

**JAPAN INTERNATIONAL COOPERATION AGENCY  
MINISTRY OF INDUSTRY, MINES AND ENERGY  
PHNOM PENH WATER SUPPLY AUTHORITY**

**THE STUDY  
ON  
THE MASTER PLAN  
OF  
GREATER PHNOM PENH WATER SUPPLY  
(PHASE 2)  
IN  
THE KINGDOM OF CAMBODIA**

**FINAL REPORT**

**VOLUME III**

**SUPPORTING REPORT  
PART B**

**FEBRUARY 2006**

**NJS CONSULTANTS CO., LTD.  
CTI ENGINEERING INTERNATIONAL CO., LTD.**

# Supporting Report Part B

## Supporting Report – 14 Drawings

<u>No.</u>	<u>Drawing Name</u>
<b>I.</b>	<b>General</b>
I-1	Base Map of The Study Area
I-2	Zone Map
I-3	Monitoring Map
<b>II.</b>	<b>Chrouy Changva Water Treatment Plant</b>
II-1	General Lay Out
II-2	WTP Process Hydraulic Profile
II-3	Intake Tower
II-4	Receiving Well
II-5	Flocculation Basin, Sedimentation Tank
II-6	Filter
II-7	Distribution Reservoir A
II-8	Distribution Reservoir B
II-9	Clear Water Pump Station
<b>III.</b>	<b>Transmission/Distribution Systems</b>
III-1	Prey Pring Choeung Loop – 1
III-2	Prey Pring Choeung Loop – 2
III-3	Prey Pring Choeung Loop – 3
III-4	Prey Pring Choeung Loop – 4
III-5	Prey Pring Choeung Loop – 5
III-6	Prey Pring Choeung Loop – 6
III-7	Samraong Kraom Branch – 1
III-8	Samraong Kraom Branch – 2
III-9	Samraong Kraom Branch – 3
III-10	Ruessei Kaev Loop – 1
III-11	Ruessei Kaev Loop – 2
III-12	Ruessei Kaev Loop – 3
III-13	Ruessei Kaev Loop – 4
III-14	Ruessei Kaev Loop – 5
III-15	Ruessei Kaev Loop – 6
III-16	Ruessei Kaev Loop – 7
III-17	Ruessei Kaev Loop – 8
III-18	Ruessei Kaev Loop – 9
III-19	Ruessei Kaev Loop – 10
III-20	Ruessei Kaev Loop – 11
III-21	Ruessei Kaev Loop – 12
III-22	Ruessei Kaev Loop – 13
III-23	Ruessei Kaev Loop – 14
III-24	Preak Leap Branch – 1
III-25	Preak Leap Branch – 2
III-26	Preak Leap Branch – 3
III-27	Kien Svay Branch – 1

III-28	Kien Svay Branch – 2
III-29	Ta Khmau Branch – 1
III-30	Ta Khmau Branch – 2
III-31	Ta Khmau Branch – 3
III-32	Ta Khmau Branch – 1
III-33	Dangkao Branch – 1
III-34	Dangkao Branch – 2
III-35	Main Trunk from Chrouy Changva WTP – 1
III-36	Main Trunk from Chrouy Changva WTP – 2

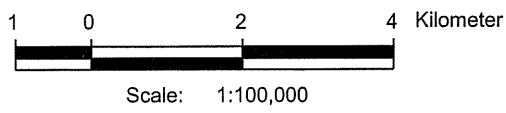
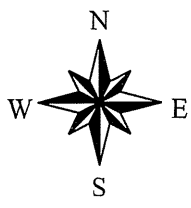
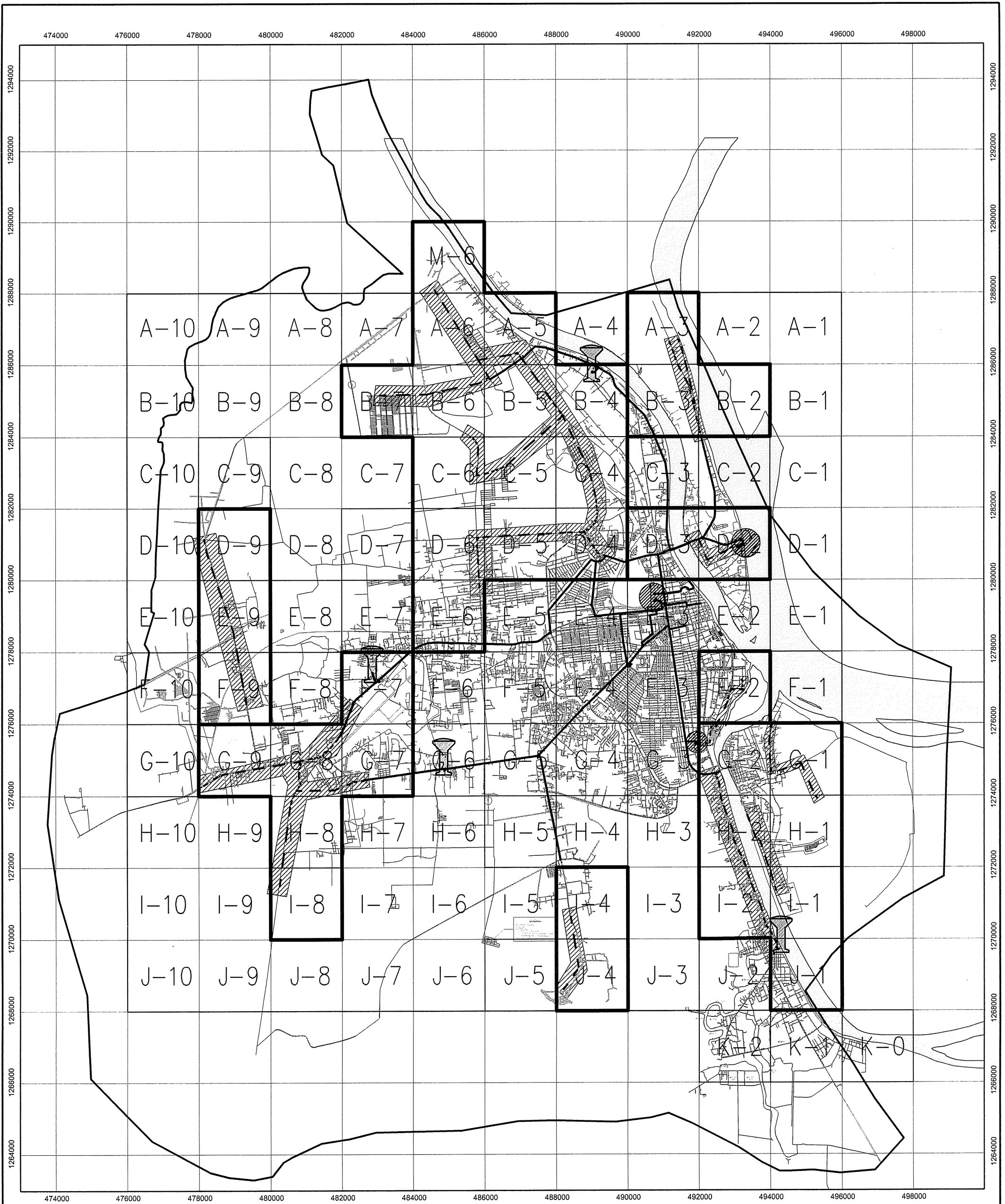
**IV. Other**

IV-1	Plant Lay Out of Airport Water Tank
IV-2	Plant Lay Out of Chaom Chau Water Tank
IV-3	Plant Lay Out of Ta Khmau Water Tank
IV-4	Hydraulic Profile of Ta Khmau Branch
IV-5	Typical of Pipe Trench
IV-6	Typical of Bridge, Culvert, and Railway Crossing

## LIST OF DRAWING

No.	Drawing Name
<b>I.</b>	<b>General</b>
I-1	Base Map of The Study Area
I-2	Zone Map
I-3	Monitoring Map
<b>II.</b>	<b>Chrouy Changva Water Treatment Plant</b>
II-1	General Lay Out
II-2	WTP Process Hydraulic Profile
II-3	Intake Tower
II-4	Receiving Well
II-5	Flocculation Basin, Sedimentation Tank
II-6	Filter
II-7	Distribution Reservoir A
II-8	Distribution Reservoir B
II-9	Clear Water Pump Station
<b>III.</b>	<b>Transmission/Distribution Systems</b>
III-1	Prey Pring Choeung Loop - 1
III-2	Prey Pring Choeung Loop - 2
III-3	Prey Pring Choeung Loop - 3
III-4	Prey Pring Choeung Loop - 4
III-5	Prey Pring Choeung Loop - 5
III-6	Prey Pring Choeung Loop - 6
III-7	Samraong Kraom Branch - 1
III-8	Samraong Kraom Branch - 2
III-9	Samraong Kraom Branch - 3
III-10	Ruessei Kaev Loop - 1
III-11	Ruessei Kaev Loop - 2
III-12	Ruessei Kaev Loop - 3
III-13	Ruessei Kaev Loop - 4

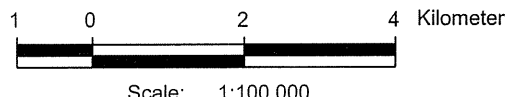
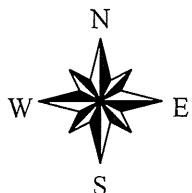
No.	Drawing Name
III-14	Ruessei Kaev Loop - 5
III-15	Ruessei Kaev Loop - 6
III-16	Ruessei Kaev Loop - 7
III-17	Ruessei Kaev Loop - 8
III-18	Ruessei Kaev Loop - 9
III-19	Ruessei Kaev Loop - 10
III-20	Ruessei Kaev Loop - 11
III-21	Ruessei Kaev Loop - 12
III-22	Ruessei Kaev Loop - 13
III-23	Ruessei Kaev Loop - 14
III-24	Preak Lieb Branch - 1
III-25	Preak Lieb Branch - 2
III-26	Preak Lieb Branch - 3
III-27	Kien Svay Branch - 1
III-28	Kien Svay Branch - 2
III-29	Ta Khmau Branch - 1
III-30	Ta Khmau Branch - 2
III-31	Ta Khmau Branch - 3
III-32	Ta Khmau Branch - 4
III-33	Dangkao Branch - 1
III-34	Dangkao Branch - 2
III-35	Main Trunk from Chrouy Changva WTP - 1
III-36	Main Trunk from Chrouy Changva WTP - 2
<b>IV.</b>	<b>Other</b>
IV-1	Lay Out of Airport Water Tank
IV-2	Lay Out of Chaom Chau Water Tank
IV-3	Lay Out of Ta Khmau Water Tank
IV-4	Hydraulic Profile of Ta Khmau Branch
IV-5	Typical of Pipe Trench
IV-6	Typical of Bridge, Culvert, and Railway Crossing



The Study on the Master Plan of Greater Phnom Penh Water Supply  
(Phase 2) in the Kingdom of Cambodia

Base Map of The Study Area

DRAWING  
No.: I-1

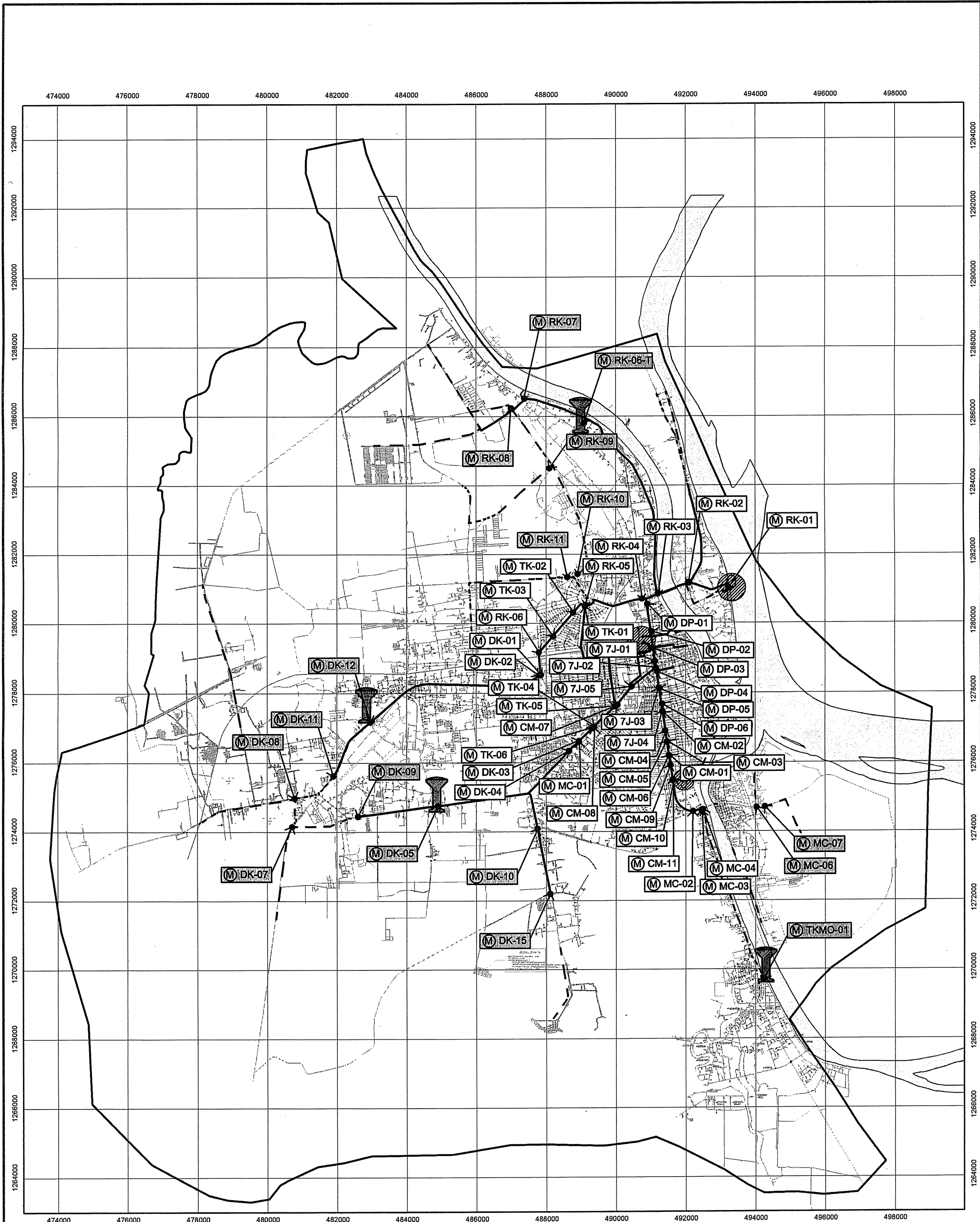


Scale: 1:100,000

The Study on the Master Plan of Greater Phnom Penh Water Supply  
(Phase 2) in the Kingdom of Cambodia

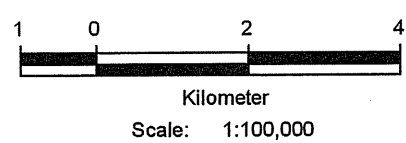
**Zone Map**

DRAWING  
No.: I-2



Note : Monitoring stations shall be reviewed based on the current transmission/distribution pipeline extension works.

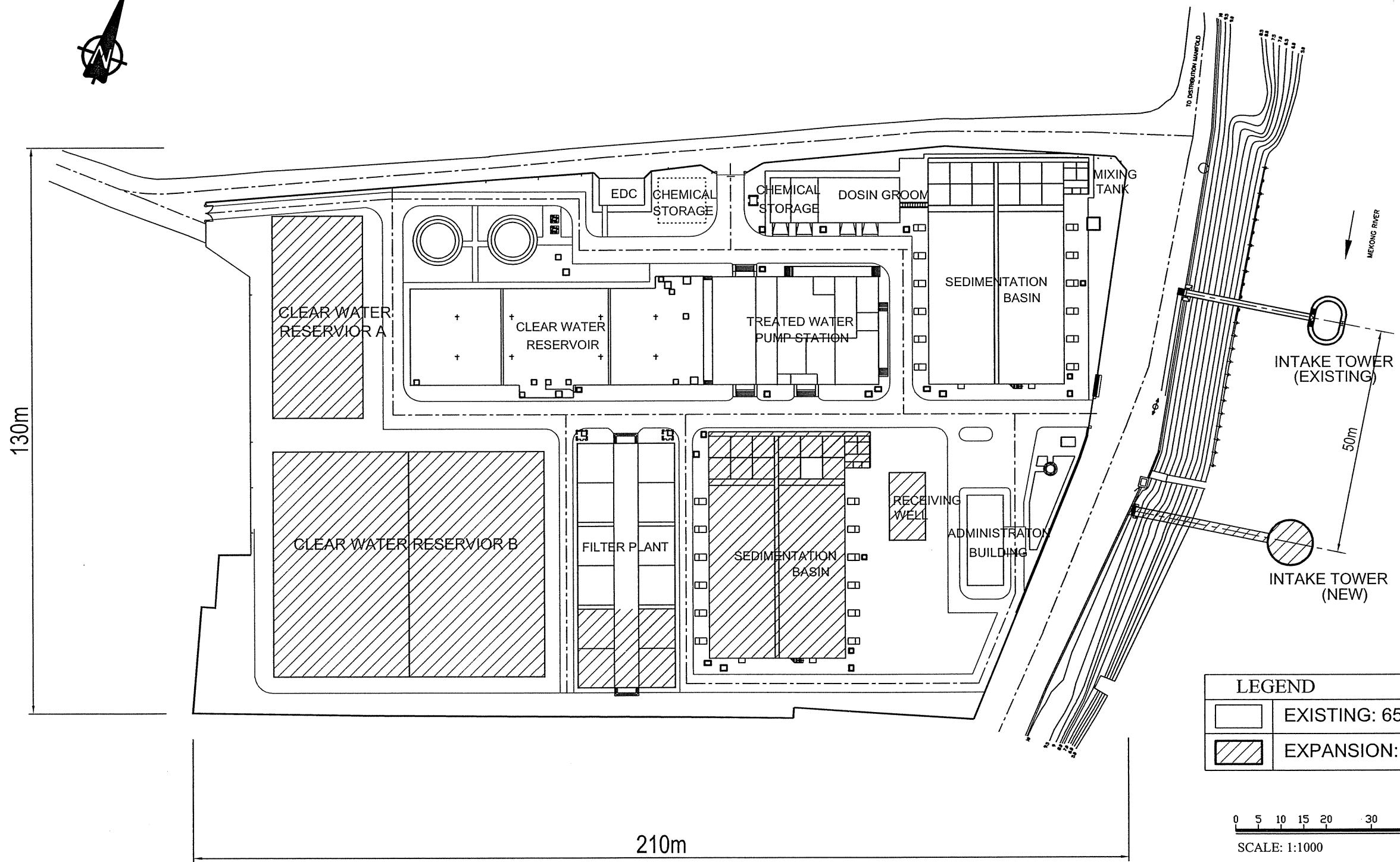
LEGEND		
	Existing Telemeter	42
	Monitoring station to be reviewed for 2010	17
	<b>Total</b>	<b>59</b>



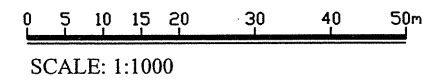
The Study on the Master Plan of Greater Phnom Penh Water Supply  
(Phase 2) in the Kingdom of Cambodia

**Monitoring Map**

DRAWING No. : I-3



LEGEND	
	EXISTING: 65,000m <sup>3</sup> /day
	EXPANSION: 65,000m <sup>3</sup> /day

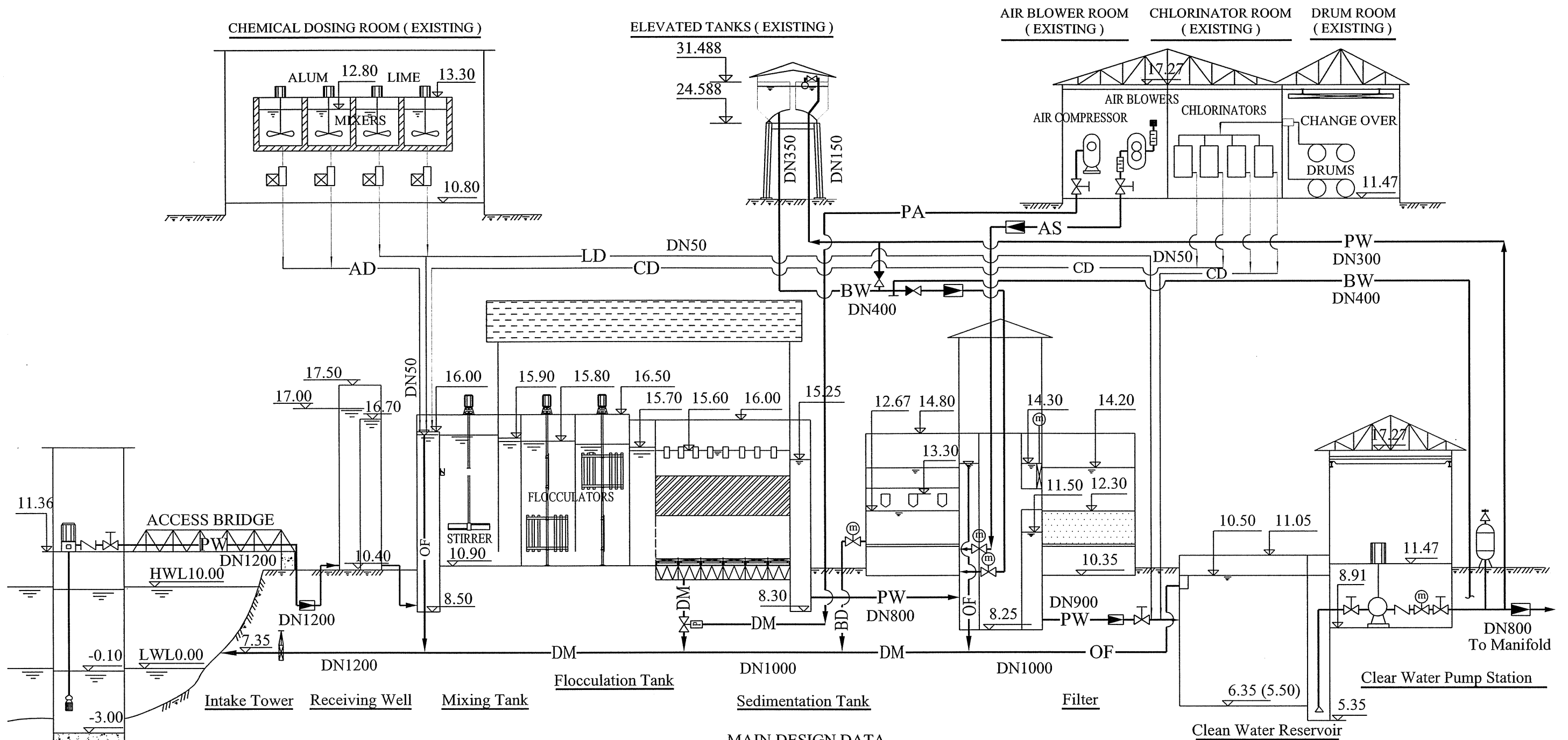


GENERAL LAYOUT OF CHROUY CHANGVA WTP

The Study on the Master Plan of Greater Phnom Penh Water Supply  
(Phase 2) in the Kingdom of Cambodia

CHROUY CHANGVA WATER TREATMENT PLANT STAGE 2 General Layout	DRAWING No.: II-1
--	----------------------





**MAIN DESIGN DATA**

**INTAKE TOWER:**  
Capacity:  $Q=1422 \text{ m}^3/\text{h}$ ,  $H=20.50 \text{ m}$ .  
Pumps: New 5 sets,  
mixed flow type.

**MIXING TANK:**  
Mixing Tank No. : Existing 2  
New 2  
Capacity:  $Q=1422 \text{ m}^3/\text{h}$ .  
Stirrers: 4 sets,  $N=4.0 \text{ kw}$ ,  
 $n=34.20 \text{ rpm}$   
Velocity Gradient:  $G=280 \text{ S}^{-1}$ .

**FLOCCULATION TANK:**  
Flocculating Tank No. : Existing 2  
New 2  
Hydraulic Capacity:  $Q=1422 \text{ m}^3/\text{h}$ ,  
Velocity Gradient:  $G=60 - 30 \text{ S}^{-1}$ .  
Flocculators : 12 sets,  $N=1.1 \text{ kw}$ ,  $n=3.35 \text{ rpm}$ ;  
12 sets,  $N=0.75 \text{ kw}$ ,  $n=2.64 \text{ rpm}$ .

**SEDIMENTATION TANK:**  
Sedimentation Tank No. : Existing 2  
New 2  
Hydraulic Capacity:  $Q=1422 \text{ m}^3/\text{h}$ ,  
Rising Velocity:  $V_u=3 \text{ m/h}$ .  
Sludge Scraper: 6 sets,  $N=0.75 \text{ kw}$ ,  
 $V=0.768 \text{ m/min.}$

**FILTER PLANT:**  
Filter Cell No. : Existing 8  
New 4  
Capacity:  $Q=474 \text{ m}^3/\text{h}$ ,  $V=8.22 \text{ m/h}$ .  
Backwash Rate:  $14.40 \text{ m}^3/\text{h m}^2$ .  
Air scour rate:  $54.00 \text{ m}^3/\text{h m}^2$ .

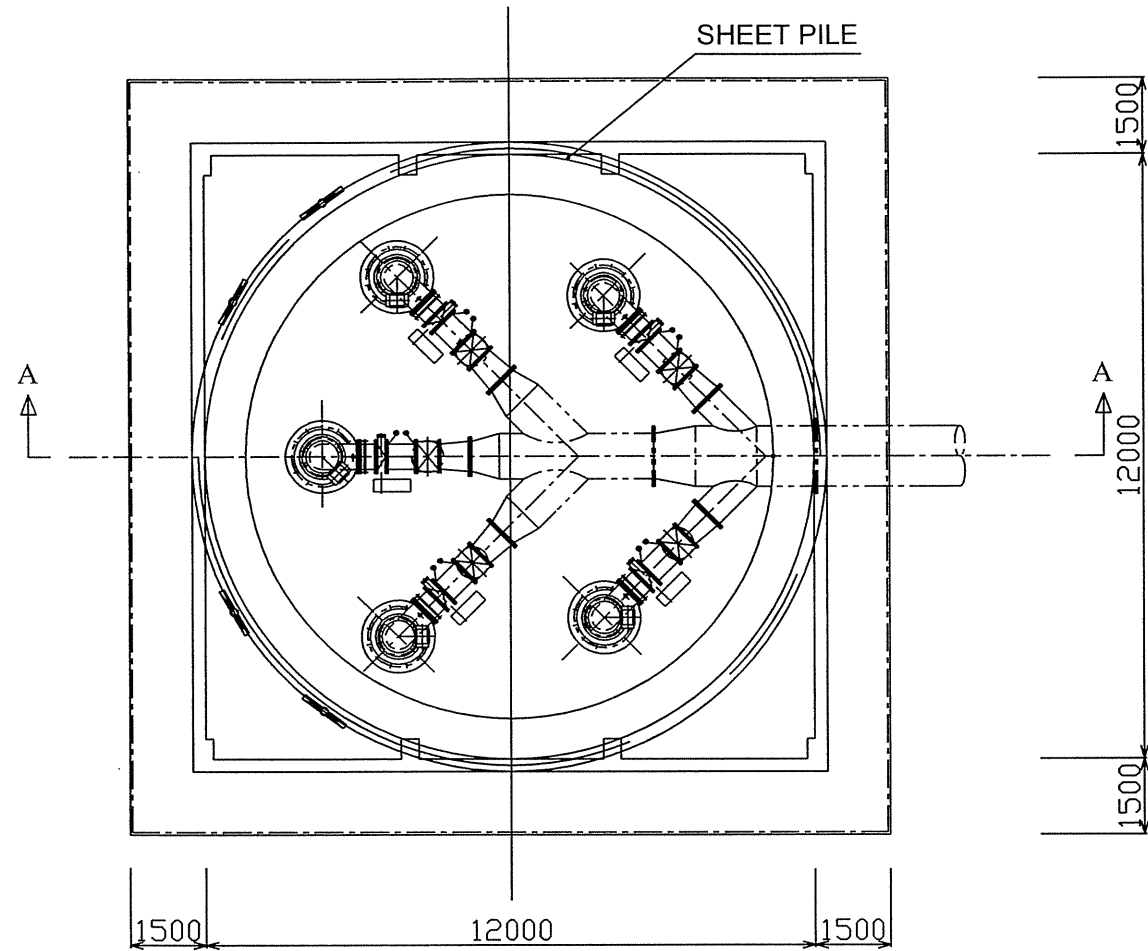
**RESERVOIR:**  
Reservoir No. : Existing 2  
New 3  
Total Volume:  $25000 \text{ m}^3$ .

**CLEAR PUMP STATION :**  
Capacity:  $Q=1445 \text{ m}^3/\text{h}$ ,  $H=55.0 \text{ m}$ .  
Pumps: Existing 3 New 5,  
centrifugal vertical type.

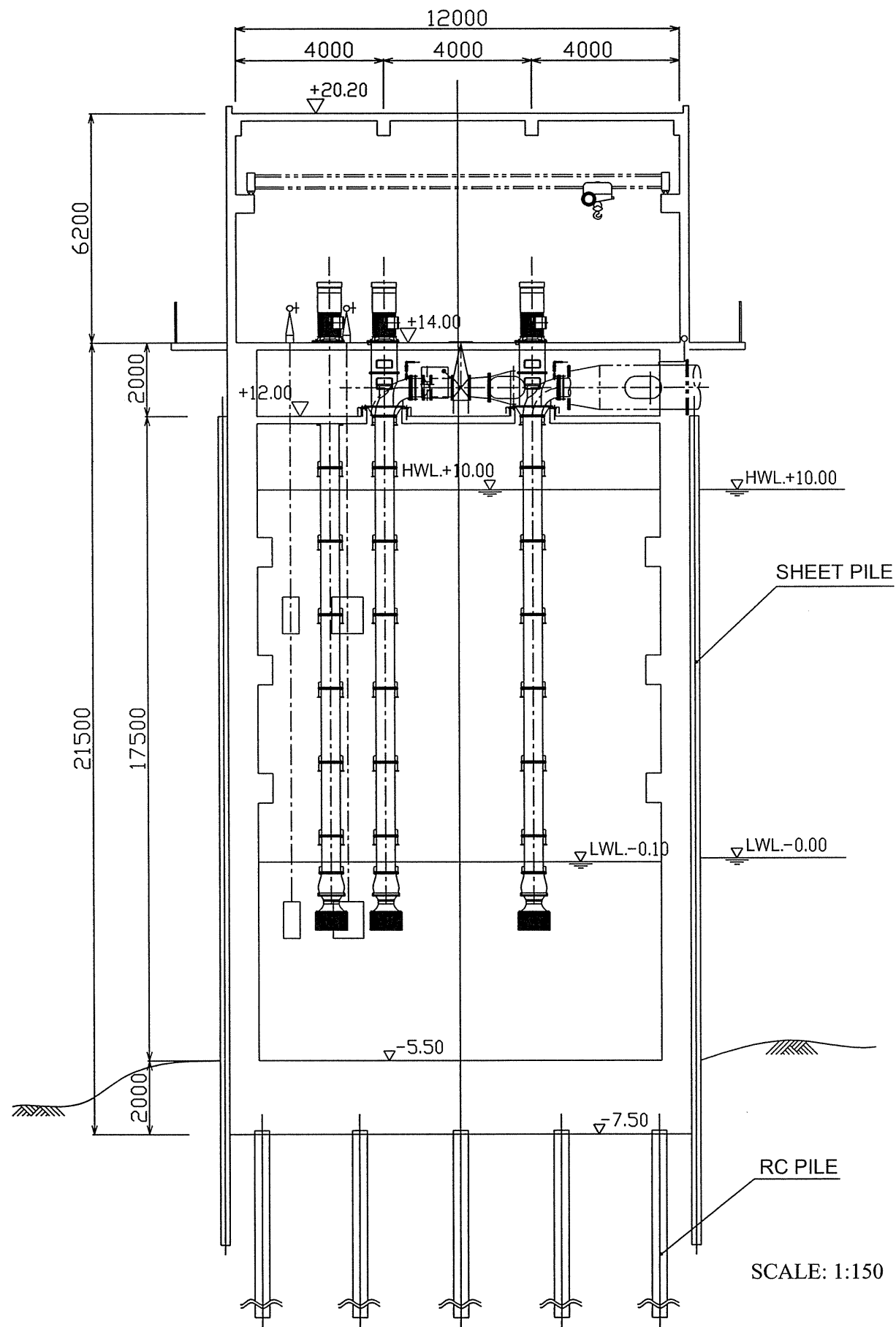
**Legend :**

- |      |                      |      |                            |   |                   |
|------|----------------------|------|----------------------------|---|-------------------|
| —PW— | Process Water Main   | —AD— | Alum Dosing Pipe           | ⊗ | Air Blower        |
| —BW— | Backwash Main        | —LD— | Lime Dosing Pipe           | ⊗ | Air Compressor    |
| —AS— | Air Scour Pipe       | —LD— | Pressure Air Pipe          | ⊗ | Metering Pump     |
| —BD— | Backwash Drain       | ⊗    | Raw Water Pump             | ⊗ | Electric Penstock |
| —OF— | Over Flow Pipe       | ⊗    | Flow Meter                 | ⊗ | Float Valve       |
| —DM— | Drain Main           | ⊗    | Manual Valve               | ⊗ | Manual Penstock   |
| —CD— | Chlorine Dosing Pipe | ⊗    | Pressure Reduce Valve      | ⊗ | Surge Tank        |
|      |                      | ⊗    | Treated Water Pump         | ⊗ |                   |
|      |                      | ⊗    | Electric Valve             | ⊗ |                   |
|      |                      | ⊗    | Check Valve                | ⊗ |                   |
|      |                      | ⊗    | Pneumatic Knife Gate Valve | ⊗ |                   |

**Note :**  
1. Elevation in meter, pipe in millimeter.



PLAN

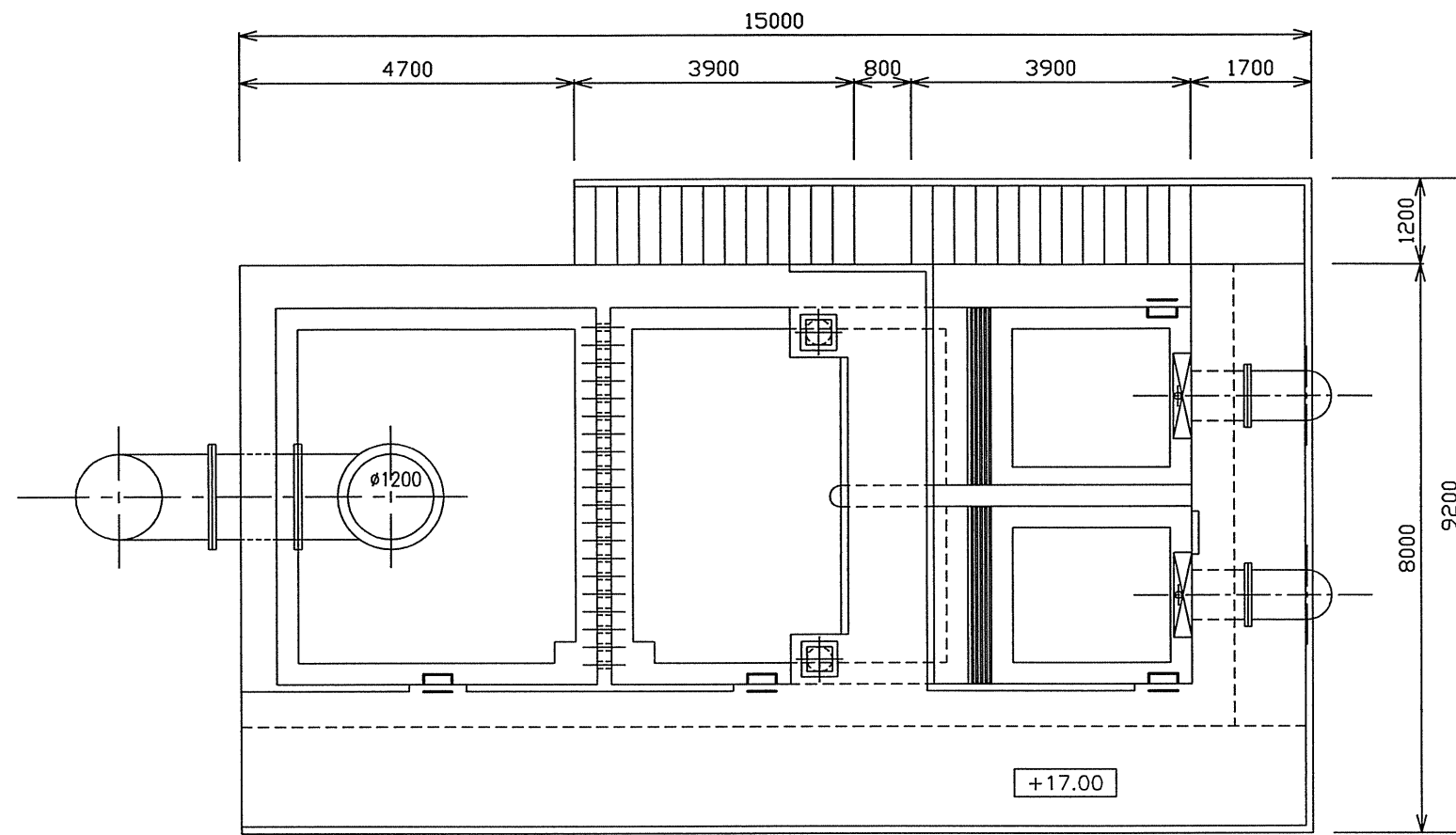


SECTION A-A

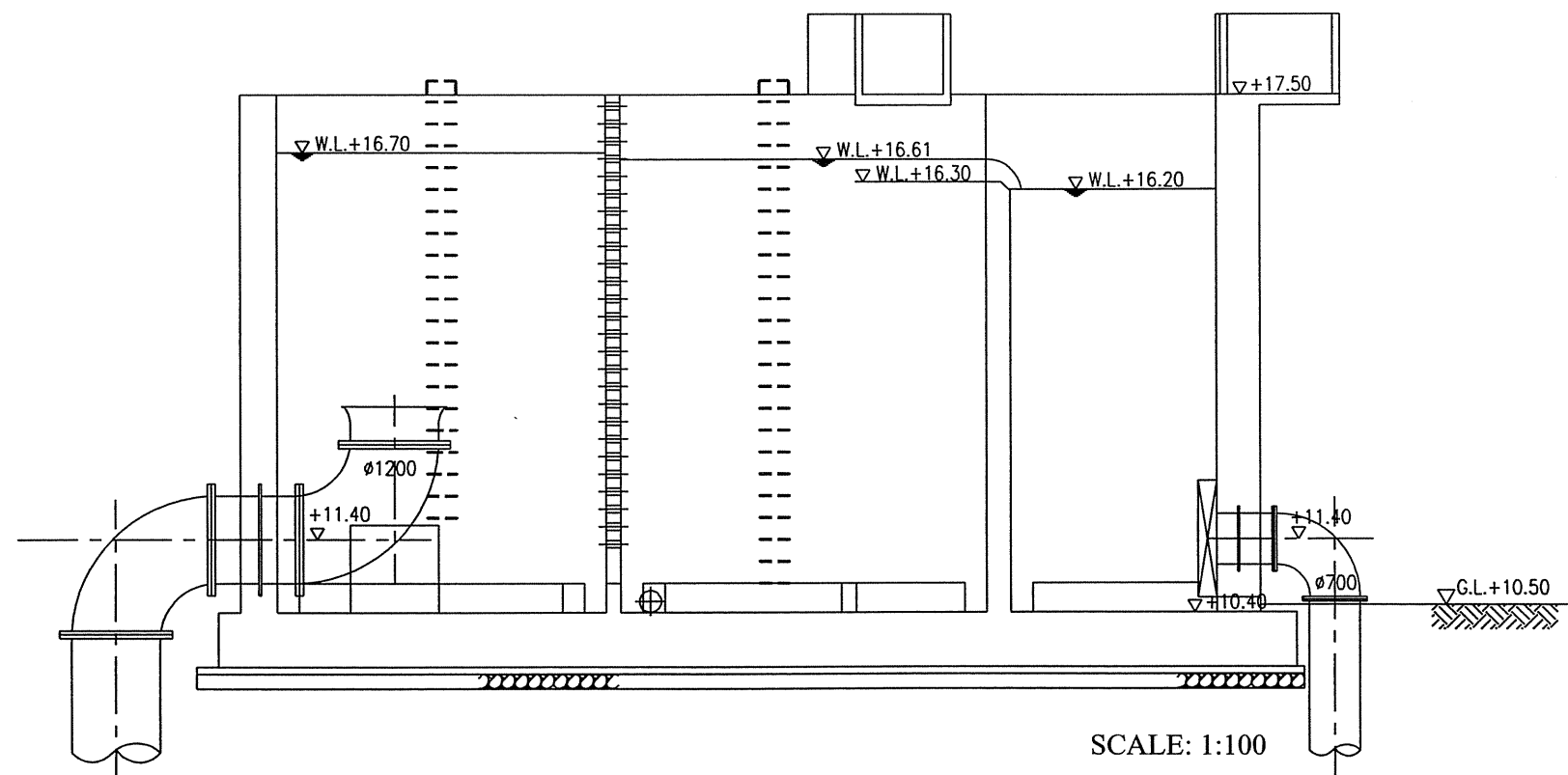
The Study on the Master Plan of Greater Phnom Penh Water Supply  
(Phase 2) in the Kingdom of Cambodia

CHROY CHANGVA WATER TREATMENT PLANT STAGE 2  
Intake Tower

DRAWING  
No.: II-3



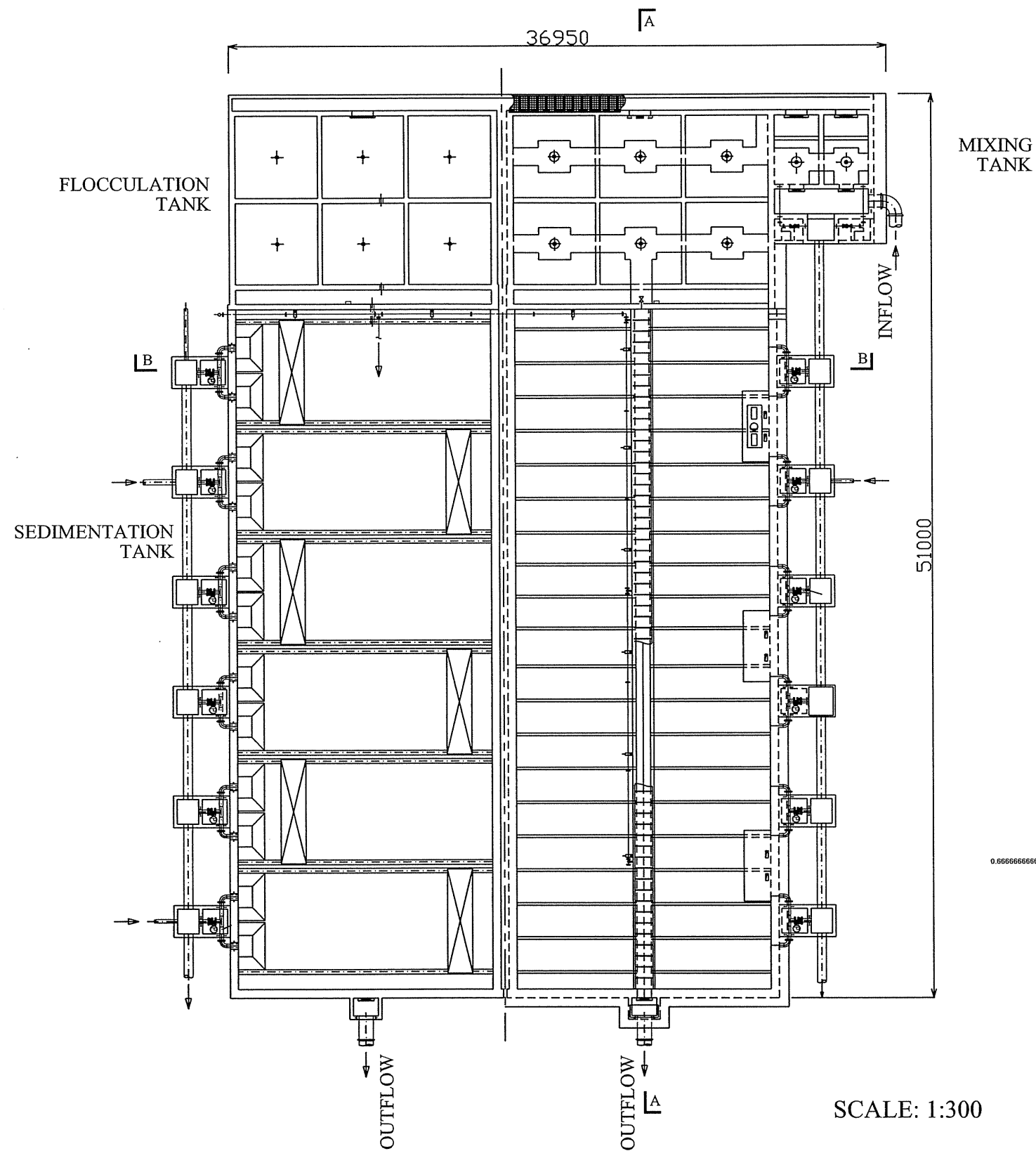
PLAN



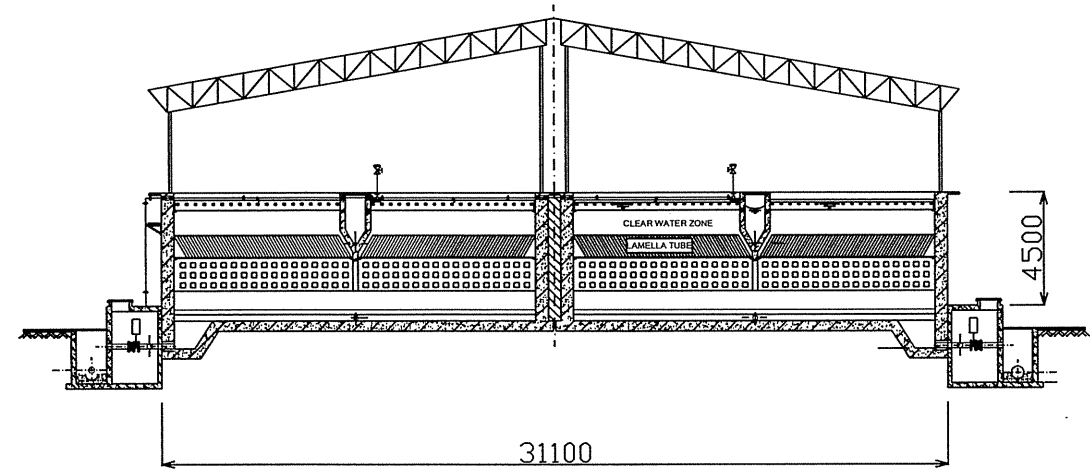
SCALE: 1:100

SECTION A-A

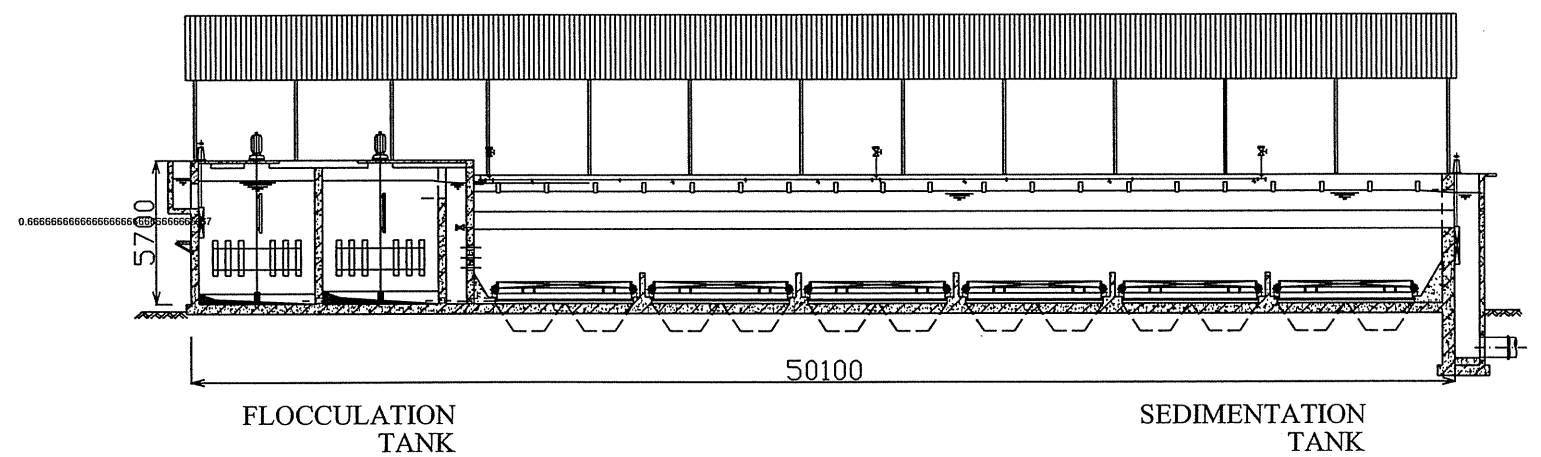
The Study on the Master Plan of Greater Phnom Penh Water Supply (Phase 2) in the Kingdom of Cambodia	
CHROUY CHANGVA WATER TREATMENT PLANT STAGE 2 Receiving Well	DRAWING No.: II-4



GENERAL PLAN



SECTION B-B

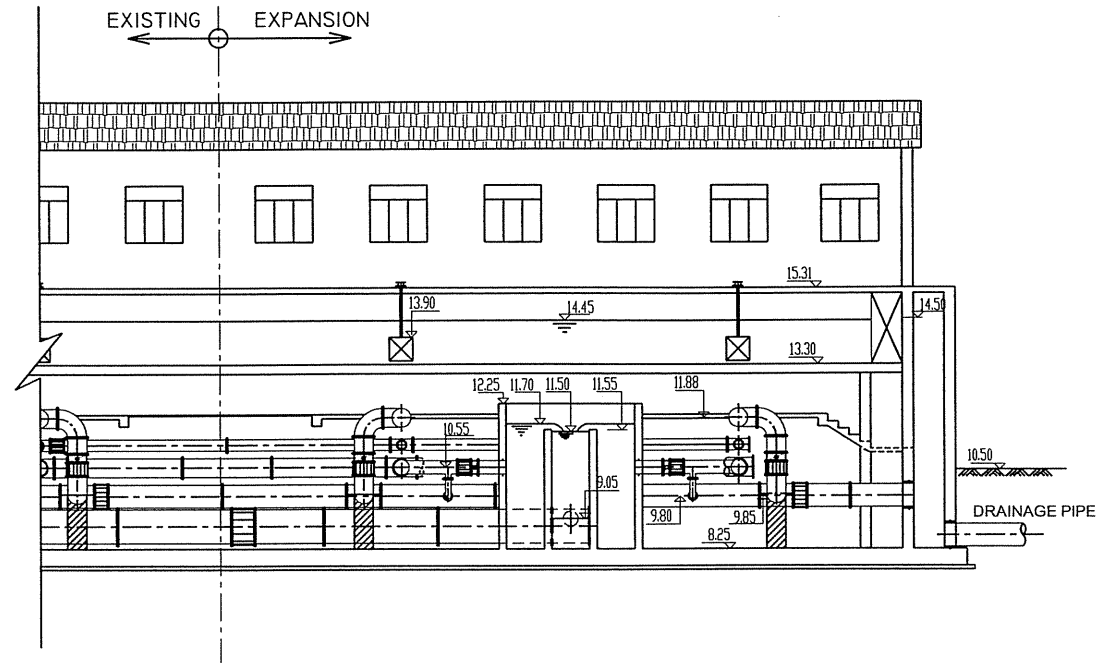


SECTION A-A

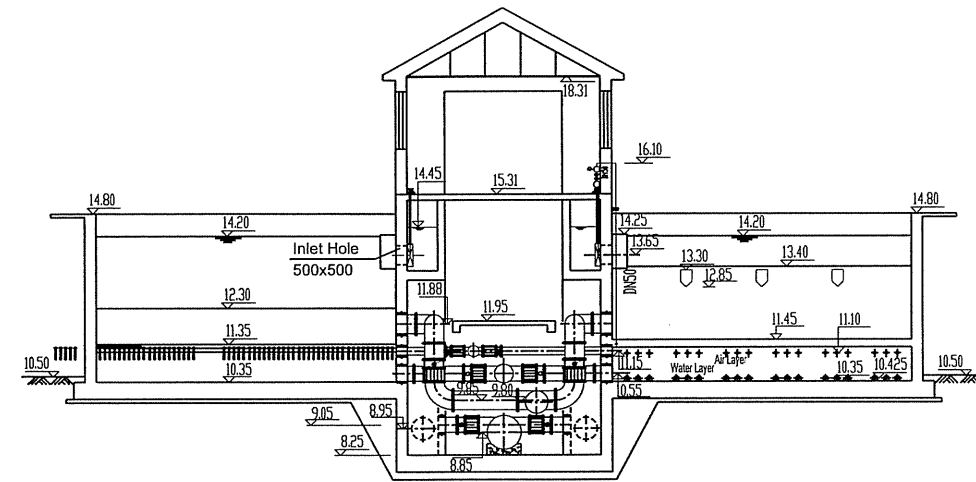
The Study on the Master Plan of Greater Phnom Penh Water Supply  
(Phase 2) in the Kingdom of Cambodia

CHROUY CHANGVA WATER TREATMENT PLANT STAGE 2  
Flocculation Basin, Sedimentation Tank

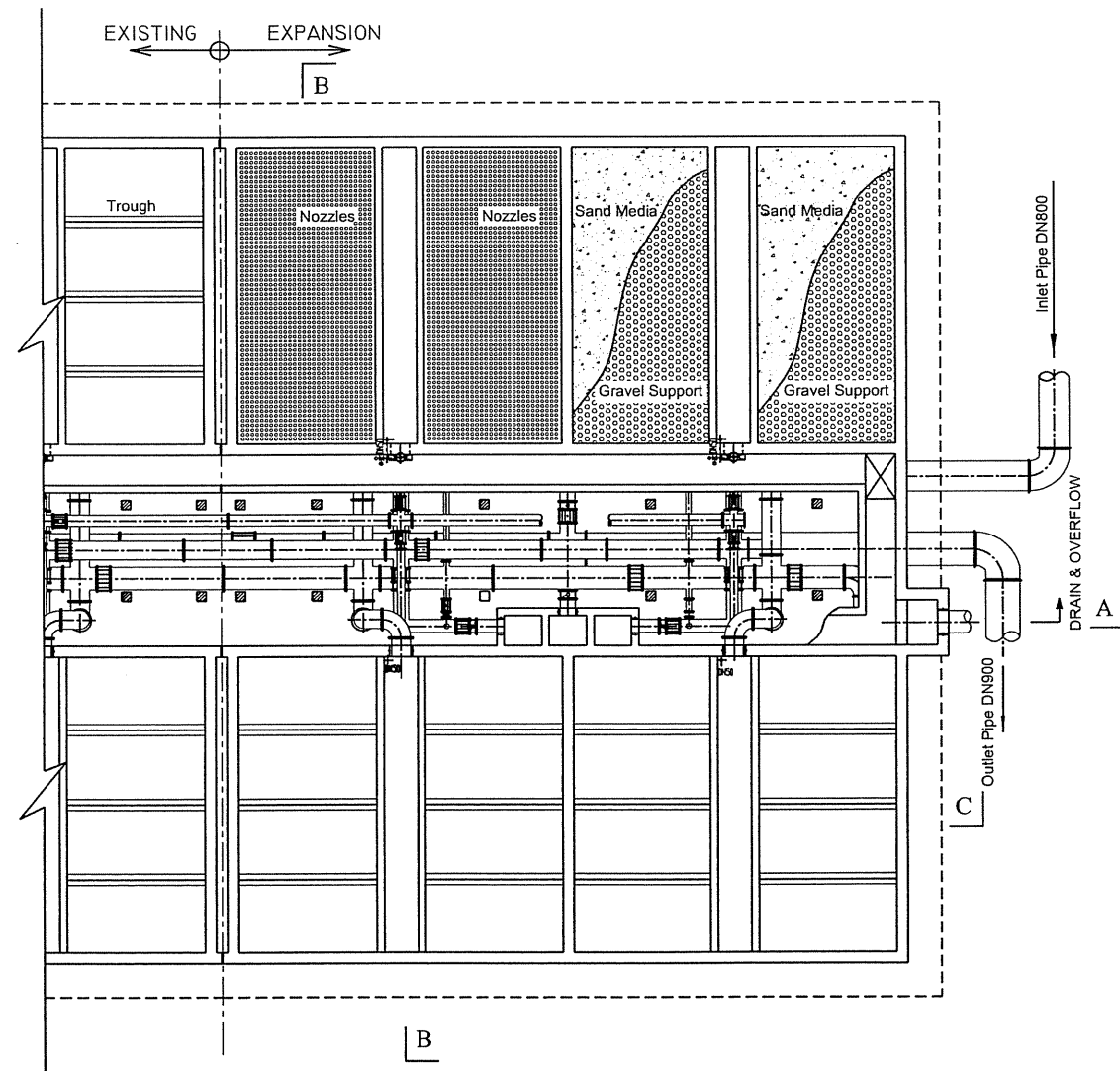
DRAWING  
No.: II-5



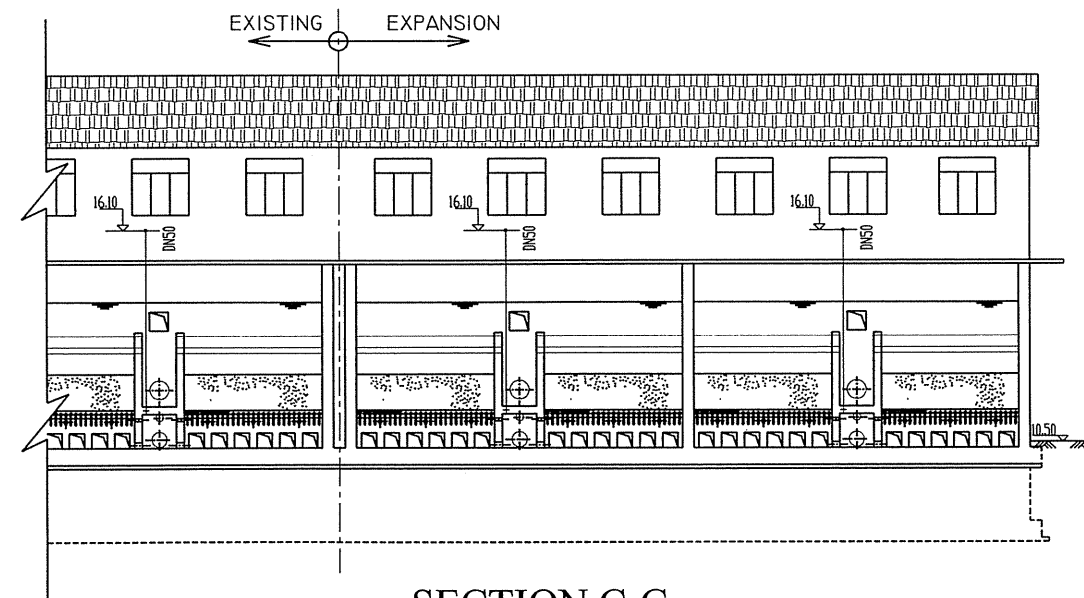
SECTION A-A



SECTION B-B



PLAN



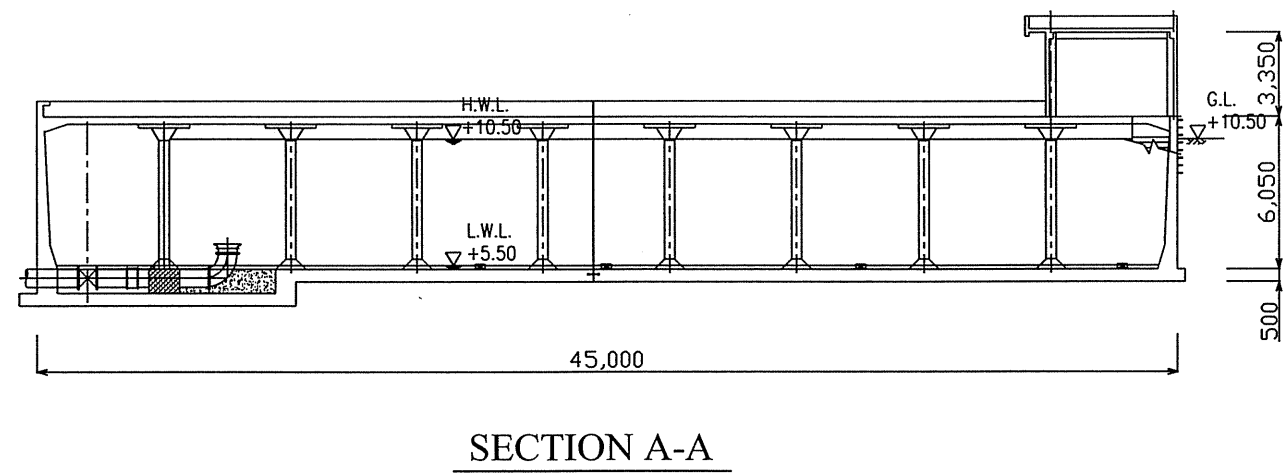
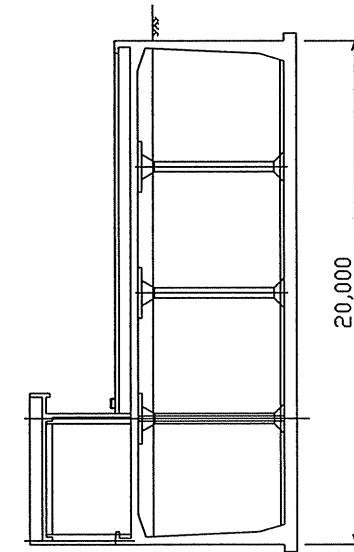
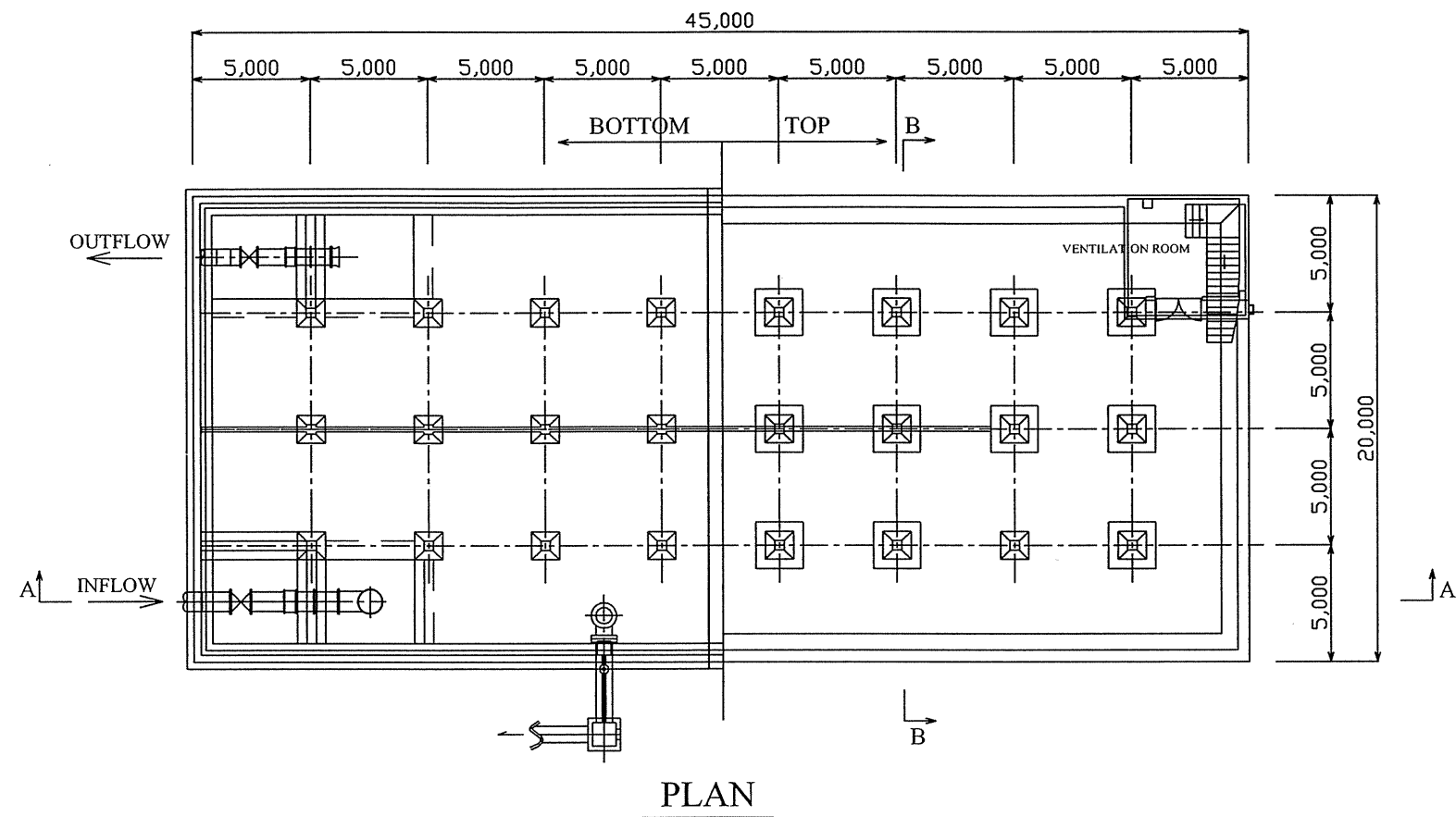
SECTION C-C

SCALE: 1:200

The Study on the Master Plan of Greater Phnom Penh Water Supply  
(Phase 2) in the Kingdom of Cambodia

CHROYU CHANGVA WATER TREATMENT PLANT STAGE 2  
Filter

DRAWING  
No.: II-6

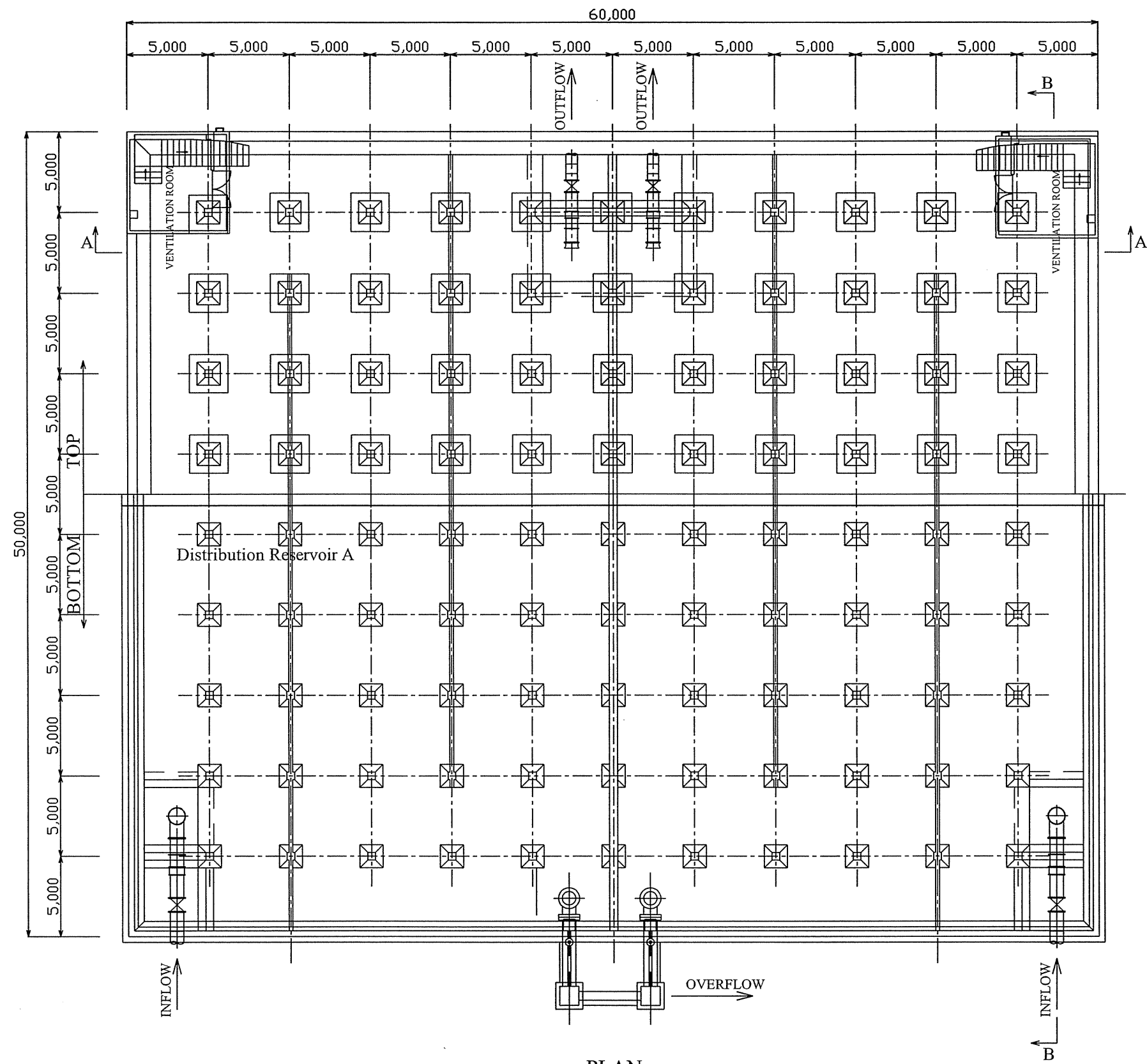


SCALE: 1:300

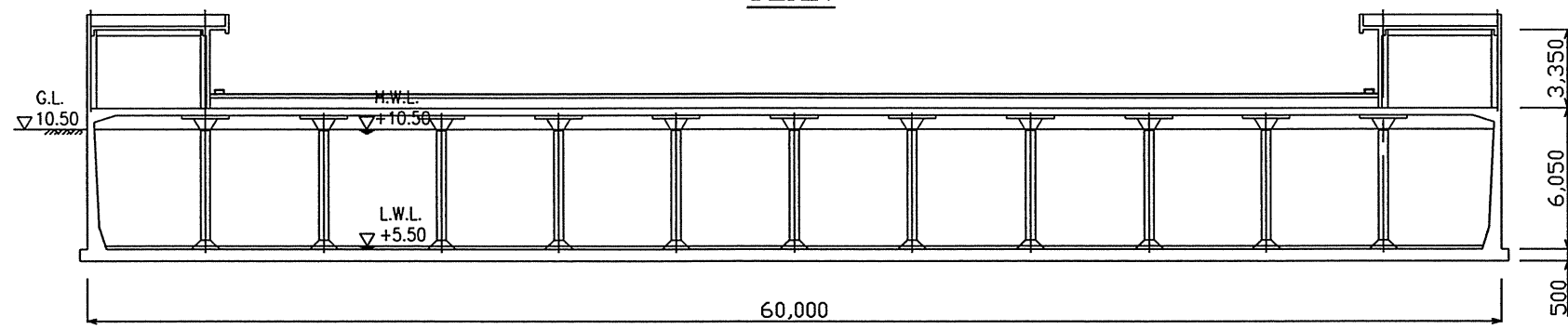
The Study on the Master Plan of Greater Phnom Penh Water Supply  
(Phase 2) in the Kingdom of Cambodia

CHROY CHANGVA WATER TREATMENT PLANT STAGE 2  
Distribution Reservoir A

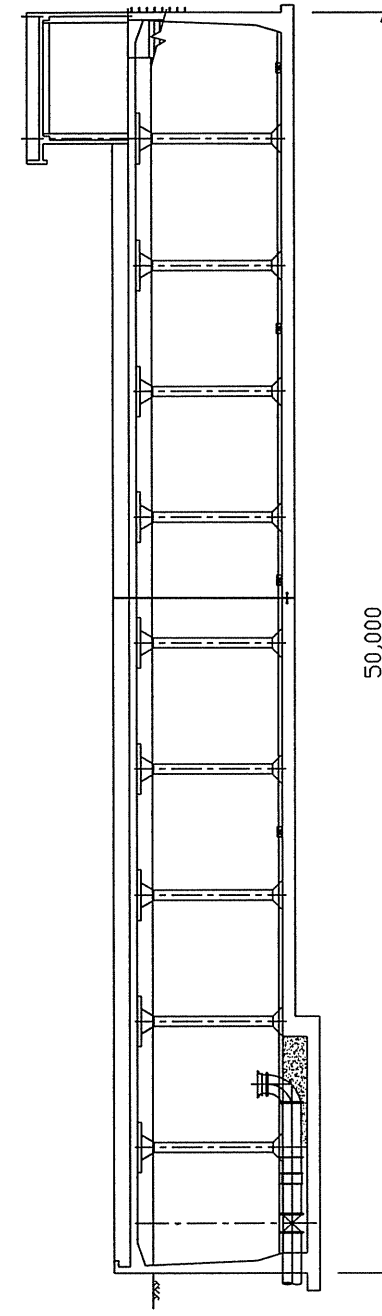
DRAWING  
No.: II-7



PLAN



SECTION A-A



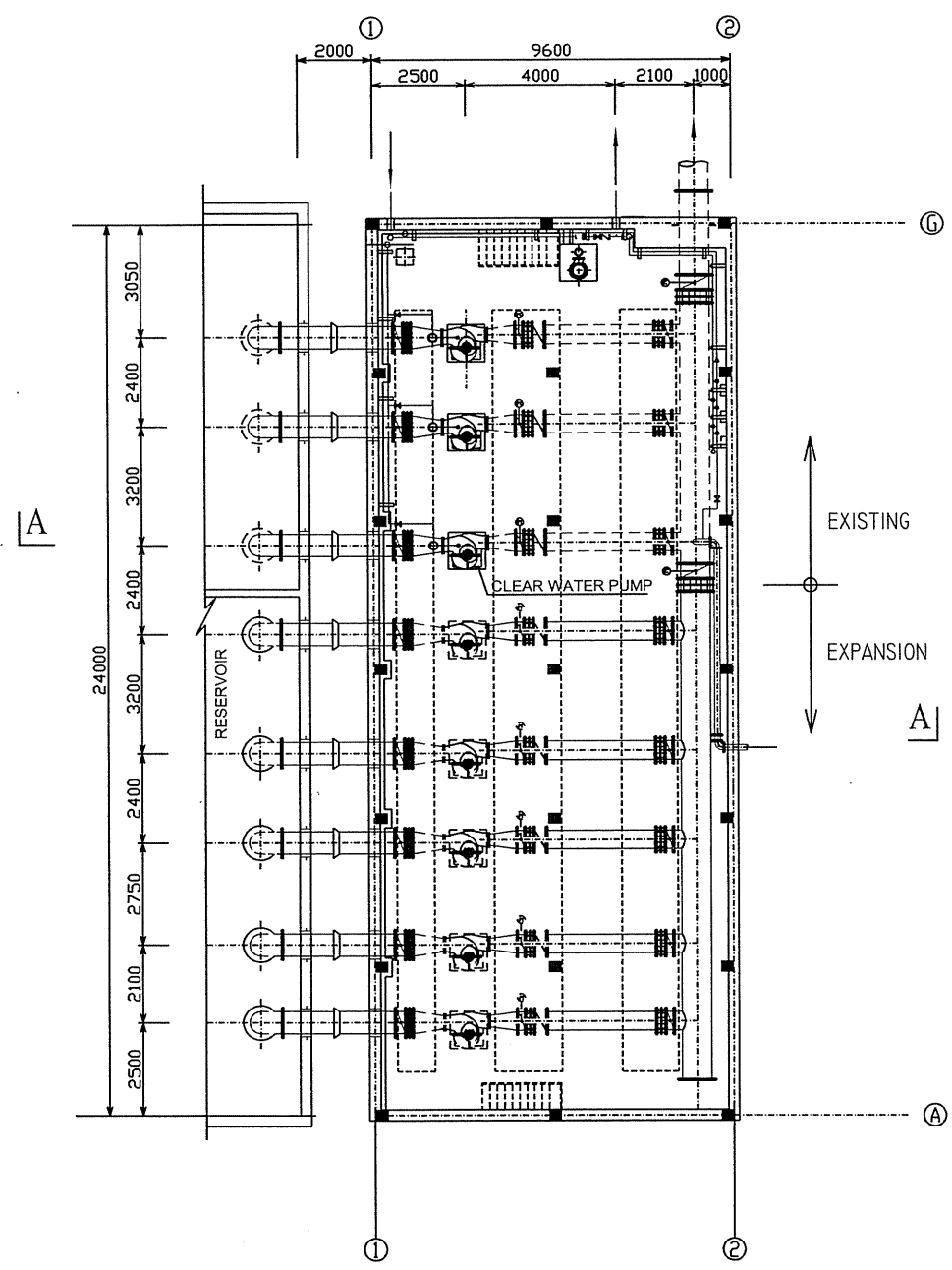
SECTION B-B

SCALE: 1:300

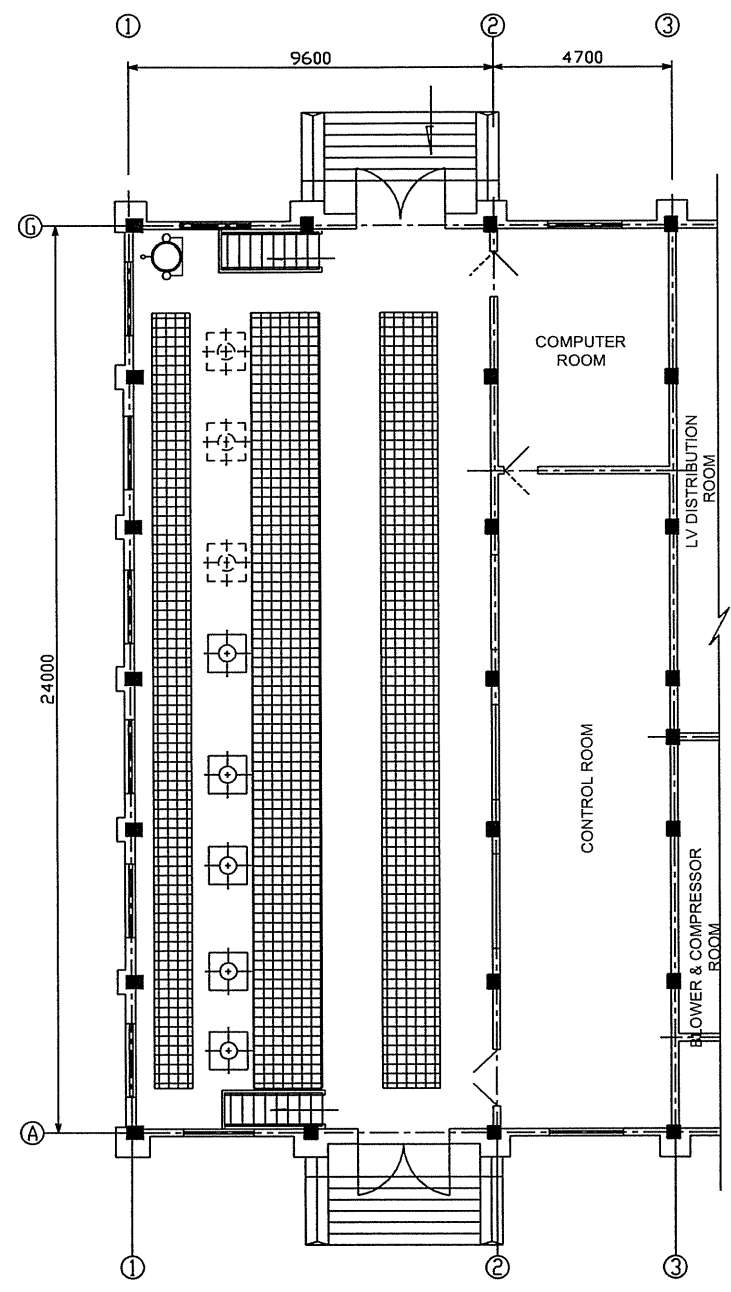
The Study on the Master Plan of Greater Phnom Penh Water Supply  
(Phase 2) in the Kingdom of Cambodia

CHROY CHANGVA WATER TREATMENT PLANT STAGE 2  
Distribution Reservoir B

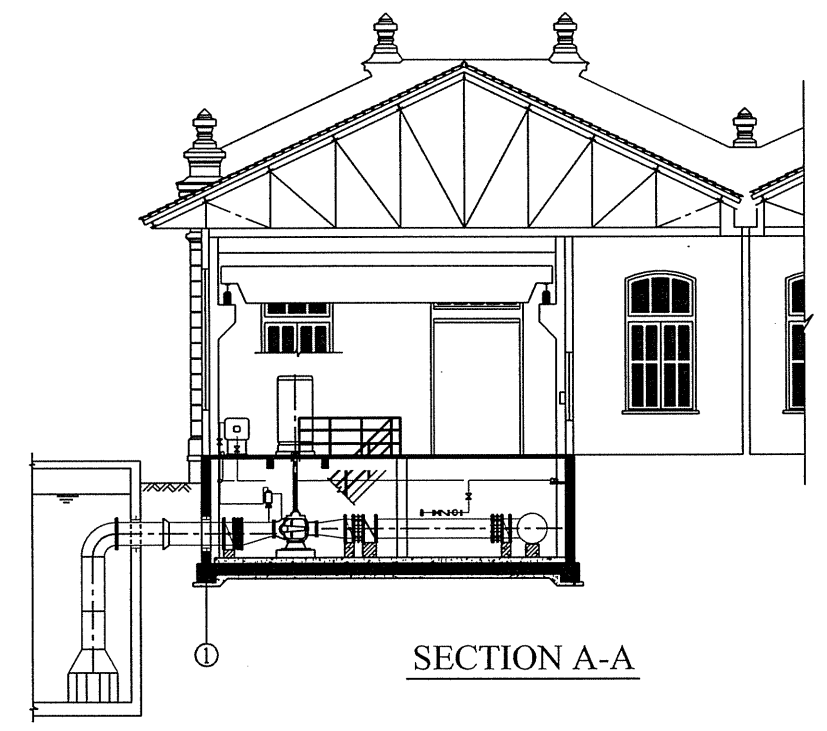
DRAWING  
No.: II-8



CELLAR PLAN



GROUND FLOOR PLAN



The Study on the Master Plan of Greater Phnom Penh Water Supply  
(Phase 2) in the Kingdom of Cambodia

CHROUY CHANGVA WATER TREATMENT PLANT STAGE 2 Clear Water Pump Station	DRAWING No.: II-9
--	----------------------