

REPUBLIC OF GUATEMALA
MUNICIPAL WATER SUPPLY CORPORATION
OF GUATEMALA CITY (EMPAGUA)

**FEASIBILITY STUDY
ON
THE GROUND WATER
DEVELOPMENT PROJECT
(FOR EMERGENCY I)**

**VOLUME 5
APPENDIX VII**

SEPTEMBER 1986

JAPAN INTERNATIONAL COOPERATION AGENCY

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FEASIBILITY STUDY
ON
THE GROUND WATER
DEVELOPMENT PROJECT
(FOR EMERGENCY I)

LIST OF REPORTS

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	APPENDIX IV	ENVIRONMENT
	APPENDIX V	SUPPLEMENTARY STUDY
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VOLUME 5	APPENDIX VII	DRAWINGS

REPUBLIC OF GUATEMALA
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OF GUATEMALA CITY (EMPAGUA)

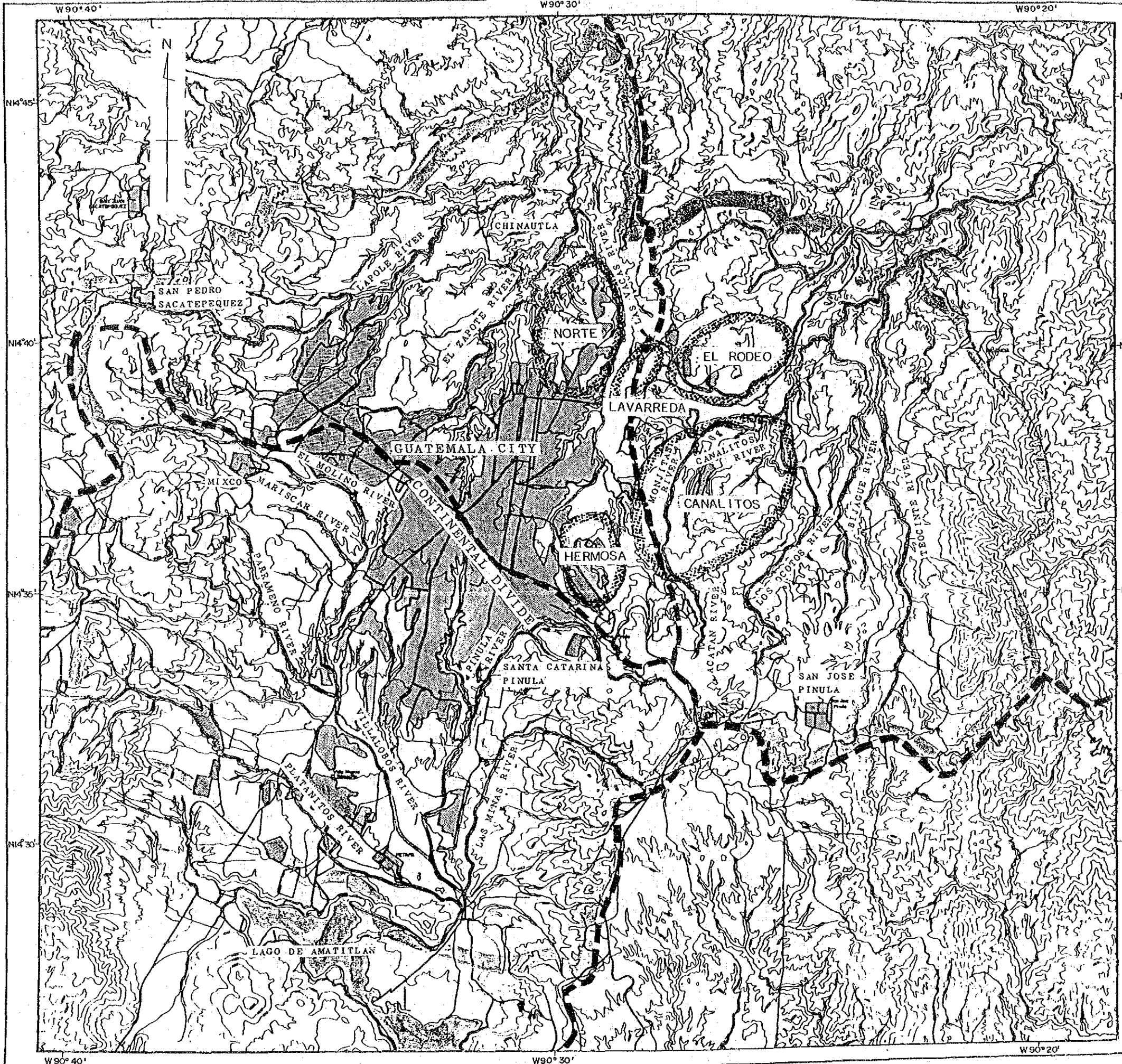
**FEASIBILITY STUDY
ON
THE GROUND WATER
DEVELOPMENT PROJECT
(FOR EMERGENCY I)**

**VOLUME 5
APPENDIX VII**





SEPTEMBER 1986

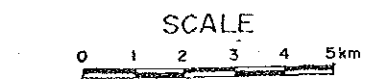
JAPAN INTERNATIONAL COOPERATION AGENCY

国際協力事業団	
受入 月日 86.10.03	611
登録No. 15455	61.8
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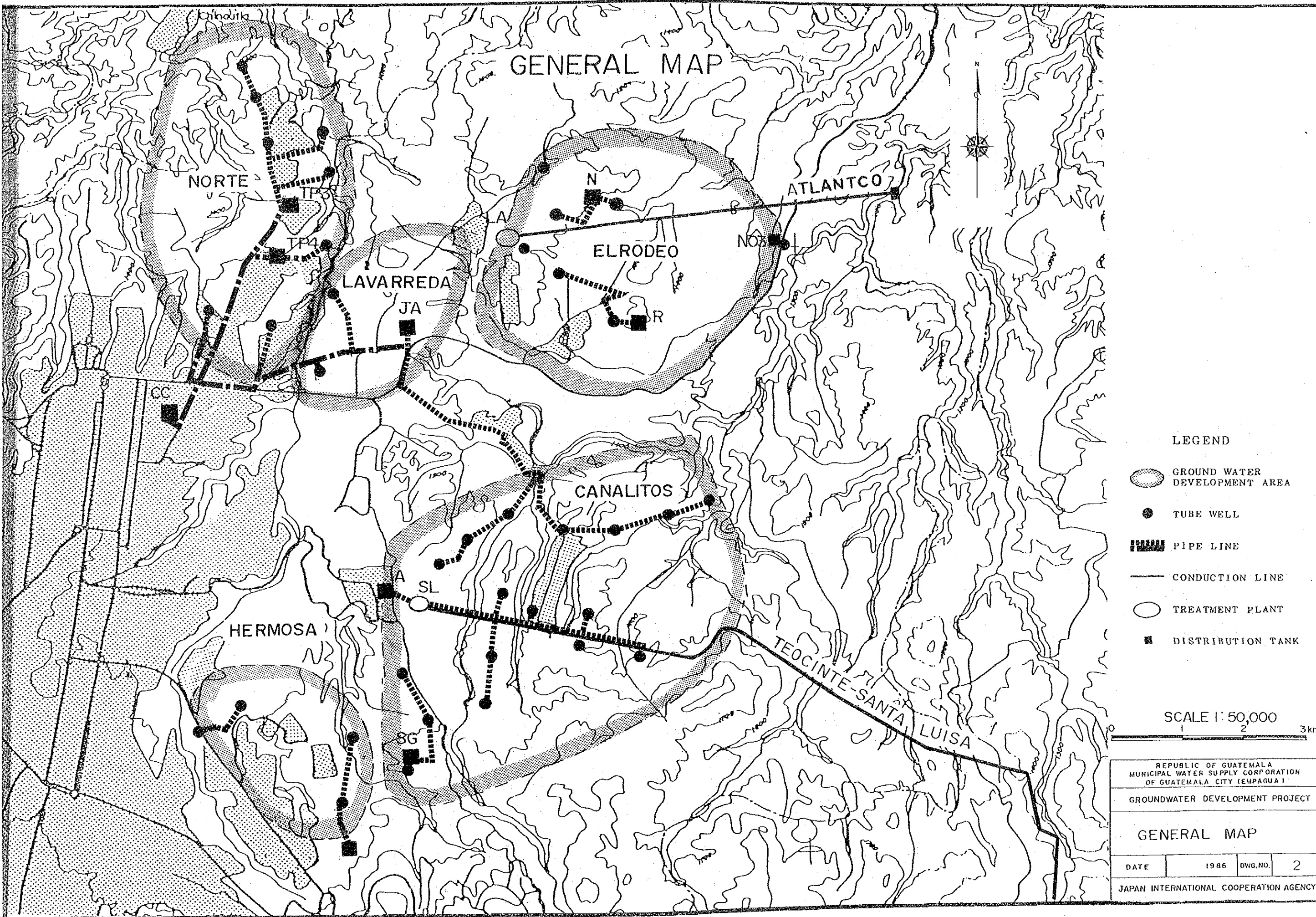


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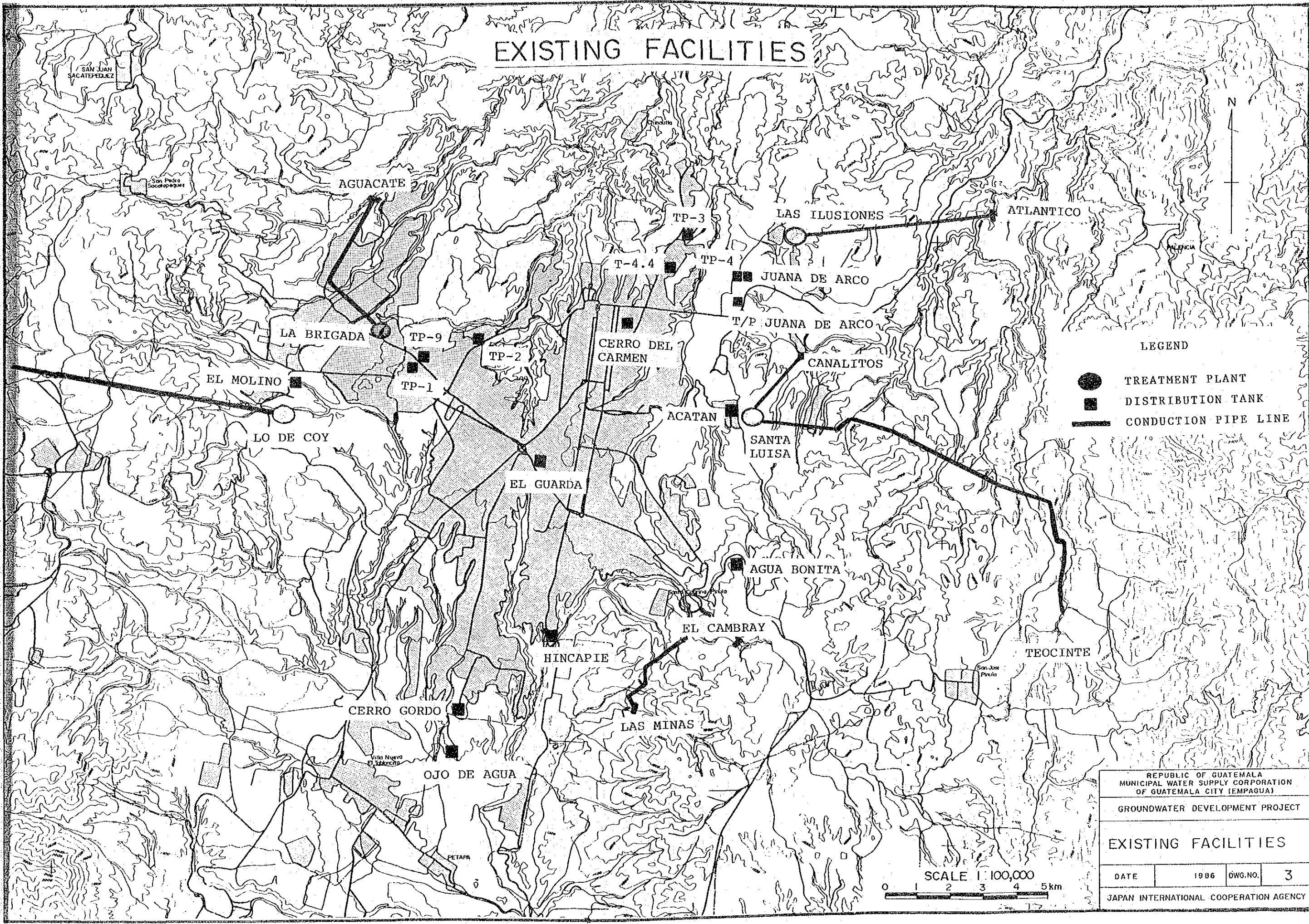
-  PROJECT AREA
-  GROUND WATER DEVELOPMENT AREA
-  RIVER
-  DIVIDE



REPUBLIC OF GUATEMALA MUNICIPAL WATER SUPPLY CORPORATION OF GUATEMALA CITY (EMPAGUA)			
GROUNDWATER DEVELOPMENT PROJECT			
PROJECT MAP			
DATE	1986	DWG.NO.	1
JAPAN INTERNATIONAL COOPERATION AGENCY			

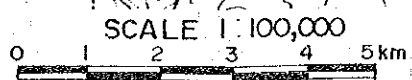


EXISTING FACILITIES

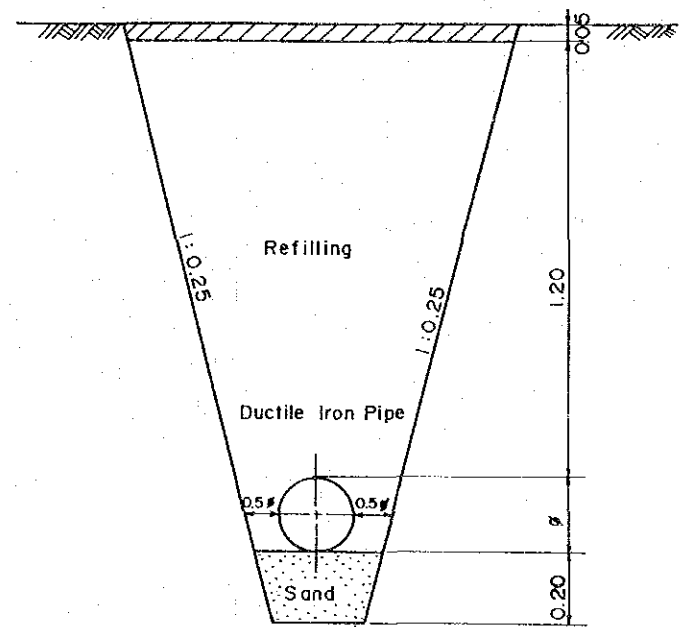
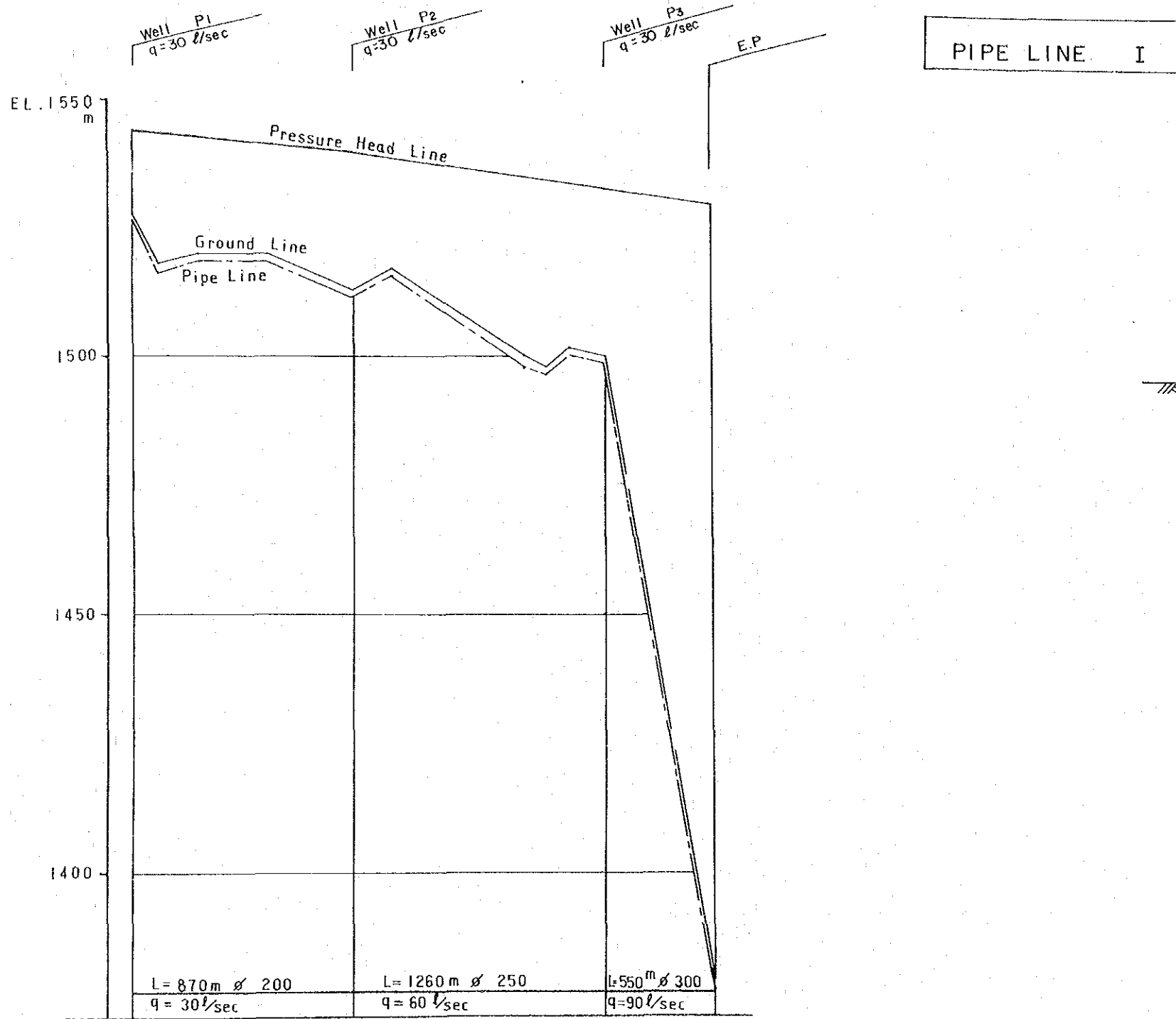


LEGEND

- TREATMENT PLANT
- DISTRIBUTION TANK
- CONDUCTION PIPE LINE



REPUBLIC OF GUATEMALA MUNICIPAL WATER SUPPLY CORPORATION OF GUATEMALA CITY (EMPAGUA)			
GROUNDWATER DEVELOPMENT PROJECT			
EXISTING FACILITIES			
DATE	1986	DWG. NO.	3
JAPAN INTERNATIONAL COOPERATION AGENCY			



SECTION OF PIPE INSTALLATION

PRESSURE HEAD (m)	1544.5	1540.1		1532.4		1525.4		
SLOPE	1/57		1/75		1/4			
EL. OF PIPE CENTER (m)	1526.50	1518.50	1511.50	1505.50	1498.50	1496.50	1468.50	1378.50
GROUND LEVEL (m)	1528.00	1520.00	1513.00	1517.00	1500.00	1500.00	1470.00	1380.00
ACCUMULATED DISTANCE (m)	0	500	850	1000	1500	1830	2000	2250
STATION	0	1	2	3	4			

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GROUNDWATER DEVELOPMENT PROJECT

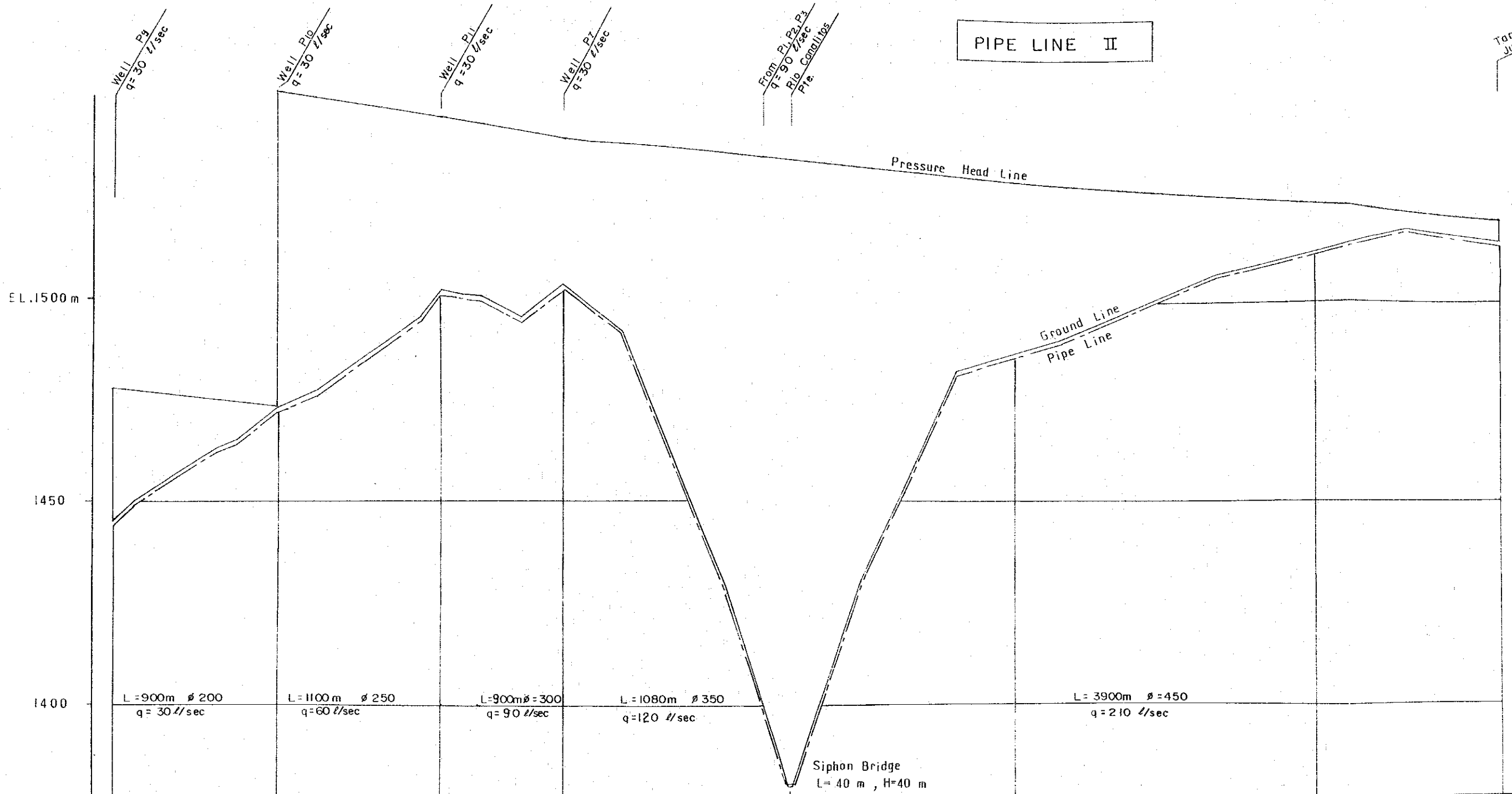
PROFILE OF PIPE LINE
CANALITOS - I

DATE	1986	DWG. NO.	4
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JAPAN INTERNATIONAL COOPERATION AGENCY

Tank Juana de Ar

PIPE LINE II



PRESSURE HEAD (m)	1477.6	1550.6	1543.9	1539.1	1534.4	1520.5
SLOPE	1/29	1/26		1/9	1/11	1/56
EL. OF PIPE CENTER (m)	1443.50	1461.50	1471.50	1475.50	1493.50	1502.50
GROUND LEVEL (m)	1445.00	1483.00	1473.00	1477.00	1495.00	1504.00
ACCUMULATED DISTANCE (m)	0	500	800	1000	1500	1600
STATION	0	1	2	3	4	5

PIPE LINE II

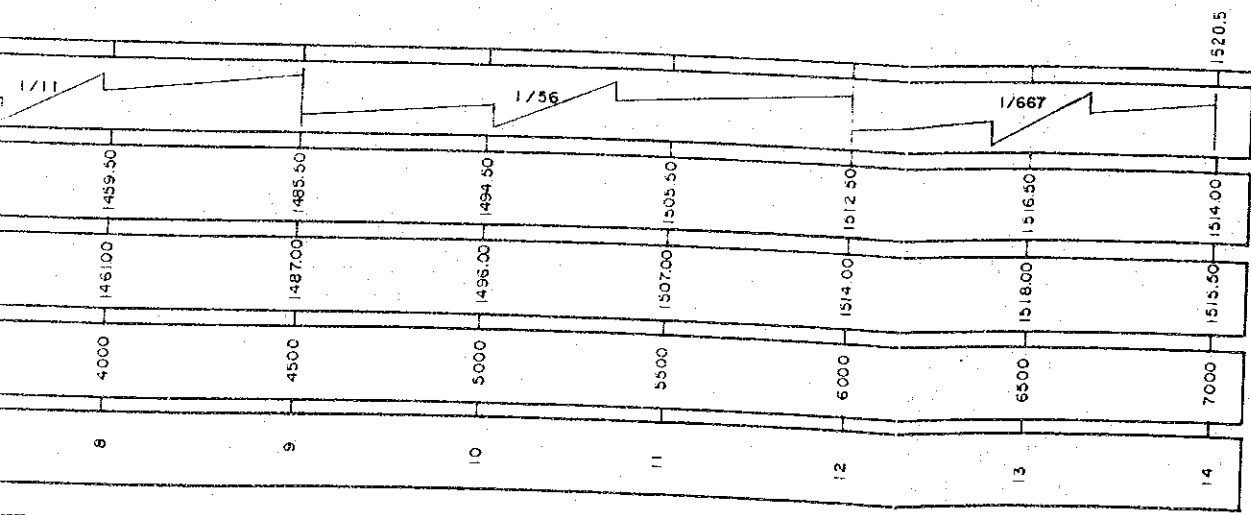
Tank
Juana de Arco

Pressure Head Line

Ground Line
Pipe Line

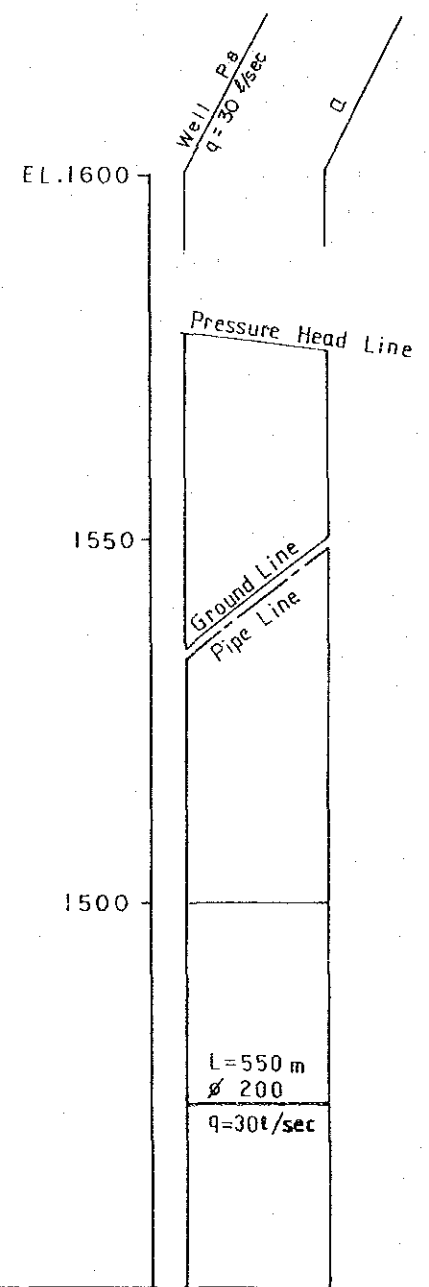
L = 3900m ϕ = 450
q = 2.10 l/sec

Bridge
m, H=40 m



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GROUNDWATER DEVELOPMENT PROJECT			
PROFILE OF PIPE LINE CANALITOS - II			
DATE	AUG, 1986	DWG.N.O.	5
JAPAN INTERNATIONAL COOPERATION AGENCY			

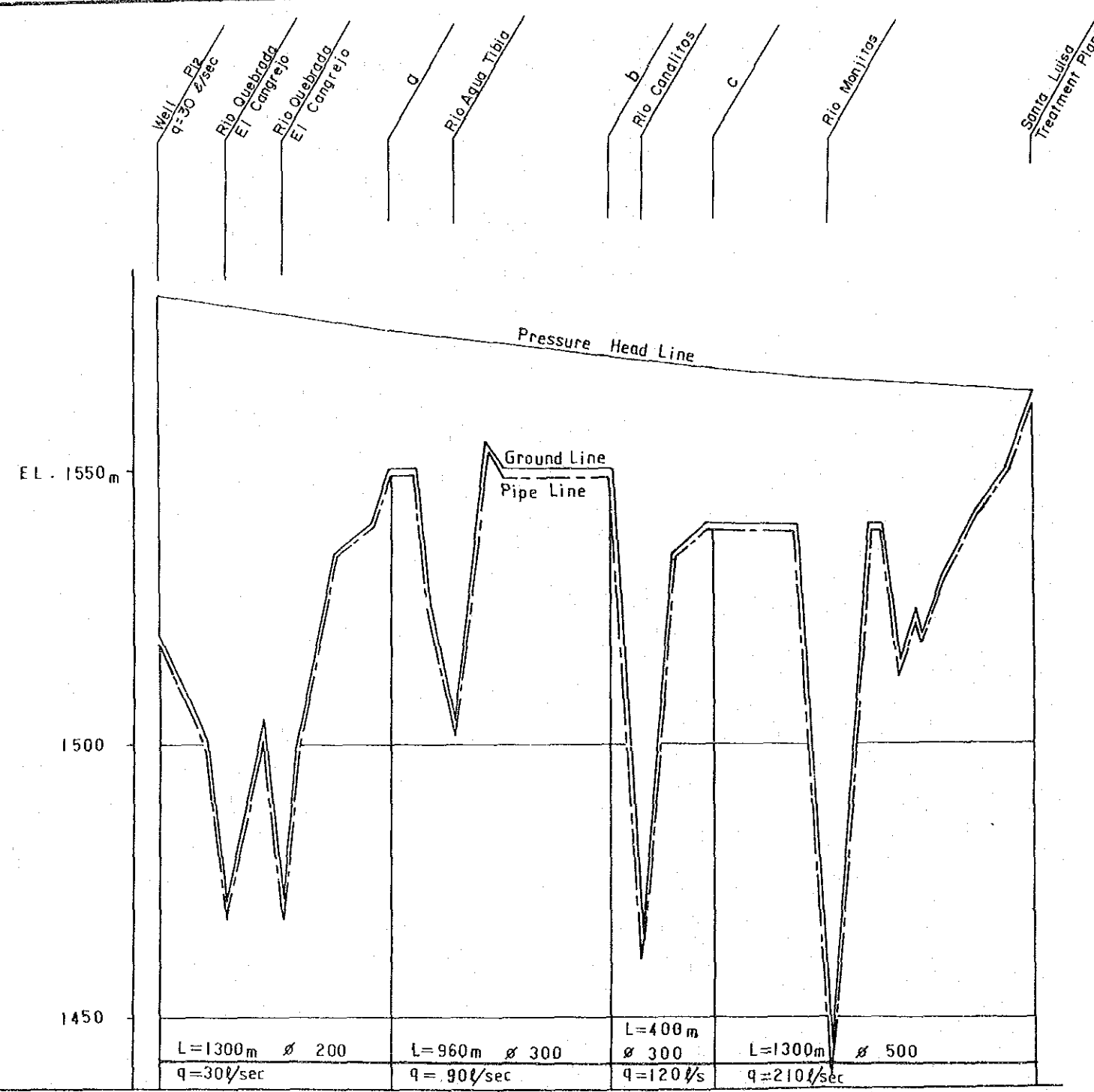
PIPE LINE III



PRESSURE HEAD (m)	1578.3	1575.5
SLOPE		
EL. OF PIPE CENTER (m)	1533.50	1548.50
GROUND LEVEL (m)	1535.00	1550.00
ACCUMULATED DISTANCE (m)	0	400
STATION	0	

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GROUNDWATER DEVELOPMENT PROJECT			
PROFILE OF PIPE LINE CANALITOS - III			
DATE	1986	DWG. NO.	6
JAPAN INTERNATIONAL COOPERATION AGENCY			

PIPE LINE IV



PRESSURE HEAD (m)	1582.1	1575.5	1570.4	1568.6	1564.0						
SLOPE											
EL. OF PIPE CENTER (m)	1518.50	1497.50	1548.50	1523.50	1548.50	1538.50	1536.50	1474.50	1541.50	1562.50	
GROUND LEVEL (m)	1520.00	1498.00	1550.00	1525.00	1550.00	1550.00	1540.00	1540.00	1476.00	1543.00	1564.00
ACCUMULATED DISTANCE (m)	0	500	850	1000	1500	1650	2000	2050	2500	3000	3200
STATION	0	1	2	3	4	5	6				

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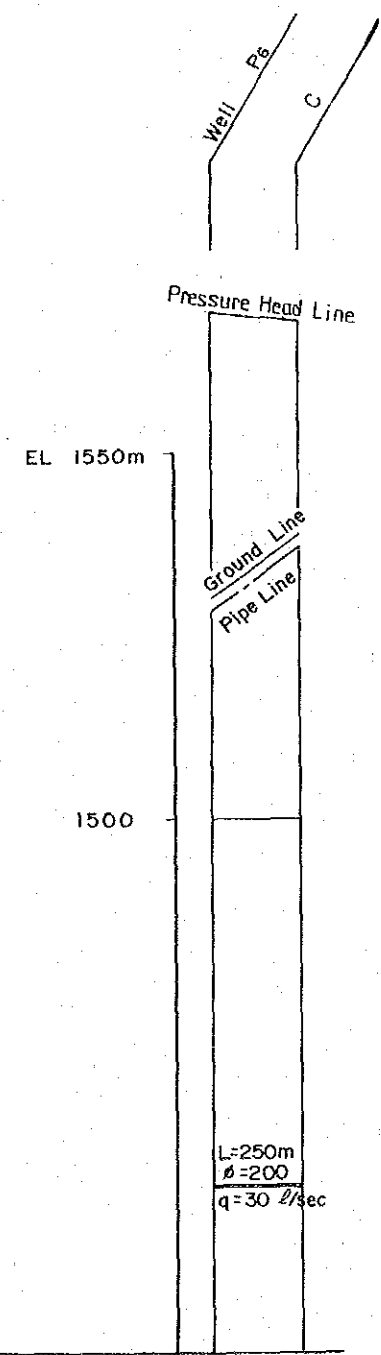
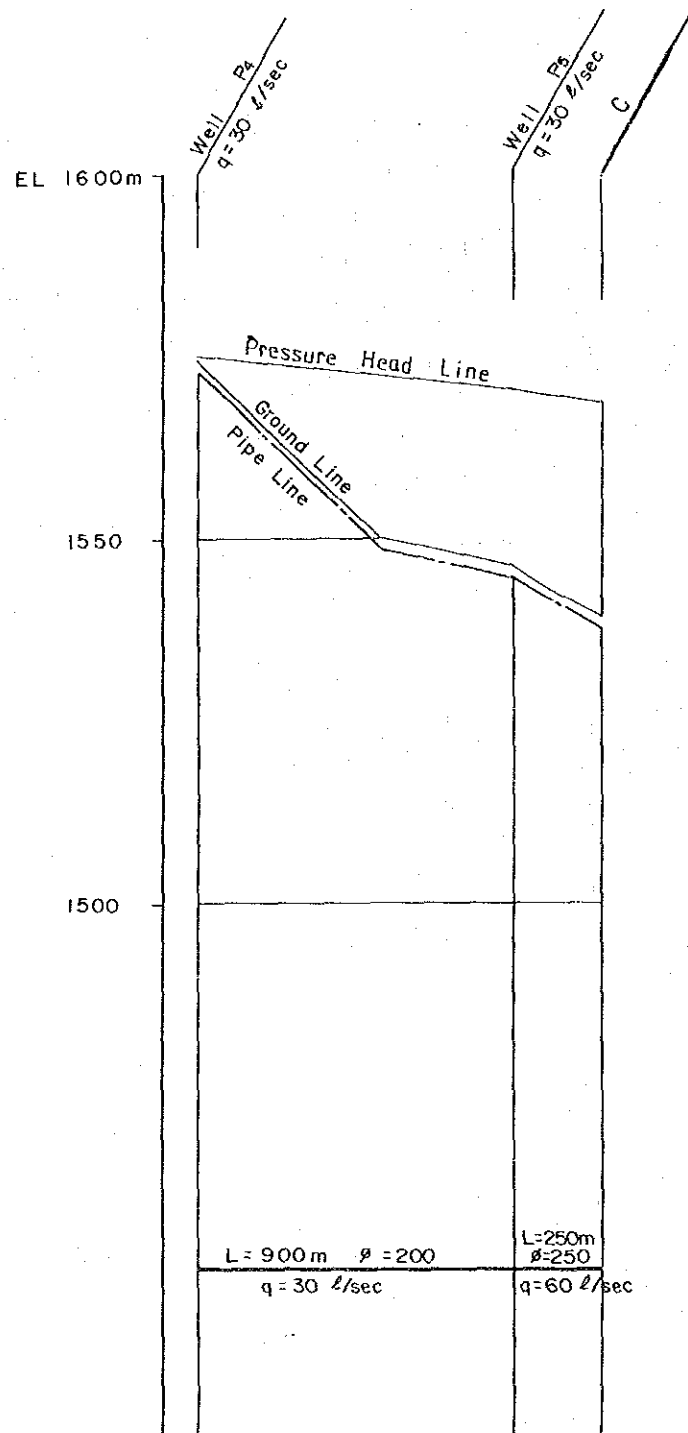
GROUNDWATER DEVELOPMENT PROJECT

PROFILE OF PIPE LINE
CANALITOS - IV

DATE 1986 DWG.N.O. 7

JAPAN INTERNATIONAL COOPERATION AGENCY

PIPE LINE V



PRESSURE HEAD (m)	1574.7	1570.2	1568.6
SLOPE			
EL. OF PIPE CENTER (m)	1572.50	1548.50	1544.50
GROUND LEVEL (m)	1574.00	1550.00	1546.00
ACCUMULATED DISTANCE (m)	0	500	870
STATION	0	1	2

PRESSURE HEAD (m)	1559.9	1558.6
SLOPE		
EL. OF PIPE CENTER (m)	1528.50	1537.50
GROUND LEVEL (m)	1530.00	1539.00
ACCUMULATED DISTANCE (m)	0	240
STATION	0	

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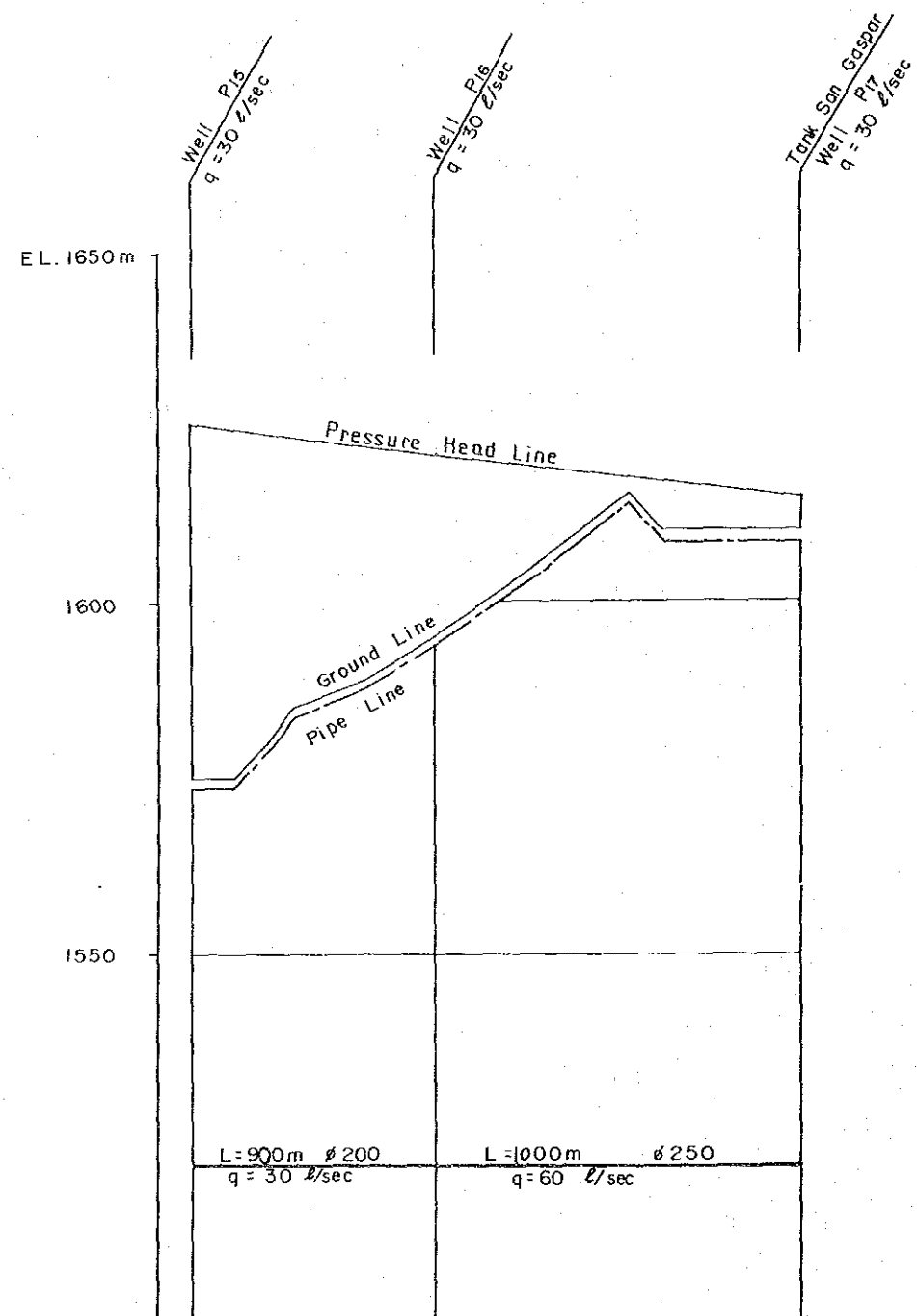
GROUNDWATER DEVELOPMENT PROJECT

PROFILE OF PIPE LINE
CANALITOS - V

DATE 1986 DWG. NO. 8

JAPAN INTERNATIONAL COOPERATION AGENCY

PIPE LINE VI



PRESSURE HEAD (m)	1625.7	1621.1	1615.0			
SLOPE	1/35		1/70			
EL. OF PIPE CENTER (m)	1573.50	1587.50	1593.50	1603.50	1498.50	1608.50
GROUND LEVEL (m)	1575.00	1589.00	1595.00	1605.00	1500.00	1610.00
ACCUMULATED DISTANCE (m)	0	500	700	1000	1500	1750
STATION	0	1	2	3		

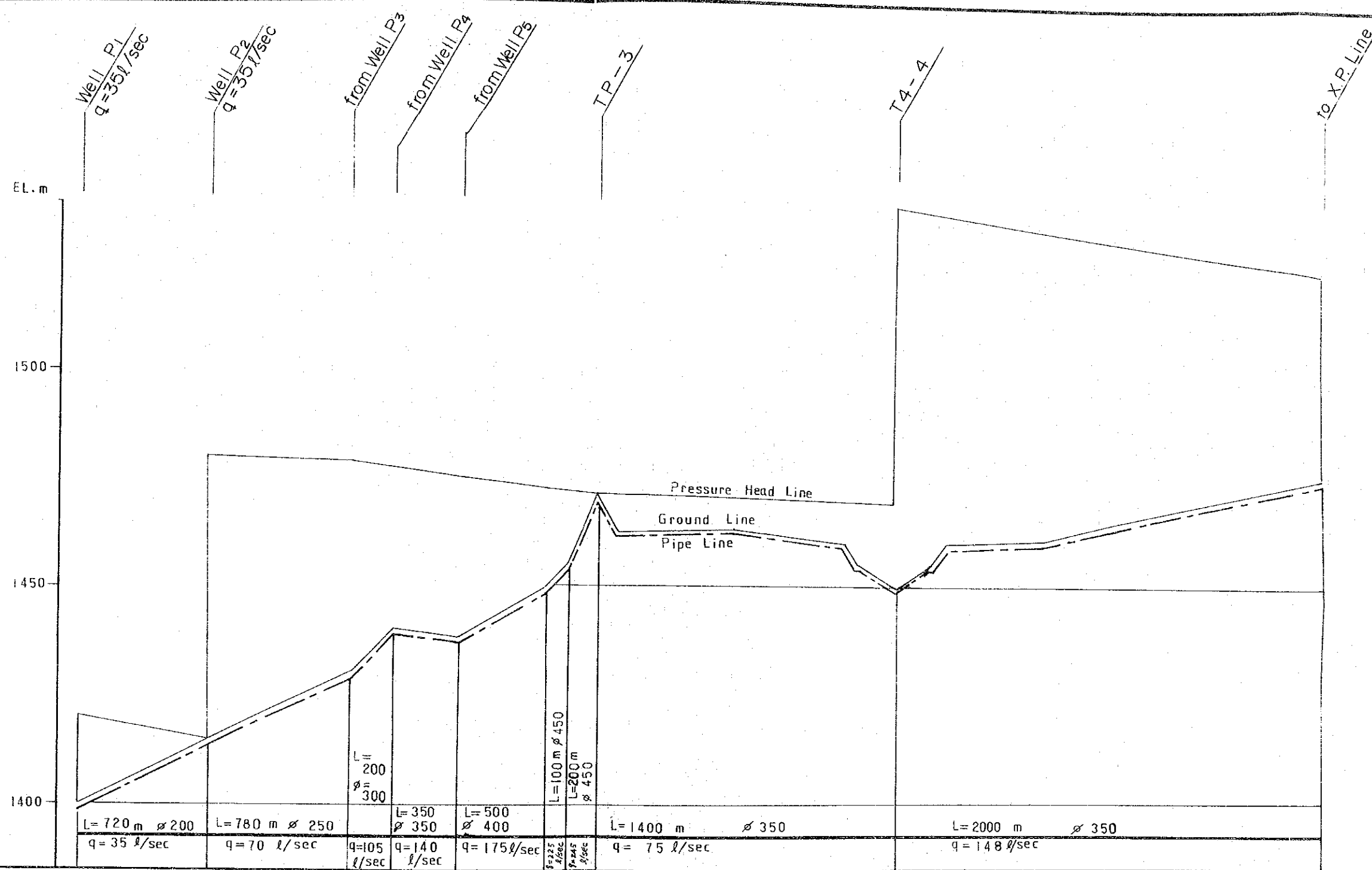
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OF GUATEMALA CITY (EMPAGUA I)

GROUNDWATER DEVELOPMENT PROJECT

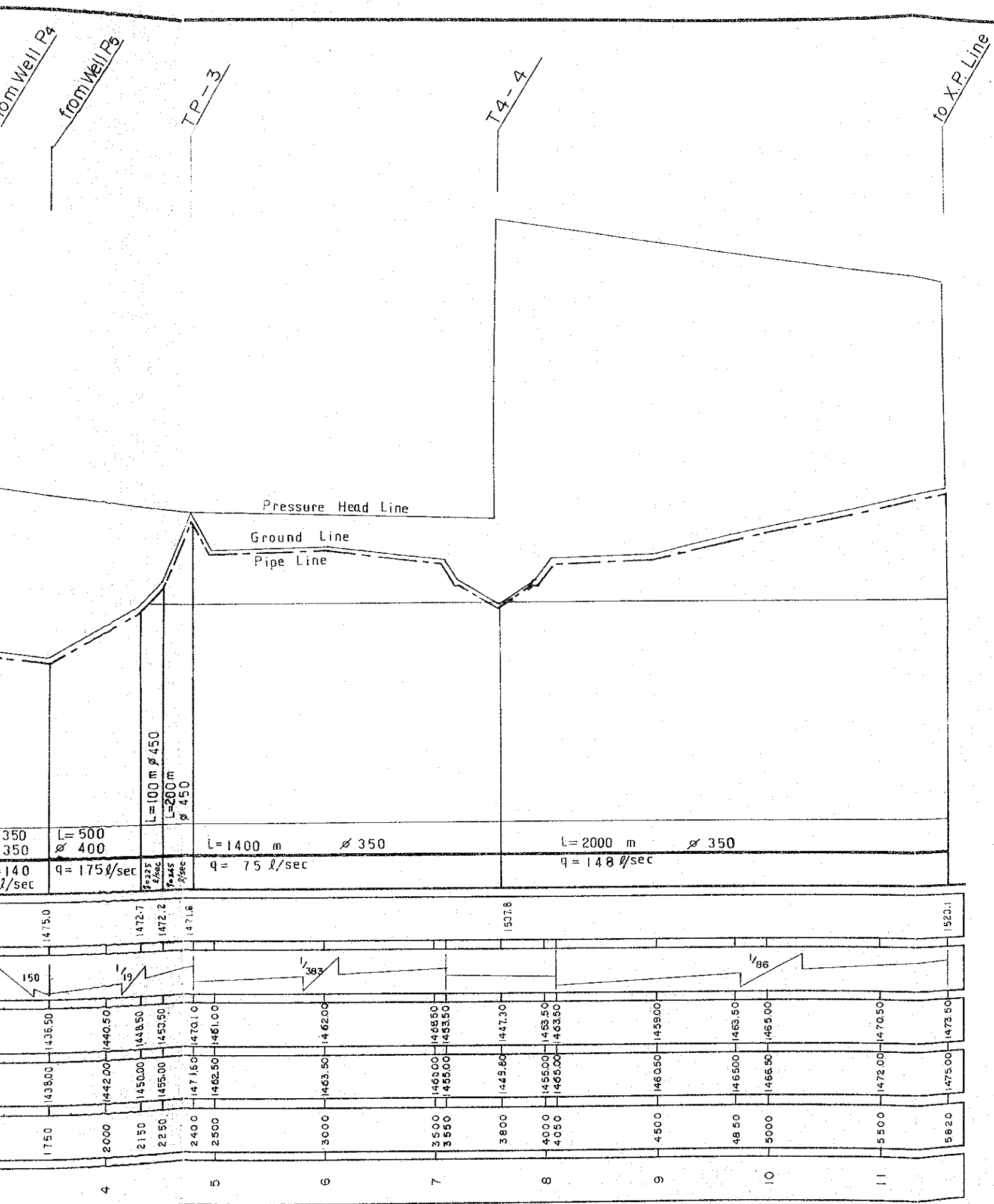
PROFILE OF PIPE LINE
CANALITOS - VI

DATE	1986	DWG.NO.	9
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JAPAN INTERNATIONAL COOPERATION AGENCY

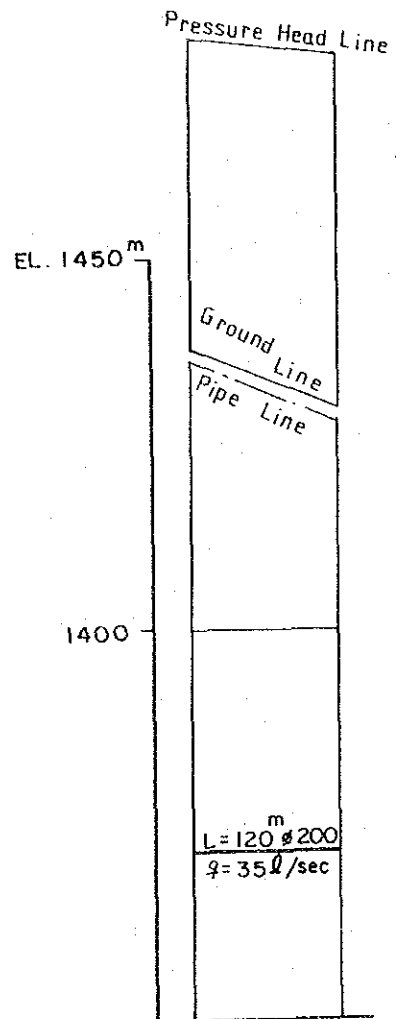


PRESSURE HEAD (m)	1419.9	1480.1	1478.5	1477.1	1475.0	1472.7	1472.2	1471.6	1537.8	1523.1
SLOPE		$1/36$		$1/50$		$1/19$		$1/383$		$1/86$
EL. OF PIPE CENTER (m)	1398.50	1411.00	1413.50	1423.00	1428.50	1438.50	1436.50	1440.50	1448.50	1453.50
GROUND LEVEL (m)	1400.00	1412.5	1415.00	1424.50	1430.00	1440.00	1438.00	1442.00	1450.00	1455.00
ACCUMULATED DISTANCE (m)	0	500	600	1000	1250	1450	1500	1750	2000	2150
STATION	0	1	2	3	4	5	6	7	8	9



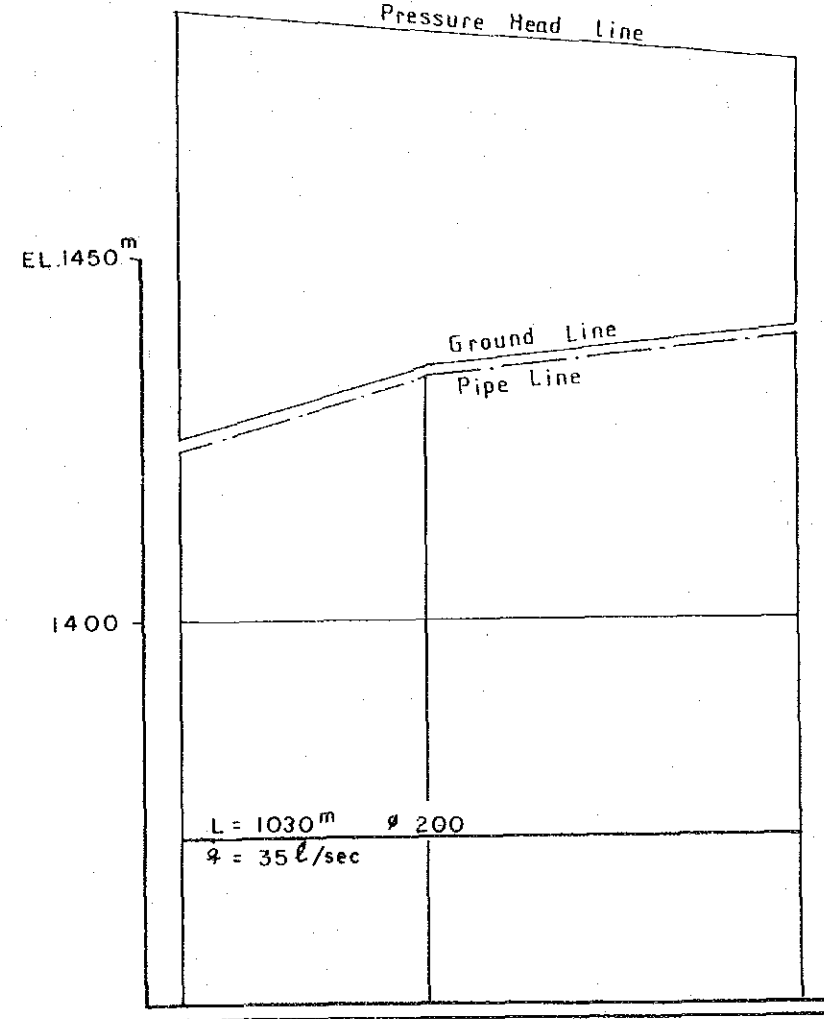
REPUBLIC OF GUATEMALA MUNICIPAL WATER SUPPLY CORPORATION OF GUATEMALA CITY (EMPAGUA)			
GROUNDWATER DEVELOPMENT PROJECT			
PROFILE OF PIPE LINE NORTE (ZONA-6) - I			
DATE	1986	DWG. NO.	10
JAPAN INTERNATIONAL COOPERATION AGENCY			

Well P3
= 35 l/sec
to Main Pipe Line



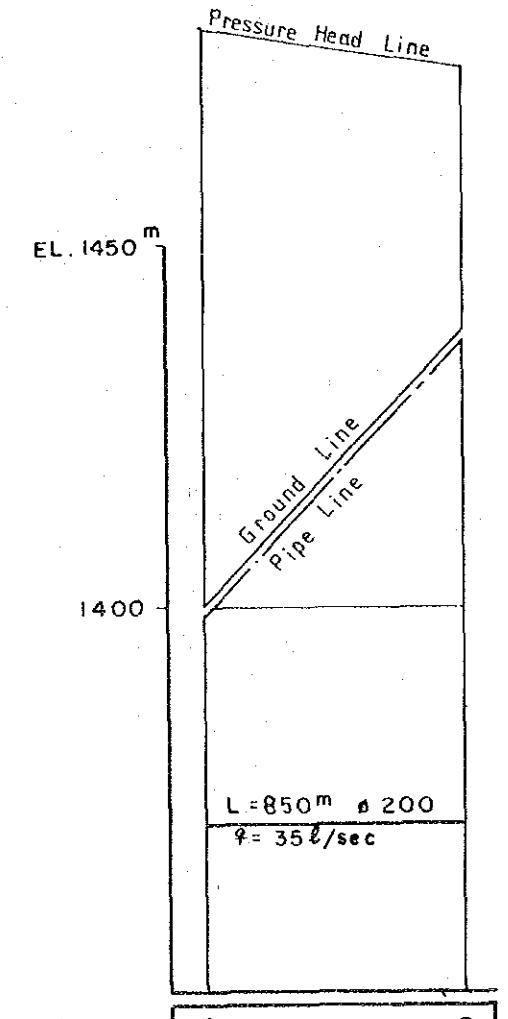
PRESSURE HEAD	1480.1	1476.5
SLOPE		
E L of PIPE CENTER (m)	1436.50	1428.50
GROUND LEVEL (m)	1438	1430
ACCUMULATED DISTANCE (m)	0	200
STATION	0	1

Well P4
= 35 l/sec
to Main Pipe Line



PRESSURE HEAD	1484.1	1477.1		
SLOPE				
E L of PIPE CENTER (m)	1423.50	1433.50	1435.00	1436.50
GROUND LEVEL (m)	1425	1435	1436.50	1440
ACCUMULATED DISTANCE (m)	0	340	500	860
STATION	0	1		

Well P5
= 35 l/sec
to Main Pipe Line



PRESSURE HEAD	1430.6	1475.0	
SLOPE			
E L of PIPE CENTER (m)	1398.50	1424.50	1436.50
GROUND LEVEL (m)	1400	1426.00	1438.00
ACCUMULATED DISTANCE (m)	0	500	710
STATION	0	1	

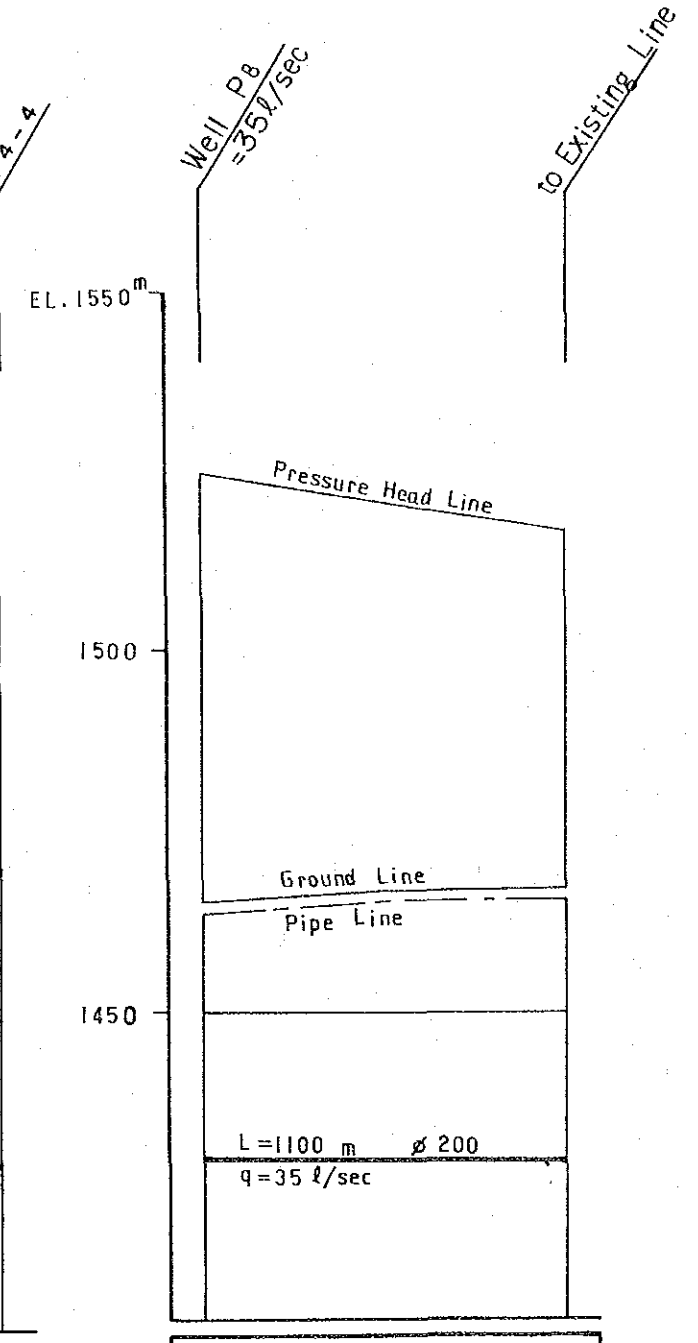
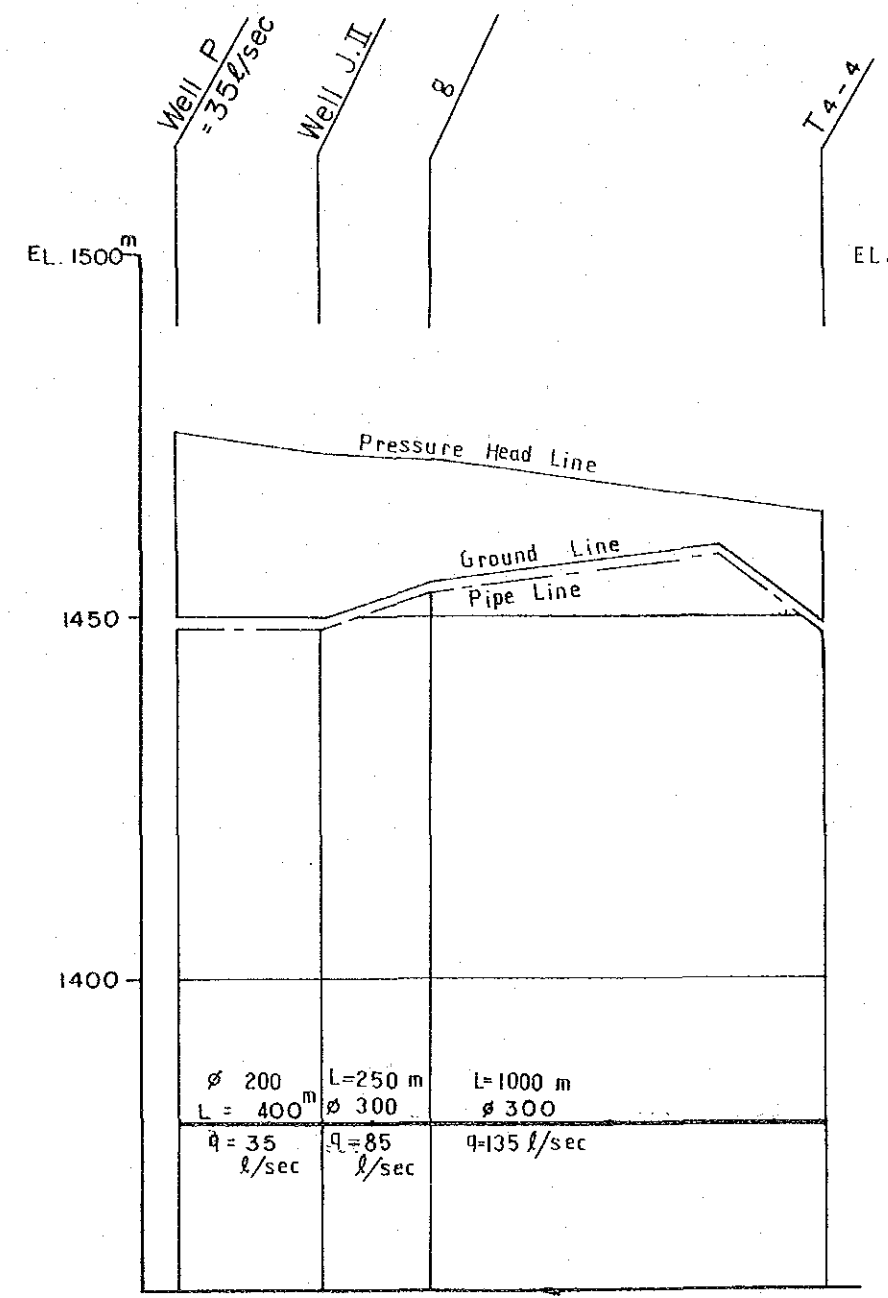
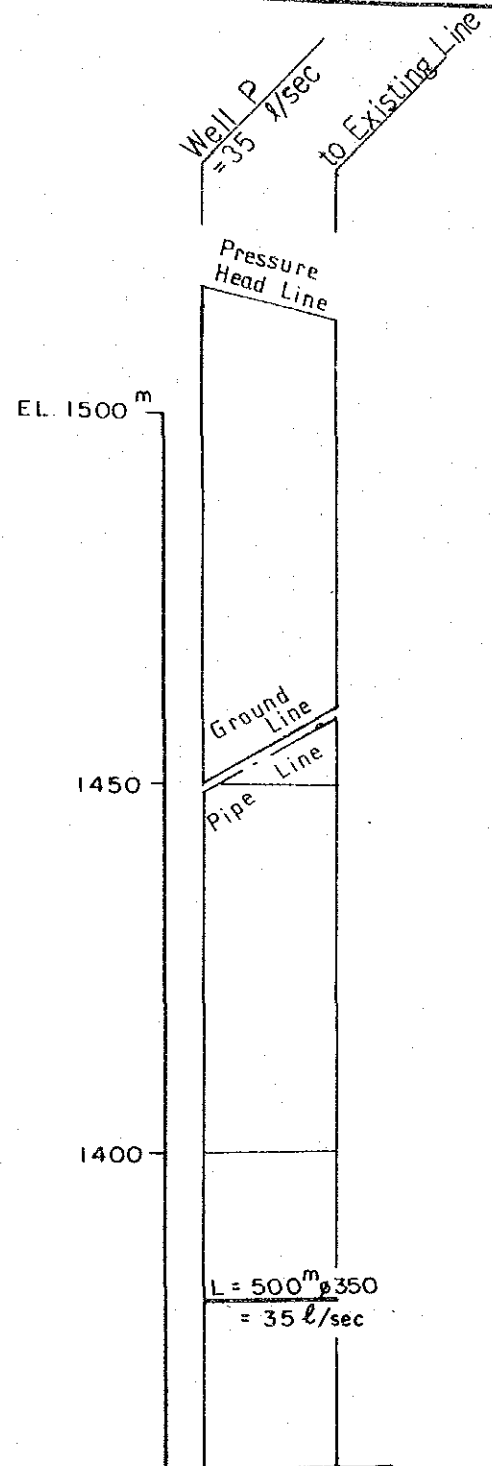
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MUNICIPAL WATER SUPPLY CORPORATION
OF GUATEMALA CITY (EMPAGUA I)

GROUNDWATER DEVELOPMENT PROJECT

PROFILE OF PIPE LINE
NORTE (Zona-6) - II

DATE 1986 DWGNO. 11

JAPAN INTERNATIONAL COOPERATION AGENCY



PRESSURE HEAD (m)	1516.8	1513.3
SLOPE		
EL of PIPE CENTER (m)	1448.50	1458.50
GROUND LEVEL (m)	1450.00	1460.00
ACCUMULATED DISTANCE (m)	0	350
STATION	0	

	1473.2	1472.5	1471.1	1464.8
	1448.50	1448.50	1450.50	1453.50
	1450.00	1450.00	1452.00	1453.00
	0	400	500	700
	0		1000	1500
	0	1	2	3

	1524.1	1516.8
	1463.50	1465.50
	1465.00	1467.00
	0	500
	0	1000
	0	2

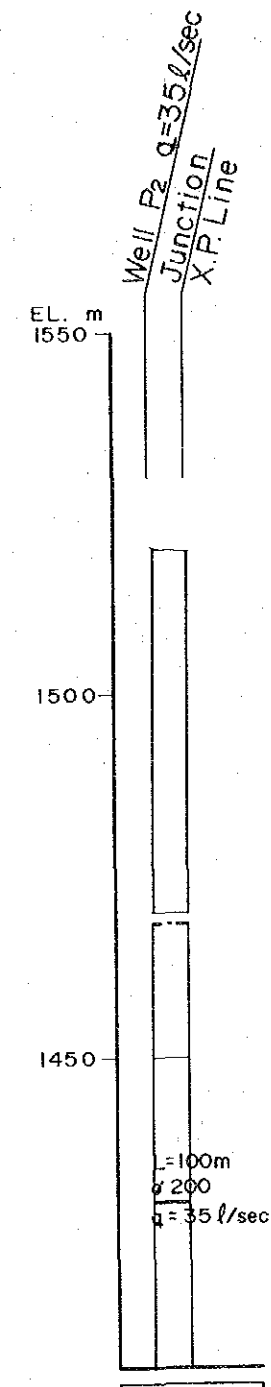
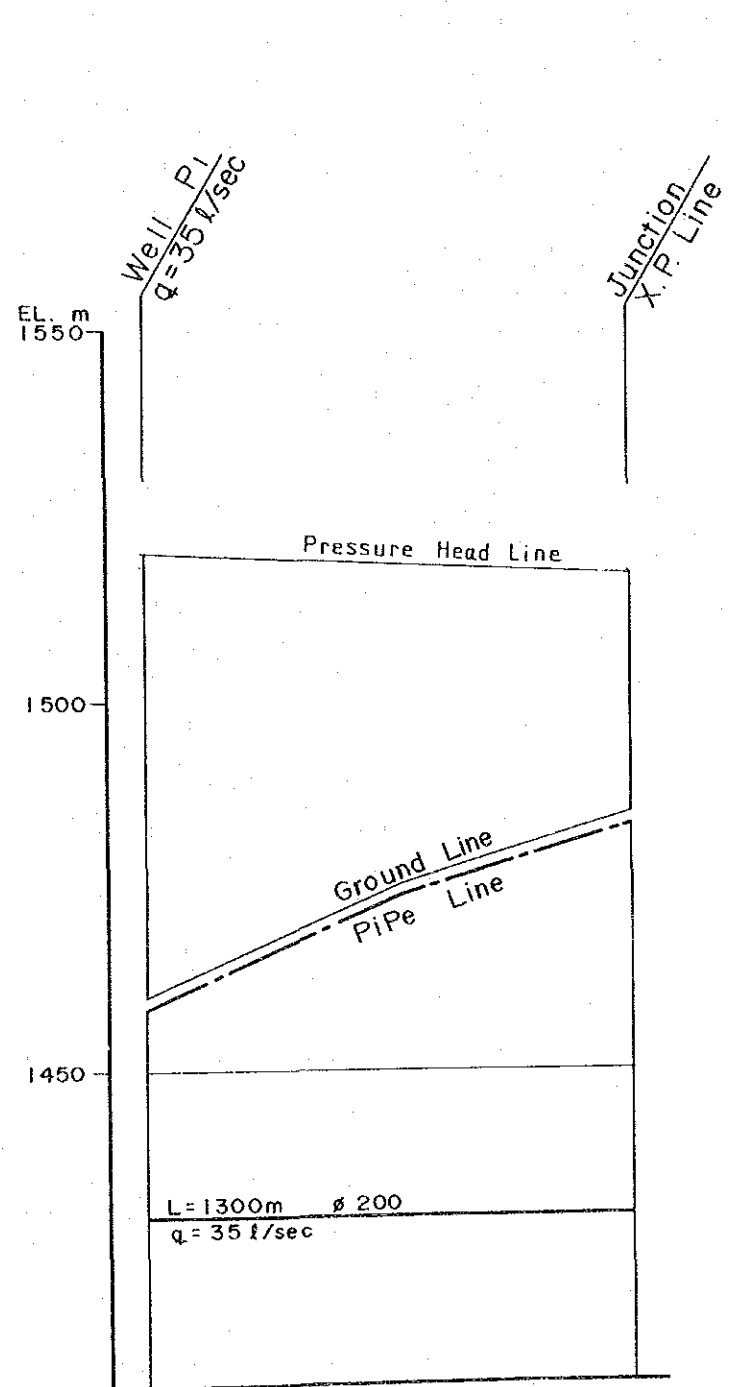
REPUBLIC OF GUATEMALA
MUNICIPAL WATER SUPPLY CORPORATION
OF GUATEMALA CITY (EMPAGUA I)

GROUNDWATER DEVELOPMENT PROJECT

PROFILE OF PIPE LINE
NORTE (Zona-6) - III

DATE 1986 DWG. NO. 12

JAPAN INTERNATIONAL COOPERATION AGENCY



PRESSURE HEAD (m)	1520.1			1518.7
SLOPE	1/52			
EL. OF PIPE CENTER (m)	1468.50	1470.00	1479.00	1485.50
GROUND LEVEL (m)	1460.00	1471.50	1480.50	1485.00
ACCUMULATED DISTANCE (m)	0	500	1000	1300
STATION	0	1	2	

1520.8	1520.1
1468.50	1468.50
1470.00	1470.00
0	100
0	

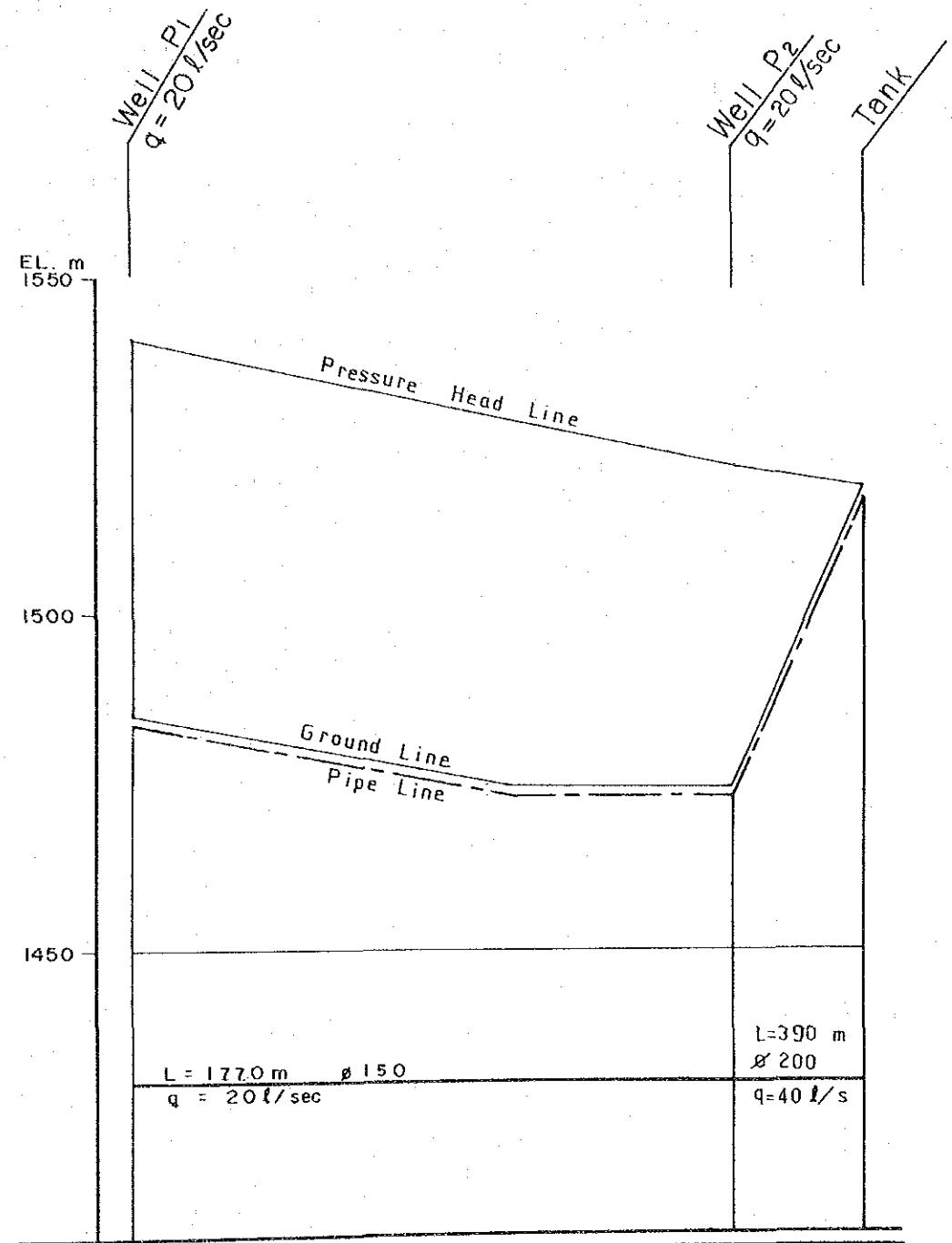
REPUBLIC OF GUATEMALA
MUNICIPAL WATER SUPPLY CORPORATION
OF GUATEMALA CITY (EMPAGUA)

GROUNDWATER DEVELOPMENT PROJECT

**PROFILE OF PIPE LINE
LAVARREDA**

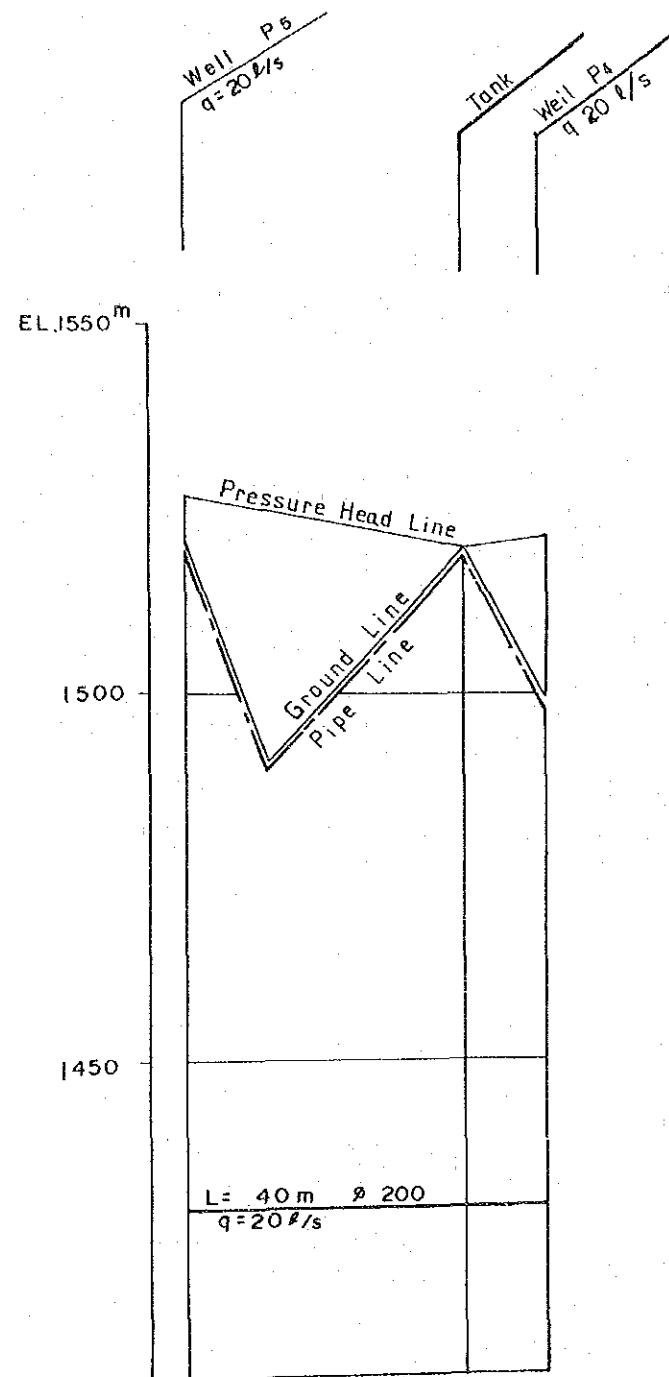
DATE 1986 DWG. NO 13

JAPAN INTERNATIONAL COOPERATION AGENCY



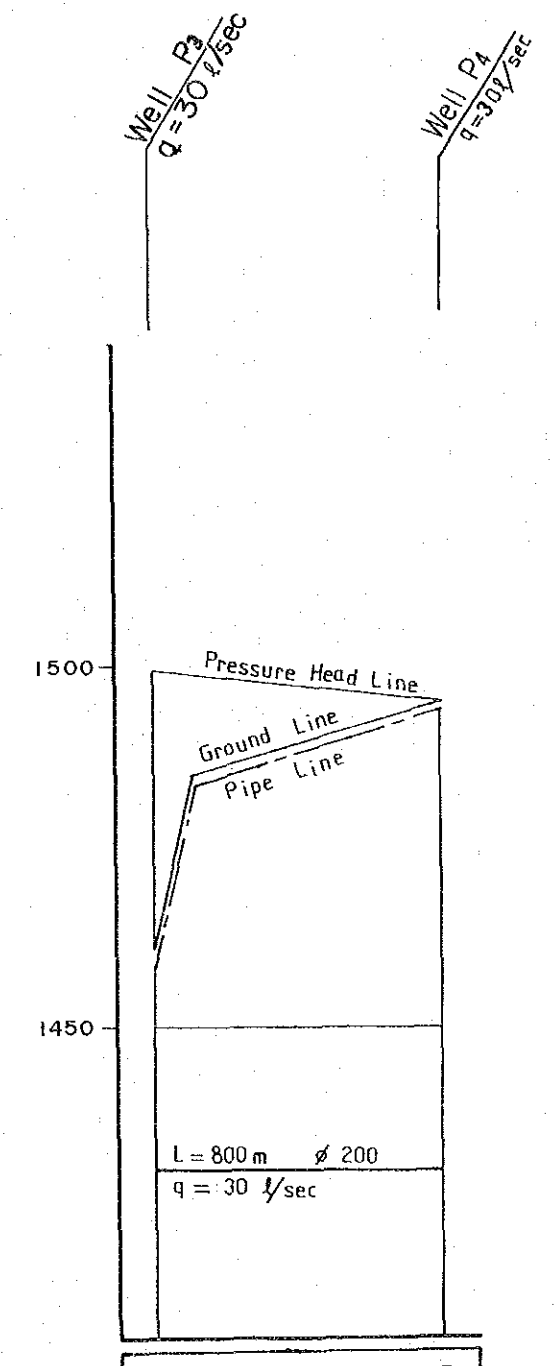
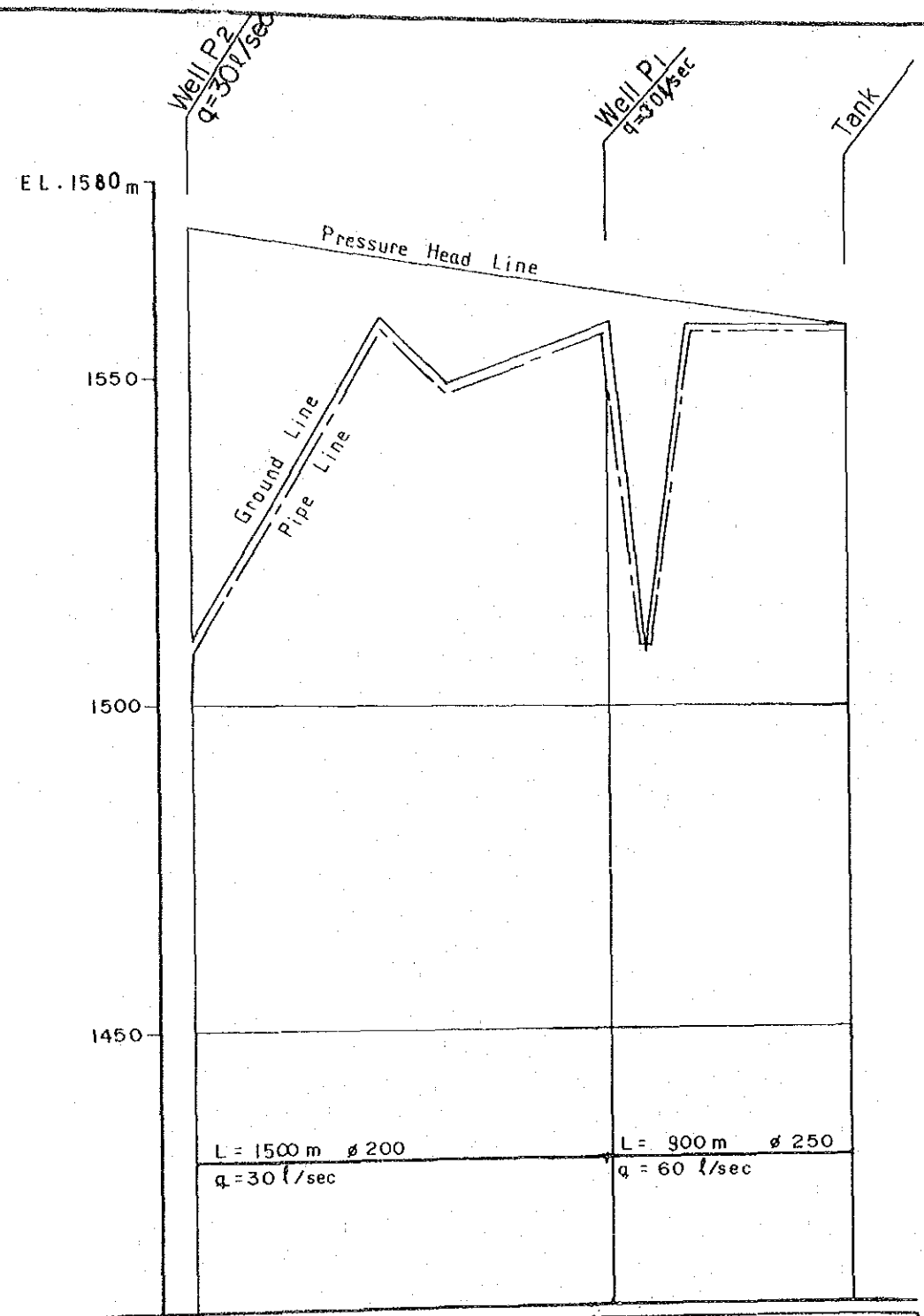
PRESSURE HEAD (m)	1540.6		1523.4		1520.0	
SLOPE						
EL. OF PIPE CENTER (m)	1483.50	1475.00	1472.40	1473.50	1501.90	1518.50
GROUND LEVEL (m)	1485.00	1480.50	1473.50	1475.00	1475.00	1503.40
ACCUMULATED DISTANCE (m)	0	500	1000	1500	1770	2160
STATION	0	1	2	3	4	

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 OF GUATEMALA CITY (EMPAGUA)
 GROUNDWATER DEVELOPMENT PROJECT
PROFILE OF PIPE LINE
EL. RODEO - I
 DATE: 1986 DWG. NO. 14
 JAPAN INTERNATIONAL COOPERATION AGENCY



PRESSURE HEAD (m)	1527.1	1520.00	1522.10
SLOPE			
EL. OF PIPE CENTER (m)	1518.50	1504.50	1478.50
GROUND LEVEL (m)	1520.00	1506.00	1480.00
ACCUMULATED DISTANCE (m)	0	50	96
STATION	0	1	

REPUBLIC OF GUATEMALA MUNICIPAL WATER SUPPLY CORPORATION OF GUATEMALA CITY (EMPAGUA)			
GROUNDWATER DEVELOPMENT PROJECT			
PROFILE OF PIPE LINE EL RODEO - II			
DATE	1986	DWG No.	15
JAPAN INTERNATIONAL COOPERATION AGENCY			



PRESSURE HEAD (m)	1573.1			1565.5		1560.0
SLOPE						
EL. OF PIPE CENTER (m)	1498.50	1550.00	1553.00	1558.50	1527.50	1558.50
GROUND LEVEL (m)	1510.00	1551.50	1554.50	1550.00	1560.00	1560.00
ACCUMULATED DISTANCE (m)	0	500	1000	1270	1500	1920
STATION	0	1	2	3		

	1499.0		1495.0
	1458.50	1480.40	1490.50
	1480.0	1481.90	1495.00
0	500	800	
0	1		

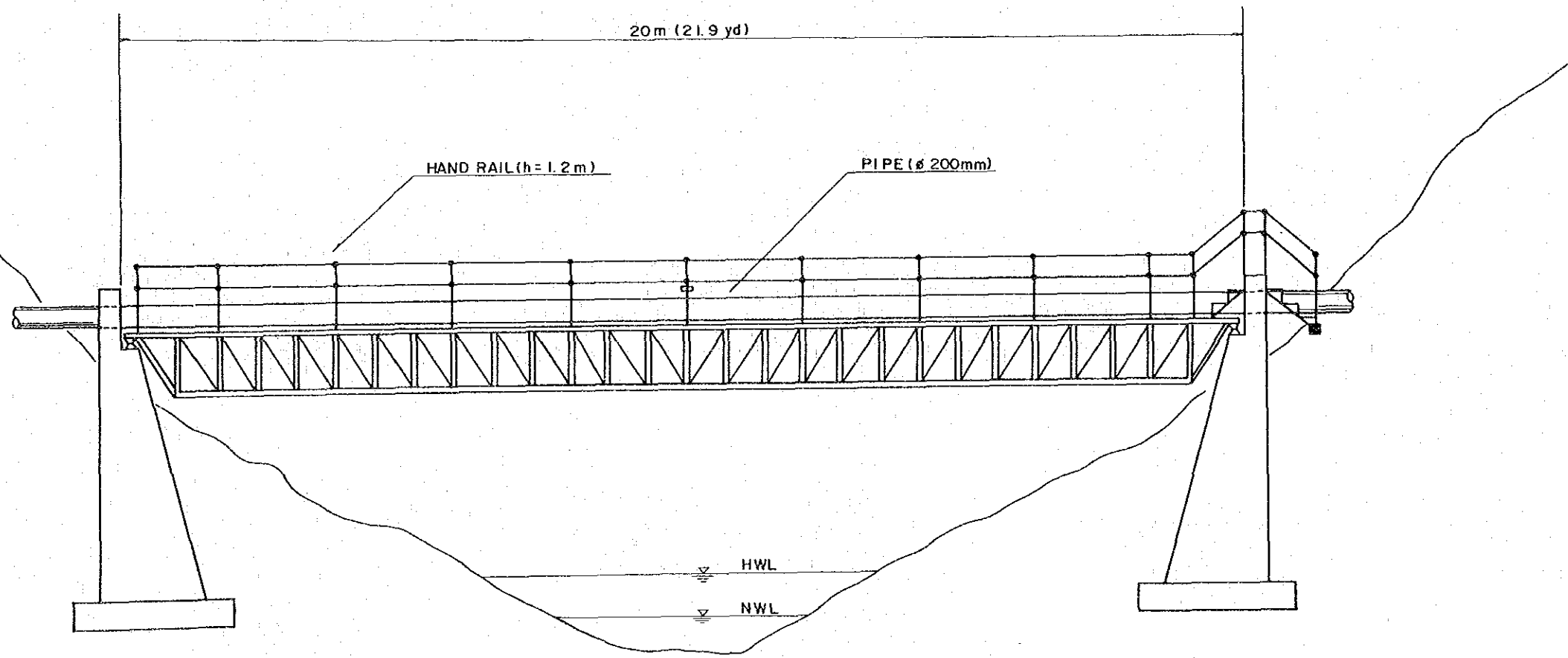
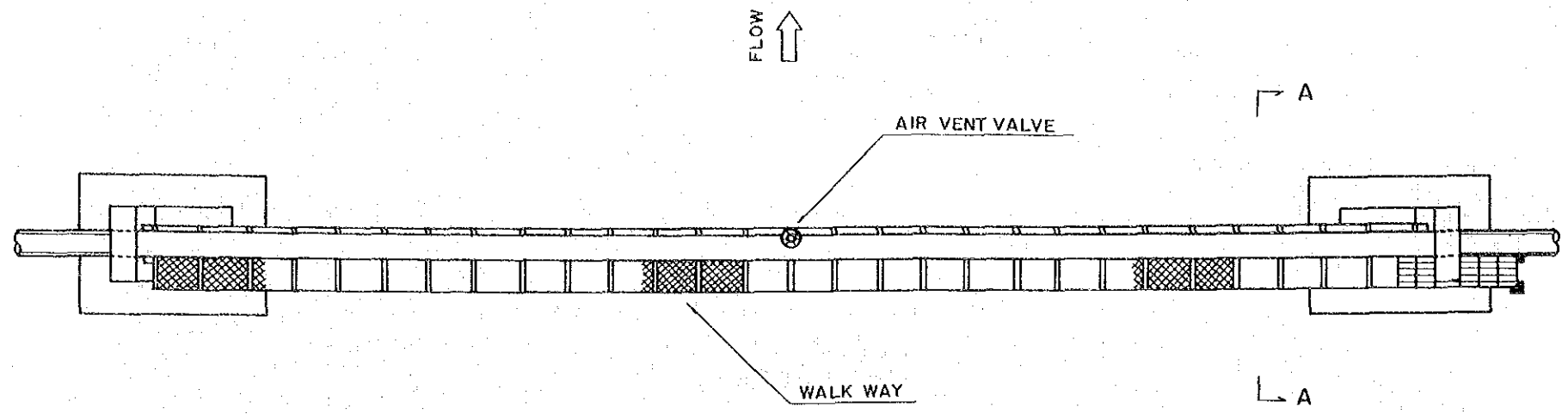
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GROUNDWATER DEVELOPMENT PROJECT

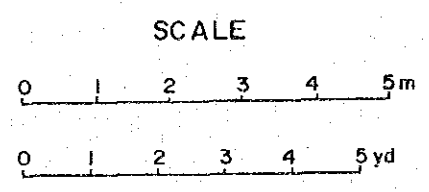
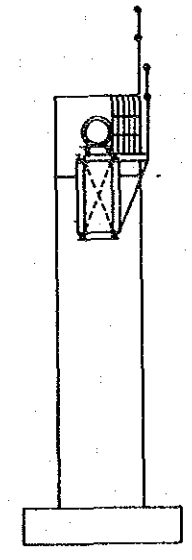
**PROFILE OF PIPE LINE
HERMOSA**

DATE 1986 DWG. NO 16

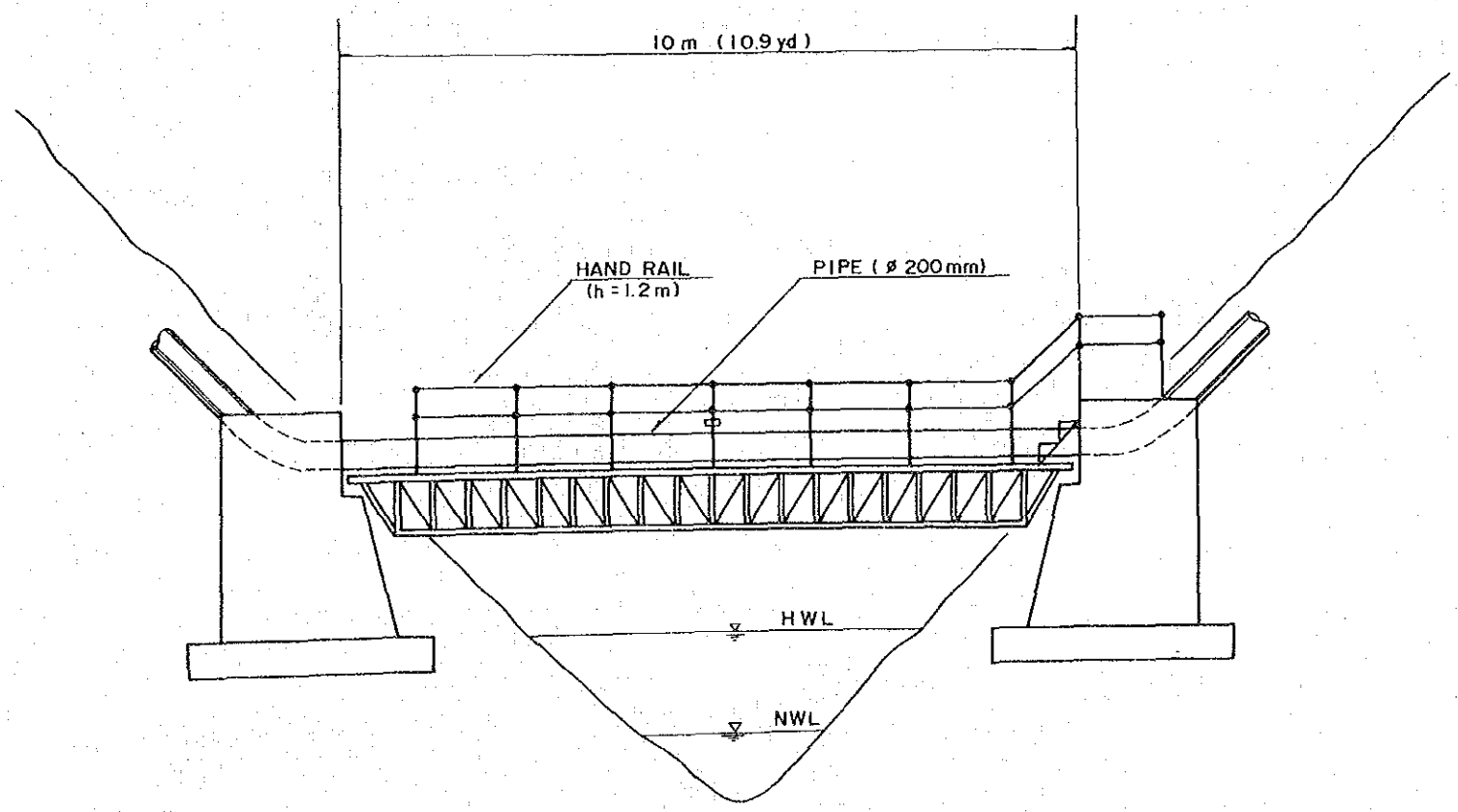
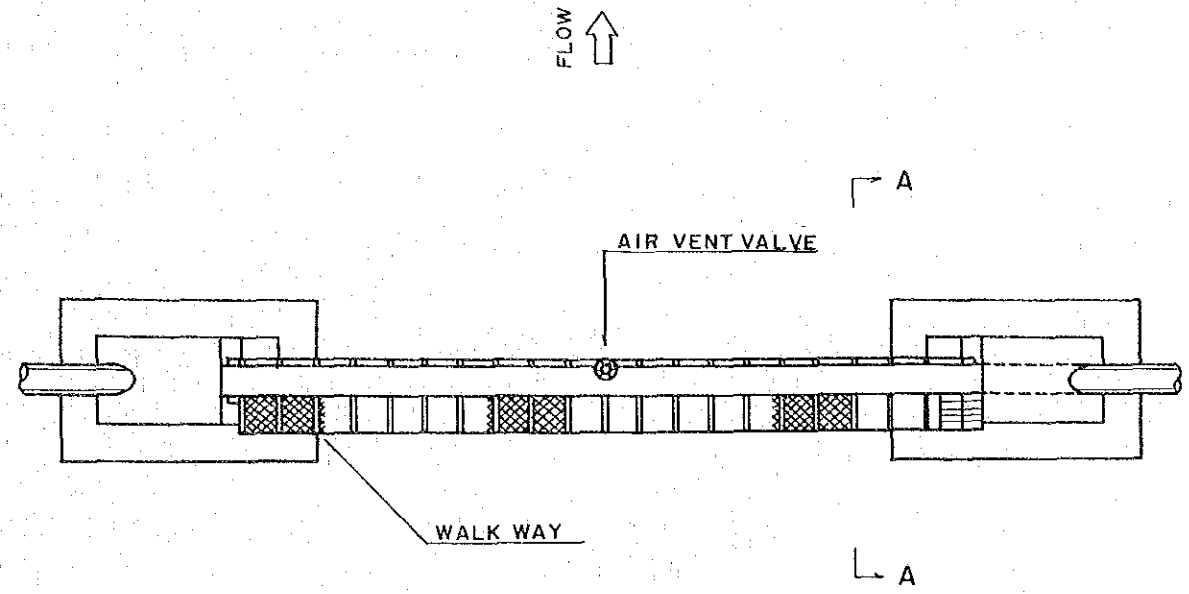
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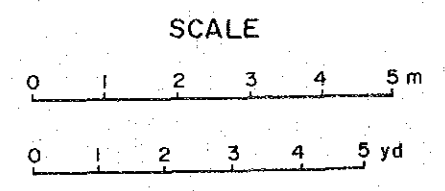
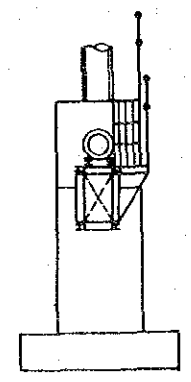
SECTION A-A



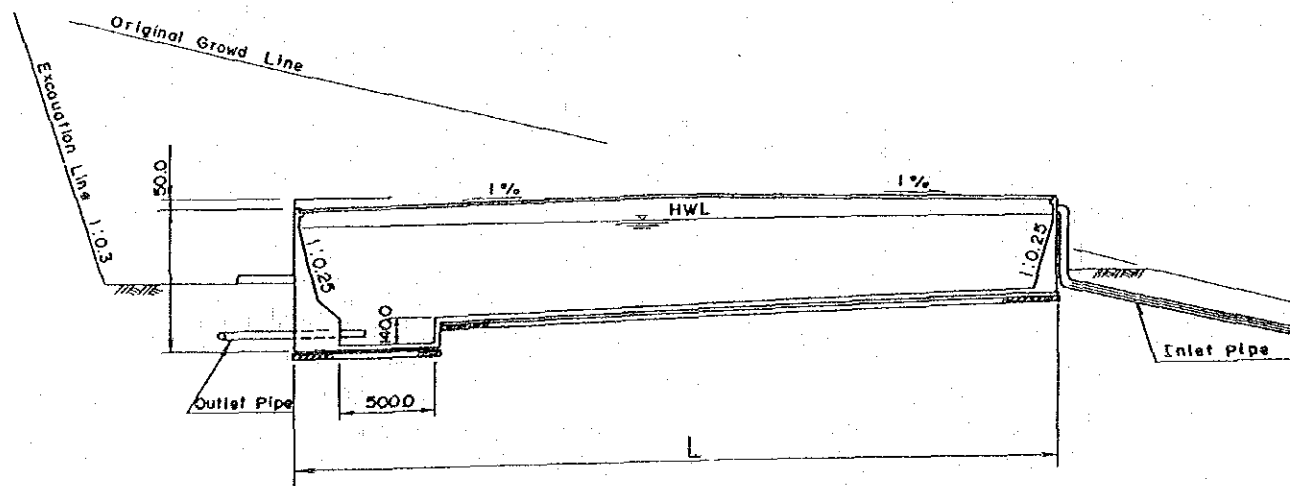
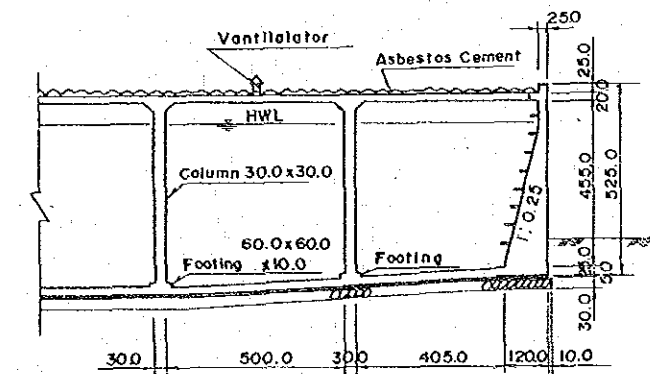
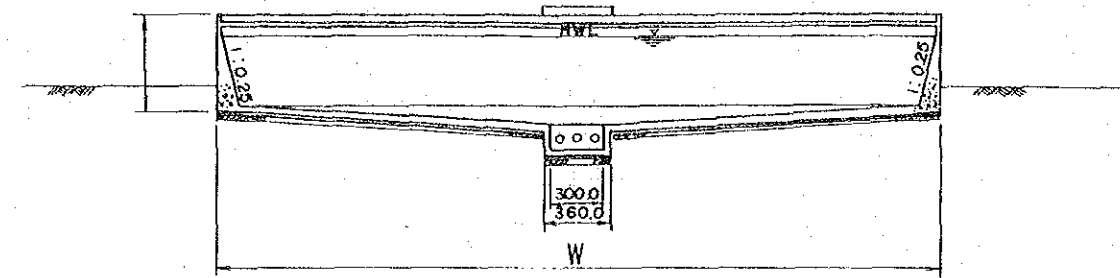
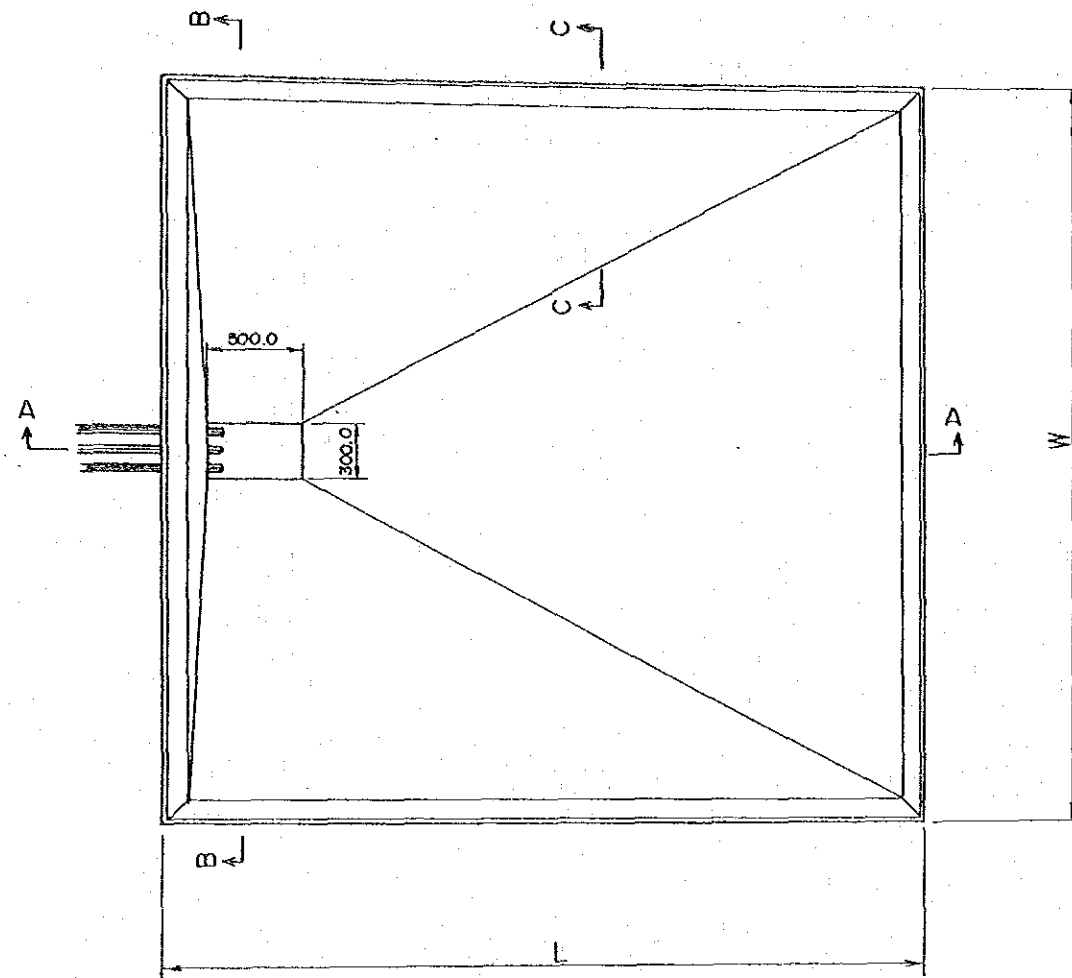
REPUBLIC OF GUATEMALA MUNICIPAL WATER SUPPLY CORPORATION OF GUATEMALA CITY (EMPAGUA)		
GROUNDWATER DEVELOPMENT PROJECT		
SIPHON BRIDGE TYPE - A		
DATE	1986	DWG. No. 17
JAPAN INTERNATIONAL COOPERATION AGENCY		



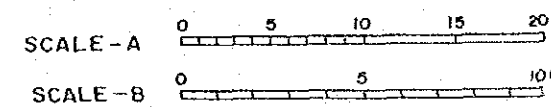
SECTION A-A



REPUBLIC OF GUATEMALA MUNICIPAL WATER SUPPLY CORPORATION OF GUATEMALA CITY (EMPAGUA)			
GROUNDWATER DEVELOPMENT PROJECT			
SIPHON BRIDGE TYPE - B			
DATE	1986	DWGNO.	18
JAPAN INTERNATIONAL COOPERATION AGENCY			



LOCATION	CAPACITY (m ³)	L (m)	W (m)	H (m)	G.L. (m)
Hermosa (I)	1,890	18.5	18.5	5.6	1,560
Canalitos San Grasper	2,835	22.5	22.5	5.6	1,610
El Rodeo (I)	1,260	15.0	15.0	5.6	1,520
El Rodeo (III)	1,260	15.0	15.0	5.6	1,500



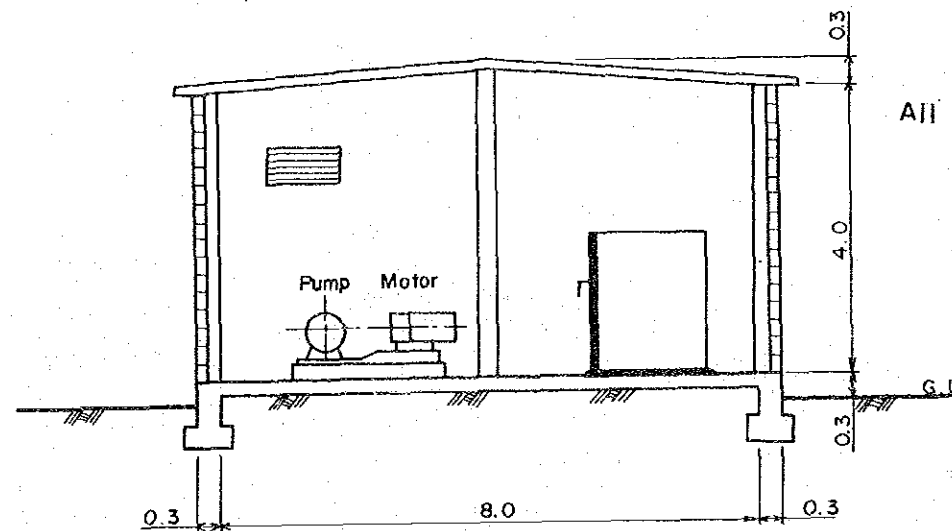
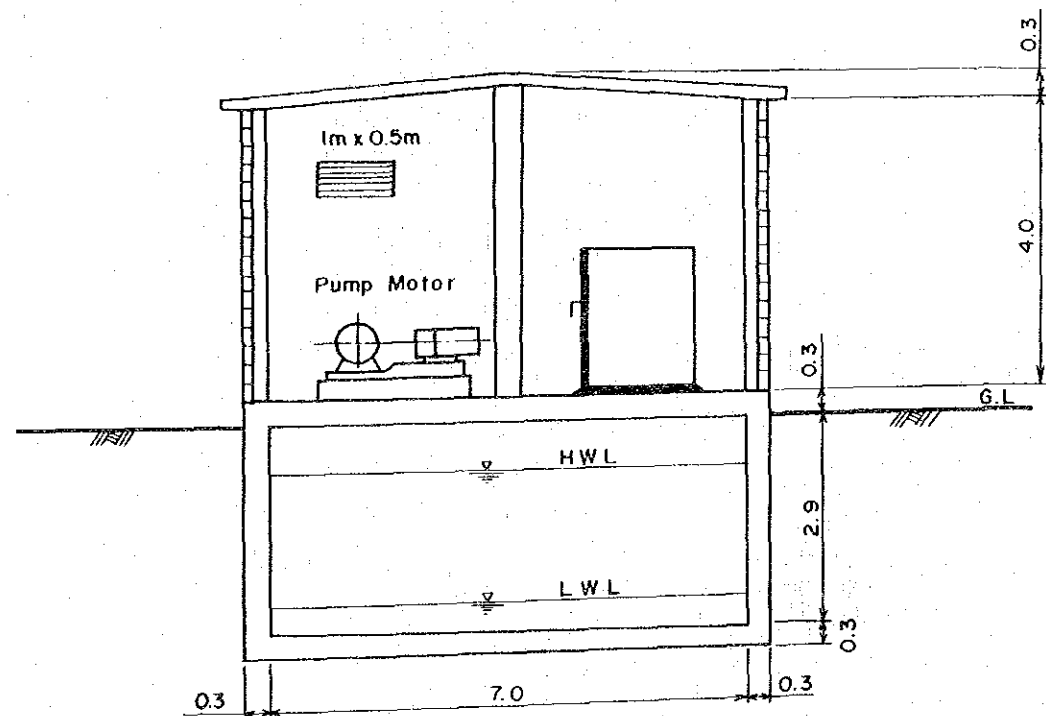
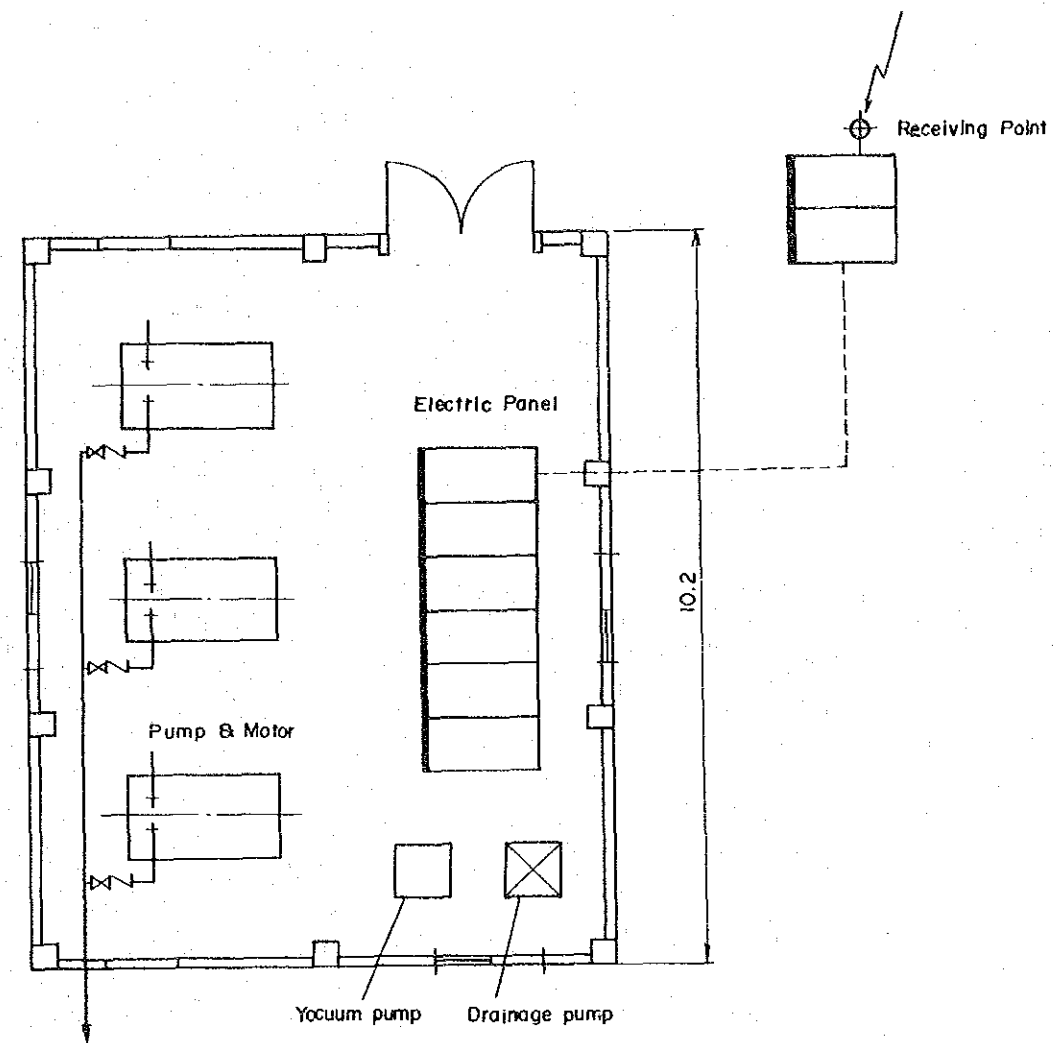
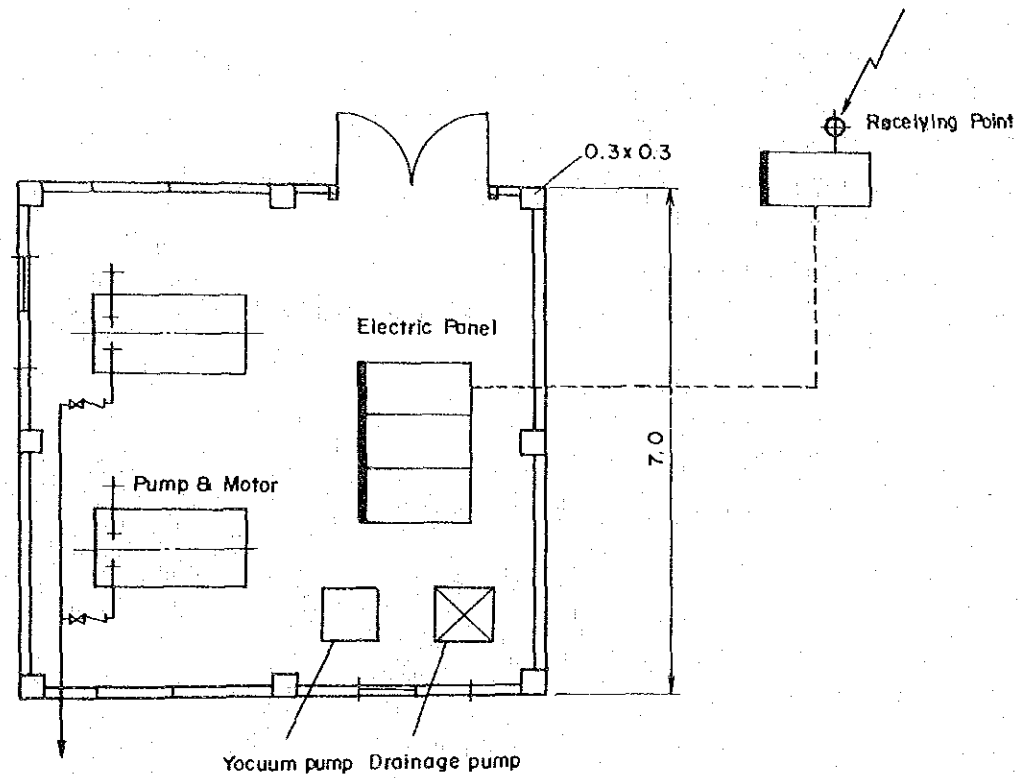
REPUBLIC OF GUATEMALA
MUNICIPAL WATER SUPPLY CORPORATION
OF GUATEMALA CITY (EMPAGUA)

GROUNDWATER DEVELOPMENT PROJECT

TANK EL RODEO

DATE	1986	DWG No	19
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JAPAN INTERNATIONAL COOPERATION AGENCY



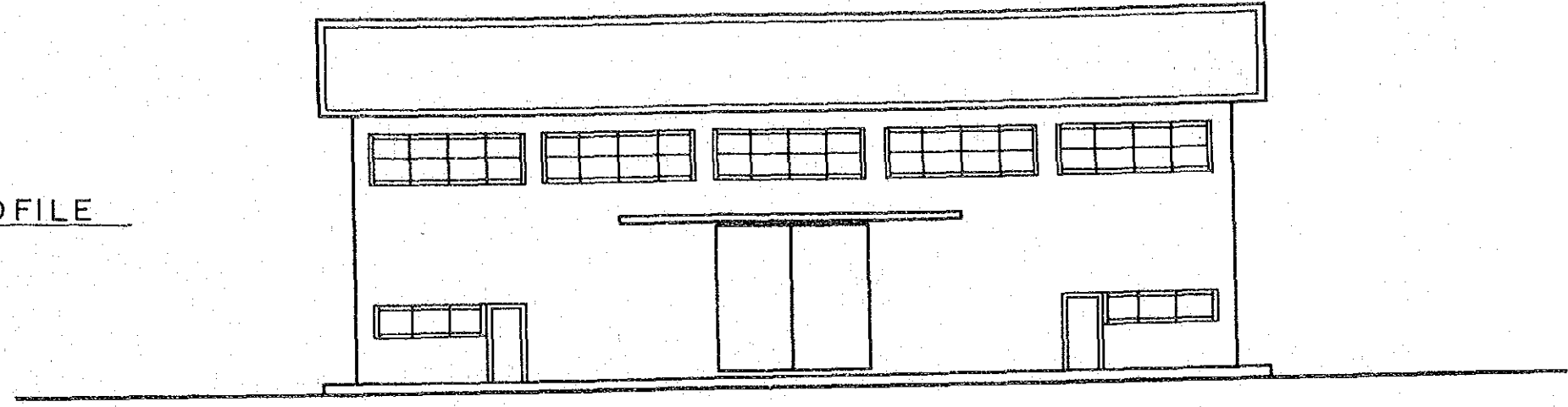
All dimensions are in meters

TYPE - A.

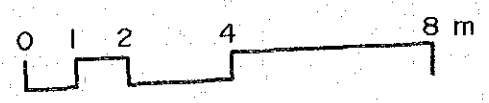
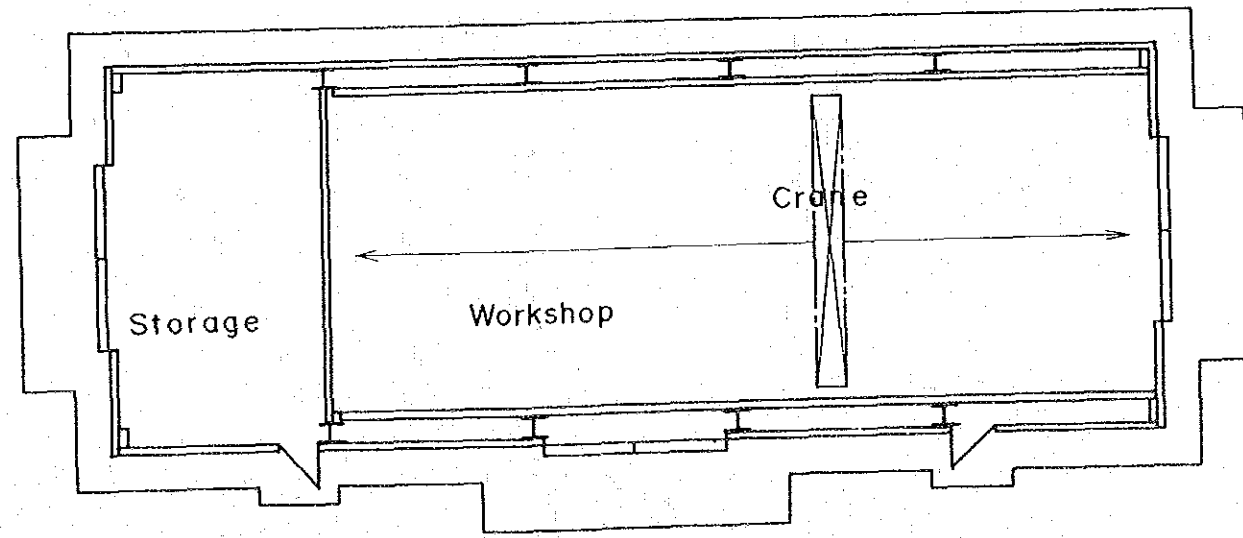
TYPE - B.

REPUBLIC OF GUATEMALA MUNICIPAL WATER SUPPLY CORPORATION OF GUATEMALA CITY (EMPAGUA)		
GROUNDWATER DEVELOPMENT PROJECT		
BOOSTER PUMP STATION		
DATE	DWG.No	20
JAPAN INTERNATIONAL COOPERATION AGENCY		

PROFILE

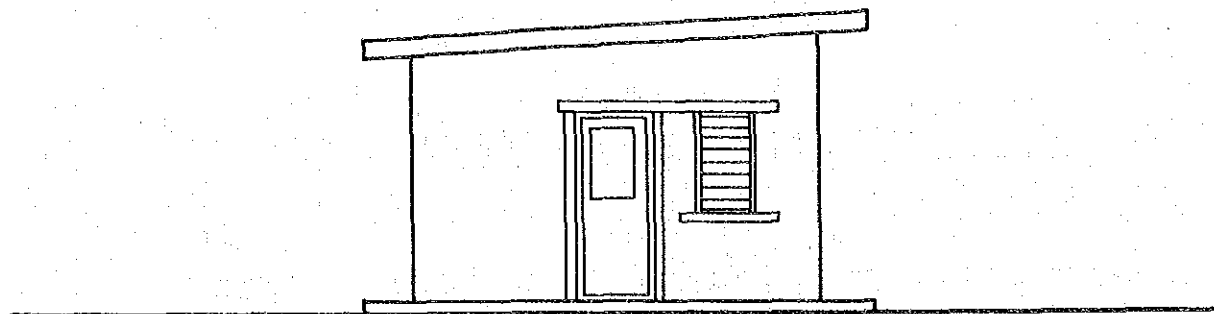


PLAN

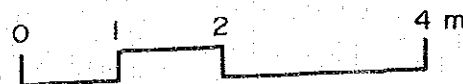
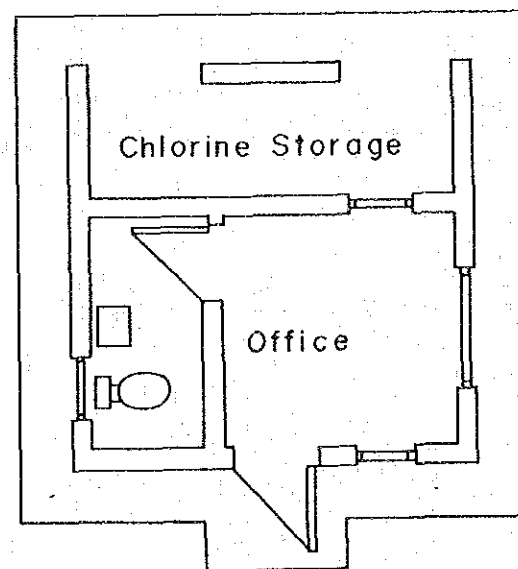


REPUBLIC OF GUATEMALA MUNICIPAL WATER SUPPLY CORPORATION OF GUATEMALA CITY (EMPAGUA)			
GROUNDWATER DEVELOPMENT PROJECT			
WORKSHOP			
DATE	1986	DWG. NO.	21
JAPAN INTERNATIONAL COOPERATION AGENCY			

PROFILE



PLAN

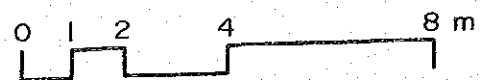
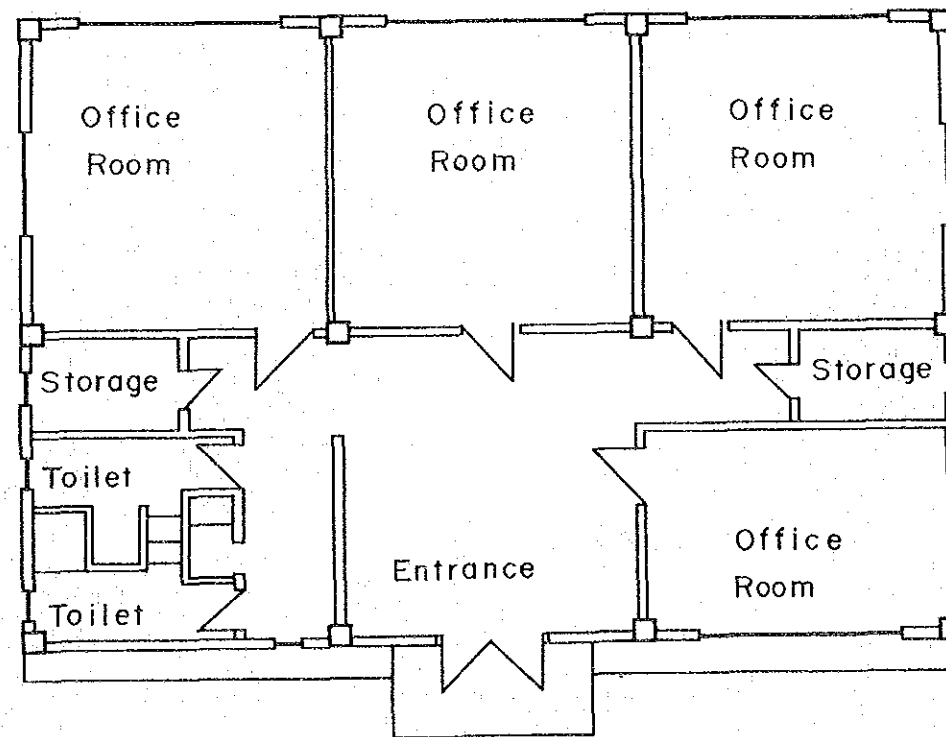


REPUBLIC OF GUATEMALA MUNICIPAL WATER SUPPLY CORPORATION OF GUATEMALA CITY (EMPAGUA)			
GROUNDWATER DEVELOPMENT PROJECT			
PUMP STATION OFFICE			
DATE	1986	DWG. NO.	22
JAPAN INTERNATIONAL COOPERATION AGENCY			

PROFILE

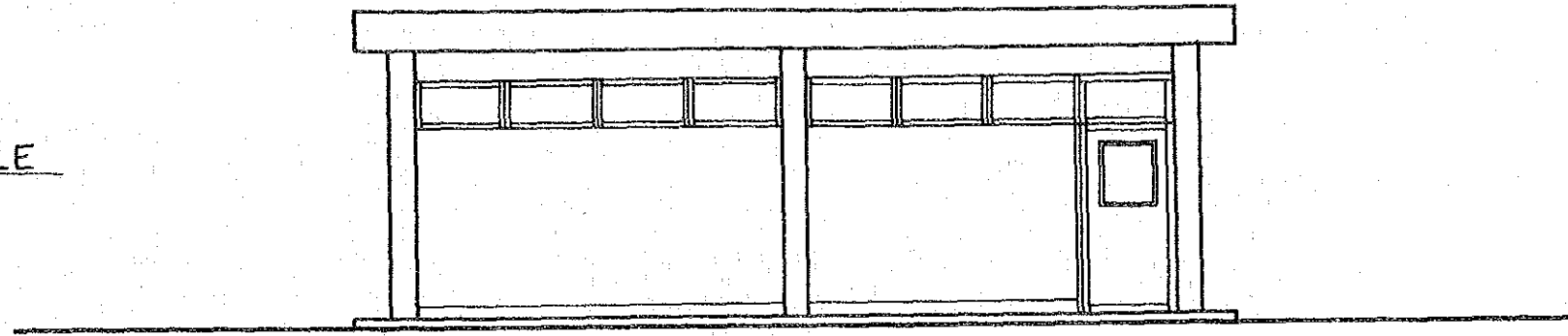


PLAN

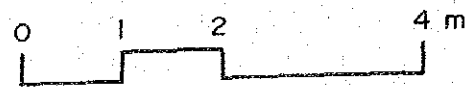
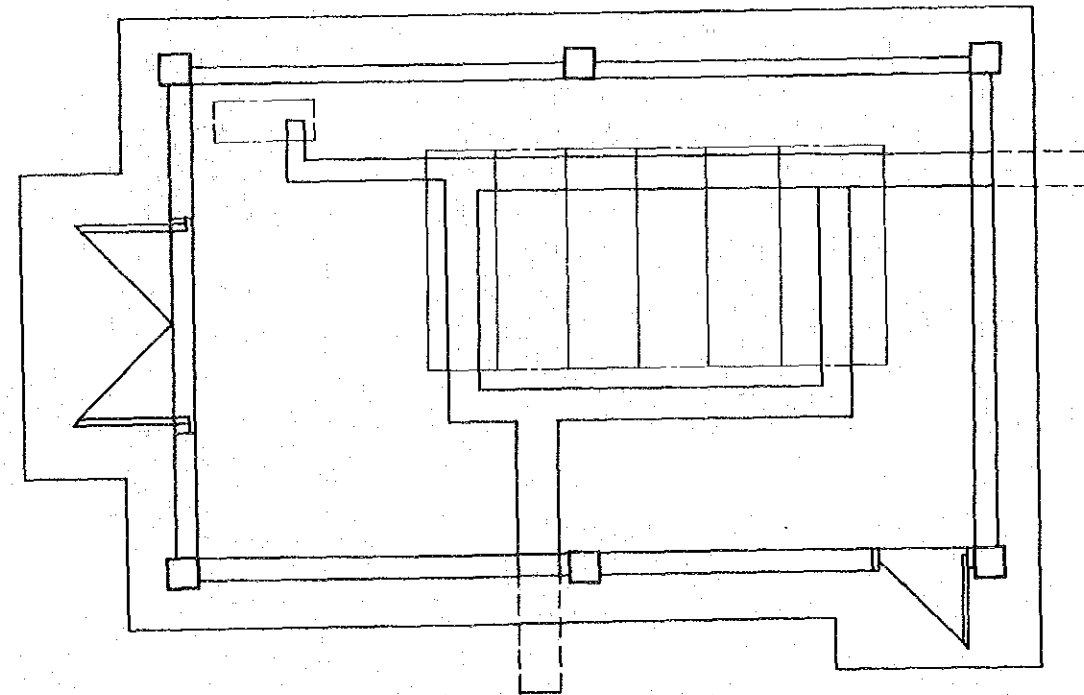


REPUBLIC OF GUATEMALA MUNICIPAL WATER SUPPLY CORPORATION OF GUATEMALA CITY (EMPAGUA I)			
GROUNDWATER DEVELOPMENT PROJECT			
O & M OFFICE			
DATE	1986	DWG. NO.	23
JAPAN INTERNATIONAL COOPERATION AGENCY			

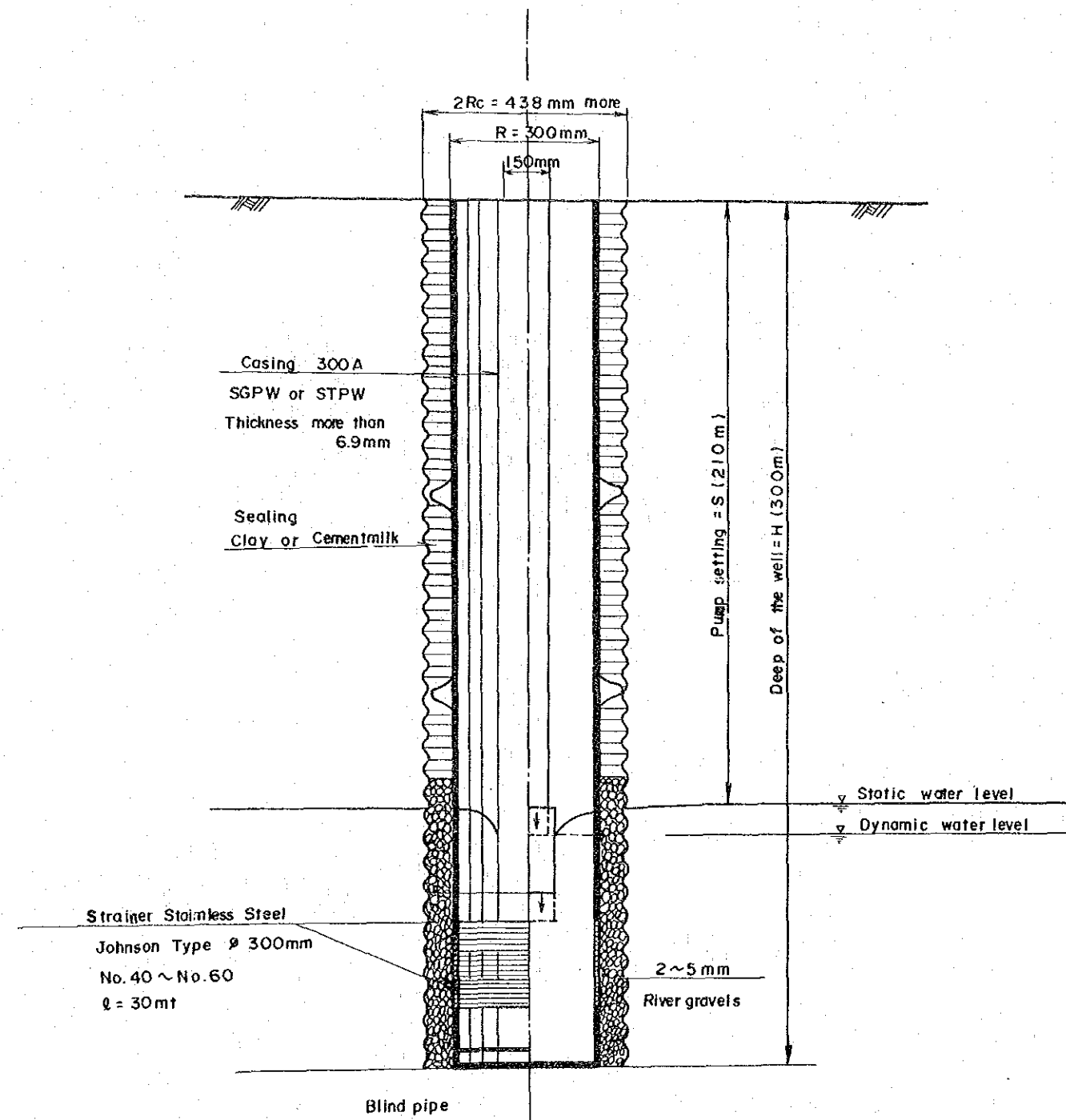
PROFILE



PLAN



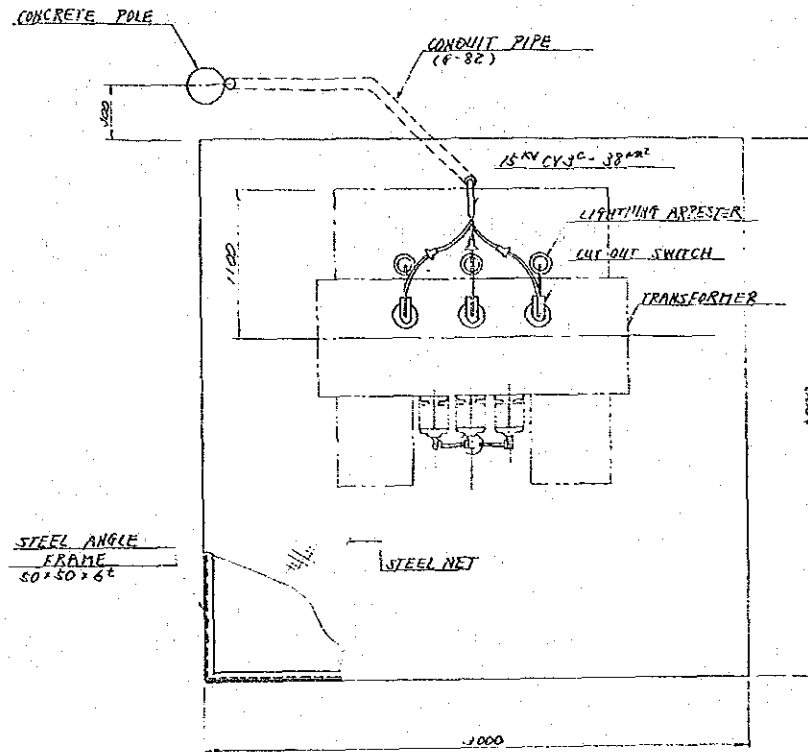
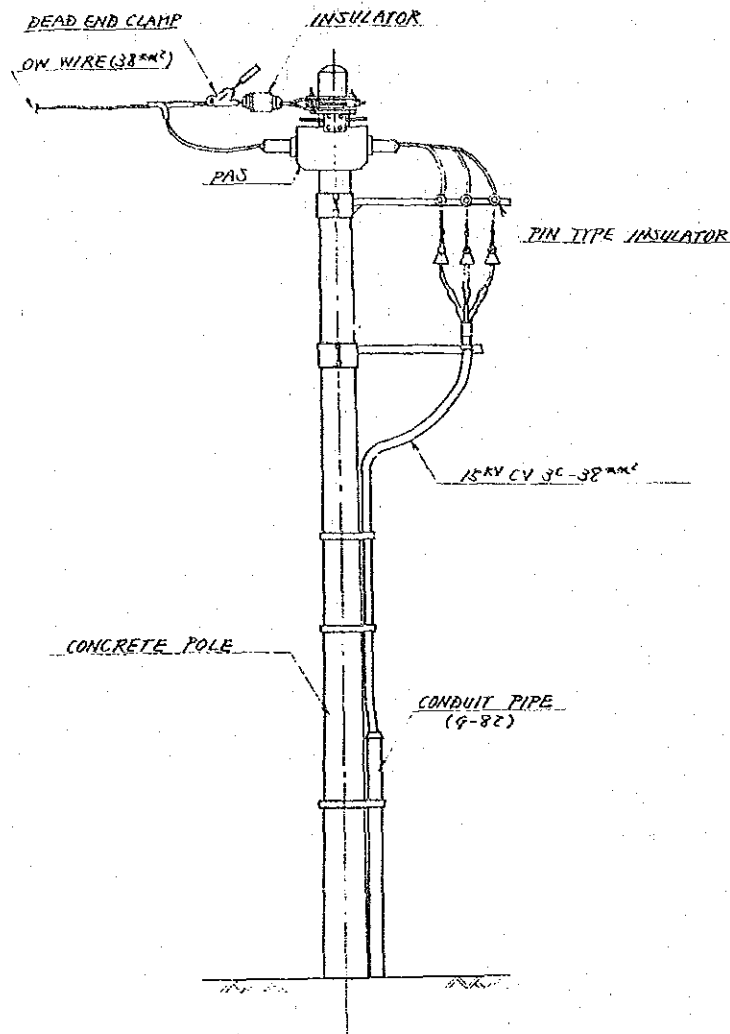
REPUBLIC OF GUATEMALA MUNICIPAL WATER SUPPLY CORPORATION OF GUATEMALA CITY (EMPAGUA)			
GROUNDWATER DEVELOPMENT PROJECT			
LOCAL OFFICE			
DATE	1986	DWG. NO.	24
JAPAN INTERNATIONAL COOPERATION AGENCY			



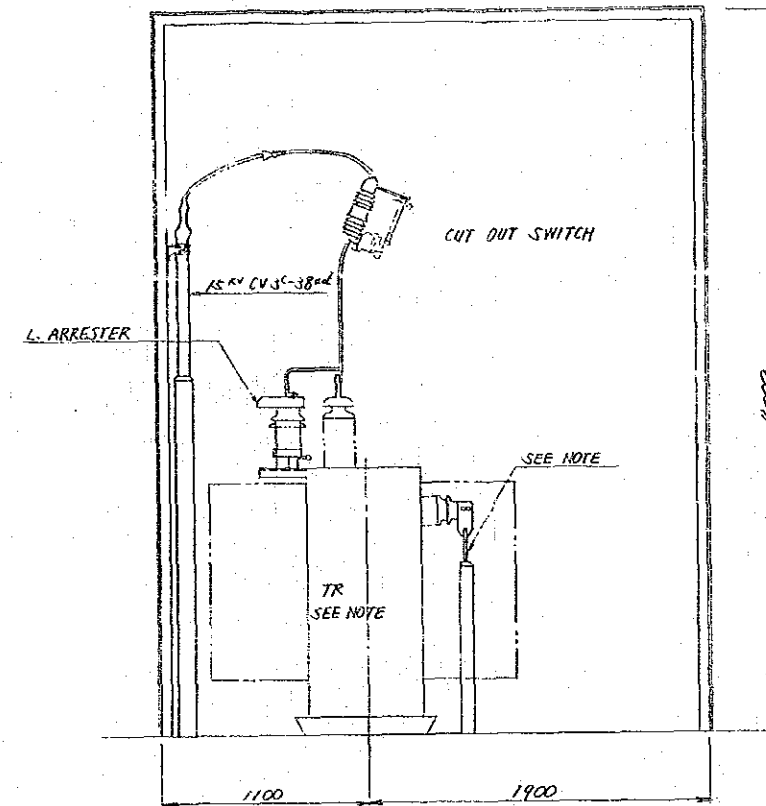
438mm → 17 1/2 inches
 300mm → 17" inches
 150mm → 6" inches

REPUBLIC OF GUATEMALA MUNICIPAL WATER SUPPLY CORPORATION OF GUATEMALA CITY (EMPAGUA)			
GROUNDWATER DEVELOPMENT PROJECT			
SECTION OF TUBE WELL			
DATE	1986	DWG.No	25
JAPAN INTERNATIONAL COOPERATION AGENCY			

26. TRANSFORMER AND POWER SWITCH GEAR YARD



PLAN (S-1/20)



ELEVATION VIEW (S-1/20)

POWER RECEIVING CONCRETE POLE (S-NONE)

NOTE

AREA GROUP	WELL NO.	TRANSFORMER CAPACITY (KVA)	CABLE SIZE (LOW TENSION SIDE)
NORTE (TANK A-4)	1	400 KVA	600 ^v CV 3-1 ^c -325 ^o
	2	600 KVA	6-1 ^o -200 ^o
	3	400 KVA	3-1 ^c -325 ^o
	4	400 KVA	DO
	5	500 KVA	6-1 ^c -200 ^o
NORTE (TANK CERRO EL CARMEN)	7	600 KVA	DO
	8	400 KVA	3-1 ^c -325 ^o
	6	500 KVA	6-1 ^c -200 ^o
CANALITOS (TANK JUANA DE ARCO)	B.P.T	700 KVA	DO
	1	300 KVA	3-1 ^c -200 ^o
	2	400 KVA	3-1 ^c -325 ^o
	3	400 KVA	DO
	7	400 KVA	DO
	9	400 KVA	DO
CANALITOS (TANK ACATAN)	10	200 KVA	3-1 ^c -200 ^o
	11	700 KVA	6-1 ^c -200 ^o
	4	200 KVA	3-1 ^c -200 ^o
	5	300 KVA	DO
	6	400 KVA	3-1 ^c -325
	8	400 KVA	DO
	12	400 KVA	DO
	13	300 KVA	3-1 ^c -200 ^o
	14	400 KVA	600 ^v CV 3-1 ^c -325 ^o

AREA GROUP	WELL NO.	TRANSFORMER CAPACITY (KVA)	CABLE SIZE (LOW TENSION SIDE)
CANALITOS (TANK SAN GABRIEL)	15	400 KVA	600 ^v CV 3-1 ^c -325 ^o
	16	300 KVA	3-1 ^c -200 ^o
	17	300 KVA	DO
HERMOSA (TANK HERMOSA)	1	300 KVA	DO
	2	400 KVA	3-1 ^c -325 ^o
	3	400 KVA	DO
	4	300 KVA	3-1 ^c -200 ^o
LAVARREDA (TANK J. A)	1	500 KVA	6-1 ^c -200 ^o
	2	400 KVA	3-1 ^c -325 ^o
EL RODEO	1	300 KVA	3-1 ^c -200 ^o
	2	300 KVA	DO
	3	200 KVA	DO
	4	200 KVA	DO
	5	300 KVA	DO
	6	200 KVA	DO
	7	300 KVA	600 ^v CV DO

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