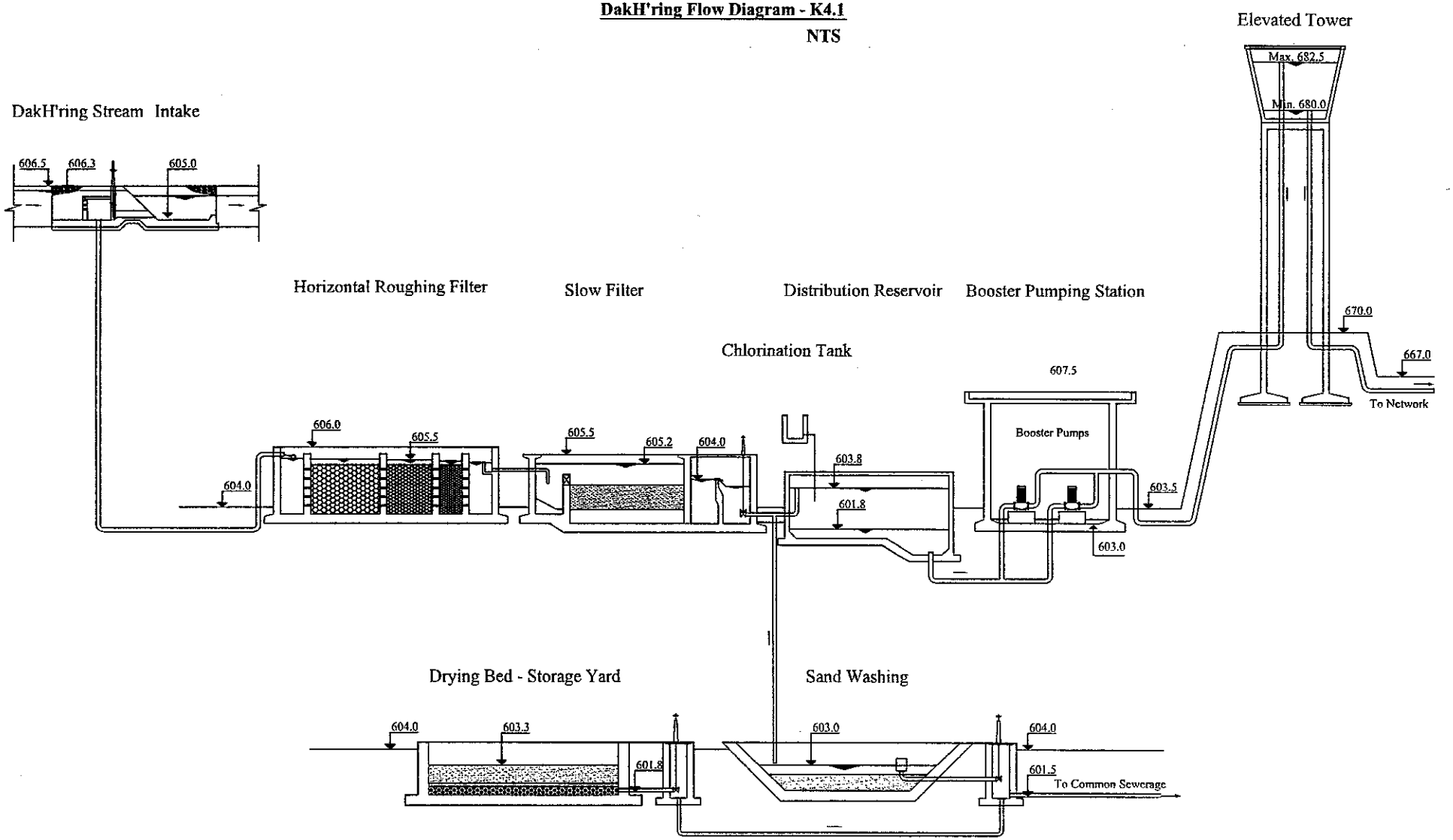
NTS



The Study on Groundwater Development in the Rural Provinces of Central highlands in the Socialist Republic of Viet Nam			
Draw.Name: Flow Diagram - Alternative 4			
Date. Nov. 2001	Scale. NTS		Draw.No.
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)			

DakH'ring Flow Diagram - K4.1

NTS



The Study on Groundwater Development in the Rural Provinces of Central Highlands in the Socialist Republic of Viet Nam			
Draw.Name: **DakH'ring Flow Diagram - K4.1**			
Date. Nov. 2001	Scale. NTS		Draw.No. A
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)			

CAD File : Layout_Alter1.dwg

Format A3

Typical Layout Plan - Alternative 1

S = 1/250

The Study on Groundwater Development in the Rural Provinces of Central Highlands in the Socialist Republic of Viet Nam	
Draw.Name	Typical Layout Plan - Alternative 1
Date. Nov. 2001	Scale. 1 : 250
For A3 size	Draw.No.
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)	

CAD File : Layout_Alter2.dwg

Format A3

Typical Layout Plan - Alternative 2

S = 1/250

The Study on Groundwater Development in the Rural Provinces of Central Highlands in the Socialist Republic of Viet Nam	
Draw.Name	Typical Layout Plan - Alternative 2
Date: Nov. 2001	Scale: 1 : 250
For A3 size	Draw.No.
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)	

Typical Layout Plan - Alternative 3

S = 1/250

The Study on Groundwater Development in the Rural Provinces of Central Highlands in the Socialist Republic of Viet Nam	
Draw.Name	Typical Layout Plan - Alternative 3
Date. Nov. 2001	Scale. 1 : 250
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)	For A3 size / Draw.No.

CAD File : Layout_Alter4.dwg

Format A3

Typical Layout Plan - Alternative 4

S = 1/250

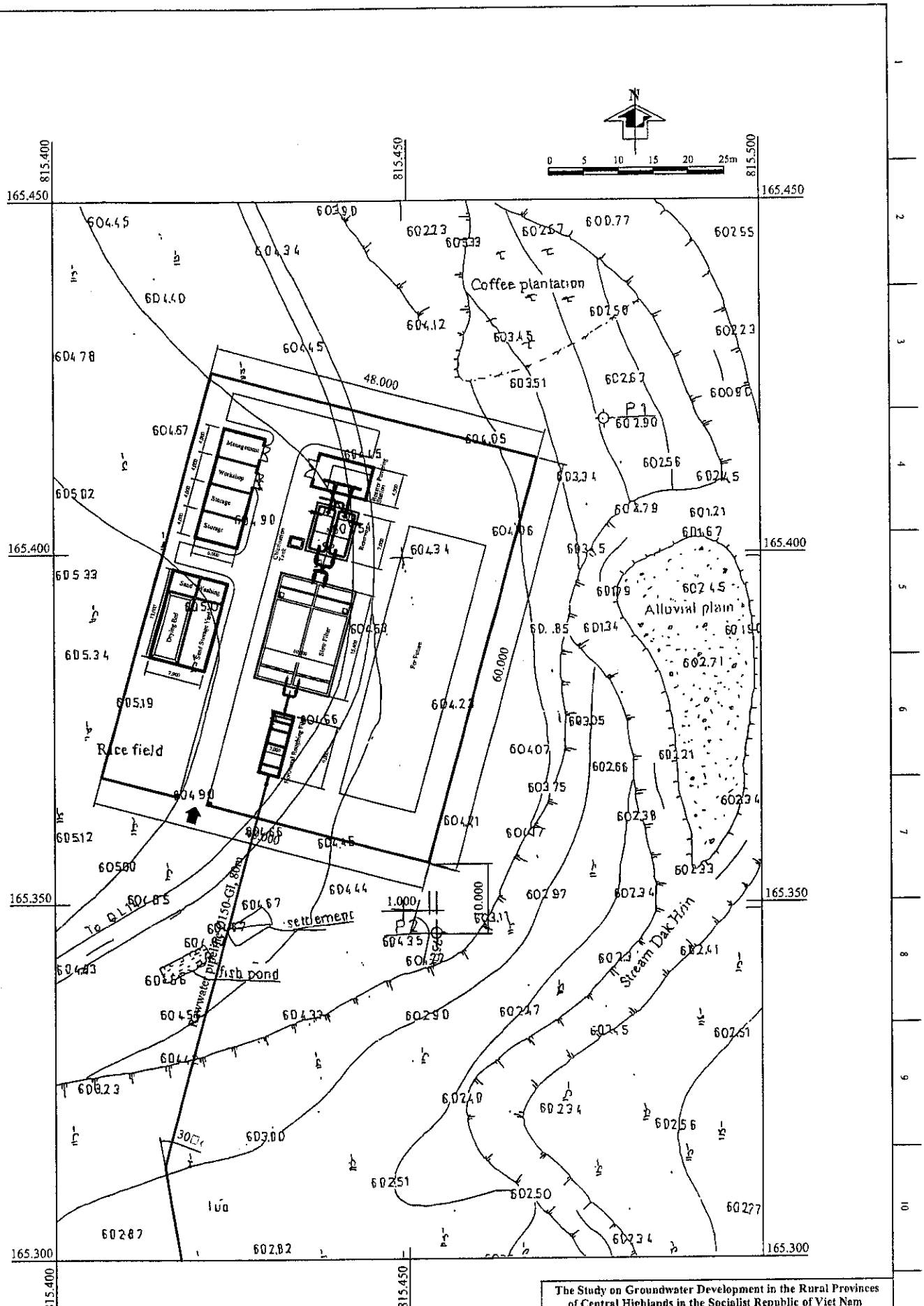
The Study on Groundwater Development in the Rural Provinces of Central Highlands in the Socialist Republic of Viet Nam

Draw.Name

Typical Layout Plan - Alternative 4

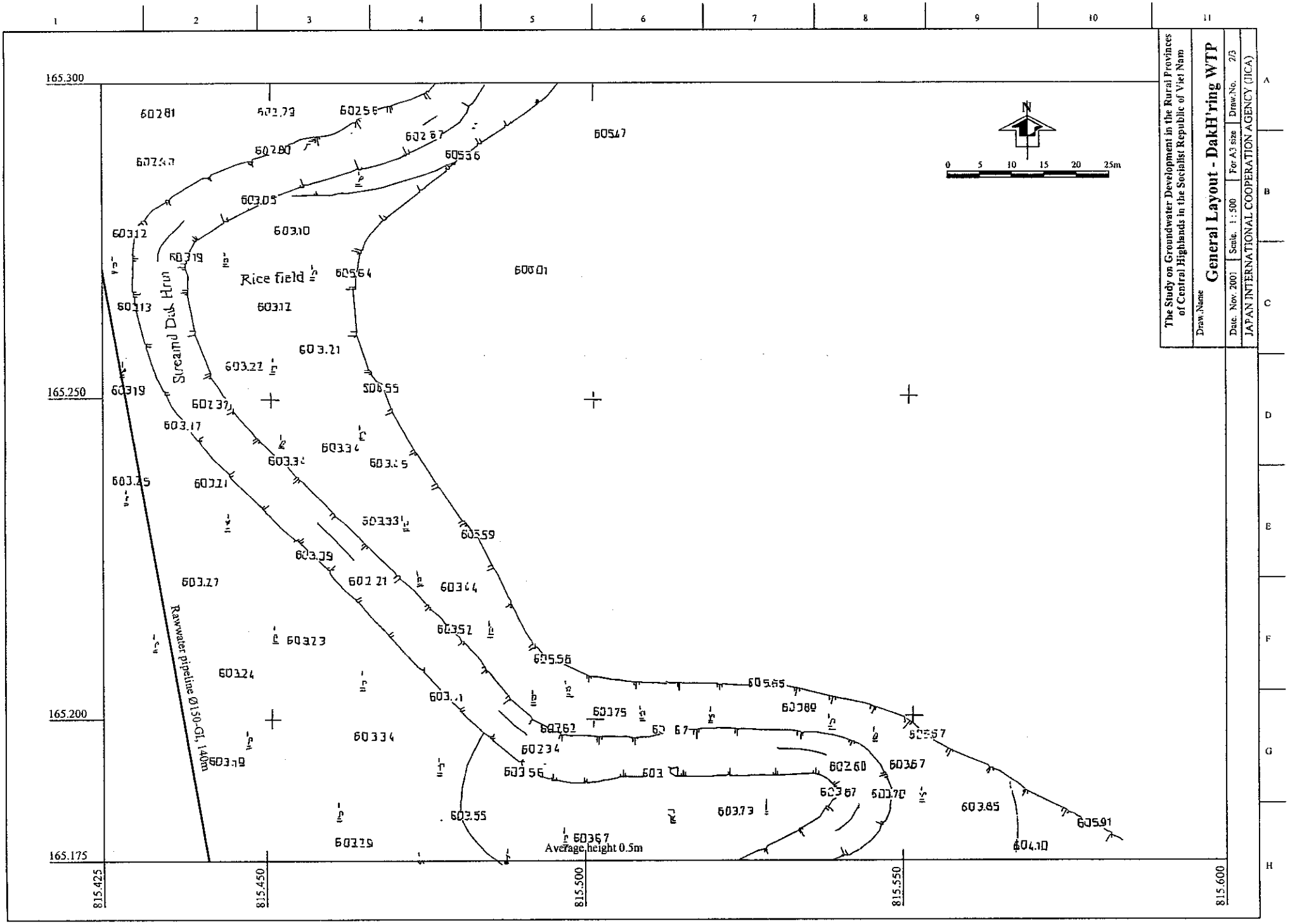
Date. Nov. 2001	Scale. 1 : 250	For A3 size	Draw.No.

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)



The Study on Groundwater Development in the Rural Provinces of Central Highlands in the Socialist Republic of Viet Nam			
Draw.Name: **General Layout - DakH'ring WTP**			
Date. Nov. 2001	Scale. 1 : 500	For A3 size	Draw.No. 1/3
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)			

CAD File : General-LayoutPlan-K41.dwg



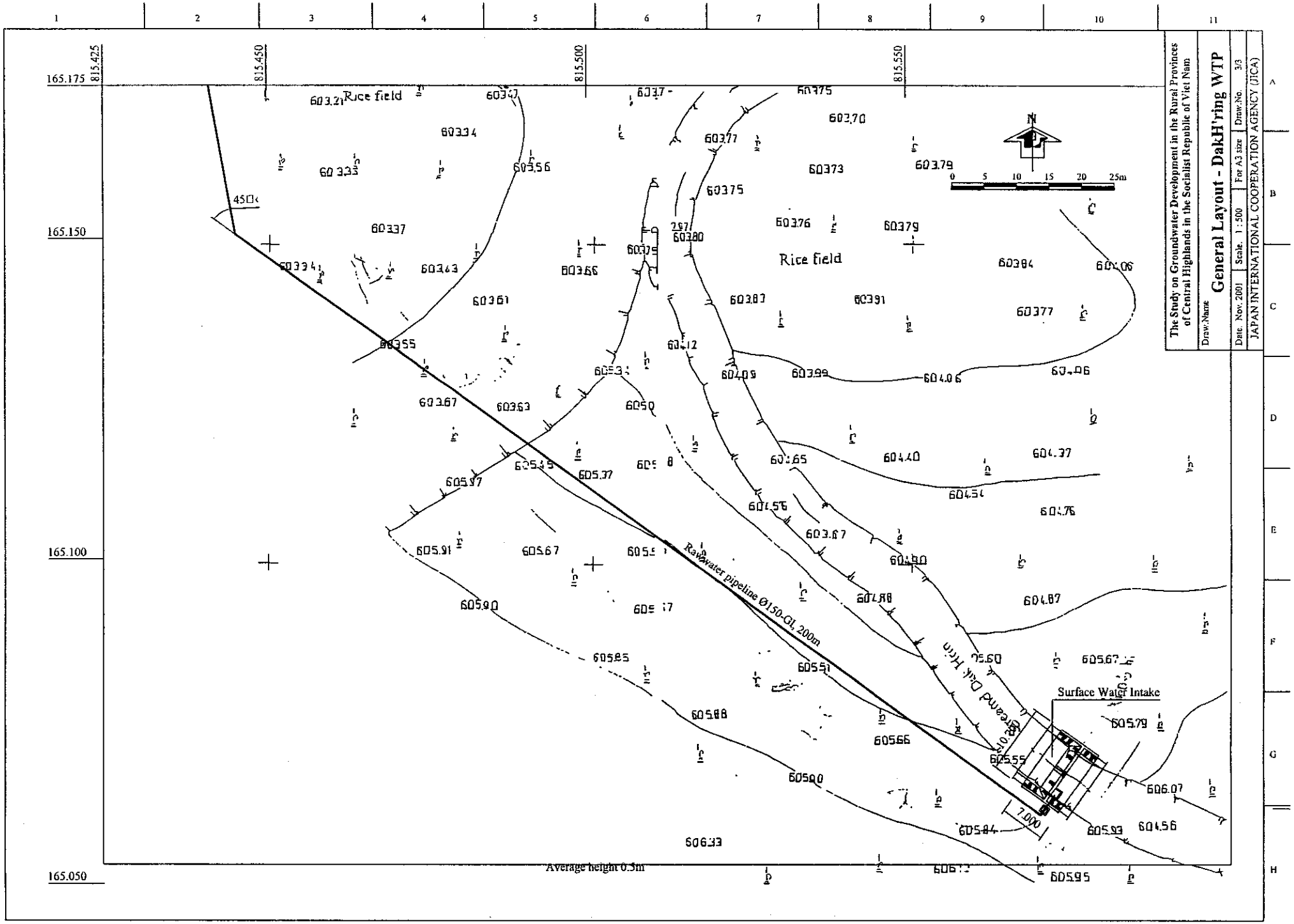
The Study on Groundwater Development in the Rural Provinces of Central Highlands in the Socialist Republic of Viet Nam

Draw.Name: **General Layout - DakH'ring WTP**

Date. Nov. 2001 | Scale. 1 : 500 | For A3 size | Draw.No. 2/3

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

CAD File : General-LayoutPlan-K41.dwg



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

Draw.Name: **General Layout - DakH'ring WTP**

Date. Nov. 2001 | Scale. 1 : 500 | For A3 size | Draw.No. 3/3

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

CAD File : General-LayoutPlan-K41.dwg

CAD File : LayoutPlan-K41.dwg

Format A3

DakH'ring Water Treatment Plant Layout - K4.1

S = 1/250

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

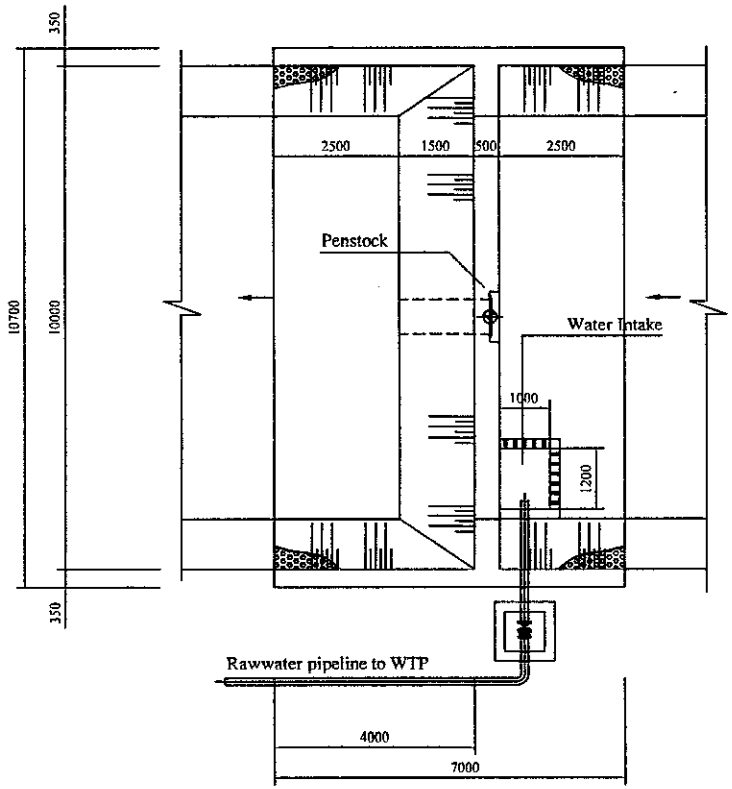
Draw.Name: DakH'ring Water Treatment Layout - K4.1

Date. Nov. 2001	Scale. 1 : 250	For A3 size	Draw.No.

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

# Surface Water Intake
S = 1/100

Plan



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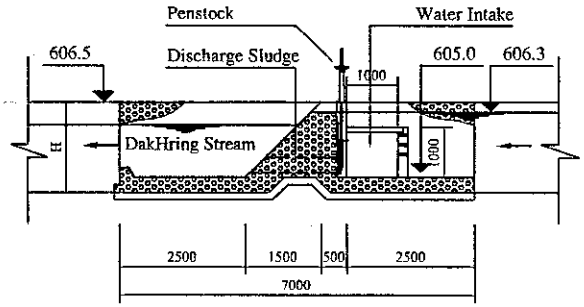
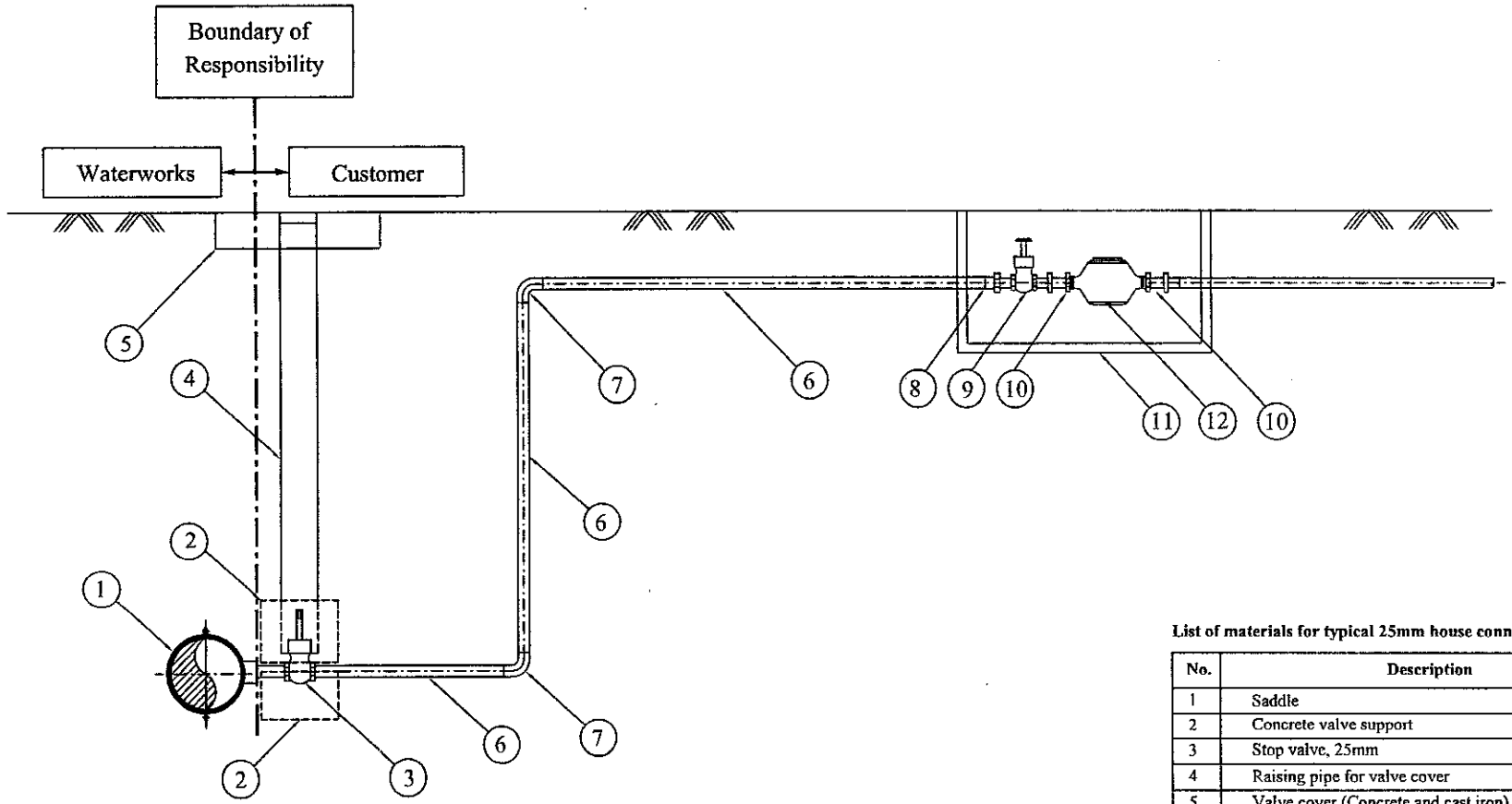


The Study on Groundwater Development in the Rural Provinces of Central Highlands in the Socialist Republic of Viet Nam			
Draw.Name: **Surface Water Intake**			
Date. Nov. 2001	Scale. 1 : 100	For A3 size	Draw.No.
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)			

CAD File : Surface Water Intake.dwg

Format A3

Typical House Connection
NTS



List of materials for typical 25mm house connection

No.	Description
1	Saddle
2	Concrete valve support
3	Stop valve, 25mm
4	Raising pipe for valve cover
5	Valve cover (Concrete and cast iron)
6	PVC Straight Pipe, 25mm
7	Elbow, 25mm
8	Socket, 25mm
9	Stop valve, 25mm
10	Union Coupling, 25mm x 15mm
11	Concrete made meter box with steel cover
12	Water meter, 15mm

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

Draw.Name **Typical House Connection**

Date. Nov. 2001	Scale. NTS		Draw.No. D

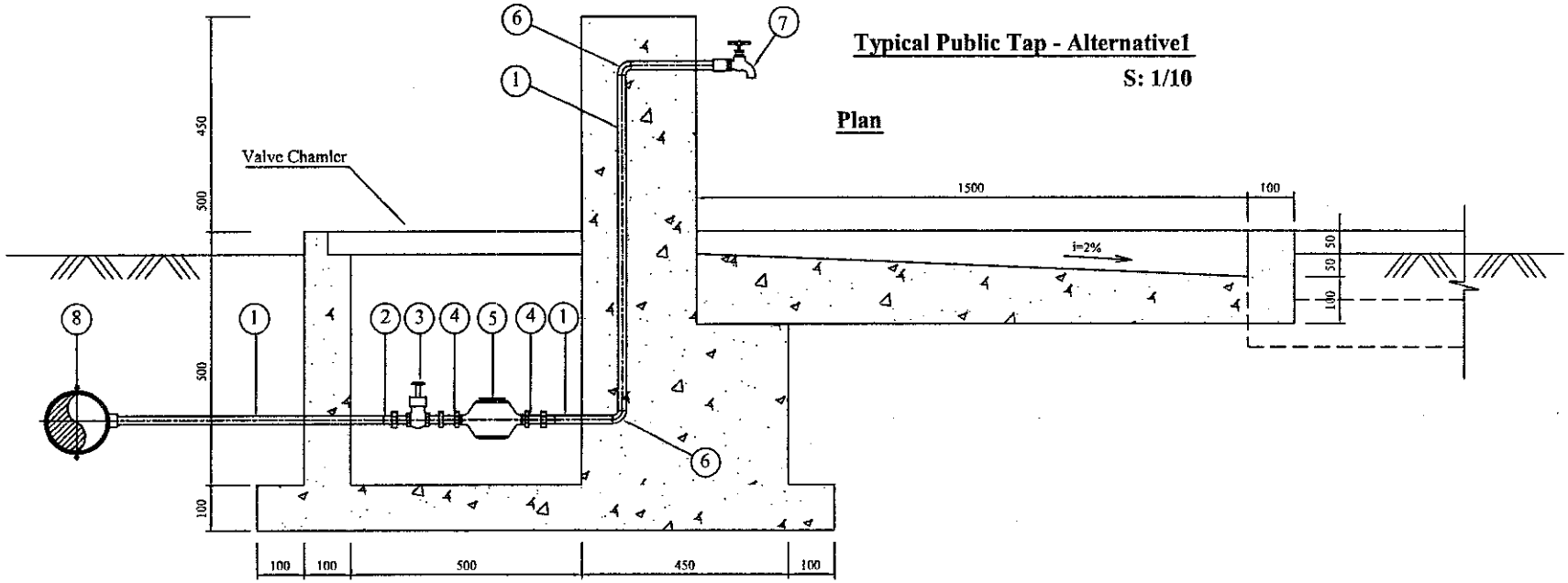
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

Format A3

Typical Public Tap - Alternative1

S: 1/10

Plan



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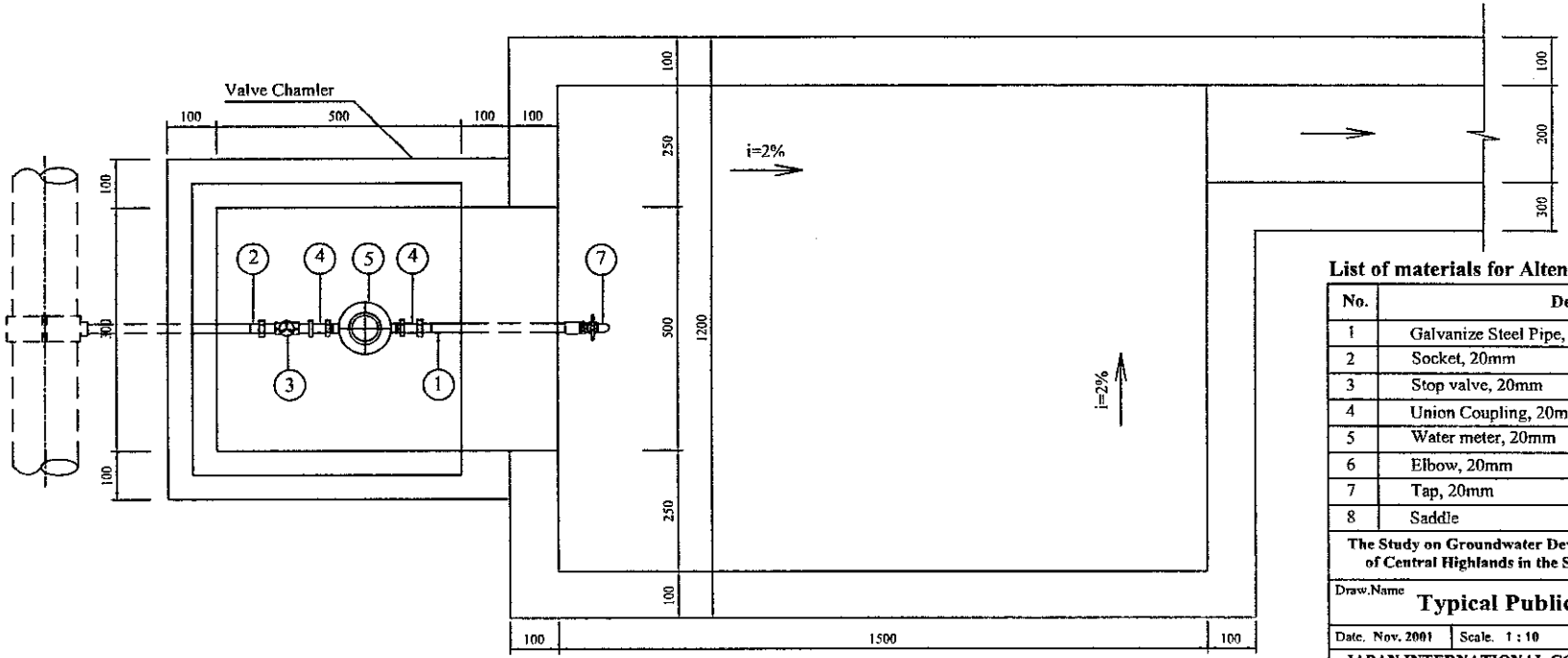


List of materials for Altenative 1

No.	Description
1	Galvanize Steel Pipe, 20mm
2	Socket, 20mm
3	Stop valve, 20mm
4	Union Coupling, 20mm x 15mm
5	Water meter, 20mm
6	Elbow, 20mm
7	Tap, 20mm
8	Saddle

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

Draw.Name: **Typical Public Tap - Alternative1**

Date. Nov. 2001	Scale. 1 : 10	For A3 size	Draw.No.

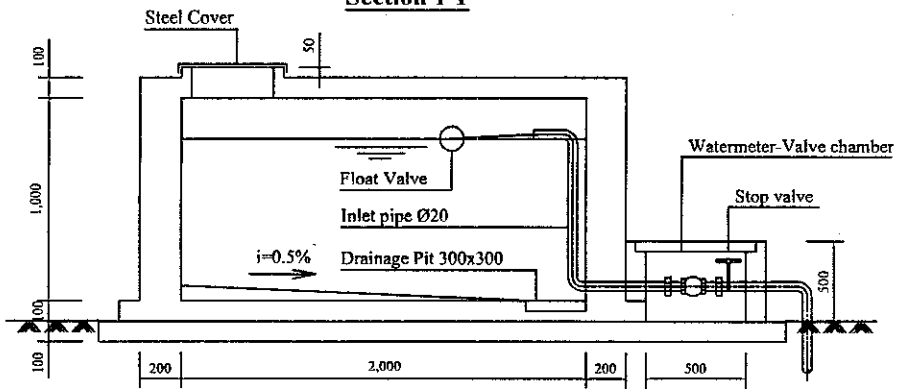
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

Format A3

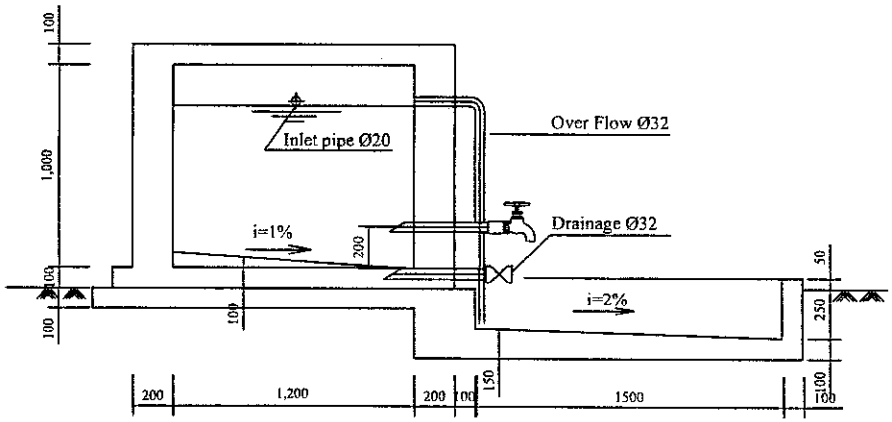
Typical Public Tap - Alternative 2

S: 1/25

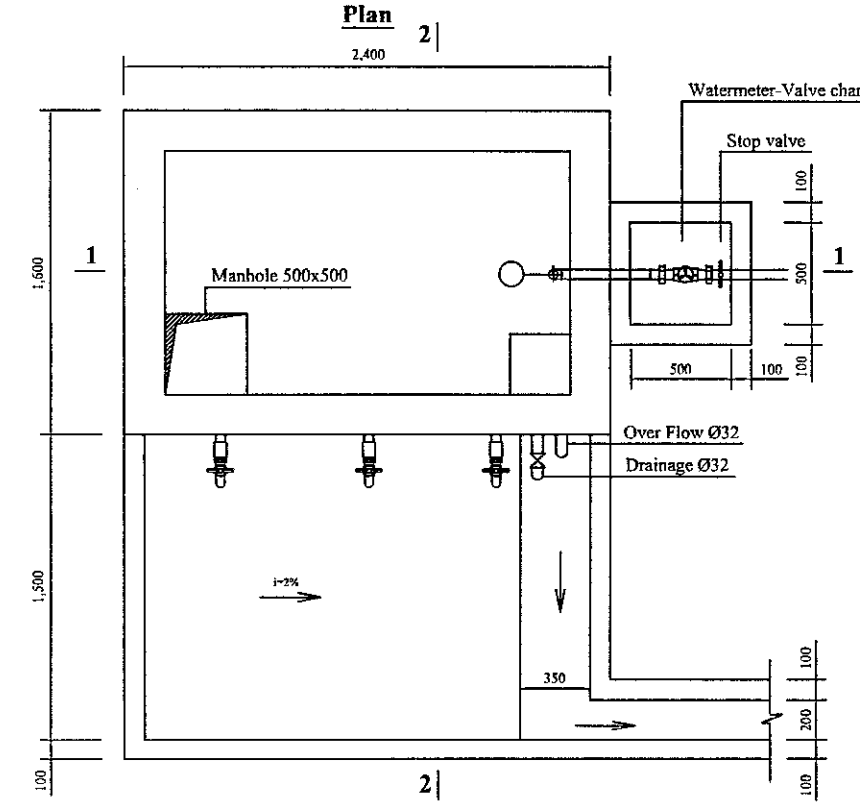
Section 1-1



Section 2-2



Plan



List of materials

No.	Description
	Galvanize Steel Pipe, 20mm
	Socket, 20mm
	Stop valve, 20mm
	Union Coupling, 20mm x 15mm
	Water meter, 20mm
	Elbow, 20mm
	Tap, 20mm
	Float Valve
	Saddle

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

Draw.Name: Typica Public Tap - Alternative 2

Date. Nov. 2001	Scale. 1 : 25	For A3 size	Draw.No. 4

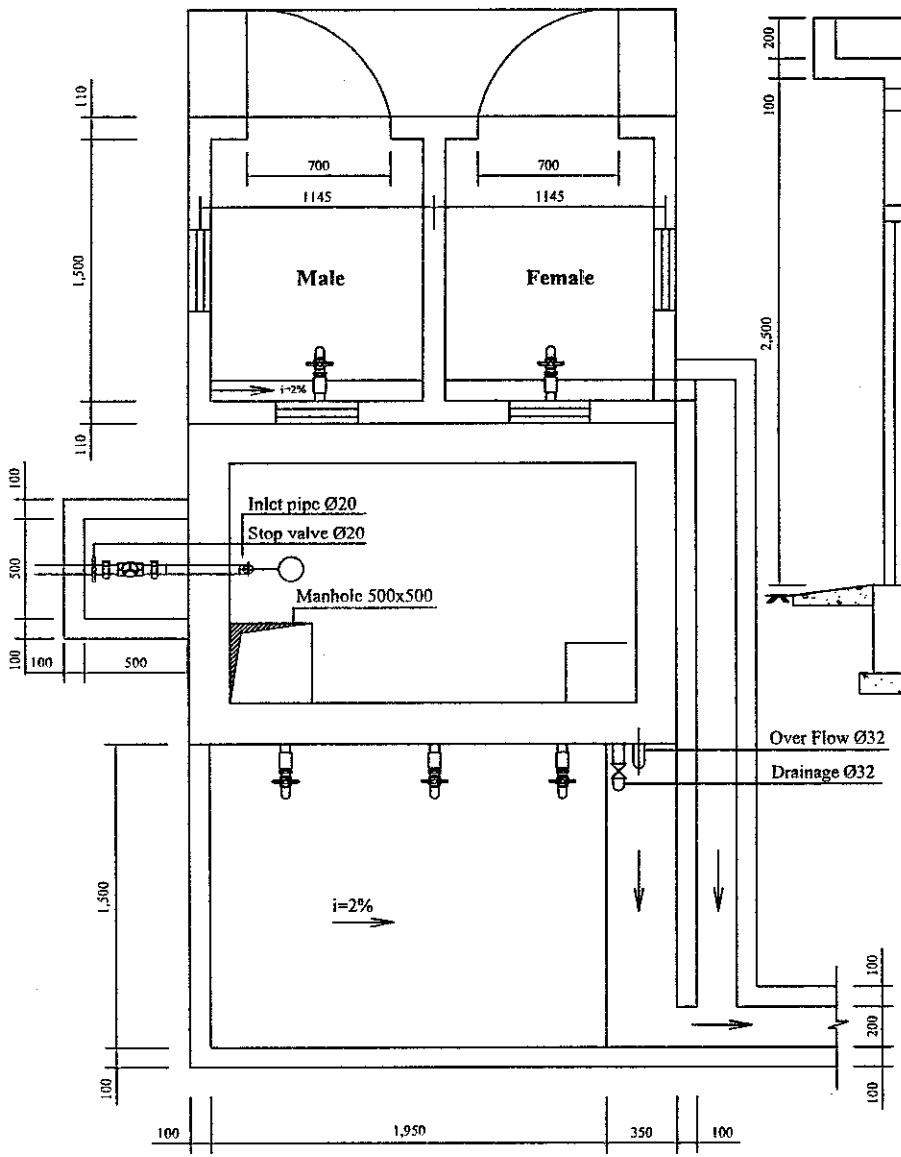
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

Format A3

Typical Public Tap - Alternative 3

S: 1/25

Plan



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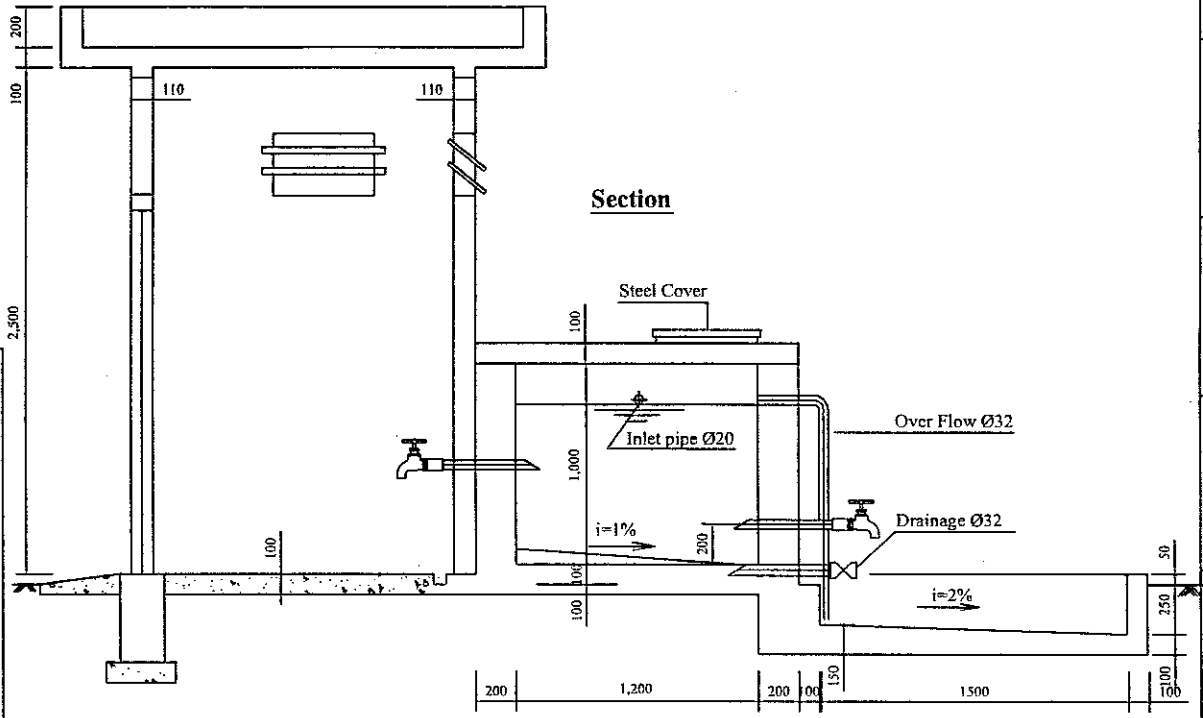


List of materials

No.	Description
	Galvanize Steel Pipe, 20mm
	Float Valve
	Socket, 20mm
	Stop valve, 20mm
	Union Coupling, 20mm x 15mm
	Water meter, 20mm
	Elbow, 20mm
	Tap, 20mm
	Saddle

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

Draw.Name: **Typical Public Tap - Alternative 3**

Date. Nov. 2001	Scale. 1 : 25	For A3 size	Draw.No. 5

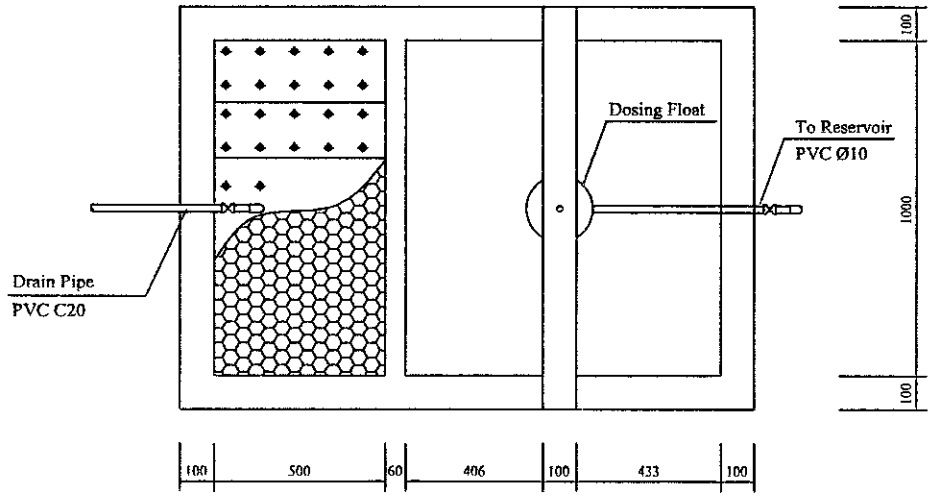
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

Format A3

Chlorinator

S = 1/15

Plan



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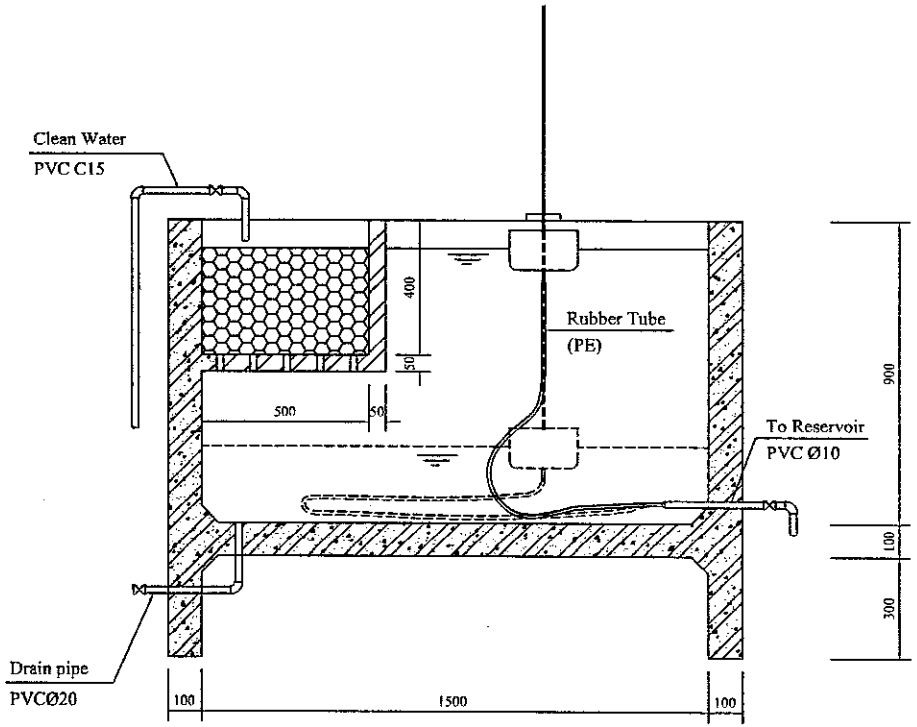


The Study on Groundwater Development in the Rural Provinces of Central Highlands in the Socialist Republic of Viet Nam			
Draw.Name: Chlorinator			
Date. Nov. 2001	Scale. 1 : 15	For A3 size	Draw.No.
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)			

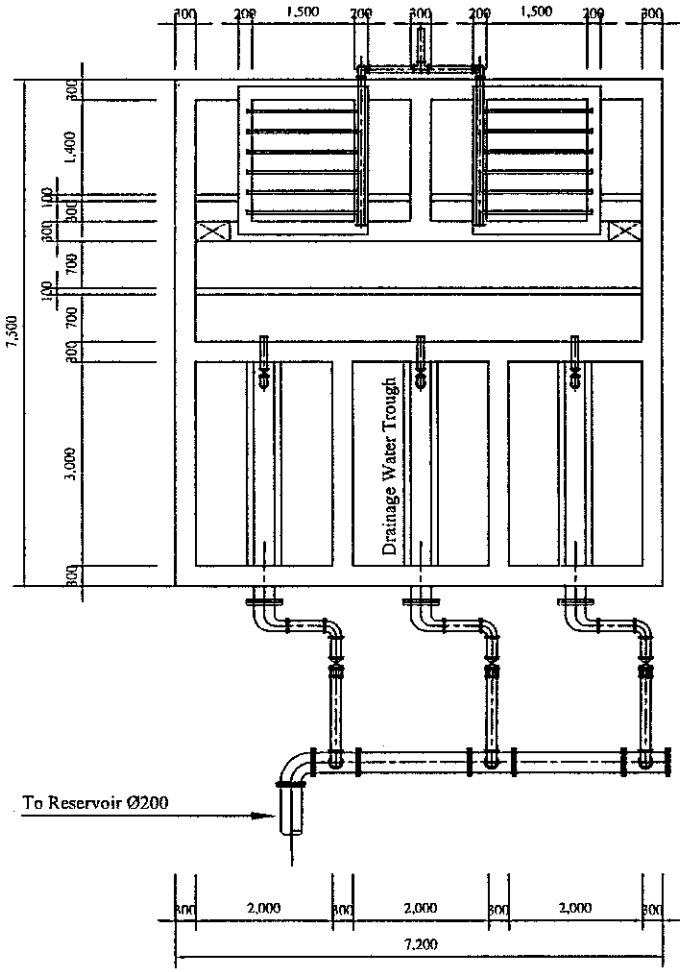
CAD File : Typ_ChemicalTank.dwg

Format A3

Aeration Tower - Reaction Tank - Slow Sand Filter

S = 1/75

Plan



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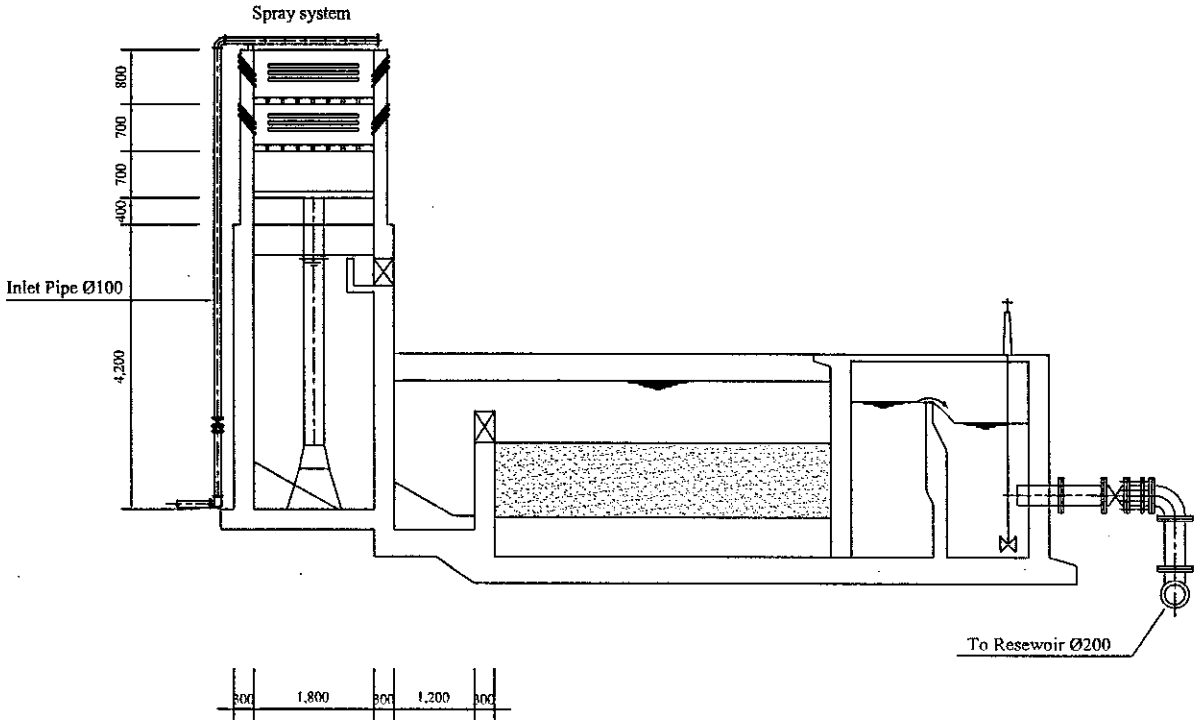


The Study on Groundwater Development in the Rural Provinces of Central Highlands in the Socialist Republic of Viet Nam			
Draw.Name: Aeration Tower - Reaction Tank - Slow Filter			
Date. Nov. 2001	Scale. 1 : 75	For A3 size	Draw.No.
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)			

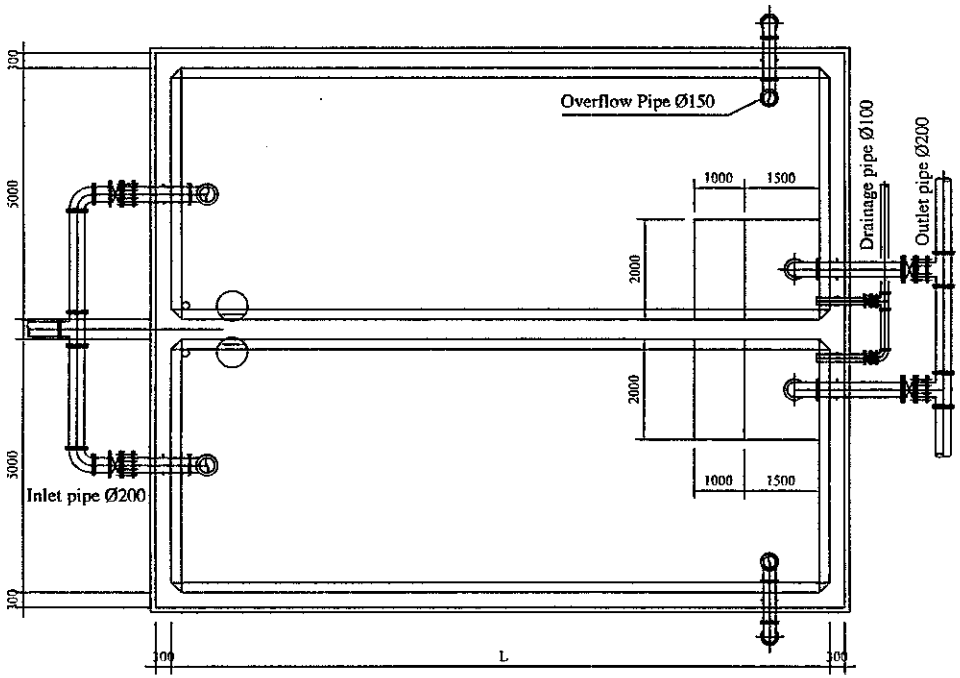
CAD File : Typ_Rapid Filter.dwg

Format A3

Distribution Reservoir

S = 1/100

Plan



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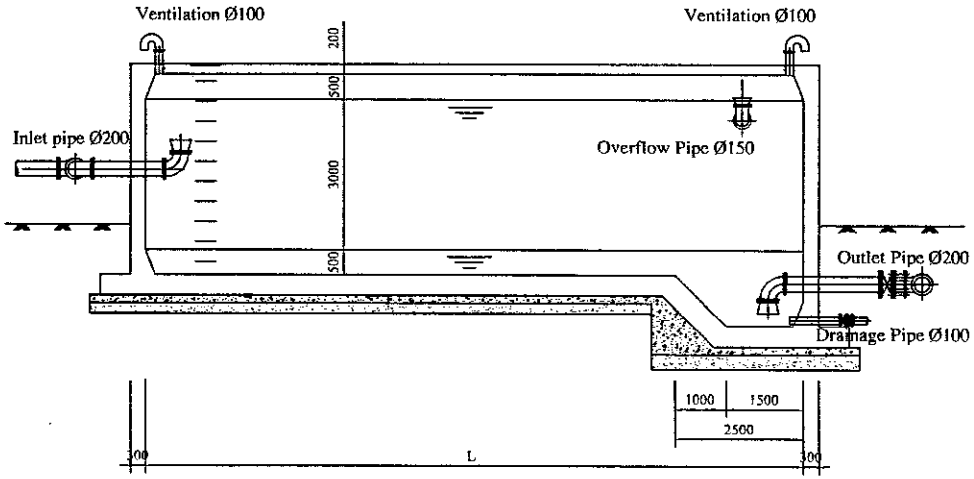


The Study on Groundwater Development in the Rural Provinces of Central Highlands in the Socialist Republic of Viet Nam			
Draw.Name: Distribution Reservoir			
Date. Nov. 2001	Scale. 1 : 100	For A3 size	Draw.No.
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)			

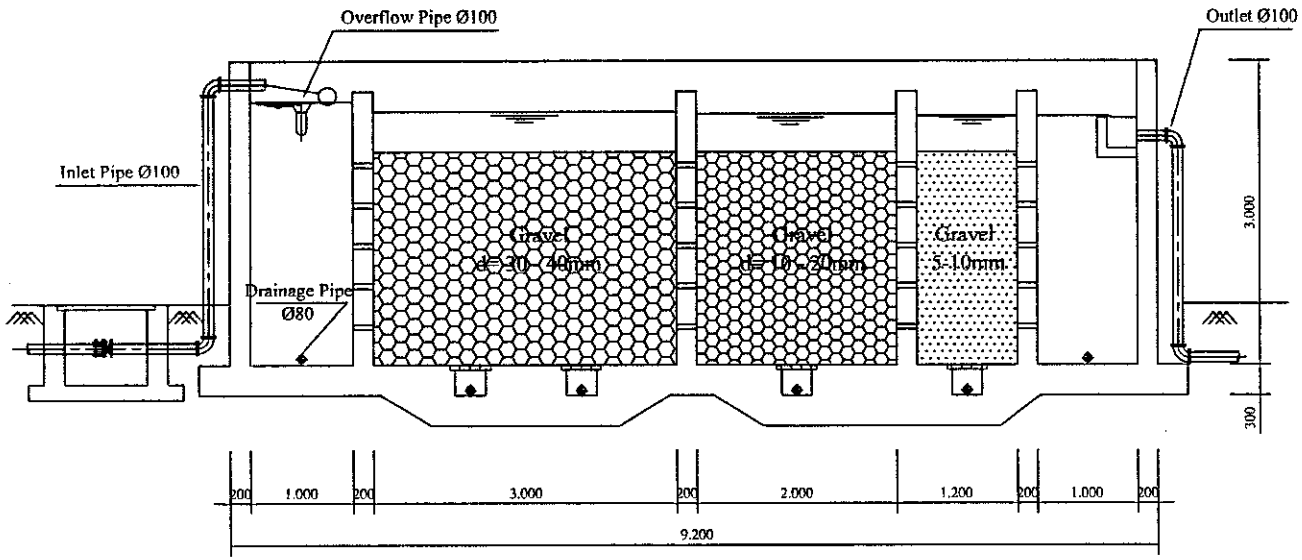
CAD File : Typ_Reservoir.dwg

Format A3

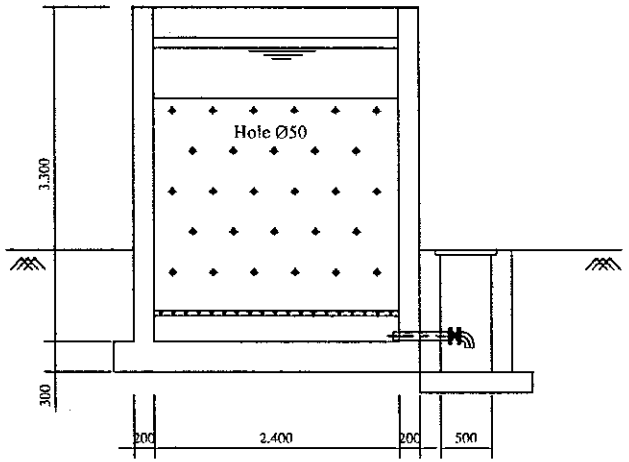
Horizontal Roughing Filter

S = 1/50

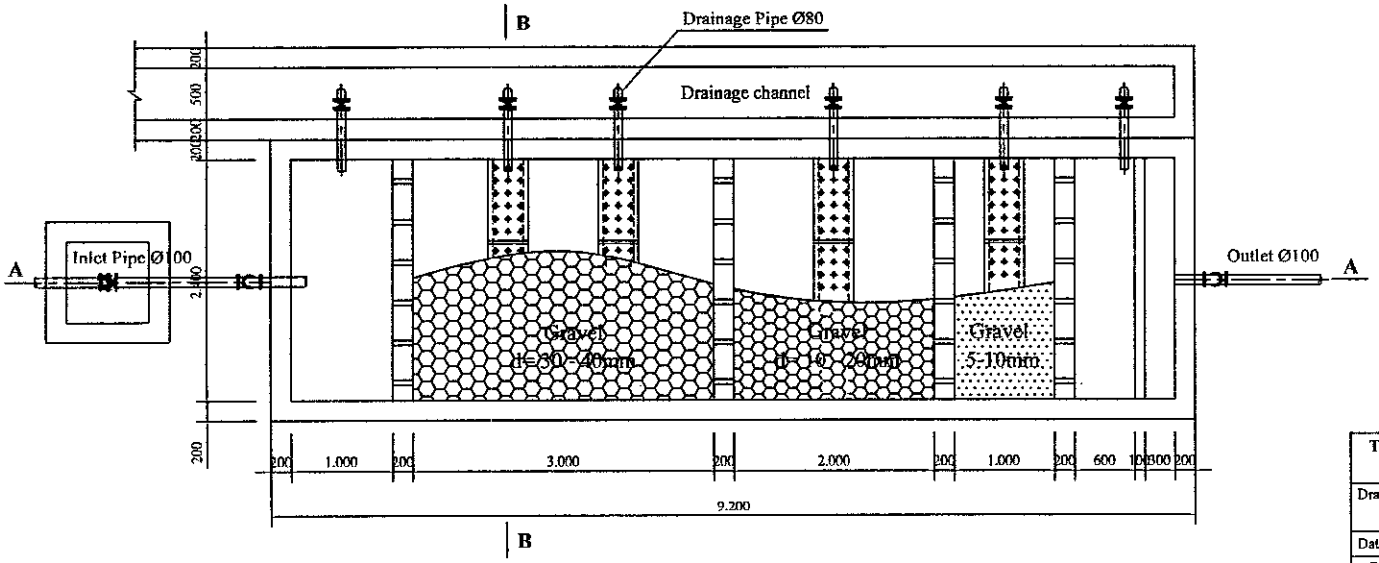
Section A - A



Section B - B



Plan



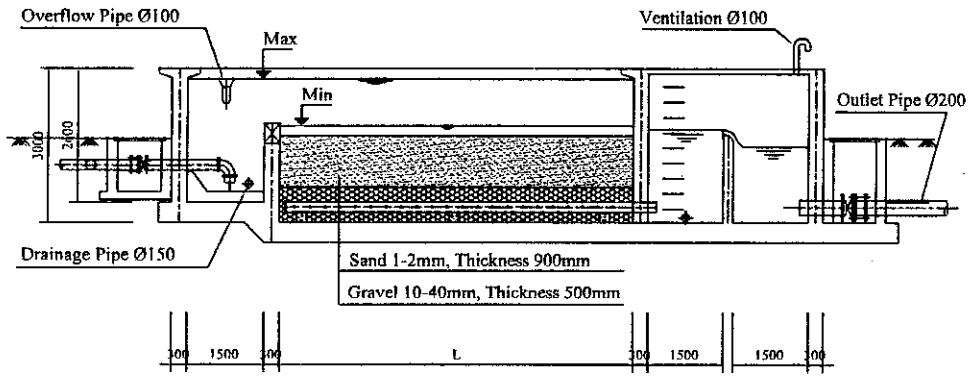
The Study on Groundwater Development in the Rural Provinces of Central Highlands in the Socialist Republic of Viet Nam			
Draw.Name: Horizontal Roughing Filter			
Date. Nov. 2001	Scale. 1 : 50	For A3 size	Draw.No.
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)			

CAD File : Typ_RoughingFilter.dwg

Format A3

Slow Filter
S = 1/100

Section A - A



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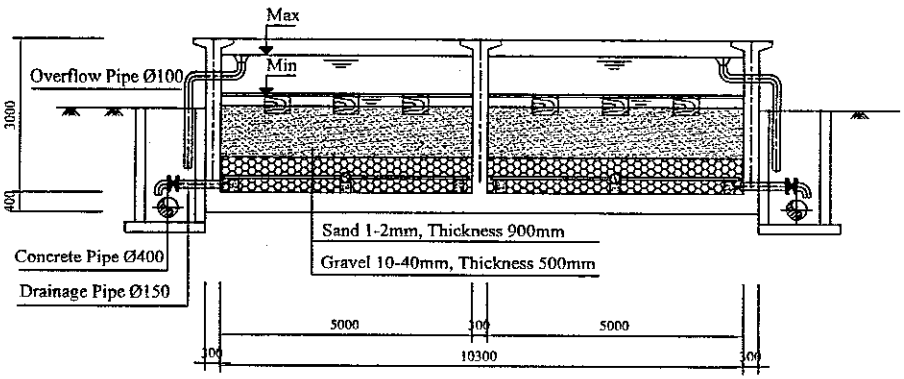
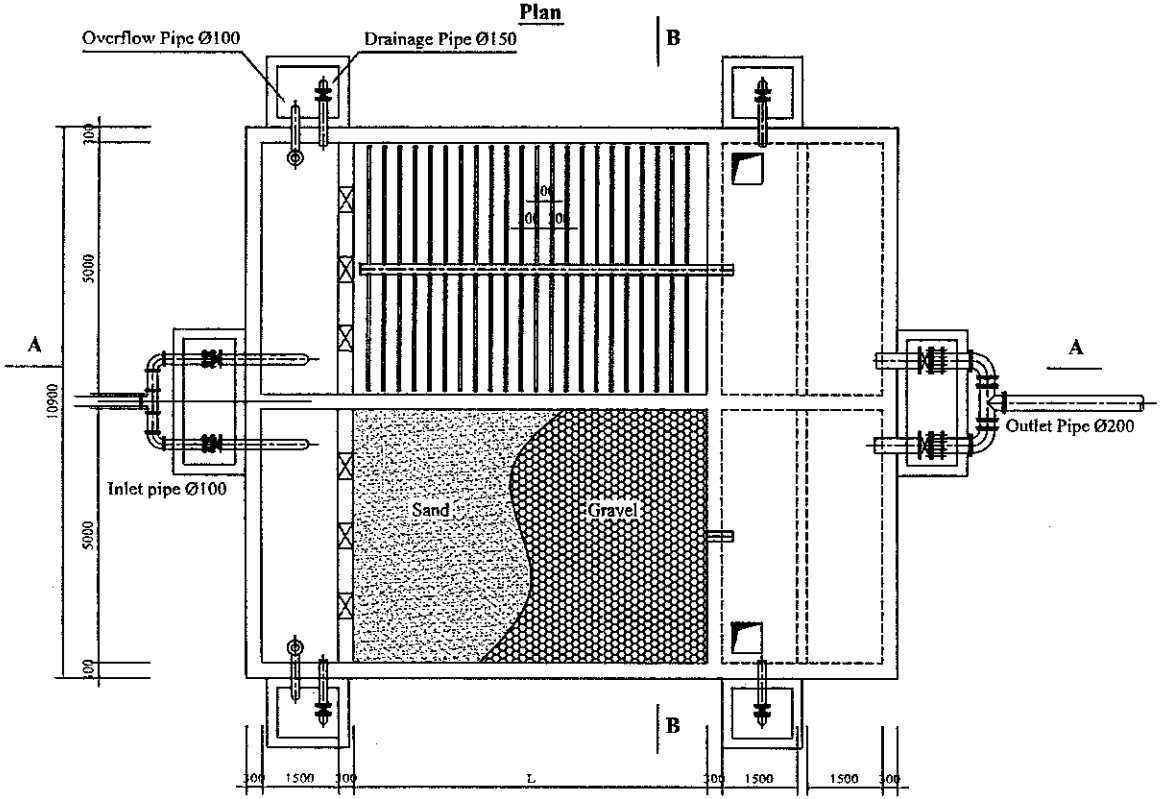
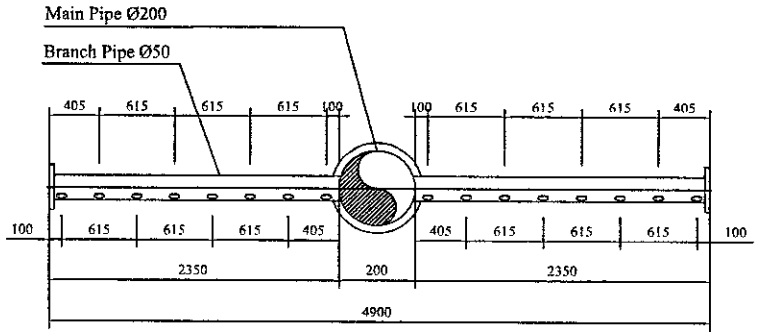


Plan



Collection System



The Study on Groundwater Development in the Rural Provinces of Central Highlands in the Socialist Republic of Viet Nam			
Draw.Name: Slow Filter			
Date. Nov. 2001	Scale. 1 : 100	For A3 size	Draw.No.
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)			

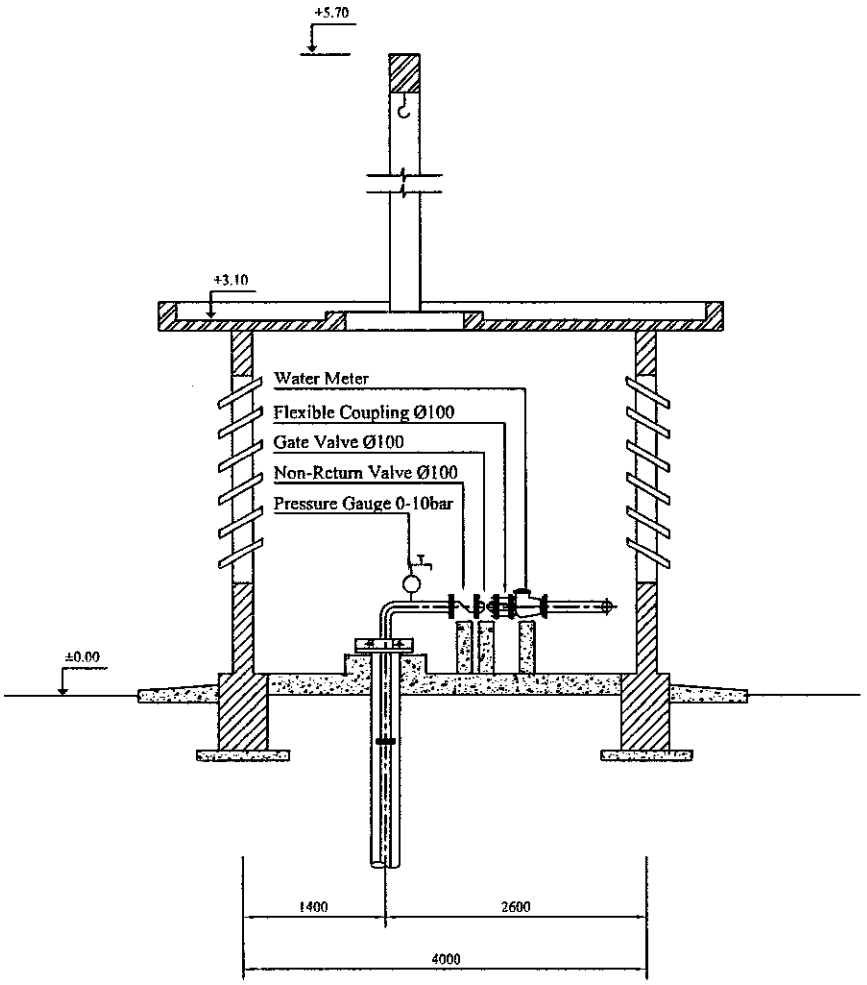
CAD File : Typ_SlowFilter.dwg

Format A3

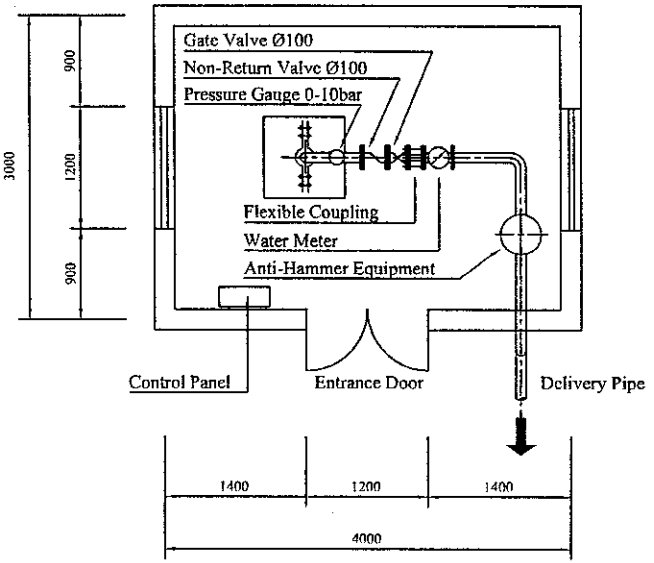
Well Pumping Station

S: 1/50

Section



Plan

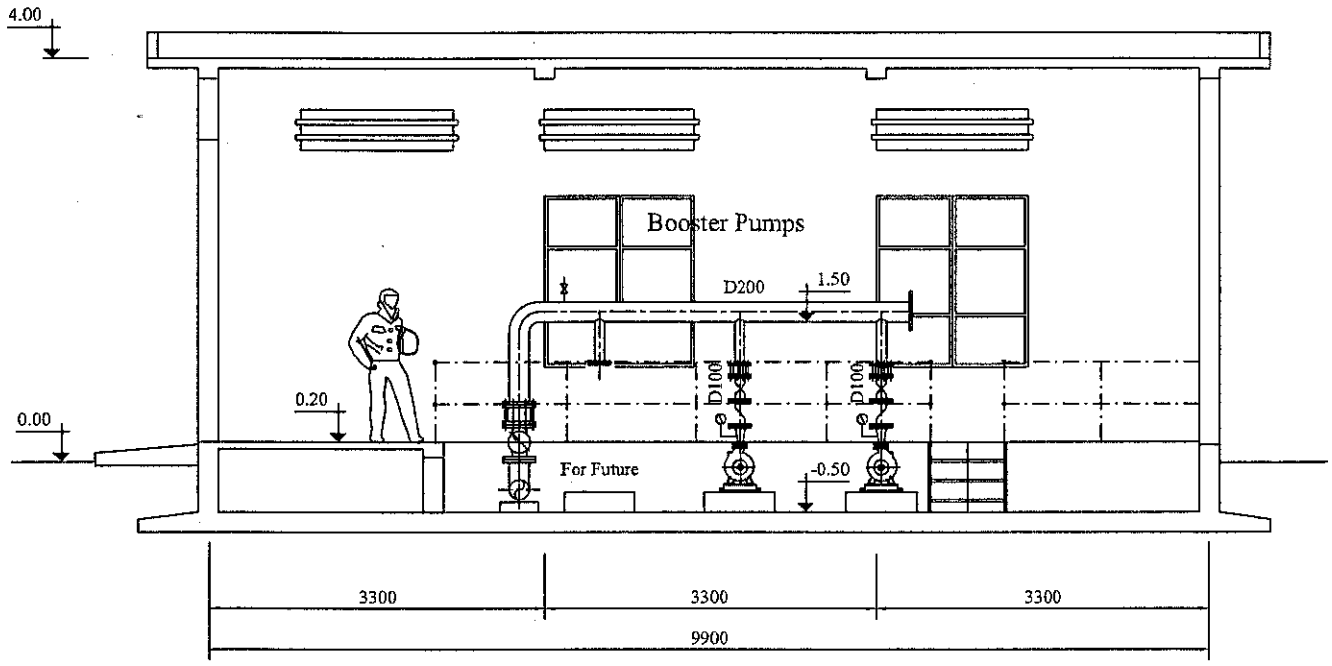


The Study on Groundwater Development in the Rural Provinces of Central Highlands in the Socialist Republic of Viet Nam			
Draw.Name: Well Pumping Station			
Date. Nov. 2001	Scale. 1 : 50	For A3 size	Draw.No. 3
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)			

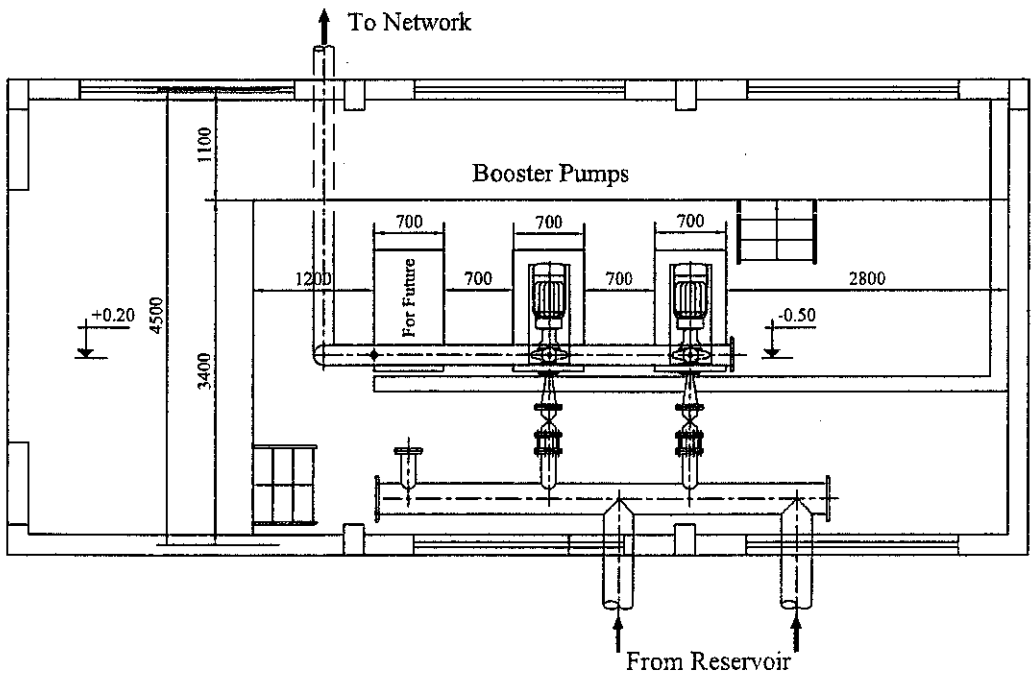
CAD File : Typ_WellPS.dwg

CAD File : Typ_BoosterPump.dwg

Section



Plan

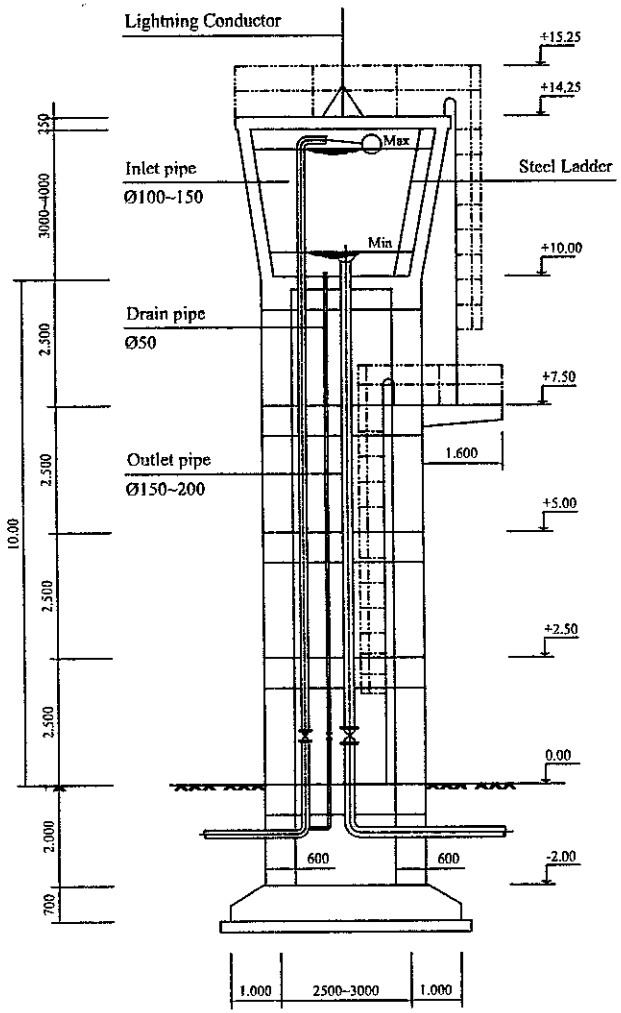


The Study on Groundwater Development in the Rural Provinces of Central Highlands in the Socialist Republic of Viet Nam			
Draw.Name **Booster Pumping Station**			
Date. Nov. 2001	Scale. 1 : 50	For A3 size	Draw.No.
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)			

Typical Elevated Tower

S : 1/100

Section



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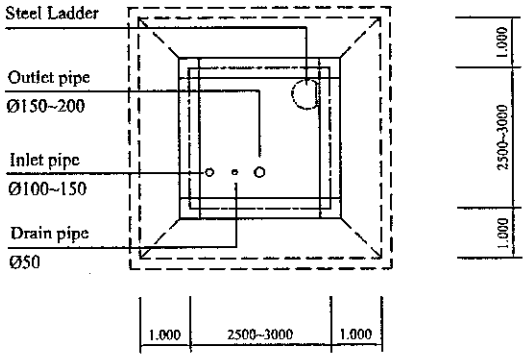

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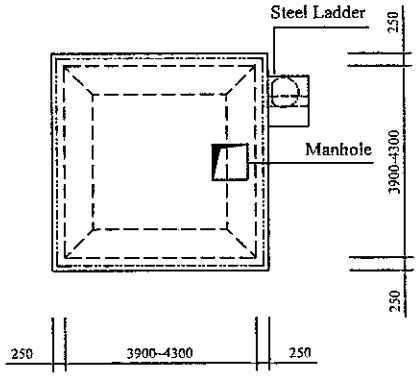

The Study on Groundwater Development in the Rural Provinces of Central Highlands in the Socialist Republic of Viet Nam			
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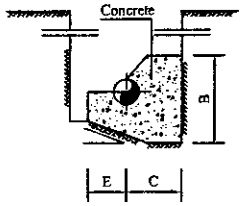
Date. Nov. 2001	Scale. 1 : 100	For A3 size	Draw.No.
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)			

CAD File : ElevatedTower.dwg

Format A3

CAD File : Typ_Thrustblock.dwg

Section 1



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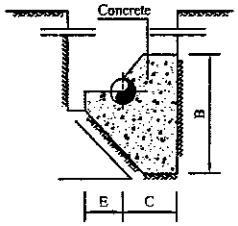

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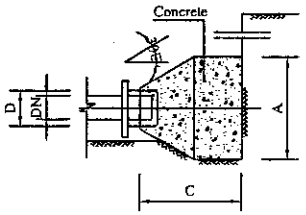
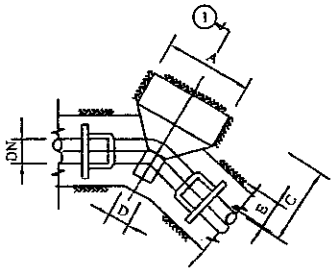
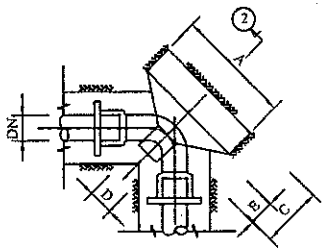


Plan of Bend < 90°



Plan of Bend 90°



Plan of Deal end

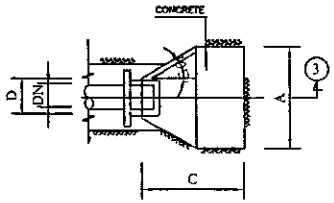


Table of Dimensions for Bends < 90°

DN (mm)	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	VOLUME m^3
65	250	250	200	150	100	
80	250	250	200	150	100	
100	300	350	400	200	100	0.04
150	500	500	600	200	150	0.08
200	700	700	600	200	200	0.16
250	850	850	600	200	250	0.20

Table of Dimensions for Bends 90°

DN (mm)	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	VOLUME m^3
65	250	250	200	150	100	
80	250	250	200	150	100	
100	500	500	400	250	100	0.10
150	700	700	600	250	150	0.20
200	950	950	600	250	200	0.40
250	1150	1150	600	250	250	0.60

Table of Dimensions for Dead end

DN (mm)	A (mm)	B (mm)	C (mm)	D (mm)	VOLUME m^3
65	250	250	350	150	
80	250	250	350	150	
100	400	400	400	200	0.05
150	600	600	600	250	0.17
200	800	800	800	300	0.41
250	1000	1000	1000	350	0.76

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

Draw.Name

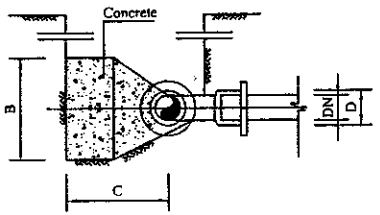
Thrust Blocks 1/2

Date. Nov. 2001 | Scale. NTS | For A3 size | Draw.No.

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

CAD File : Typ_Thrustblock.dwg

Section 4



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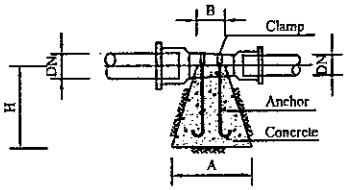

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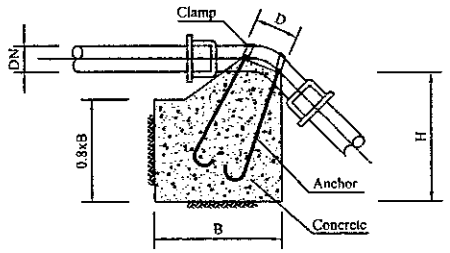
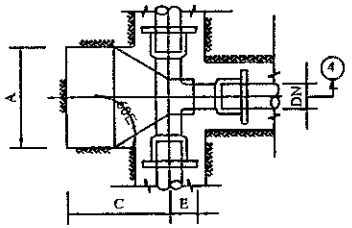
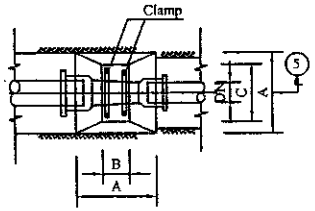


Plan of Tee



Plan of Reducer



Plan of Vertical Bend

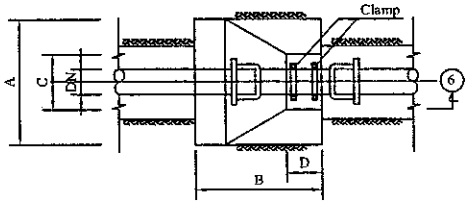


Table of Dimensions for Tees

DN (mm)	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	VOLUME m^3
65	300	300	300	150	100	
80	300	300	300	150	100	
100	400	400	400	200	100	0.06
150	600	600	600	250	150	0.18
200	800	800	800	300	200	0.45
250	1000	1000	1000	350	250	0.90

Table of Dimensions for Reducer

DN1xND2 (mmxmm)	A (mm)	B (mm)	C (mm)	H (mm)	VOLUME m^3
80x65	250	150	150	300	
100x80	250	150	150	300	
150x100	500	250	350	500	0.08
200x150	700	260	450	700	0.2
250x200	800	270	550	800	0.3

Table of Dimensions for Vertical Bend

DN (mm)	A (mm)	B (mm)	C (mm)	D (mm)	H (mm)	VOL (m^3)
65	300	300	150	150	300	
80	300	300	150	150	300	
100	700	700	300	200	700	0.33
150	900	900	400	250	900	0.71
200	1100	1100	450	260	1100	1.25
250	1250	1250	550	330	1250	1.90

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

Draw.Name

Thrust Blocks 2/2

Date. Nov. 2001 | Scale. NTS | For A3 size | Draw.No.

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

Appendix 4

Technical Specifications

Appendix 4

TECHNICAL SPECIFICATIONS

1. Introduction

This appendix includes detailed specification for delivery and installation of all relevant items of implementation of a piped network. The specifications include delivery and laying of Pipes (GI, PVC, PE, valves, airvalves, checkvalves and water meters).

The structure can be directly used for preparation of specifications in detailed design. British Standard has been used as basis everywhere.

2. Galvanised Steel Pipes

Standards

Except where otherwise stated, steel pipes and fittings shall be in accordance with BS 534: Specification for Steel Pipes and Specials for Water and Sewage, BS 3601: Carbon Steel Pipes and Tubes with specified Room Temperature Properties for Pressure Purposes and BS 1387: Screwed and Socketed Steel Tubes and Tubulars and for Plain End Steel Tubes suitable for Welding or for Screwing to BS 21 Pipe Threads.

Joints

Mild steel pipes and fittings shall be supplied with either flanged ends or with screwed ends as specified in the Bill of Quantities.

Flange joints shall have flanges in accordance with BS 4504: Section 3.1. Where pipes supplied with flanges welded on, the welding shall be carried out in accordance with BS 2633 or BS 2971.

Bolts and nuts, unless otherwise specified shall be of mild steel and the dimensions and finish shall comply with BS 3692. Where washers are used they shall be of appropriate material and the dimensions shall comply with BS 4320.

Where screwed ends are specified each pipe shall be supplied complete with one screwed socket to complete the joint.

Gaskets for flange joints shall be of the inside-bolt-circle type. The dimensions of gaskets shall comply with BS 4865:Part 1. Gaskets shall be manufactured from material complying with the provisions of BS 2494 for type W rings.

Tests

Before dispatch all mild steel straight pipes shall be hydraulically tested by the manufacturer in accordance with BS 3601.

The hydraulic test pressure to be applied to each straight pipe shall be the greater of:

- either the pressure given in the relevant clause of Section 2 of BS 3601, or
- twice the specified working pressure.

Hydraulic testing of mild steel fittings and specials shall be carried out in accordance with the recommendations given in Clause 4.3 of BS 534.

Galvanising

After being tested the mild steel pipes and fittings shall be galvanised in accordance with BS 729.

3. Screwed Stainless Steel Pipes

Screwed stainless steel pipes shall comply with BS 6362: Specification for Stainless Steel Tubes suitable for Screwing in accordance with BS 21 Pipe Threads for Tubes and Fittings where pressure tight Joints are made on the Threads.

Welded Stainless Steel Tubes

Welded stainless steel tubes shall comply with BS 6323, Part 8: Specific Requirements for longitudinally welded Stainless Steel Tubes. Welded pipe joints shall be welded in compliance with the procedures laid down in BS 4870 and welders shall be approval tested in accordance with BS 4871 and BS 4872.

4. Unplasticized Polyvinyl Chloride (PVC) Pipes

PVC Pipes for Pressure Applications

PVC pipes for pressure applications shall comply with BS 3505. Joints and fittings to be used therewith shall comply with BS 4346. The pressure classification shall be PN 6 or PN 10.

All buried pipes shall, unless otherwise indicated, be of the socket and spigot type made water tight in the joints by the compression of rubber gaskets with two thick lips.

Common Requirements

PVC pipes shall be capable of withstanding ultraviolet degradation. A rodent inhibitor shall be incorporated in the material of the pipe.

The Contractor shall advise the manufacturer of the climatic and conditions at the site of the Works and shall seek his advice on the storage of PVC materials on site. Subject to the Engineer's approval this advice shall be followed at all times.

Except in the case of flanged joints and where otherwise specified or approved by the Engineer pipe joints shall be flexible and sealed with a rubber gasket to the approval of the Engineer and shall withstand the various tests specified in the applicable standards. For pipes with a nominal bore of 100 to 230 mm the joints shall be capable of withstanding a deflection of not less than 3.0 degrees in any direction and for pipes with a nominal bore of 250 to 330 mm a deflection of 2.0 degrees and from 350 to 600 mm 0.5 degrees in any direction. All pipes shall be capable of

withstanding a "draw" of 13 mm over and above the initial jointing allowance. The initial jointing allowance is the gap measured parallel to the centre line of the pipeline and shall not be less than 6 mm or more than 13 mm or as otherwise recommended by the pipe manufacturer and approved by the Engineer. Pipes and fittings shall be indelibly marked prior to laying to indicate the correct initial jointing allowance.

Gaskets

The gasket consists of a substantial body, which is extended into two thick lips directed towards the bottom of the socket. The outer edge of the body is formed into an annular shoulder, which fits into the recess in the socket of the pipe. The side of the shoulder facing the entry to the socket is given a chamfer, which centres the gasket in its recess.

The standard gaskets are moulded components with a generous cross section providing large seating surfaces to ensure fluid tightness and a substantial reserve of elasticity. The maximum continuous working temperature for these gaskeks is 70^{o}C. In natural rubber or an equivalent elastomer the gaskets for ND 60 to 600 are homogenous. It is preferred that the gaskets are factory fitted and factory lubricated with a long lasting silicone lubricant. The pipes must be supplied with end caps protecting the pipes effectively against fouling etc.

The storage conditions for the gaskets are:

- the storage temperature should be between +5^{o}C and +25^{o}C. They should be brought to about 30^{o}C for long enough to give them their original flexibility before being used.
- for vulcanised elastomer based products the following should be avoided:

  - storage in a too damp or too dry atmosphere;
  - direct sunlight or high ultra-violet artificial light;
  - protect them from ambient air and the especially harmful effects of ozone.

Transport and Storage

During transport pipes shall be solidly supported under the lower layer and at the sides to prevent accidental damage. Storage on site shall be on a raised floor with support frames so that the sockets do not touch the ground and shall be head to tail to prevent pipes from resting on the sockets.

Pipes must at all times during storage be protected against ultraviolet light from the sun.

Excavation of Trenches

Trenches shall be excavated to the width and the depth and to the lines shown on the drawings and in conformity with Clause “Earthworks”. The earth cover shall be at least 0.6 metre above the pipeline and must never exceed 3 metres.

Laying PVC Pipes

The Contractor shall submit for the Engineer's approval the pipe manufacturer's complete and detailed recommendations for the handling and installation of pipes and fittings in open trench.

Flexible pipes shall be laid and bedded in approved granular materials except where concrete protection is required. The particle size in the material must not exceed 16 mm and the contents of particles between 8 and 16 mm must not exceed 10 %. Sharp stones or crushed material must not be present in the material. The granular material shall be placed over the full with of the bottom of

the trench and shall extend from a level 150 mm below the underside of the sockets or couplings on the pipeline to 200 mm above the crown of the pipes for the full length of the pipeline. The granular material shall be carefully compacted by hand.

Jointing of PVC Pipes

Before lowering the pipes into the trench the Contractor shall carefully inspect and clean the pipe to ensure that it has been freed for all foreign matter.

The alignment of the pipe in the trench shall be controlled by level instrument or boning rods to ensure correct levels. For water supply the minimum slope shall be 1 mm per metre pipe length. No zero slope will be tolerated.

The Contractor shall keep the interior of pipes clean and free from water, dirt, stones and other foreign matter as laying proceeds, and at the end of the day's work or at other times when installation work is not proceeding the open ends of the pipes shall be sealed off by a suitable stopper or end cap. The Contractor shall take such precautions as are necessary to prevent pipes from floating.

The pipes shall be laid in straight lines both in horizontal and vertical planes. Changes of direction of less than $11\frac{1}{4}^{o}$ shall be obtained by deviating the pipes after jointing at one or more joints. The angle of deviation at each joint depends on the ND and has the maximum values as stated above.

General Jointing Procedure

The general jointing procedure may vary with the type of joint used, but the basic requirements are:

- Overall cleanliness
- Correct positioning of the components
- Correct centring of the spigot in the socket
- Strict observance of the manufacturer's assembling instructions.

The Contractor shall be responsible for providing the necessary copies of these instructions.

The general jointing procedure is as follows:
The spigot end of the pipe P2 to be laid must penetrate into the socket of the waiting pipe P1 fitted with its gasket.

- Check that the spigot end of pipe P2 is correctly chamfered.
- Carefully clean with a rag:
  - the interior of the socket and especially the seat of the gasket of pipe P1, if the gasket is not factory fitted;
  - the spigot of the pipe P2 to be assembled;
  - the gasket, if not.
- Fit the gasket, if not factory fitted, in the socket of pipe P1 with the lips pointing towards the bottom of the socket. Check that it is correctly and uniformly placed in its groove.
- Mark the normal jointing depth on the spigot of pipe P2 on each side of the pipe. These marks should be the depth of the socket less 10 mm away from the end of the pipe.
- Lower the pipe P2 into the trench carefully. Hold the spigot about 400 mm from the socket of the pipe P1.
  Bring the spigot of pipe P2 into the socket of pipe P1 to the level of the gasket.
- Coat with lubricant:
  - the inside of the gasket;

- the spigot of pipe P2 up to about 25 mm from the two socketing depth marks.
- Push in place to the socketing depth marks manually.
  If difficult to push the pipe in place a special jointing tackle with looped slings fitted around the two pipes can be used.

Note: It shall not be permitted to use the arm of an excavator to push the pipe P2 into position in the socket of pipe P1.

- If the pipeline lay out indicates a deviation this may now be made.
- The levelling layer must be checked to make sure the pipes are evenly supported.
- The side fill to the pipe must provide adequate support with the approved granular material in order to keep it centred in the socket. Stamping with the foot is recommended.
- The top layer of 200 mm to be equally filled and stamped with the foot.

Polyethylene Pipes

Polyethylene pipes for cold water services shall comply with ISO 161:1988 and ISO 4065:1978 pressure class PN 6 and PN 10. Fittings shall be compression type fittings to BS 864 Part 3.

Nominal diameters are 20, 25, 32, 50, 63 and 80mm.

Polyethylene piping shall be laid in accordance with the pipe manufacturer's recommendations as described under PVC pipes above and to the approval of the Engineer.

5. CHAMBERS

General

Chambers shall be constructed on water supply pipelines in the positions indicated at the drawings and to house valves and flow meters. Generally all chambers shall be constructed in either precast or in-situ concrete made with Portland cement to the standard details shown on the Drawings.

Construction details

Precast concrete chamber sections shall be constructed with slabs aligned correctly. Joints shall be made so that the required jointing material fills the joint cavity. Any surplus jointing material extruded inside the chamber shall be trimmed off and joints shall be pointed on completion.

Bases for chambers shall be constructed to the standard details shown on the Drawings.
Valves and other accessories shall be seated, embedded and anchored to concrete plinths cast in concrete Class 20.

For valves with DN up to 200 mm surfaces boxes will be provided and shall be ductile iron Class A in accordance with BS 5834 and shall have a minimum clear opening of 380 x 230 mm. Surface boxes for other purposes shall be cast iron and shall comply with the relevant provisions of BS 5834 and be heavy duty grade A.

For large bulk flow meter chambers, covers shall be of raised pattern non-slip mild steel solid floor plates to BS 1449 Part 2, in Grade 43 steel and in the dimensions shown on the Drawings. Covers will be installed hinged as shown on the Drawings and shall be holed for and supplied with standard lifting keys. Steel plates for this purpose shall be hot dip galvanised in accordance with the relevant provisions of BS 729 and will be minimum 4,5 mm thick.

Covers and frames with minimum clear openings outside the ranges in BSEN 124 shall comply with the relevant provisions of that standard where applicable. All manhole covers shall have at least two closed keyways per complete cover. Keyways shall be at symmetrical points to enable lifting without tilting or jamming.

Chamber covers and frames shall in general be constructed flush with the final ground level. In cases where existing pipes are laid close to the surface and it is not possible to construct chambers with the top flush with final ground, the Contractor will propose for the Engineer's approval, the construction of the chamber to be partly above ground in order to accommodate the correct installation of valves etc.

The external surface of all chambers including roof slabs shall be protected with bituminous coating.

Chambers shall be substantially watertight, with no identifiable flow of water penetrating the permanent works. If there is any discernible flow of water entering the chamber at a point which can be located by visual inspection, the Contractor shall take such measures as are necessary to stop such infiltration. Plasticized PVC waterstops shall comply with the relevant provisions of WIs No. 4-31-02.

Pipework
All pipes and assembling parts selected under this Contract must be of first quality, truly circular, and of uniform thickness, free from scale, lamination, honeycombs and other defects, and shall be designed and suitable for the stated pressures and temperatures.

6. Gate Valves and accessories

The Contractor shall submit full details of valves with manufacturer's drawings to the Engineer and obtain his approval before manufacture is commenced. All valves shall be individually tested by the manufacturer for both strength and leakage.

Gate (sluice) valves shall comply with BS 5163:1986 unless otherwise stated in the Contract.

i) Valves shall be Type B.

ii) The pressure rating shall be PN10 unless stated otherwise in the Contract.

iii) Gates shall be resilient faced up to 300mm diameter. Gates shall be cast iron to BS 1452 GR220 min or ductile iron to BS 2789 73 min.

For resilient faced gates the gate shall be entirely encapsulated with rubber to BS 2494 Type W. Nitrile/EPDM with a minimum 3mm of rubber in the seating area.

For metal seated gates both the body and the gate rings shall be gunmetal to BS 1400 LG2 and components shall be designed to provide adequate seating performance before and after wear of the seating surfaces.

iv) The body and bonnet shall be cast iron to BS 1452 GR 220 min or Ductile Iron to BS 2789 73 min.

v) Valve stems shall be threaded sufficiently to allow the gate to be raised clear of the nominal bore of the valve. Stem sealing shall be as detailed within the following table:

Diameter (mm)	Actuator or Gearbox Fitted	No Actuator or Gearbox
50 - 150 inc	0 - seal	0 - seal
200 - 300 inc	Packed Gland	0 - seal

[0 - seal = Double toroidal sealing ring to BS 2494 Type W]

Means shall be provided for resealing the stem under working conditions.

vi) Valves shall be designed to pass potable water and raw water.

vii) Valve caps shall be secured by hexagonal headed set screws.

viii) Operating levers will be hand wheels for 100-300 mm valves..

ix) Direction of closure shall be clockwise. The direction of closing shall be indicated by an arrow cast on the upper face of the gland or stem seal housing.

x) Unless indicated otherwise on the Drawings valves will be used in the closed end application.

xi) Valves with nominal diameter greater than 200 mm will be installed with ductile iron anchoring pipes on the upstream side as shown on the Drawings. Anchoring pipes will have 2 flanges and 1 puddle flange.

Gate valves shall be coated in accordance with WIS No 4-52-01 - Class A internally and Class B externally.

Extension spindles, support brackets and centring spiders shall be constructed of mild steel galvanised to BS729. Support brackets of the bolt-fixing type shall be provided to extension spindles at centres not exceeding 2 metres. The top bracket shall be located a maximum 300mm below the spindle cap, handwheel or top of wall as appropriate. Extension spindles in gate valve extension spindle chambers shall be provided with centring spiders at centres not exceeding 2 metres. The top spider shall be located a maximum 300mm below the spindle cap. All exposed universal joints shall be coated with a non-perishable material with an internal grease packing to allow flexible movement.

Check Valves

Check valves shall comply with BS 5153 unless otherwise stated in the Contract and shall be as follows:

i) Nominal pressure shall be 10 bar (PN106) unless otherwise stated in the contract.

ii) Valve to be swing type resilient seated.

iii) Body ends to be flanged to BS 4504 PN10 unless otherwise stated in the contract.

Altitude valves (Level control valves)

Altitude valves shall be used to control the water level in public taps and treatment plants to avoid any overflow events. Altitude valves shall regulate the water flow in a reservoir by means of a float with 2 positions. The valve shall be able to close at a preset high water level, and open at a preset low water level. This function shall be governed by a hydraulic system connected to the float. The altitude valves shall be Danfoss C701 or similar approved.

7. Mechanical flow meters

Mechanical water meters shall comply with the relevant provisions of BS 5728 Class B or ISO 4064 and shall be of the in-line helical rotary type for bulk flows. They shall be designed on the basis of the expected flow rating.

Meter housings shall be of cast iron or other approved material and be double flanged to BS 4504. The meters must be capable of being installed in horizontal, vertical or inclined pipelines without loss of accuracy. The complete measurement mechanism shall be removable from the meter body and a blank cover to replace the working unit shall also be supplied. The design of the meter shall be such that water passes through it with negligible head loss and without restriction or change of direction.

Meters shall have straight reading counters registering total flow in cubic meters (m^3). A centre sweep hand registering in litres (l) shall also be fitted.

Meters shall be suitable to a maximum working pressure of 16 bars and the Contractor shall ensure their suitability for use in the prevailing conditions.

Meter housings shall be coated by dipping or other equivalent means using a cold applied black bitumen material complying with BS 3416 and made from petroleum or asphaltic bitumen but not coal tar bitumen. No coating is to be applied to the casting until its surfaces are clean, dry and free from rust, oil and deleterious material.

The complete working mechanism of the meters shall be manufactured from materials offering maximum resistance to wear and corrosion.

8. Support of Pipework and Valves

All necessary supports including foundations, hangers, saddles, sliding shoes, slings, expansion pieces, fixing bolts, foundation bolts, fixing and anchor points and all other attachments shall be supplied to support the pipework and its associated equipment in an approved manner. Valves, meters, strainers and other devices mounted in the pipework shall be supported independently of the pipes to which they connect.

All brackets or other forms of support which can conveniently be so designed, shall be rigidly built up of steel sections by riveting or welding, in preference to the use of castings.

No point of passage of pipes through floors or walls shall be used as a point of support, except with the approval of the Engineer.
All brackets and fixings shall be hot-dip galvanised in accordance with BS 729.

pumped to the proposed injection point on the pipeline as shown in the Drawings. The chlorinator capacity shall be such that a free chlorine residual of at least 1 mg/l can be attained in the water after a minimum contact time of 20 minutes. This condition must be attainable even when maximum flow rates coincide with anticipated maximum chlorine demands. The equipment shall be of such design that it will operate accurately at both minimum and maximum flow rates without the use of standby equipment.

9. Dosing Pumps

In case dosing pumps are to be used for chlorination they shall fullfil the following conditions.
Dosing pumps shall be of the positive displacement reciprocating variable stroke type suitable for sodium hypochlorite solution dosing and shall be designed to. It shall be possible to regulate the pump output by adjustment of the pump stroke length or the stroke frequency. Pump housing shall be of composite material ensuring mechanical strength and chemical resistance. The pumps shall be able to draw from the solution storage tanks. Sealing materials shall be of Viton and the diaphragms of teflon. The proposed dosing pump will comply at least with the following requirements:

Max. suction lift:	3 m
Max. back pressure:	10 bar
Electrical connection:	230 V, 50 Hz
Max temperature of medium:	35^{o} C

Pump capacity shall range between 3.5 l/h and 25 l/h.

The dosing pump shall be manual start and manual stop with automatic cut-out in the event of the feed tank being emptied.

The delivery lines shall also be provided with an overpressure cut-out to stop the pumps in the event of either the line becoming blocked or an attempt being made to run the pump against closed valve.

Appendix 5

Comparison of Power Cost between Existing Line Use and Generator Driven Pump

Appendix 5

COMPARISON OF POWER COST BETWEEN EXISTING LINE USE AND GENERATOR DRIVEN PUMP

1) Power cost with existing electricity line

The power cost is calculated on the following assumptions;

a) Pumping efficiency of 50%

b) Cost of electricity is 750 VND/kWh, and

The power cost is calculated for following 4 communes (systems);

Commune	Daily kWh	Monthly cost (VND/day)	Discharge rate (m^3/hr)	Cost per m^3 (VND/m^3)
K-1	30	686,250	3.6	318
K-2	54	1,235,250	6.1	338
G-3	220	5,032,500	13	524
D-4	110	2,516,250	13	323

2) Alternative power cost with generator-driven pump

The power cost is calculated on the following conditions;

a) Cost of fuel is 4,000VND/hr

b) Fuel consumption at 100% load is as followings;

Generator	Consumption(l/hr)
30 kVA	7.2
20 kVA	5.8
15 kVA	4.6
10.5kVA	3.3

The power cost is calculated for following 4 communes;

Commune	Required power (kVA)	Fuel cost (VND/hr)	Discharge rate (m^3/hr)	Cost per m^3 (VND/m^3)
K-1	10.5	13,200	7.2	1,833
K-2	15	18,400	11.9	1,546
G-3	30	28,800	13.0	2,215
D-4	20	23,200	10.8	2,148

3) Conclusion

The power cost with using generator is around 6 times higher than with using electric line.

Appendix 6

Cost Estimates for Feasibility Study

Cost Estimates for feasibility Study, kong tang town _ g1 **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		
		Aeration Tower	m2	5	2	450	135	200	60		
		Reaction Tank	m3	24	11	4,700	1,645	2,200	770		
		Rapid Filter	m2	10	4	17,000	3,000	6,800	1,200		
		Reservoir	m3	163	77	12,551	4,890	5,929	2,310		
		Elevated Tower	m3	24	11	5,520	2,400	2,530	1,100		
		Booster Pumping Station : Pumps, Pipes and Acessories	m3/hour	46	22	18,560	5,568	8,880	2,664		
		Chlorinator	item	1		4,200	200				
		Power Supply System	item	1		4,000	800				
		Sub-Total				162,981	27,658	93,539	13,614		
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								
	2.1	25-65		31.0	3.0	77,500	108,500	7,500	10,500		
	2.2	80-125		14.0	1.5	84,000	49,000	9,000	5,250		
	2.3	150-200		2.5	0.5	28,750	13,750	5,750	2,750		
	3	Public taps		15		6,750	750				
		Sub-Total				233,000	184,000	40,250	24,500		
C	**Construction cots (A+B)**					395,981	211,658	133,789	38,114		
D	**Land cost**										
E	**Engineering Service (15%C)**					59,397	31,749	20,068	5,717		
		(Incl. Soil investigation, field serve, detailed design and construction supervisor									
F	**Base cost (C+D+E)**					455,378	243,407	153,857	43,831		
G	**Physical contingency (10%F)**					45,538	24,341	15,386	4,383		
H	**Project cost (F+G)**					500,916	267,747	169,243	48,214		
I	**Price contingency (10%H)**					50,092	26,775	16,924	4,821		
J	**Total financing required (H+I)**					**551,008**	**294,522**	**186,167**	**53,036**		

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

Cost estimates for feasibility study, nhon hoa commune _ g2 **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		
		Aeration Tower	m2	9	5	900	270	450	135		
		Reaction Tank	m3	47	22	9,300	3,255	4,400	1,540		
		Rapid Filter	m2	19	9	32,300	5,700	15,300	2,700		
		Reservoir	m3	323	154	24,871	9,690	11,858	4,620		
		Elevated Tower	m3	47	22	10,810	4,700	5,060	2,200		
		Booster Pumping Station : Pumps, Pipes and Acessories	m3/hour	92	44	36,960	11,088	17,600	5,280		
		Chlorinator	item	1		4,200	200				
		Power Supply System	item	1		4,000	800				
		Sub-Total				480,841	64,923	227,168	30,155		
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								
	2.1	25-65		29.7	3.5	74,250	103,950	8,750	12,250		
	2.2	80-125		11.0	1.5	66,000	38,500	9,000	5,250		
	2.3	150-200		3.5	0.0	40,250	19,250	0	0		
	3	Public taps		18		8,100	900				
		Sub-Total				314,600	204,600	71,750	35,500		
C	**Construction cots (A+B)**					795,441	269,523	298,918	65,655		
D	**Land cost**										
E	**Engineering Service (15%C)**					119,316	40,428	44,838	9,848		
	(Incl. Soil investigation, field serve, detailed design and construction supervisor										
F	**Base cost (C+D+E)**					914,757	309,951	343,756	75,503		
G	**Physical contingency (10%F)**					91,476	30,995	34,376	7,550		
H	**Project cost (F+G)**					1,006,233	340,947	378,131	83,054		
I	**Price contingency (10%H)**					100,623	34,095	37,813	8,305		
J	**Total financing required (H+I)**					**1,106,856**	**375,041**	**415,944**	**91,359**		

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

Cost estimates for feasibility study, chu ty town _ g3-1 **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	186	89	14,322	5,580	6,853	2,670		
		Semi-Elevated Tower	m3	27	13	6,210	2,700	2,990	1,300		
		Booster Pumping Station : Pumps, Pipes and Acessories	m3/hour	53	25	21,280	6,384	10,080	3,024		
		Chlorinator	item	1		4,200	200				
		Power Supply System	item	1		4,000	800				
		Sub-Total				146,012	24,684	86,923	12,504		
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		25.0	4.0	62,500	87,500	10,000	14,000		
		80-125		12.5	1.5	75,000	43,750	9,000	5,250		
		150-200		6.0	0.5	69,000	33,000	5,750	2,750		
	3	Public Tap		9		4,050	450				
		Sub-Total				246,550	176,700	42,750	28,000		
C	**Construction cots (A+B)**					392,562	201,384	129,673	40,504		
D	**Land cost**										
E	**Engineering Service (15%C)**					58,884	30,208	19,451	6,076		
	(Incl. Soil investigation, field serve, detailed design and construction supervisor										
F	**Base cost (C+D+E)**					451,446	231,592	149,124	46,580		
G	**Physical contingency (10%F)**					45,145	23,159	14,912	4,658		
H	**Project cost (F+G)**					496,591	254,751	164,036	51,238		
I	**Price contingency (10%H)**					49,659	25,475	16,404	5,124		
J	**Total financing required (H+I)**					**546,250**	**280,226**	**180,440**	**56,361**		

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

Cost estimates for feasibility study, thang hung commune _ g4-1 **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	25,000	2,500	12,500	1,250		
		Aeration Tower	m2	4	2	400	120	150	45		
		Reaction Tank	m3	18	9	3,600	1,260	1,700	595		
		Rapid Filter	m2	8	3	13,600	2,400	5,100	900		
		Reservoir	m3	126	59	9,702	3,780	4,543	1,770		
		Elevated Tower	m3	18	9	4,140	1,800	2,070	900		
		Booster Pumping Station : Pumps, Pipes and Acessories	m3/hour	36	17	14,320	4,296	6,800	2,040		
		Chlorinator	item	1		4,200	200				
		Power Supply System	item	1		4,000	800				
		Sub-Total				141,962	22,876	83,363	11,360		
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		10.5	2.5	26,250	36,750	6,250	8,750		
		80-125		2.5	0.5	15,000	8,750	3,000	1,750		
		150-200		2.5	0.0	28,750	13,750	0	0		
	3	Public taps	Unit	7		3,150	350				
		Sub-Total				109,150	71,600	27,250	16,500		
C	**Construction cots (A+B)**					251,112	94,476	110,613	27,860		
D	**Land cost**										
E	**Engineering Service (15%C)**					37,667	14,171	16,592	4,179		
	(Incl. Soil investigation, field serve, detailed design and construction supervisor										
F	**Base cost (C+D+E)**					288,779	108,647	127,205	32,039		
G	**Physical contingency (10%F)**					28,878	10,865	12,720	3,204		
H	**Project cost (F+G)**					317,657	119,512	139,925	35,243		
I	**Price contingency (10%H)**					31,766	11,951	13,993	3,524		
J	**Total financing required (H+I)**					**349,422**	**131,463**	**153,918**	**38,767**	**1,972**	**582**

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

Cost estimates for feasibility study, nghia hoa commune _ g5-1 **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	25,000	2,500	12,500	1,250		
		Reservoir	m3	96	46	7,392	2,880	3,542	1,380		
		Semi-Elevated Tower	m3	14	7	3,220	1,400	1,610	700		
		Booster Pumping Station : Pumps, Pipes and Acessories	m3/hour	27	13	10,960	3,288	5,280	1,584		
		Chlorinator	item	1		4,200	200				
		Power Supply System	item	1		4,000	800				
		Sub-Total				117,772	16,788	73,432	8,774		
B	**Pipeline Network**										
	1	Rawwater Pipeline	km	3.0	1.5	36,000	12,000	18,000	6,000		
	1.1	80-100									
		150-200									
	2	Distribution Pipeline	km								
		25-65		13.0	1.2	32,500	45,500	3,000	4,200		
		80-125		8.0	0.7	48,000	28,000	4,200	2,450		
		150-200		0.0	0.0	0	0	0	0		
	3	Public taps		8		3,600	400				
		Sub-Total				120,100	85,900	25,200	12,650		
C	**Construction cots (A+B)**					237,872	102,688	98,632	21,424		
D	**Land cost**										
E	**Engineering Service (15%C)**					35,681	15,403	14,795	3,214		
	(Incl. Soil investigation, field serve, detailed design and construction supervisor										
F	**Base cost (C+D+E)**					273,553	118,091	113,427	24,638		
G	**Physical contingency (10%F)**					27,355	11,809	11,343	2,464		
H	**Project cost (F+G)**					300,908	129,900	124,769	27,101		
I	**Price contingency (10%H)**					30,091	12,990	12,477	2,710		
J	**Total financing required (H+I)**					**330,999**	**142,890**	**137,246**	**29,811**		

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

Cost estimates for feasibility study, iarsion commune _ g6-1 **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	0	1	0	0	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	33,000	3,300	16,500	1,650		
		Aeration Tower	m2	3	2	330	99	150	45		
		Reaction Tank	m3	16	8.0	3,200	1,120	1,600	560		
		Rapid Filter Basin	m2	7	3	11,900	2,100	5,100	900		
		Reservoir	m3	112	54	8,624	3,360	4,158	1,620		
		Elevated Tower	m3	16	8	3,680	1,600	1,840	800		
		Booster Pumping Station : Pumps, Pipes and Acessories	m3/hour	32	15	12,800	3,840	6,160	1,848		
		Chlorinator	item	1		4,200	200				
		Power Supply System	item	1		4,000	800				
		Sub-Total				94,234	18,279	86,008	11,283		
B	**Pipeline Network**										
	1	Rawwater Pipeline	km	1.5	1.5	18,000	6,000	18,000	6,000		
	1.1	80-100									
	1.2	150-200									
	2	Distribution Pipeline	km								
		25-65		7.4	0.7	18,500	25,900	1,750	2,450		
		80-125		1.9	0.2	11,400	6,650	1,200	700		
		150-200		0.6	0.1	6,900	3,300	1,150	550		
	3	Public taps	Unit	7		3,150	350				
		Sub-Total				57,950	42,200	22,100	9,700		
C	**Construction cots (A+B)**					152,184	60,479	108,108	20,983		
D	**Land cost**										
E	**Engineering Service (15%C)**					22,828	9,072	16,216	3,147		
		(Incl. Soil investigation, field serve, detailed design and construction supervisor									
F	**Base cost (C+D+E)**					175,012	69,551	124,324	24,130		
G	**Physical contingency (10%F)**					17,501	6,955	12,432	2,413		
H	**Project cost (F+G)**					192,513	76,506	136,757	26,543		
I	**Price contingency (10%H)**					19,251	7,651	13,676	2,654		
J	**Total financing required (H+I)**					**211,764**	**84,157**	**150,432**	**29,198**		

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

Cost estimates for feasibility study, kong yang commune _ g7-1 **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	0	0	0	0	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	33,000	3,300	16,500	1,650		
		Aeration Tower	m2	2	1	200	60	60	18		
		Reaction Tank	m3	9	0.2	1,860	651	40	14		
		Rapid Filter Basin	m2	4	0.0	6,800	1,200	0	0		
		Reservoir	m3	44	21	3,388	1,320	1,617	630		
		Elevated Tower	m3	7	3	1,610	700	690	300		
		Booster Pumping Station : Pumps, Pipes and Acessories	m3/hour	13	6	5,040	1,512	2,400	720		
		Chlorinator	item	1		4,200	200				
		Power Supply System	item	1		4,000	800				
		Sub-Total				72,598	11,603	21,307	3,332		
B	**Pipeline Network**										
	1	Rawwater Pipeline	km	1.5	0.0	18,000	6,000	0	0		
		80-100									
		150-200									
	2	Distribution Pipeline	km								
		25-65		12.0	0.7	30,000	42,000	1,750	2,450		
		80-125		1.9	0.2	11,400	6,650	1,200	700		
		150-200		1.5	0.0	17,250	8,250	0	0		
	3	Public taps	Unit	7		3,150	350				
		Sub-Total				79,800	63,250	2,950	3,150		
C	**Construction cots (A+B)**					152,398	74,853	24,257	6,482		
D	**Land cost**										
E	**Engineering Service (15%C)**					22,860	11,228	3,639	972		
	(Incl. Soil investigation, field serve, detailed design and construction supervisor										
F	**Base cost (C+D+E)**					175,258	86,081	27,896	7,454		
G	**Physical contingency (10%F)**					17,526	8,608	2,790	745		
H	**Project cost (F+G)**					192,783	94,689	30,685	8,200		
I	**Price contingency (10%H)**					19,278	9,469	3,069	820		
J	**Total financing required (H+I)**					**212,062**	**104,158**	**33,754**	**9,020**		

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

Appendix 7

Summary of Price for Well Drilling Equipment, Supporting Equipment, Mobile Workshop Equipment & Spare Parts

Summary of Price for Well Drilling Equipments, Supporting Vehicles & Equipment, Mobile Workshop Equipment & Spare Parts

Summary of Price for Well Drilling Equipment Supporting Equipment, Mobile Workshop Equipment & Spare Parts					
Item	**Description**	**Q'ty**	**Unit**	**Unit Price**	**Amount**
I	**Water Well Drilling Equipment (I-1 to I-E)**	**1**	**Lot**		
I-1	Drilling Rig	1	Set		
I-2	Operating Accessories	1	Set		
I-3	Drilling Casing and Fishing Tools	1	Lot		
I-A	Drilling tools & Accessories	1	Set		
I-B	Down-the-hole Tools	1	Set		
I-C	Direct Mud Circulation Drilling Tools & Accessories	1	Set		
I-D	Casing Tools	1	Set		
I-E	Fishing Tools	1	Set		
II	**High Pressure Air Compressor**	**1**	**Set**		
III	**Miscellaneous Ancillary Equipment**	**1**	**Lot**		
IV	**Air Lift Equipment**	**1**	**Lot**		
V	**Spare Parts for Item I. to IV.**	**1**	**Lot**		
VI	**Supporting Equipment (VI-1 to VI-5)**	**1**	**Lot**		
VI-1	Cab-back crane cargo truck	1	Set		
VI-2	Water tank truck	1	Set		
VI-3	Pumping test equipment	1	Set		
VI-4	Well logging equipment with accessories	1	Set		
VI-5	Water Quality Analysis Instruments	1	Lot		
VII	**Spare Parts for Item VI.**	**1**	**Lot**		
VIII	**Mobile Workshop Equipment (VIII-1 and VIII-2)**	**1**	**Lot**		
VIII-1	Mobile Workshop Truck	1	Set		
VIII-2	Maintenance and repairing equipment and tools	1	set		
IX	**Spare Parts for Item VIII.**	**1**	**Lot**		
	Total (Ex-go-down YOKOHAMA, without export packing)	**1**	**Lot**		
X	**Solar and Generator Driven Pumping System for 5 systems**	**1**	**Lot**		
XI	**Supporting Vehicles**	**4**	**Sets**		
				Grand Total	**¥361,000,000**

Appendix 8-1

General Regulations of Services for Piped Water Supply

GENERAL REGULATIONS OF SERVICES FOR PIPED WATER SUPPLY PROVIDED BY _____ WATER SUPPLY UNIT

GENERAL REGULATIONS OF SERVICES FOR PIPED WATER SUPPLY PROVIDED BY _____ WATER SUPPLY UNIT

Chapter I: General Conditions

Article 1: Name, address and mission

The name of the provider of water supply services is _____ Water Supply Unit (hereinafter WSU).

The address of the WSU is _____.

The Mission of the WSU is to supply piped potable water to the population living in the service area of the WSU in an efficient, economical and sustainable manner. The first priority is given to domestic water use and the second priority, as the capacity of the system allows, to water use in services and businesses.

The WSU is a non-profitable service provider, who operates the water supply system and is responsible for the services and the technical and financial performance and sustainability of the system. The WSU shall cover its costs, including electricity, chemicals, staff salaries, repairs, expansion of services (new connections), maintenance and replacement of facilities and installations at the end of their economic life. In order to cover its cost WSU is authorised to collect revenues for house connections (connection fee or rent) and water sold to the clients (water bills based on metered water use).

Article 2: Service area of WSU

The service area of the WSU is defined by the Board of the Water Supply Unit (hereinafter the Board). The present service area is shown on a map in Attachment 1.

Within the service area as defined above, the WSU is generally responsible for accepting connections applied by household and other consumers. The WSU may also supply water to clients outside the service area. These General Regulations would then be applied only to the extent reasonable.

Article 3: Organisation of WSU

The WSU is responsible for the operation and maintenance of the water supply system providing piped potable in the service area defined above. The WSU comprises employed staff under the management of the Manager of the WSU. The Manager, on behalf of the WSU, is accountable to the Board.

The Board comprises five members appointed by the People's Committee of _____ commune/town (hereinafter PC). _____ of the five members of the Board shall be elected by the clients as their representatives. This election shall take place in an annual meeting of registered clients of the WSU.

The Chairperson of the Board, on behalf of the Board, is accountable to the PC. The Board convenes meetings whenever necessary, however at least once a month. The members of the Board, if paid for performing their duties in the Board, shall not be paid from the funds of the WSU.

The organisational chart of the WSU is shown in Figure 1.

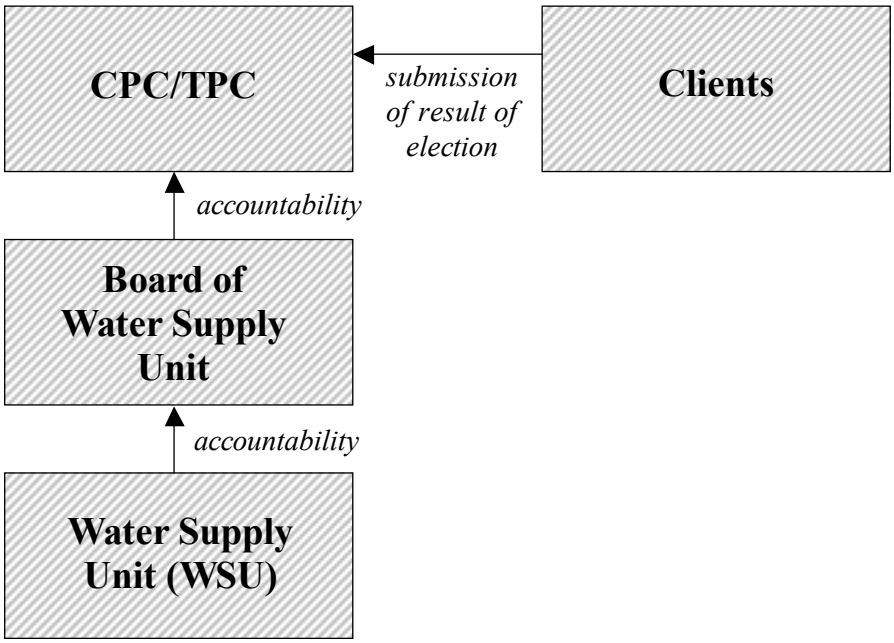


Figure 1 Organisation of WSU

Chapter II: Clients of WSU

Article 4: Rights of clients

All people residing within the service area of the WSU ale eligible to sign a contract with the WSU. However, if the capacity of the water supply system is restricted and does not allow the WSU to accept to clients, in order to be able to fulfil its duties as defined in the contracts with already served clients, the WSU may reject the application. The relations between the WSU and the client are defined in the contract to be signed between before its effectiveness.

The clients have the right to:

- to enjoy uninterrupted 24-hour service provided by the WSU , except for a) interruptions caused by regularly scheduled improvements and maintenance, or b) sudden interruptions caused by unexpected repairs,
- terminate the contract by their initiative,
- transfer the contract to a third person, and

- participate in the management of the WSU, especially through their elected members in the Board.

Article 5: Responsibilities of clients

The clients have the responsibility to:

- pay to the WSU the monthly water bills based on metered water use and the costs resulting from connection and possible relocation of the connection,
- allow the WSU's authorised personnel to inspect the installations that belong to the connection, to read the meter and to collect the water bills,
- protect the meter against damage and theft and inform the WSU about any irregular performance, breakdown or loss of the meter soonest, latest within 24 hours from the incidence,
- protect the water supply system against any damage and illegal water abstraction from the system, and report to the WSU about any such irregularities soonest.
- obey the General Regulations of the WSU, decided by the Board, and comply with the terms of the contract with the WSU
- file a complaint against the WSU if s/he considers that it violates the General Regulations or the terms of the contract, and if not satisfied the decision of the Board, s/he has the right to send the complaint to the competent State agency or start a legal action at the Court as prescribed by law,
- transfer the contract to a third person (for example, a new owner of the property), after notifying the WSU to make the legal change of the ownership,
- withdraw from any exploitation and cultivation of land in the protection zone of the water source as illustrated in Attachment 2.

Chapter III: Water Supply Unit

Article 6: Appointment of staff

The manager of the WSU shall be appointed by the Board. The other staff members are also appointed by the Board based on the proposal made by the Manager. The duties of the other staff members include pump operation, treatment plant operation (if there is a treatment plant), pipeline inspection (including installation of connections, disconnection and reconnection), accounting, meter reading and money collection.

The staff members of the WSU can be full-time or part-time employees. Their salaries are paid from the revenues collected from the clients. In the initial period of the water supply system operation, some staff members may not be paid at all if they perform their duties as an additional task associated with their previous duties. For example, the duties of the Manager may temporarily be undertaken by a PC member or the Chief of Administration of the commune/town.

If the Board is dissatisfied with the performance of the Manager or other WSU staff members, it can terminate the work contract and appoint a new member as the replacement.

The Manager and the Board shall ensure that for each activity of the WSU there are always at least two staff members who are familiar with this activity. This means that although there have to be

clear responsibilities with one person having the responsibility for the task there is a need to develop overlapping skills. This will ensure uninterrupted operation and performance if a staff member is temporarily or permanently out of service.

Article 7: Rights and responsibilities of WSU

The WSU is responsible for the technical and financial performance of the water supply system. The rights and responsibilities of the WSU include, but are not limited to:

- the supply of adequate amount of water, as defined in the contract signed with the client, and with adequate pressure (minimum 4m or 0.4 bar at the water meter) and quality (as defined in the Standard 505 of the Ministry of Health) without any undue interruptions, except for a) interruptions caused by regularly scheduled improvements and maintenance, or b) sudden interruptions caused by unexpected repairs,
- in case a) above, notification of clients at least 48 hours prior to the interruption,
- ensuring the service to clients if they move to another location in the service area,
- inspection of the meter and other house connection installations as well as the way in which clients use water,
- reading of the meter and maintaining a record of the amount of water used by each client for at least two full year after the "water use month"[1],
- protection of the water source,
- ensuring the sustainability of the water supply system by preparing annual financial plans with a tariff proposal and closely and timely monitoring the balance of costs and revenues against the financial plan and reporting to the Board with a frequency not exceeding one month,
- transparent management of funds and accounts,
- routine maintenance as well maintenance and repair of faulty facilities by themselves or by contracted service providers,
- maintenance of water meters and calibration of the meters when there is a reason to suspect their accurate performance or at least once in three years.

Article 8: Responsibilities of Manager:

The Manager has the overall responsibility for the WSU and s/he is accountable for her/his work to the Board. The Manager especially focuses on the service and financial management of the WSU but s/he also assumes the responsibility for the technical operations of the WSU. The duties of the Manager include planning and budgeting, monitoring of the performance of the WSU, reporting to the Board, personnel management, liaison with PC and authorities, customer relations, material management, contract management and supervision and control of the WSU staff.

As being responsible for the financial performance of the WSU, the Manager needs to be active in promoting and marketing water sales in order to improve the efficiency of the water supply system and to reduce water tariff per cubic metre.

[1] The term "water use month" means the time between two consecutive meter readings. In normal conditions the "water use month" shall be 30 days plus/minus five days.

The Manager is the legitimate representative of the WSU before the law. S/he is responsible for the bank account of the WSU. S/he defines the detailed division of duties of each staff member and ensures that there is clear responsibility for each task to be performed. For that purpose, the Manager defines the job description for each staff member and provides them with written procedures and instructions. The Manager countersigns water bills and all records kept by respective staff members.

Article 9: Responsibilities of Accountant:

The Accountant is responsible for accurate and timely accounting of the WSU. In addition to accounting s/he is also responsible for preparing monthly water bills, based on the data provided by meter readers, and maintaining customer ledgers. The Accountant assists the Manager in the preparation of the annual financial plan and tariff calculation and performs other tasks requested by the Manager.

The Accountant reports to the Manager.

Article 10: Responsibilities of Pump Operator:

The responsibilities of the Pump operator cover the water intake, its structures and installations, the rising main from the borehole to the treatment plant and (only for K3) the reservoir, and the treatment plant and (only for K3) the reservoir.

The main daily tasks of the Pump Operator include the operation and control of the borehole pump, keeping record on the flow, pressure, voltage, power consumption, the times of switch-on and switch-off of the pumps, as well as any observations of irregularities at the intake and the facilities up to the reservoir. Because the pump operation is fully manual, the Pump Operator needs to monitor closely the water use pattern of the clients and develop an optimal pumping schedule to ensure that a) there is a continuous 24-supply of water in the service area, and b) there is no wastage of water and pumping energy caused by overflow from the reservoir.

(This applies only to K3:) At the treatment plant the Pump Operator controls the volume and quality of inflow and outflow at the plant, the condition and operation of all installations at the plan, monitoring and control of the performance of filtration, and cleaning of the topmost layer of sand in the filter.

The Pump Operator reports to the Manager and informs her/him for any purchasing and maintenance needs that require disbursement of funds.

Article 11: Responsibilities of Pipeline Inspector:

The Pipeline Inspector is responsible for the overall network operation downstream of the reservoir and for the supply of water to the customers in adequate quantity and with adequate pressure, and in general for the technical performance of the distribution system, paying particular attention on minimising the non-revenue water.

The duties of the Pipeline Inspector include general monitoring of the performance of distribution, based on readings of the master meters and customer meters, observation of any irregularities, detection of potential leaks and illegal connections, consequent repair, installation, possible disconnection and reconnection of house connections and public water taps, and testing of water quality in the system. The Pipeline Inspector is also responsible for the performance of the water meters, including the maintenance and calibration of the meters. This responsibility does not mean that s/he has to carry out these tasks personally. Rather it means that he has to ensure the timely meter calibration and maintenance by a contracted service provider.

The Pipeline Inspector reports to the Manager and informs her/him about the purchase and maintenance needs (pipes, meters, valves, fittings, etc.) that require disbursement of funds.

Article 12: Responsibilities of Meter Reader:

The main tasks of the Meter Reader include monthly reading of customer meters, distribution of water bills and collection of payments. Additionally, the Meter Reader is to inspect the functioning and condition of the meter as well as its seal. The Meter Reader reports the readings to the Accountant and receives the bills from her/him.

The Meter Reader is accountable for her/his work and the collected payments to the Manager. S/he also reports about her/his work and any observed irregularities to the Manager.

Initially, the duties of the Meter Reader are undertaken by the Pipeline Inspector until the Board decides to fill the vacancies of the Meter Reader along with increasing number of connections.

Chapter IV: Board of Water Supply Unit

Article 13 Rights and responsibilities of Board:

The main duties of the Board are to monitor and supervise the financial and technical performance of the WSU, and to approve the annual plans and decide upon the water tariff and other payments and fines related to water supply services provided by the WSU.

The responsibilities of the Board include:

- appointment of the Manager of the WSU,
- appointment of other staff members of the WSU on the basis of the proposal of the Manager,
- decisions on the salaries and possible performance incentives of the Manager and other staff members of the WSU,
- decision of the General Regulation of the WSU and the conditions of contracts between the clients and the WSU,
- decisions on protection of the water source and the water supply system,
- approval of annual (financial) plans proposed by the WSU, (if the Board is not satisfied with the WSU's proposal, it requests WSU to submit anew plan that takes into account the guidance provided by the Board)
- decisions on water tariff, connection fees, meter rents, reconnection fees, fines etc.,

- close and timely monitoring of the balance of costs and revenues against the financial plan and taking measures to ensure the sustainability in the case of possible deficit (either by reducing costs or increasing revenues),
- monitoring of the efficiency and performance of the WSU in the provision of water supply services through customer satisfaction and inspections,
- provision of transparent information of the performance and accounts of the WSU to PC and clients,
- promotion of water use in collaboration of health and educational authorities and mass organisations,
- settlement of disputes between the clients and the WSU,
- reporting to PC and submission of tariff decisions and other decisions to PC for adoption, and
- support to the WSU in the enforcement of the General Regulations and requesting support from relevant authorities if necessary.

Article 14: Working modalities of Board:

The Board members are appointed by PC for a period of two years. At least two members shall be elected by the clients.

The decisions of the Board are binding and legal when at least three members of the Board agree wit the decision. The Board shall keep minutes of their meetings and they have to be signed by each member.

The Board convenes meetings according to the schedule decided by them, however at least once a month. If need arises, the Chairman of the Board may invite the Board to have additional meetings by inviting the members accordingly. However, to enter into legal decisions, three members have to agree with the decision.

Each of the Board members is accountable to PC and responsible before the law for the performance of the Board in its task.

Chapter V: People's Committee

Article 15: Rights and responsibilities of People's Committee

The People's Committee appoints the members of the Board and adopts the tariff and other relevant decisions of the Board.

PC is in charge of resolving problems on sabotage, damaging the safety of the water supply system, and enforcing the measures against the violators of the General regulations and other relevant rules and misconduct of the staff of the WSU and the members of the Board.

PC provides support to the Board and the WSU in their duties, especially in training.

If PC refuses to adopt the new tariffs decided by the Board and accepted by the representatives of the clients in the Board, PC shall reimburse the WSU any and all losses incurred due, or related to, the PC's decision of not adopting the required tariff.

Chapter VI: Other Clauses

Article 16: Implications of violation of regulations

If a client fails to pay the water bill when the money collector authorised by the WSU is collecting the payment or within 10 days thereafter, the WSU has the right to interrupt water supply to the said client. If this client fails to pay the water bill during the following 20 days, the WSU has the right to disconnect the client and terminate the contract. If the client wishes to be reconnected, s/he has to settle all due payments and pay the reconnection fee of VND _____.

If Party B breaks the seal of the meter, tampers with the meter or lets the meter be damaged or lost, Party A has the right to charge Party A for the cost of a new meter and a fine from Party B in the range of VND _____ to VND _____ or decided by the Board.

If the WSU violates the contract signed with the client, the client can claim compensation from the WSU in the range of VND _____ to VND _____ or a sum to be specifically decided by the Board. If the client violates the contract, otherwise than mentioned above, the WSU can terminate the contract, disconnect the client and claim compensation and fine from her/him in the range of VND _____ to VND _____ or a sum to be specifically decided by the Board. In case of clearly unintentional damage the compensation and fine can be exempted by the Board.

Those who cause damage to the water intake or the water supply system, have to:

- compensate the damage,
- pay a fine in the range of VND _____ to VND _____, and
- be brought to court.

The compensation shall include:

- compensation for revenues that are lost during repair and recovery,
- costs of investigation and excavation of violated areas in order to repair, and
- repair or replacement of pipelines, valves, manholes and other assets.

If a staff member of the WSU is guilty for misconduct, the Board can give her/him a written warning, deduct a share of whole of her/his salary, dismiss her/him and/or bring him to court. The Board is responsible for supervision of the WSU staff and if it is found that misconduct of a WSU staff member has been made possible by the neglect of supervision by the Board, the Board members may also be brought to court.

Article 17: Public taps

Instead of and in addition to house connections there can be public or collective taps in the water supply system. They are intended to provide service to those without a connection of their own. For each public tap, the WSU signs a contract with a representative of the user group of the tap. The General Regulations, the terms of the contract and other rules relevant to house connections apply also to public taps.

The water use from a public tap is metered and the person responsible for the tap is accountable to the WSU for the payment of water bills. The user group shares the bills as they decide between themselves.

The user group of the public tap is responsible for the protection of the tap, its installations and the cleanliness of its environment. If the tap or its installations are damaged as a result of improper use or intentional vandalism, the user group is responsible for covering the expenses of the repir. Otherwise the tap will be disconnected.

The manholes of tanks associated with the taps are allowed to be opened only by persons authorised by the WSU.

It is forbidden to hang buckets or any other vessels at the cock of the tap.

In _____ on _____

_____ _____
Chairperson of the Board Member of the Board

_____ _____
Member of the Board Member of the Board

_____
Member of the Board

Adopted by _____ People's Committee

_____
Position

Appendix 8-2

Application for a Connection to Piped Water Supply

Appendix 8-2

APPLICATION FOR A CONNECTION TO PIPED WATER SUPPLY

I apply for a house connection to _____ piped water supply system and promise to pay all expenses for the connection and water meter and to comply with the terms of Water Supply Contract and the General Terms of _____ Water Supply Unit.

Address of the property to be connected:_____

Number of people living in the address: _____

Type of non-domestic water use in the address: _____

Date: _____

Applicant:

Signature: _____

Name: _____

Address: _____

Telephone: _____

Decision of _____ Water Supply Unit

Connection approved _____

Connection rejected _____, because _____

_____

Date: _____

Signature: _____

Name: _____

Position: _____

Appendix 9

Contractor for Water Supply between the User and the WSU

Appendix 9

CONTRACT FOR PIPED WATER SUPPLY

BETWEEN

_____ WATER SUPPLY UNIT

AND

_____

CONTRACT FOR PIPED WATER SUPPLY

Pursuant to the civil law of the Socialist republic of Viet Nam, and
based on the requirements to supply piped potable water,
we have entered into this contract on supply of piped potable water between the following two parties:

Supplier of potable water: _____ Water Supply Unit (hereinafter Party A)

Address: _____

Bank and account number:_____

Telephone: _____

Client: Mr./Ms. _____ (hereinafter Party A)

Address: _____

Bank and account number:_____

Telephone: _____

Article 1: Location and service level:

Party A shall be responsible for supplying Party B with potable water as regulated by law with adequate pressure (minimum 4m or 0.4 bar at the water meter) and in adequate quantity (at least ____m^3/month) in the following location _____, shown also on the attached map.

The supply of water by Party A and the water use of Party B shall be verified with a water meter installed and managed by Party A.

Article 2: Water tariff, billing and payments:

1. The water tariff shall be calculated and set by the Board of the Water Supply Unit and adopted by the People's Committee of _____ commune/town. The tariff shall cover the operation and maintenance cost of the water supply system and it shall in longer term provide sufficient saving to cover the cost of replacement of civil structures, pipelines and electrical and mechanical installations. If the revenues from water sales are not sufficient to cover the

aforesaid costs and saving need, the Board of the Water Supply Unit shall recalculate to tariff and set a new tariff to ensure the sustainability of the water supply system. Party A shall inform Party B about tariff adjustments within one week from the decision and the new tariff shall not be applied until for the next full "water use month".

2. The term "water use month" means the time between two consecutive meter readings. In normal conditions the "water use month" shall be 30 days plus/minus five days.
3. The water meter and all installations upstream of the meter are the property of Party A and all installations downstream of the meter are the property of Party B. Although the installations upstream of the meter and the meter itself are the property of Side A, Side B shall cover the whole cost of the connection from the main pipe, including the meter and the upstream installations. The cost of the meter can be paid as part of the connection fee in one instalment or in a number of instalments decided by the Board, or Party B may pay a monthly rent fro the meter to Party A as agreed by the Board. In the latter case, the meter rent has to be specified in the water bill separated from the water charge based on metered use.
4. Party B shall pay for the water s/he has used on the basis of the reading of the meter and the valid water tariff. If the user fails to pay to the money collector authorised by Party A, Party B shall settle the payment in the office of Party A. If Party B has a bank account, s/he can pay directly to the bank account.
5. If the meter reader authorised by Party A has not access to the meter or otherwise fails to read the meter, the monthly water use shall be calculated as the average of the previous three months. The estimated water use shall be balanced as a result from the following meter reading.

Article 3: Rights and responsibilities of each party:

Party A:

1. Party A shall supply adequate amount of water with adequate pressure as per contract without any undue interruptions, except for a) interruptions caused by regularly scheduled improvements and maintenance, or b) sudden interruptions caused by unexpected repairs. In case a) above, Party A shall notify Party B at least 48 hours prior to the interruption.
2. Party A shall ensure the service under this contract to Party B if s/he moves to another location in the service area. Party A has the right to charge Party B for all material and labour costs resulting from moving the connection.
3. Party has the right to inspect the meter and other house connection installations as well as the way in which Party B uses water. Party A shall read the meter and record the amount of water used by Party B. Party A shall maintain the records for at least two full year after the "water use month"
4. Party A is responsible for routine maintenance of the meter and its calibration when there is a reason to suspect its accurate performance or at least once in three years. Party A shall then remove the meter and replace it by a calibrated and sealed meter.

Party B:

1. Party B has the right to uninterrupted 24-hour service provided by Party A under this contract with the exceptions defined in Paragraph 1 under the rights and responsibilities of Party A above.
2. Party B shall pay to Party A the monthly water bills based on metered water use and the costs resulting from connection and possible relocation of the connection.

3. Party B shall allow Party A's authorised personnel to inspect the installations that belong to the connection, to read the meter and to collect the water bills.
4. Party B shall not deliberately move, remove or repair the meter and installations upstream of the meter, and s/he shall protect the meter from damage and theft and the sealing of the meter, and pay for possible damage. Particularly serious are any attempts to stop the meter from rotating, to manipulate the meter, and to exploit water upstream of the meter (theft). It is not allowed, either, to accelerate the flow in the connection by using pumps by Party B.
5. Party B shall inform Party A about any irregular performance, breakdown or loss of the meter soonest, latest within 24 hours from the incidence.
6. Party B shall obey the General Regulations of the WSU, decided by the Board. Violation of the General Regulations may be result in payment of fines set by the Board or termination of the contract.
7. Party B can file a complaint against party B if s/he considers that Party A violates the General Regulations or the terms of this contract. The complaint shall be addressed to the Board of the WSU. If Party B disagrees with the decision of the Board, s/he has the right to send the complaint to the competent State agency or start a legal action at the Court as prescribed by law.
8. If Party B transfers this contract to a third person (for example, a new owner of the property), the transfer shall take place within seven days after Party B notifies Party A to make the legal change of the ownership.

Article 4: Implications of violation of contract:

1. If Party B fails to pay the water bill when the money collector authorised by Party A is collecting the payment or within 10 days thereafter, Party A has the right to interrupt water supply to Party B. If Party B fails to pay the water bill during the following 20 days, Party A has the right to disconnect the connection of Party B and terminate the contract. If Party B wishes to be reconnected, s/he has to settle all due payments and pay the reconnection fee decided by the Board.
2. If Party B breaks the seal of the meter, tampers with the meter or lets the meter be damaged or lost, Party A has the right to charge Party A for the cost of a new meter and a fine from Party B in the range of VND _____ to VND _____ or decided by the Board.
3. Disputes between Party A and Party B shall, in principle, be settled by the Board. In general, if Party A violates the contract, Party B can claim compensation from Party A in the range of VND _____ to VND _____ or a sum to be specifically decided by the Board. If Party B violates the contract, otherwise than mentioned above, Party A can terminate the contract, disconnect Party B, and claim compensation and fine from Party B in the range of VND _____ to VND _____ or decided by the Board.
4. In case of clearly unintentional damage the compensation and fine can be exempted by the Board.

Article 5: Other agreements:

1. Within the service area as defined in The General Regulations for the Water Supply Unit as decided by the Board, Party A is generally responsible for accepting connections. If mutually agreed between Party A and Party B, Party B can be authorised by Party A to sign sub-contracts with other water users, who would connect to the connection of Party B downstream of the meter of Party B. Party B shall then be responsible for the payment of all metered water use to Party A and s/he would have the right to charge the other users as s/he has agreed with them.

Party A will not be responsible for the service level provided to the sub-contracted users through Party B.

2. If Party B does not use water from the connection for two consecutive months (no metered use), Party A has the right to disconnect Party B. If Party B wishes to be reconnected, s/he has to settle all due payments and pay the reconnection fee decided by the Board.
3. This contract has to be in compliance with the General Regulations of the WSU, decided by the Board. If the Board amends the General regulations, the amendments shall apply to this contract.
4. This contract has been made in two identical copies signed by both parties. Each party shall keep one copy that is effective from the signatory date until the day when one of the parties wishes to terminate or amend it. Amendments can only be made mutually.

In _____ on _____

On behalf of the Client: On behalf of _____ Water Supply Unit

_____ _____

Appendix 10

Daily Operations Record

DAILY OPERATIONS RECORD

1. Pumping record (raw water):

Date	Time of pump switch-on	Time of pump switch-off	Flow meter reading at switch-on	Flow meter reading at switch-off	Volume pumped	Power meter reading at switch-on	Power meter reading at switch-off	Power consumption
Total								

2. Availability of water to consumers: ____ h/d. If less than 24 h, specify where and why (in an attachment).

3. Observations, if any, on water quality:

_____

_____

_____

_____

4. **Observations, if any, on problems or irregularities (power failure, leaks, violation of regulations, etc.) and description of corrective or other special measures, (repair, filter backwash, etc.):**

5. **Additional information:**

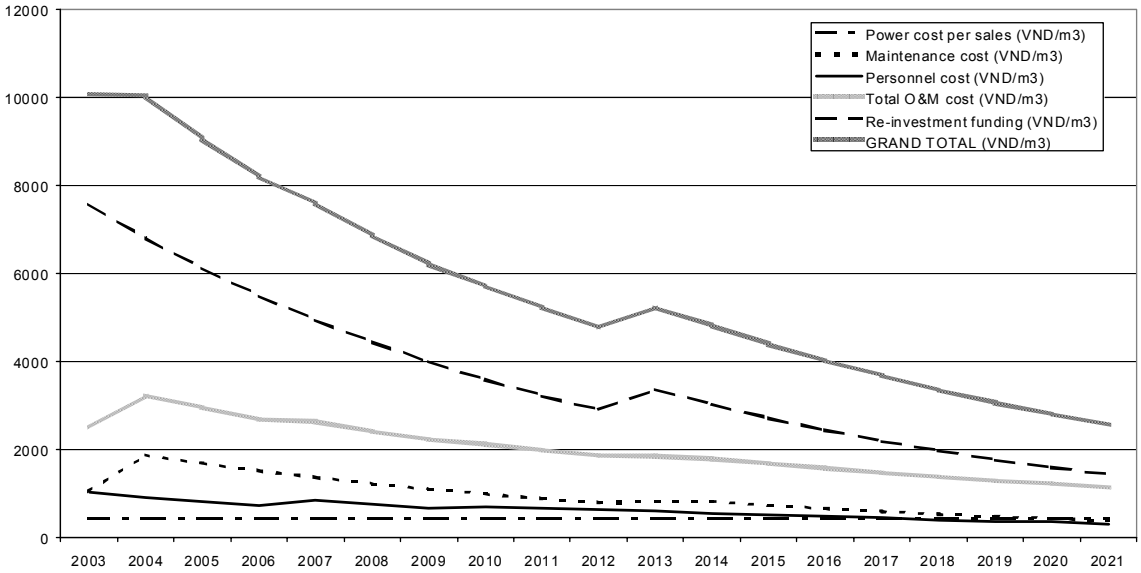
6. **Date, name and signature of Operator**

7. **Date, name and signature of Manager**

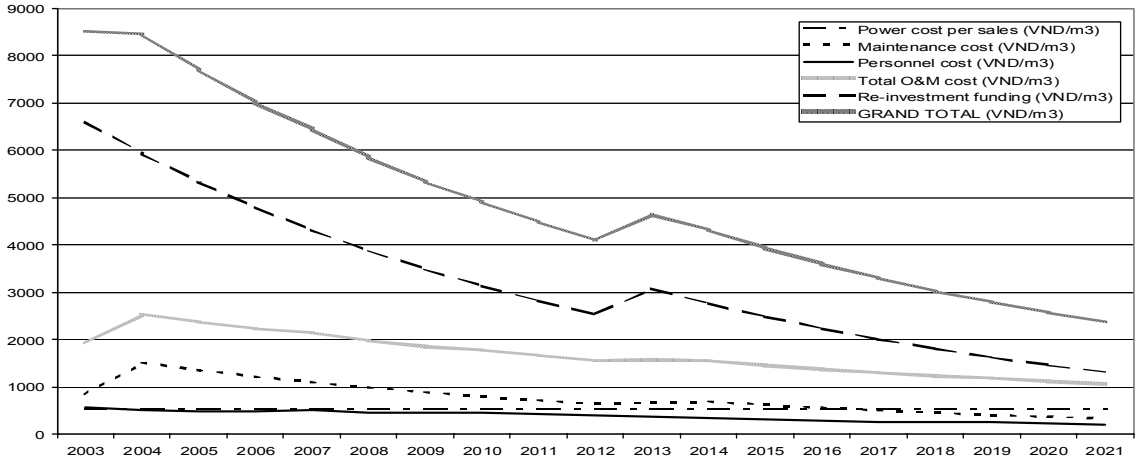
Appendix 11

O&M Costs for Each Target Communes

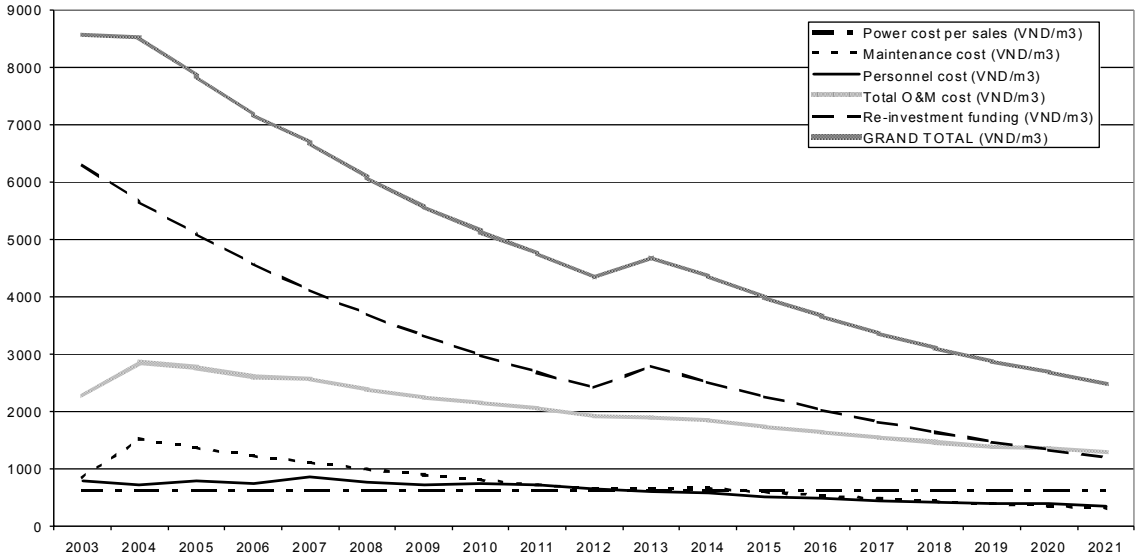
O&M costs of Kong Tang scheme G1



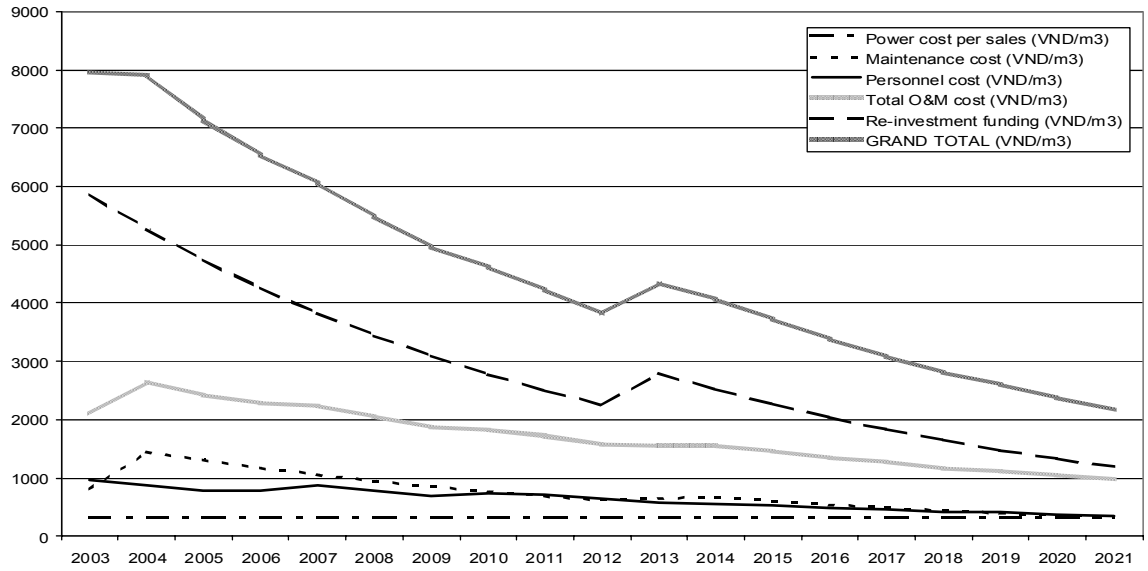
O&M costs of Krong Kmar scheme G2



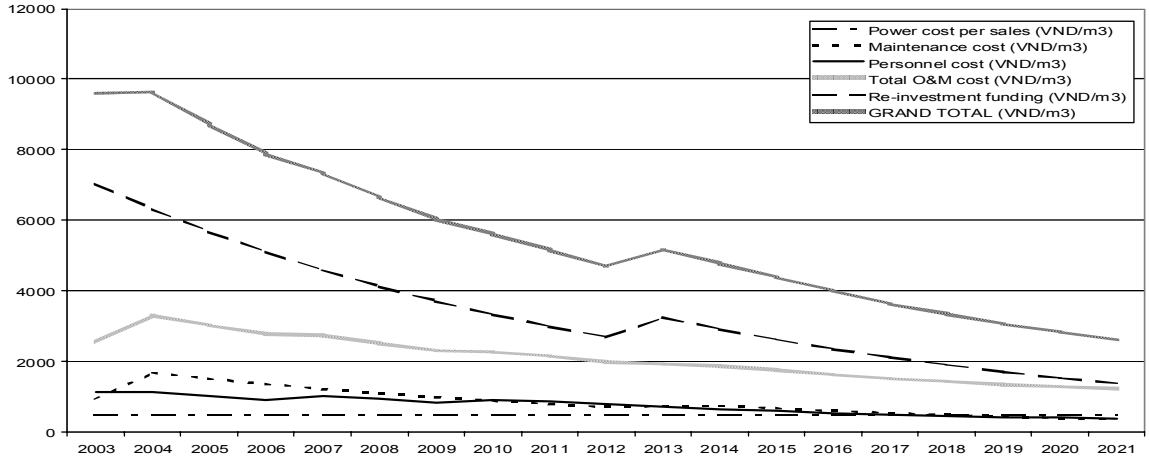
O&M costs of Chu Ty scheme G3



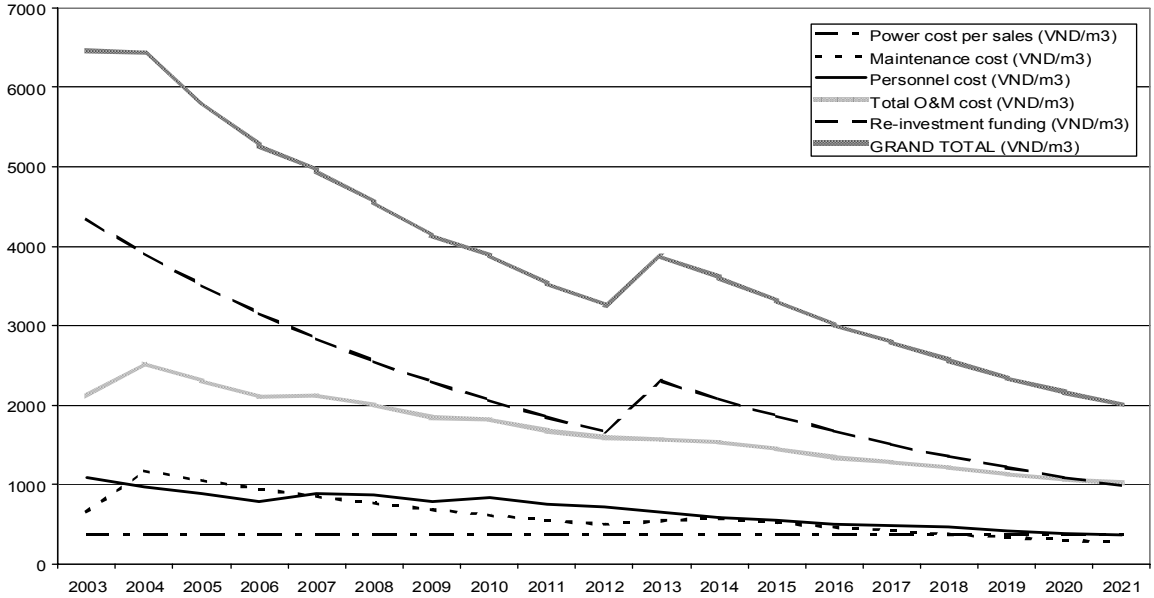
O&M costs of Thang Hung scheme G4



O&M costs of Nghia Hoa scheme G5



O&M costs of la Rsion scheme G6



O&M costs of Kong Yang scheme G7