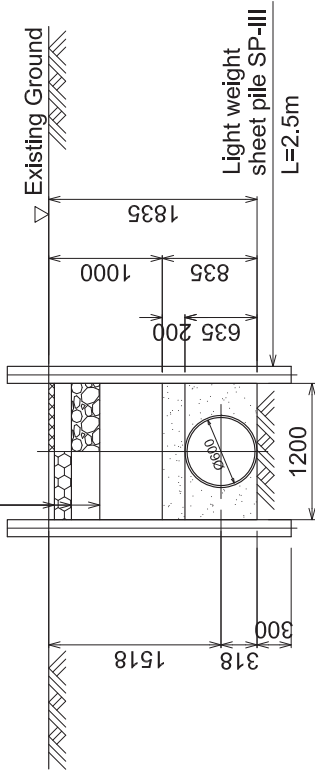
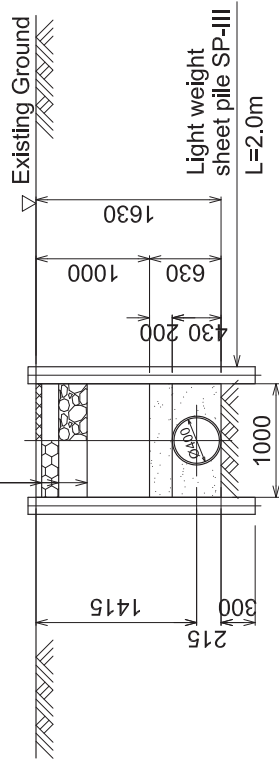


Single Bituminous Surface Treatment (t50)
 Mechanically Stabilized Base Course (t150)
 Crusher - Run Subbase (t250)



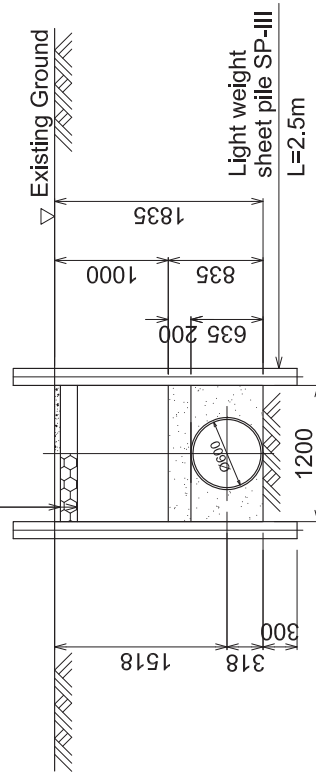
TYPE-2

Single Bituminous Surface Treatment (t50)
 Mechanically Stabilized Base Course (t150)
 Crusher - Run Subbase (t250)



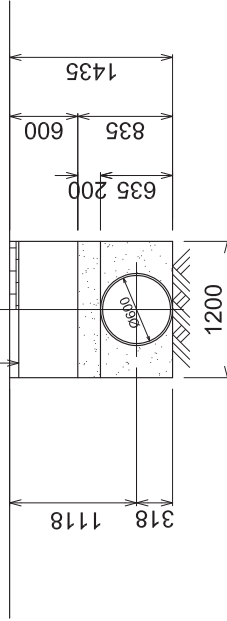
TYPE-1

Concrete Surface Course (t50)
 Crusher - Run Subbase (t150)



TYPE-3

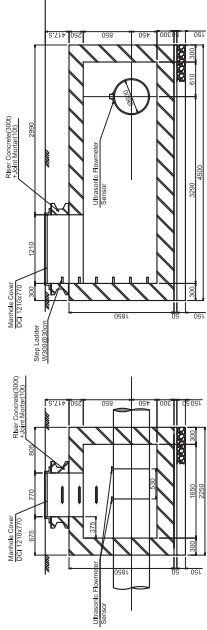
Sidewalk Block (t80)



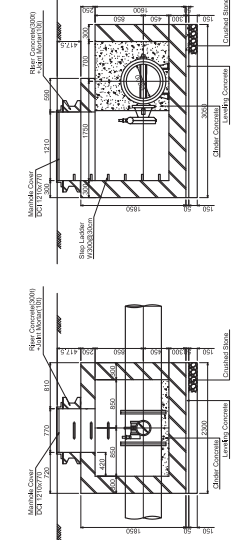
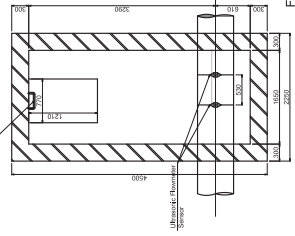
TYPE-4

TYPICAL CROSS SECTION OF CONVEYANCE PIPE

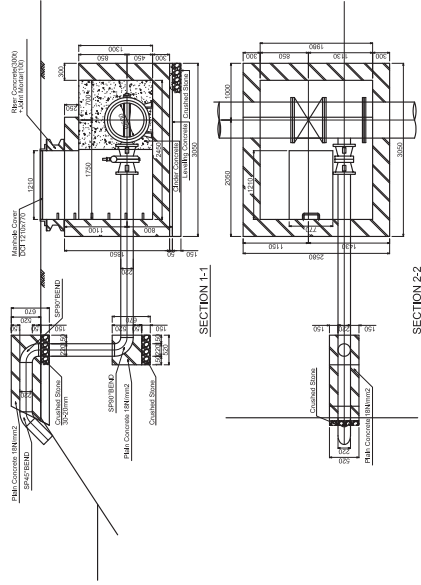
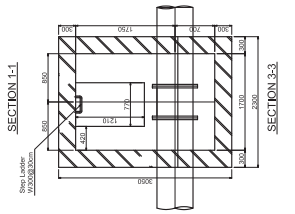
PROJECT	DESCRIPTION	APPROVE BY	DATE	DRAWING No
THE PREPARATORY SURVEY ON THE PROJECT ON ADDITIONAL NEW WATER TREATMENT PLANTS FOR KAMPONG CHAM AND BATTAMBANG WATERWORKS カンボジア国地方上水道拡張整備計画準備調査	Typical Cross Section for Conveyance Pipe			B-R2
		PREPARED BY	DATE	SCALE
				1:40



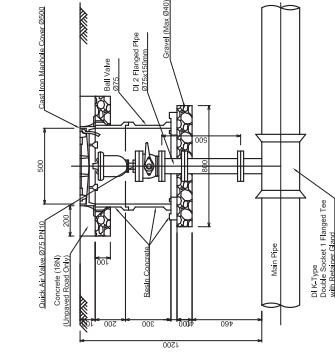
FLOWMETER CHAMBER FOR DCIØ600



BUTTERFLY VALVE & FLOW CONTROL VALVE CHAMBER FOR DCIØ600

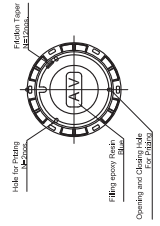


WASHOUT VALVE CHAMBER FOR DCIØ600



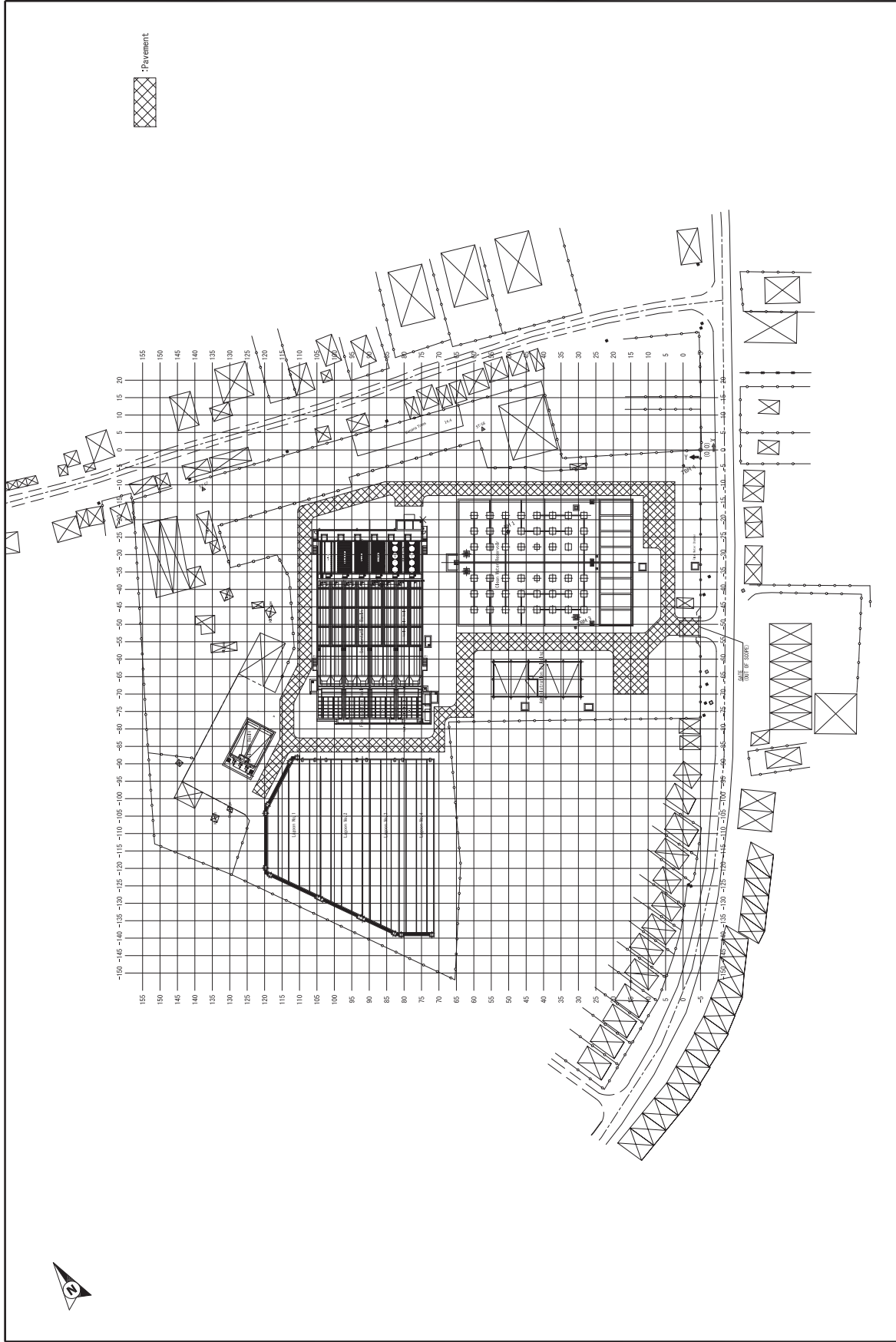
QUICK AIR VALVE CHAMBER (MAIN PIPE DCIØ600)

AIR VALVE CHAMBER



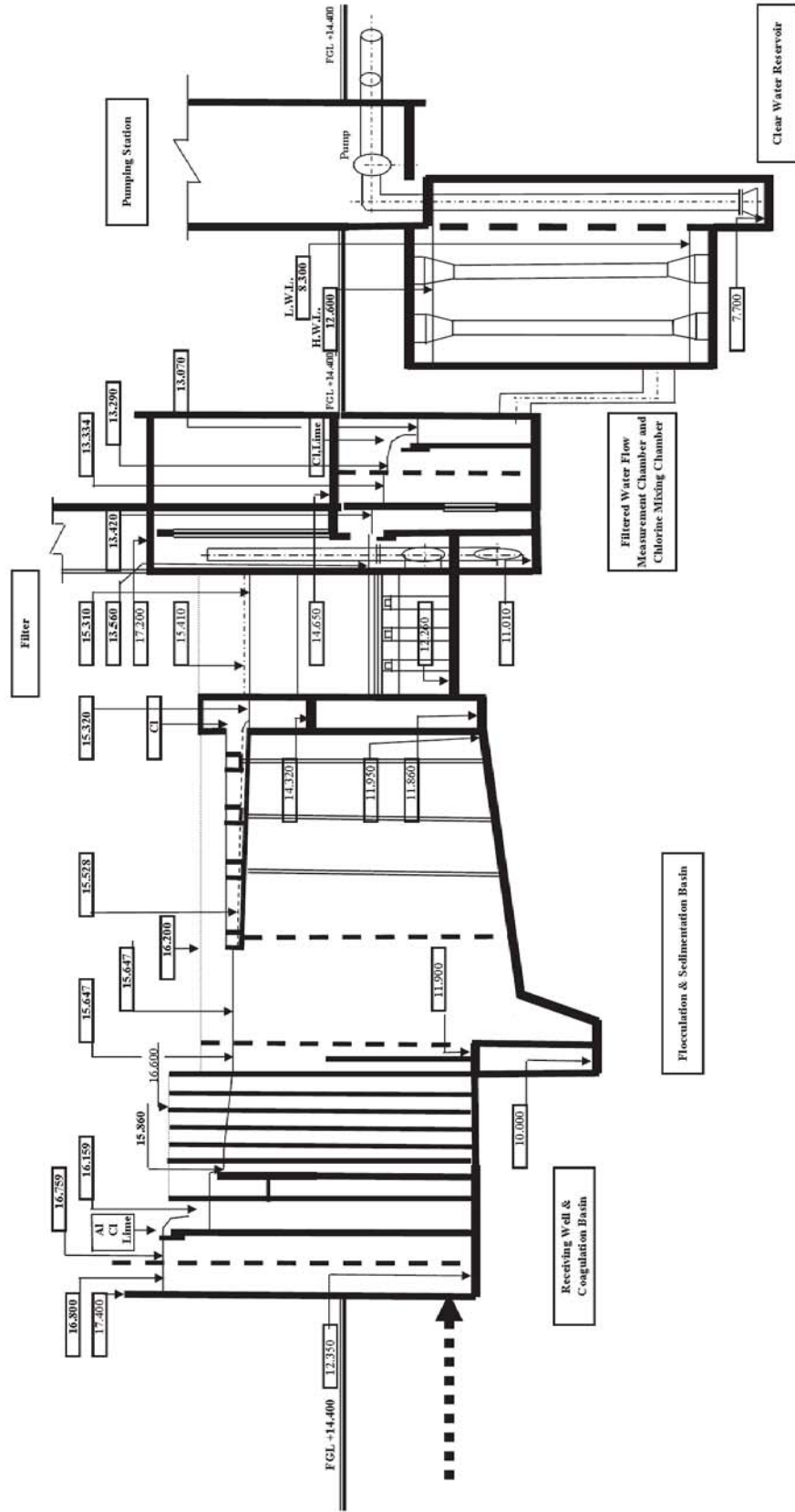
CAST IRON MANHOLE COVER Ø500

PROJECT	THE PREPARATORY SURVEY ON THE PROJECT ON ADDITIONAL NEW WATER TREATMENT PLANTS FOR KAMPONG CHAM AND BATTAMBANG WATERWORKS カンボジア国地方上水道拡張整備計画準備調査	DESCRIPTION	Valve Chamber for Battambang Conveyance Pipe	APPROVE BY	DATE	DRAWING No
				PREPARED BY	DATE	SCALE
				NIHON SUDO CONSULTANTS CO., LTD. WATER AND SEWER BUREAU, CITY OF KITAKYUSHU CTI ENGINEERING INTERNATIONAL CO., LTD.		

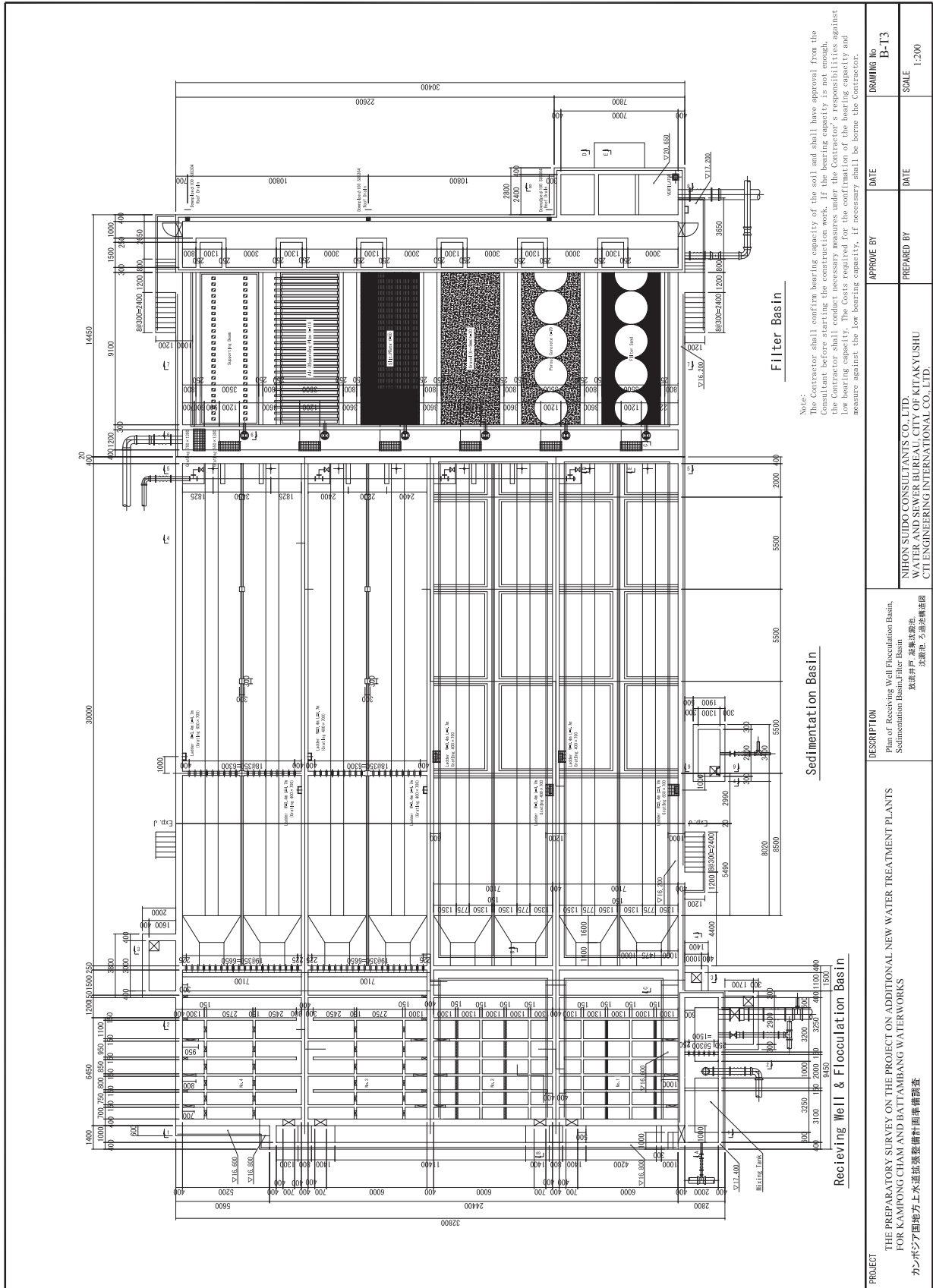


PROJECT	THE PREPARATORY SURVEY ON THE PROJECT ON ADDITIONAL NEW WATER TREATMENT PLANTS FOR KAMPONG CHAM AND BATTAMBANG WATERWORKS カンボジア国地方上水道拡張整備計画準備調査	DESCRIPTION	General Plan of Landscaping 場内整備図	APPROVE BY	DATE	DRAWING No	B-11
				PREPARED BY	DATE	SCALE	1:1000
				NIHON SUIDO CONSULTANTS CO., LTD. WATER AND SEWER BUREAU, CITY OF KITAKYUSHU CTI ENGINEERING INTERNATIONAL CO., LTD.			

FLOW DIAGRAM OF BATTAMBANG WATER TREATMENT PLANT

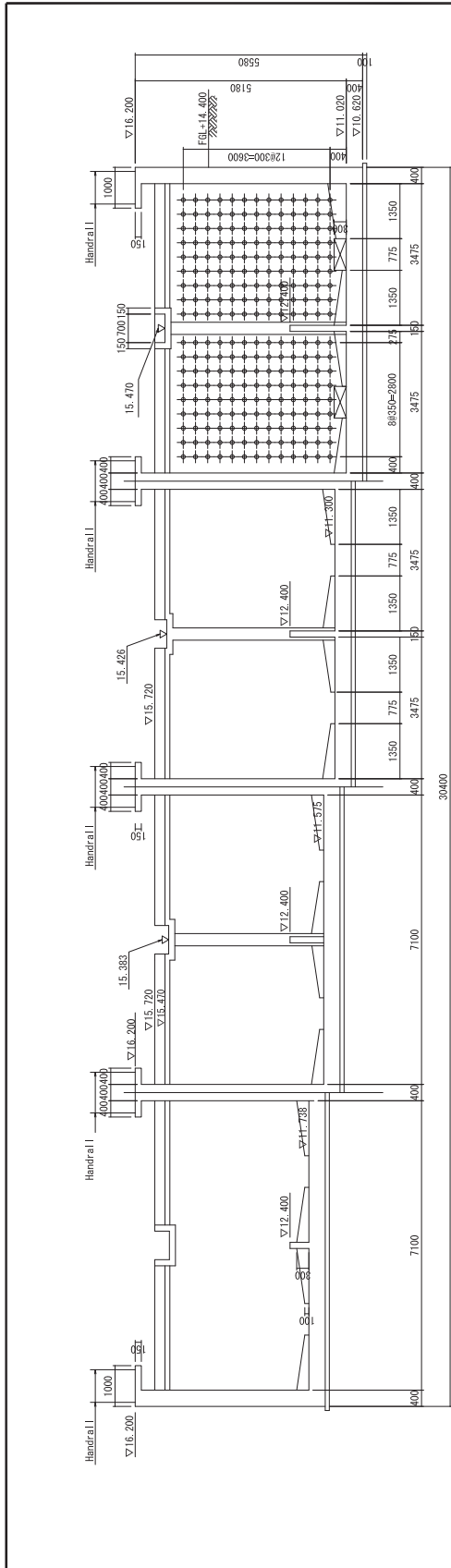


PROJECT	DESCRIPTION	APPROVE BY	DATE	DRAWING No.
THE PREPARATORY SURVEY ON THE PROJECT ON ADDITIONAL NEW WATER TREATMENT PLANTS FOR KAMPONG CHAM AND BATTAMBANG WATERWORKS カンボジア 国地方 水道拡張整備計画準備調査	Water Level Profile of Battambang WTP バタンバン浄水場水位高低図	NIHON SUDO CONSULTANTS CO., LTD. WATER AND SEWER BUREAU, CITY OF MIYAKYUSHU CI ENGINEERING INTERNATIONAL CO., LTD.	DATE	B-T2
		PREPARED BY	DATE	SCALE

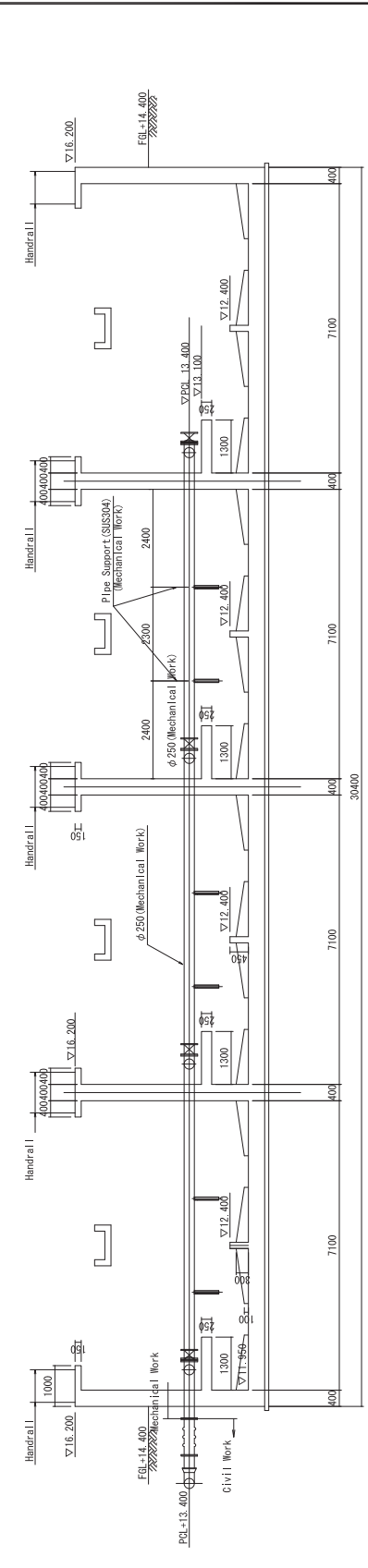


Note:
 The Contractor shall confirm bearing capacity of the soil and shall have approval from the Consultant before starting the construction work. If the bearing capacity is not enough, the Contractor shall conduct necessary measures under the Contractor's responsibilities against low bearing capacity. The costs required for the confirmation of the bearing capacity and measure against the low bearing capacity, if necessary shall be borne the Contractor.

PROJECT	THE PREPARATORY SURVEY ON THE PROJECT ON ADDITIONAL NEW WATER TREATMENT PLANTS FOR KAMPONG CHAM AND BATTAMBANG WATERWORKS カンボジア国地方上水道拡張整備計画準備調査	DESCRIPTION	Plan of Receiving Well Flocculation Basin, Sedimentation Basin, Filter Basin 配水井戸、絮凝沈降池、ろ過池、ろ過用集配池	APPROVE BY	DATE	DRAWING No	B-13
				PREPARED BY	DATE	SCALE	1:500



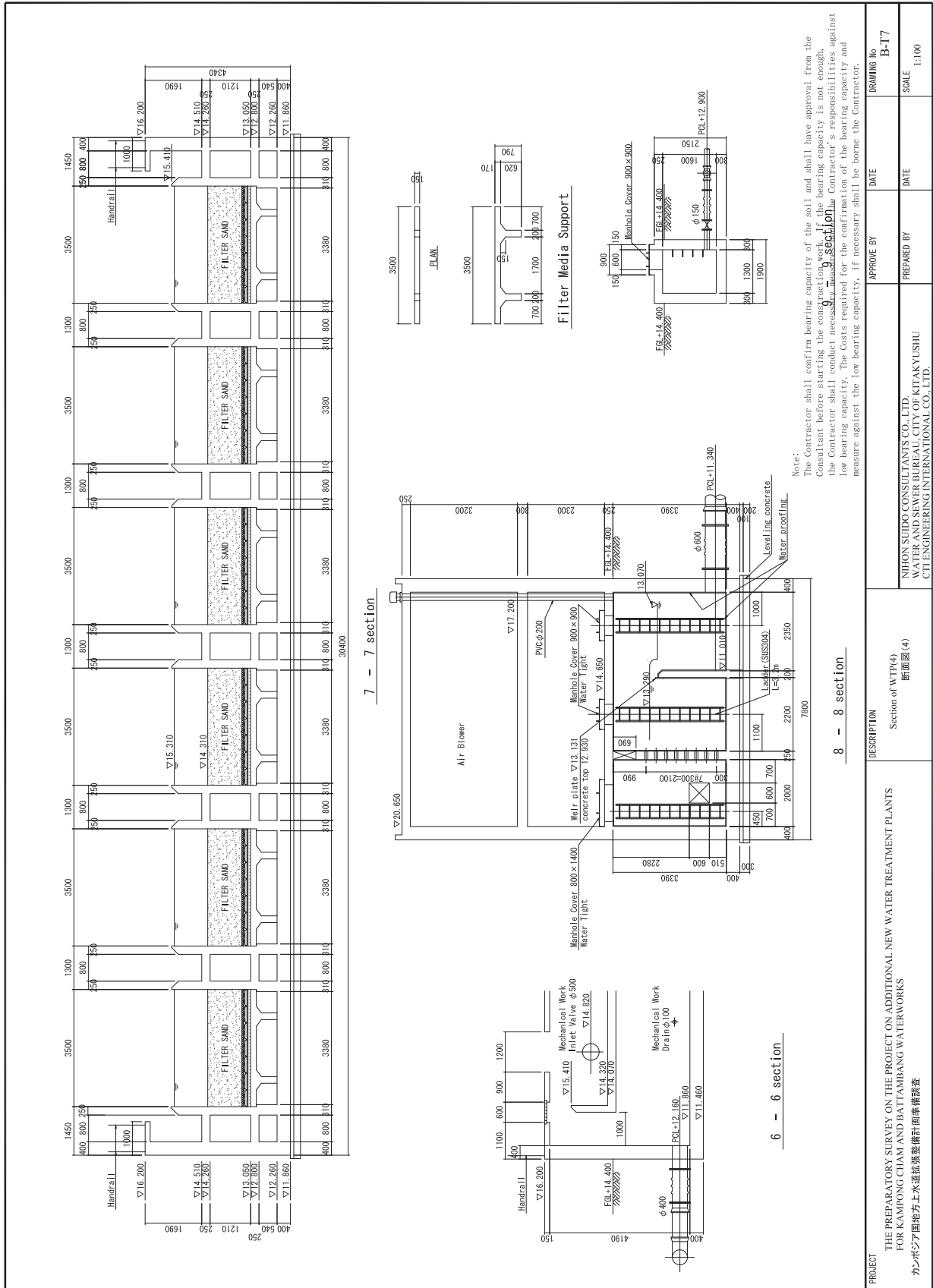
4 - 4 section



5 - 5 section

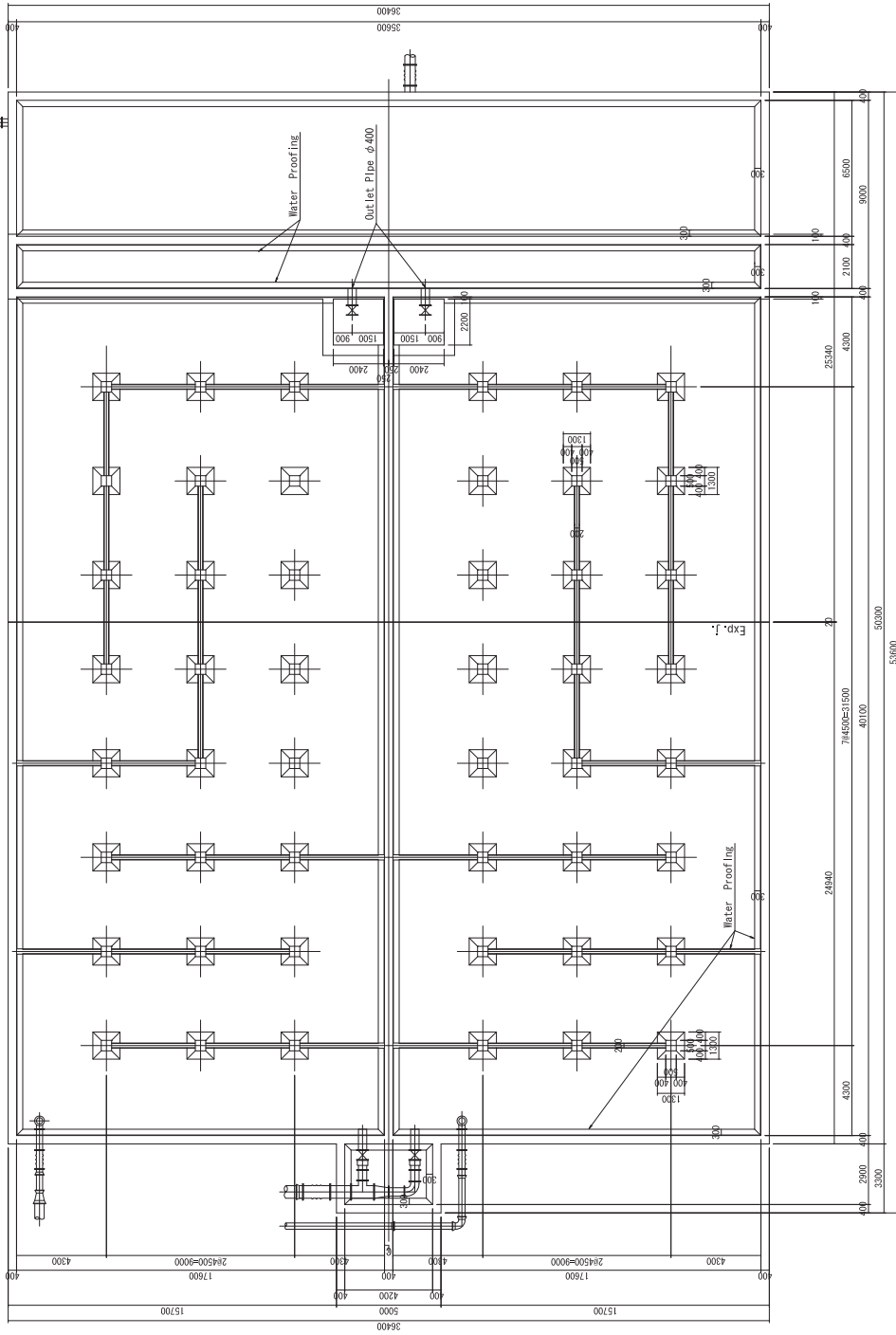
Note:
 The Contractor shall confirm bearing capacity of the soil and shall have approval from the Consultant before starting the construction work. If the bearing capacity is not enough, the Contractor shall conduct necessary measures under the Contractor's responsibilities against low bearing capacity. The Costs required for the confirmation of the bearing capacity and measure against the low bearing capacity, if necessary shall be borne the Contractor.

PROJECT	THE PREPARATORY SURVEY ON THE PROJECT ON ADDITIONAL NEW WATER TREATMENT PLANTS FOR KAMPONG CHAM AND HATTAMBANG WATERWORKS カンボジア国地方上水道拡張整備計画調査	DESCRIPTION	Section of WTP(3)	APPROVE BY	DRAWING No
			断面図(3)	PREPARED BY	B-16
				DATE	SCALE
					1:100



PROJECT THE PREPARATORY SURVEY ON THE PROJECT ON ADDITIONAL NEW WATER TREATMENT PLANTS FOR KAMPONG CHAM AND BATTAMBANG WATERWORKS カンボジア国地方上水道拡張整備計画調査	DESCRIPTION Section of WTP(+) 断面図 (4)	APPROVE BY DATE DRAWING No B-17
		PREPARED BY DATE SCALE 1:100

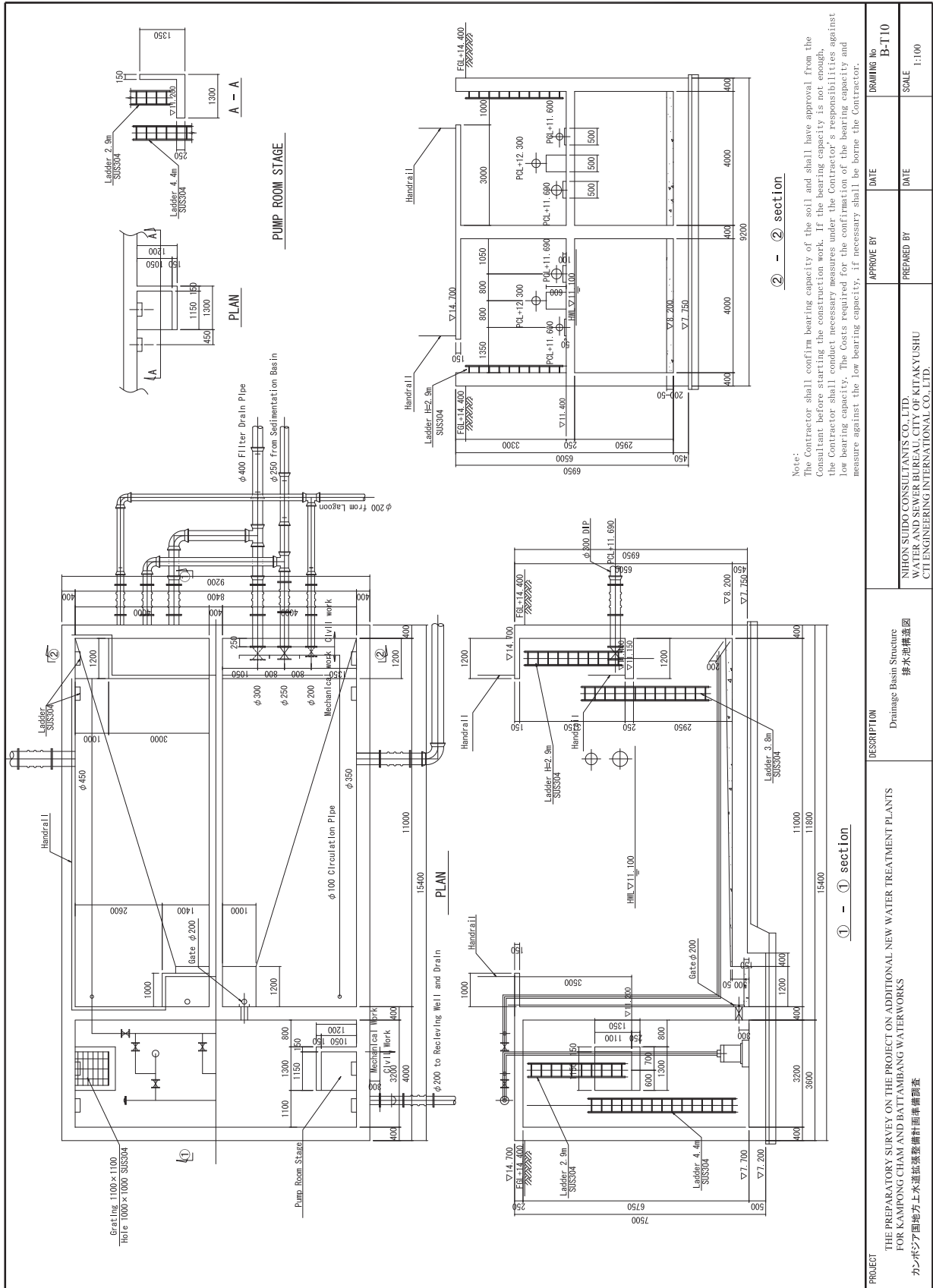
Service Reservoir and Pumping Station
Structure (2/3)
Scale=1/200



Note:
The Contractor shall confirm bearing capacity of the soil and shall have approval from the Consultant before starting the construction work. If the bearing capacity is not enough, the Contractor shall conduct necessary measures under the Contractor's responsibilities against low bearing capacity. The Costs required for the confirmation of the bearing capacity and measure against the low bearing capacity, if necessary shall be borne the Contractor.

A - A section

PROJECT	THE PREPARATORY SURVEY ON THE PROJECT ON ADDITIONAL NEW WATER TREATMENT PLANTS FOR KAMPONG CHAM AND HATTAMBANG WATERWORKS		DESCRIPTION	Service Reservoir and Pumping Station Structure (1)		DRAWING No	B-18
	カンボジア国地方上水道拡張整備計画準備調査			バタンペン配水池構想図(1)			DATE
			Nihon Suido Consultants Co., Ltd. Water and Sewer Bureau, City of Kitakyushu		APPROVE BY	DATE	1:200
			CIT ENGINEERING INTERNATIONAL CO., LTD.		PREPARED BY	DATE	



Note:
 The Contractor shall confirm bearing capacity of the soil and shall have approval from the Consultant before starting the construction work. If the bearing capacity is not enough, the Contractor shall conduct necessary measures under the Contractor's responsibilities against low bearing capacity. The Costs required for the confirmation of the bearing capacity and measure against the low bearing capacity, if necessary shall be borne the Contractor.

PROJECT	THE PREPARATORY SURVEY ON THE PROJECT ON ADDITIONAL NEW WATER TREATMENT PLANTS FOR KAMPONG CHAM AND BATTAMBANG WATERWORKS		排水池構造図		DRAWING No B-110
	カンボジア地方上水道拡張整備計画調査		排水池構造図		
DESCRIPTION			Drainage Basin Structure		DATE
APPROVE BY			PREPARED BY		DATE

LOCALITY MAP Scale 1/25,000



バットアンパン配水管路敷設概要図
Location Map for Distribution Pipeline, Battambang

B-D1

PLAN-1 S4/4.000



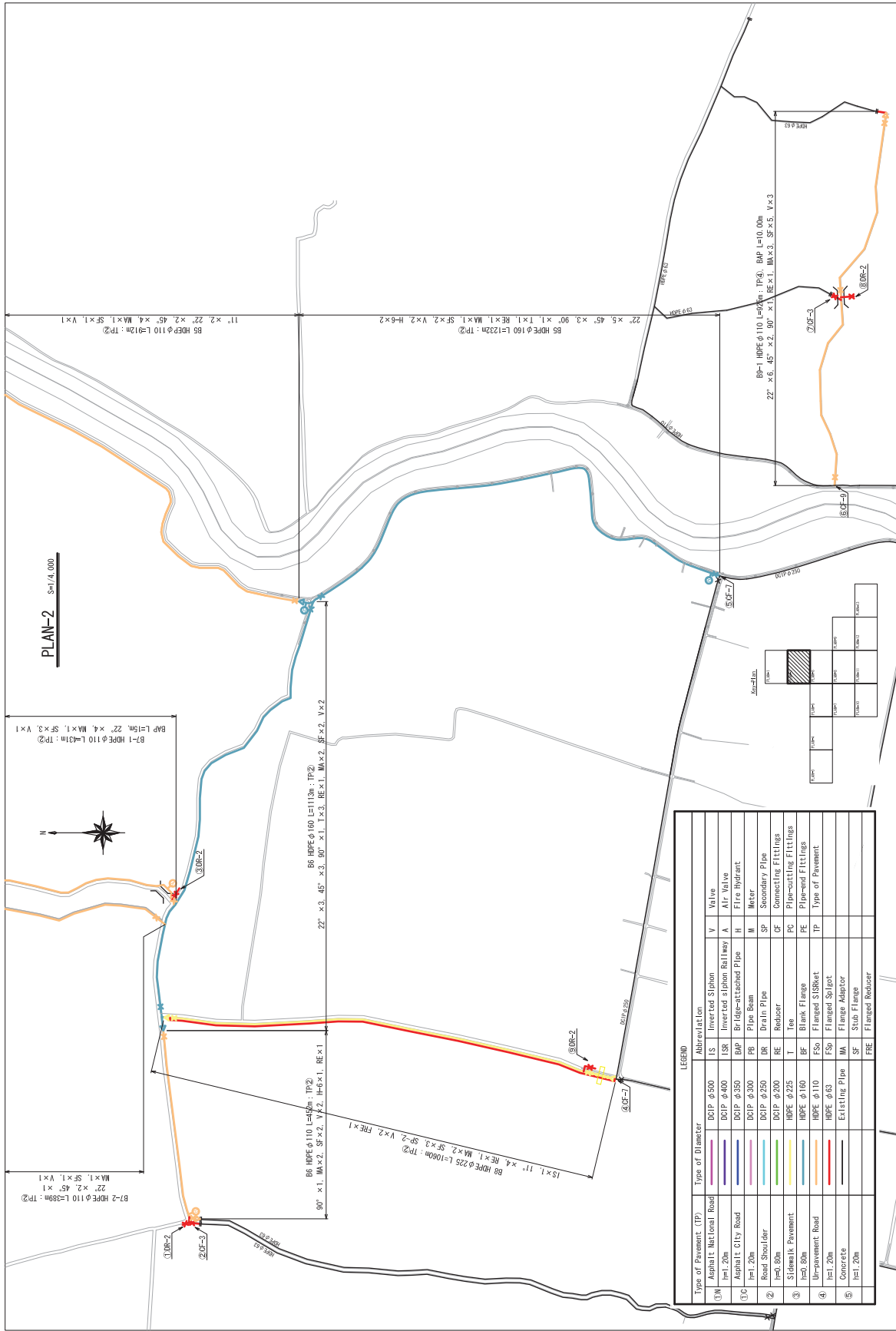
LEGEND

Type of Pavement (TP)	Type of Diameter	Abbreviation
(1) Asphalt National Road H=L 20m	DCP φ500	IS Inverted Siphon
(1) Asphalt City Road H=L 20m	DCP φ400	ISR Inverted siphon Railway
(2) Road Shoulder H=0.80m	DCP φ350	BR Bridge-attached Pipe
(3) Slabwalk Pavement H=0.80m	DCP φ300	PI Pipe Beam
(4) Un-pavement Road H=L 20m	DCP φ250	DR Drain Pipe
(5) Concrete H=L 20m	DCP φ200	RE Reducer
	HDPF φ225	T Tee
	HDPF φ180	PC Blank Flange
	HDPF φ110	FS Flanged S/Socket
	HDPF φ63	FSO Flanged Spigot
	Existing Pipe	MA Flange Manior
		SF Stub Flange
		FRE Flanged Reducer
		V Valve
		A Air Valve
		H Fire Hydrant
		M Meter
		SP Secondary Pipe
		CF Connecting Fittings
		PC Pipe-outline Fittings
		DE Pipe-end Fittings
		TP Type of Pavement



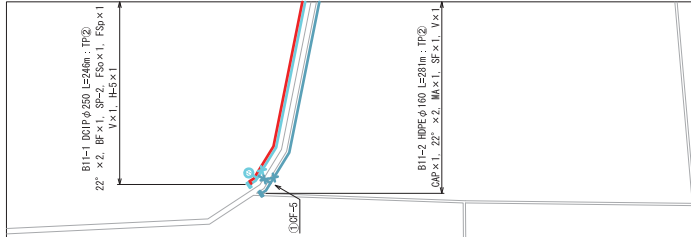
バットンバン配水管路敷設詳細図 (1)
Plan (1) for Distribution Pipeline, Battambang

B-D2



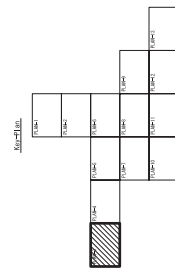
បាត់ដំបង ប្រព័ន្ធបណ្តាញបំពង់បែងចែកទឹក (២)
Plan (2) for Distribution Pipeline, Battambang

PLAN-3 84/4.000



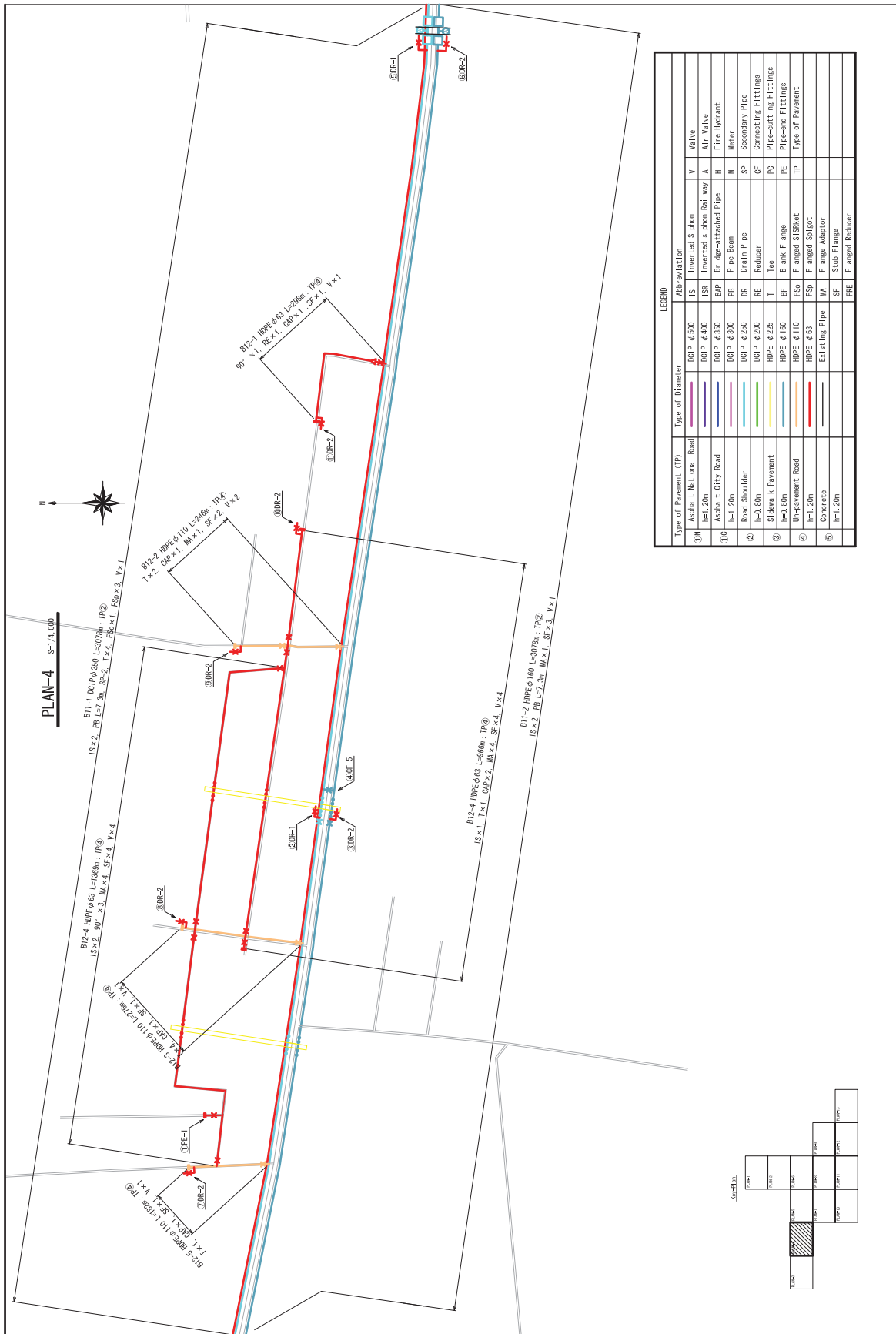
LEGEND

Type of Pavement (TP)	Type of Diameter	Abbreviation
①M Asphalt National Road H=L-20m	DCIP φ500	IS Inverted Siphon
①C Asphalt City Road H=L-20m	DCIP φ400	ISF Inverted siphon Railway
② Road Shoulder H=L-30m	DCIP φ350	BAP Bridge-attached Pipe
③ Street Pavement H=L-30m	DCIP φ300	PR Pipe Beam
④ Unpaved Road H=L-20m	DCIP φ250	DR Drain Pipe
⑤ Concrete H=L-20m	DCIP φ200	RE Reducer
	HDPE φ225	T Tee
	HDPE φ160	BF Blank Flange
	HDPE φ110	F50 Flanged Siphon
	HDPE φ63	F50 Flanged Siphon
	Existing Pipe	MA Flange Adaptor
		SF Stub Flange
		FR Flanged Reducer
		V Valve
		A Air Valve
		H Fire Hydrant
		M Meter
		SP Secondary Pipe
		CF Connecting Fittings
		PF Pipe-end Fittings
		TP Type of Pavement

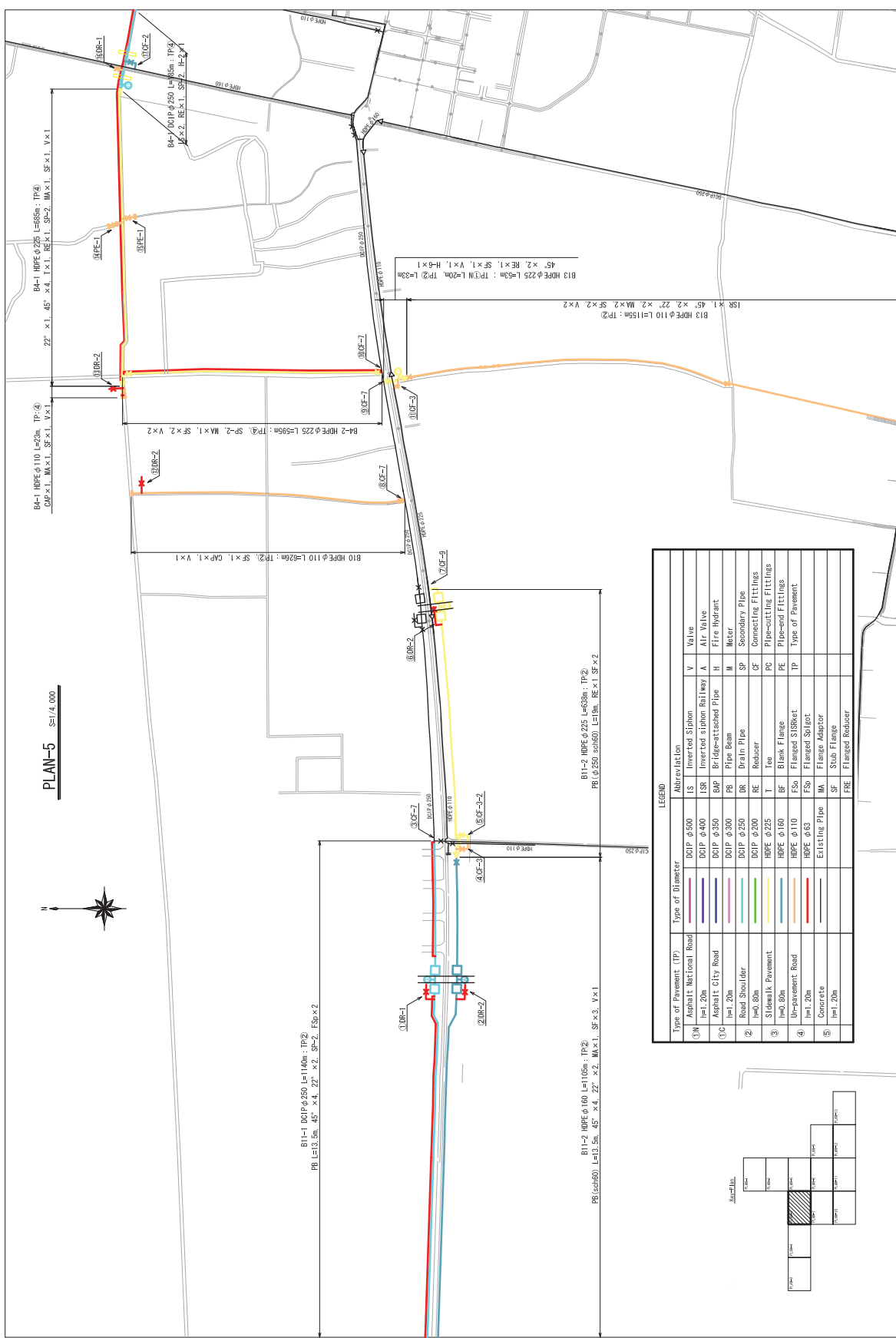


バタンバン配水管路設計詳細図 (3)
Plan (3) for Distribution Pipeline, Battambang

B-D4



Battambang 配水管路敷設詳細図 (4)
 Plan (4) for Distribution Pipeline, Battambang

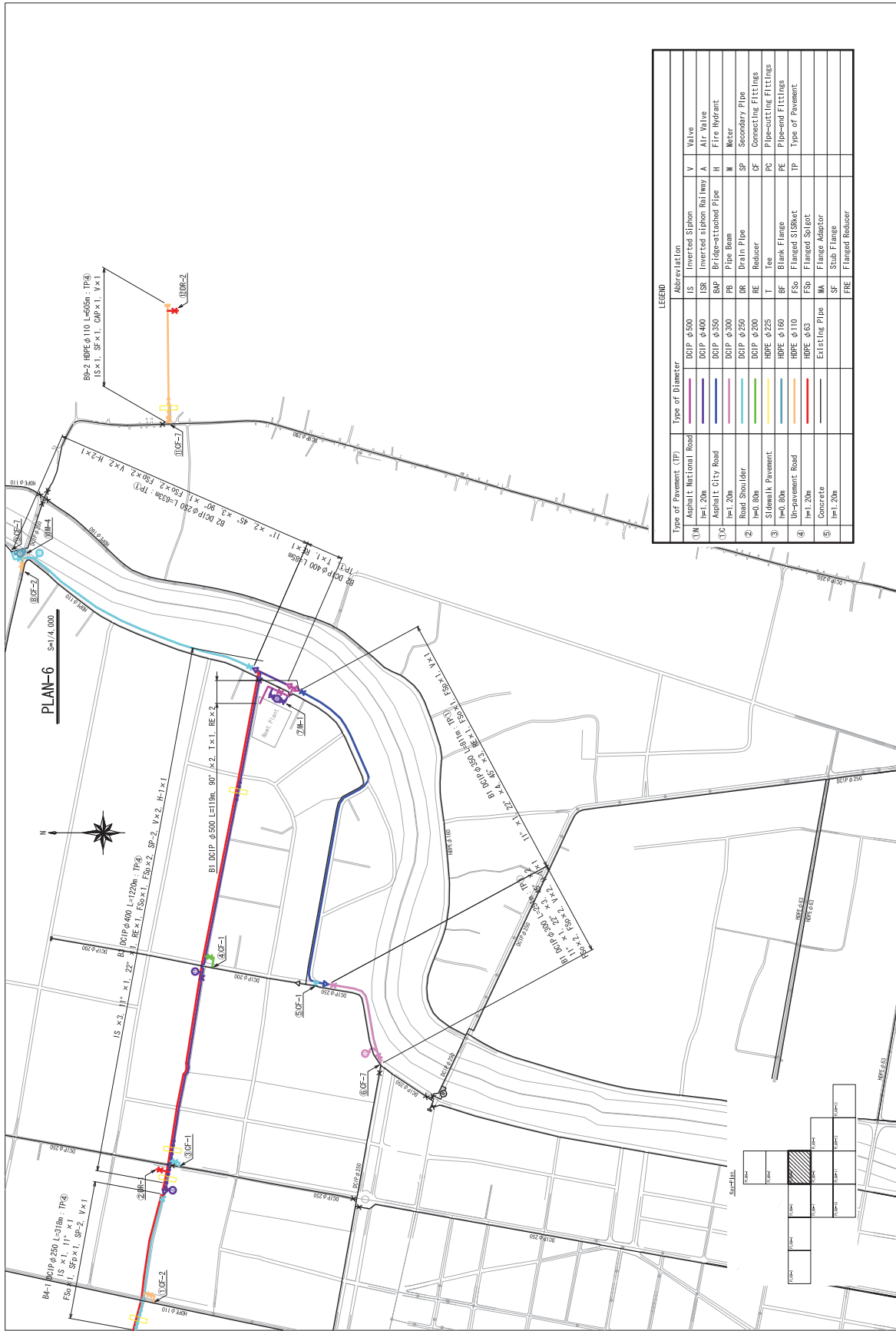


PLAN-5 S=1/4,000

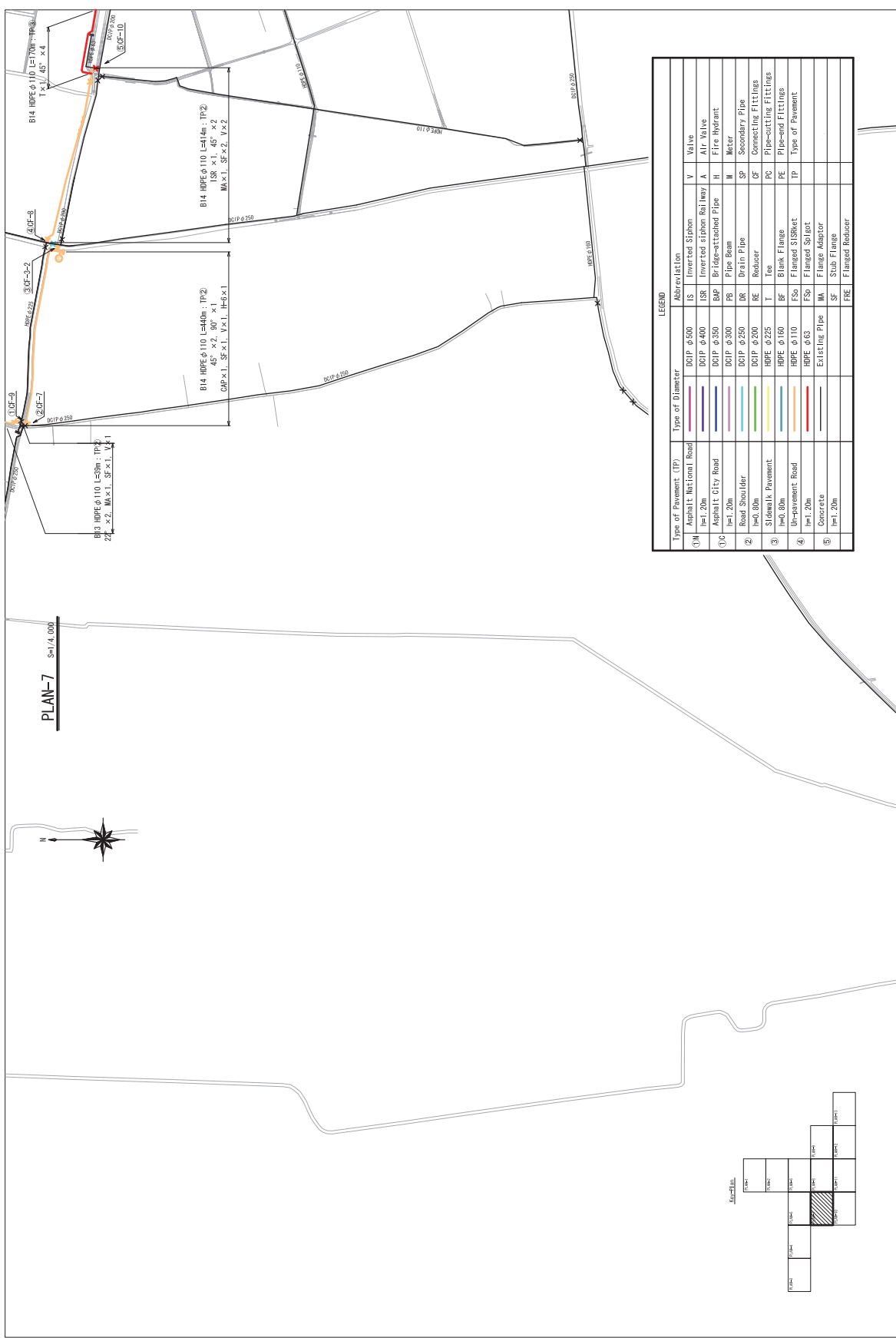
LEGEND

Type of Pavement (TP)	Type of Diameter	Abbreviation	Abbreviation
① Asphalt National Road	DCIP φ500	IS	Inverted Siphon
① Asphalt City Road	DCIP φ400	ISR	Inverted siphon
② Road Shoulder	DCIP φ350	BAP	Bridge-attached Pipe
③ Street Pavement	DCIP φ300	PR	Pipe Ram
④ Un-pavement Road	DCIP φ250	DR	Drain Pipe
⑤ Concrete	DCIP φ200	RE	Reducer
⑥ Asphalt	DCIP φ150	T	tee
⑦ Concrete	DCIP φ100	BF	Blank Flange
⑧ Asphalt	DCIP φ75	FSB	Flanged Siphon
⑨ Concrete	DCIP φ50	FSA	Flanged Siphon
⑩ Asphalt	DCIP φ25	MA	Flange Adaptor
⑪ Concrete	DCIP φ15	SF	Stub Flange
⑫ Asphalt	DCIP φ10	FRE	Flanged Reducer

Battambang 配水管路敷設詳細図 (5)
Plan (5) for Distribution Pipeline, Battambang



バタワンバン配水管路敷設詳細図 (6)
Plan (6) for Distribution Pipeline, Battambang

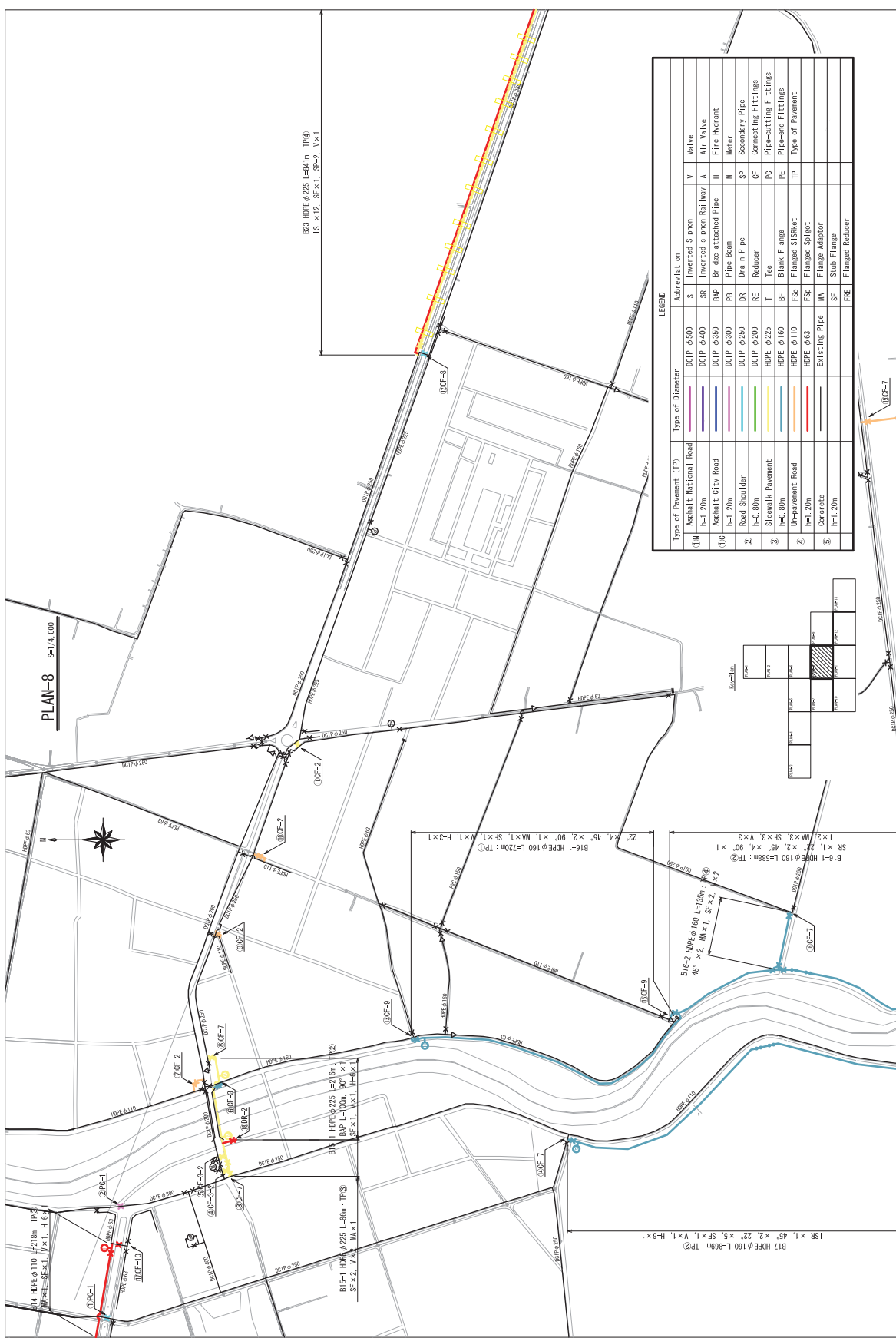


PLAN-7 1/4,000

LEGEND

Type of Pavement (TP)	Type of Diameter	Abbreviation
①A Asphalt National Road =L 20m	DCP φ500	IS Inverted Siphon
①C Asphalt City Road =L 20m	DCP φ400	ISR Inverted Siphon
② Road Shoulder =L 80m	DCP φ350	BR Bridge-attached Pipe
③ Street Pavement =L 30m	DCP φ300	FB Fire Beam
④ Un-pavement Road =L 20m	DCP φ250	DR Drain Pipe
⑤ Concrete	DCP φ200	RE Reducer
	HDPE φ225	OE Connecting Fittings
	HDPE φ160	PE Pipe-end Fittings
	HDPE φ110	FS Flanged Siphon
	HDPE φ63	FS Flanged Siphon
	Existing Pipe	MA Flange Adaptor
		SF Stub Flange
		FRE Flanged Reducer
		V Valve
		A Air Valve
		H Fire Hydrant
		M Meter
		SP Secondary Pipe
		OE Connecting Fittings
		PE Pipe-end Fittings
		TP Type of Pavement

バタワンバン配水管路敷設詳細図 (7)
Plan (7) for Distribution Pipeline, Battambang



LEGEND

Type of Pavement (TP)	Type of Diameter	Abbreviation	Symbol	Abbreviation	Symbol
①M Asphalt National Road	φ150	IS	Inverted Siphon	V	Valve
①C Asphalt City Road	φ400	ISR	Inverted siphon Railway	A	Air Valve
② Road Shoulder	φ350	BAP	Bridge-attached Pipe	H	Fire Hydrant
③ Street Pavement	φ300	PR	Pipe Beam	M	Manhole
④ Un-pavement Road	φ250	DR	Drain Pipe	SC	Secondary Pipe
⑤ Concrete	φ200	RE	Reducer	CP	Connecting Fittings
	φ160	T	Blank Flange	PF	Pipe-end Fittings
	φ110	FSS	Flanged Siphon	TP	Type of Pavement
	φ63	FS	Flange Siphon		
	Existing Pipe	MA	Flange Adaptor		
		SF	Stub Flange		
		FR	Flanged Reducer		

バットアンバン 配水管路敷設詳細図 (8)
Plan (8) for Distribution Pipeline, Battambang

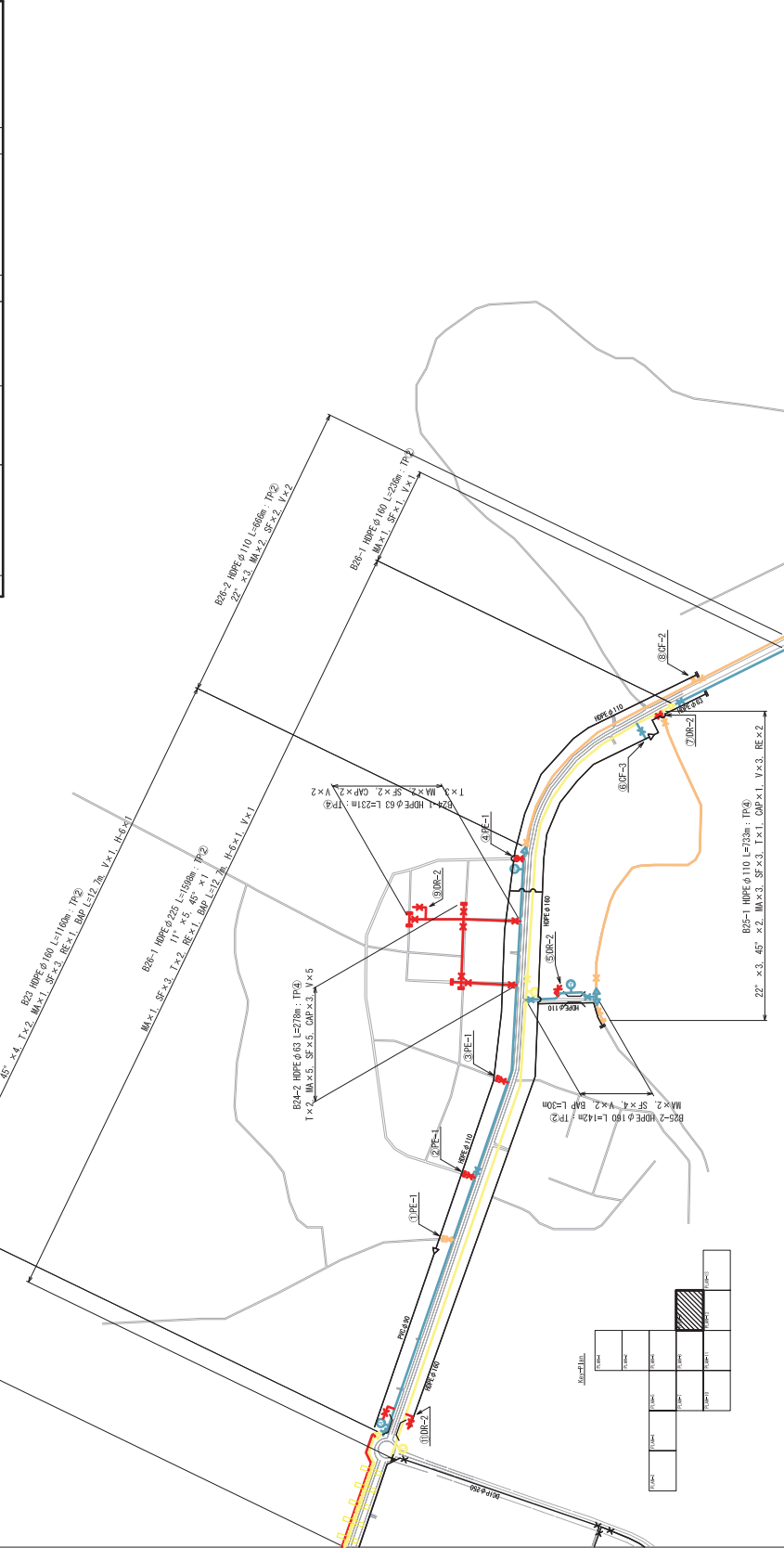
B-D9

PLAN-9 84/4.000



LEGEND

Type of Pavement (TP)	Type of Diameter	Abbreviation
(1) Asphalt National Road =1.20m	DCP φ500	IS Inverted Siphon
(1) Asphalt City Road =1.20m	DCP φ400	ISR Inverted siphon Railway
(2) Road Shoulder =0.80m	DCP φ350	BAP Bridge-attached Pipe
(3) Slabwalk Pavement =0.80m	DCP φ300	PB Pipe Beam
(4) Un-pavement Road =1.20m	DCP φ250	DR Drain Pipe
(5) Concrete =1.20m	DCP φ200	RE Reducer
	HPPE φ225	T Tee
	HPPE φ180	BF Blank Flange
	HPPE φ110	ESG Flanged S/Socket
	HPPE φ63	FSB Flanged Spigot
	Existing Pipe	MA Flange Motor
		SF Stub Flange
		FRE Flanged Reducer
		V Valve
		A Air Valve
		H Fire Hydrant
		M Meter
		SP Secondary Pipe
		PC Pipe-outline Fittings
		DE Pipe-end Fittings
		TP Type of Pavement



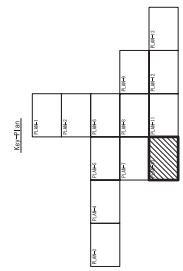
プラン(9)配水管路施設詳細図 (9)
B-D10
Plan (9) for Distribution Pipeline, Battambang



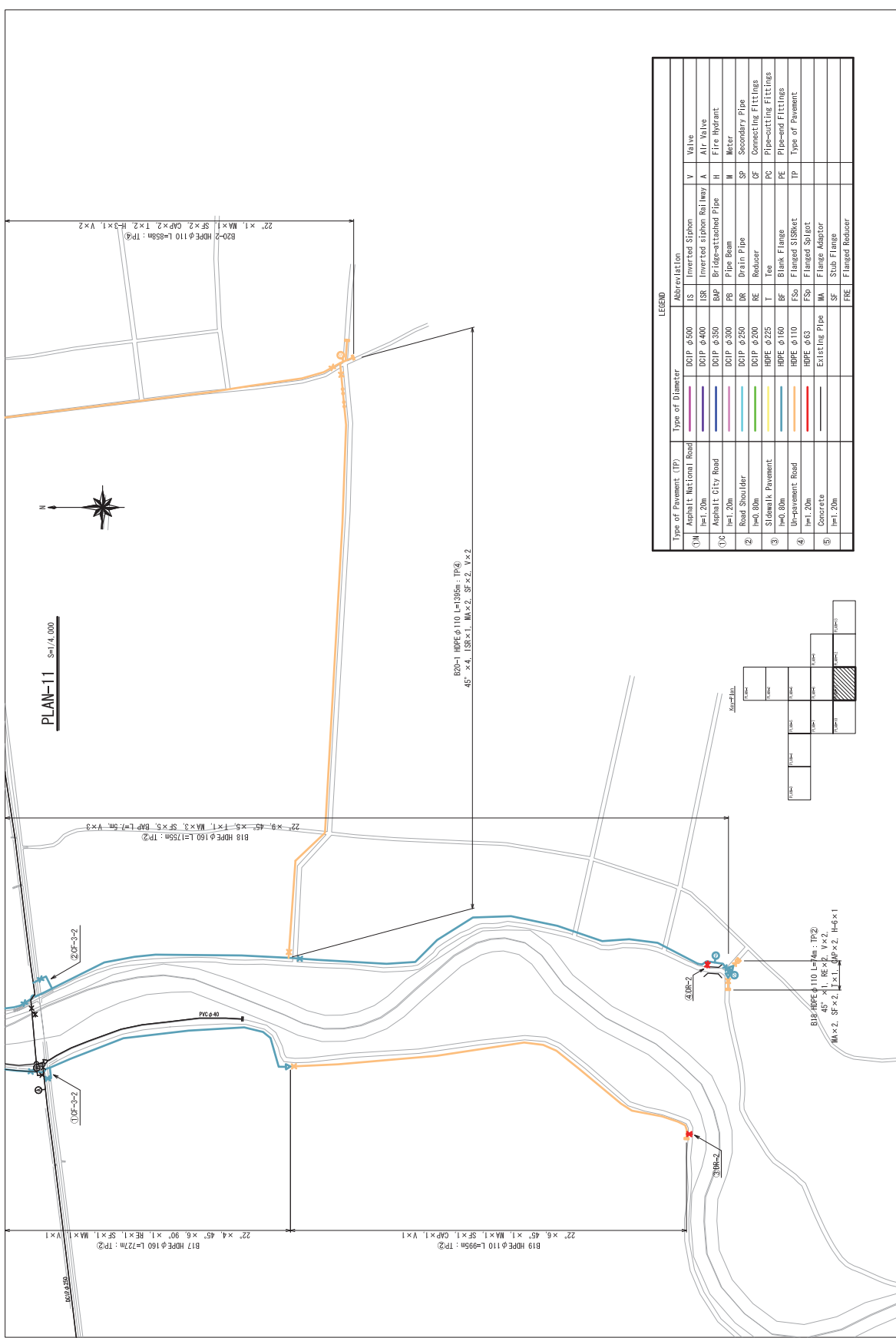
PLAN-10 S=1:4,000

LEGEND

Type of Pavement (TP)	Type of Diameter	Abbreviation	Valve
①A Asphalt National Road =1.20m	DCIP φ500	IS Inverted Siphon	V Valve
	DCIP φ400	ISR Inverted siphon Railway	A Air Valve
①C Asphalt City Road =1.20m	DCIP φ350	BAP Bridge-attached Pipe	H Fire Hydrant
	DCIP φ300	PR Pipe Beam	M Meter
② Road Shoulder =1.80m	DCIP φ250	DR Drain Pipe	SP Secondary Pipe
	DCIP φ200	RE Reducer	CF Connecting Fittings
③ Street Pavement =1.80m	HDPE φ225	T Tee	PC Pipe-socket Fittings
	HDPE φ180	SF Flange	PE Pipe-end Fittings
④ Un-pavement Road =1.20m	HDPE φ110	FSS Flanged Siphon	TP Type of Pavement
	HDPE φ83	FM Flange Manicor	
⑤ Concrete =1.20m	Existing Pipe	MA Flange Manicor	
		SF Sub Flange	
		FRE Flanged Reducer	



B-D11
 បាត់ដំបង ប្រទេស កម្ពុជា
 Plan (10) for Distribution Pipeline, Battambang

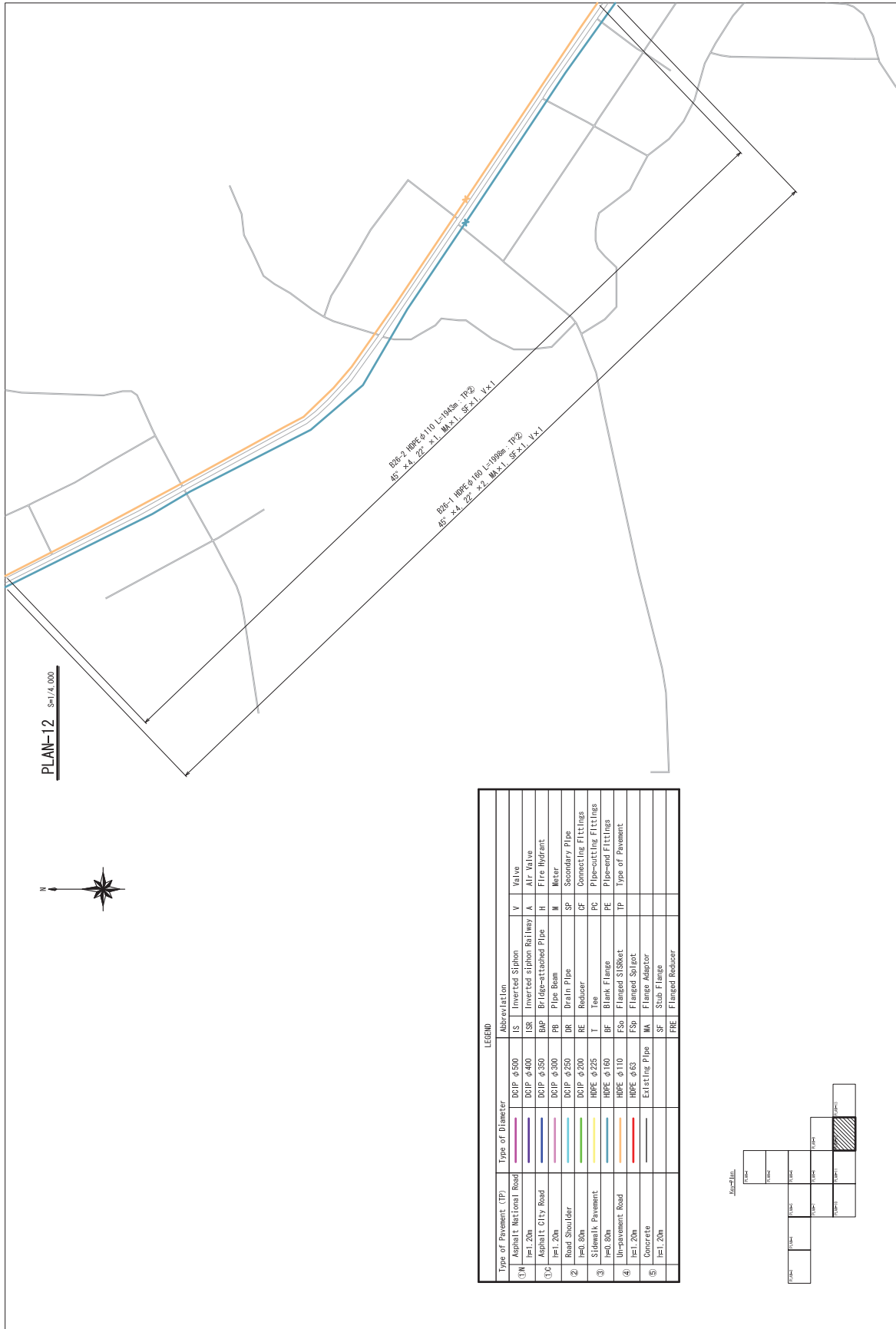


LEGEND

Type of Pavement (TP)	Type of Diameter	Abbreviation	Symbol
①M Asphalt National Road	DCP φ500	IS	Inverted Siphon
①C Asphalt City Road	DCP φ400	ISF	Inverted Siphon
② Road Shoulder	DCP φ350	BAP	Bridge-attached Pipe
③ Street Pavement	DCP φ300	PR	Pipe Beam
④ Un-pavement Road	DCP φ250	DR	Drain Pipe
⑤ Concrete	DCP φ200	RE	Reducer
	DCP φ150	T	Tee
	DCP φ100	Y	Y-junction
	DCP φ75	FS	Flanged Socket
	DCP φ50	MA	Flange Adaptor
	DCP φ30	SF	Stub Flange
	DCP φ15	FR	Flanged Reducer
	DCP φ10	V	Valve
	DCP φ5	A	Air Valve
	DCP φ3	H	Fire Hydrant
	DCP φ2	M	Manhole
	DCP φ1	SP	Secondary Pipe
	DCP φ0.5	CP	Connecting Pipe
	DCP φ0.25	PF	Pipe-end Fittings
	DCP φ0.1	PE	Pipe-end Fittings
	DCP φ0.05	TP	Type of Pavement

បាត់ដំបងបែងចែកបណ្តាញបណ្តាញបណ្តាញបណ្តាញ (1 1)
 Plan (11) for Distribution Pipeline, Battambang

B-D12



PLAN-12 S=1/10,000

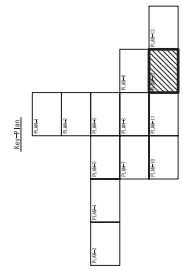


R25-2 HRP-φ110 L=1040m TP②
RS x4 22 x1 Mx1.5φx1 Vx1

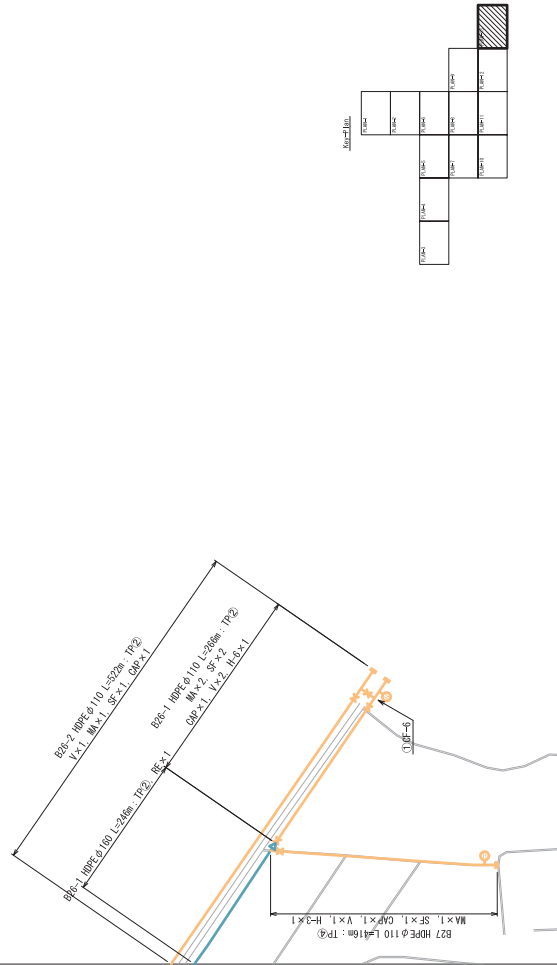
R25-1 HRP-φ100 L=1090m TP②
RS x4 22 x2 Mx1.5φx1 Vx1

LEGEND

Type of Pavement (TP)	Type of Diameter	Abbreviation			
① Asphalt National Road I=1.20m	DCIP φ500	IS	Inverted Siphon	V	Valve
	DCIP φ400	ISR	Inverted siphon Railway	A	Air Valve
② Asphalt City Road I=1.20m	DCIP φ350	BAP	Bridge-attached Pipe	H	Fire Hydrant
	DCIP φ300	PP	Pipe beam	M	Meter
③ Road Shoulder I=0.80m	DCIP φ250	DR	Drain Pipe	SP	Secondary Pipe
	DCIP φ200	RE	Reducer	CF	Connecting Fittings
④ Sidewalk Pavement I=0.80m	HDPPE φ225	T	Tee	PC	Pipe-cutting Fittings
	HDPPE φ180	BF	Blank Flange	PE	Pipe-end Fittings
⑤ Unpaved Road I=1.20m	HDPPE φ110	FSφ	Flanged Socket	TP	Type of Pavement
	HDPPE φ63	FSφ	Flanged Socket		
Concrete I=1.20m	Existing Pipe	MA	Flange Adaptor		
		SF	Sub Flange		
		FRE	Flanged Reducer		



バタマンバン配水管路敷設詳細図 (1.2)
Plan (12) for Distribution Pipeline, Batam, Indonesia



プラン (13) for Distribution Pipeline, Battambang B-D14

7.2 アンケート調査結果

2012年7月中旬に社会調査を実施した。調査は、Kampong Cham 市及び Battambang 市のそれぞれで給水区域、未給水区域において、質問票を用いながらインタビュー形式によって実施された。調査範囲について下図に示す。

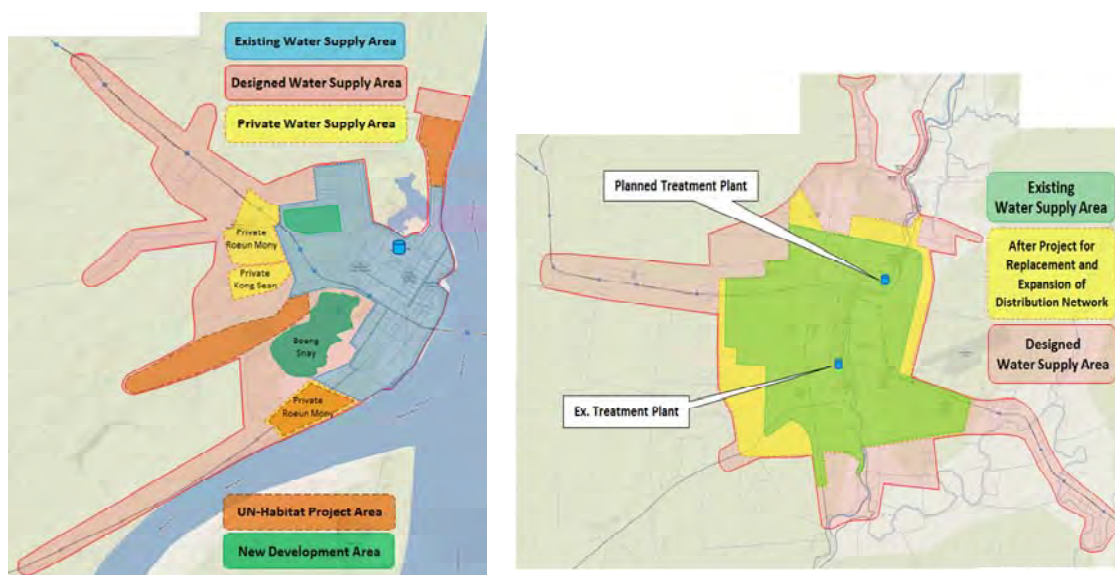


図 7.2-1 住民意識調査範囲図 (Kampong Cham;左、 Battambang ; 右)

尚、当初計画は両市ともに給水区域、未給水区域でそれぞれ 50 サンプル（合計 200 サンプル）を抽出するものであったが、Kampong Cham 市においては、未給水区域の一部で私企業による給水がなされており、一部対象を増やし、結果として未給水区域において 54 世帯を対象に調査を実施した。54 世帯の結果の内、10 世帯については未給水地域に存在するが、上記企業からの給水を受けている世帯である。Battambang 市においては、給水区域 50 世帯、未給水区域 50 世帯について調査を実施した。

7.2.1 コンポンチャムにおける社会調査の概要

(1) 給水区域内の水消費の現状

Kampong Cham 市水道局 (KWW) による給水地域内における、消費の現状について表 7.2-1 に示す。月消費量 10m³ 以下の世帯について低消費世帯、10m³ より多く 25m³ 以下の世帯を中消費世帯、25m³ より多く消費している世帯について多消費世帯としている。50 世帯の平均月消費量は 19.4m³ であった。尚、使用の目的について表 7.2-2 に示す。

表 7.2-1 Kampong Cham 市給水区域内の水利用の現状

水消費	該当世帯数
低消費世帯	11
中消費世帯	28
多消費世帯	11
計	50

表 7.2-2 水利用の目的

給水源目的	回答数 (複数回答あり)	50 世帯中の割合
入浴	49	98.0%
調理	49	98.0%
飲料	49	98.0%
その他	6	12.0%

(2) 未給水地域の水利用の現状

未給水区域の水供給源について下表に記載する。

表 7.2-3 未給水区域の水供給源

給水源	回答数 (複数回答あり)	54 世帯中の割合
企業（給水事業者）による給水	10	18.5%
その他からの購入	16	29.6%
井戸	28	51.9%

(3) 接続、支払い意思

公共上水への接続について、KWW 及び私企業の給水事業者による給水を受けていない 44 世帯に確認したところ、44 世帯中 34 世帯（77.3%）が接続したいと回答した。8 世帯（4.5%）が接続は望まず、2 世帯（18.2%）がよく分からないと回答した。また、水道料金（全支払い額）がいくらであったら接続するかという確認に対する回答を以下に示す。

表 7.2-4 支払い意思

水道料金(1m ³ あたり)	回答世帯数	44 世帯中の割合
1\$~2\$未満	17	38.6%
2\$~5\$未満	10	22.7%
5\$~7\$未満	6	13.6%
実際の価格による	11	25.0%

3.4.2 バッタバンにおける社会調査の概要

(1) 給水区域内の水消費の現状

Battambang 市水道局（BWW）による給水地域内における、消費の現状について表 7.2-5 に

示す。月消費量 10m³ 以下の世帯について低消費世帯、10m³ より多く 25m³ 以下の世帯を中消費世帯、25m³ より多く消費している世帯について多消費世帯としている。50 世帯の平均月消費量は 16m³ であった。尚、使用の目的について表 7.2-6 に示す。

表 7.2-5 Battambang 市給水区域内の水利用の現状

水消費	該当世帯数
低消費世帯	18
中消費世帯	27
多消費世帯	5
計	50

表 7.2-6 水利用の目的

給水源	回答数 (複数回答あり)	50 世帯中の割合
入浴	50	100.0%
調理	49	98.0%
飲料	37	74.0%
その他	3	6.0%

(2) 未給水地域の水利用の現状

未給水区域の水供給源について下表に記載する。

表 7.2-7 未給水区域の水供給源

給水源	回答数 (複数回答あり)	50 世帯中の割合
水路等からの導水	25	50.0%
企業等からの購入	20	40.0%
井戸	5	10.0%

(3) 接続、支払い意思

公共上水への接続について、未給水地域の 50 世帯に確認したところ、50 世帯中 42 世帯 (84.0%) が接続したいと回答した。5 世帯 (10.0%) が接続は望まず、3 世帯 (0.6%) がよく分からないと回答した。また、水道料金 (全支払い額) がいくらであったら接続するかという確認に対する回答を以下に示す。

表 7.2-8 支払い意思

水道料金(1m ³ 当たり)	回答世帯数	50 世帯中の割合
1\$~2\$未満	10	20.0%
2\$~5\$未満	17	34.0%
5\$~7\$未満	6	12.0%
実際の価格による	17	34.0%

7.3 配水管網の水理計算書 (Network Analysis of Distribution System)

(1) コンポンチャム水道局

(1.1) 水理計算概要

本調査の送配水管の管網計算は、EPANET ver2.0 を用い、下記の条件で行った。

- 管水路の流量公式 : ヘーゼン・ウィリアムズ公式
- 流速係数 : 110
- 最小残存水圧 : 50kPa 以上 (表 3.2.2.6-1 参照)
- 時間係数 : 1.72 (表 3.2.2.6-2 参照)

送配水施設計画のための管網計算で特に留意した点は下記のとおりである。

- 残存水頭を確保できるような送配水管口径を確保する。
- 時間最大需要を満足する配水池の容量とする。

水理計算管網モデルを図 7.3-1 に示す。また、管網計算データ及び計算結果を以下に示す。

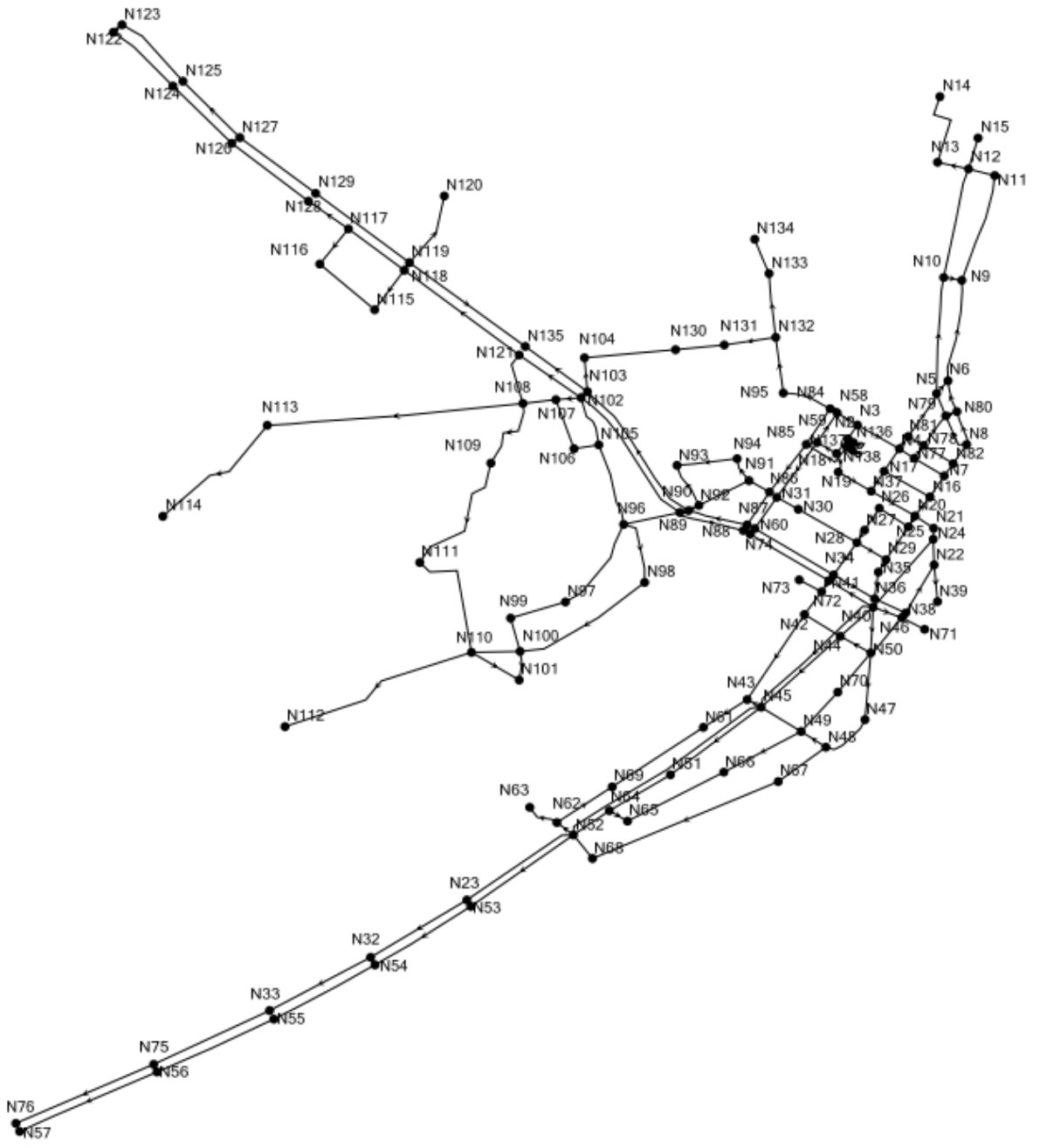


図 7.3-1 管網モデル (コンポンチャム)

(1). 2 節点データ

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 (m ³ /d)	Residual Pressure (m)	
	(m)		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 (m ³ /d)	Residual Pressure (m)	
	(m)		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 管網データ

Link ID	Start Node	End Node	Length (m)	Dia. (mm)	Peak Demand		Average Demand	
	ID	ID			Flow	Velocity	Flow	Velocity
					(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 (m)	Dia. (mm)	Peak Demand		Average Demand	
	ID	ID			Flow	Velocity	Flow	Velocity
					(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 (m)	Dia. (mm)	Peak Demand		Average Demand	
	ID	ID			Flow	Velocity	Flow	Velocity
					(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 (m)	Dia. (mm)	Peak Demand		Average Demand	
	ID	ID			Flow	Velocity	Flow	Velocity
					(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 配水池/高架水槽水位データ

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) バッタバン水道局

(2.1) 水理計算概要

本調査の送配水管の管網計算は、EPANET ver2.0 を用い、下記の条件で行った。

- 管水路の流量公式 : ヘーゼン・ウィリアムズ公式
- 流速係数 : 110
- 最小残存水圧 : 50kPa 以上 (表 3.2.2.6-1 参照)
- 時間係数 : 1.65 (表 3.2.2.6-2 参照)

送配水施設計画のための管網計算で特に留意した点は下記のとおりである。

- 残存水頭を確保できるような送配水管口径を確保する。
- 時間最大需要を満足する配水池の容量とする。

水理計算管網モデルを図 7.3-2 に示す。また、管網計算データ及び計算結果を以下に示す。



図 7.3-2 管網モデル (バタンバン)

(2).2 節点データ

Node ID	Elevation	Base Demand (m ³ /d)	Residual Pressure (m)	
	(m)		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 管網データ

Link ID	Start Node	End Node	Length (m)	Dia. (mm)	Peak Demand		Average Demand	
	ID	ID			Flow	Velocity	Flow	Velocity
					(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 (m)	Dia. (mm)	Peak Demand		Average Demand	
	ID	ID			Flow	Velocity	Flow	Velocity
					(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 (m)	Dia. (mm)	Peak Demand		Average Demand	
	ID	ID			Flow	Velocity	Flow	Velocity
					(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
					(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
					(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 配水池/高架水槽水位データ

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