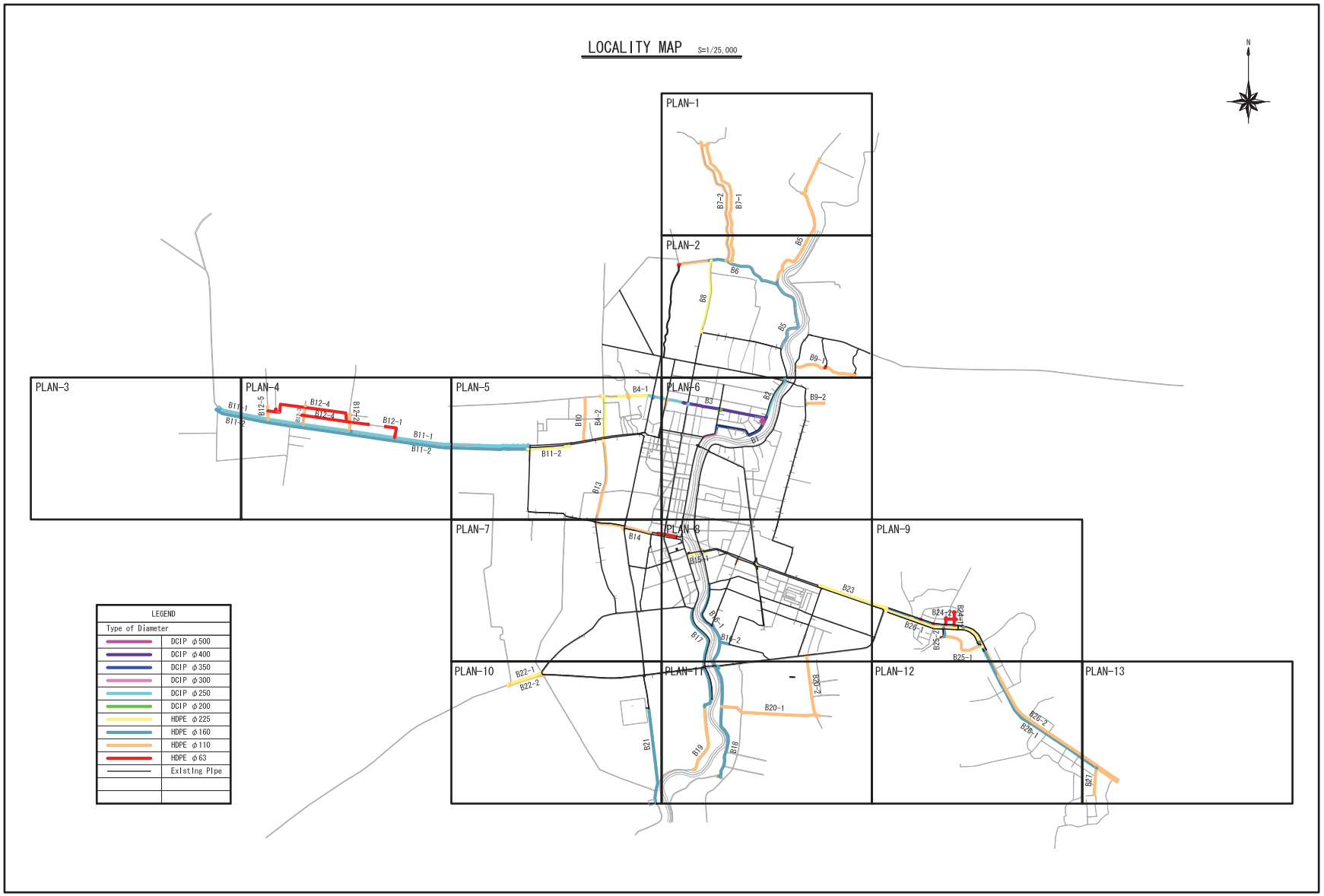
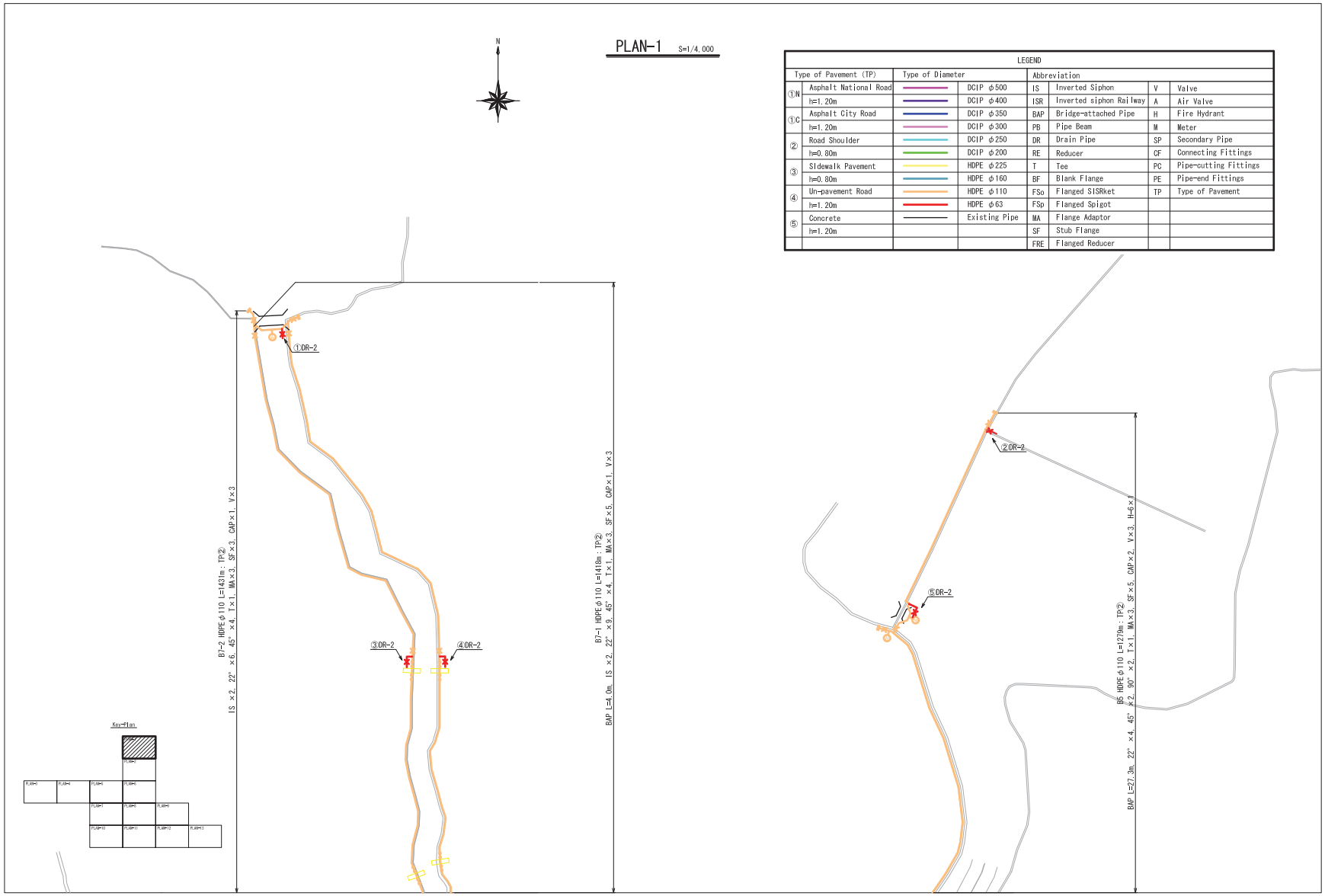


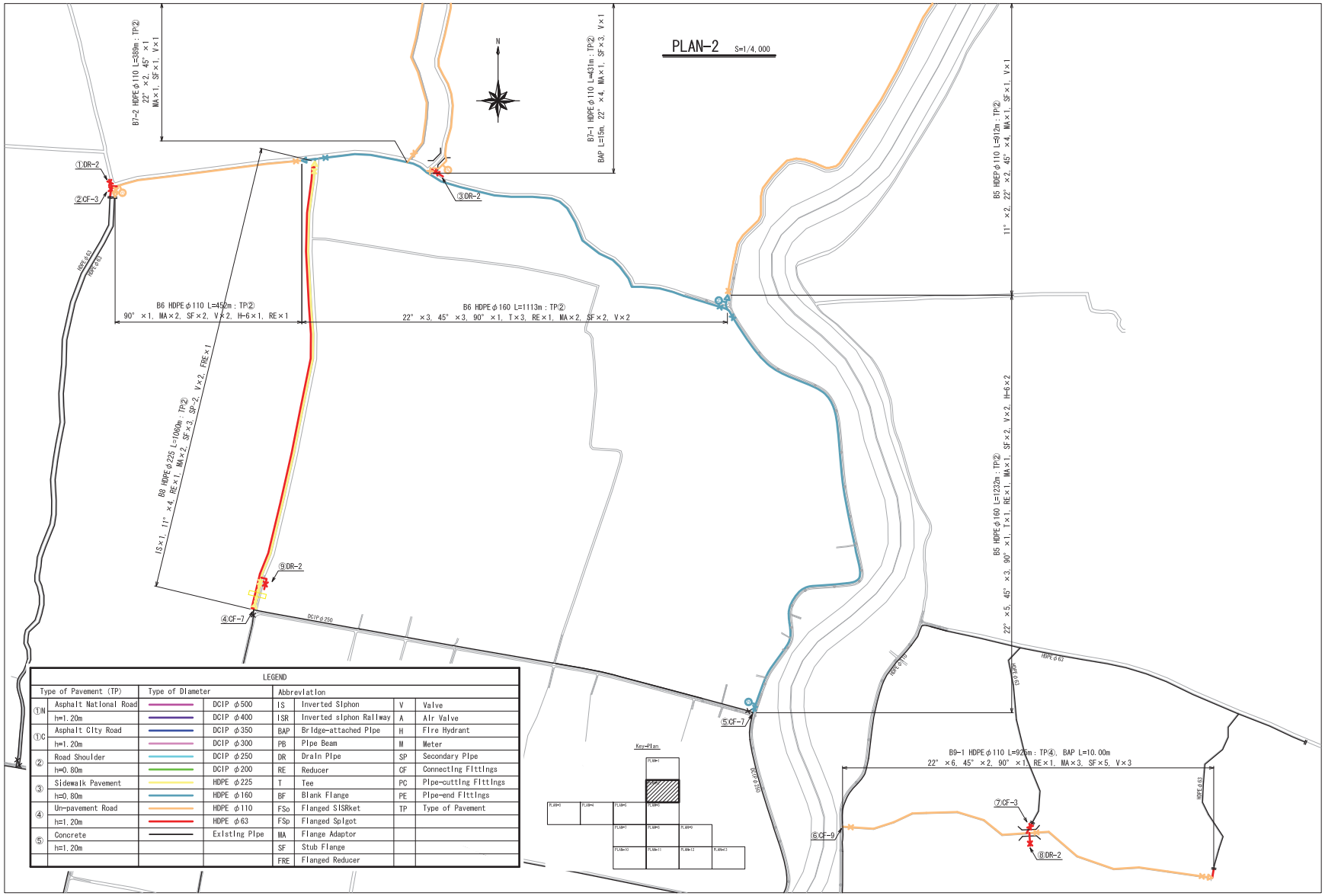
バッタンバン配水管路敷設概要図
Location Map for Distribution Pipeline, Battambang

B-D1



バッタンバン配水管路敷設詳細図（１）
Plan (1) for Distribution Pipeline, Battambang

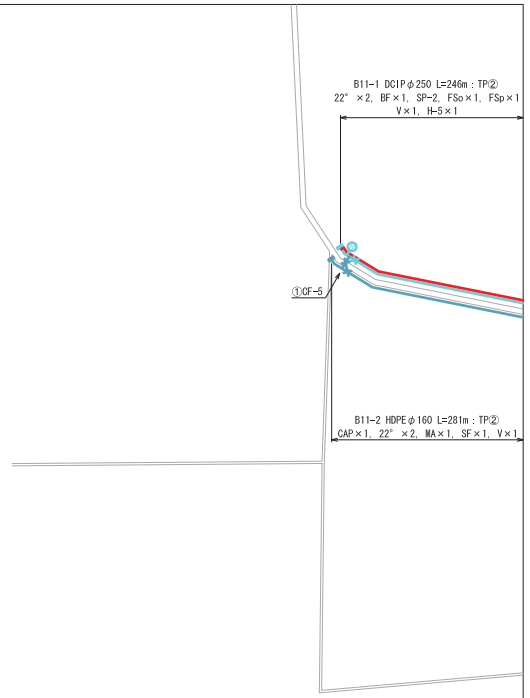
B-D2

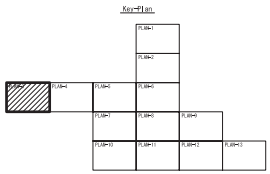


バッタンバン配水管路敷設詳細図（２）
Plan (2) for Distribution Pipeline, Battambang

B-D3

PLAN-3 S=1/4,000

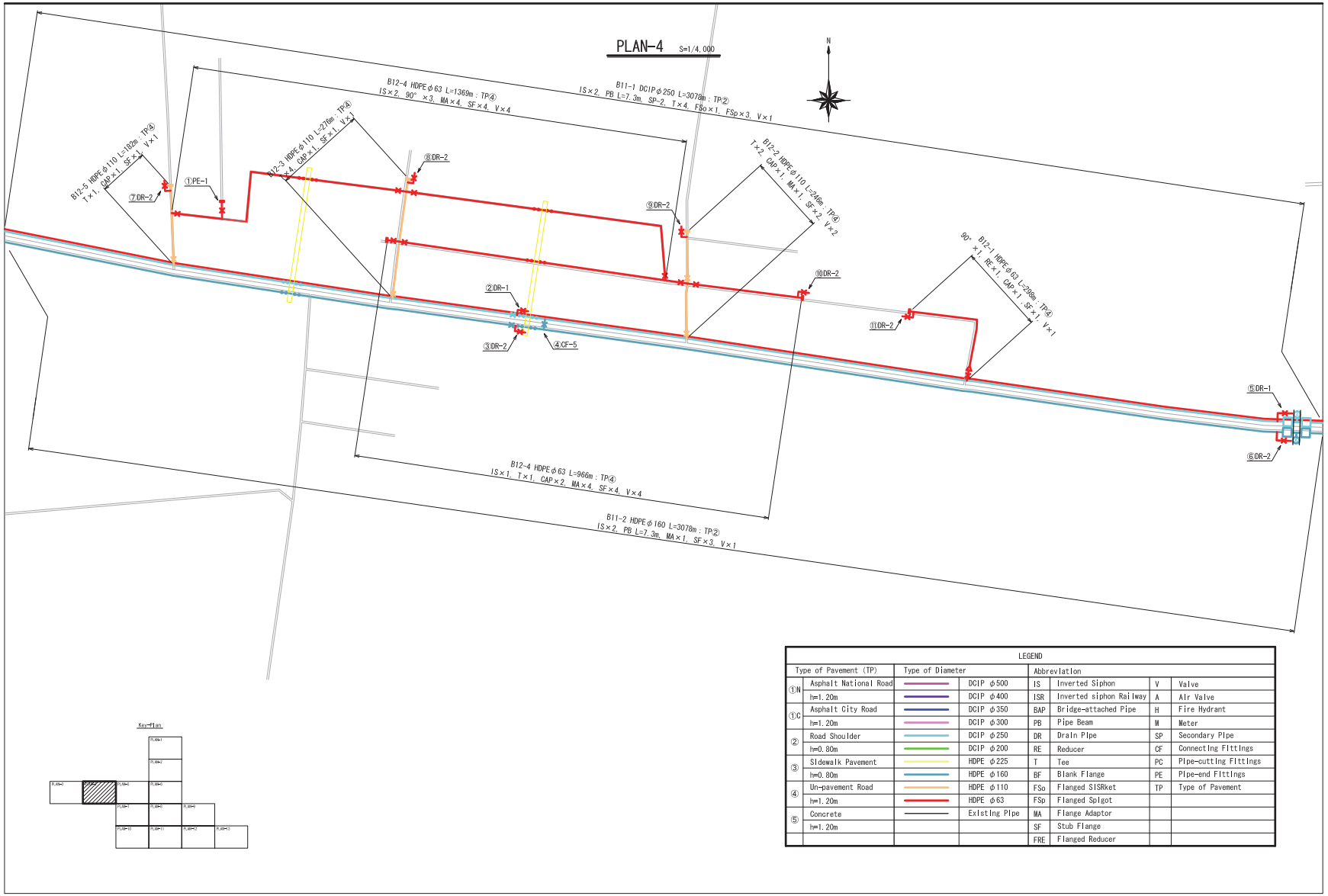




LEGEND							
Type of Pavement (TP)		Type of Diameter		Abbrevlation			
①N	Asphalt National Road		DCIP φ500	IS	Inverted Siphon	V	Valve
	h=1.20m		DCIP φ400	ISR	Inverted siphon Railway	A	Air Valve
①C	Asphalt City Road		DCIP φ350	BAP	Bridge-attached Pipe	H	Fire Hydrant
	h=1.20m		DCIP φ300	PB	Pipe Beam	M	Meter
②	Road Shoulder		DCIP φ250	DR	Drain Pipe	SP	Secondary Pipe
	h=0.80m		DCIP φ200	RE	Reducer	CF	Connecting Fittings
③	Sidewalk Pavement		HDPE φ225	T	Tee	PC	Pipe-cutting Fittings
	h=0.80m		HDPE φ160	BF	Blank Flange	PE	Pipe-end Fittings
④	Un-pavement Road		HDPE φ110	FSo	Flanged SISRket	TP	Type of Pavement
	h=1.20m		HDPE φ63	FSp	Flanged Spigot		
⑤	Concrete		Existing Pipe	MA	Flange Adaptor		
	h=1.20m			SF	Stub Flange		
				FRE	Flanged Reducer		

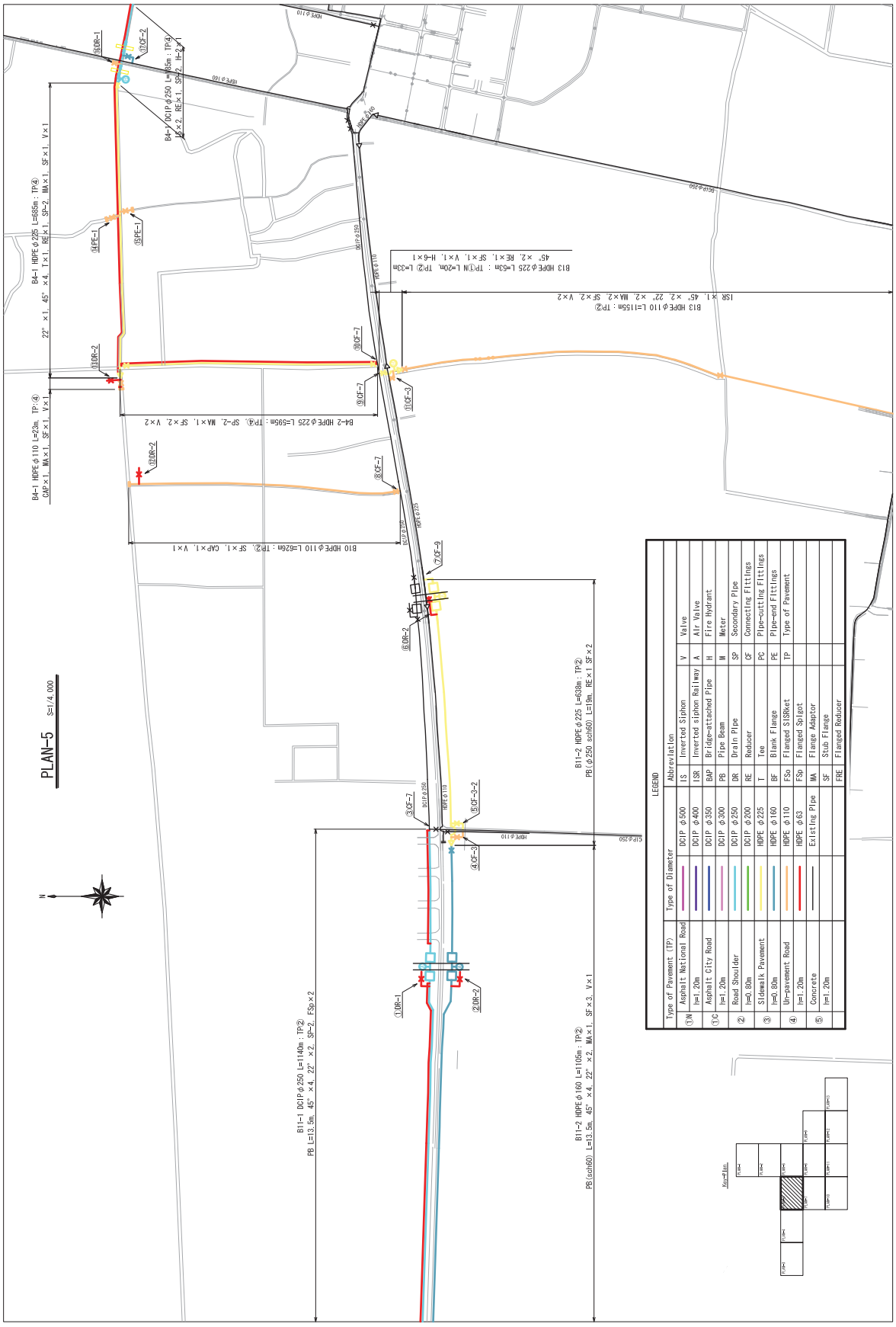
バッタンバン配水管路敷設詳細図（３）
Plan (3) for Distribution Pipeline, Battambang

B-D4



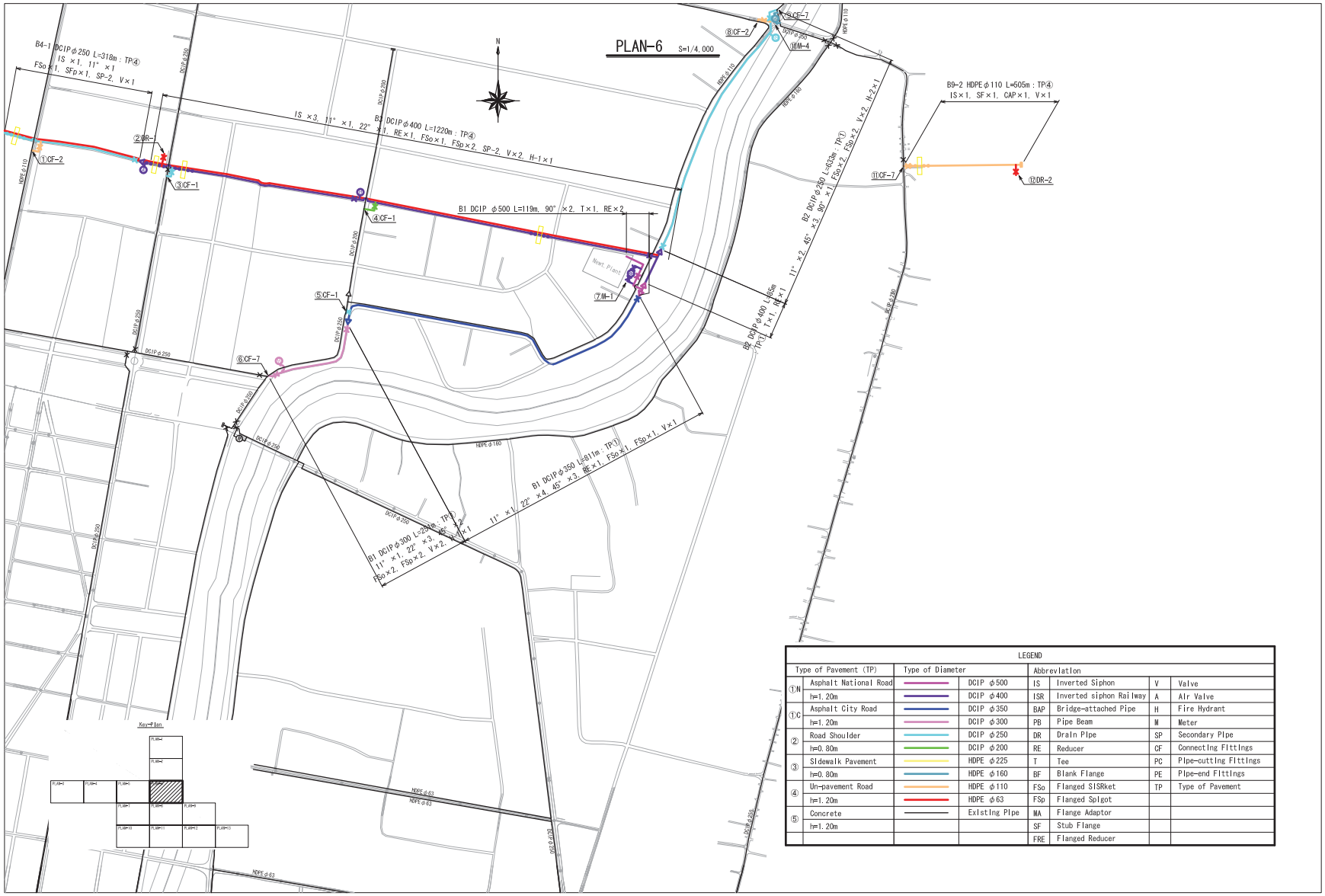
LEGEND							
Type of Pavement (TP)		Type of Diameter		Abbreviation			
①N	Asphalt National Road h=1.20m		DCIP φ500	IS	Inverted Siphon	V	Valve
			DCIP φ400	ISR	Inverted siphon Railway	A	Air Valve
①C	Asphalt City Road h=1.20m		DCIP φ350	BAP	Bridge-attached Pipe	H	Fire Hydrant
			DCIP φ300	PB	Pipe Beam	M	Meter
②	Road Shoulder h=0.80m		DCIP φ250	DR	Drain Pipe	SP	Secondary Pipe
			DCIP φ200	RE	Reducer	CF	Connecting Fittings
③	Sidewalk Pavement h=0.80m		HDPE φ225	T	Tee	PC	Pipe-cutting Fittings
			HDPE φ160	BF	Blank Flange	PE	Pipe-end Fittings
④	Un-pavement Road h=1.20m		HDPE φ110	FSo	Flanged SISRket	TP	Type of Pavement
			HDPE φ63	FSp	Flanged Spigot		
⑤	Concrete h=1.20m		Existing Pipe	MA	Flange Adaptor		
				SF	Stub Flange		
				FRE	Flanged Reducer		

バッタンバン配水管路敷設詳細図（４）
Plan (4) for Distribution Pipeline, Battambang B-D5



パッタンバン配水管路敷設詳細図（5）
Plan (5) for Distribution Pipeline, Battambang

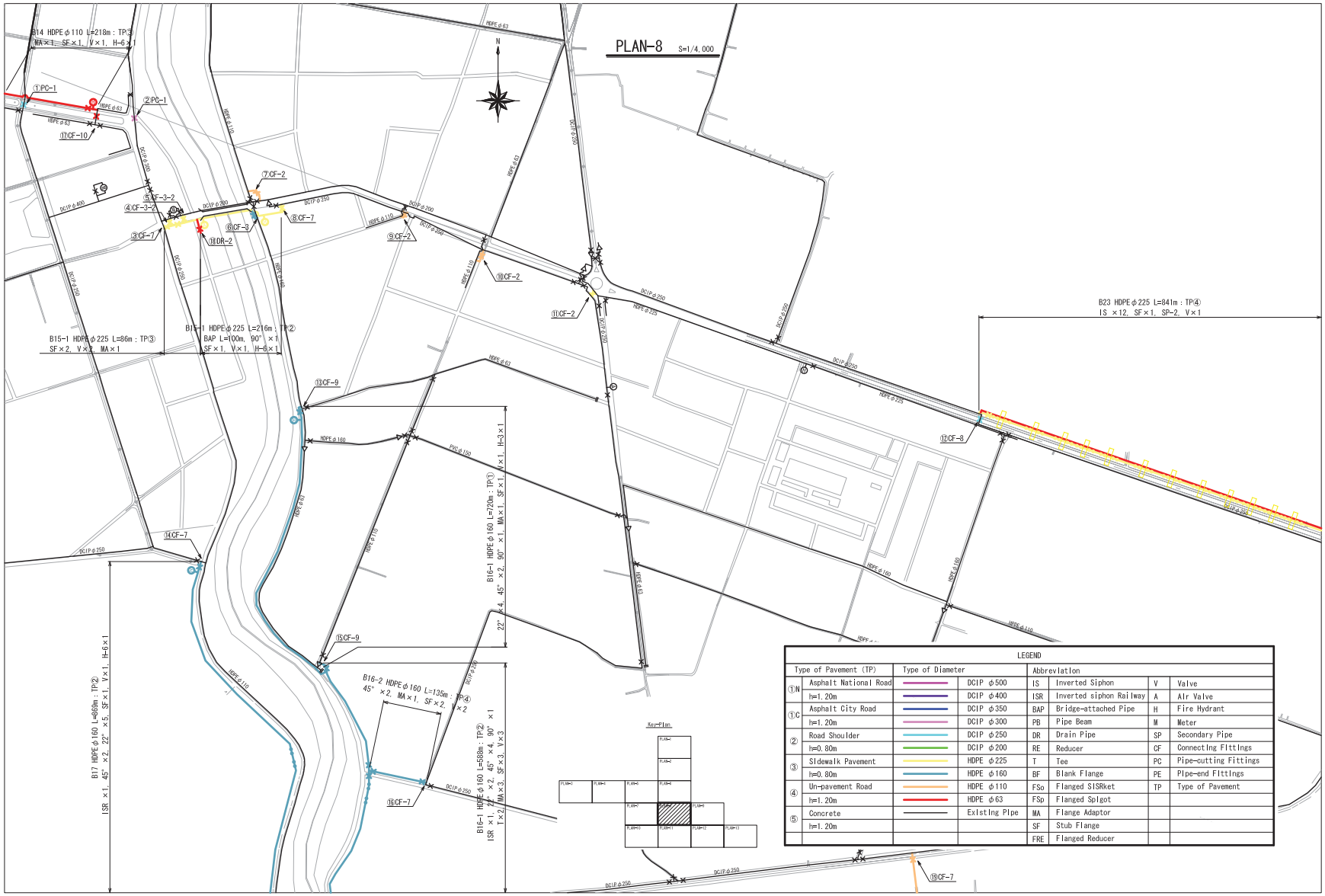
B-D6



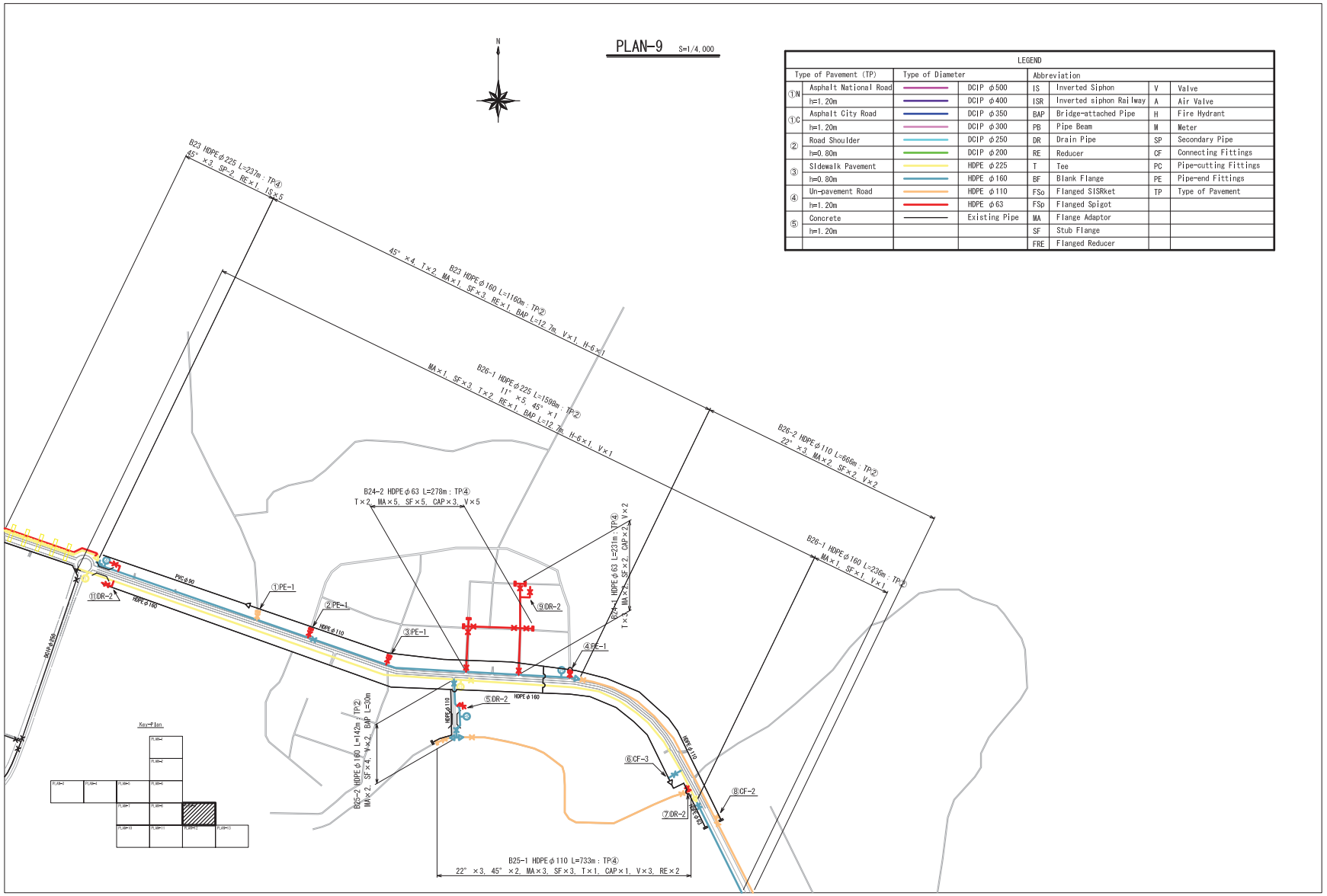
バッタンバン配水管路敷設詳細図（６）
Plan (6) for Distribution Pipeline, Battambang

B-D7

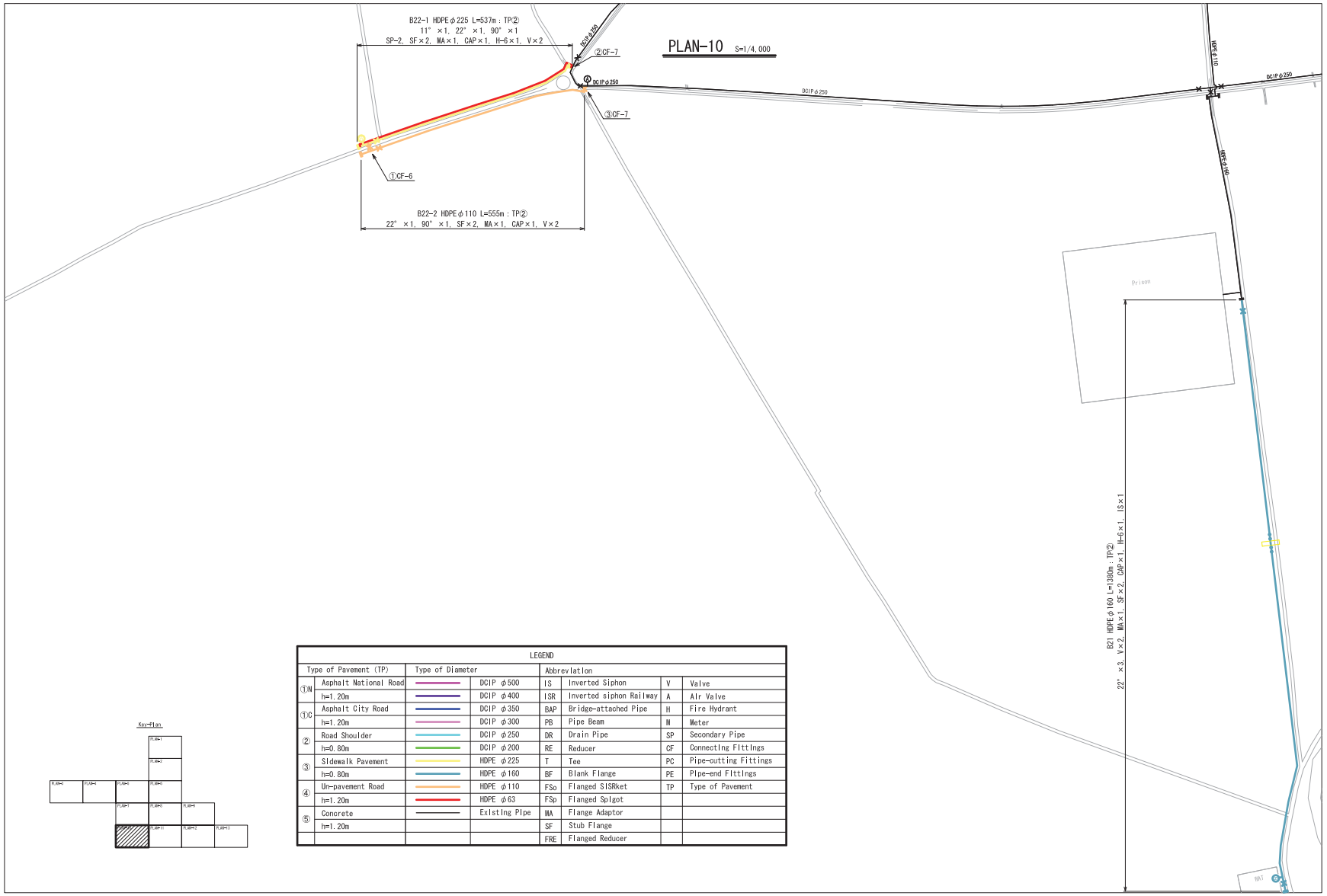
バッタンバン配水管路敷設詳細図（７）
Plan (7) for Distribution Pipeline, Battambang B-D8



バッタンバン配水管路敷設詳細図（８）
Plan (8) for Distribution Pipeline, Battambang

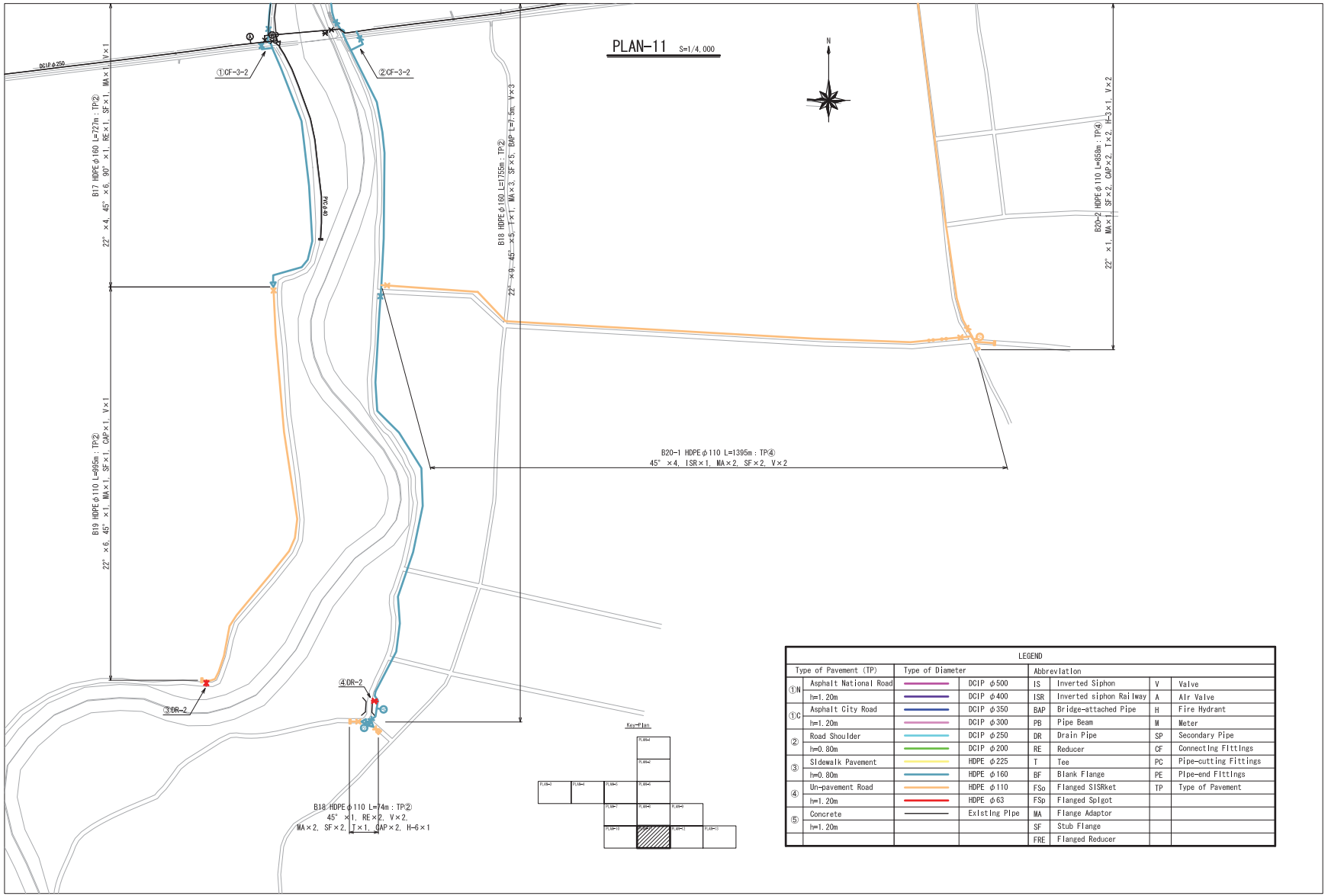


バッタンバン配水管路敷設詳細図（９）
Plan (9) for Distribution Pipeline, Battambang B-D10



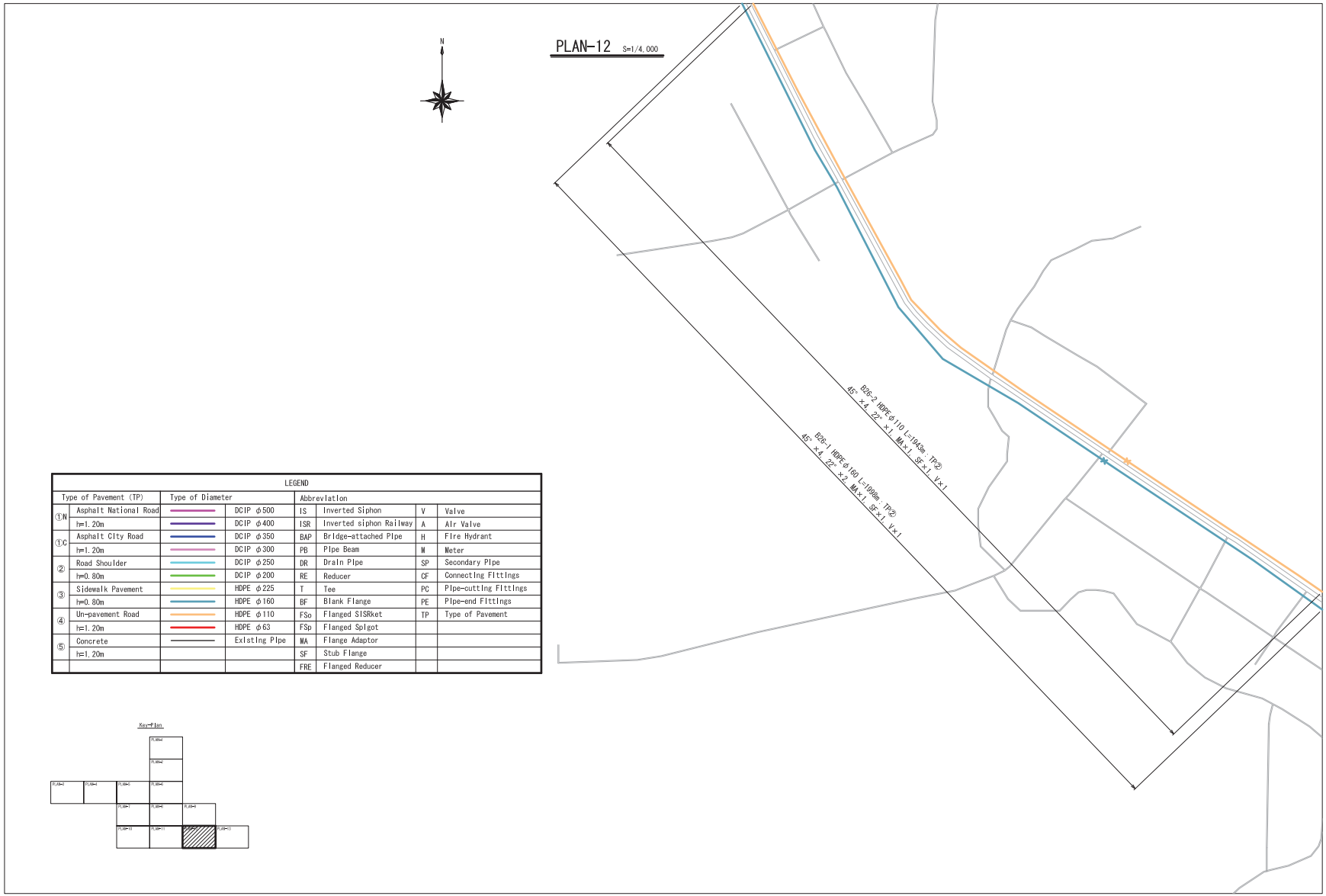
LEGEND								
Type of Pavement (TP)		Type of Diameter		Abbreviation			
①N	Asphalt National Road		DCIP φ500	IS	Inverted Siphon	V	Valve
	h=1.20m		DCIP φ400	ISR	Inverted siphon Railway	A	Air Valve
①C	Asphalt City Road		DCIP φ350	BAP	Bridge-attached Pipe	H	Fire Hydrant
	h=1.20m		DCIP φ300	PB	Pipe Beam	M	Meter
②	Road Shoulder		DCIP φ250	DR	Drain Pipe	SP	Secondary Pipe
	h=0.80m		DCIP φ200	RE	Reducer	CF	Connecting Fittings
③	Sidewalk Pavement		HDPE φ225	T	Tee	PC	Pipe-cutting Fittings
	h=0.80m		HDPE φ160	BF	Blank Flange	PE	Pipe-end Fittings
④	Un-pavement Road		HDPE φ110	FSo	Flanged SISRket	TP	Type of Pavement
	h=1.20m		HDPE φ63	FSp	Flanged Spigot		
⑤	Concrete		Existing Pipe	MA	Flange Adaptor		
	h=1.20m			SF	Stub Flange		
				FRE	Flanged Reducer		

バッタンバン配水管路敷設詳細図（１０）
Plan (10) for Distribution Pipeline, Battambang B-D11



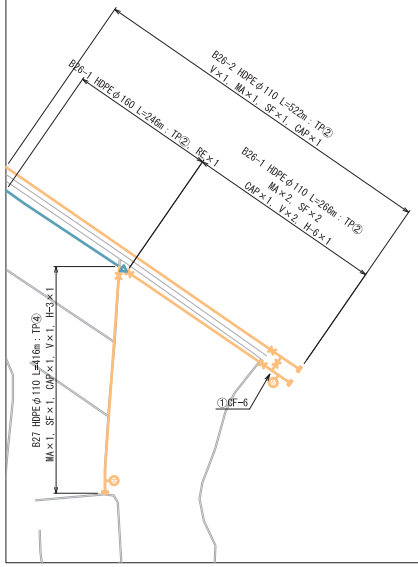
LEGEND							
Type of Pavement (TP)		Type of Diameter		Abbrevlation			
①N	Asphalt National Road h=1.20m	DCIP φ500		IS	Inverted Siphon	V	Valve
		DCIP φ400		ISR	Inverted siphon Railway	A	Air Valve
①C	Asphalt City Road h=1.20m	DCIP φ350		BAP	Bridge-attached Pipe	H	Fire Hydrant
		DCIP φ300		PB	Pipe Beam	M	Meter
②	Road Shoulder h=0.80m	DCIP φ250		DR	Drain Pipe	SP	Secondary Pipe
		DCIP φ200		RE	Reducer	CF	Connecting Fittings
③	Sidewalk Pavement h=0.80m	HDPE φ225		T	Tee	PC	Pipe-cutting Fittings
		HDPE φ160		BF	Blank Flange	PE	Pipe-end Fittings
④	Un-pavement Road h=1.20m	HDPE φ110		FSo	Flanged SISRket	TP	Type of Pavement
		HDPE φ63		FSp	Flanged Spigot		
⑤	Concrete h=1.20m	Existing Pipe		MA	Flange Adaptor		
				SF	Stub Flange		
				FRE	Flanged Reducer		

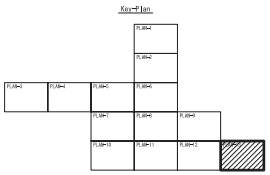
バッタンバン配水管路敷設詳細図（１１）
Plan (11) for Distribution Pipeline, Battambang B-D12



バッタンバン配水管路敷設詳細図（１２）
Plan (12) for Distribution Pipeline, Battambang B-D13

PLAN-13 S=1/4,000





LEGEND							
Type of Pavement (TP)		Type of Diameter		Abbrevlation			
①N	Asphalt National Road	DCIP φ500	IS	Inverted Siphon	V	Valve
	h=1.20m	DCIP φ400	ISR	Inverted siphon Railway	A	Air Valve
①C	Asphalt City Road	DCIP φ350	BAP	Bridge-attached Pipe	H	Fire Hydrant
	h=1.20m	DCIP φ300	PB	Pipe Beam	M	Meter
②	Road Shoulder	DCIP φ250	DR	Drain Pipe	SP	Secondary Pipe
	h=0.80m	DCIP φ200	RE	Reducer	CF	Connecting Fittings
③	Sidewalk Pavement	HDPE φ225	T	Tee	PC	Pipe-cutting Fittings
	h=0.80m	HDPE φ160	BF	Blank Flange	PE	Pipe-end Fittings
④	Un-pavement Road	HDPE φ110	FSo	Flanged SISRket	TP	Type of Pavement
	h=1.20m	HDPE φ63	FSp	Flanged Splgot		
⑤	Concrete	Existing Pipe	MA	Flange Adaptor		
	h=1.20m		SF	Stub Flange		
			FRE	Flanged Reducer		

バッタンバン配水管路敷設詳細図（１３）
Plan (13) for Distribution Pipeline, Battambang

7.2 Results of Questionnaire on Socio & Economic Conditions

Interview surveys were conducted for researching attitude toward water supply in Kampong Cham City and Battambang City during mid July 2012. Interviews were conducted with using questionnaire in both water supply area and non-water supply area. At the first, collection of 50 samples in each area (water supply and non-supply area), total 100 samples was originally planned to be conducted in each city. Reflecting the fact that private water supply organizations are running in part of Kampong Cham city, as a result, 50 samples from public water supply area, 10samples from private water supply area and 44 samples from non-supply were collected in Kampong Cham City. For Battambang City, 50 samples in each area (water supply and non-supply area), total 100 samples were collected for the survey. The survey areas in both cities are shown in the following figures.

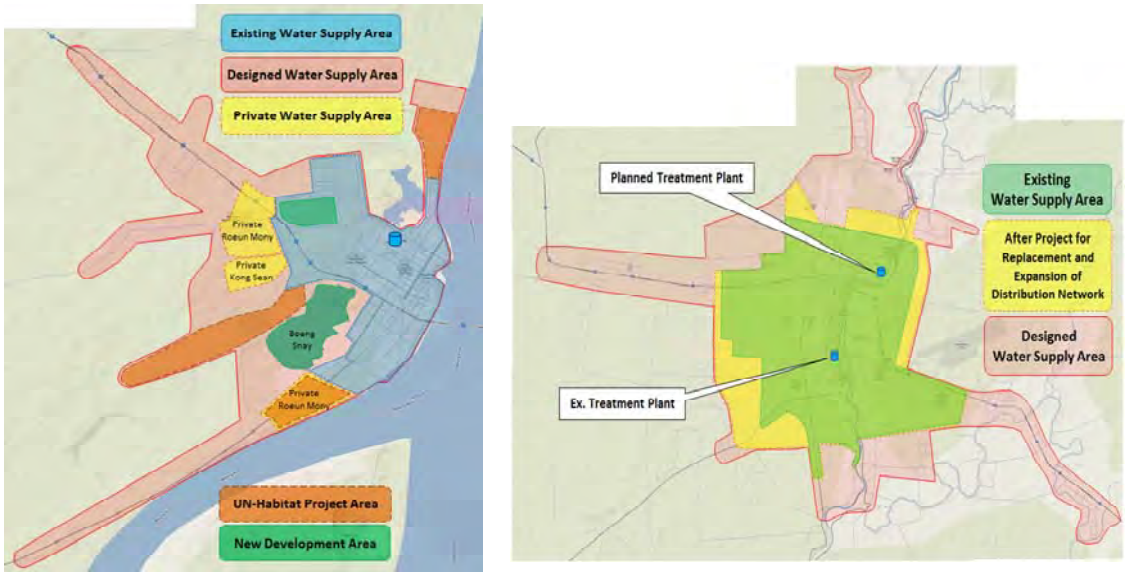


Figure 7.2-1 Surveyed Area （Kampong Cham: left and Battambang: right）

7.2.1 Result of the Survey in Kampong Cham City

(1) Current Condition in Water Supply Area

Current conditions of water consumption in water supply area by Kampong Cham Water Works (KWW) are shown in **Table 7.2-1**. The consumption patterns are categorized into, Low house hold which is consuming less than m^3 per month, Medium house hold which is consuming $10m^3$ or more to less than $25m^3$ per month and High house hold which is consuming $25m^3$ or more per month. The average water consumption in a month is $19.4m^3$. The purpose of water use is shown in **Table 7.2-2**.

Table7.2-1 Condition of Water Use in Kampong Cham City

Water Consumption Category	Num House Hold
Low	11
Medium	28
High	11
Total	50

Table7.2-2 Purpose of Water Use

Purpose of Water Use	Num. Answers (multiple answers allowed)	Percentage in 50 house holds
Bathing	49	98.0%
Cooking	49	98.0%
Drinking	49	98.0%
Other	6	12.0%

(2) Water Utilization Condition in Non-water Supply Area

Water utilization condition in non-water supply area is shown in the following table.

Table7.2-3 Water Source in Non-water Supply Area

Source of Water	Num. Answers (multiple answers allowed)	Percentage in 54 house holds
Supply from Private Water Supplier	10	18.5%
Buying from shops	16	29.6%
Well	28	51.9%

(3) Willing to Connect and Willing to Pay.

As conduct the interview toward the 44 households in the non-water supplied area, 34 households (77.3%) answered that they are willing to connect the water supply service, 8 households (18.2%) answered that they do not want to connect and the rest 4 households (4.5%) answered that they do not know as shown in the following table.

Table7.2-4 Willing to Pay

Unit Price(per $1m^3$)	Num. Answers	Percentage in 54 house holds
1$~2$	17	38.6%
2$~5$	10	22.7%
5$~7$	6	13.6%
Up to the actual price setting	11	25.0%

7.2.2 Result of the Survey in Battambang City

(1) Current Condition in Water Supply Area

Current conditions of water consumption in water supply area by Battambang Water Works (BWW) are shown in **Table 7.2-5**. The consumption patterns are categorized into, Low house

hold which is consuming less than m^3 per month, Medium house hold which is consuming $10m^3$ or more to less than $25m^3$ per month and High house hold which is consuming $25m^3$ or more per month. The average water consumption in a month is $16m^3$. The purpose of water use is shown in **Table 7.2-6**.

Table7.2-5 ondition of Water Use in Battambang City

Water Comsumption Category	Num House Hold
Low	18
Medium	27
High	5
Total	50

Table7.2-6 Purpose of Water Use

Purpose of Water Use	Num. Answeres (multiple answers allowed)	Precentage in 50 house holds
Bathing	50	100.0%
Cooking	49	98.0%
Drinking	37	74.0%
Other	3	6.0%

(2) Water Utilization Condition in Non-water Supply Area

Water utilization condition in non-water supply area is shown in the following table.

Table7.2-7 Water Source in Non-water Supply Area

Source of Water	Num. Answers (multiple answers allowed)	Percentage in 50 house holds
Supply from channel	25	50.0%
Buying from shops	20	40.0%
Well	5	10.0%

(3) Willing to Connect and Willing to Pay.

As conduct the interview toward the 50 households in the non-water supplied area, 42 households 84.0%) answered that they are willing to connect the water supply service, 5 households (10.0%) answered that they do not want to connect and the rest 3 households (0.6%) answered that they do not know as shown in the following table.

Table7.2-8 Willing to Pay

Unit Price(per $1m^3$)	Num. Answers	Percentage in 50 house holds
1$~2$	10	20.0%
2$~5$	17	34.0%
5$~7$	6	12.0%
Up to the actual price setting	17	34.0%

7.3 Hydraulic Analysis of Water Distribution System

(1) Kampong Cham

(1).1 Outline of Hydraulic Calculation

The Network calculation was calculated by EPANET ver2.0 with the following conditions.

- Hazen-Williams formula
- Coefficient of flow velocity C = 110
- Minimum dynamic pressure : 50kPa (refer to **Table 2.2.2.6-1**)
- Hourly Factor : 1.72 (refer to **Table 2.2.2.6-2**)

Things that were kept in mind regarding the distribution network calculation are as follows.

- To ensure that the diameter of transmission and distribution pipes will maintain an effective pressure.
- That the effective capacity of the service reservoir satisfies the hourly maximum demand.

The network map for Kampong Cham (KMC) is shown in **Figure 7.3-1**, and the distribution network calculation data and the results are as follows.

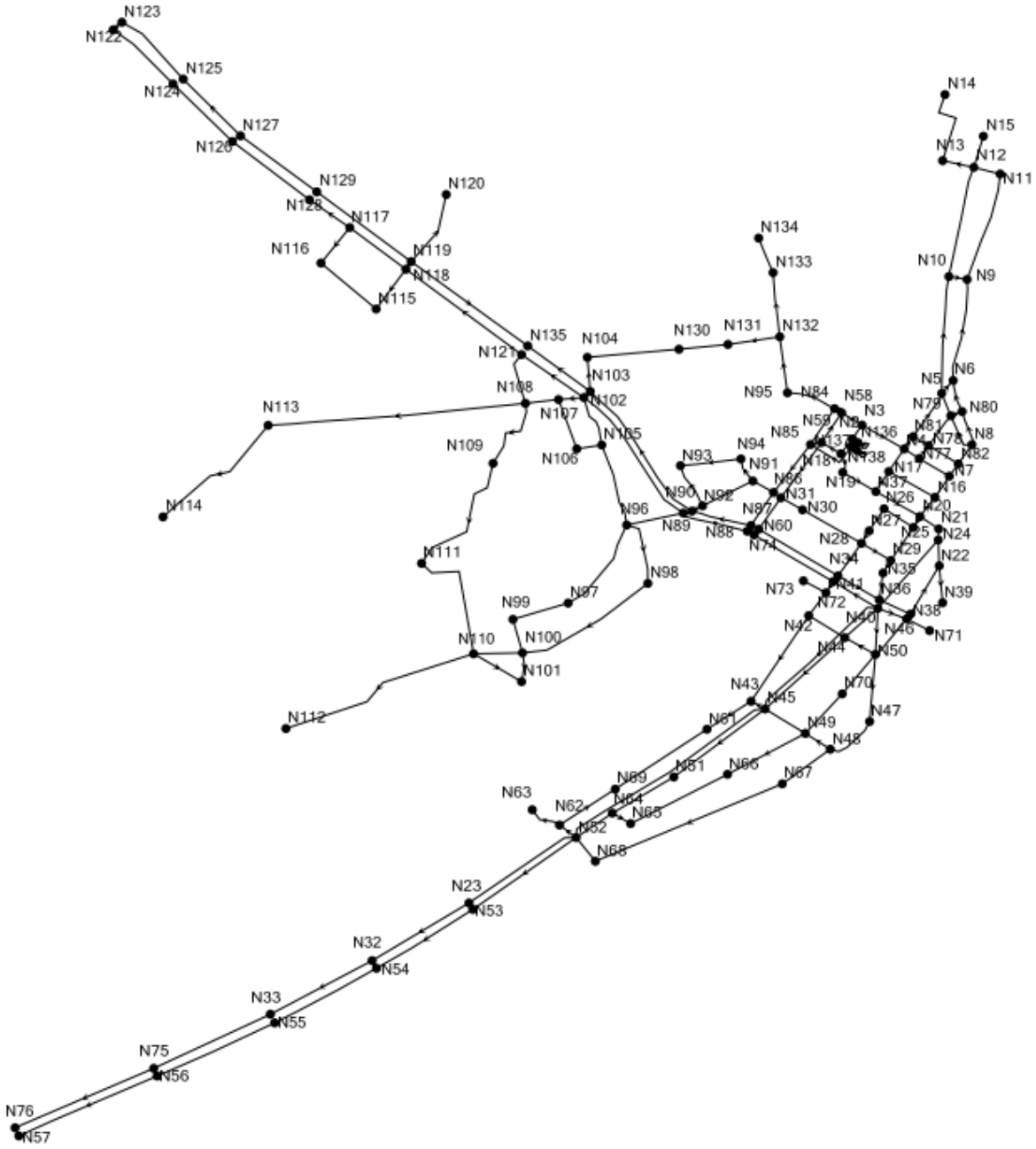


Figure 7.3-1 Network map in KMC

(1). 2 Node Data

Node ID	Elevation	Base Demand	Residual Pressure (m)	
	(m)	(m^3/d)	Peak Demand	Average Demand
Junc N2	20.63	73.4	22.76	23.03
Junc N3	16.81	221.2	25.12	26.31
Junc N4	14.91	221.2	24.44	27.27
Junc N5	16.45	86.4	19.08	24.33
Junc N6	16.73	86.4	18.49	23.93
Junc N7	15.04	221.2	22.09	26.33
Junc N8	16.75	89.0	19.33	24.23
Junc N9	16.39	43.2	15.85	23.18
Junc N10	15.65	43.2	19.00	24.80
Junc N11	16.67	86.4	12.06	21.62
Junc N12	16.95	86.4	10.08	20.98
Junc N13	16.59	69.1	9.60	20.77
Junc N14	20.00	43.2	5.99	17.28
Junc N15	17.29	60.5	10.31	20.59
Junc N16	16.14	86.4	22.22	25.68
Junc N17	17.60	86.4	22.09	24.70
Junc N18	21.42	73.4	21.03	21.89
Junc N19	21.68	73.4	20.13	21.40
Junc N20	16.67	86.4	22.57	25.47
Junc N21	16.13	97.6	21.71	25.49
Junc N22	15.61	97.6	21.50	25.75
Junc N24	15.93	129.6	21.19	25.43
Junc N25	16.32	86.4	22.84	25.79
Junc N26	17.24	86.4	21.86	24.85
Junc N27	16.16	86.4	22.91	25.91
Junc N28	14.40	184.9	24.66	27.67
Junc N29	16.20	184.9	22.39	25.70
Junc N30	18.53	184.9	21.14	23.76
Junc N31	19.73	184.9	21.42	23.11
Junc N34	16.32	113.2	22.73	25.75
Junc N35	16.22	113.2	22.22	25.63
Junc N36	15.78	113.2	22.55	26.02
Junc N37	18.86	86.4	21.73	23.77
Junc N38	16.00	113.2	21.11	25.36
Junc N39	15.19	184.9	20.81	25.76
Junc N40	15.78	121.0	16.71	23.88
Junc N41	16.32	121.0	15.29	23.02
Junc N42	14.18	116.6	17.06	25.03
Junc N43	14.76	302.4	11.91	22.77
Junc N44	15.99	117.5	15.17	23.19
Junc N45	16.21	337.8	12.15	21.94
Junc N46	16.00	121.0	15.52	23.31
Junc N47	16.07	116.6	14.07	22.73
Junc N48	16.22	264.4	11.94	21.86
Junc N49	16.16	337.8	10.43	21.34
Junc N50	16.17	117.5	15.02	23.02

Node ID	Elevation	Base Demand	Residual Pressure (m)	
	(m)	(m^3/d)	Peak Demand	Average Demand
Junc N51	21.00	147.7	5.54	16.49
Junc N52	15.66	216.0	10.13	21.55
Junc N53	16.06	129.6	8.16	20.58
Junc N54	16.00	129.6	7.16	20.25
Junc N55	15.39	51.8	6.96	20.56
Junc N56	15.15	51.8	6.71	20.62
Junc N57	14.94	51.8	6.76	20.77
Junc N58	17.01	221.2	24.86	26.09
Junc N59	22.07	73.4	19.98	21.10
Junc N60	16.51	113.2	24.56	26.30
Junc N61	19.00	74.3	6.67	18.17
Junc N62	15.74	43.2	9.90	21.42
Junc N63	18.00	43.2	5.14	18.24
Junc N64	15.42	147.7	10.37	21.79
Junc N65	19.00	147.7	6.43	18.08
Junc N66	20.00	147.7	5.56	17.13
Junc N67	18.00	147.7	8.87	19.61
Junc N68	16.36	147.7	8.96	20.68
Junc N69	19.00	43.2	6.59	18.14
Junc N70	20.39	116.6	7.18	17.47
Junc N71	15.70	117.5	15.52	23.50
Junc N72	13.80	116.6	17.59	25.46
Junc N73	13.46	116.6	17.62	25.69
Junc N66	20.00	147.7	5.56	17.13
Junc N67	18.00	147.7	8.87	19.61
Junc N68	16.36	147.7	8.96	20.68
Junc N69	19.00	43.2	6.59	18.14
Junc N70	20.39	116.6	7.18	17.47
Junc N71	15.70	117.5	15.52	23.50
Junc N72	13.80	116.6	17.59	25.46
Junc N73	13.46	116.6	17.62	25.69
Junc N74	16.51	121.0	15.06	22.82
Junc N23	16.06	129.6	7.10	20.19
Junc N32	16.00	129.6	7.11	20.23
Junc N33	15.39	51.8	6.67	20.46
Junc N75	15.15	51.8	6.71	20.62
Junc N76	14.94	51.8	6.76	20.77
Junc N77	18.00	221.2	19.20	23.39
Junc N78	19.00	89.0	17.84	22.26
Junc N79	21.00	89.0	14.73	19.85
Junc N80	17.00	89.0	18.59	23.80
Junc N81	16.24	89.0	20.94	25.14
Junc N82	20.00	89.0	16.73	21.22
Junc N84	17.01	210.8	42.27	45.90
Junc N85	22.07	0.0	41.70	42.48
Junc N86	19.73	176.3	42.88	44.39
Junc N87	16.51	94.2	45.53	47.40
Junc N88	16.51	94.2	45.47	47.39
Junc N89	16.48	94.2	43.93	46.84
Junc N90	16.48	94.2	43.76	46.78

Node ID	Elevation	Base Demand	Residual Pressure (m)	
	(m)	(m^3/d)	Peak Demand	Average Demand
Junc N91	20.67	176.3	39.01	42.38
Junc N92	16.93	93.3	42.87	46.17
Junc N93	18.40	93.3	36.34	42.84
Junc N94	21.54	176.3	37.18	41.16
Junc N95	20.82	210.0	33.45	40.25
Junc N96	18.60	137.4	34.01	41.86
Junc N97	20.00	68.3	22.72	36.84
Junc N98	15.49	68.3	33.04	43.48
Junc N99	19.37	68.3	23.35	37.47
Junc N100	17.90	68.3	25.02	39.01
Junc N101	15.32	68.3	25.52	40.83
Junc N102	27.75	164.2	30.12	34.64
Junc N103	27.75	291.2	28.66	34.10
Junc N104	25.44	127.0	26.61	34.82
Junc N105	19.31	69.1	34.05	41.43
Junc N106	21.68	69.1	30.96	38.79
Junc N107	27.34	69.1	27.98	34.12
Junc N108	27.34	69.1	26.40	33.54
Junc N109	24.98	69.1	24.01	34.15
Junc N110	17.93	68.3	23.67	38.50
Junc N111	23.21	68.3	20.32	33.93
Junc N112	15.31	68.3	0.04	31.51
Junc N113	26.77	69.1	22.70	32.54
Junc N114	24.11	69.1	24.52	34.89
Junc N115	30.23	69.1	24.52	31.02
Junc N116	30.41	69.1	21.70	29.87
Junc N117	31.62	164.2	22.73	29.48
Junc N118	29.35	164.2	25.91	32.08
Junc N119	29.35	164.2	25.64	31.98
Junc N120	31.69	69.1	22.92	29.50
Junc N122	47.16	155.5	5.21	13.21
Junc N123	47.16	155.5	5.14	13.19
Junc N124	44.36	127.9	8.34	16.13
Junc N125	44.36	155.5	7.72	15.91
Junc N126	32.36	155.5	20.92	28.35
Junc N127	32.36	155.5	20.79	28.30
Junc N128	31.76	155.5	22.31	29.24
Junc N129	31.76	155.5	21.36	28.89
Junc N130	25.32	304.1	21.45	33.00
Junc N131	25.32	304.1	21.50	33.02
Junc N132	19.82	259.2	31.16	40.05
Junc N133	24.00	86.4	25.54	35.34
Junc N134	25.00	86.4	18.71	32.20
Junc N121	28.37	164.2	27.91	33.44
Junc N135	28.37	164.2	26.48	32.91
Junc N136	19.20	0.0	24.19	24.46
Junc N137	19.20	0.0	45.69	45.76
Junc N138	19.20	0.0	45.69	45.76
Resvr N1	43.81		0.00	0.00
Resvr N83	65.00		0.00	0.00
Total		16303.7		

(1). 3 Pipeline data

Link ID	Start Node	End Node	Length	Dia.	Peak Demand		Average Demand	
					Flow	Velocity	Flow	Velocity
	ID	ID	(m)	(mm)	(m^3/d)	(m/s)	(m^3/d)	(m/s)
Pipe 2	N 2	N 3	91.0	150	1,935.4	1.27	1,125.8	0.74
Pipe 3	N 3	N 4	336.2	150	1,297.7	0.85	754.3	0.49
Pipe 5	N 5	N 6	122.8	100	245.4	0.36	142.6	0.21
Pipe 6	N 6	N 9	761.9	100	311.0	0.46	180.6	0.27
Pipe 7	N 5	N 10	886.4	150	432.0	0.28	251.4	0.16
Pipe 8	N 9	N 11	698.8	100	356.0	0.52	206.5	0.30
Pipe 9	N 11	N 12	131.6	75	207.4	0.54	120.1	0.32
Pipe 10	N 12	N 15	276.6	100	103.7	0.15	60.5	0.09
Pipe 11	N 10	N 12	708.1	75	238.5	0.63	139.1	0.36
Pipe 12	N 12	N 13	237.3	75	193.5	0.51	112.3	0.29
Pipe 13	N 13	N 14	700.0	100	74.3	0.11	43.2	0.06
Pipe 16	N 7	N 16	184.7	150	-1,203.6	0.79	-699.8	0.46
Pipe 17	N 16	N 20	170.9	150	-1,048.9	0.69	-610.0	0.40
Pipe 18	N 20	N 25	89.8	250	1,573.3	0.37	915.0	0.22
Pipe 19	N 16	N 17	355.0	100	-304.1	0.45	-176.3	0.26
Pipe 20	N 25	N 29	288.5	150	626.4	0.41	364.6	0.24
Pipe 21	N 29	N 35	102.4	150	523.6	0.34	304.1	0.20
Pipe 22	N 35	N 36	191.3	150	328.3	0.22	190.9	0.13
Pipe 23	N 25	N 26	237.2	250	798.3	0.19	464.0	0.11
Pipe 24	N 26	N 27	188.5	250	649.7	0.15	377.6	0.09
Pipe 25	N 27	N 28	99.6	250	501.1	0.12	291.2	0.07
Pipe 26	N 28	N 34	280.7	200	143.4	0.05	83.8	0.03
Pipe 27	N 29	N 28	237.4	100	-215.1	0.32	-124.4	0.18
Pipe 28	N 28	N 30	454.5	100	-175.4	0.26	-102.0	0.15
Pipe 29	N 30	N 31	161.3	100	-493.3	0.73	-286.8	0.42
Pipe 30	N 2	N 18	162.1	400	14,716.5	1.36	8,556.2	0.79
Pipe 32	N 18	N 19	137.8	400	13,055.0	1.20	7,590.2	0.70
Pipe 33	N 19	N 37	268.0	400	12,928.9	1.19	7,516.8	0.69
Pipe 34	N 37	N 20	355.0	400	11,729.7	1.08	6,819.6	0.63
Pipe 35	N 20	N 21	150.0	300	8,958.8	1.47	5,209.1	0.85
Pipe 36	N 21	N 24	80.0	300	8,791.2	1.44	5,111.4	0.84
Pipe 37	N 24	N 22	191.3	250	316.2	0.07	184.0	0.04
Pipe 42	N 34	N 36	319.4	100	230.7	0.34	133.9	0.20
Pipe 43	N 22	N 38	410.0	250	-170.2	0.04	-98.5	0.02
Pipe 44	N 38	N 36	231.3	100	-364.6	0.54	-211.7	0.31
Pipe 45	N 22	N 39	271.3	100	318.0	0.47	184.9	0.27
Pipe 46	N 24	N 40	575.6	300	8,252.1	1.35	4,797.8	0.79
Pipe 47	N 41	N 40	319.4	200	-1,594.1	0.59	-927.1	0.34
Pipe 48	N 40	N 46	231.3	200	1,996.7	0.74	1,160.4	0.43
Pipe 49	N 40	N 50	414.5	150	800.1	0.52	465.7	0.30
Pipe 50	N 50	N 47	486.5	200	1,398.8	0.52	813.0	0.30
Pipe 51	N 47	N 48	300.0	150	1,198.4	0.78	696.4	0.46
Pipe 52	N 48	N 49	191.6	100	463.1	0.68	269.6	0.40
Pipe 53	N 49	N 45	327.9	50	-59.6	0.35	-34.6	0.20
Pipe 54	N 46	N 50	355.9	250	1,586.3	0.37	921.9	0.22
Pipe 55	N 40	N 44	359.7	100	300.7	0.44	174.5	0.26
Pipe 56	N 44	N 45	760.4	150	875.2	0.57	508.9	0.33
Pipe 59	N 42	N 44	218.6	200	511.5	0.19	297.2	0.11
Pipe 60	N 44	N 50	275.0	200	-265.2	0.10	-153.8	0.06
Pipe 61	N 45	N 51	645.0	150	756.0	0.50	439.8	0.29
Pipe 63	N 52	N 53	998.7	200	1,175.9	0.43	683.4	0.25

Link ID	Start Node	End Node	Length	Dia.	Peak Demand		Average Demand	
					Flow	Velocity	Flow	Velocity
	ID	ID	(m)	(mm)	(m^3/d)	(m/s)	(m^3/d)	(m/s)
Pipe 64	N 53	N 54	998.6	200	953.0	0.35	553.8	0.20
Pipe 65	N 54	N 55	1009.3	150	382.8	0.25	222.9	0.15
Pipe 66	N 55	N 56	995.1	150	293.8	0.19	171.1	0.11
Pipe 67	N 56	N 57	1421.0	150	133.1	0.09	76.9	0.05
Pipe 68	N 3	N 58	146.8	150	257.5	0.17	149.5	0.10
Pipe 70	N 18	N 59	156.4	200	1,536.2	0.57	893.4	0.33
Pipe 71	N 59	N 31	480.9	200	1,288.2	0.47	749.1	0.28
Pipe 72	N 31	N 60	283.1	200	476.9	0.18	277.3	0.10
Pipe 73	N 60	N 34	619.7	100	281.7	0.42	164.2	0.24
Pipe 74	N 45	N 43	110.0	100	651.5	0.96	378.4	0.56
Pipe 75	N 43	N 61	600.0	100	196.1	0.29	114.0	0.17
Pipe 76	N 52	N 62	135.4	100	154.7	0.23	89.9	0.13
Pipe 77	N 62	N 63	310.0	50	74.3	0.44	43.2	0.25
Pipe 78	N 51	N 64	575.0	150	502.0	0.33	292.0	0.19
Pipe 79	N 64	N 52	329.2	150	1.7	0.00	0.9	0.00
Pipe 80	N 64	N 65	140.0	100	246.2	0.36	142.6	0.21
Pipe 81	N 65	N 66	940.0	50	-8.6	0.05	-5.2	0.03
Pipe 82	N 66	N 49	360.0	100	-262.7	0.39	-152.9	0.22
Pipe 83	N 48	N 67	400.0	100	279.9	0.41	162.4	0.24
Pipe 84	N 67	N 68	1373.2	50	25.9	0.15	14.7	0.09
Pipe 87	N 45	N 52	1549.3	250	2,179.9	0.51	1,267.5	0.30
Pipe 88	N 62	N 69	600.0	50	6.0	0.04	3.5	0.02
Pipe 89	N 10	N 9	125.0	50	119.2	0.70	69.1	0.41
Pipe 90	N 50	N 70	355.6	100	521.0	0.77	302.4	0.45
Pipe 91	N 70	N 49	238.5	100	320.5	0.47	185.8	0.27
Pipe 92	N 46	N 71	172.8	100	202.2	0.30	117.5	0.17
Pipe 93	N 41	N 72	140.0	200	1,177.6	0.43	685.2	0.25
Pipe 94	N 72	N 42	203.7	200	776.7	0.29	451.9	0.17
Pipe 95	N 72	N 73	175.9	100	200.4	0.30	116.6	0.17
Pipe 96	N 42	N 43	729.9	50	64.8	0.38	38.0	0.22
Pipe 98	N 59	N 58	253.5	100	122.7	0.18	71.7	0.11
Pipe 99	N 40	N 45	1120.1	250	3,352.3	0.79	1,949.2	0.46
Pipe 100	N 41	N 74	619.7	200	208.2	0.08	121.0	0.04
Pipe 101	N 52	N 68	210.0	100	228.1	0.34	133.1	0.20
Pipe 103	N 61	N 69	345.8	100	68.3	0.10	39.7	0.06
Pipe 31	N 52	N 23	998.7	100	251.4	0.37	146.0	0.22
Pipe 38	N 23	N 32	998.6	100	28.5	0.04	16.4	0.02
Pipe 39	N 32	N 33	1009.3	100	152.1	0.22	88.1	0.13
Pipe 40	N 33	N 75	995.1	100	63.1	0.09	36.3	0.05
Pipe 41	N 75	N 76	1421.0	100	45.8	0.07	26.8	0.04
Pipe 58	N 32	N 54	10.0	100	-346.5	0.51	-201.3	0.30
Pipe 69	N 75	N 56	10.0	100	-71.7	0.11	-41.5	0.06
Pipe 85	N 76	N 57	10.0	100	-44.1	0.06	-25.1	0.04
Pipe 86	N 77	N 78	104.0	100	292.0	0.43	170.2	0.25
Pipe 104	N 78	N 79	267.0	100	320.5	0.47	186.6	0.27
Pipe 105	N 79	N 80	112.8	100	165.0	0.24	95.9	0.14
Pipe 106	N 4	N 77	108.3	100	748.2	1.10	434.6	0.64
Pipe 107	N 77	N 7	237.2	100	75.2	0.11	44.1	0.06
Pipe 108	N 4	N 81	104.0	100	767.2	1.13	446.7	0.66
Pipe 109	N 81	N 5	367.0	100	336.1	0.49	195.3	0.29
Pipe 110	N 81	N 78	108.3	100	279.1	0.41	162.4	0.24

Link ID	Start Node	End Node	Length	Dia.	Peak Demand		Average Demand	
					Flow	Velocity	Flow	Velocity
	ID	ID	(m)	(mm)	(m^3/d)	(m/s)	(m^3/d)	(m/s)
Pipe 111	N 78	N 82	237.4	100	97.6	0.14	56.2	0.08
Pipe 112	N 7	N 82	104.0	150	898.6	0.59	522.7	0.34
Pipe 113	N 82	N 8	188.6	150	843.3	0.55	489.9	0.32
Pipe 114	N 8	N 80	275.5	100	202.2	0.30	117.5	0.17
Pipe 115	N 80	N 6	190.5	100	214.3	0.32	124.4	0.18
Pipe 116	N 5	N 79	160.0	150	-489.9	0.32	-285.1	0.19
Pipe 117	N 79	N 8	280.0	150	-487.3	0.32	-283.4	0.19
Pipe 122	N 37	N 17	174.0	150	1,050.6	0.69	610.8	0.40
Pipe 123	N 17	N 4	185.3	150	598.8	0.39	348.2	0.23
Pipe 14	N 85	N 84	253.5	150	2,041.6	1.34	1,187.1	0.78
Pipe 15	N 85	N 86	480.1	400	9,219.7	0.85	5,360.3	0.49
Pipe 57	N 86	N 87	283.1	400	8,322.9	0.77	4,838.4	0.45
Pipe 62	N 87	N 88	15.0	350	7,853.8	0.94	4,566.2	0.55
Pipe 97	N 88	N 89	471.3	350	7,692.2	0.93	4,472.1	0.54
Pipe 102	N 87	N 90	471.3	100	306.7	0.45	178.0	0.26
Pipe 118	N 90	N 92	97.3	100	333.5	0.49	193.5	0.29
Pipe 119	N 92	N 91	382.9	100	82.9	0.12	48.4	0.07
Pipe 120	N 86	N 91	226.1	100	593.6	0.87	345.6	0.51
Pipe 121	N 91	N 94	174.2	100	373.2	0.55	216.9	0.32
Pipe 124	N 94	N 93	546.6	50	70.0	0.41	40.6	0.24
Pipe 125	N 92	N 93	437.7	50	89.9	0.53	52.7	0.31
Pipe 126	N 90	N 89	20.0	100	-480.4	0.71	-279.1	0.41
Pipe 127	N 89	N 96	381.3	100	759.5	1.12	441.5	0.65
Pipe 128	N 96	N 98	443.9	100	493.3	0.73	286.8	0.42
Pipe 129	N 89	N 102	1106.4	350	6,289.9	0.76	3,657.3	0.44
Pipe 130	N 90	N 103	1106.4	100	291.2	0.43	169.3	0.25
Pipe 131	N 102	N 105	414.3	75	254.0	0.66	147.7	0.39
Pipe 132	N 105	N 96	575.5	75	81.2	0.21	46.7	0.12
Pipe 133	N 102	N 107	175.1	100	632.4	0.93	368.1	0.54
Pipe 134	N 107	N 106	425.7	50	64.8	0.38	38.0	0.22
Pipe 135	N 106	N 105	161.9	50	-53.6	0.32	-31.1	0.18
Pipe 136	N 107	N 108	205.0	100	448.4	0.66	260.9	0.38
Pipe 137	N 103	N 104	255.0	100	689.5	1.02	400.9	0.59
Pipe 138	N 104	N 130	625.0	100	470.9	0.69	273.9	0.40
Pipe 139	N 130	N 131	330.0	100	-51.8	0.08	-30.2	0.04
Pipe 140	N 131	N 132	340.7	100	-575.4	0.85	-334.4	0.49
Pipe 141	N 132	N 95	416.4	150	-1,318.5	0.86	-766.4	0.50
Pipe 142	N 95	N 84	406.6	150	-1,679.6	1.10	-976.3	0.64
Pipe 143	N 132	N 133	400.0	100	297.2	0.44	172.8	0.25
Pipe 144	N 133	N 134	200.0	50	148.6	0.88	86.4	0.51
Pipe 145	N 108	N 109	604.1	100	453.6	0.67	263.5	0.39
Pipe 147	N 99	N 97	500.0	100	6.0	0.01	3.5	0.01
Pipe 148	N 97	N 96	581.3	50	-111.5	0.65	-64.8	0.38
Pipe 149	N 99	N 100	282.1	100	-123.6	0.18	-71.7	0.11
Pipe 150	N 100	N 101	220.1	50	81.2	0.48	46.7	0.28
Pipe 151	N 101	N 110	353.5	50	-36.3	0.22	-21.6	0.13
Pipe 152	N 100	N 110	295.1	50	53.6	0.32	31.1	0.18
Pipe 153	N 110	N 112	1392.7	50	117.5	0.69	68.3	0.40
Pipe 154	N 108	N 113	1797.1	100	237.6	0.35	138.2	0.20

Link ID	Start Node	End Node	Length	Dia.	Peak Demand		Average Demand	
					Flow	Velocity	Flow	Velocity
	ID	ID	(m)	(mm)	(m^3/d)	(m/s)	(m^3/d)	(m/s)
Pipe 155	N 113	N 114	1272.8	100	119.2	0.18	69.1	0.10
Pipe 158	N 118	N 115	372.2	100	176.3	0.26	102.8	0.15
Pipe 159	N 115	N 116	527.2	50	57.0	0.34	33.7	0.20
Pipe 160	N 116	N 117	393.0	50	-61.3	0.36	-35.4	0.21
Pipe 161	N 118	N 117	538.6	250	2,195.4	0.52	1,276.1	0.30
Pipe 163	N 119	N 120	579.8	100	119.2	0.18	69.1	0.10
Pipe 164	N 117	N 128	230.4	250	1,851.6	0.44	1,076.5	0.25
Pipe 165	N 128	N 126	854.0	250	1,583.7	0.37	921.0	0.22
Pipe 166	N 126	N 124	700.0	200	834.6	0.31	485.6	0.18
Pipe 167	N 124	N 122	700.0	200	615.2	0.23	357.7	0.13
Pipe 169	N 129	N 127	854.0	100	-26.8	0.04	-15.6	0.02
Pipe 170	N 127	N 125	700.0	100	187.5	0.28	108.9	0.16
Pipe 171	N 125	N 123	700.0	100	-79.5	0.12	-46.7	0.07
Pipe 172	N 123	N 122	15.0	100	-347.3	0.51	-202.2	0.30
Pipe 173	N 127	N 126	15.0	100	-482.1	0.71	-279.9	0.41
Pipe 174	N 119	N 118	15.0	100	-705.0	1.04	-409.5	0.60
Pipe 175	N 103	N 102	35.0	100	-1,118.9	1.65	-650.6	0.96
Pipe 176	N 98	N 100	1009.0	100	375.8	0.55	218.6	0.32
Pipe 162	N 129	N 119	769.1	100	-241.1	0.35	-140.0	0.21
Pipe 156	N 102	N 121	755.4	300	4,002.9	0.66	2,327.6	0.38
Pipe 157	N 121	N 118	673.2	300	3,359.2	0.55	1,952.6	0.32
Pipe 168	N 103	N 135	755.4	100	219.5	0.32	127.9	0.19
Pipe 177	N 135	N 119	673.2	100	-63.1	0.09	-36.3	0.05
Pipe 178	N 121	N 108	490.0	100	362.0	0.53	210.8	0.31
Pipe 146	N 109	N 111	1215.6	100	335.2	0.49	194.4	0.29
Pipe 179	N 111	N 110	957.5	100	217.7	0.32	126.1	0.19
Pipe 1	N 1	N 136	30.0	350	16,778.0	2.02	9,754.6	1.17
Pipe 4	N 137	N 85	318.4	400	11,261.4	1.04	6,547.4	0.60
Pipe 185	N 83	N 138	30.0	400	11,261.4	1.04	6,547.4	0.60

(1). 4 Service reservoir data

Day	Time	Water Level at Reservoir (m)
1st day	0:00	1.5
	1:00	1.7
	2:00	2.3
	3:00	2.8
	4:00	3.5
	5:00	3.8
	6:00	3.2
	7:00	2.6
	8:00	2.3
	9:00	2.2
	10:00	2.0
	11:00	1.9
	12:00	1.8
	13:00	1.7
	14:00	1.8
	15:00	1.8
	16:00	1.7
	17:00	1.4
	18:00	1.0
	19:00	0.6
	20:00	0.5
	21:00	0.5
	22:00	0.9
	23:00	1.4
2nd day	0:00	1.6
	1:00	1.8
	2:00	2.4
	3:00	2.9
	4:00	3.6
	5:00	3.8
	6:00	3.3
	7:00	2.7
	8:00	2.5
	9:00	2.3
	10:00	2.2
	11:00	2.0
	12:00	1.9
	13:00	1.9
	14:00	1.9
	15:00	2.0
	16:00	1.8
	17:00	1.6
	18:00	1.2
	19:00	0.9
	20:00	0.7
	21:00	0.8
	22:00	1.1
	23:00	1.7

(2) Battambang

(2).1 Outline of Hydraulic Calculation

The Network calculation was calculated by EPANET ver2.0 with the following conditions.

- Hazen-Williams formula
- Coefficient of flow velocity C = 110
- Minimum dynamic pressure : 50kPa (refer to **Table 2.2.2.6-1**)
- Hourly Factor : 1.65 (refer to **Table 2.2.2.6-2**)

Things that were kept in mind regarding the distribution network calculation are as follows.

- To ensure that the diameter of transmission and distribution pipes will maintain an effective pressure.
- That the effective capacity of the service reservoir satisfies the hourly maximum demand.

The network map for Battambang (BTB) is shown in **Figure 7.3-2**, and the distribution network calculation data and the results are as follows.

Figure 7.3-2 Network map in BTB

(2). 2 Node data

Node ID	Elevation	Base Demand	Residual Pressure (m)	
	(m)	(m^3/d)	Peak Demand	Average Demand
Junc N2	14.00	274.8	35.45	35.72
Junc N3	14.55	274.8	33.55	34.47
Junc N4	15.60	429.4	22.07	28.02
Junc N5	15.53	429.4	21.34	27.84
Junc N6	13.07	146.9	23.77	30.30
Junc N7	13.42	282.5	24.27	30.36
Junc N8	12.86	282.5	14.47	26.71
Junc N9	13.84	274.8	29.39	32.66
Junc N10	13.82	274.8	26.30	31.10
Junc N11	14.10	172.8	28.96	32.34
Junc N12	13.91	274.8	22.41	29.06
Junc N13	14.50	275.6	28.73	32.00
Junc N14	14.60	275.6	23.87	29.32
Junc N15	14.20	275.6	22.53	28.84
Junc N16	14.44	122.7	15.94	25.14
Junc N17	15.57	122.7	20.93	27.22
Junc N18	14.63	123.6	21.54	28.03
Junc N19	14.83	122.7	21.25	27.80
Junc N20	14.43	123.6	21.52	28.16
Junc N21	14.44	122.7	21.04	27.92
Junc N22	14.08	311.9	14.01	23.87
Junc N24	13.90	272.2	12.48	22.50
Junc N25	13.95	169.3	13.97	24.21
Junc N27	14.40	402.6	11.04	21.90
Junc N31	12.18	146.0	17.15	28.21
Junc N32	13.16	257.5	15.05	26.79
Junc N33	11.82	711.9	16.00	27.97
Junc N34	13.78	340.4	6.43	23.00
Junc N35	13.95	172.8	5.64	22.59
Junc N36	11.99	198.7	5.33	23.65
Junc N37	16.41	275.6	18.96	25.57
Junc N38	14.83	274.8	12.88	21.95
Junc N39	15.92	239.8	18.11	20.77
Junc N40	14.42	275.6	14.95	22.67
Junc N41	14.70	275.6	13.99	21.61
Junc N42	14.43	223.8	11.18	20.60
Junc N43	14.87	113.2	6.71	18.54
Junc N44	14.55	275.6	17.86	15.14
Junc N45	14.90	223.8	13.79	21.52
Junc N46	13.16	137.4	20.13	27.02
Junc N47	14.58	137.4	23.09	29.04
Junc N48	15.72	116.6	13.94	24.73
Junc N49	14.67	137.4	21.29	27.82
Junc N50	12.54	256.6	18.55	28.55
Junc N51	13.13	282.5	18.95	28.37
Junc N52	13.61	274.8	24.66	30.38
Junc N53	14.46	275.6	18.95	26.81
Junc N54	14.35	122.7	17.80	26.23
Junc N55	14.32	122.7	22.08	28.54
Junc N56	13.01	537.4	17.43	26.73
Junc N57	12.62	282.5	9.93	25.05
Junc N58	12.05	197.9	7.28	24.35
Junc N59	11.60	146.0	8.39	25.06
Junc N60	15.82	116.6	15.80	25.40

Node ID	Elevation	Base Demand	Residual Pressure (m)	
	(m)	(m^3/d)	Peak Demand	Average Demand
Junc N61	16.37	77.8	8.74	22.27
Junc N62	16.58	77.8	11.75	23.34
Junc N63	16.58	77.8	1.85	22.98
Junc N64	16.58	77.8	6.65	21.32
Junc N66	13.44	286.8	5.85	20.65
Junc N67	12.81	286.8	5.57	20.92
Junc N68	12.83	286.8	5.30	20.81
Junc N69	13.17	286.8	9.04	22.08
Junc N70	13.49	339.6	11.63	22.91
Junc N71	13.95	339.6	14.05	24.26
Junc N72	13.49	572.8	11.63	22.91
Junc N73	13.17	286.8	7.66	21.53
Junc N74	13.44	286.8	5.82	20.64
Junc N75	12.81	286.8	5.26	20.80
Junc N76	12.83	286.8	5.27	20.80
Junc N77	14.74	122.7	21.36	27.89
Junc N78	14.32	122.7	21.21	28.06
Junc N79	14.71	122.7	20.09	27.36
Junc N80	14.23	122.7	18.48	26.78
Junc N81	13.84	311.9	14.91	24.66
Junc N82	14.50	122.7	21.07	27.91
Junc N83	14.36	122.7	16.90	25.90
Junc N84	14.61	123.6	16.47	25.60
Junc N85	14.39	122.7	21.88	28.31
Junc N86	14.26	140.0	21.82	28.41
Junc N87	14.16	434.6	15.32	24.87
Junc N88	13.92	140.0	14.41	24.90
Junc N89	13.92	140.0	17.16	26.29
Junc N90	14.17	122.7	18.14	26.57
Junc N91	14.31	122.7	16.44	25.52
Junc N92	14.44	122.7	15.37	24.80
Junc N93	14.13	140.0	14.15	24.68
Junc N94	14.00	140.0	14.35	24.92
Junc N95	13.98	140.0	17.28	26.31
Junc N96	14.28	140.0	21.91	28.45
Junc N97	14.22	275.6	15.92	23.58
Junc N98	15.24	274.8	12.15	21.04
Junc N99	14.22	274.8	14.33	22.30
Junc N100	14.25	274.8	14.29	22.04
Junc N101	14.26	242.8	8.64	19.69
Junc N102	14.21	255.7	10.01	20.26
Junc N23	13.95	170.2	13.96	24.21
Junc N26	13.90	272.2	12.50	22.53
Junc N29	14.83	118.4	21.75	22.18
Junc N30	14.44	118.4	21.42	22.41
Junc N103	14.08	116.6	19.27	22.35
Junc N104	14.48	235.0	20.29	22.16
Junc N105	13.90	116.6	12.48	22.50
Junc N106	14.32	116.6	18.84	22.05
Junc N107	14.47	235.0	19.04	21.90
Junc N108	14.71	118.4	22.05	22.32
Junc N109	14.76	118.4	21.82	22.25
Junc N110	14.62	118.4	21.36	22.27
Junc N111	14.52	118.4	21.41	22.35
Junc N112	14.47	235.0	18.74	21.84
Junc N113	15.21	681.7	17.73	21.11
Junc N114	14.81	118.4	20.19	21.88
Junc N115	14.92	118.4	20.10	21.77
Junc N116	14.86	563.3	11.51	20.85
Junc N117	15.75	602.2	9.44	19.13
Junc N118	16.23	602.2	8.53	18.48
Junc N119	15.53	148.6	9.82	19.35
Junc N120	15.80	148.6	9.78	19.11

Node ID	Elevation	Base Demand	Residual Pressure (m)	
	(m)	(m^3/d)	Peak Demand	Average Demand
Junc N121	16.16	90.7	9.42	18.75
Junc N122	15.60	0.0	10.56	19.52
Junc N123	15.24	0.0	10.92	19.90
Junc N124	15.05	82.9	11.59	20.19
Junc N125	15.23	166.8	12.34	20.26
Junc N126	15.17	166.8	12.80	20.38
Junc N127	14.67	82.9	12.67	20.82
Junc N128	14.66	82.9	12.66	20.81
Junc N129	14.36	82.9	12.96	21.11
Junc N130	15.92	166.8	17.74	20.73
Junc N131	15.75	166.8	15.98	20.51
Junc N132	14.25	166.8	15.94	22.14
Junc N133	14.70	166.8	13.99	21.61
Junc N134	14.27	82.9	13.80	21.73
Junc N135	14.47	82.9	13.35	21.41
Junc N136	14.47	82.9	12.86	21.16
Junc N137	14.46	82.9	12.67	21.09
Junc N138	14.79	82.9	12.09	20.65
Junc N139	14.70	173.7	10.88	20.22
Junc N140	14.92	166.8	12.42	20.82
Junc N141	14.70	166.8	11.66	20.60
Junc N142	14.43	166.8	11.18	20.60
Junc N143	14.36	166.752	11.24	20.66
Junc N144	14.56	166.752	11.80	20.73
Junc N145	14.44	166.752	11.16	20.57
Junc N146	14.66	82.944	10.91	20.33
Junc N147	14.50	192.672	10.86	20.35
Junc N148	14.26	192.672	10.82	20.51
Junc N149	14.21	255.744	10.81	20.54
Junc N150	16.00	222.912	8.48	18.54
Junc N151	16.59	59.616	7.71	17.88
Junc N152	15.85	148.608	9.10	18.81
Junc N153	15.12	148.608	7.97	18.80
Junc N154	15.98	108.864	8.85	18.63
Junc N155	14.96	200.448	8.82	19.25
Junc N156	15.80	57.024	8.85	18.74
Junc N157	16.59	51.84	7.46	17.78
Junc N158	15.27	76.032	7.82	18.72
Junc N159	14.77	185.76	8.17	19.17
Junc N160	13.56	38.016	8.94	20.20
Junc N161	13.56	38.016	8.85	20.17
Junc N162	13.63	38.016	8.13	19.84
Junc N163	13.63	38.016	7.62	19.64
Junc N164	13.25	38.016	7.85	19.96
Junc N165	13.25	38.016	7.33	19.75
Junc N166	12.72	76.032	7.62	20.19
Junc N167	13.42	38.016	7.22	19.61
Junc N168	13.15	38.016	7.24	19.78
Junc N169	13.08	38.016	7.31	19.85
Junc N170	13.08	38.016	7.31	19.85
Junc N171	15.10	8.64	21.79	21.96
Junc N172	16.07	51.84	8.40	18.40
Junc N173	15.10	0	21.79	21.96
Junc N174	14.00	0	35.45	35.72
Junc N65	11.99	43.2	5.20	23.60
Junc N175	15.27	156.384	6.33	18.15
Junc N176	15.92	17.28	12.54	20.37
Junc N177	15.92	17.712	12.56	20.37
Junc N178	14.87	43.2	6.71	18.54
Total		32501.1		

(2). 3 Pipeline data

Link ID	Start Node	End Node	Length	Dia.	Peak Demand		Average Demand	
					Flow	Velocity	Flow	Velocity
	ID	ID	(m)	(mm)	(m^3/d)	(m/s)	(m^3/d)	(m/s)
Pipe 2	N 2	N 3	90.0	400	24,586.0	2.26	17,185.8	1.58
Pipe 3	N 3	N 4	619.9	250	7,611.0	1.79	5,338.7	1.26
Pipe 4	N 3	N 9	680.8	400	16,521.4	1.52	11,572.4	1.07
Pipe 5	N 9	N 10	464.9	400	15,903.6	1.46	11,043.6	1.02
Pipe 7	N 2	N 13	772.2	350	12,385.4	1.49	8,679.7	1.04
Pipe 8	N 13	N 9	250.0	200	121.0	0.04	-80.4	0.03
Pipe 9	N 9	N 11	360.0	150	285.1	0.19	172.8	0.11
Pipe 10	N 13	N 14	304.7	300	11,809.2	1.93	8,484.5	1.39
Pipe 11	N 14	N 17	130.3	250	7,182.4	1.69	5,324.8	1.26
Pipe 12	N 14	N 15	315.2	250	4,172.3	0.98	75.0	0.68
Pipe 14	N 7	N 10	596.8	250	-3,542.4	0.84	-2,356.1	0.56
Pipe 15	N 10	N 15	455.0	250	4,903.2	1.16	3,567.5	0.84
Pipe 16	N 8	N 12	588.9	100	-648.9	0.96	-384.5	0.57
Pipe 17	N 12	N 16	565.0	150	1,541.4	1.01	1,139.6	0.75
Pipe 18	N 4	N 7	1315.3	100	-16.4	0.02	-48.4	0.07
Pipe 20	N 7	N 6	451.2	250	2,327.6	0.55	1,575.9	0.37
Pipe 21	N 5	N 6	1189.2	250	201.3	0.05	-42.3	0.01
Pipe 22	N 4	N 5	481.0	250	2,191.1	0.52	1,163.8	0.27
Pipe 32	N 24	N 27	1000.0	250	1,597.5	0.38	214.3	0.05
Pipe 37	N 5	N 33	1210.0	150	1,282.2	0.84	776.7	0.51
Pipe 38	N 33	N 32	822.1	150	-292.0	0.19	-177.1	0.12
Pipe 41	N 32	N 34	1181.8	100	418.2	0.62	253.2	0.37
Pipe 42	N 34	N 35	638.6	100	146.9	0.22	89.0	0.13
Pipe 43	N 33	N 36	1688.9	100	399.2	0.59	241.9	0.36
Pipe 44	N 17	N 37	170.0	250	4,621.5	1.09	3,851.7	0.91
Pipe 47	N 37	N 49	870.0	150	-351.6	0.23	-324.0	0.21
Pipe 48	N 49	N 47	1000.0	150	-578.0	0.38	-461.4	0.30
Pipe 53	N 40	N 41	480.0	250	1,991.5	0.47	2,157.4	0.51
Pipe 54	N 41	N 45	432.3	250	-115.8	0.03	-785.4	0.19
Pipe 55	N 45	N 42	560.3	200	2,312.9	0.85	1,504.2	0.55
Pipe 57	N 45	N 46	1741.8	250	-2,797.6	0.66	-2,513.4	0.59
Pipe 58	N 46	N 47	1439.3	250	-3,024.9	0.71	-2,650.8	0.62
Pipe 60	N 22	N 21	597.2	100	-578.9	0.85	-438.0	0.65
Pipe 61	N 21	N 19	248.7	100	-240.2	0.35	-156.4	0.23
Pipe 39	N 6	N 50	1068.9	200	2,286.1	0.84	1,386.7	0.51
Pipe 62	N 32	N 50	266.3	150	-1,563.8	1.02	-947.8	0.62
Pipe 63	N 50	N 31	482.1	100	298.9	0.44	182.3	0.27
Pipe 65	N 7	N 51	293.9	100	731.8	1.08	449.3	0.66
Pipe 66	N 51	N 8	214.3	100	792.3	1.17	489.0	0.72
Pipe 67	N 10	N 52	312.2	300	7,005.3	1.15	4,845.3	0.79
Pipe 68	N 52	N 12	212.0	250	5,489.9	1.29	3,858.6	0.91
Pipe 69	N 15	N 53	328.9	250	5,780.2	1.36	4,112.6	0.97
Pipe 72	N 17	N 55	250.9	50	14.7	0.09	-12.1	0.07
Pipe 74	N 51	N 52	595.8	100	-527.0	0.78	-321.4	0.47

Link ID	Start Node	End Node	Length	Dia.	Peak Demand		Average Demand	
					Flow	Velocity	Flow	Velocity
	ID	ID	(m)	(mm)	(m^3/d)	(m/s)	(m^3/d)	(m/s)
Pipe 75	N 52	N 53	455.0	100	534.8	0,.79	390.5	0.58
Pipe 77	N 15	N 55	121.1	250	2,840.8	0.67	2,064.1	0.49
Pipe 78	N 12	N 56	728.3	200	2,846.9	1.05	2,059.8	0.76
Pipe 6	N 8	N 57	132.3	100	1,033.3	1.52	626.4	0.92
Pipe 13	N 57	N 58	751.5	100	326.6	0.48	197.9	0.29
Pipe 19	N 57	N 59	1047.8	100	241.1	0.36	146.0	0.22
Pipe 25	N 47	N 60	217.1	100	898.6	1.32	544.3	0.80
Pipe 49	N 60	N 48	532.8	100	300.7	0.44	182.3	0.27
Pipe 59	N 48	N 61	283.1	50	108.0	0.64	65.7	0.39
Pipe 81	N 61	N 64	527.6	50	47.5	0.28	28.5	0.17
Pipe 84	N 63	N 62	480.2	100	-209.1	0.31	-127.0	0.19
Pipe 85	N 61	N 62	468.4	50	-68.3	0.40	-41.5	0.24
Pipe 86	N 62	N 60	513.9	100	-405.2	0.60	-245.4	0.36
Pipe 87	N 32	N 34	1128.6	100	428.5	0.63	260.1	0.38
Pipe 88	N 34	N 35	720.7	100	138.2	0.20	83.8	0.12
Pipe 89	N 31	N 8	1394.2	50	29.4	0.17	18.1	0.11
Pipe 90	N 31	N 8	1394.2	50	29.4	0.17	18.1	0.11
Pipe 91	N 71	N 25	20.0	200	1,958.7	0.72	1,490.4	0.55
Pipe 93	N 70	N 72	20.0	250	-608.3	0.14	117.5	0.03
Pipe 94	N 72	N 27	935.3	250	-933.1	0.22	188.4	0.04
Pipe 98	N 68	N 76	20.0	150	504.6	0.33	305.9	0.20
Pipe 99	N 16	N 71	636.0	250	3,375.6	0.80	2,500.4	0.59
Pipe 100	N 71	N 70	1081.5	250	2,816.6	0.66	2,193.7	0.52
Pipe 101	N 25	N 72	1081.5	200	1,541.4	0.57	1,201.8	0.44
Pipe 103	N 70	N 69	1055.0	250	2,865.0	0.68	1,736.6	0.41
Pipe 104	N 72	N 73	1055.0	150	921.9	0.60	558.1	0.37
Pipe 105	N 69	N 66	1485.0	250	2,388.1	0.56	1,448.1	0.34
Pipe 106	N 73	N 74	1485.0	150	445.8	0.29	269.6	0.18
Pipe 107	N 66	N 67	1172.7	250	1,445.5	0.34	876.1	0.21
Pipe 108	N 67	N 68	726.7	250	974.6	0.23	591.0	0.14
Pipe 109	N 74	N 75	1172.7	150	436.3	0.29	264.4	0.17
Pipe 110	N 75	N 76	726.7	150	-33.7	0.02	-20.7	0.01
Pipe 112	N 16	N 91	109.8	100	-288.6	0.43	-236.7	0.35
Pipe 113	N 91	N 54	110.4	100	-586.7	0.86	-419.0	0.62
Pipe 114	N 54	N 90	133.7	100	-165.0	0.24	-163.3	0.24
Pipe 115	N 90	N 55	198.6	100	-762.9	1.12	-534.0	0.79
Pipe 116	N 16	N 92	183.7	250	3,056.8	0.72	2,293.9	0.54
Pipe 117	N 92	N 87	130.0	250	2,752.7	0.65	2,120.3	0.50
Pipe 120	N 81	N 22	534.4	250	1,849.8	0.44	1,681.3	0.40
Pipe 121	N 17	N 85	295.4	300	2,344.9	0.38	1,362.5	0.22
Pipe 122	N 85	N 18	184.5	300	2,004.5	0.33	1,184.5	0.19
Pipe 123	N 18	N 77	521.8	300	892.5	0.15	560.7	0.09
Pipe 124	N 77	N 19	361.9	300	183.2	0.07	279.1	0.05
Pipe 125	N 55	N 96	171.3	250	1,890.4	0.45	1,394.5	0.33
Pipe 127	N 86	N 20	201.0	250	1,302.0	0.31	988.4	0.23
Pipe 128	N 20	N 82	324.0	250	1,787.6	0.42	1,217.4	0.29
Pipe 129	N 82	N 78	171.0	250	784.5	0.18	550.4	0.13
Pipe 130	N 78	N 21	383.0	250	541.7	0.13	404.4	0.10
Pipe 131	N 77	N 78	220.0	100	248.0	0.37	159.0	0.23
Pipe 132	N 78	N 79	216.0	100	288.6	0.42	182.3	0.27
Pipe 133	N 79	N 80	198.0	50	85.5	0.51	59.6	0.35
Pipe 134	N 82	N 80	127.0	100	800.9	1.18	544.3	0.80
Pipe 135	N 80	N 83	70.0	100	763.8	1.13	535.7	0.79

Link ID	Start Node	End Node	Length	Dia.	Peak Demand		Average Demand	
					Flow	Velocity	Flow	Velocity
	ID	ID	(m)	(mm)	(m^3/d)	(m/s)	(m^3/d)	(m/s)
Pipe 136	N 83	N 81	370.9	100	418.2	0.62	344.7	0.51
Pipe 137	N 83	N 84	190.0	100	143.4	0.21	68.3	0.10
Pipe 138	N 84	N 88	372.6	50	70.8	0.42	49.2	0.29
Pipe 139	N 88	N 93	130.0	50	14.7	0.09	5.2	0.03
Pipe 140	N 93	N 91	192.1	50	-95.9	0.56	-59.6	0.35
Pipe 141	N 18	N 20	225.2	200	908.1	0.33	500.3	0.18
Pipe 142	N 85	N 86	230.0	100	137.4	0.20	55.3	0.08
Pipe 143	N 86	N 89	200.1	50	136.5	0.81	93.3	0.55
Pipe 144	N 89	N 88	257.7	50	86.4	0.51	59.6	0.35
Pipe 145	N 88	N 87	101.7	50	-89.0	0.52	-36.3	0.21
Pipe 146	N 94	N 54	190.0	50	-121.0	0.71	-7.8	0.46
Pipe 147	N 95	N 90	173.6	100	-395.7	0.58	-248.8	0.37
Pipe 148	N 96	N 95	195.2	50	137.4	0.81	164.2	0.55
Pipe 149	N 95	N 94	130.0	50	128.7	0.76	85.5	0.51
Pipe 150	N 94	N 93	115.0	50	19.0	0.11	23.3	0.14
Pipe 151	N 93	N 92	105.9	50	-102.0	0.60	-51.8	0.30
Pipe 152	N 84	N 89	182.8	100	7.8	0.01	-10.4	0.01
Pipe 153	N 89	N 95	130.0	100	-173.7	0.26	-116.6	0.17
Pipe 154	N 96	N 86	130.0	250	1,521.5	0.36	1,161.2	0.27
Pipe 155	N 37	N 44	581.6	250	3,989.1	0.94	3,471.6	0.82
Pipe 156	N 44	N 97	560.0	250	3,533.8	0.83	3,195.9	0.75
Pipe 157	N 97	N 40	258.3	250	2,990.3	0.71	2,865.0	0.68
Pipe 158	N 40	N 99	97.7	100	468.3	0.69	384.5	0.57
Pipe 159	N 99	N 100	408.9	100	15.6	0.02	109.7	0.16
Pipe 160	N 37	N 38	732.0	100	528.8	0.78	429.4	0.63
Pipe 161	N 38	N 98	266.0	100	164.2	0.24	210.0	0.31
Pipe 163	N 38	N 97	782.0	50	-44.1	0.26	-27.6	0.16
Pipe 164	N 98	N 40	845.8	50	-38.0	0.22	-23.3	0.14
Pipe 165	N 42	N 102	968.2	200	1,123.2	0.41	683.4	0.25
Pipe 166	N 102	N 101	538.0	150	701.6	0.46	427.7	0.28
Pipe 168	N 54	N 16	220.2	250	5,114.0	1.21	3,771.4	0.89
Pipe 169	N 84	N 20	190.0	50	-138.2	0.82	-94.2	0.55
Pipe 170	N 20	N 80	350.0	50	80.4	0.47	54.4	0.32
Pipe 171	N 38	N 97	782.0	50	-13.0	0.26	-27.6	0.16
Pipe 172	N 98	N 40	845.8	50	-38.0	0.22	-23.3	0.14
Pipe 174	N 100	N 41	240.7	200	-708.5	0.26	-217.7	0.08
Pipe 175	N 87	N 81	539.3	250	1,946.6	0.46	1,648.5	0.39
Pipe 23	N 16	N 23	636.0	100	309.3	0.46	229.8	0.34
Pipe 24	N 23	N 26	1229.9	100	165.9	0.25	178.8	0.26
Pipe 26	N 22	N 26	436.2	200	1,914.6	0.71	1,807.5	0.67
Pipe 28	N 53	N 54	121.1	250	5,859.6	1.38	4,227.6	1.00
Pipe 30	N 171	N 109	115.3	400	9,817.6	0.90	3,607.2	0.33
Pipe 31	N 171	N 108	115.2	400	6,305.5	0.58	2,705.2	0.25
Pipe 33	N 109	N 29	267.1	300	195.3	0.03	118.4	0.02
Pipe 35	N 30	N 104	183.0	200	2,418.3	0.89	990.1	0.36
Pipe 36	N 104	N 103	414.1	200	1,791.9	0.66	650.6	0.24
Pipe 40	N 103	N 105	436.2	100	665.3	0.98	31.1	0.05
Pipe 45	N 30	N 108	384.4	250	-2,613.6	0.62	-1,108.5	0.26
Pipe 46	N 108	N 111	270.9	250	3,020.5	0.71	1,276.1	0.30
Pipe 50	N 111	N 114	426.6	250	2,522.0	0.59	1,037.7	0.24
Pipe 51	N 109	N 110	270.9	250	2,536.7	0.60	1,112.0	0.26
Pipe 52	N 110	N 115	534.5	250	2,275.8	0.54	956.4	0.23

Link ID	Start Node	End Node	Length	Dia.	Peak Demand		Average Demand	
					Flow	Velocity	Flow	Velocity
	ID	ID	(m)	(mm)	(m^3/d)	(m/s)	(m^3/d)	(m/s)
Pipe 56	N 115	N 114	123.2	250	585.8	0.14	230.7	0.05
Pipe 64	N 111	N 110	231.8	100	-65.7	0.10	-36.3	0.05
Pipe 70	N 104	N 107	523.9	100	238.5	0.35	104.5	0.15
Pipe 71	N 107	N 112	297.3	100	150.3	0.22	60.5	0.09
Pipe 73	N 108	N 107	376.6	100	476.1	0.70	202.2	0.30
Pipe 76	N 111	N 112	507.1	100	368.9	0.54	156.4	0.23
Pipe 79	N 103	N 106	538.7	250	934.0	0.22	502.8	0.12
Pipe 80	N 106	N 113	673.6	250	918.4	0.22	397.4	0.09
Pipe 92	N 106	N 107	252.6	100	-177.1	0.26	-11.2	0.02
Pipe 95	N 112	N 113	343.3	100	131.3	0.19	-18.1	0.03
Pipe 96	N 113	N 114	727.4	250	-2,911.7	0.69	-1,150.0	0.27
Pipe 97	N 116	N 113	280.2	150	-2,375.1	1.56	-660.1	0.43
Pipe 111	N 105	N 116	1386.7	250	57.9	0.01	1,142.2	0.27
Pipe 118	N 116	N 117	1412.8	250	1,503.4	0.35	1,238.1	0.29
Pipe 119	N 117	N 118	499.6	200	855.4	0.32	518.4	0.19
Pipe 126	N 117	N 118	499.6	100	138.2	0.20	83.8	0.12
Pipe 176	N 117	N 119	1510.0	250	-483.8	0.11	33.7	0.01
Pipe 177	N 113	N 119	930.8	100	462.2	0.68	188.4	0.28
Pipe 178	N 119	N 150	578.0	150	537.4	0.35	325.7	0.21
Pipe 179	N 150	N 151	1018.5	150	169.3	0.11	102.8	0.07
Pipe 180	N 151	N 157	978.1	100	71.7	0.11	43.2	0.06
Pipe 181	N 119	N 120	880.9	250	-804.4	0.19	-252.3	0.06
Pipe 182	N 120	N 152	584.6	150	449.3	0.29	272.2	0.18
Pipe 183	N 152	N 153	1043.2	100	203.9	0.30	123.6	0.18
Pipe 185	N 115	N 120	949.7	150	1,494.7	0.98	607.4	0.40
Pipe 187	N 130	N 131	129.6	150	1,855.9	1.22	778.5	0.51
Pipe 188	N 131	N 126	358.4	150	1,537.9	1.01	625.5	0.41
Pipe 189	N 126	N 125	58.4	150	1,228.6	0.80	447.6	0.29
Pipe 190	N 125	N 124	612.0	150	542.6	0.36	266.1	0.17
Pipe 191	N 124	N 122	286.2	150	571.1	0.37	277.3	0.18
Pipe 192	N 122	N 121	355.1	150	564.2	0.37	324.9	0.21
Pipe 193	N 121	N 154	607.2	150	486.4	0.32	293.8	0.19
Pipe 195	N 130	N 132	577.7	250	475.2	1.03	1,074.0	0.25
Pipe 196	N 131	N 132	536.5	50	42.3	0.25	-13.8	0.08
Pipe 197	N 132	N 129	191.9	50	103.7	0.61	56.2	0.33
Pipe 198	N 129	N 128	132.9	50	1.7	0.01	1.7	0.01
Pipe 199	N 128	N 127	157.0	100	-62.2	0.09	-46.7	0.07
Pipe 200	N 127	N 124	573.9	100	165.9	0.24	94.2	0.14
Pipe 201	N 126	N 128	332.5	50	34.6	0.20	11.2	0.07
Pipe 202	N 125	N 127	253.6	150	410.4	0.27	14.7	0.01
Pipe 203	N 132	N 133	288.7	250	4,027.1	0.95	838.1	0.20
Pipe 204	N 133	N 134	194.8	250	3,112.1	0.73	2,129.8	0.50
Pipe 205	N 134	N 135	83.7	250	2,940.2	0.69	2,018.3	0.48
Pipe 206	N 135	N 136	189.8	250	2,765.7	0.65	1,911.2	0.45
Pipe 207	N 136	N 137	164.5	250	1,852.4	0.44	1,155.2	0.27
Pipe 208	N 137	N 138	247.5	250	1,678.8	0.40	1,051.5	0.25
Pipe 209	N 138	N 123	822.0	250	1,542.2	0.36	968.5	0.23
Pipe 210	N 123	N 139	653.8	250	1,549.2	0.37	921.0	0.23
Pipe 211	N 122	N 123	145.1	100	7.8	0.01	-47.5	0.07
Pipe 212	N 121	N 139	794.1	250	-76.0	0.02	-124.4	0.03
Pipe 213	N 129	N 134	372.1	50	-35.4	0.21	-28.5	0.17
Pipe 214	N 128	N 135	438.7	50	-38.0	0.22	-23.3	0.14
Pipe 215	N 127	N 136	534.7	150	45.8	0.03	-209.1	0.14

Link ID	Start Node	End Node	Length	Dia.	Peak Demand		Average Demand	
					Flow	Velocity	Flow	Velocity
	ID	ID	(m)	(mm)	(m^3/d)	(m/s)	(m^3/d)	(m/s)
Pipe 216	N 133	N 140	497.3	200	1,582.8	0.58	990.1	0.36
Pipe 217	N 140	N 142	495.2	150	847.6	0.56	587.5	0.34
Pipe 218	N 142	N 149	968.2	250	1,274.4	0.30	840.7	0.20
Pipe 219	N 139	N 147	406.4	250	1,186.3	0.28	622.9	0.15
Pipe 220	N 147	N 148	1221.4	250	757.7	0.18	382.8	0.09
Pipe 221	N 148	N 149	450.6	250	546.9	0.13	260.9	0.06
Pipe 222	N 140	N 141	120.6	100	459.6	0.68	298.1	0.44
Pipe 223	N 141	N 144	305.3	100	-3.5	0.00	21.6	0.03
Pipe 224	N 142	N 143	115.5	150	118.4	0.08	114.9	0.08
Pipe 225	N 143	N 145	306.8	150	31.1	0.02	57.9	0.04
Pipe 226	N 145	N 146	152.3	150	193.5	0.13	139.1	0.09
Pipe 227	N 146	N 147	486.4	100	93.3	0.14	76.9	0.11
Pipe 228	N 136	N 144	294.7	150	822.5	0.54	464.0	0.30
Pipe 229	N 144	N 145	497.9	150	544.3	0.36	318.8	0.21
Pipe 230	N 145	N 148	968.2	100	107.1	0.16	70.8	0.10
Pipe 231	N 137	N 146	720.5	50	36.3	0.22	20.7	0.12
Pipe 232	N 154	N 156	884.4	150	179.7	0.12	108.9	0.07
Pipe 233	N 156	N 172	516.2	100	85.5	0.13	51.8	0.08
Pipe 234	N 154	N 155	1399.0	100	127.0	0.19	76.0	0.11
Pipe 235	N 155	N 147	882.6	100	-203.9	0.30	-124.4	0.18
Pipe 239	N 158	N 160	688.3	200	851.0	0.31	514.1	0.19
Pipe 240	N 160	N 161	10.0	100	470.0	0.69	282.5	0.42
Pipe 241	N 160	N 162	724.0	150	435.5	0.29	263.5	0.17
Pipe 242	N 161	N 163	724.0	100	191.8	0.28	116.6	0.17
Pipe 243	N 162	N 164	878.2	150	372.4	0.24	225.5	0.15
Pipe 244	N 163	N 165	878.2	100	128.7	0.19	78.6	0.12
Pipe 245	N 164	N 167	840.5	150	310.2	0.20	187.5	0.12
Pipe 246	N 165	N 168	840.5	100	66.5	0.10	40.6	0.06
Pipe 247	N 167	N 166	415.9	100	125.3	0.18	76.0	0.11
Pipe 248	N 167	N 169	365.0	100	121.8	0.18	73.4	0.11
Pipe 249	N 168	N 170	365.0	100	3.5	0.01	2.6	0.00
Pipe 250	N 170	N 169	10.0	100	-58.8	0.09	-35.4	0.05
Pipe 83	N 149	N 158	889.9	200	1,399.7	0.52	845.9	0.31
Pipe 236	N 158	N 159	152.6	150	423.4	0.28	255.7	0.17
Pipe 237	N 159	N 160	704.3	100	116.6	0.17	70.0	0.10
Pipe 238	N 141	N 143	495.2	100	187.5	0.28	110.6	0.16
Pipe 257	N 63	N 64	448.2	50	80.4	0.47	49.2	0.29
Pipe 258	N 28	N 173	30.0	400	16,136.9	1.49	6,321.0	0.58
Pipe 259	N 1	N 174	50.0	500	37,424.2	2.21	26,140.3	1.54
Pipe 82	N 25	N 23	10.0	100	137.4	0.20	119.2	0.18
Pipe 261	N 56	N 71	603.2	200	1,960.4	0.72	1,522.4	0.56
Pipe 262	N 24	N 26	10.0	200	-1,632.1	0.60	-1,714.2	0.63
Pipe 102	N 65	N 36	506.8	100	-71.7	0.11	-43.2	0.06
Pipe 167	N 101	N 175	351.9	100	300.7	0.44	184.9	0.27
Pipe 263	N 175	N 43	265.9	100	43.2	0.06	28.5	0.04
Pipe 34	N 109	N 39	222.0	200	3,444.8	1.27	1,129.2	0.42
Pipe 186	N 39	N 130	10.0	200	6,494.7	2.39	2,019.2	0.74
Pipe 264	N 66	N 74	20.0	150	466.6	0.31	283.4	0.19
Pipe 265	N 109	N 39	222.0	200	3,444.8	1.27	1,129.2	0.42
Pipe 194	N 176	N 98	552.2	100	212.5	0.31	18.1	0.03
Pipe 266	N 177	N 100	577.7	200	-270.4	0.10	-52.7	0.02
Pipe 267	N 176	N 177	10.0	100	-215.1	0.36	-35.4	0.05
Pipe 269	N 178	N 161	422.4	100	-215.1	0.32	-127.9	0.19

(2). 4 Service reservoir data

Day	Time	Water Level at Reservoir (m)
1st day	0:00	2.2
	1:00	2.3
	2:00	2.5
	3:00	2.6
	4:00	3.1
	5:00	3.3
	6:00	3.0
	7:00	2.6
	8:00	2.5
	9:00	2.4
	10:00	2.3
	11:00	2.2
	12:00	2.2
	13:00	2.2
	14:00	2.2
	15:00	2.2
	16:00	2.2
	17:00	2.0
	18:00	1.8
	19:00	1.6
	20:00	1.5
	21:00	1.6
	22:00	1.8
	23:00	2.2
2nd day	0:00	2.3
	1:00	2.4
	2:00	2.6
	3:00	2.8
	4:00	3.2
	5:00	3.4
	6:00	3.1
	7:00	2.7
	8:00	2.6
	9:00	2.5
	10:00	2.4
	11:00	2.4
	12:00	2.3
	13:00	2.3
	14:00	2.3
	15:00	2.4
	16:00	2.3
	17:00	2.1
	18:00	1.9
	19:00	1.7
	20:00	1.6
	21:00	1.7
	22:00	1.9
	23:00	2.3