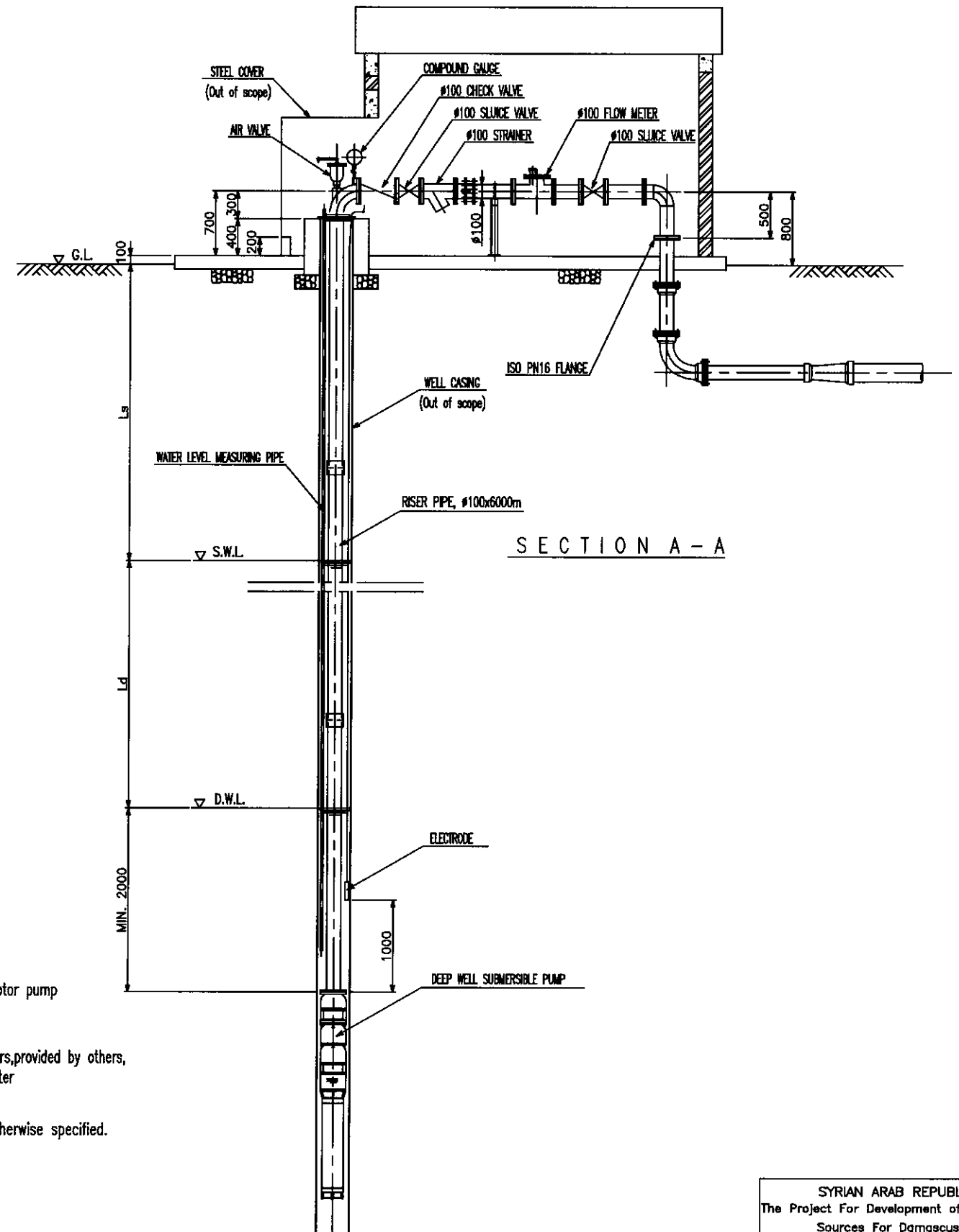


PLAN



SECTION A-A

Well No.	Discharge (m <sup>3</sup> /min)	Total Head (m)	G.L. (EL.m)	Ls (EL.m)	Ld (EL.m)	No. of Riser Pipe	Well diameter (inch)
Y1	0.83	160	1280.62	97.0	20.0	20	12
Y2	0.83	160	1285.32	101.5	16.0	20	12
Y3	0.83	170	1277.69	93.2	33.0	22	12
Y4	0.83	160	1308.59	111.6	34.0	25	12
Y5	0.83	160	1282.13	99.3	23.0	21	12
Y6	0.83	160	1268.49	87.0	16.0	18	12
Y7	0.83	170	1272.07	90.7	35.0	22	12
Y8	0.83	160	1281.20	100.0	19.0	21	12
Y9	0.83	170	1287.19	107.0	32.0	24	12
Y10	0.83	220	1299.33	117.8	78.0	33	12
Y11	0.83	220	1307.99	127.7	73.0	34	12

Note,

- 1, Installation and maintenance of the submersible motor pump will be carried out by a mobile crane through the opening of the steel cover.
- 2, The pump room will be heated up by electric heaters, provided by others, to protect the air valve, compound gauge, flow indicator and valves from freezing in winter season.
- 3, All dimensions are given in millimeter, unless otherwise specified.
- 4, G.L. : Ground Level  
 $\phi$  : Nominal diameter (mm)  
 D.W.L. : Draw-down water level  
 S.W.L. : Static water level

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YABOOS WELL PUMP HOUSE	DRW. NO 02
PREPARED BY	APPROVED BY
CONCURRED BY	DATE
DAMASCUS CITY WATER SUPPLY AND SEWERAGE AUTHORITY DAWSSA	

S=1:500 5m 20m 35m 60m

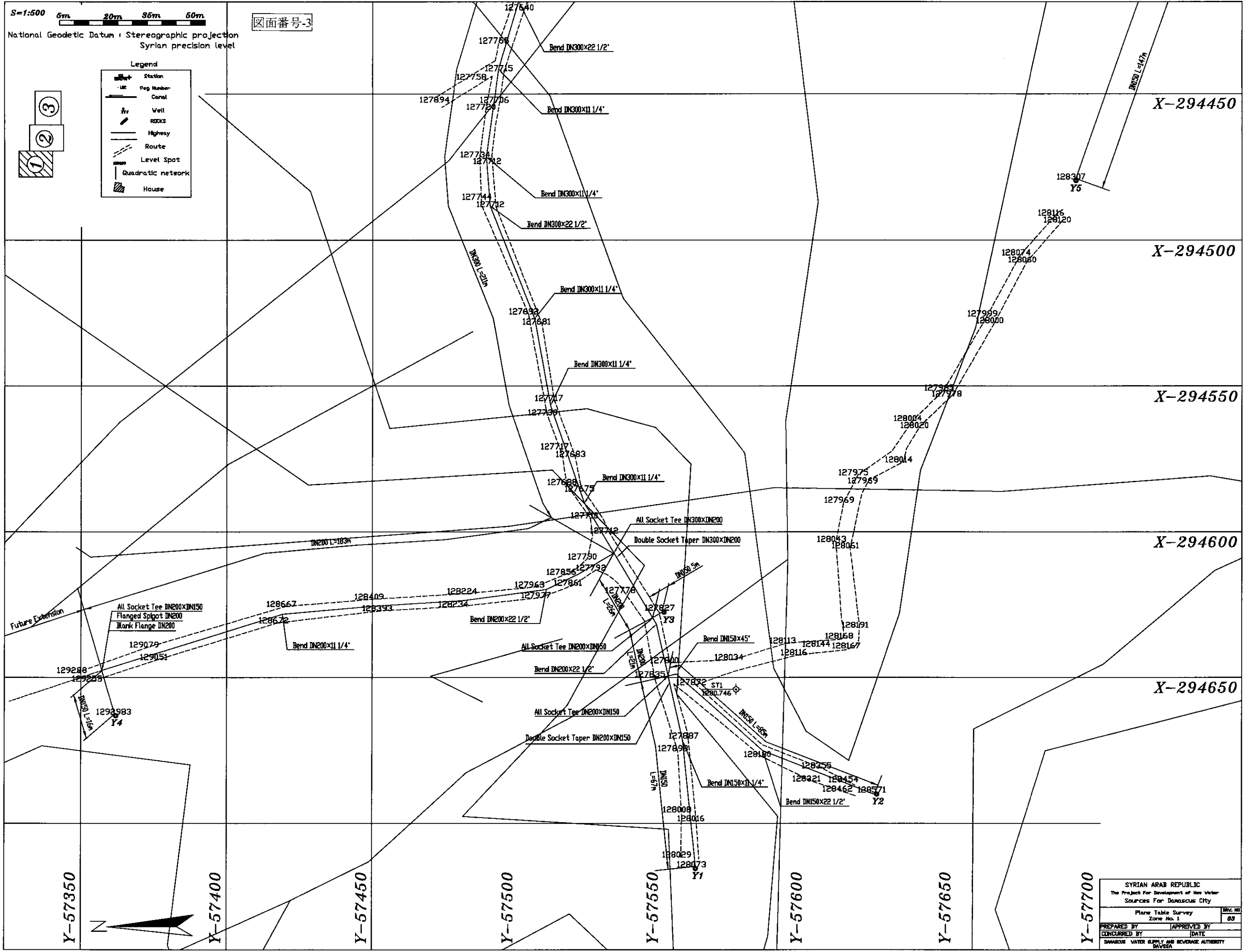
National Geodetic Datum : Stereographic projection  
Syrian precision level

図面番号-3

Legend

- Station
- Peg Number
- Canal
- Well
- ROCKS
- Highway
- Route
- Level Spot
- Quadratic network
- House

①  
②  
③



SYRIAN ARAB REPUBLIC  
The Project For Development of New Water  
Sources For Damascus City

Plane Table Survey Zone No. 1

PREPARED BY: [ ] APPROVED BY: [ ]  
DATE: [ ]

DAMASCUS WATER SUPPLY AND SEWERAGE AUTHORITY  
DWASA

図面番号-4

To yabou

X-294100

X-294150

X-294200

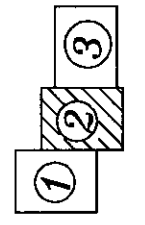
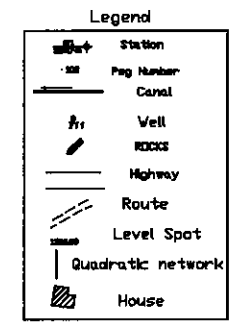
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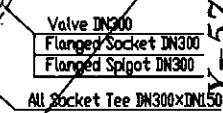
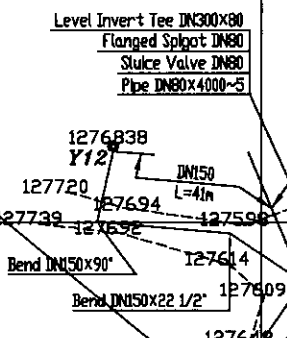
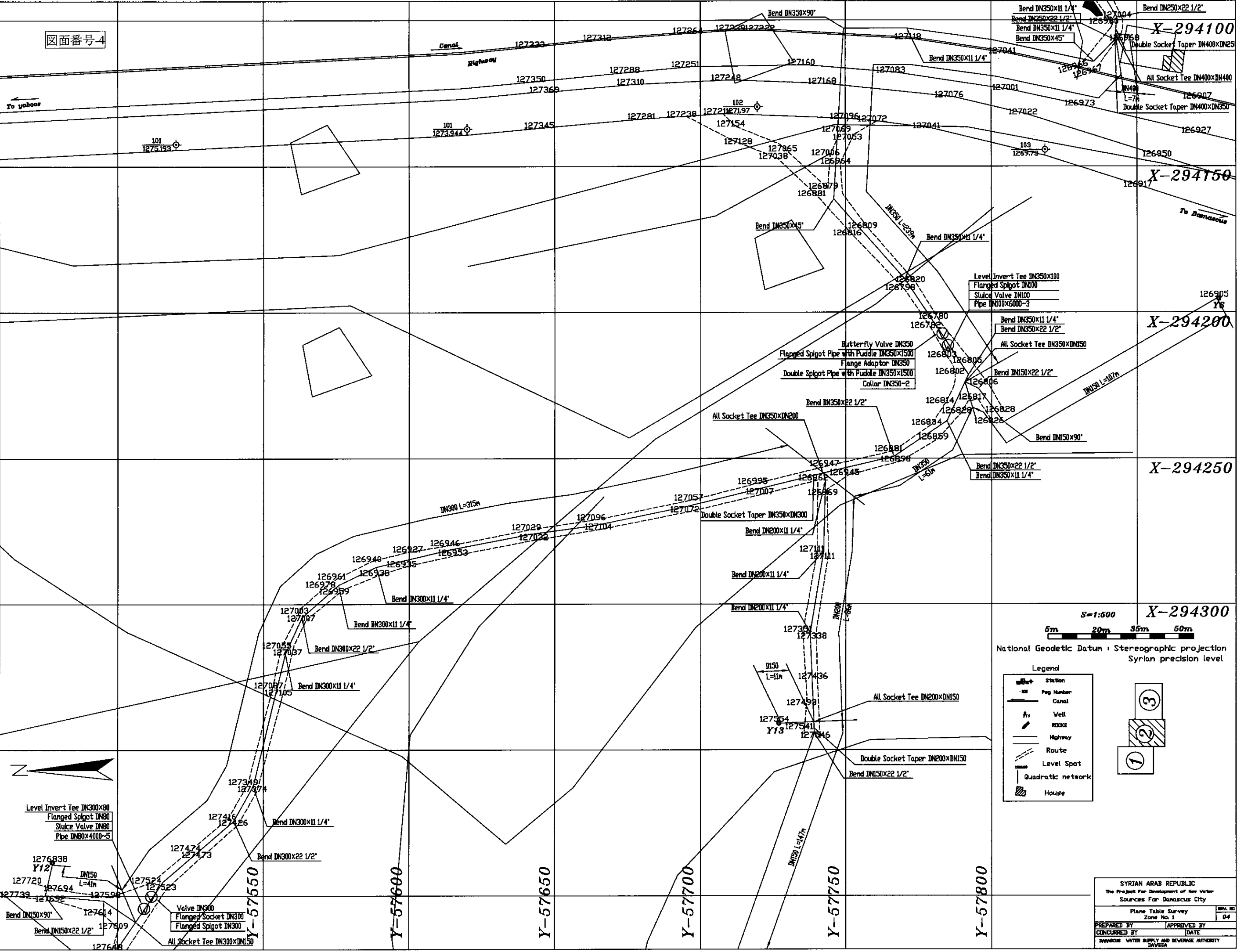
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National Geodetic Datum | Stereographic projection  
Syrian precision level



SYRIAN ARAB REPUBLIC	
The Project For Development of New Water Sources For Damascus City	
Plane Table Survey	Blk. No
Zone No. 1	04
PREPARED BY	APPROVED BY
CONCLUDED BY	DATE
DAMASCUS WATER SUPPLY AND SEWERAGE AUTHORITY	



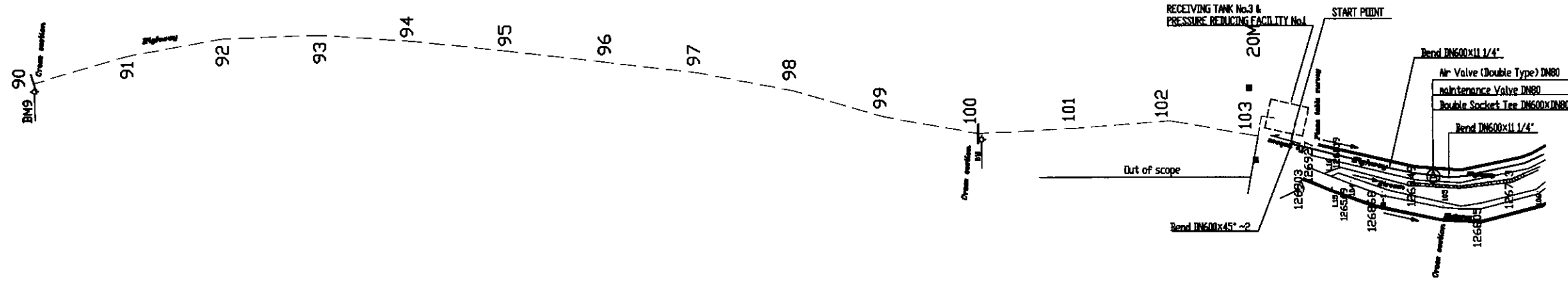


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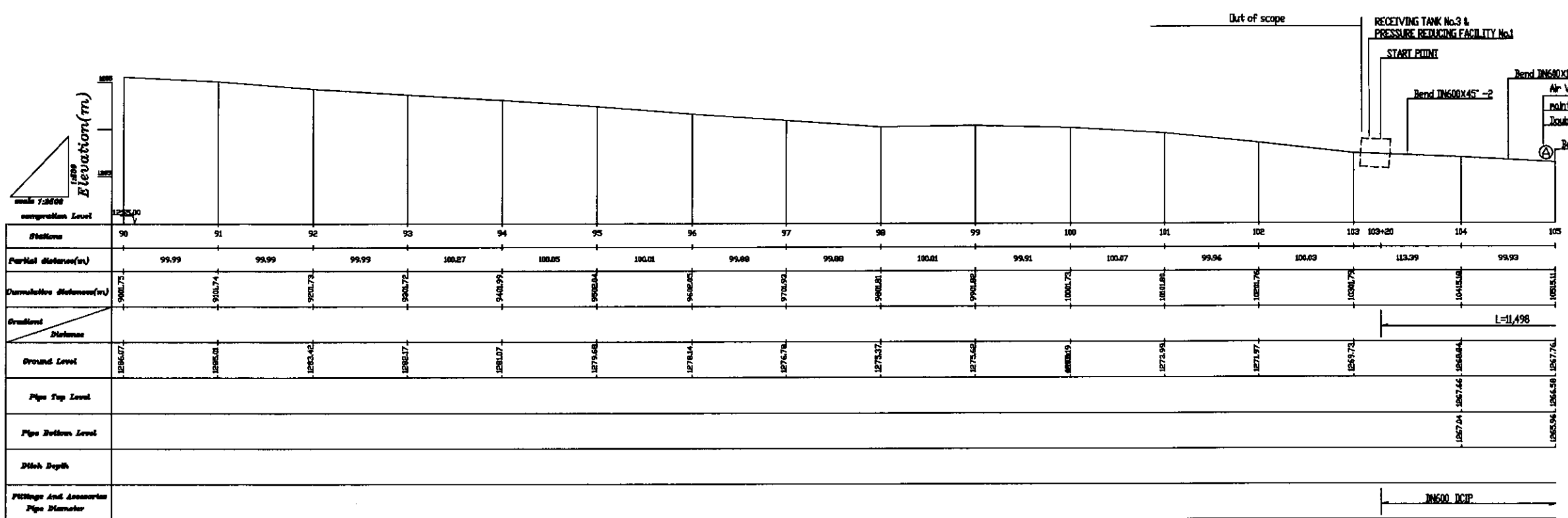
図面番号-6

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪ ⑫ ⑬ ⑭ ⑮



**Legend**

- ◊ BM Bench Mark
- ~ Curve
- B G.P.S points
- L Changing of Center Line Direction
- 2 Peg Number
- ⊕ Air Valve
- ⊗ Wash Out
- ⊙ Valve



Station	90	91	92	93	94	95	96	97	98	99	100	101	102	103	103+20	104	105
Partial distance(m)		99.99	99.99	99.99	100.27	100.85	100.01	99.88	99.88	100.01	99.91	100.47	99.96	100.03	113.39	99.93	
Cumulative distance(m)	0	99.99	199.98	299.97	399.94	499.79	598.80	698.68	798.56	898.44	998.35	1098.26	1198.17	1298.08	1411.47	1511.40	1611.33
Gradient																	
Ground Level	1276.07	1276.03	1276.42	1276.17	1276.07	1276.48	1276.14	1276.76	1276.37	1276.42	1276.19	1273.95	1271.97	1269.73	1267.64	1266.64	1267.61
Pipe Top Level																	
Pipe Bottom Level																	
Min. Depth																	
Pipeline And Accessories																	
Pipe Diameter																	

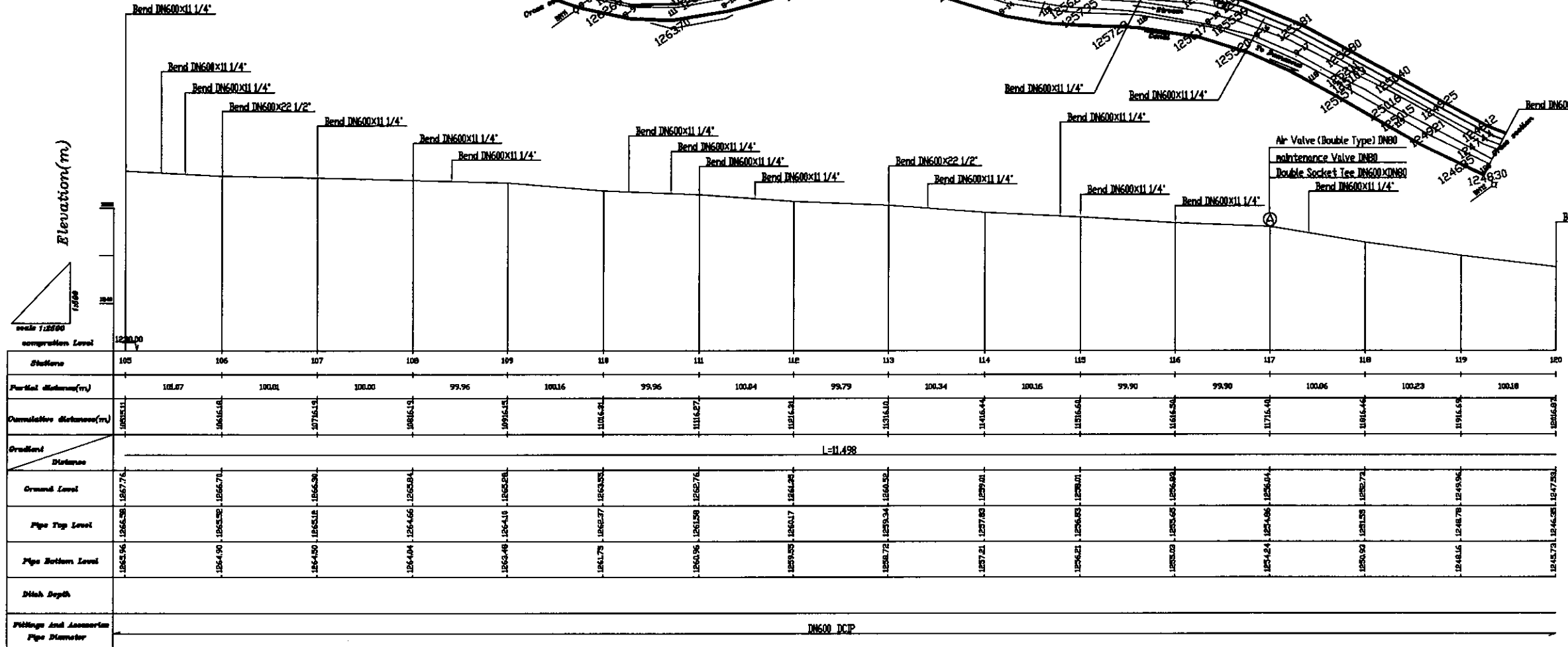
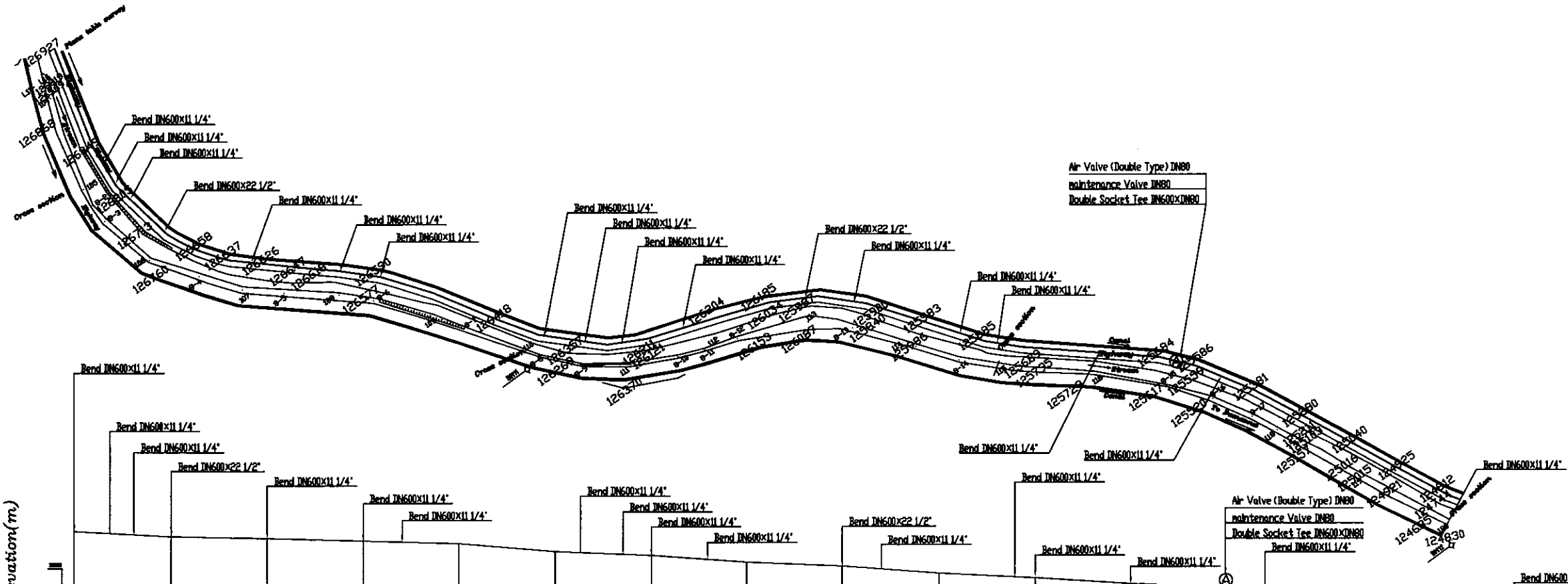
SYRIAN ARAB REPUBLIC  
The Project For Development of New Water Sources For Damascus City

PLAN & PROFILE  
OF  
Maadar\_Yaboos\_Zerzar\_Takea PBR Route

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CONCURRED BY: [ ] DATE: [ ]

DAMASCUS CITY WATER SUPPLY AND SEWERAGE AUTHORITY  
DAWSSA

DRW. NO. 06



**Legend**

- ◊ BM Bench Mark
- C Curve
- B G.P.S points
- L Changing of Center Line Direction
- 2 Peg Number
- ⊕ Air Valve
- ⊖ Wash Out
- ⊙ Valve

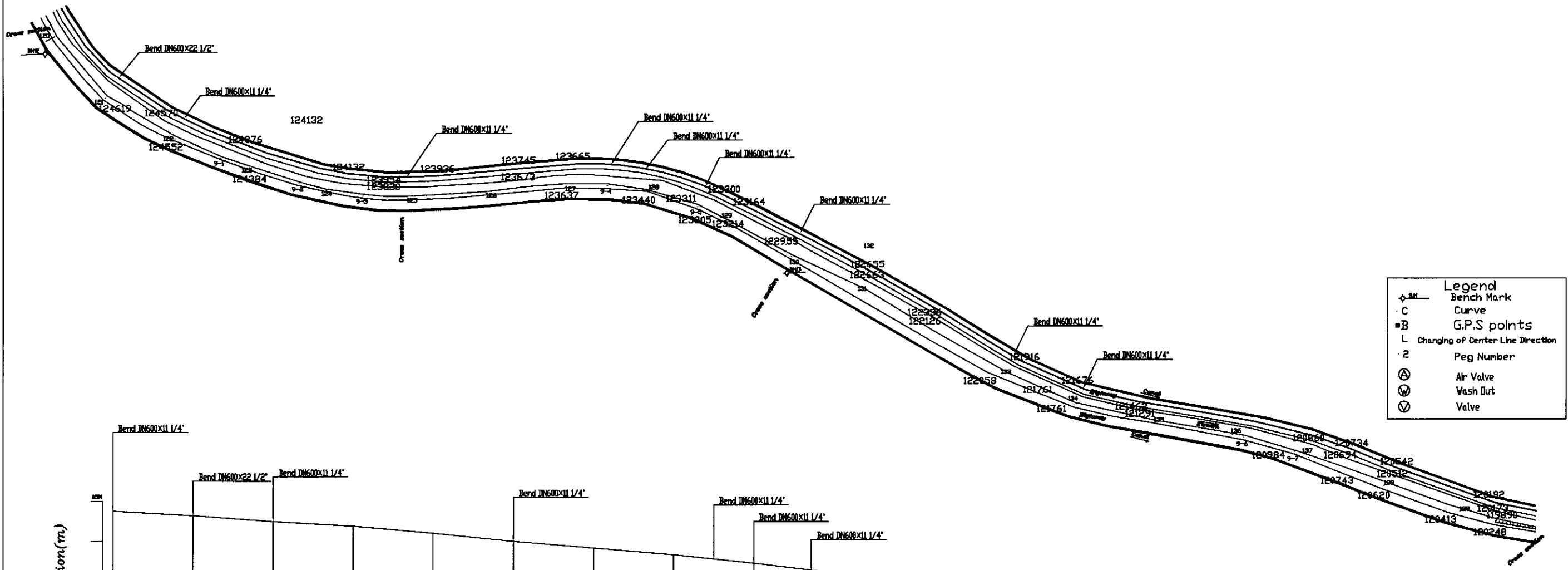
SYRIAN ARAB REPUBLIC  
 The Project For Development of New Water Sources For Damascus City

PLAN & PROFILE  
 OF  
 Maadar\_Yaboos\_Zerzar\_Takea PBR Route

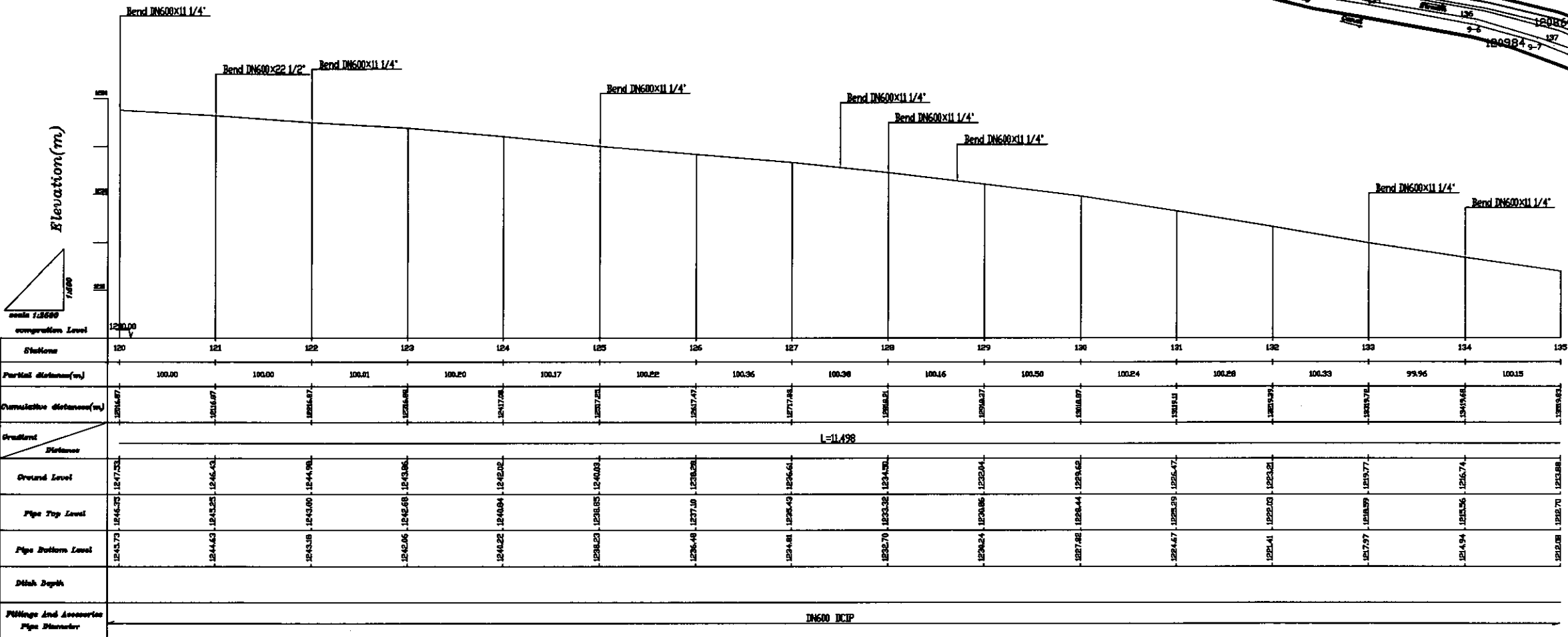
DRW. NO 07

PREPARED BY [ ] APPROVED BY [ ]  
 CONCURRED BY [ ] DATE [ ]

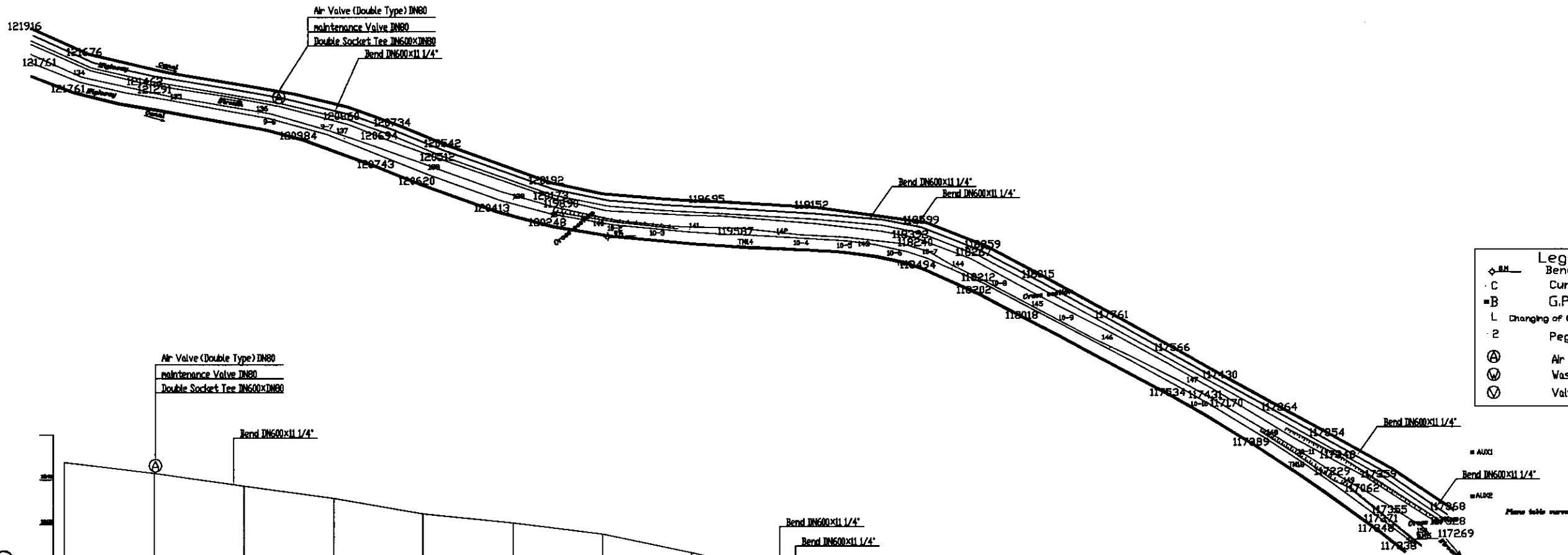
DAMASCUS CITY WATER SUPPLY AND SEWERAGE AUTHORITY  
 DAWSSA



	Bench Mark
	Curve
	G.P.S. points
	Changing of Center Line Direction
	Peg Number
	Air Valve
	Wash Dirt
	Valve

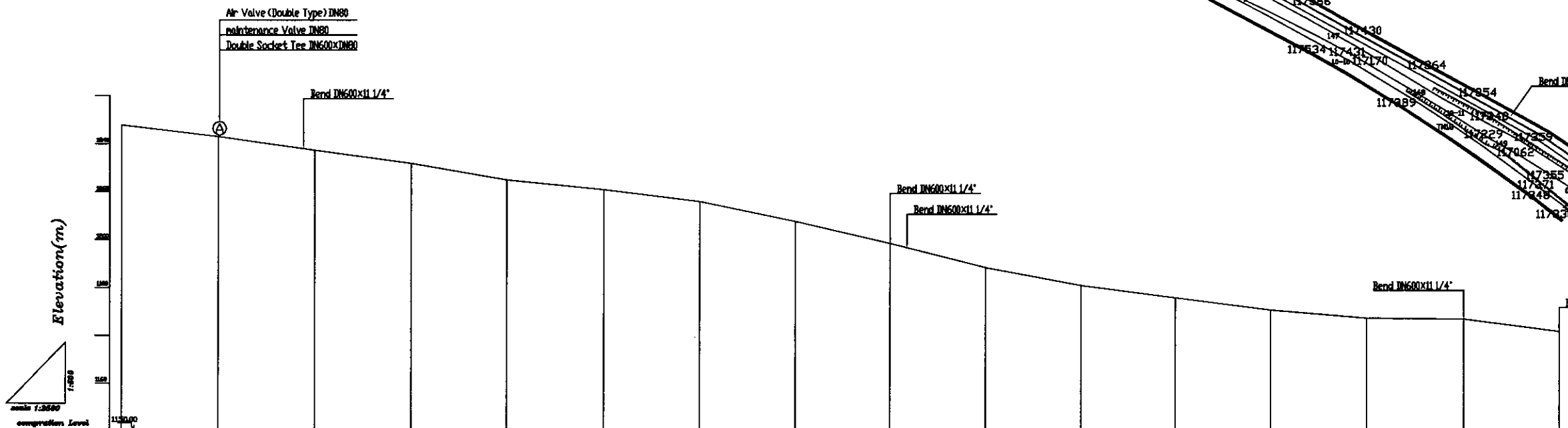


SYRIAN ARAB REPUBLIC	
The Project For Development of New Water Sources For Damascus City	
PLAN & PROFILE	DRV. NO
OF	08
Maadar_Yaboos_Zerzar_Takea PBR Route	APPROVED BY
PREPARED BY	DATE
DAMASCUS CITY WATER SUPPLY AND SEWERAGE AUTHORITY DAWSSA	



**Legend**

- ◆ BM Bench Mark
- C Curve
- B G.P.S points
- L Changing of Center Line Direction
- 2 Peg Number
- ⊕ Air Valve
- ⊙ Wash Out
- ⊖ Valve



Station	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
Partial distance(m)	100.50	100.49	100.55	100.29	100.45	99.82	100.10	98.97	99.06	99.21	98.88	100.04	100.09	100.41	100.20	
Cumulative distance(m)	121916.00	121916.49	121917.04	121917.33	121917.78	121917.60	121918.70	121919.67	121920.63	121921.69	121923.00	121924.88	121926.92	121928.01	121929.42	121930.42
Gradient	-11.498															
Ground Level	121916.00	121917.17	121918.64	121919.91	121921.26	121922.61	121924.06	121925.51	121926.96	121928.41	121929.86	121931.31	121932.76	121934.21	121935.66	121937.11
Pipe Top Level	121916.70	121917.87	121919.34	121920.61	121921.96	121923.31	121924.66	121926.01	121927.36	121928.71	121930.06	121931.41	121932.76	121934.11	121935.46	121936.81
Pipe Bottom Level	121916.00	121917.17	121918.64	121919.91	121921.26	121922.61	121924.06	121925.51	121926.96	121928.41	121929.86	121931.31	121932.76	121934.21	121935.66	121937.11
Ditch Depth																
Fittings and accessories	DN600 DCIP															

SYRIAN ARAB REPUBLIC  
 The Project For Development of New Water Sources For Damascus City

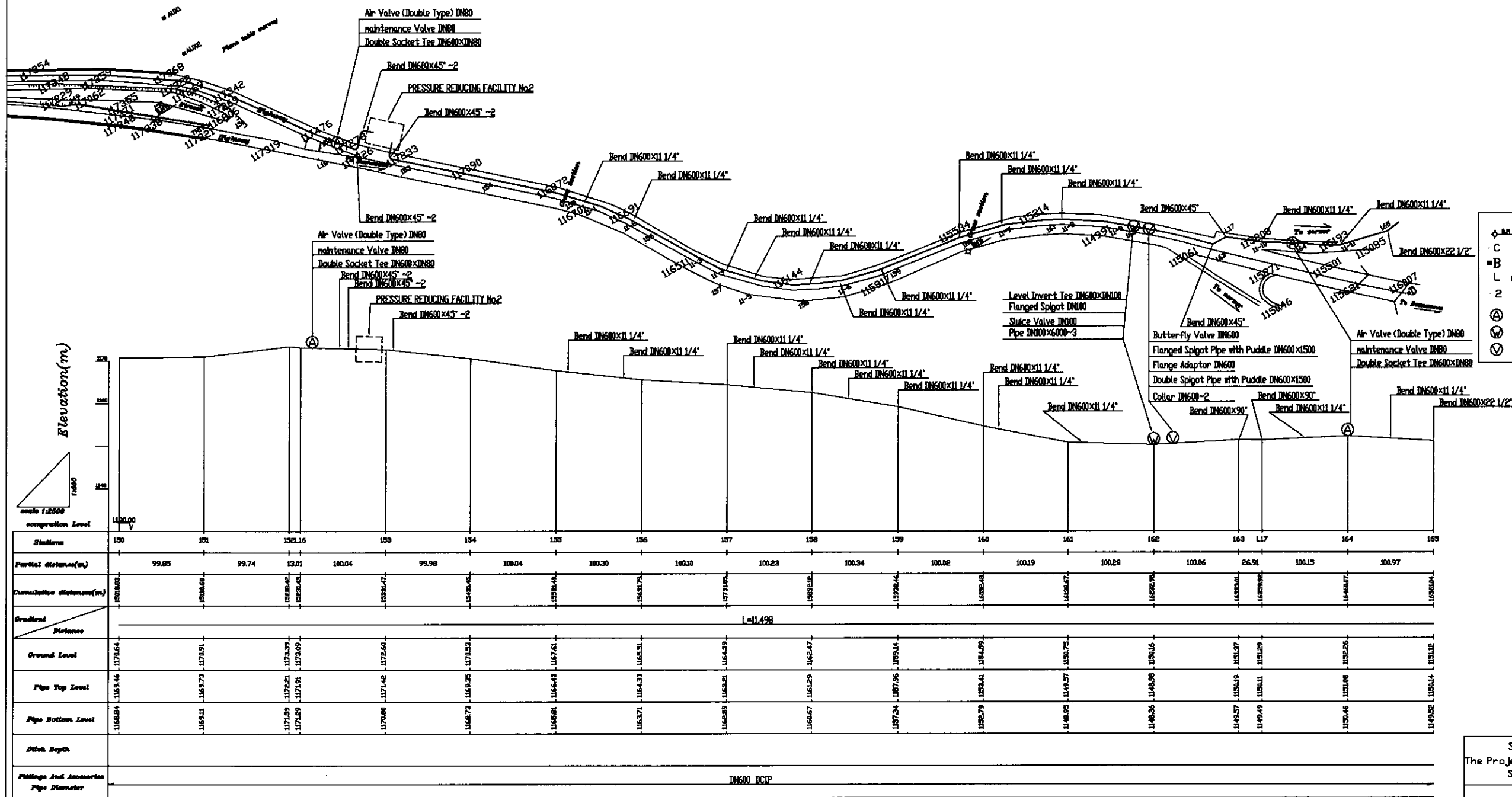
PLAN & PROFILE  
 OF  
 Maadar\_Yaboos\_Zerzar\_Takea PBR Route

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 CONCURRED BY: [ ] DATE: [ ]

DAMASCUS CITY WATER SUPPLY AND SEWERAGE AUTHORITY  
 DAWSSA

DRW. NO: 08





**Legend**

- ◊ BM Bench Mark
- ⋄ C Curve
- B G.P.S points
- L Changing of Center Line Direction
- 2 Peg Number
- ⊙ Air Valve
- ⊙ Wash Out
- ⊙ Valve

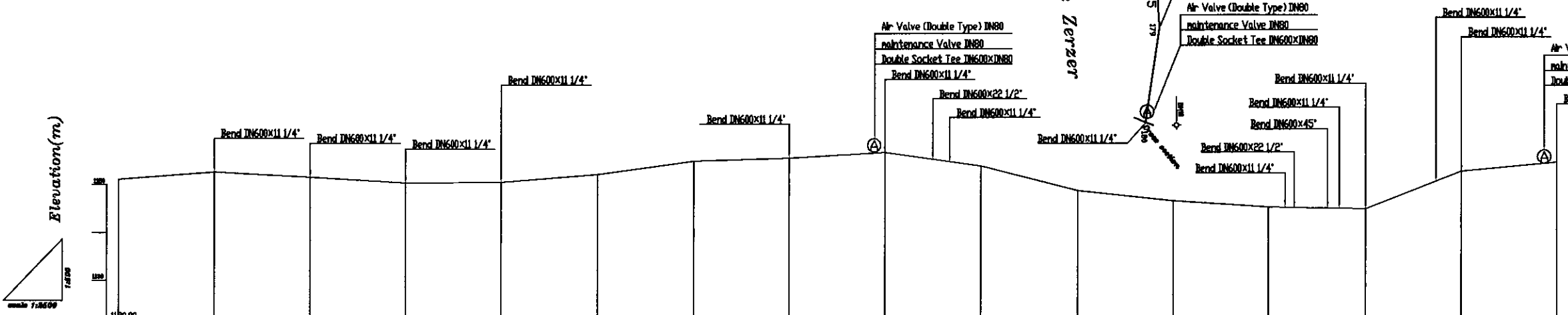
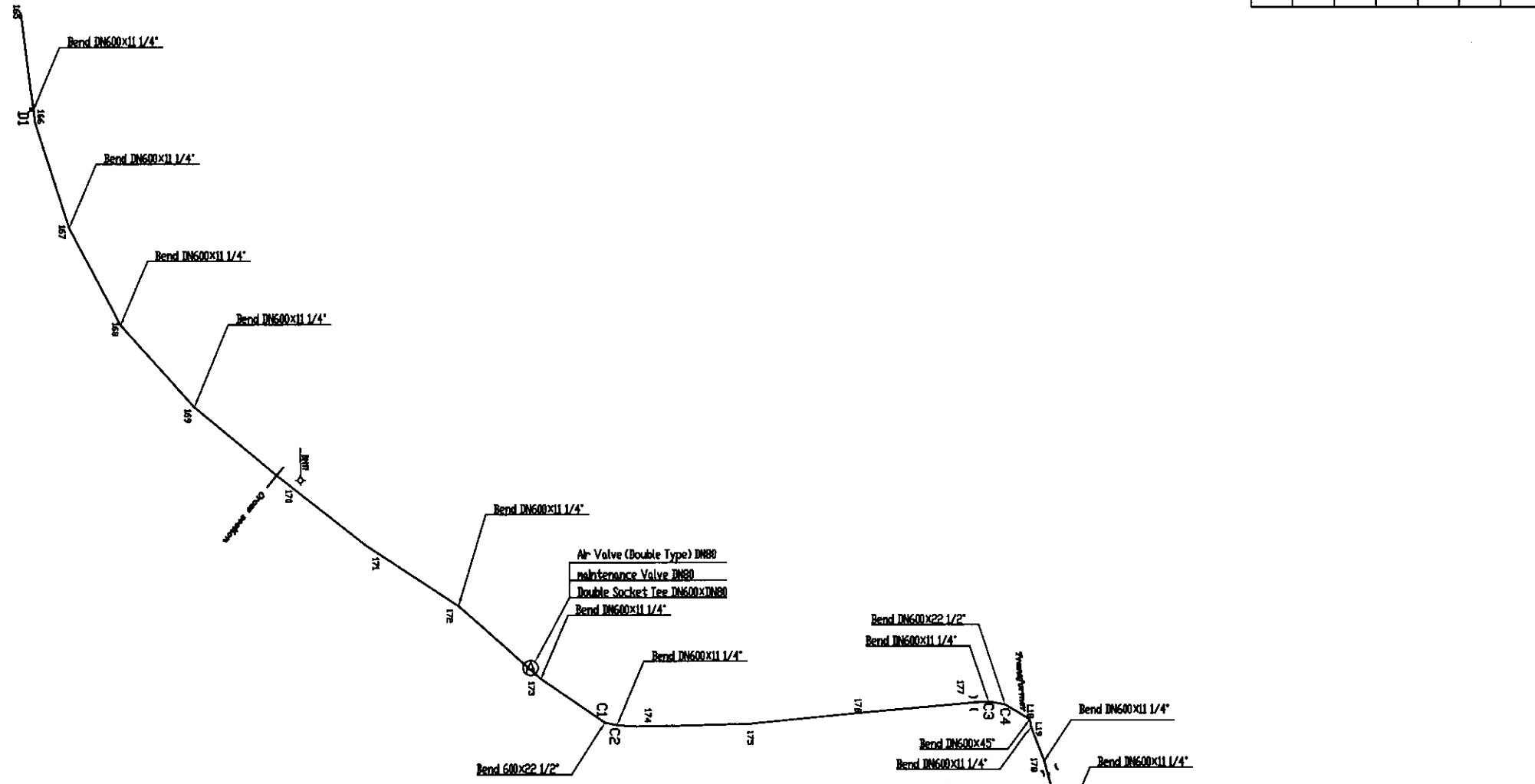
SYRIAN ARAB REPUBLIC  
The Project For Development of New Water Sources For Damascus City

PLAN & PROFILE OF Maadar Yaboos Zerzar Takea PBR Route

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CONCURRED BY: [ ] DATE: [ ]

DAMASCUS CITY WATER SUPPLY AND SEWERAGE AUTHORITY DAWSSA

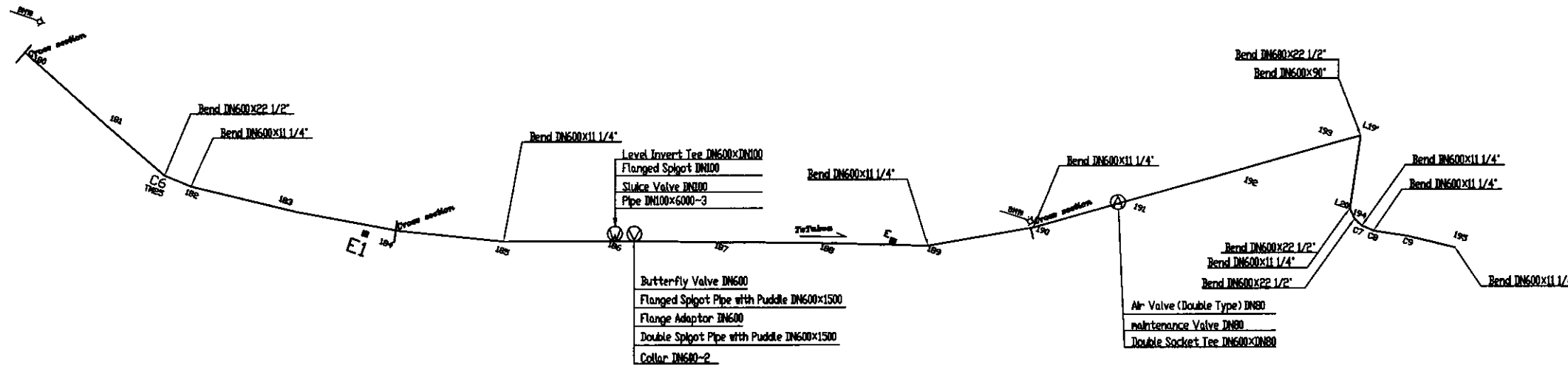
DRW. NO 10



	Bench Mark
	Curve
	G.P.S points
	Changing of Center Line Direction
	Peg Number
	Air Valve
	Wash Det
	Valve

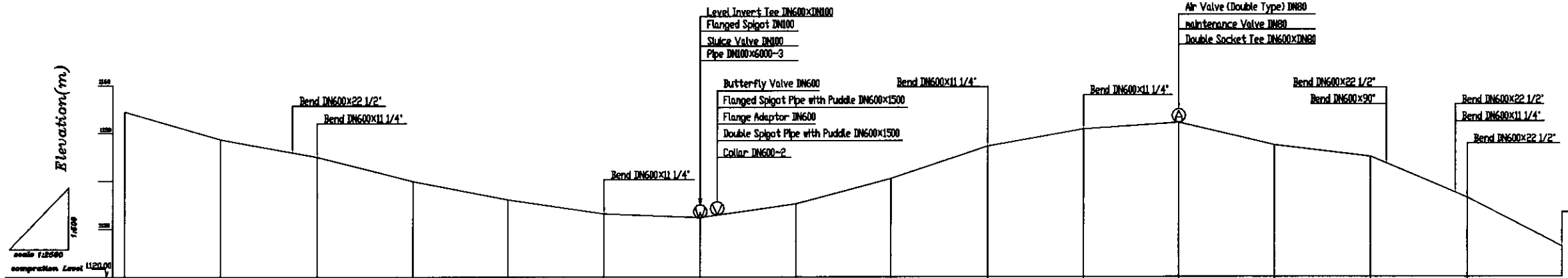
Station	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180
Partial distance(m)	99.04	99.90	99.27	99.99	100.10	100.07	99.93	100.02	99.90	100.74	100.03	99.06	100.00	99.66	100.00	
Cumulative distance(m)	099.04	198.94	298.21	398.20	498.30	598.37	698.30	798.32	898.22	998.96	1098.99	1198.05	1298.05	1397.69	1497.69	1597.69
Gradient	1:1.438															
Ground Level	1149.32	1149.29	1149.21	1149.18	1149.12	1149.02	1148.92	1148.82	1148.72	1148.62	1148.52	1148.42	1148.32	1148.22	1148.12	1148.02
Pipe Top Level	1149.14	1149.11	1149.03	1148.99	1148.93	1148.83	1148.73	1148.63	1148.53	1148.43	1148.33	1148.23	1148.13	1148.03	1147.93	1147.83
Pipe Bottom Level	1148.92	1148.89	1148.81	1148.77	1148.71	1148.61	1148.51	1148.41	1148.31	1148.21	1148.11	1148.01	1147.91	1147.81	1147.71	1147.61
Ditch Depth																
Pittings and Accessories																
Pipe Diameter	DN600 ICIP															

SYRIAN ARAB REPUBLIC  
 The Project For Development of New Water Sources For Damascus City  
 PLAN & PROFILE OF Maadar\_Yaboos\_Zerzar\_Takea PBR Route  
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 CONCURRED BY: [ ] DATE: [ ]  
 DAMASCUS CITY WATER SUPPLY AND SEWERAGE AUTHORITY  
 DAWSSA



**Legend**

- ◊ BM Bench Mark
- C Curve
- B G.P.S points
- L Changing of Center Line Direction
- 2 Peg Number
- ⊕ Air Valve
- ⊗ Wash Out
- ⊙ Valve



Station	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	
Partial distance(m)	99.97	100.42	100.02	99.63	99.70	100.01	100.01	99.90	100.12	99.60	100.05	100.00	100.05	100.73	99.40		
Cumulative distance(m)	0.00	99.97	200.39	300.41	400.04	499.74	599.75	699.65	799.77	899.89	999.49	1099.54	1199.59	1299.64	1399.04	1498.44	1598.44
Gradient	i = -11.498																
Ground Level	1125.42	1148.57	1144.99	1139.95	1136.09	1132.20	1128.26	1123.24	1118.16	1114.23	1109.85	1105.16	1101.41	1097.50	1093.50	1089.26	
Pipe Top Level	1123.44	1147.25	1144.01	1138.97	1135.11	1131.22	1127.28	1123.34	1119.40	1115.46	1111.52	1107.58	1103.64	1099.70	1095.76	1091.82	
Pipe Bottom Level	1122.06	1145.77	1142.53	1137.49	1133.63	1129.74	1125.80	1121.86	1117.92	1113.98	1110.04	1106.10	1102.16	1098.22	1094.28	1090.34	
Ditch Depth																	
Remarks And Assumptions	DN600 DCP																

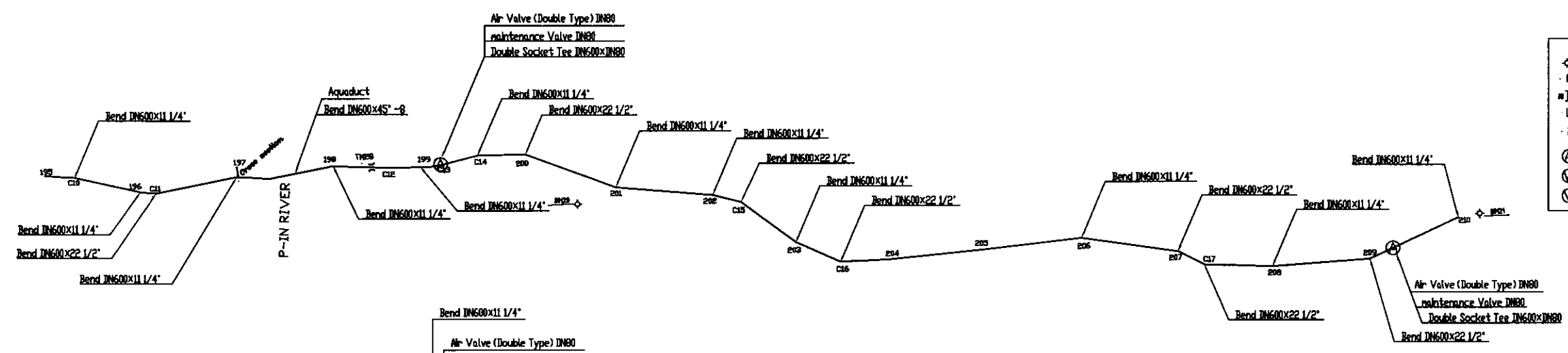
SYRIAN ARAB REPUBLIC  
The Project For Development of New Water Sources For Damascus City

PLAN & PROFILE  
OF  
Maadar\_Yaboos\_Zerzar\_Takeoff PBR Route

PREPARED BY: [ ] APPROVED BY: [ ]  
CONCURRED BY: [ ] DATE: [ ]

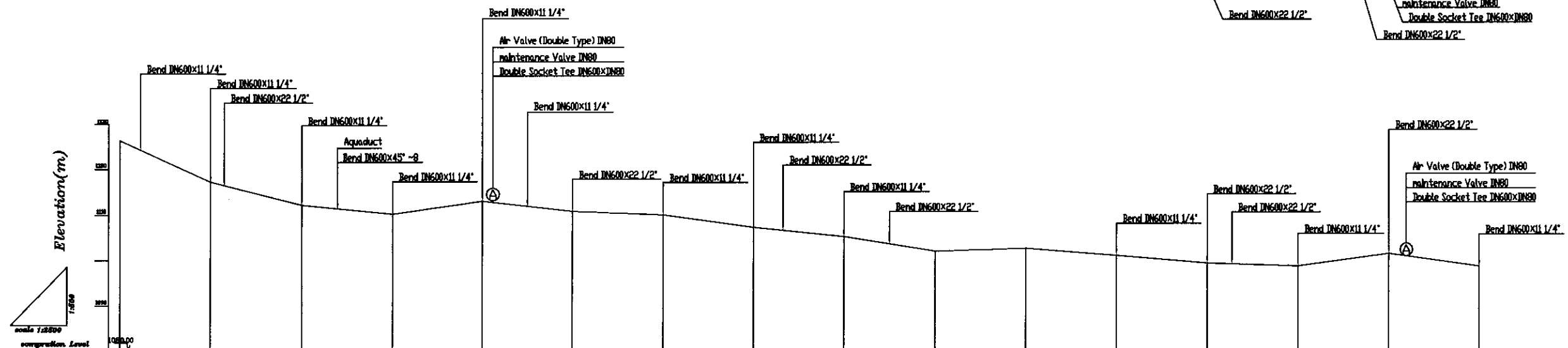
DAMASCUS CITY WATER SUPPLY AND SEWERAGE AUTHORITY  
DAWSSA

DRV. NO 12



**Legend**

- ◊ BM Bench Mark
- C Curve
- B G.P.S points
- L Changing of Center Line Direction
- 2 Peg Number
- ⊕ Air Valve
- ⊗ Wash Out
- ⊙ Valve



Station	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210
Partial distance(m)		99.29	99.93	100.29	98.98	98.49	99.36	99.67	99.64	99.81	99.33	100.20	100.06	99.93	99.37	99.78
Cumulative distance(m)	1086.00	1086.00	1086.00	1086.00	1086.00	1086.00	1086.00	1086.00	1086.00	1086.00	1086.00	1086.00	1086.00	1086.00	1086.00	1086.00
Gradient								1:1498								
Ground Level	1102.06	1107.29	1102.16	1102.27	1103.13	1101.90	1101.96	1107.25	1102.28	1102.06	1102.69	1101.80	1095.37	1096.74	1101.59	1098.72
Pipe Top Level	1102.30	1106.51	1101.18	1102.29	1102.15	1101.92	1101.98	1106.28	1104.30	1101.28	1101.71	1100.85	1095.37	1097.76	1100.95	1097.74
Pipe Bottom Level	1094.76	1105.69	1100.56	1100.67	1101.80	1099.90	1100.46	1103.66	1103.68	1100.46	1100.99	1099.43	1097.77	1097.14	1099.90	1097.12
Min. Depth																
Fittings and accessories																
Pipe Diameter																

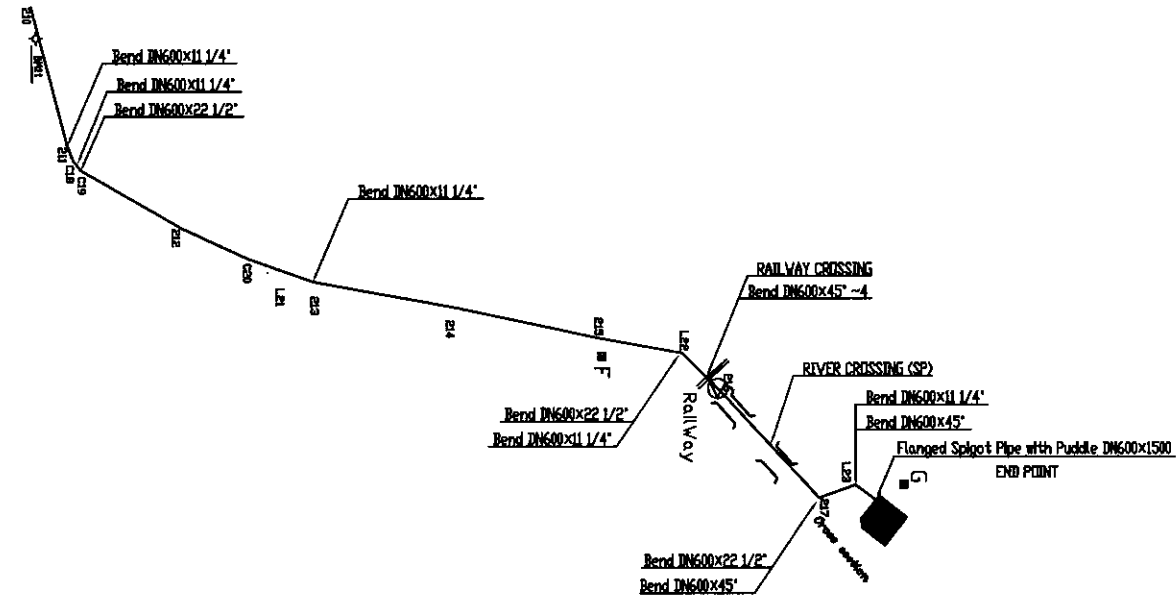
SYRIAN ARAB REPUBLIC  
 The Project For Development of New Water Sources For Damascus City

PLAN & PROFILE  
 OF  
 Maadar Yaboos Zerzar Takea PBR Route

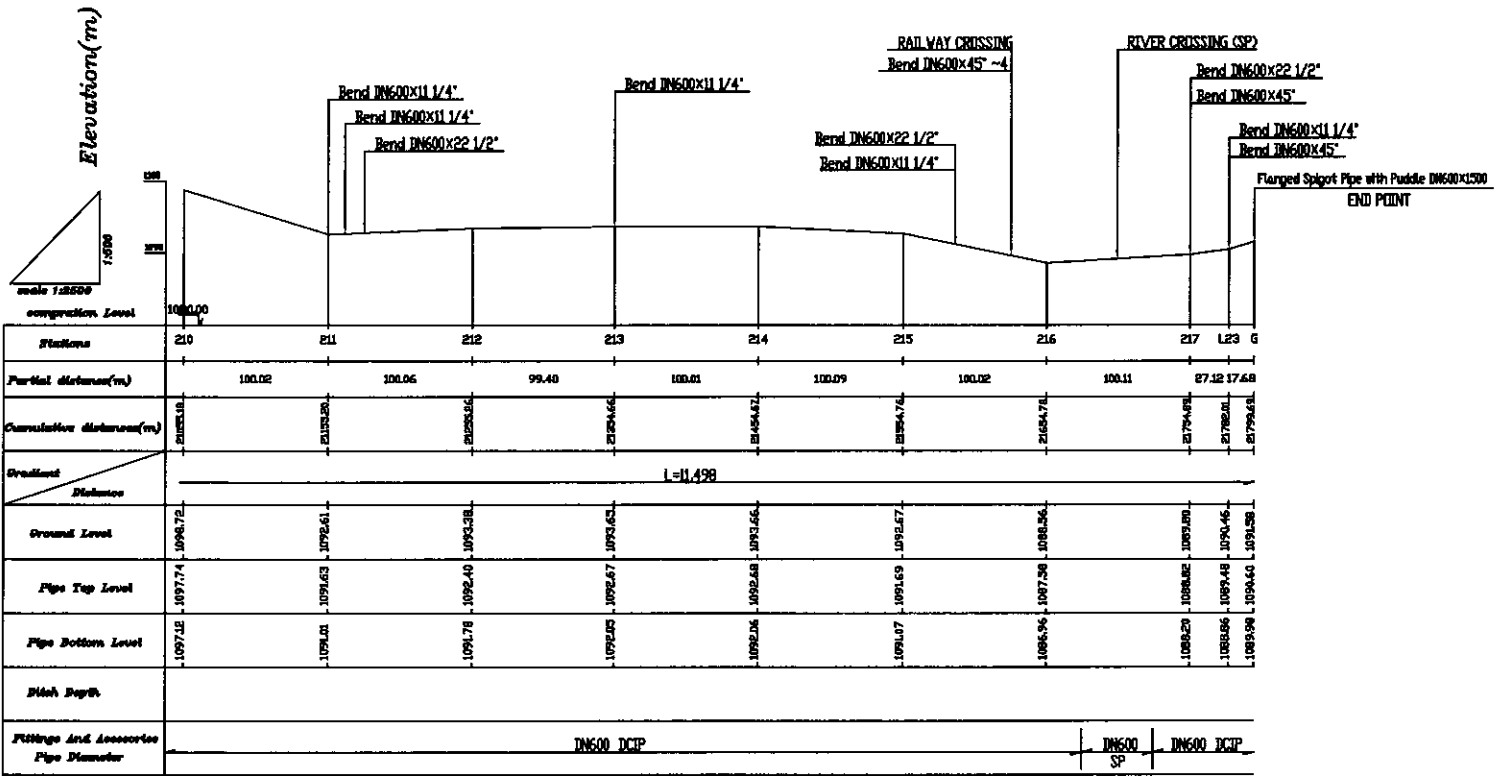
PREPARED BY: [ ] APPROVED BY: [ ]  
 CONCURRED BY: [ ] DATE: [ ]

DAMASCUS CITY WATER SUPPLY AND SEWERAGE AUTHORITY  
 DAWSSA

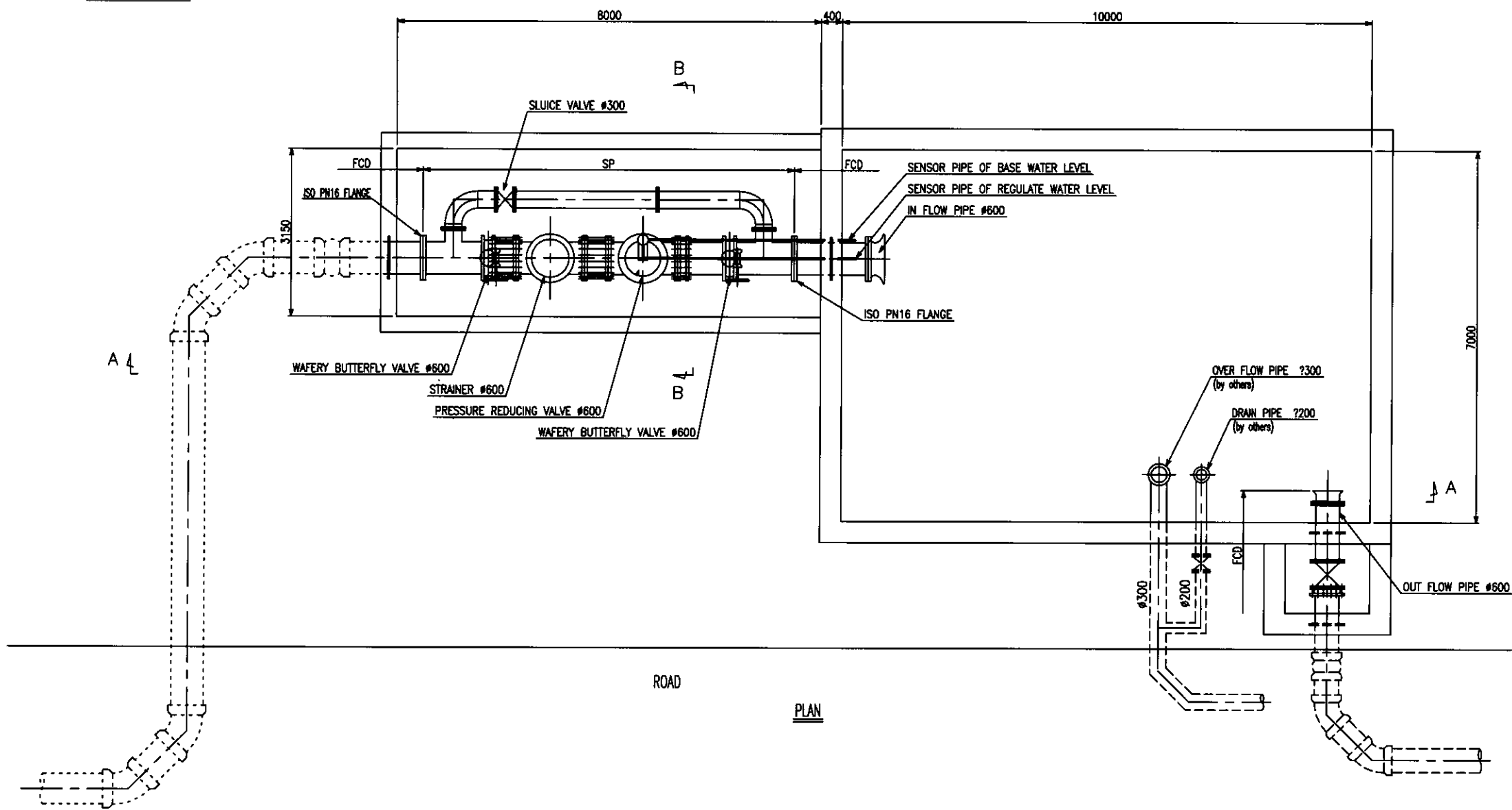
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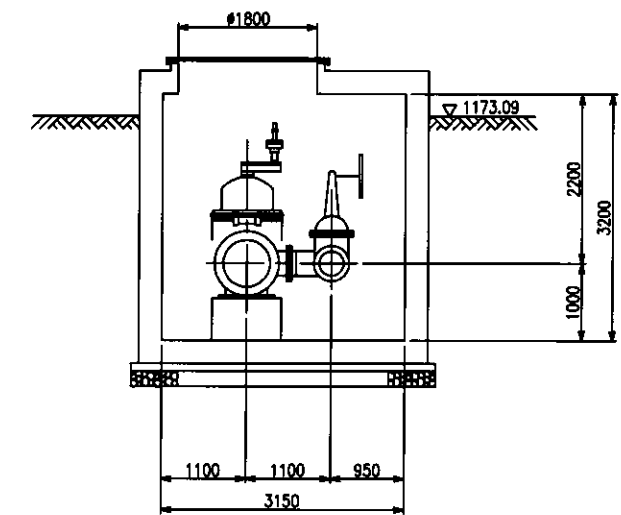
	Bench Mark
	Curve
	G.P.S points
	Changing of Center Line Direction
	Peg Number
	Air Valve
	Wash Out
	Valve



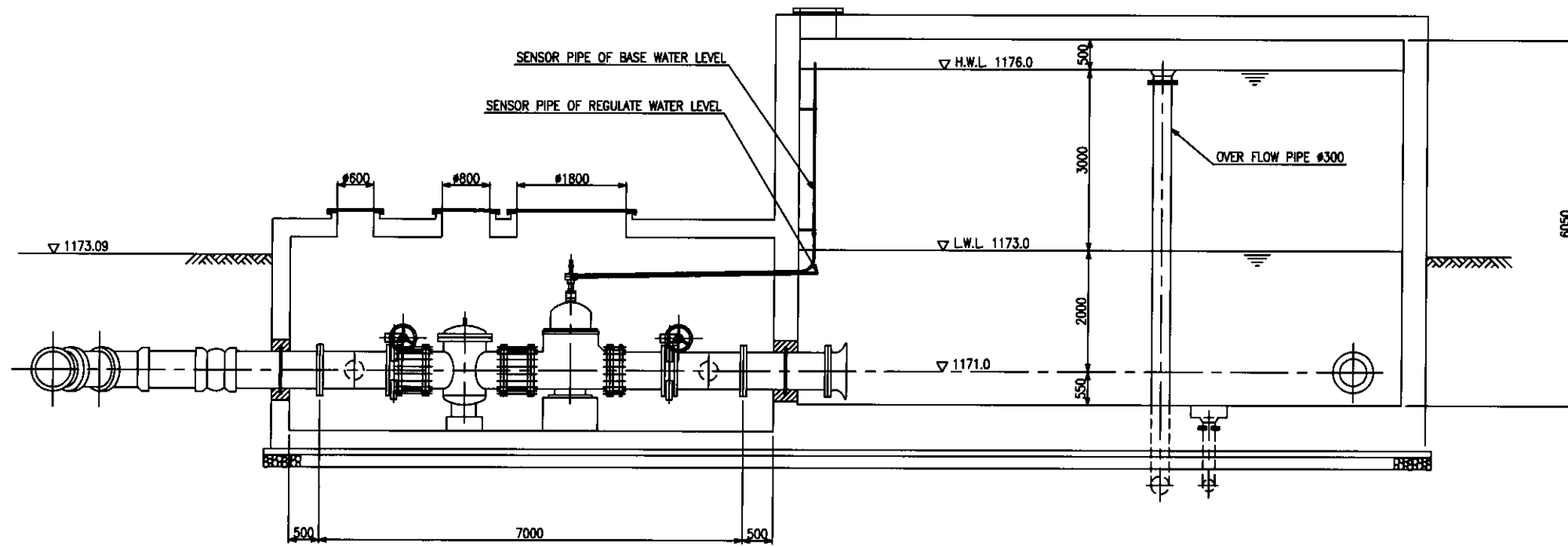
SYRIAN ARAB REPUBLIC	
The Project For Development of New Water Sources For Damascus City	
PLAN & PROFILE	DRV. NO
OF	14
Maadar_Yaboos_Zerzar_Takea PBR Route	
PREPARED BY	APPROVED BY
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DAMASCUS CITY WATER SUPPLY AND SEWERAGE AUTHORITY	
DAWSSA	



PLAN

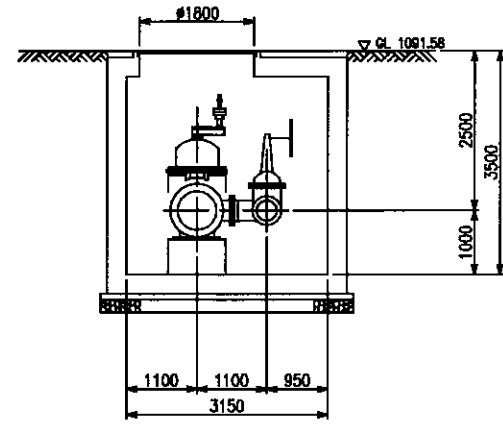
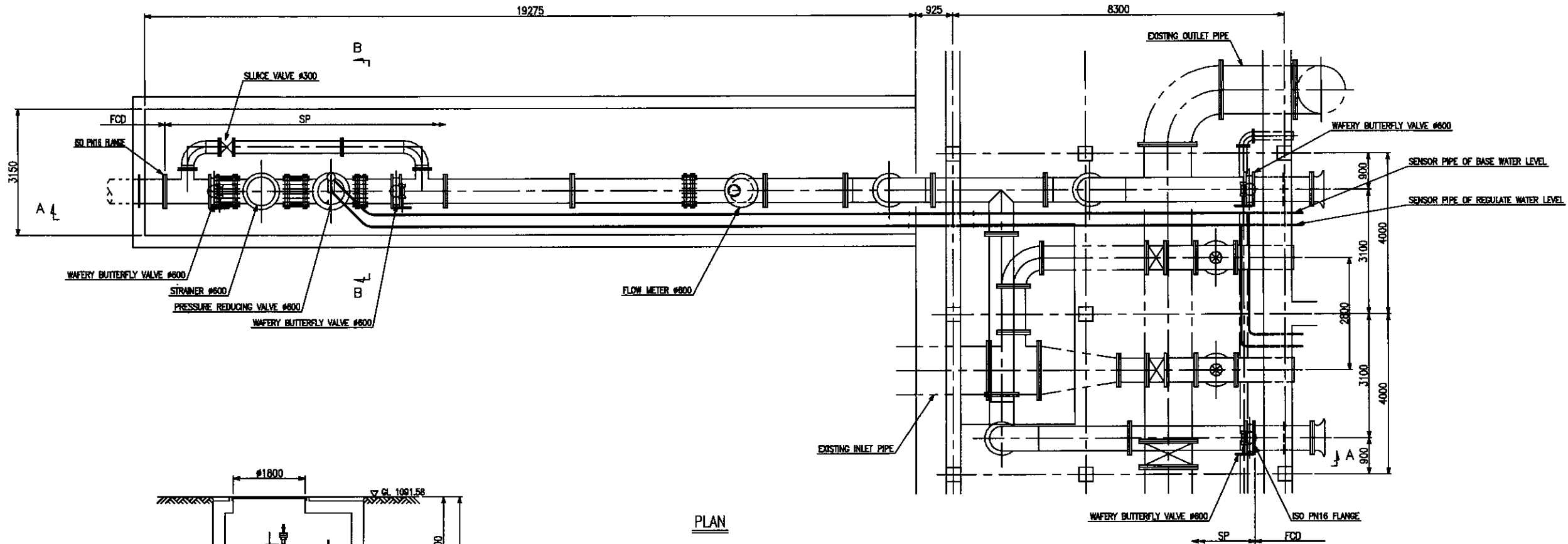


SECTION B - B



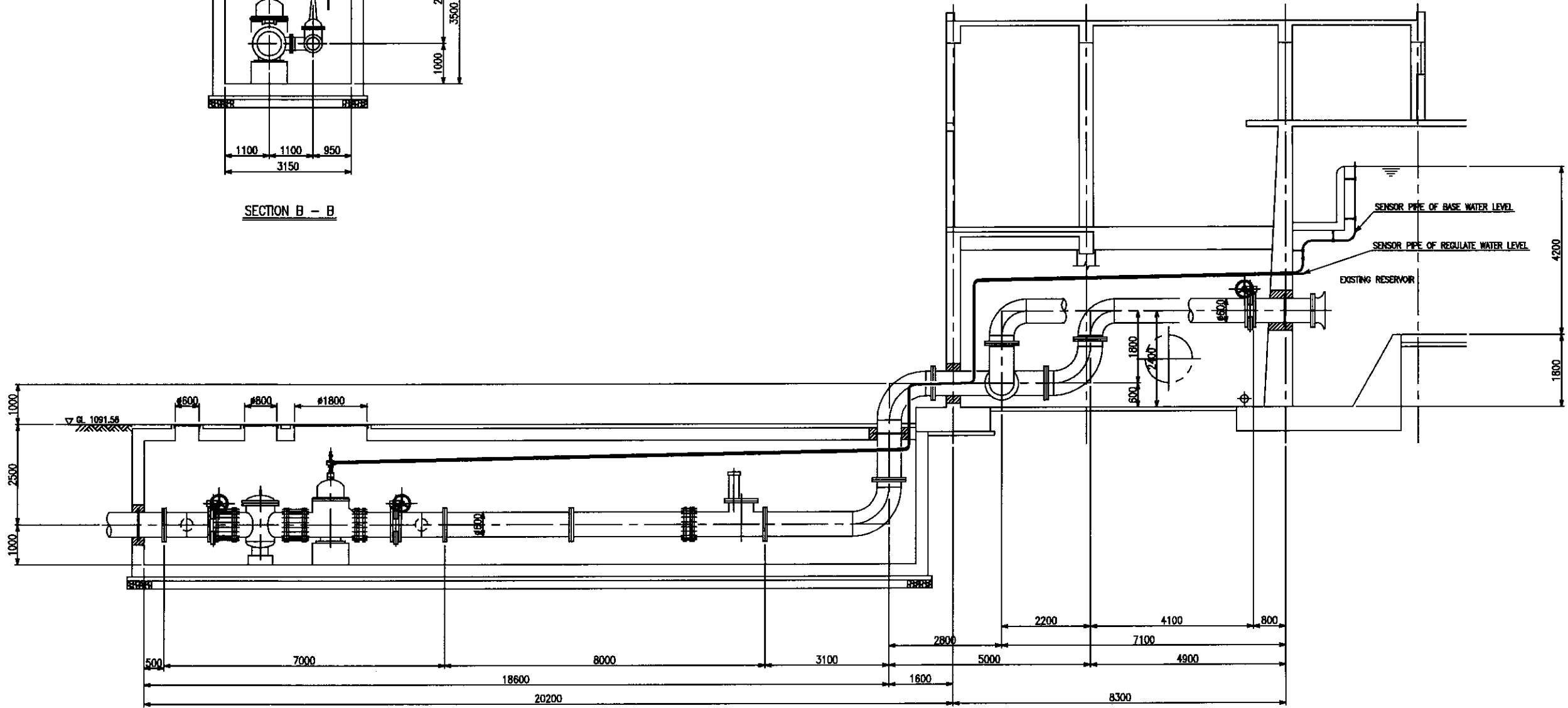
SECTION A - A

SYRIAN ARAB REPUBLIC	
The Project For Development of New Water Sources For Damascus City	
LAYOUT OF PRESSURE REDUCING FACILITY No2	DRW. NO 15
PREPARED BY	APPROVED BY
CONCURRED BY	DATE
DAMASCUS CITY WATER SUPPLY AND SEWERAGE AUTHORITY DAWSSA	



SECTION B - B

PLAN



SECTION A - A

SYRIAN ARAB REPUBLIC	
The Project For Development of New Water Sources For Damascus City	
LAYOUT OF PRESSURE REDUCING FACILITY No.3 AT YABOOS EXISTING RESERVOIR	DRW. NO 16
PREPARED BY	APPROVED BY
CONCURRED BY	DATE
DAMASCUS CITY WATER SUPPLY AND SEWERAGE AUTHORITY DAWSSA	

### 3-2-4 調達計画

#### 3-2-4-1 調達方針

本計画の主要な資機材は、水中ポンプ、ダクティル鑄鉄管、自力式定水位弁等であり、これらの資機材はシリア国内で調達できないためすべて輸入品となる。これらの調達先は日本のほかヨーロッパ等の第三国に対し、輸送費を含めた経済性、規格・品質、納入実績、納期、アフターサービス体制、スペアパーツ入手の難易等を検討して決定する。また、予備品に関し、機器類については性能を維持するために必要な消耗部品を計上し、配管材料については、地下埋設物や地中状況の不明な部分があるため、施工にあたってはこれらに直面した場合に材料の不足が生じないように直管や異形管の予備数量を見込むものとする。

本計画で調達される資機材は種類・規格が多岐に亘るため、資機材納入業者は資機材調達の便利性、通関手続き、その他該当国を含む中東地域の実情を熟知している商社による調達方式が最適である。シリア国およびその近隣国には日本の商社事務所があるため、海上輸送時における資機材の一部損傷への対応や資機材納入後保証期間内の不具合箇所、故障発生に対して、DAWSSA からの要求に迅速な対応が可能であると考えられる。

資機材の荷受け港として考えられるシリア国の主要な港は、ラタキア港とタルトゥース港である。港の規模はラタキア港の方が若干大きいですが、タルトゥース港はダマスカス市に近いと言う利点がある。本計画で調達する資機材は、管路、バルブ、井戸ポンプ等であり、その員数が多いため、内陸輸送距離が短いタルトゥース港での港渡しとする。

#### 3-2-4-2 調達上の留意事項

日本側の無償資金協力の範囲は、一般的に資機材の調達と資機材の海上輸送までであり、シリア国タルトゥース港での港渡しとなる。資機材の輸入に対して DAWSSA は今までに「ダマスカス市内配水管改修計画」において 5 回の輸入手続きを行っており、その手続きをよく理解しており問題は無い。しかし、資機材が安全で確実に現地まで到着するように、シリア国内陸輸送の保険費用は日本側で負担することとする。

ポンプ施設や減圧施設等の調達機器が据付けられる土木施設は、機器の規模、特性を考慮して詳細設計が行われ、かつその性能が十分に発揮できるよう据付け・施工されることが必要であるため、機械・電気設備との調整が重要となる。又、ポンプ操作盤を含めた電気設備の製作・据付け工事は全てシリア国側で実施されるが、ポンプ・電動機運転時の損傷を防ぐために保護回路を設置する等、重要な部分については日本側が提示する設計条件に基づいて回路設計がなされるよう確認が必要である。

したがって、日本側で主要機器の据付け・システム上重要な施設については、標準図や検討資料を提示した上、土木施設と機械・電気設備の調整、機械設備と電気設備のシステム上の留意点の協議を行い、シリア国側がこれらの主要施設の意図を十分に理解し、土木施設・電気設備の実設計、施設建設および運転操作・維持管理ができるように配慮する。

#### 3-2-4-3 調達・据付け区分

本計画における主要資機材およびそれら資機材の施工区分は表 3-16 に示すとおりであり、日本側は主要な資機材を調達し、施設建設に必要な土木工事や機械・電気設備の据付け工事は全てシリア国側で行うこととする。



表 3-16 主要施設の分担範囲

主 要 施 設	日 本	シリア国
水中ポンプ資機材		
水中ポンプの据付・配管工事		
井戸ポンプ室の建設		
変圧器、ディーゼル発電機、操作盤等の電気資機材		
電気設備の据付		
集水管材料（管径 200mm 以下）		
集水管材料（管径 250mm 以上）		
集水管敷設工事		
受水槽の建設		
導水管資機材		
導水管敷設工事		
減圧弁資機材		
減圧槽建設工事（減圧弁据付工事を含む）		

上表の調達・施工に関連し、以下のような事項についても両国の負担範囲を示す。

日本側負担事項

- 資機材調達のための入札図書作成、入札・業者契約業務
- 調達資機材の検査およびタルトゥース港までの海上輸送
- 内陸輸送を含めた輸送保険の負担

シリア国側負担事項

- 深井戸の掘削、揚水試験
- 土木施設の詳細設計
- 受水槽、減圧槽等の用地の確保
- タルトゥース港から DAWSSA アドラ資材倉庫への内陸輸送
- 集水管および導水管敷設等の工事許可の取得

3-2-4-4 調達監理計画

(1) 調達監理方針

本計画の調達監理を行うコンサルタントは、実施機関である DAWSSA とコンサルタント契約を締結後、井戸位置の再確認や基本設計後の大幅な計画の変更がないかどうか現場調査を行うとともに、DAWSSA と土木施設および電気設備等に関し詳細に協議を行い、基本設計調査により計画した資機材の仕様、数量、設置位置等の再検討・変更を行う。

資機材納入業者の選定にあたって、コンサルタントは DAWSSA の名前の下に日本国内の主要建設・経済関係日刊紙に入札を公示するとともに JICA のホームページにのせる。

入札にあたって、DAWSSA がこれを主催するが、コンサルタントは DAWSSA からの委任の下、入札に係る議事進行・書類の確認等を行い、業者契約が円滑に完了するよう務めるものとする。

資機材の製作監理にあたっては、製作前に納入業者より提出される製作仕様書、製作図が計

画仕様および数量と相違がないかどうかを確認する。また、製作の途中・完成時等において必要な検査を実施し、資機材が適正に調達できるよう監理する。

一方で、製作・輸送等契約工期の遵守も重要であるため、製作中の工程を監視し、工期遅延の生じないように工程監理を行う。

## (2) 調達監理体制

調達監理の実施体制としては、業務主任、機械/電気設計担当、管路/土木設計担当および入札図書作成/積算担当により行われる。

業務主任は DAWSSA とのコンサルタント契約、入札図書の作成、業者契約、資機材の出荷とシリアでの荷受の確認等について、全般的な監理と各種報告書の作成および諸手続を担当する。

各設計担当は、DAWSSA との協議、現地調査・協議に基づく基本設計調査の資機材仕様の再検討、数量の確認と入札仕様書の作成、製作図の照合および承諾、機材の性能、特性試験の立会い検査を行う。

また、調達機材の船積前検査は契約書に従って、梱包前の仕様・員数検査、梱包後の荷姿・梱包数量の書類照合とする。船積前検査はコンサルタントが第三者検査機関に委託して実施する。

### 3-2-4-5 資機材等調達計画

主要資機材の調達計画は、以下のとおりである。

#### (1) 水中ポンプ

現在 DAWSSA において使用されている水中モーターポンプは、デンマーク、ドイツ、イタリア等の製品であり、その都度発注仕様書に基づいて購入されている。

本計画のポンプは井戸の諸条件に合わせて設計、製作することが必要となるため、一般の汎用品が適応できない。単価のみならず輸送費を含めた第三国との経済比較の結果、日本製品は第三国製品に比べ安価である。したがって、水中ポンプは日本製品を採用する。

#### (2) 管路

DAWSSA のアドラ資材倉庫には配管資材、弁類、発電機等が保管・管理されている。

この資材倉庫に保管されている配管材料のうち、ダクタイル鋳鉄管はフランス製と日本製であり、小口径(口径 150mm 以下)の普通鋳鉄管ではシリア国内製と中国製があった。

本計画の管種として、管径は 250mm 以上のダクタイル鋳鉄管を計画している。近年ダクタイル鋳鉄管は中東地域でも製造されているが、DAWSSA での実績はない。DAWSSA において現在保管されているフランス製や日本製は、将来の補修にも有利と考えられる。したがって、資材調達先についてはフランス製と日本製について比較することとし、水中ポンプと同様に輸送費を含めた費用で日本と第三国を検討した。

その結果、日本製品は第三国製品(フランス製品)に比べ約 5%安い。また、日本製品はダマスカス市内配水管の納入実績が多く、品質に関しては現地で高い評価を得ている。さらに、日本の場合は本件のような大量な生産・出荷に対応可能であることを考慮し、日本製品を採用する。

(3) 自力式定水位弁

既存の減圧施設で市内配水管に設置されている減圧弁は、ドイツ製およびフランス製であり、そのタイプは自力式減圧弁である。減圧施設の検討のところで述べたように本計画では自力式定水位弁 + 減圧水槽タイプがもっともよく、口径 600mm の中口径、多流量の減圧設備となる。既存のものと比較すると、高圧力差でのキャピテーションによる孔蝕、破損や長期の連続使用に耐える耐久性など高度な技術検討が要求される。このため、同様な条件下での使用実績が多い日本製を使用するものとする

3-2-4-6 実施工程

実施工程表は図 3-4 に示す。

図 3-4 実施工程表

月	1	2	3	4	5	6	7	8	9	10	11	12
実施設計	■	(現地調査・協議)										
		(国内作業・入札図書作成)										
			(入札・入札評価・調達契約)									
施工・調達	■	(準備、設計)										
		(製造・調達)										
							(輸送)					

### 3-3 相手国側分担事業の概要

シリア国側は日本の無償資金協力を受けるに際し、各段階で下記事項を実施しなければならない。

#### (1) 調査・計画段階

- 開発水源地周辺の住民を含む利害関係者より、工事实施のための了解を得ること。
- シリア国の関連法に従い環境影響評価(EIA)の手続きを行うこと。
- 井戸を完成させること。
- 地下水位を監視するための、モニタリング体制を構築すること。
- 本計画に必要な土木施設、電気設備の詳細設計を行うこと。

#### (2) 調達段階

- 本計画のために輸入される資機材について、陸揚げ、通関並びにシリア国内輸送の業務を速やかに行うこと。
- 本計画実施のための役務を提供する日本国民に対し、シリア国の法律に則りシリア国への出入国及び滞在に必要な便宜を図ること。
- 日本の外国為替銀行に口座を開設し、銀行取極めに基づく手数料の負担、支払い授權証書の発給を行うこと。
- 認証された契約に基づいて調達される資機材及び役務を提供する日本国民に課せられる関税、内国税及びその他の財政課徴金を免除すること。
- 無償資金協力に含まれないその他全ての経費を負担すること。
- シリア国側で準備することになっている資機材の調達を行うこと。

#### (3) 工事实施段階

- 本計画の工事实施に必要な許認可、予算を取得すること。
- 本計画に必要な施設用地を確保すること。
- 工事の際の交通規制、通行者・車両の安全確保、工事における周辺環境への影響対策、電気や電話等の埋設物への影響に関する対策、関連施設管理者との連絡調整を行うこと。
- 調達された資機材に必要な商用電気を供給すること。
- 調達された資機材に関連する土木工事、機械・電気設備工事を行うこと。
- 本事業が日本の無償資金協力によるものであることがわかる広報掲示を行うこと。

#### (4) 運営・維持管理段階

- 調達された資機材に関連する施設の運営・維持管理に必要な人員、予算を割り当てること。
- 環境影響のための適切なモニタリングを実施すること。
- モニタリング結果を反映させた適切な運用(計画揚水量を超えない範囲での必要最小限の揚水、想定以上の影響が生じた場合の適切な対処等)を行うこと。
- 既存配水システム改善や流域外導水の検討を含めた包括的な水資源管理を推進させること。

一方、シリア国側の実施機関である DAWSSA の事業実施能力について考察すれば、本機関は住宅建設省傘下に計 12 部局、総裁以下 1,688 名の職員を抱え、首都ダマスカス市及びその近

辺への上下水事業を一手に実施しており、かつこれまでに多く日本からの技術援助を受けていることから大きな問題はないと判断できる。

技術水準に関して、DAWSSA は 1996 年に始まった JICA 開発調査以降、幹部技術者は数々の JICA 研修を行っており、その技術水準は高い。設計部門はいまだ手計算による解析が行われているが、図化は CAD により作図されている。工事部門はほとんど請負形式により工事を業者に発注し、その施工管理は DAWSSA の職員が行なっている。本計画における工事は、同様の形態になると考えられる。

一方、施工管理を行なう DAWSSA 職員には、土木担当 24 名、機械・電気担当各 1 名、助手 11 名がいる。土木・管路工事部門に関しては、ダマスカス市内配水管改修工事の実績より考えれば、人員的にもまた技術的にも本計画の施工管理は問題ないと考えられる。しかし、機械・電気工事部門に関しては、今までこれらの職員は簡単な補修や工事管理を実施しているだけであり、本工事では据付深度が 100m を超える井戸ポンプ及び減圧バルブ等の特殊な機器の据付け・維持管理の技術にはやや不安がある。このため、次期事業においてこれらの特殊な機器の据付け・維持管理に関する支援を組み入れることを検討することが望ましい。

本プロジェクトではモニタリングシステムを有効に活用し、環境影響を最小限に止める運用を行うことが極めて重要である。DAWSSA にとって EIA プロセスを完全に実施するのは本プロジェクトが初めてであるが、これまでの調査・計画段階ではベースライン調査やステークホルダーミーティング、EIA 報告書作成などの手続きを着実に実施してきており、意識も高まってきた。ステークホルダーミーティングでは、地元住民、地元自治体、灌漑省等の関係者も含めてモニタリングの重要性を議論しているため、これら関係者が今後も DAWSSA の運用を監視していくという効果が期待できる。また、DAWSSA は、所有している全ての水源地で観測井を設け、地下水位の観測と所定のモニタリングルールの下での運用をこれまで行ってきたため、井戸の運用に関しては十分な経験を有していると判断できる。

### 3-4 プロジェクトの運営・維持管理計画

本計画で建設される施設は、井戸ポンプ(11 箇所)、集水管路(2.2km)、導水管路(11.5km)、受水槽(1 箇所)、減圧施設(2 箇所)であり、水源地より水中ポンプで取水された地下水はこれらの施設により既設タケア減圧槽へ導水されるシステムとなっている。

本施設の運営・維持管理は DAWSSA の生産部でおこなわれる計画である。この生産部には臨時職員を含め 239 名在籍し(2004 年 3 月時点)、そのうち、バラダおよびフィジェ事務所には所長を含め 55 名で、本施設と類似したバラダ～フィジェ導水管路(内径 1200mm)の維持管理をしている。また、ポンプの補修に関しても、生産部に機械・電気担当が 40 名おり、部品の交換・ポンプの検査等必要な作業ができるようになっている。

したがって、DAWSSA は要員面・技術面において十分な運営・維持管理能力を有していると判断できる。ただし、本計画施設のうち 100m 以上の深井戸ポンプや減圧施設の設置および操作・維持管理については、類似する既存施設が少ないため、これらの機材に関しては適正な据付・維持管理ができるように計画する。特に、減圧施設の運転開始前には維持管理教育を行って、将来において適正な施設の運転・維持管理ができるように計画する。なお、これらの据付指導や維持管理教育を行うには、調達資機材が現地に到着し、かつ土木施設が出来上がっていることが条件となるため、本調達期間内に実施することは困難である。したがって、次期の資機材調達時にこれらの作業を計画する。

一方、本計画で調達するダクタイル鋳鉄管については、概ね 50 年の耐用年数があり、継手等もしっかりしている。漏水による補修が必要な場合は、受水槽或いは管路内の制水弁を閉めて、切管と継輪によって処理することになるが、これらの技術も DAWSSA の生産部もしくは工事管理部は十分に持っている。

ただし、本計画のように長期間導水をとめておき再度導水を始める場合には、初期の水は汚れていることが予想される。このため、導水再開の初期にはその通水水質に留意し、水がきれいになるまで排水し、清浄になってから使用する必要がある。

プロジェクト運営中の環境へのインパクトは、調査実施の EIA 調査において地下水低下に起因する地下水利用障害、水質悪化、地下水汚染の進行、植生への影響などが想定されている(「2-2-3 環境社会配慮」の項、および下表参照)。

表 3-17 環境へのインパクト

プロジェクト ステージ	活動	想定される環境 へのインパクト	環境要素									
			物理項目				生物環境項目			社会経済人間活動項目		
			地下水 資源量	水質	表流水 湧水	土地 河川 湖沼	森林 植生	文化 遺産	公共 施設	健康	経済	社会 組織
運用 期間	地下水 揚水・送 水	地下水位低下	○	-	N/A	-	-	-	△	-	△	-
		地下水資源量低下	○	△	N/A	-	-	-	-	-	△	-
		地下水汚染	-	△	N/A	-	-	-	-	△	△	-
		湧出量低下(泉)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		森林植生への影響	-	-	N/A	△	-	-	-	-	-	-

Note: - :プロジェクト活動による影響なし △:極小 ○:小～中程度  
●:中～大規模 N/A: 評価不可能(近郊に対象の環境要素なし)

このなかで、緊急かつ継続的に施設運転中のモニタリングが必要となるのは、地下水位また

は水質への影響であり、取水施設の上流側へ観測井戸(2井)と取水量観測点(1箇所)を設けることにより、取水の適正規模を監視する計画となっている。これらのモニタリング施設はいずれも取水の影響圏に設けられる予定であり、取水の近隣での環境影響を監視する目的をもつ。

一方、副流域単位での地下水資源量への影響評価も行う予定としている。シリア国灌漑省が2004年よりバラダアワジ全流域で気象水文観測網を再構築し、本プロジェクトの対象副流域(マーダル、ヤブース副流域)近郊においては、21観測所(14井戸、4気象観測、3湧水量観測)が2005年度より本格的に稼働する予定である。また同観測データから、毎年の水収支の状況が公開されることとなっている。これら公開情報を使い、本プロジェクトの水収支への影響を検討する計画である。また、地下水資源の低減量および地下水位低下が生じた場合の植生への影響も観測を行う予定となっている。

揚水量の管理は、将来的には特定井戸で管理水位(揚水停止水位)を設定することで行うが、管理水位の決定には、施設運転後に、モニタリング施設および灌漑省気象水文観測施設で数年の継続観測が必要となる。決定までの間、DAWSSAの運転計画に沿った渇水期(8月~2月)のみの試験運転とし、豊水期(3月~7月)には運転休止し、水位の回復状況(地下水涵養)を観測することとする。また、運転中の最低水位は過去の自然条件での最低水位(最近10年の最大渇水年2001/02水文年)を目安とする。

なお、こうしたモニタリングの実際は、DAWSSA生産部、バラダ・フィジェ事務所が、調査・設計部環境課と密接な協力関係を結びつつ実施する。モニタリング計画の詳細については、「第2章、2-2-3.環境社会配慮、(3)モニタリング」に示す。

### 3-5 プロジェクトの概算事業費

#### 3-5-1 協力対象事業の概算事業費

本計画を日本の無償資金協力により実施する場合に必要な総事業費は約 9.46 億円となり、日本とシリア国の負担区分に基づく双方の経費内訳は次のとおり見積もられる。

なお、この概算事業費は即交換公文上の供与限度額を示すものではない。

#### (1) 日本側負担経費

表 3-18 日本側概算事業費

費目		概算事業費（百万円）	
施設		0	
機材	配管材料一式、水中ポンプ、手動ハイドラリック弁、自力式定水位弁、スクリーン、7 形ハイドラリック弁、流量計等	709	709
機材設計監理費			28
合計			737

#### (2) シリア国側負担経費

表 3-19 シリア国側概算事業費

事業費区分	千 US \$	千 SP	円換算（百万円）
1. 設計/建設工事	0	44,495	96
2. 電気設備費	0	20,970	45
3. モニタリング費	0	1,920	4
4. 現地港湾/倉庫保管費	182	0	20
5. 内陸輸送費	400	0	44
合計	582	67,385	209

シリア国側の負担経費は、2.09 億円(= 9,749 万 S.P)である。そのうち、設計・電気設備調達および工事にかかる費用は 6,547 万 S.P である。今までの DAWSSA の実績として、2002 年に 4 億 S.P、2003 年に 2 億 S.P.に相当する工事を行っており、工事量にあわせて必要な特別投資予算を確保している。本工事についても 3 年にわたり上記の金額を捻出するのは問題ないと考える。

#### (3) 積算条件

- (a) 積算時点 平成 16 年 11 月
- (b) 交換為替レート 円 / US\$ 1US\$ = 111.09 円  
円 / Euro 1Euro = 135.99 円  
現地通貨 / US\$ 1US\$ = 51.72 S.P.  
円 / 現地通貨 1 S.P. = 2.15 円

#### (c) 施工期間



入札図書作成、入札	4.0 ヶ月
製造・調達	5.5 ヶ月
輸送・検査	2.0 ヶ月
技術指導	0.0 ヶ月
合計	11.5 ヶ月

(d) その他本計画は、日本国政府の無償資金協力の制度に従い、実施されるものとする。

### 3-5-2 運営・維持管理費

施設増加に伴う年間の増加経費は、下記のとおり算定される。

(a) 人件費：増員を必要としないため、計上しない。

(b) 維持管理費：

電気・燃料費

取水ポンプ (37 kW × 6 台 + 45 kW × 3 台 + 55 kW × 2 台) = 467.0 kW

467.0 kW × 24 hr × 365 日 × 37.5 %<sup>\*1</sup> × 2.7 SP/kWh × 1.05 = 4,349,159 S.P

(\*1：稼働期間として、(2 ヶ月 × 100% + 5 ヶ月 × 50%)/12 ヶ月とする)

修理費：機械・電気設備費の 1 %とする。

¥170,530,000 × 0.01/2.15SP/円 = 793,163 S.P

管理点検費：管路・土木施設費の 0.5%とする。

¥337,985,000 × 0.005/2.15 SP/円 = 786,012 S.P

維持管理費合計

4,349,159 S.P + 793,163 S.P + 786,012 S.P = 5,928,334 S.P/年

年間の維持管理増加額は 5,928 千円と推定される。

(c) 施設更新費：

取水ポンプの耐用年数を 12 年、管路・土木施設の耐用年数を 50 年とした場合の施設更新費用は下式となる。

$$M = A \times i \times (1+i)^n / \{(1+i)^n - 1\}$$

M：施設更新費

A：施設費

i：年利率(=6%とする)

n：耐用年数

ポンプ設備

M1 = ¥170,530,000 × 0.06 × 1.06<sup>12</sup> / (1.06<sup>12</sup> - 1) / 2.15SP/円 = 9,460,610 S.P

管路・土木施設

M2 = ¥337,985,000 × 0.06 × 1.06<sup>50</sup> / (1.06<sup>50</sup> - 1) / 2.15SP/円 = 9,973,589 S.P

全施設更新費

9,460,610 S.P + 9,973,589 S.P = 19,434,199 S.P

一方、新規水源からの給水量の増加に伴う水道料金の徴収増により、年間約 400 万リットルの収入増となる。

$$50\text{m}^3/\text{hr} \times 24\text{hr} \times 365 \text{ 日} \times 11 \text{ 台} \times 37.5\% \times 75\%(1-\text{漏水率}) \times 3 \text{ SP} = 4,065,188 \text{ リットル}$$

新規水源はポンプによる揚水を伴うため生産コストが高くなることから、維持管理費増加額を水道料金の収入増で全てを賄うことはできない。極度の給水制限を緩和するという本新規水源開発の目的に照らせばやむを得ないものと考えられ、「2-1-2 財政・予算」の項で述べたように、新規施設により維持管理費および原価償却費に必要な経費が増加し赤字が出ても、赤字分は国庫から補填されるため水道事業運営上の問題はない。しかし、将来的には現在著しく低く抑えられている水道料金の値上げも含めて、DAWSSA の経営改善の検討が必要になるであろう。

### 3-6 協力対象事業実施に当たっての留意事項

本事業において、主要な資機材は日本側が調達し、その機材の設置、配管材料の敷設およびこれらの資機材に関連する土木構造物の建設はシリア国側で実施される。本事業を円滑に完成させるためには、日本側で調達する資機材の製造・輸送期間に、出来る限りシリア国側の土木工事が進み、資機材の到着後これら資機材の据え付けが速やかに完了することが望ましい。

本事業の日本側の実施工程表は図 3-4 に示すとおりであるが、この工程表にあわせたシリア国側の作業は以下のとおりである。また、これらの作業を図 3-5 シリア国側実施工程表(案)に示す。

- 詳細設計：土木構造物(井戸ポンプ室、受水槽、減圧槽、減圧バルブ室、既存減圧槽接続、管路付帯工等)、  
電気設備(発電機、変圧器、操作盤、配電盤、計装盤等)
- 入札：土木建設工事、集水管敷設工事、導水管敷設工事、電気資機材調達、機械・電気設備工事、
- 建設工事：土木建設工事、集水管敷設工事、導水管敷設工事、機械・電気設備工事、
- その他：試験、検査

図 3-5 シリア国側実施工程表(案)

項 目	月																																
	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11
<b>1 期工事</b>	施工月数																																
<b>日本側調達</b>																																	
交換公文調印																																	
設計及び入札	4.0																																
機材調達	6.0																																
海上輸送・検査	2.0																																
<b>シリア側工事</b>																																	
a) 詳細設計	3.0																																
b) 建設工事																																	
入札	2.0																																
準備工	1.0																																
井戸ポンプ室	2.5×11か所																																
No.3 受水槽	10.9																																
No.2 減圧水槽	9.0																																
No.3 減圧水槽	5.2																																
<b>c) 機器据付工事</b>																																	
電気設備(調達)	5.0																																
井戸ポンプ	1.0×11か所																																
減圧バルブ	2.0×2か所																																
電気設備	3.0																																
<b>d) 管路布設工事</b>																																	
入札	2.0																																
準備工	1.0																																
集水管	2.8																																
導水管	9.2×5班																																
減圧槽接続	2.0																																
<b>e) 試験・検査</b>	1.0																																

## 第4章 プロジェクトの妥当性の検証

### 4-1 プロジェクトの効果

本プロジェクトによる効果は、以下の点が考えられる。

#### (1) 直接効果

本プロジェクトに係る、現状と問題点、本計画での対策および計画による直接的な効果・改善程度は、以下のようにまとめられる。

表 4-1 問題点、対策、およびその効果

現状と問題点	本計画での対策	計画の効果・改善程度
本給水対象地域は首都ダマスカス市およびその周辺住民約282万の人々である。この地域は人口増加が著しく、かつ主水源である湧水は雨や雪に影響され、1999年より3年続いた旱魃時には非常に厳しい断水が続いた。	ヤブース水源地に新規井戸11本を開発し、井戸ポンプの設置、集水管2.2kmおよび導水管11.5kmの整備を行い、既存のタケア減圧槽に接続する。	渇水時の緊急用新規水源として、1日当り13,200 m <sup>3</sup> 給水能力が増加する。これにより、ダマスカス市およびその周辺における水不足が軽減され、渇水時の断水が1日当たり約30分減少する。

#### (2) 間接効果

上記の直接効果に加え、以下のような間接効果が期待できる。

頻繁かつ長時間の断水による市民生活への経済的・衛生的・社会的悪影響、特に貧困層への圧迫が軽減され、社会不安の解消が促される。

緊急用水源施設が複数整備され、給水水源のフレキシビリティが増加し、また1ヶ所からの過剰な揚水が避けられる。

EIA プロセス、特に地域住民を巻き込んだステークホルダーミーティングや群井揚水試験の実施により、住民の環境社会影響や衛生的な水、更には節水灌漑に関する関心が高まる。

本格的なEIA プロセスの実施により、DAWSSA内に環境社会影響の専門家グループが形成され、以後のEIAが容易に実施されるようになる。

### 4-2 課題・提言

2000年のJICA「北西部・中部水資源開発計画調査(フェーズII)」によれば、本計画対象地区を含む「バラダ・アワジ流域」は流域全体の水収支が既にマイナスになっており、地下水系は過剰揚水に陥っていることが明らかにされている。こうした状況の下、本新規水源開発によりさらなる水収支の悪化が懸念されるため、モニタリングの実施とその結果を反映させた適切な運用が重要である。さらに、深刻なダマスカス市の給水事情を勘案した場合、他流域からの送水に係る調査・設計を始め、さらなる漏水対策、節水灌漑の普及促進、下水処理水の再利用等、流域全体の水収支をさらに悪化させずに同市の給水事情を改

善するような対策を、今後も鋭意進めることが必要と考えられる。その上で、以下に挙げる技術的な諸点が改善・整備されれば、本計画はより円滑かつ効果的に実施し得るであろう。

DAWSSA 生産部が、新しく導入される減圧施設の設置、運用・維持管理に係る技術を十分に習得すること。

今回建設される新規井戸は全て 300m 以上と深く、ポンプ設置位置も 100m 以上とかなり深い。DAWSSA はこのような深い井戸ポンプの設置経験がないため、この点に関する技術援助が得られること。

DAWSSA には、給水施設の建設、運用、維持管理等に関する技術者は十分にいるが、水源施設(井戸施設)の計画、調査、建設に係る水理地質技術者の数が極めて少なく、また、それらの解析に関する技術が十分ではない。したがって、水理地質調査およびその解析に係る研修、技術移転が必要である。

#### 4-3 プロジェクトの妥当性

本プロジェクトの実施により、ヤブース地区に新規水源が開発され、ヤブース水源地区内の集水管の整備およびヤブース水源地区～既存タケア減圧槽間の導水管の敷設により水源水量が増加し、ダマスカス市およびその周辺住民約 282 万人の人々の給水事情が改善されることになる。本プロジェクトは以下の観点より妥当と判断できる。

- 本プロジェクトの裨益対象は、シリア国の首都ダマスカス市およびその周辺住民約 282 万人の人々であり、対象人口が多数である。
- 首都ダマスカス市は旱魃の影響で、1999 年～2002 年に 10 万 m<sup>3</sup>/日以上給水不足となり、ダマスカス市内で 12 時間以上の断水が半年以上連続するような非常に厳しい日々が続いたが、新規水源が開発されることにより断水時間が軽減される。
- 本プロジェクトの主要資機材は、井戸ポンプおよび配管材料であり、シリア国側は十分にその設置・敷設等の工事実施が可能である。また、その運営・維持管理に関し要員・体制は充分整っており問題はない。
- 本プロジェクトを実施するに当り環境影響評価(EIA)が行われ、モニタリング計画も検討されており、新規揚水による既存水利用への影響、流域全体への水収支への影響、環境面でのマイナスの影響等を排除するような措置が取られている。

#### 4-4 結論

本プロジェクトは、前述したように渇水時に 13,200 m<sup>3</sup>/日の水源給水量を増加させ、その効果は「断水時間を 30 分短縮する」というものであるが、その対象はシリア国の首都ダマスカス市の市民およびその周辺住民の約 282 万人であるため、その効果は大きく、協力対象事業の一部として我が国の無償資金協力を実施することの妥当性が確認される。さらに、本プロジェクトの運営・維持管理についても、シリア国の実施機関である DAWSSA は人員・予算ともに充

分で問題はないと考えられる。しかし、本プロジェクトにより首都ダマスカス市およびその周辺地域の水不足問題がすべて解決されるということではないため、DAWSSA による更なる改善・整備が必要となる。今後開発される新規水源に関しても、本プロジェクトで実施された EIA の経験に基づき、既存水利用への影響、流域全体の水収支への影響、環境面の影響等を考慮して行われることを期待する。

## [資料集]

資料1： 調査団員・氏名 .....	A1-1
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資料3： 関係者（面会者）リスト .....	A3-1
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資料8： 水理地質ノート .....	A8-1

## 資料- 1. 調査団員・氏名

### 1-1 第1次現地調査

氏名	担当	所属
松本 重行 Shigeyuki MATSUMOTO	総括	独立行政法人国際協力機構 無償資金協力部 業務第一グループ 水・衛生チーム
川崎 良一 Ryoichi KAWASAKI	業務主任/ 地下水開発計画	株式会社三祐コンサルタンツ
木全 教泰 Noriyasu KIMATA	導水施設計画/ 運営・維持管理計画	株式会社三祐コンサルタンツ
荒井 正利 Masatoshi ARAI	機材計画/調達計画	株式会社三祐コンサルタンツ
加藤 泉 Izumi KATO	環境配慮/水質	株式会社三祐コンサルタンツ

### 1-2 第2次現地調査

氏名	担当	所属
大竹 茂 Sigeru OTAKE	総括	独立行政法人国際協力機構 シリア事務所 次長
松本 重行 Shigeyuki MATSUMOTO	計画管理	独立行政法人国際協力機構 無償資金協力部 業務第一グループ 水・衛生チーム
川崎 良一 Ryoichi KAWASAKI	業務主任/ 地下水開発計画	株式会社三祐コンサルタンツ
木全 教泰 Noriyasu KIMATA	導水施設計画/ 運営・維持管理計画	株式会社三祐コンサルタンツ
加藤 泉 Izumi KATO	環境配慮/水質	株式会社三祐コンサルタンツ



1-3 基本設計概要書説明調査

氏名	担当	所属
長澤 一秀 Kazuhide NAGASAWA	総括	独立行政法人国際協力機構 シリア事務所 所長
松本 重行 Shigeyuki MATSUMOTO	計画管理	独立行政法人国際協力機構 無償資金協力部 業務第一グループ 水・衛生チーム
川崎 良一 Ryoichi KAWASAKI	業務主任/ 地下水開発計画	株式会社三祐コンサルタンツ
木全 教泰 Noriyasu KIMATA	導水施設計画/ 運営・維持管理計画	株式会社三祐コンサルタンツ

## 資料- 2. 調査行程

### 2-1 第1次現地調査（平成16年）

日付	行程	宿泊地	行動
3月14日(日)	日本 経由地		移動日
15日(月)	経由地 ダマスカ	ダマスカ	ダマスカ到着
16日(火)		ダマスカ	JICA 事務所打合せ、大使館・国家計画委員会・住宅建設省・DAWSSA 等表敬
17日(水)		ダマスカ	DAWSSA との協議
18日(木)		ダマスカ	現地踏査
19日(金)		ダマスカ	(休日) 団内打合せ
20日(土)		ダマスカ	(休日) 現地踏査、現地再委託業務準備等
21日(日)		ダマスカ	(休日) 現地踏査、現地再委託業務準備等
22日(月)		ダマスカ	ミッツ協議、環境省・灌漑省・水資源情報センター等 関連機関訪問
23日(火)		ダマスカ	ミッツ協議
24日(水)	ダマスカ発 (総括)	ダマスカ	ミッツ署名、JICA・大使館報告、 (総括)ダマスカ発(23:30)
25日(水)	ダマスカ着 (機材・調達計画)	ダマスカ	資料収集、現地調査、DAWSSA その他関連諸機関との協議、 機材・調達計画団員着
26日(金) ~ 4月6日(火)		ダマスカ	資料収集、現地調査、DAWSSA その他関連諸機関との協議
7日(水) ~ 8日(木)		ダマスカ	ワークショップ(現地説明会、及びダマスカ-DAWSSA)
9日(金) ~ ~ 10日(土)		ダマスカ	ワークショップの整理、収集資料整理と未収資料のチェック
11日(日)	ダマスカ発 (環境・水質)	ダマスカ	ワークショップの整理、収集資料整理と未収資料のチェック、 環境・水質団員帰国。
12日(月) ~ ~ 14日(水)		ダマスカ	資料収集、現地調査、DAWSSA その他関連諸機関との協議
15日(木)		ダマスカ	DAWSSA との協議、JICA・大使館報告
16日(金)	ダマスカ 経由地		移動日
17日(土)	経由地 日本着 (コンサルタント)		移動日

2-2 第2次現地調査(平成16年)

日付	行程	宿泊地	行動
10月1日(金)	日本 経由地 (導水施設計画)		移動日
2日(土)	経由地 ダマスカ	ダマスカ	ダマスカ着
3日(日)		ダマスカ	DAWSSA と協議、JICA 事務所打合せ
4日(月)		ダマスカ	現地踏査、測量業者と打合せ
5日(火)		ダマスカ	DAWSSA と協議
6日(水)		ダマスカ	(休日) 現地踏査
7日(木)		ダマスカ	資料収集、現地再委託契約
8日(金)		ダマスカ	(休日) 現地踏査、測量現場指示
9日(土)	ダマスカ着 (業務主任)	ダマスカ	(休日) 資料整理
10日(日)		ダマスカ	DAWSSA と協議、JICA 事務所打合せ、現地踏査
11日(月)		ダマスカ	DAWSSA と協議、リモセンツグ センター訪問
12日(火)		ダマスカ	DAWSSA と協議、現地踏査
13日(水)		ダマスカ	現地踏査、資料収集
14日(木)		ダマスカ	レバノン側周辺状況調査、DAWSSA と協議
15日(金)		ダマスカ	資料整理・解析、中間報告書作成、
16日(土)	ダマスカ着 (計画管理)	ダマスカ	資料整理、団内打合せ
17日(日)		ダマスカ	団内打合せ、JICA 事務所打合せ、日本大使館表敬
18日(月)		ダマスカ	現地調査、DAWSSA と協議、ミニッツ案作成
19日(火)		ダマスカ	ミニッツ案協議、現地調査、DAWSSA と協議
20日(水)		ダマスカ	ミニッツ署名、日本大使館報告
21日(木)	ダマスカ発 (計画管理)	ダマスカ	現地踏査、DAWSSA と協議
22日(金)	ダマスカ 経由地 (コンサルタンツ)		移動日
23日(土)	経由地 日本		

注) 以上の他、環境配慮/水質団員が10月30日から現地参加し、11月8日に帰国している。

2.3 基本設計概要書説明調査（平成 17 年）

日付	行程	宿泊地	行 動
1月14日(金)	日本 経由地 (コンサルタンツ)		移動日
15日(土)	経由地 ダマスカ (計画管理)		ダマスカス着
16日(日)		ダマスカ	JICA 事務所打合せ、大使館・国家計画委員会・住宅建設省・DAWSSA 等表敬
17日(月)		ダマスカ	概要書説明、DAWSSA と協議、現地調査
18日(火)		ダマスカ	概要書及びミニッツ協議、現地調査
19日(水)		ダマスカ	ミニッツ署名、日本大使館報告
20日(木)	ダマスカス発 (計画管理)	ダマスカ	資料収集、現地調査
21日(金)		ダマスカ	(休日) 団内会議、資料整理
22日(土)		ダマスカ	(休日) 現地調査
23日(日)		ダマスカ	(休日) 現地調査
24日(月)	ダマスカ 経由地 (コンサルタンツ)		移動日
25日(火)	経由地 日本		

### 資料- 3 . 関係者（面会者）リスト

- (1) 国家計画委員会（State Planning Commission）  
Mr. Bassam Al Sibai : Deputy Head of State Planning Commission  
Ms. Elham Morad : Coordinator
- (2) 住宅建設省（Ministry of Housing and Construction）  
Dr. Nabil Al Ashraf : Deputy Minister
- (3) ダマスカス市上下水道公社（Damascus City Water Supply and Sewerage Authority; DAWSSA）  
Eng. Muwafak Khallouf : General Director  
Eng. Khaled Al Shalak : Deputy General Director, Director of Studies & Design  
Eng. Mai Al Safadi : Head of Water Resources section  
Eng. Nabel Abo Trab : Head of Study section  
Eng. Abed Al Naser Hamed : Deputy Head of Water Resources section  
Mr. Ahmed Hadaya : Environment section  
Eng. Hosam Eddin Al Huraiden : Director of Construction & Supervision  
Eng. Marwan Soman : Director of Production  
Eng. Bassam Asekria : Director of Distribution  
Eng. Hazem Safadi : Director of Planning & Statistics  
Eng. Nabeel Lwis : Head of Electric & Mechanical Department  
Eng. Dr. M. Chafic Safadi : Water Resources Consultant  
島田 寛三 : シニアボランティア（上水道漏水対策）
- (4) 灌漑省バラダ・アワジ流域総局（General Directorate for Irrigation Barada and Awaji Basins, Ministry of Irrigation）  
Dr. Jamil Fallouh : General Director  
Dr. Hassan Al Fayad : Deputy General Director  
Eng. Ahmad Abdullah : Head of WRIC（バラダ・アワジ流域総局分室）  
Eng. Kassem Natouf : WRIC Sector（同上）  
Eng. Zaki Jamal Addin : Hydrogeology Section  
Eng. Jan Khiami : Hydrogeology Section  
Mr. Maroan Satah
- (5) 灌漑省水資源情報センター（Water Resources Information Center, Ministry of Irrigation: WRIC）  
Dr. Bachar J. Faiad : Director  
伊藤 和久 : JICA 専門家（チーフアドバイザー、～2004,6）  
染矢 武彦 : JICA 専門家（水文）  
杉浦 伸郎 : JICA 専門家（業務調整）  
森 範行 : JICA 専門家（チーフアドバイザー、2004,6～）
- (6) 灌漑省国際水理局（International Water Bureau, Ministry of Irrigation）  
Dr. Eng. Abdel Aziz Al Masri : Technical Committee member of International Water

Bureau

- (7) 農業省化学農業研究委員会(General Commission for Scientific Agricultural Research, Ministry of Agriculture)  
Mr. Ali M. Kaisi : Department Director, ANRR (天然資源調査部)  
Mr. Awadi Arslan : Department Director, ANRR (同上)  
湖東 朗 : JICA 専門家
- (8) 在シリア国日本大使館  
村瀬 充 : 参事官  
奥田 健 : 二等書記官
- (9) JICA シリア事務所  
長澤 一秀 : 所長  
大竹 茂 : 次長  
船場 玲子 : 所員  
Mr. Sakher Mrishih : Programme Office, Water Resources & Agriculture sectors  
Dr. Hafez Al Sadeq : Consultant

MINUTES OF DISCUSSIONS  
ON THE BASIC DESIGN STUDY  
ON THE PROJECT FOR DEVELOPMENT OF NEW WATER SOURCES  
FOR DAMASCUS CITY  
IN THE SYRIAN ARAB REPUBLIC

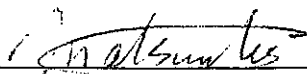
In response to a request from the Government of Syrian Arab Republic ( hereinafter referred to as "Syria" ), the Government of Japan decided to conduct a Basic Design Study on the Project for Development of New Water Sources for Damascus City ( hereinafter referred to as "the Project" ) and entrusted the study to the Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent to Syria the Basic Design Study Team (hereinafter referred to as "the Team" ), which is headed by Mr. Shigeyuki Matsumoto, First Project Management Division, Grant Aid Management Department, JICA, and is scheduled to stay in the country from March 15 to April 20.

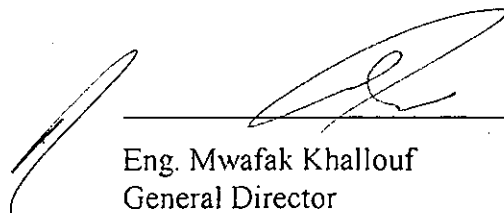
The Team held discussions with the officials concerned of the Government of Syria and conducted a field survey at the study area.

In the course of discussions and field survey, both parties confirmed the main items described on the attached sheets. The Team will proceed to further works and prepare the Basic Design Study Report.

Damascus, March 24, 2004



Mr. Shigeyuki Matsumoto  
Leader  
Basic Design Study Team  
Japan International Cooperation Agency  
Japan



Eng. Mwafak Khallouf  
General Director  
Damascus Water Supply and Sewerage  
Authority  
Syrian Arab Republic

## ATTACHMENT

### 1. Objective of the Project

The objective of the Project is to strengthen water supply capacity of Damascus City Water Supply and Sewerage Authority (DAWSSA) by developing new water sources in order to improve living and sanitary conditions of people in the service areas of Damascus City and its vicinal villages.

### 2. Project sites

The original requested sites of the Project were the water sources at Yaboos, Maadar and Deir Al Ashayer in the northwestern suburbs of Damascus City. However, through the discussions and site surveys, both sides agreed to change Maadar to Maadar II. The location of the three sites is shown in Annex-1.

### 3. Responsible and Implementing Agency

3-1. The Responsible Agency is Ministry of Housing and Construction (MOHC).

3-2. The Implementing Agency is Damascus City Water Supply and Sewerage Authority (DAWSSA). The organization chart is shown in Annex-2.

### 4. Items requested by the Government of Syria

After discussions with the Team, the items described in Annex-3 were finally requested by the Syrian side. JICA will assess the appropriateness of the request and will recommend to the Government of Japan for approval.

### 5. Japan's Grant Aid Scheme

5-1. The Syrian side understands the Japan's Grant Aid Scheme explained by the Team, as described in Annex-4.

5-2. The Syrian side will take the necessary measures, as described in Annex-5, for smooth implementation of the Project, as a condition for the Japanese Grant Aid to be implemented.

### 6. Schedule of the Study

6-1. The consultants will proceed to further studies in Syria until April 15, 2004, modified from the original schedule to April 20.

6-2. JICA will dispatch the Second Basic Design Study Team for the second field survey in Syria



around October 2004 upon completion of the construction work of production wells by the Syrian side.

6-3. JICA will prepare the draft report in English and dispatch a mission in order to explain its contents around January 2005.

6-4. In case that the contents of the report is accepted in principle by the Government of Syria, JICA will complete the final report and send it to the Government of Syria by March 2005.

## 7. Other relevant issues

### 7-1. Necessity of groundwater development for water supply to Damascus city

The Syrian side explained the future plan for water supply and water sources development for Damascus city as follows;

- (1) DAWSSA is now revising the former master plan prepared with JICA cooperation in 1997,
- (2) The water sources development plan consists of five activities, namely continuation of the rehabilitation of existing facilities, development of the Damascus aquifer, development of the Al Hermon region aquifer (the Project is included in this activity), water transmission from other basins such as the coastal region and Euphrates region, and wastewater reuse for indirect usage, and
- (3) The Fijha Spring, main water source of DAWSSA, has large fluctuation of production depending on the amount of snow and rain. In the past drought years, water shortage was so severe that it badly affected living conditions and economic activities of the capital city by prolonged water suspension. In order to prepare for such an emergency situation, DAWSSA desperately requires additional new water sources to be operated in dry season.

Both sides agreed that the groundwater of the Barada and Awaj basin has been already overexploited so that additional development of groundwater should be kept as temporary and emergency measures to ease severe water shortage in Damascus city before drastic solution is realized. In this aspect, DAWSSA is conducting the study for "The Project of Supplying Part of the Water Demand of Damascus City and its Countryside from the Syrian Coastal Area Water Surplus" and the target year of the first stage of this project is 2020.

The Team indicated that the measures against water leakage and other waste of water should be preceded. DAWSSA explained that the replacement of the old distribution pipelines was carried out

with the cooperation of the Japanese Grant Aid and countermeasures against water leakage would be strengthened continuously by reinforcement of leakage detection capability and introduction of District Meter Area (DMA).

The Team will investigate the water supply plan, water sources development plan, balance between water supply and demand, measures taken for water savings and actual situation of water shortage more in detail during the study to confirm urgent and serious necessity of groundwater development.

#### 7-2. Environmental issues

The Syrian side explained that the procedure of Environmental Impact Assessment (EIA) is based on the guideline and EIA decree set in 1995. It requires EIA for this Project including scoping, preparation of the EIA report by DAWSSA, submission of the EIA report to the General Commission for Environmental Affairs (GCEA) and approval by GCEA.

The Team indicated the possible major environmental impact as follows:

- (1) Change of water balance and drop of the groundwater level in the Barada and Awaj basin,
- (2) Hindrance to water usage by private wells around the new water sources, and
- (3) Influence to the existing water usage in the border area of Lebanese side.

Both sides agreed that the following items should be set as an essential prerequisite for the implementation of the Project in order to make it environmentally and socially acceptable:

- (1) The fact that the water shortage in Damascus city is extremely severe and is desperately serious problem in social and economic aspects should be confirmed,
- (2) The countermeasures against water leakage and other water loss should be sufficiently undertaken,
- (3) There should be positive prospect and solid implementation plan for future drastic solution such as inter-basin water transmission in order to minimize the deterioration of water balance in the Barada and Awaj basin,
- (4) The social consensus for the implementation of the Project should be built through the EIA process. Especially the residents around the new water sources should agree to the groundwater development in the Project,
- (5) The EIA should be undertaken in compliance with related laws and regulations in Syria,
- (6) The adequate monitoring system of environmental impact should be established, and

- (7) There should be decision-making mechanism which can stop the operation of the new water sources when negative influence emerges more than initially envisioned.

Both sides agreed that the Syrian side should complete the EIA procedures before the commencement of the Project. The Team will provide data, information and assistance to the Syrian side in the course of the study. The tentative schedule is shown in Annex-6.

If the influence to water usage in the Lebanese territory is predicted, the Syrian side will take necessary measures for appropriate coordination.

### 7-3. Change of the project sites

Based on the results of the site survey, the Team recommended to exclude Maadar area from the project sites, because all of the wells were located on the top of ridge which is not suitable to construct a well field. The groundwater table shall easily drop down by group pumping and it may result in drying up of the Maadar Spring downstream.

The Syrian side basically agreed to the above view of the Team and strongly requested to replace Maadar by Maadar II area to keep three different sites for development, because DAWSSA needs to ensure flexibility of water sources operation in emergency with as many options as possible. The Team understood the situation and agreed to include Maadar II area for the Basic Design Study.

### 7-4. Selection and construction of production wells

After recognition of the existing data and site surveys, the Team found that all the existing wells were not suitable to be converted into the production wells, because of small casing diameter or inadequate well structure in casing and strainer installation, gravel packing and grout sealing. Therefore, both sides agreed that DAWSSA should construct the production wells with enough specification as soon as possible. DAWSSA explained that it had already prepared the draft tender documents for well construction in order to finish it by September and was ready to modify the specification in accordance with requests from the Team. Desirable location, required well specification, necessary number of the production wells and required specification of pumping tests shall be discussed between DAWSSA and the Team. As for the construction schedule, the Team requested to prioritize wells in Yaboos area, which is the most promising site. DAWSSA shall send the information about work progress, well log data and results of the pumping tests to the Team via JICA Syria Office. The tentative schedule is described in Annex-6.



The Team will investigate the existing data and information, hydrogeological characteristics of aquifers, production capacity and water quality. The Team will also conduct pumping tests and groundwater simulation to estimate environmental and social impacts. Based on these surveys, production amount will be examined with due consideration for environmental impact and social acceptability.

The Team strongly recommended for DAWSSA the implementation of group well pumping tests in each of the three new water sources development area promptly after the construction of production wells in order to assure the environmental impact. DAWSSA agreed to do the tests. The Team will provide necessary technical assistance to the Syrian side.

#### 7-5. Modification of the study schedule

Since the construction work of the production wells become necessary, the Team recognized a need to change the study schedule as follows:

- (1) The Second Basic Design Study Team shall be dispatched for the second field work in Syria after the completion of construction work to confirm the new production wells and conduct surveys for collection pipes,
- (2) The first field work, originally scheduled until April 20, shall be shortened until April 15, because some parts of the planned work are postponed to the second field work or omitted, and
- (3) The explanation of the draft report in Syria, originally scheduled in July, shall be postponed after the second field work and successive work in Japan.

The tentative revised schedule is shown in Annex-6.

#### 7-6. Water transmission plan

The route of water transmission pipelines will be determined in consideration with hydraulic performance, permissibility and facility of construction work and economical efficiency. The Team explained the necessity of several pressure breaking reservoirs in the route of transmission pipelines. The Syrian side agreed to construct them.

#### 7-7. Demarcation of procurement

Both sides agreed that the collection pipes under 200mm diameter be prepared by the Syrian side.

The Team mentioned to the budgetary limitation of the Japanese side and the possibility of rearrangement of demarcation at the latter stage of the study. The Syrian side understood the

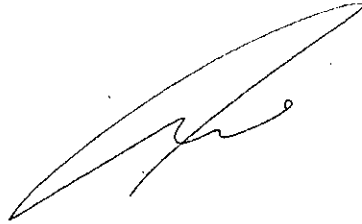
situation of the Japanese side.

7-8. Name of the Project

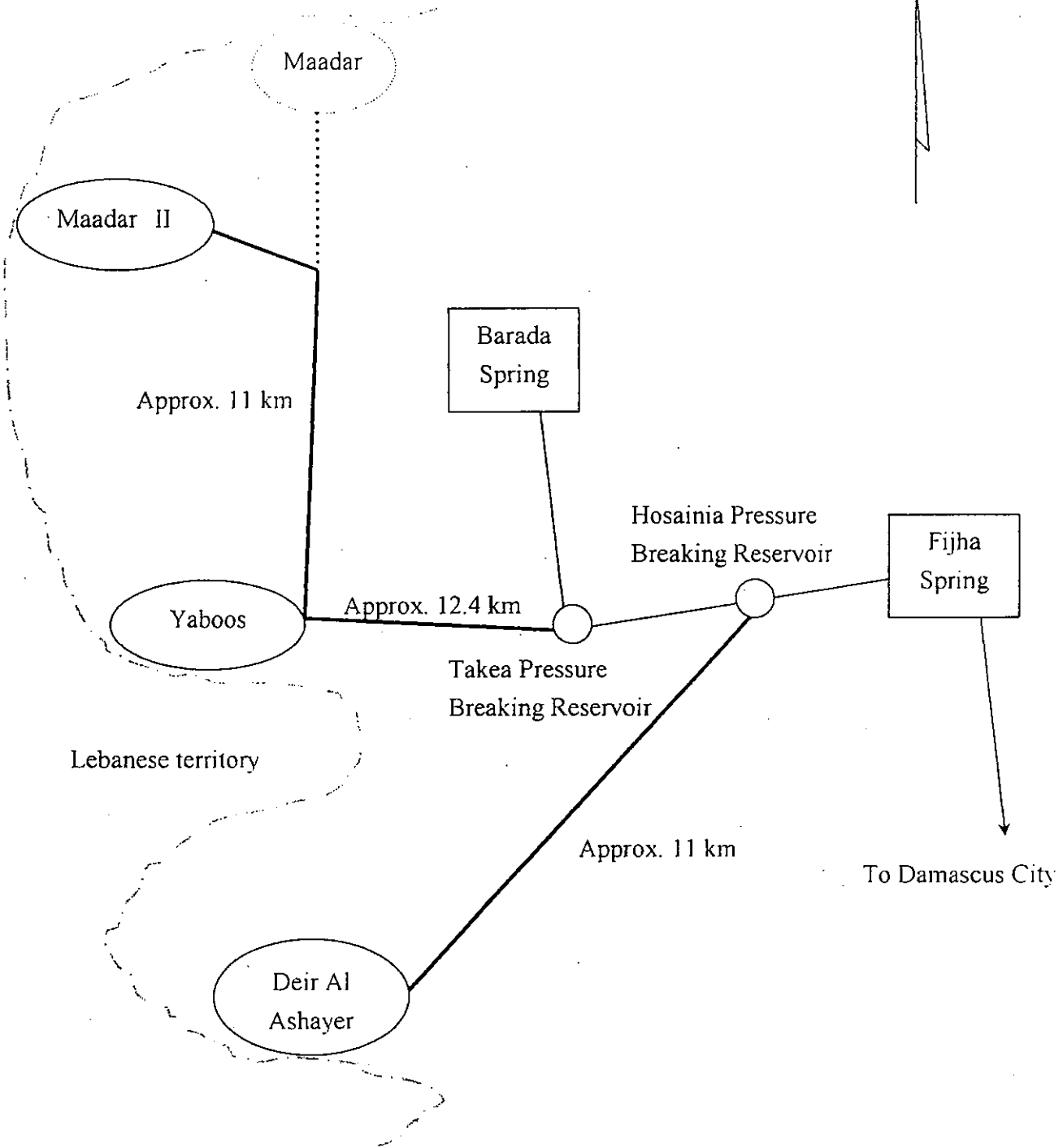
Both sides agreed to name the Project "The Project for Development of New Water Sources for Damascus City".

7-9. Visibility








The Syrian side shall take necessary measures to secure high visibility of the Project.

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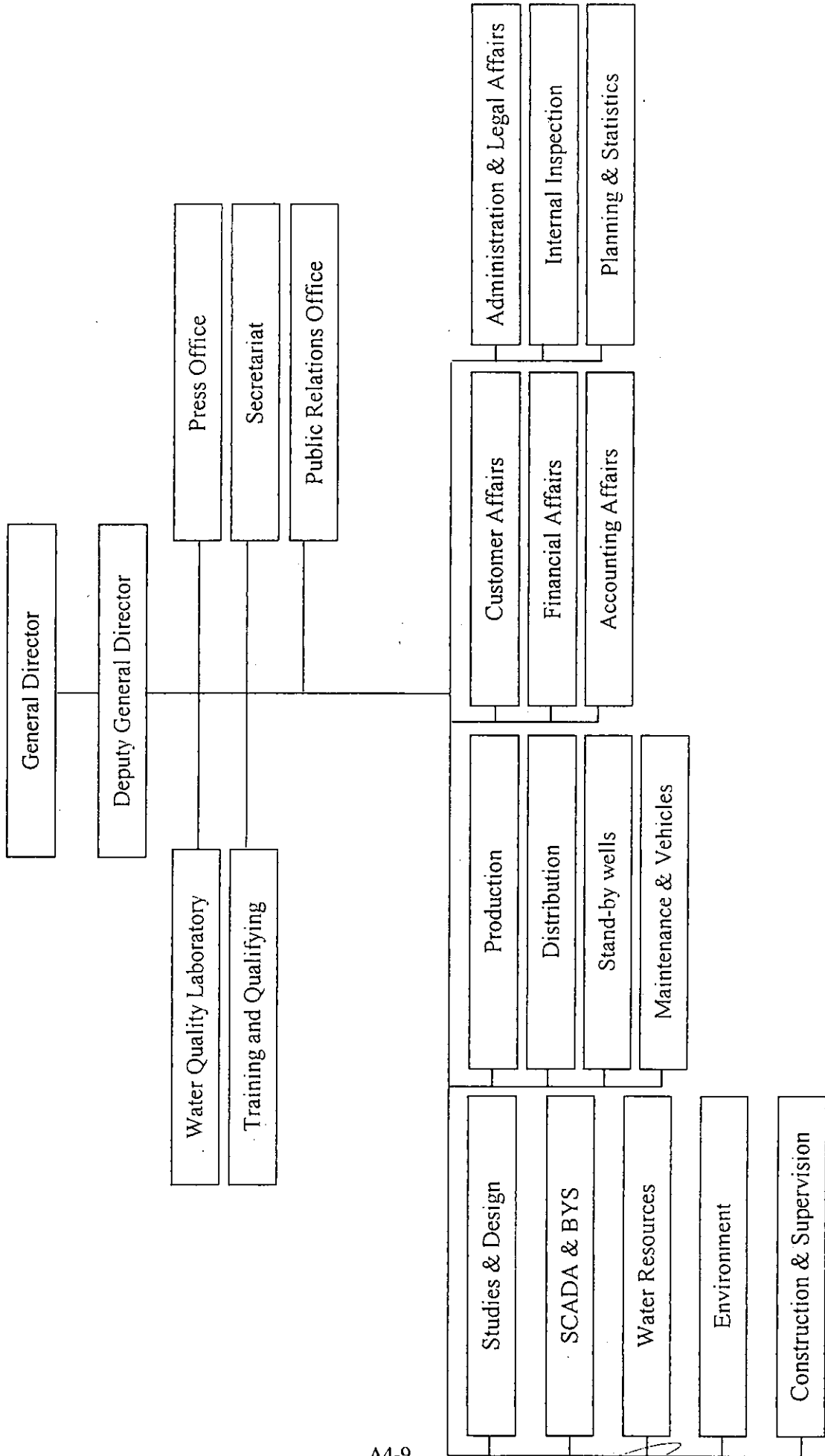
ANNEX-1 : Project Sites



Legend

-  : Proposed well field site
-  : Site excluded from the original request
-  : Existing water source
-  : Border between Syria and Lebanon
-  : Proposed water transmission pipeline
-  : Existing water transmission pipeline
-  : Existing pressure breaking reservoir

ANNEX-2 : Organization Chart of the Damascus City Water and Sewerage Authority



*[Handwritten signature]*

ANNEX-3 : Items requested by the Syrian side

Procurement of the following Equipment:

Yaboos and Maadar II scheme		
1) Submersible pump	Q = 50 m <sup>3</sup> /hr, H = 300 m	15 sets
2) Collection pipe		1 lot
3) Diesel generator	P = 300 kVA	4 sets
4) Transmission pipeline	DN = 500 – 600 mm	24 km
Deir Al Ashayer scheme		
1) Submersible pump	Q = 35 m <sup>3</sup> /hr, H = 100 m	10 sets
2) Collection pipe		1 lot
3) Diesel generator	P = 200 kVA	1 set
4) Transmission pipeline	DN = 300 – 400 mm	11 km





## ANNEX-4 : JAPAN'S GRANT AID SCHEME

### 1. Grant Aid Procedure (Attachment 1)

#### 1) Japan's Grant Aid Program is executed through the following procedures.

Application (Request made by a recipient country)

Study (Basic Design Study conducted by JICA)

Appraisal & Approval (Appraisal by the Government of Japan and Approval by Cabinet)

Determination of (The Notes exchanged between the Governments of Japan

Implementation and the recipient country)

#### 2) Firstly, the application or request for a Grant Aid project submitted by a recipient country is examined by the Government of Japan (the Ministry of Foreign Affairs) to determine whether or not it is eligible for Grant Aid. If the request is deemed appropriate, the Government of Japan assigns JICA to conduct a study on the request. If necessary, JICA send a Preliminary Study Team to the recipient country to confirm the contents of the request.

Secondly, JICA conducts the study (Basic Design Study), using Japanese consulting firms.

Thirdly, the Government of Japan appraises the project to see whether or not it is suitable for Japan's Grant Aid Programme, based on the Basic Design Study report prepared by JICA, and the results are then submitted to the Cabinet for approval.

Fourthly, the project, once approved by the Cabinet, becomes official with the Exchange of Notes signed by the Governments of Japan and the recipient country.

Finally, for the implementation of the project, JICA assists the recipient country in such matters as preparing tenders, contracts and so on.

### 2. Basic Design Study

#### 1) Contents of the Study

The aim of the Basic Design Study (hereinafter referred to as "the Study"), conducted by JICA on a requested project (hereinafter referred to as "the Project"), is to provide a basic document necessary for the appraisal of the Project by the Government of Japan. The contents of the Study are as follows:

- a) confirmation of the background, objectives and benefits of the Project and also institutional capacity of agencies concerned of the recipient country necessary for the Project's implementation;
- b) evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from the technical, social and economic points of view;
- c) confirmation of items agreed on by both parties concerning the basic concept of the Project;
- d) preparation of a basic design of the Project; and
- e) estimation of costs of the Project.



The contents of the original request are not necessarily approved in their initial form as the contents of the Grant Aid project. The Basic Design of the Project is confirmed considering the guidelines of Japan's Grant Aid Scheme.

The Government of Japan requests the Government of the recipient country to take whatever measures are necessary to ensure its self-reliance in the implementation of the Project. Such measures must be guaranteed even through they may fall outside of the jurisdiction of the organization in the recipient country actually implementing the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country through the Minutes of Discussions.

2) Selection of Consultants

For the smooth implementation of the Study, JICA uses a consulting firm selected through its own procedure (competitive proposal). The selected firm participates the Study and prepares a report based upon the terms of reference set by JICA.

At the beginning of implementation after the Exchange of Notes, for the services of the Detailed Design and Construction Supervision of the Project, JICA recommends the same consulting firm which participated in the Study to the recipient country, in order to maintain the technical consistency between the Basic Design and Detailed Design as well as to avoid any undue delay caused by the selection of a new consulting firm.

3. Japan's Grant Aid Scheme

1) What is Grant Aid?

The Grant Aid Program provides a recipient country with non-reimbursable funds to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for economic and social development of the country under principles in accordance with the relevant laws and regulations of Japan. Grant Aid is not supplied through the donation of materials as such.

2) Exchange of Notes (E/N)


Japan's Grant Aid is extended in accordance with the Notes exchanged by the two Governments concerned, in which the objectives of the project, period of execution, conditions and amount of the Grant Aid, etc., are confirmed.

3) "The period of the Grant" means the one fiscal year which the Cabinet approves the project for. Within the fiscal year, all procedure such as exchanging of the Notes, concluding contracts with consulting firms and contractors and final payment to them must be completed.

However, in case of delays in delivery, installation or construction due to unforeseen factors such as weather, the period of the Grant Aid can be further extended for a maximum of one fiscal year at most by mutual agreement between the two Governments.

4) Under the Grant, in principle, Japanese products and services including transport or those of the recipient country are to be purchased.

When the two Governments deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country.



However, the prime contractors, namely consulting, contracting and procurement firms, are limited to "Japanese nationals". (The term "Japanese nationals" means persons of Japanese nationality or Japanese corporations controlled by persons of Japanese nationality.)

5) Necessity of "Verification"

The Government of the recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by the Government of Japan. This "Verification" is deemed necessary to secure accountability of Japanese taxpayers.

6) Undertakings required to the Government of the recipient country (Attachment 2)

- a) to secure a lot of land necessary for the construction of the Project and to clear the site;
- b) to provide facilities for distribution of electricity, water supply and drainage and other incidental facilities outside the site;
- c) to ensure prompt unloading and customs clearance at ports of disembarkation in the recipient country and internal transportation therein of the products purchased under the Grant Aid;
- d) to exempt Japanese nationals from customs duties, internal taxes and fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contracts;
- e) to accord Japanese nationals whose services may be required in connection with the supply of the products and services under the verified contracts such as facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work;
- f) to ensure that the facilities constructed and products purchased under the Grant Aid be maintained and used properly and effectively for the Project; and
- g) to bear all the expenses, other than those covered by the Grant Aid, necessary for the Project.

7) "Proper Use"

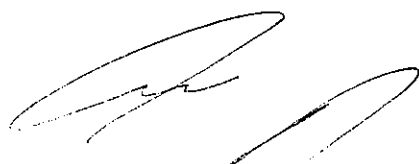
The recipient country is required to maintain and use the facilities constructed and equipment purchased under the Grant Aid properly and effectively and to assign the necessary staff for operation and maintenance of them as well as to bear all the expenses other than those covered by the Grant Aid.

8) "Re-export"

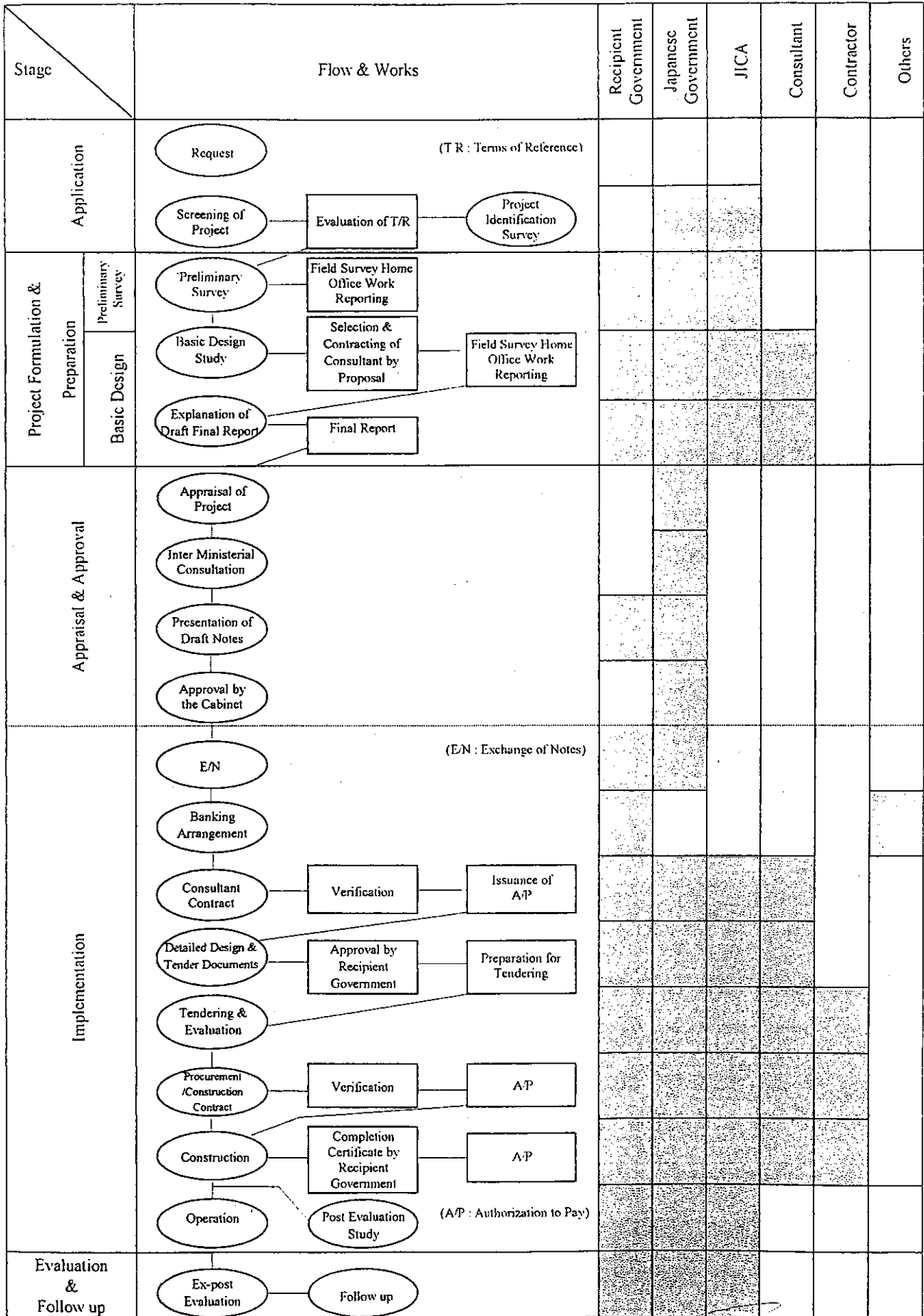
The products purchased under the Grant Aid shall not be re-exported from the recipient country.

9) Banking Arrangement (B/A)

- a) The Government of the recipient country or its designated authority should open an account in the name of the Government of the recipient country in an authorized foreign exchange bank in Japan (hereinafter referred to as "the Bank"). The Government of Japan will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the verified contracts.
- b) The payments will be made when payment requests are presented by the Bank to the Government of Japan under an Authorization to Pay (A/P) issued by the Government of recipient country or its designated authority.



FLOW CHART OF JAPAN'S GRANT AID PROCEDURES



## Major Undertakings to be taken by Each Government

NO	Items	To be covered by Grant Aid	To be covered by Recipient side
1	To secure land		●
2	To clear, level and reclaim the site when needed		●
3	To construct gates and fences in and around the site when needed		●
4	To supply equipment and materials		
	1) Submersible pumps	●	
	2) Diesel generator	●	
	3) Pipe and fittings	●	
	4) Valves related transmission and collection pipelines	●	
	5) Electric transformer		●
	6) Switch board and control panel		●
	7) Others		●
5	To construct facilities and install equipment and materials		
	1) Civil works, such as receiving tanks from collection pipes, pump houses for submersible pumps, electric houses for generators, pressure breaking reservoirs, connection with existing pressure breaking reservoirs		●
	2) Pipe laying works of collection pipes and transmission pipelines		●
	3) Installation of submersible pumps and diesel generators		●
	4) Installation of electric panels		●
	5) To provide electric distribution lines to the site and circuit breakers/relay		●
6	To bear the following commissions to a bank of Japan for the banking services based upon the B/A		
	1) Advising commission of A/P		●
	2) Payment commission		●
7	To ensure prompt unloading and customs clearance at the port of disembarkation in recipient country		
	1) Marine (Air) transportation of the products from Japan to the recipient country	●	
	2) Tax exemption and custom clearance of the products at the port of disembarkation		●
	3) Internal transportation from the port of disembarkation to the project site		●
8	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		●
9	To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contract		●
10	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid		●
11	To bear all the expenses, other than those to be borne by the Grant Aid, necessary for the transportation and installation of the equipment		●

(B/A: Banking Arrangement, A/P: Authorization to Pay)

## ANNEX-5 : UNDERTAKINGS BY THE GOVERNMENT OF THE RECIPIENT COUNTRY

### [ Study and Planning Stage ]

1. To build the consensus on the implementation of the Project among stakeholders including residents living around the new water sources;
2. To complete the EIA procedures following the related laws and regulation in Syria;
3. To complete the well construction work for the Project;
4. To establish the monitoring system;

### [ Procurement Stage (Cooperation by the Japanese Grant Aid) ]

5. To ensure prompt unloading and customs clearance of the products purchased under the Japan's Grant Aid at ports of disembarkation in the Recipient Country;
6. To accord Japanese nationals whose services may be required in connection with the supply of the products and services under the verified contracts such facilities as may be necessary for their entry into Syria and stay therein for the performance of their work;
7. To bear commissions, namely advising commissions of an Authorization to Pay (A/P) and payment commissions, to the Japanese foreign exchange bank for the banking services based upon the Banking Arrangement (B/A);
8. To exempt Japanese nationals from customs duties, internal taxes and fiscal levies which may be imposed in Syria with respect to the supply of the products and services under the verified contracts;
9. To bear all the expenses, other than those covered by the Japan's Grant Aid, necessary for the Project;

### [ Construction Stage ]

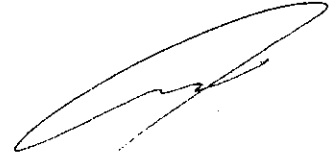
10. To obtain necessary permissions, licenses, and other authorization for implementing the Project, if necessary;
11. To secure a lot of land necessary for the Project;
12. To provide a proper access road to the Project site;
13. To provide facilities for distribution of electricity and other incidental facilities in and around the site;
14. To undertake installation and construction work using equipment and materials provided by the Japanese Grant Aid;

### [ Operation and Monitoring Stage ]

15. To ensure that the equipment and materials purchased under the Japan's Grant Aid be maintained and used properly and effectively for the Project;
16. To monitor the environmental impact appropriately;
17. To operated the new water sources based on the result of the monitoring (bare essential production within the designed permissible amount, appropriate measures in case of

unexpected negative influence); and

18. To enhance comprehensive water resources management including improvement of the existing water distribution systems and the study of inter-basin water transmission.



Annex-6 : Tentative Schedule

	2004												2005		
	March	April	May	June	July	August	September	October	November	December	January	February	March		
Preparation of the production wells [Yaboos] Well Construction Group well pumping test [Deir Al Ashayer] Well Construction Group well pumping test [Maadar II] Well Construction Group well pumping test															
		↕	↕	↕	↕	↕	↕								
EIA		△ 1st Workshop			△ 2nd Workshop			△ 3rd Workshop							
									↕	↕	↕				
Study Schedule															
		↕ 1st field survey						↕ 2nd field survey		↕ Work in Japan	↕ Explanation of the draft report		△ Submission of the final report		



MINUTES OF DISCUSSIONS  
ON THE BASIC DESIGN STUDY (SECOND FIELD SURVEY)  
ON THE PROJECT FOR DEVELOPMENT OF NEW WATER SOURCES  
FOR DAMASCUS CITY  
IN THE SYRIAN ARAB REPUBLIC

In response to the request from the Government of Syrian Arab Republic ( hereinafter referred to as "Syria" ), the Government of Japan decided to conduct a Basic Design Study on the Project for Development of New Water Sources for Damascus City ( hereinafter referred to as "the Project" ) and entrusted the study to the Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent to Syria the Basic Design Study Team (hereinafter referred to as "the Team" ), which is headed by Mr. Shigeru Otake, Deputy Resident Representative, Syria Office, JICA, and is scheduled to stay in the country from October 2 to October 22.

The Team held discussions with the officials concerned of the Government of Syria and conducted a field survey at the study area.

In the course of discussions and field survey, both parties confirmed the main items described on the attached sheets. The Team will proceed to further works and prepare the Basic Design Study Report.

Damascus, October 20, 2004



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Mr. Shigeru Otake  
Leader  
Basic Design Study Team  
Japan International Cooperation Agency  
Japan



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Eng. Mwafak Khallouf  
General Director  
Damascus Water Supply and Sewerage  
Authority  
Syrian Arab Republic

## ATTACHMENT

### 1. Background

Based on the request from Syrian Government, JICA conducted the first field survey for the Basic Design Study from March 15 to April 15, 2004. Main items which both sides agreed by the Minutes of Discussions dated on March 24 are as follows:

- (1) The original requested sites of the Project were the water sources at Yaboos, Maadar and Deir Al Ashayer. However, both sides agreed to change Maadar to adjacent Maadar II, because all the wells in Maadar were located on the top of the ridge which was not suitable to construct a well field from the fear of lowering groundwater table,
- (2) The Japanese side found that all the existing wells were not suitable to be converted into the production wells, because of small casing diameter or inadequate well structure in casing and strainer installation, gravel packing and grout sealing. Therefore, both sides agreed that DAWSSA should construct the production wells with enough specification by September,
- (3) Both sides confirmed that EIA would be necessary for the Project and DAWSSA should prepare EIA report and get approval from the General Commission for Environmental Affairs (GCEA), and
- (4) The Second Basic Design Study Team shall be dispatched for the second field work in October after the completion of construction work to confirm the new production wells and conduct surveys for collection pipes.

Following the above agreement, JICA dispatched the Second Basic Design Study Team.

### 2. Work progress of well construction

DAWSSA has been constructing production wells in the three sites. Here is the progress of the production well construction as of October 15:

Area	Pumping test complete	Drilling complete	Under construction
Yaboos	9	9	4
Maadar II	0	0	8
Deir Al Ashayer	1	3	3

The location of the sites is shown in Annex-1. The well list is shown in Annex-2.



### 3. Environmental and social consideration

#### (1) Progress

DAWSSA has established the EIA Team with 13 staff members and Mr. Mohamad Kayyal as an advisor from the Damascus University. The progress of environmental and social consideration was explained as follows:

##### 1) EIA process

The First Progress Report was submitted to JICA on October 14. It clearly states work progress, future work and work schedule.

##### 2) Consensus building with stakeholders

The first stakeholders' meeting was convened in April 2004.

Talk with residents of Deir Al Ashayer is in progress. DAWSSA expects that parties concerned will reach an agreement in the near future.

##### 3) Coordination with the Lebanese side

DAWSSA sent letters three times to the vice minister of irrigation in order to urge the ministry to place the Project on the agenda of the Syrian-Lebanese Ministerial Committee on Water.

DAWSSA contacted the Lebanese side by itself. The expert of GTZ has started investigation of shared water.

#### (2) Tentative schedule

According to the First Progress Report, DAWSSA's tentative schedule on EIA process is as described below:

Task Number	Task	Date for Completion
1	Assembling information from the group teams which provide background information on the assessment of impacts	Week 4, Oct. 2004
2	Preparing a presentation to assess the impacts which provides background information on the nature of the project activities and the environmental conditions in the project sites	Week 2, Nov. 2004
3	Convening the EIA study team in a series of meetings for: a. Explaining the basis of impacts assessment including types of impacts and determination of their significance b. Presentation of background information for each environmental aspect c. Conducting a group survey of each impact in order to determine its significance d. Determination of major impacts and their level of	Week 4, Nov. 2004

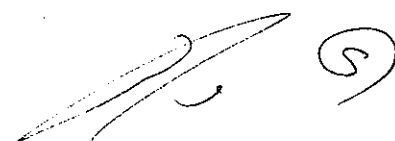
	<p>significance</p> <p>e. Determination of mitigation measures for these impacts including alternatives</p> <p>f. Proposing monitoring plans to ensure the impacts are minimized</p>	
4	Convening a stakeholders' meeting to explain the major impacts, mitigation measures and monitoring plan	Week 1, Dec. 2004
5	Review of mitigation measures and monitoring plan based on input from stakeholders	Week 3, Dec. 2004
6	Preparation of draft EIA report	Week 4, Jan. 2005
7	Presentation of the summary of the draft report to stakeholders in order to gain their approval and address their concerns	Week 1, Feb. 2005
8	Revision and translation of final EIA report and submission to the environment agency for approval	Week 4, Feb. 2005
9	Submission of approved final report to JICA	Week 4, Mar. 2005

The Team requested to shorten the schedule as much as possible in accordance with decision-making process of the Japanese side.

### (3) Confirmation of the prerequisite

Both sides reaffirmed the prerequisite for the implementation of the Project agreed by the previous Minutes of Discussions:

- 1) The fact that the water shortage in Damascus city is extremely severe and is desperately serious problem in social and economic aspects should be confirmed,
  - Water supply suspension was obliged severely during dry year.
  - The Team collects backup data such as record of cuts in water supply.
- 2) The countermeasures against water leakage and other water loss should be sufficiently undertaken,
  - The replacement of the old distribution pipelines was carried out with the cooperation of the Japanese Grant Aid.
  - Countermeasures against water leakage will be strengthened continuously by reinforcement of leakage detection capability and introduction of District Meter Area (DMA).
  - Rate of water leakage decreased from 34.7% in 1997 to 23% in 2003.
- 3) There should be positive prospect and solid implementation plan for future drastic solution such as inter-basin water transmission in order to minimize the deterioration of water balance in the Barada and Awaj basin,
  - The water transmission plans from coastal basin and Euphrates River are in progress.
  - Wastewater reuse for irrigation is in operation.



- 4) The social consensus for the implementation of the Project should be built through the EIA process. Especially the residents around the new water sources should agree to the groundwater development in the Project.
  - DAWSSA held a series of stakeholders' meetings.
  - Talk with residents in Deir Al Ashayer is continuing.
- 5) The EIA should be undertaken in compliance with related laws and regulations in Syria.
  - DAWSSA has organized the EIA Study Team with assistance of Mr. Mohamad Kayyal, Associate Professor of the Faculty of Civil Engineering at Damascus University.
  - DAWSSA will prepare EIA report and submit to General Commission for Environmental Affairs (GCEA) based on the EIA decree put in force in 1995.
- 6) The adequate monitoring system of environmental impact should be established,
  - DAWSSA is negotiating with the Ministry of Irrigation to utilize a part of its monitoring wells.
  - DAWSSA has own monitoring wells and maintains constant monitoring. Monitoring records are described in annual reports of DAWSSA.
- 7) There should be decision-making mechanism which can stop the operation of the new water sources when negative influence emerges more than initially envisioned.
  - DAWSSA has the operation criteria for existing well fields. The Study Team will revise it or submit recommendation for it, if necessary, considering application to the Project sites.

#### 4. Requirements and conditions for future work

The Team requires well data obtained by pumping tests including groundwater table and yield for basic design work. Definite possibility of social agreement is also necessary for decision-making of the Japanese side.

Therefore, both sides agreed to the following conditions and time limits:

- 1) Yaboos: DAWSSA should report the results of pumping test for remaining wells by November 7 to the Team and the JICA Syria Office. The Team will proceed to basic design and cost estimation for wells reported by then.
- 2) Maadar II:
  - a) Condition 1: DAWSSA should report the results of pumping test for all the planned 8 wells by November 7 to the Team and the JICA Syria Office. Otherwise, Maadar II should be postponed.
  - b) Condition 2: If condition 1 is met, the Team will simulate the effect on the Lebanese side. If



certain amount of influence is predicted. DAWSSA should obtain consensus of the Lebanese Government through the official channel under the control of Ministry of Irrigation in writing by December 15. Otherwise, Maadar II should be postponed. Effect on the Lebanese side should be also confirmed by a group well pumping test.

3) Deir Al Ashayer:

- a) Condition 1: DAWSSA should report the results of pumping test for all the planned 6 wells by November 7 to the Team and the JICA Syria Office. Otherwise, Deir Al Ashayer should be postponed.
- b) Condition 2: If condition 1 is met, DAWSSA should obtain consensus of residents in Deir Al Ashayer in writing by the end of November. Otherwise, Deir Al Ashayer should be postponed.
- c) Condition 3: If condition 1 is met, the Team will simulate the effect on the Lebanese side. If certain amount of influence is predicted, DAWSSA should obtain consensus of the Lebanese Government through the official channel under control of Ministry of Irrigation in writing by December 15. Otherwise, Deir Al Ashayer should be postponed. Effect on the Lebanese side should be also confirmed by a group well pumping test.

As for the coordination with the Lebanese side, the Syrian side should at least notify the Lebanese side through the official channel, because all the project sites are located in the boarder area. In case certain influence is predicted in Maadar II and/or Deir Al Ashayer, the Syrian side should obtain consensus in writing in order to avoid future trouble. In Yaboos area, there is no habitant and water use in the Lebanese side, so that no effect is foreseen.

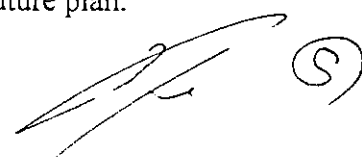
The work schedule for EIA should be shortened as much as possible.

If it happens that an area (or areas) should be postponed to the next fiscal year, the Basic Design Study will continue next fiscal year without renewed request.

5. Water transmission plan

DAWSSA has started consultation with the Ministry of Transport to deal with construction of water transmission pipelines along the highway to Beirut and railway crossing. The results should be informed to the Team as soon as possible.

DAWSSA has a future plan to develop Sergaya area and Maadar I area and to extend the three well fields requested in the Project. This will affect the size of pipelines of the Project, so that the Team will carefully examine the realizable possibility and relevance of the future plan.



#### 6. Equipment plan and procurement plan

Both sides reaffirmed that the collection pipes less than 200mm diameter would be prepared by the Syrian side as agreed by the previous Minutes of Discussions signed on March 24.

Both side also agreed that diesel generators would be also prepared by the Syrian side. because they would be used only for standby.

#### 7. Items requested by the Government of Syria

After discussions with the Team, the items described in Annex-3 were finally requested by the Syrian side. JICA will assess the appropriateness of the request and will recommend to the Government of Japan for approval.

#### 8. Undertakings of the Syrian side

The Syrian side will take the necessary measures, as described in Annex-4, for smooth implementation of the Project, as a condition for the Japanese Grant Aid to be implemented.

#### 9. Schedule of the Study

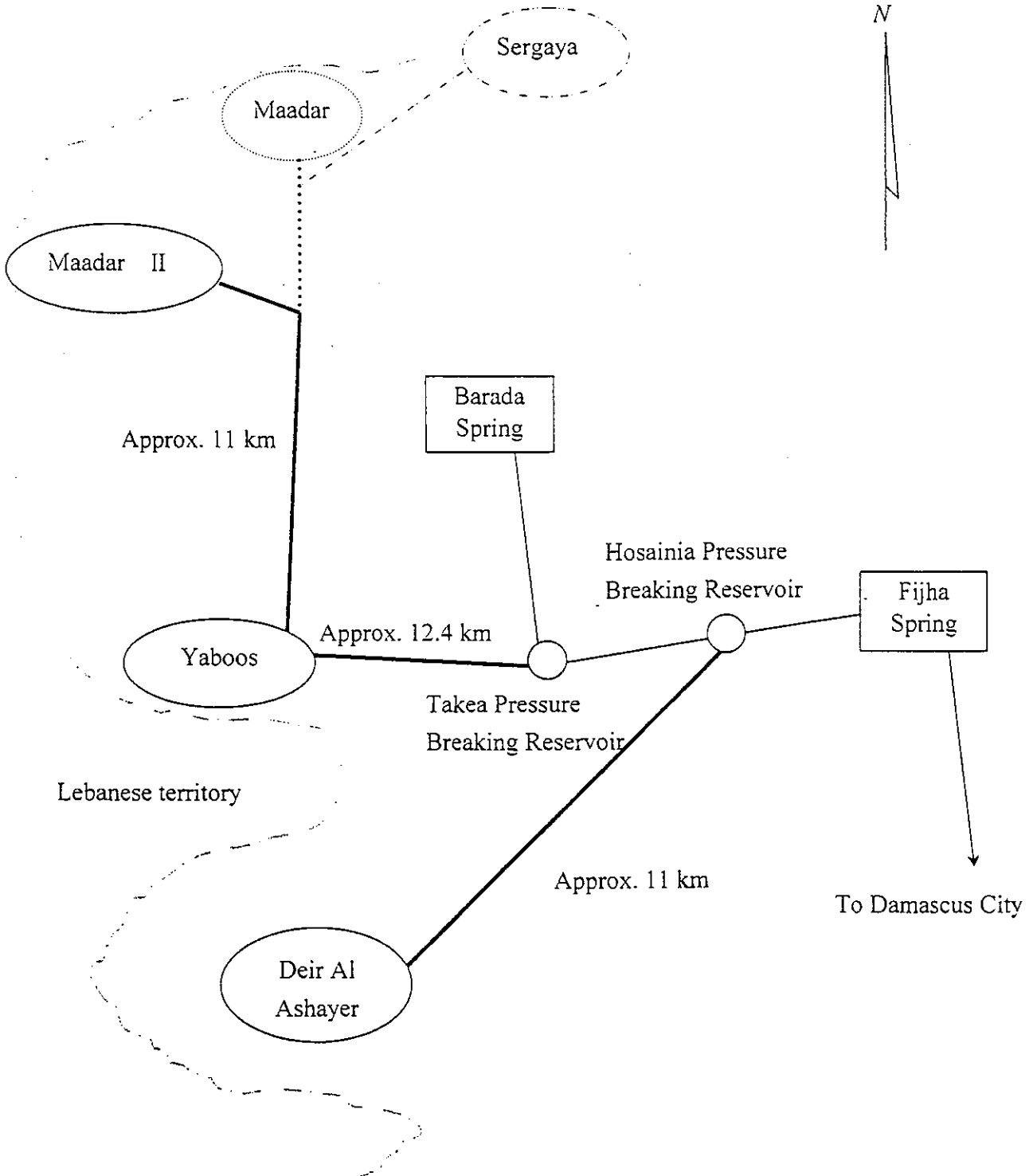
9-1. The consultants will proceed to further studies in Syria until October 22 and in November 2004.

9-2. JICA will prepare the draft report in English and dispatch a mission in order to explain its contents around January 2005.

9-3. In case that the contents of the report is accepted in principle by the Government of Syria, JICA will complete the final report and send it to the Government of Syria by March 2005.



ANNEX-1 : Project Sites



Legend


- : Well field site for fast track portion
- (dotted) : Site excluded from the original request
- : Existing water source
- - - : Border between Syria and Lebanon
- (solid) : Proposed water transmission pipeline
- (small) : Existing pressure breaking reservoir
- (dashed) : Existing water transmission pipeline
- (dotted) : Site of future plan by DAWSSA



ANNEX-2 : List of Wells Constructed by DAWSSA

	Well I.D. No.	Drilling complete	Pumping test complete	Depth (m)	Static water level (meter below the surface)	Specific yield (m <sup>3</sup> /hr/m)
Yaboos						
1	YAW 1	*	*	400	97.0	5.89
2	YAW 2	*	*	400	101.5	12.05
3	YAW 3	*	*	400	93.2	2.50
4	YAW 4			( 250 )	-	-
5	YAW 5	*	*	400	Under data analysis	Under data analysis
6	YAW 6	*	*	396.6	87.0	6.96
7	YAE 7	*	*	400	90.7	2.01
8	YAE 8			( 190 )	-	-
9	YAE 9	*	*	400	107.0	2.22
10	YAE 10	*	*	425	117.8	0.29
11	YAE 11	*	*	450	127.7	0.85
12	YAE 12			( 140 )	-	-
13	YAE 13			( 70 )	-	-
Maadar II						
1	MA1			( 320 )	-	-
2	MA2			( 200 )	-	-
3	MA3			( 240 )	-	-
4	MA4			( 250 )	-	-
5	MA5			( 210 )	-	-
6	MA6			( 140 )	-	-
7	MA7			( 18 )	-	-
8	MA8			( 400 )	-	-
Deir Al Ashayer						
1	DA1	*		285.4	-	-
2	DA2	*	*	277.8	18.1	3.05
3	DA3	*		273.7	-	-
4	DA4			( 200 )	-	-
5	DA5			( 70 )	-	-
6	DA6			( 15 )	-	-

Wells with I.D. No. starting with YAW are located in Yaboos West.  
Wells with I.D. No. starting with YAE are located in Yaboos East.  
Depth figure in parentheses shows drilling progress as of Oct. 15.



ANNEX-3 : Items Requested by the Syrian Side for the Fast Track Potion

Procurement of the following Equipment:

Yaboos and Maadar II scheme		
1) Submersible pump	Q = 50 m <sup>3</sup> /hr, H = 300 m	19 sets
2) Collection pipe		1 lot
3) Transmission pipeline	DN = 500 – 600 mm	25 km
Deir Al Ashayer scheme		
1) Submersible pump	Q = 50 m <sup>3</sup> /hr, H = 150 m	6 sets
2) Collection pipe		1 lot
3) Transmission pipeline	DN = 300 – 400 mm	11 km

#### ANNEX-4 : Undertakings of the Syrian Side

##### [ Study and Planning Stage ]

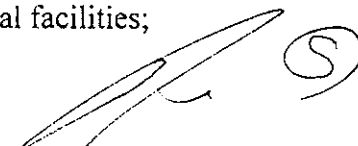
1. To build the consensus on the implementation of the Project among stakeholders, including residents living around the new water sources;
2. Coordination with the Lebanese side;
3. To complete the EIA procedures following the related laws and regulation in Syria;
4. To complete the well construction work for the Project;
5. To consult with related authorities to determine the routes of water transmission pipelines;
6. To establish the monitoring system;

##### [ Procurement Stage (Cooperation by the Japanese Grant Aid) ]

7. To ensure prompt unloading and customs clearance of the products purchased under the Japan's Grant Aid at ports of disembarkation in the Recipient Country;
8. To accord Japanese nationals whose services may be required in connection with the supply of the products and services under the verified contracts such facilities as may be necessary for their entry into Syria and stay therein for the performance of their work;
9. To bear commissions, namely advising commissions of an Authorization to Pay (A/P) and payment commissions, to the Japanese foreign exchange bank for the banking services based upon the Banking Arrangement (B/A);
10. To exempt Japanese nationals from customs duties, internal taxes and fiscal levies which may be imposed in Syria with respect to the supply of the products and services under the verified contracts;
11. To bear all the expenses, other than those covered by the Japan's Grant Aid, necessary for the Project;
12. To procure equipment which is due to be borne by the Syrian side;

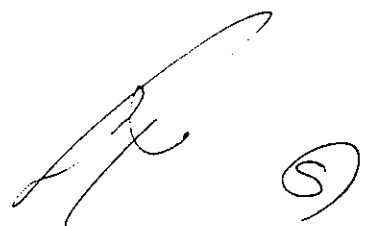
##### [ Construction Stage ]

13. To obtain necessary permissions, licenses, and other authorization for implementing the Project, if necessary;
14. To secure a lot of land necessary for the Project;
15. To provide a proper access road to the Project site;
16. To provide facilities for distribution of electricity and other incidental facilities in and around the site;
17. To control traffic, secure security of pedestrians and passing cars, minimize negative effects for surrounding environment, protect other burial facilities such as electric cables and telephone lines, coordinate with related authorities;
18. To undertake installation and construction work using equipment and materials provided by the Japanese Grant Aid such as installation of equipment, construction of pipelines, construction of pressure breaking reservoirs and construction of incidental facilities;



[ Operation and Monitoring Stage ]

19. To ensure that the equipment and materials purchased under the Japan's Grant Aid be maintained and used properly and effectively for the Project;
20. To monitor the environmental impact appropriately;
21. To operated the new water sources based on the result of the monitoring (bare essential production within the designed permissible amount, appropriate measures in case of unexpected negative influence); and
22. To enhance comprehensive water resources management including improvement of the existing water distribution systems and the study of inter-basin water transmission.

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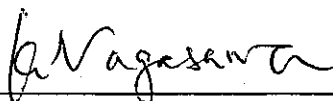
MINUTES OF DISCUSSIONS  
ON THE BASIC DESIGN STUDY  
ON THE PROJECT FOR DEVELOPMENT OF NEW WATER SOURCES  
FOR DAMASCUS CITY  
IN THE SYRIAN ARAB REPUBLIC  
(EXPLANATION ON DRAFT REPORT (1))

In March and October 2004, the Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched the Basic Design Study Team on the Project for Development of New Water Sources for Damascus City ( hereinafter referred to as "the Project" ) to Syrian Arab Republic ( hereinafter referred to as "Syria" ), and through discussion, field survey, and technical examination of the results in Japan, JICA prepared a draft report of the study.

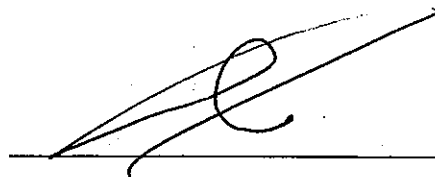
In order to explain and to consult with the Government of Syria on the components of the draft report, JICA sent to Syria the Draft Report Explanation Team (hereinafter referred to as "the Team" ), which is headed by Mr. Kazuhide Nagasawa, Resident Representative, Syria Office, JICA, from January 15 to 24, 2005.

In the course of discussions, both parties confirmed the main items described on the attached sheets.

Damascus, January 19, 2005



Mr. Kazuhide Nagasawa  
Leader  
Draft Report Explanation Team  
Japan International Cooperation Agency  
Japan



Eng. Mwafak Khallouf  
General Director  
Damascus Water Supply and Sewerage  
Authority (DAWSSA)  
Syrian Arab Republic

## ATTACHMENT

### 1. Components of the Draft Report

The Government of Syria agreed and accepted in principle the components of the draft report (1) explained by the Team.

### 2. Japan's Grant Aid scheme

The Syrian side understands the Japan's Grant Aid Scheme and the necessary measures to be taken by the Government of Syria as explained by the Team and described in Annex-4 and Annex-5 of the Minutes of Discussions signed by both parties on March 24, 2004.

### 3. Schedule of the Study

JICA will complete the final report in accordance with the confirmed item and send it to the Government of Syria by April, 2005.

### 4. Other relevant issues

#### 4-1. Project components

The Team explained that the draft report (1) dealt with Yaboos area and the draft report (2) would be prepared for Maadar II area and Deir Al Ashayer area after further work to be conducted. Main components of the project for Yaboos area are shown in Annex-1.

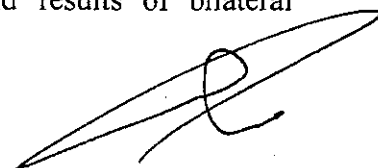
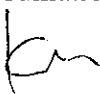
#### 4-2. Draft detailed specification of the equipment

The Team handed one copy of the draft detailed specification of the equipment to Eng. Mwafak Khallouf, General Director of DAWSSA. Both sides agreed that this draft specification was confidential and should not be duplicated or released to any outside parties.

#### 4-3. Environmental and social consideration

The Team explained the following major comments from JICA's Advisory Council of Environmental and Social Considerations Review, which consists of academic experts, NGOs, etc.:

- (1) JICA is requested to confirm results of EIA conducted by the Syrian side,
- (2) JICA is requested to make a decision based on the results of group pumping test,
- (3) It is necessary to gain approval from the Lebanese side at the Syrian-Lebanese Committee on water and JICA is requested to describe the process and results of bilateral coordination in the B/D report,



- (4) It is desirable to propose a monitoring plan in detail,
- (5) To estimate groundwater recharge ratio and recharge area is very difficult especially in limestone areas. The B/D report is requested to give a description of data, figure, basis of assumption, scientific reasoning, etc. in order to ensure traceability and repeatability of estimation,
- (6) Water quality analysis is requested to be conducted in more items such as arsenic (As), fluorine (F), selenium (Se), heavy metals (Fe, Mn, Cu, Pb, Zn, Hg, Cr, Cd) and organic compounds (COD or TOC),
- (7) Water quality of Yaboos area is contaminated with coliform bacteria. Mechanism of contamination should be described in the B/D report. Countermeasures and monitoring plan are also important,
- (8) An operation plan should be clearly stated to avoid excessive groundwater extraction,
- (9) The groundwater simulation model used in the draft report involves many assumptions. The B/D report is requested to mention those assumptions and limits of the model clearly and to emphasize importance of monitoring,
- (10) Because the operation of the Project is seasonal, the B/D report is requested to describe important points of operation and maintenance corresponding to this operation characteristic, and
- (11) Impact of water shortage should be described more in detail.

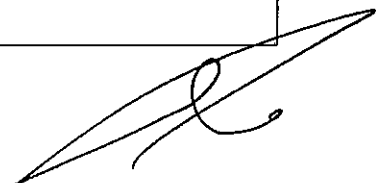
The Team will finalize the draft report in consideration of these comments. DAWSSA transferred these comments to the supervisor of EIA Study Team, Dr. Kayyal of Damascus University.

DAWSSA agreed to the necessity of countermeasures against water source contamination and promised to conduct additional water quality analysis.

Both sides confirmed the following progress and schedule of EIA process for Yaboos area:

Task Number	Task	Schedule
1	Stakeholders meeting (2 <sup>nd</sup> )	Dec. 28 – 29, 2004 (done)
2	Group pumping test	Jan. 16, 2005 – (started) (about 1 month duration)
3	Preparation of EIA report (1 <sup>st</sup> draft)	Jan. 19, 2005
4	Stakeholders meeting (3 <sup>rd</sup> )	1 <sup>st</sup> or 2 <sup>nd</sup> week of Feb., 2005
5	Submission of EIA report (Yaboos) to GCEA	Feb.20, 2005

*Kayyal*



6	Examination of EIA report (Yaboos) by GCEA	Feb. 20 – March 20, 2005
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DAWSSA explained achievement of environmental and social considerations as follows:

(1) EIA report

DAWSSA submitted a part of EIA report (1<sup>st</sup> draft) to the Team on January 17 and explained that the rest would be also submitted in a few days. The EIA report is prepared in English and DAWSSA will translate it into Arabic. DAWSSA explained that the EIA report would be finalized reflecting further check by DAWSSA, results of the ongoing group pumping test and comments from stakeholders, and submitted to GCEA (General Commission for Environmental Affair) by February 20 (same as the original schedule).

(2) Stakeholders meeting

DAWSSA provided the minutes of meeting of the 2<sup>nd</sup> stakeholders meeting held on December 28 and 29, 2004. No objection was raised to the Project in the meeting. Requests from the representative of local residents (Jdaidet Yaboos village) will be considered as follows:

1) Drinking water supply to the village

The Minister of Housing and Construction agreed to this request and Water Supply Authority for Rural Damascus will take necessary action.

2) Participation to the group pumping test

DAWSSA had sent an official invitation letter and already received a response letter.

3) Introduction of group irrigation by dripping

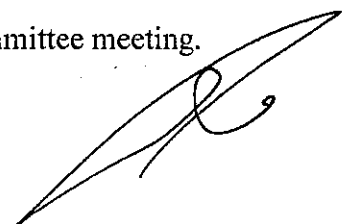
Ministry of Irrigation plans to conduct a pilot study near Barada Spring. In association with this, DAWSSA expressed its expectation for continuation of technical transfer by JICA to competent authorities in Syria.

The 3<sup>rd</sup> stakeholders meeting will be held in 1<sup>st</sup> or 2<sup>nd</sup> week of February as soon as the groundwater level stabilizes and the result of group pumping test is estimated.

(3) Official coordination with the Lebanese government

DAWSSA reported that an oral approval for the whole Project had been already obtained at the previous official committee meeting on water between Syrian government and Lebanese government. The Lebanese side is in process of nominating delegations to attend site visit and monitoring. The Syrian side will request written approval in the next committee meeting.

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#### (4) Information disclosure

DAWSSA made minutes of meeting for each stakeholders meeting in Arabic and English. The EIA report is also prepared in English and Arabic. Both of them are open to public.

#### 4-4. Water transmission plan

The Team explained methodology and design results of the water transmission pipeline, which had been determined taking into consideration future connection and expansion. DAWSSA understood them.

DAWSSA explained that there was no need to change the transmission route according to consultation and coordination with the Ministry of Transport and other line ministries.

#### 4-5. Undertakings of the Syrian side

The Syrian side will take the necessary measures, as described in Annex-2, for smooth implementation of the Project, as a condition for the Japanese Grant Aid to be implemented.

The Team requested DAWSSA to keep contact and provide following information and documents via JICA Syria Office as soon as possible:

- (1) Result of the group pumping test in Yaboos area,
- (2) Minutes of meeting for the 3<sup>rd</sup> stakeholders meeting,
- (3) Final version of the EIA report, and
- (4) Result of EIA examination by GCEA.

#### 4-6. Technical assistance

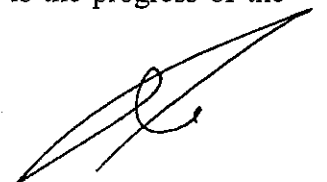
DAWSSA requested technical assistance (so-called Soft Component) and counterpart training in Japan in the following areas:

- (1) Installation and maintenance of a pressure reducing facility,
- (2) Installation of a submersible pump to a deep well, and
- (3) Hydrogeology to evaluate and monitor influence area and protection area around wells.

The Team recognized the necessity and promised to convey the request to JICA headquarters.

#### 4-7. Work progress of well construction and EIA process for Maadar II area and Deir Al Ashayer area

DAWSSA has been constructing production wells in the three sites. Here is the progress of the production well construction as of January 17:



Area	Pumping test complete	Drilling complete	Under construction
Yaboos	12	12	1
Maadar II	3	3	5
Deir Al Ashayer	4	4	2

The location of the sites is shown in Annex-3. The well list is shown in Annex-4.

DAWSSA also explained the progress of EIA process as follows:

(1) Consensus building among stakeholders

DAWSSA, Ministry of Housing and Construction and Damascus Countryside Governorate held several discussions with residents (mainly farmers) of Deir Al Ashayer area and have obtained written approval to the Project from them. DAWSSA submitted a copy of letter from the Chairman of Dimas Town Council to the Damascus Countryside Governorate dated on December 2, 2004, which stated that they did not have objection to the groundwater exploiting in Deir Al Ashayer area on condition that drinking water would be supplied to Dimas and Deir Al Ashayer.

(2) Official coordination with the Lebanese government

DAWSSA is taking the procedure to obtain written approval from the Lebanese side for Maadar II area and Deir Al Ashayer area as well as Yaboos area.

DAWSSA explained a future schedule as follows:

Task Number	Task	Schedule
1	Well construction in Deir Al Ashayer area	By the middle of February, 2005
2	Group pumping test in Deir Al Ashayer area	From the middle of February, 2005 – (about 1 month duration)
3	Well construction in Maadar II area	By the middle of March, 2005
4	Group pumping test in Maadar II area	From the middle of March, 2005 – (about 1 month duration)
5	Stakeholders meeting for Maadar II area and Deir Al Ashayer area	April, 2005
6	Submission of EIA report (Maadar II and Deir Al Ashayer) to GCEA	May, 2005

The Team explained that JICA would conduct the 3<sup>rd</sup> field survey for Maadar II area and Deir Al Ashayer area under the following conditions in principle:

*km*

- (1) Construction of all the production wells is completed,
- (2) Group pumping tests are conducted,
- (3) The Lebanese side indicates acceptance of the Project based on recognition of the group pumping test results, and
- (4) Stakeholders including nearby local residents approved the implementation of the Project based on recognition of the group pumping test results.

The Team explained purposes of the 3rd field survey as follows:

- (1) To verify location and conditions of the wells,
- (2) To verify results of pumping tests and water quality analysis,
- (3) To conduct survey necessary for design of water collection pipelines, and
- (4) To discuss contents of the EIA report.

JICA will prepare a draft report for Maadar II area and Deir Al Ashayer area after approval of EIA by the Syrian government and then dispatch a draft report explanation team to Syria.



ANNEX-1 : Main components of the project for Yaboos area

Procurement of the following Equipment:

Yaboos scheme		
1) Submersible pump	Q = 0.83 m <sup>3</sup> /min	11 sets
2) Collection pipe	DN = 250 – 400 mm	1 lot
3) Transmission pipeline	DN = 600 mm	11.5 km
4) Fixed water level valve	600 mm, with strainer and sluice valve	2 units



## ANNEX-2 : Undertakings of the Syrian Side

### [ Study and Planning Stage ]

1. To build the consensus on the implementation of the Project among stakeholders, including residents living around the new water sources;
2. Coordination with the Lebanese side;
3. To complete the EIA procedures following the related laws and regulation in Syria;
4. To complete the well construction work for the Project;
5. To consult with related authorities to determine the routes of water transmission pipelines;
6. To establish the monitoring system;
7. To make detailed design of civil engineering facilities and electric facilities;

### [ Procurement Stage (Cooperation by the Japanese Grant Aid) ]

8. To ensure prompt unloading and customs clearance of the products purchased under the Japan's Grant Aid at ports of disembarkation in the Recipient Country;
9. To accord Japanese nationals whose services may be required in connection with the supply of the products and services under the verified contracts such facilities as may be necessary for their entry into Syria and stay therein for the performance of their work;
10. To bear commissions, namely advising commissions of an Authorization to Pay (A/P) and payment commissions, to the Japanese foreign exchange bank for the banking services based upon the Banking Arrangement (B/A);
11. To exempt Japanese nationals from customs duties, internal taxes and fiscal levies which may be imposed in Syria with respect to the supply of the products and services under the verified contracts;
12. To bear all the expenses, other than those covered by the Japan's Grant Aid, necessary for the Project;
13. To procure equipment which is due to be borne by the Syrian side (collection pipes with diameter less than 200 mm and diesel generators);

### [ Construction Stage ]

14. To obtain necessary permissions, licenses, other authorization and budget for implementing the Project, if necessary;
15. To secure a lot of land necessary for facility construction in the Project;
16. To provide facilities for distribution of electricity and other incidental facilities in and around the site;
17. To control traffic, secure security of pedestrians and passing cars, minimize negative effects for surrounding environment, protect other burial facilities such as electric cables and telephone lines, coordinate with related authorities;
18. To undertake installation and construction work using equipment and materials provided by the Japanese Grant Aid such as installation of equipment, construction of pipelines,

construction of pressure breaking reservoirs and construction of incidental facilities;

19. To secure high visibility of the Project;

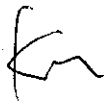
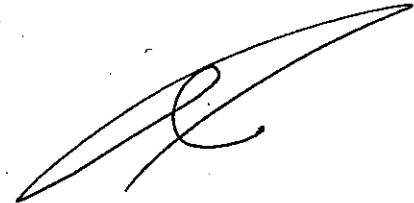
[ Operation and Monitoring Stage ]

20. To ensure that the equipment and materials purchased under the Japan's Grant Aid be maintained and used properly and effectively for the Project with necessary allocation of personnel and budget;

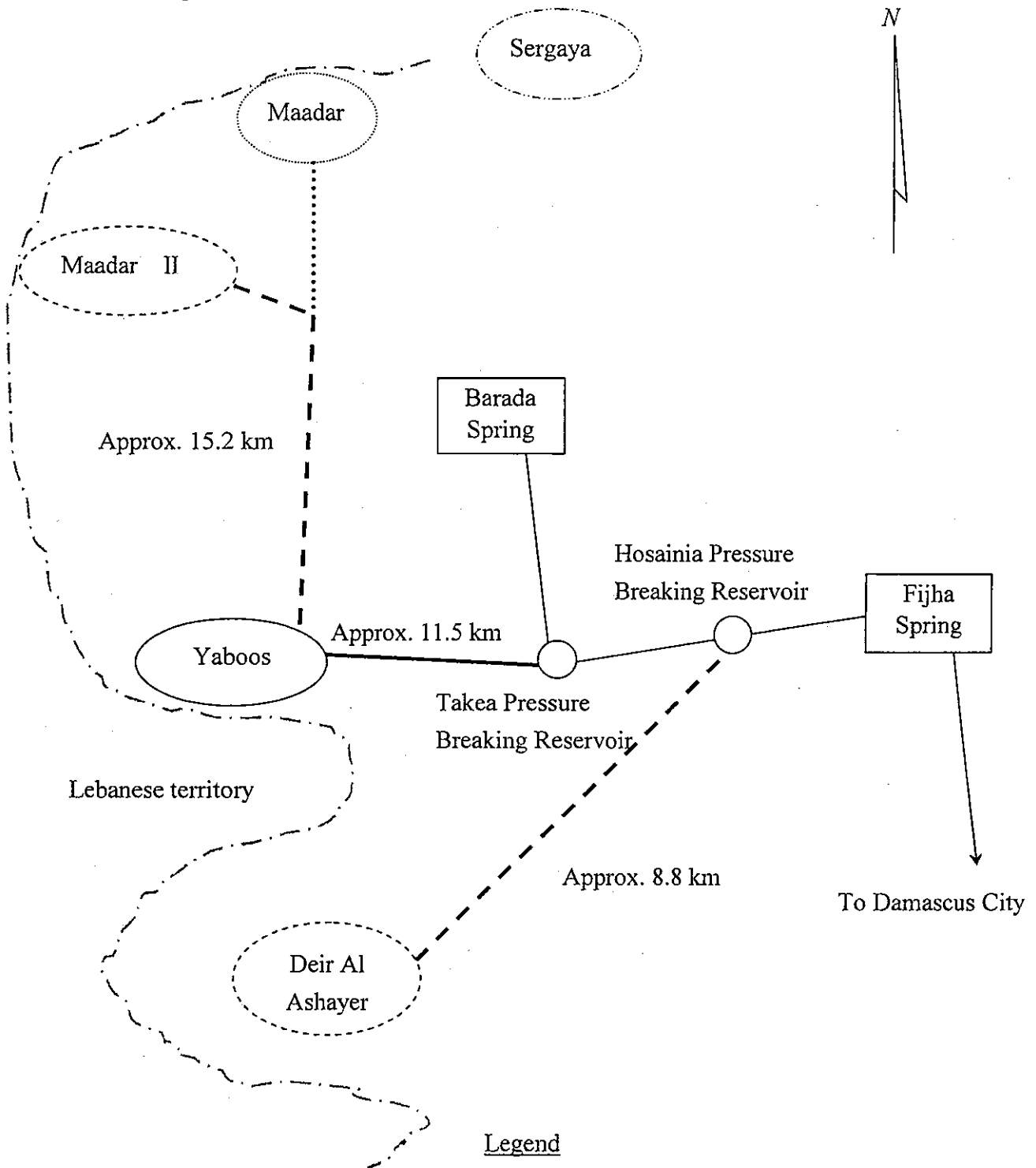
21. To monitor the environmental impact appropriately;

22. To operated the new water sources based on the result of the monitoring (bare essential production within the designed permissible amount, appropriate measures in case of unexpected negative influence); and









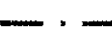

23. To enhance comprehensive water resources management including improvement of the existing water distribution systems and the study of inter-basin water transmission.

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ANNEX-3 : Project Sites



Legend

- |   |   |
|---|---|
|  : Well field site (1 <sup>st</sup> stage) |  : Water transmission pipeline (1 <sup>st</sup> stage) |
|  : Well field site (2 <sup>nd</sup> stage) |  : Water transmission pipeline (2 <sup>nd</sup> stage) |
|  : Site excluded from the original request |  : Existing pressure breaking reservoir                |
|  : Existing water source                   |  : Existing water transmission pipeline                |
|  : Border between Syria and Lebanon        |  : Site of future plan by DAWSSA                       |

*for*

ANNEX-4 : List of Wells Constructed by DAWSSA

	Well I.D. No.	Drilling complete	Pumping test complete	Depth (m)	Static water level (meter below the surface)	Specific yield (m <sup>3</sup> /hr/m)
<b>Yaboos</b>						
1	YA 1	*	*	400	97.0	5.83
2	YA 2	*	*	400	101.5	12.06
3	YA 3	*	*	400	93.25	2.55
4	YA 4	*	*	400	111.95	1.91
5	YA 5	*	*	400	99.3	4.19
6	YA 6	*	*	396.6	87.0	7.04
7	YA 7	*	*	400	90.7	1.9
8	YA 8	*	*	400	106.85	0.95
9	YA 9	*	*	400	107.0	2.16
10	YA 10	*	*	425	117.8	0.27
11	YA 11	*	*	450	127.7	0.87
12	YA 12			( 357 )	-	-
13	YA 13	*	*	400	94.10	0.85
<b>Maadar II</b>						
1	MA1			( 400 )	-	-
2	MA2			( 480 )	-	-
3	MA3			( 345 )	-	-
4	MA4			( 400 )	-	-
5	MA5	*	*	400	-	-
6	MA6	*	*	500	19.63	-
7	MA7			( 280 )	-	-
8	MA8	*	*	500	200.25	1.28
<b>Deir Al Ashayer</b>						
1	DA1	*	*	290	3.43	3.14
2	DA2	*	*	283	18.35	3.3
3	DA3	*	*	279	6.59	6.65
4	DA4	*	*	295	9.84	5.06
5	DA5			( 200 )	-	-
6	DA6			( 250 )	-	-

Depth figure in parentheses shows drilling progress as of Jan. 17.

(a)



## 事業事前計画表（基本設計時）

1. 案件名
シリア・アラブ共和国 ダマスカス市水道水源拡張計画
2. 要請の背景（協力の必要性・位置付け）
<p>シリア・アラブ共和国（以下、「シ」国）の首都ダマスカス市は、同国の政治・経済・文化の中心地である。ダマスカス市およびその周辺部の給水事業は、住宅建設省傘下の「ダマスカス市上下水道公社（以下、「DAWSSA」という）」が担っており、その給水人口は約260万人と推定される。ダマスカス市およびその周辺地域の人口は年率約3.0%で急速に増加を続けており、現在既に不足に陥っている同地域の給水事情は、今後年々悪化の一途をたどると推定される。ダマスカス首都圏への主水源は、同市北西部に位置するフィジェ湧水とバラダ湧水およびダマスカス市内井戸群であるが、フィジェ湧水だけで全体給水量の65～75%を占める。しかし、この湧水量は季節や降雨量により大きく変動し、湯水年や乾季（8月～12月）には深刻な水不足に見舞われる。近年では1999年から3年続いた旱魃時には1日12時間以上の断水が6ヶ月間4年連続で起こる緊急事態となった。</p> <p>ダマスカスの水道事業に関しては、「シ」国の要請に基づいて1997年に実施されたJICA開発調査「ダマスカス市給水システム改善拡充計画調査」によってマスタープランが作成されており、漏水対策を優先的に実施し、その上で不足分を新規地下水開発に求めることとしている。この内漏水対策については、2回にわたる日本の無償資金協力により配水管材料の調達が行われ、また日本の専門家派遣により配水コントロールの技術レベルも向上し、漏水率は97年の34.7%から03年には23%にまで改善されている。この漏水対策工事は現在も継続されている。</p> <p>一方、地下水開発については、2000年のJICA開発調査「北西部・中部水資源開発計画調査」において、本計画対象地区を含む「バラダ・アワジ流域」は流域全体の水収支が既にマイナスになっており、特に地下水系は過剰揚水に陥っていることが明らかにされた。こうした状況の下、「シ」国側はさらなる水収支の悪化を避けつつ給水事情を好転させるべく、他流域からの送水に係る調査・設計を始め、節水灌漑の普及促進、下水処理水の再利用等の対策を鋭意進めている。</p> <p>こうした背景の下、本事業の実施主体であるDAWSSAは、ダマスカス市の北西部において新たに水利権を獲得した3水源地で地下水を開発し、新規導水管路により既存水路（バラダ・フィジェ幹線導水管）まで導水する水源拡張計画を策定し、2002年に日本政府に本計画に必要な取水・導水施設の資機材調達を要請した。</p> <p>この3水源地の開発のみでダマスカス首都圏の水不足が全て解消するわけではないが、将来の抜本的な給水改善事業（他流域からの導水計画）が実現するまでの間、緊急避難的に地下水を開発し首都圏260万人への劣悪な給水事情を少しでも緩和することは、政治的・社会的・経済的にきわめて重要なことである。</p>
3. プロジェクト全体計画概要
<p>(1) プロジェクト全体計画の目標（裨益対象の範囲および規模）</p> <p>「シ」国の首都ダマスカス市およびその周辺（ダマスカス首都圏）の住民約260万人に安全かつ安定した水が供給される。</p> <p>(2) プロジェクト全体計画の成果（下線は無償資金協力が直接関与する事項）</p> <p><u>ヤブース地区に新規水源施設が整備される。</u></p> <p><u>ヤブース～タケヤ間導水管が整備される。</u></p> <p><u>新しい減圧施設が導入され、それに関する技術が移転される。</u></p> <p>適切な環境社会配慮の下で新規水源の計画、運用がなされる。</p> <p>(3) プロジェクト全体計画の主要活動（下線は無償資金協力が直接関与する事項）</p> <p>ア ヤブース地区に11本の井戸を掘削する。</p> <p>イ <u>必要な資機材（水中ポンプ、集水管、導水管、減圧バルブ）を調達する。</u></p> <p>ウ <u>上記資機材を用い据付、敷設、または建設する。</u></p> <p>エ <u>本プロジェクト実施にかかるEIAレポートを作成し、環境審査委員会の許可を得る。</u></p> <p>オ <u>上記施設を使用して給水を開始する。</u></p>

(4) 投入(インプット)			
ア	日本側：無償資金協力	7.37 億円	
イ	相手国側：		
	(ア) 必要な生産井を建設するのに要する費用		
	(イ) 調達された資機材の据付、敷設・建設に係る経費		
	(ウ) 建設された施設の運営・維持管理に係る経費		
(5) 実施体制			
	主管官庁：	住宅建設省 (MoHC)	
	実施機関：	ダマスカス市上下水道公社 (DAWSSA)	
4 . 無償資金協力案件の内容			
(1) サイト			
	(水源開発地域)：	「シ」国、ダマスカス郊外県ヤブース地区	
	(受益地)：	「シ」国、ダマスカス首都圏	
(2) 概要			
	・新規水源開発に係る資機材(水中ポンプ、集水管、導水管、減圧バルブ)の調達		
(3) 相手国側負担事項			
	・井戸掘削	11 本	
	・ポンプ据付	11 基	
	・集水管敷設工事	2.2km	
	・導水管敷設工事	11.5 km	
	・電気設備の調達	1 式	
	・土木・電気工事	1 式	
	・維持・管理	1 式	
	・モニタリング	1 式	
(4) 概算事業費			
	・概算事業費 9.46 億円 (無償資金協力 7.37 億円、「シ」国側負担 2.09 億円)		
(5) 工期			
	・日本側：詳細設計期間を含め、約 1 年 (予定)		
	・「シ」国側：詳細設計期間を含め、約 2 年 5 ヶ月 (予定)		
(6) 貧困、ジェンダー、環境および社会面の配慮			
	(ア) 「シ」国内法によって、EIA プロセスの実施が義務付けられる。		
	(イ) 本計画実施に当って特に検討が必要と想定される環境社会影響項目は以下のとおり： 揚水に伴う地下水位低下による既存水利用(地下水利用)への影響、 井戸建設地がレバノンとの国境に近いことから、レバノン側の水利用への影響、 流域全体の水収支への影響。		
	・上記各項目は EIA プロセスの中で十分に検討され、必要な項目についてはその軽減策が講じられ、 また、モニタリング・システムが整備される。		
5 . 外部要因リスク(プロジェクト全体計画の目標達成に関するもの)			
	(ア) 極端な旱魃に見舞われない。		
	(イ) 受益人口(ダマスカス首都圏人口)が極端に増加しない。		
6 . 過去の類似案件からの教訓の活用			
	・特になし。		
7 . プロジェクト全体計画の事後評価に係る提案			
(1) 主たる指標			
		現状	2010 年
	ア) ダマスカス首都圏の平均断水時間	・約 13 時間/日	・約 12.5 時間/日
	イ) 水源地からの給水量(最大)	・719,610 m <sup>3</sup> /日	・732,810 m <sup>3</sup> /日
(2) 評価のタイミング			
	2010年 (施設完成後 3 年経過時点)		

## 資料-6 参考資料 / 入手資料リスト

### (1) EIA 関連資料

- The Seven Water Basins of Syria: Environmental Action Plans  
World Bank/UNDP, April 1998  
Environmental Resources Management (ERM),  
8 Cavendish Square, London W1M 0ER
- General Environmental Impact Assessment Guideline including Draft EIA Decree  
Establishment of an Environmental Assessment (EIA) Unit  
World Bank, European Investment Bank, March 1995  
DHV Consultants BV, Amersfoort, The Netherlands in association with  
Alfa Group, Damascus, Syrian Arab Republic
- Industrial Pollution Abatement Guideline  
Wastewater Treatment Plants  
Establishment of an Environmental Assessment (EIA) Unit  
World Bank, European Investment Bank, May 1995  
DHV Consultants BV, Amersfoort, The Netherlands in association with  
Alfa Group, Damascus, Syrian Arab Republic
- STUDIES AND DESIGN OF WORKS CONCERNING REHABILITATION AND  
EXPANSION OF THE WATER SUPPLY SYSTEM OF DAMASCUS CITY AND ITS  
SURROUNDINGS (DRAFT), ENVIRONMENTAL REPORT, DAWSSA, March 2004  
LAHMEYER INTERNATIONAL in association with  
AAC (Kuwait) and AWMc (United Kingdom)
- National Environmental Action Plan for the Syrian Arab Republic  
Ministry of State for Environmental Affairs, Syrian Arab Republic  
UNDP, The World Bank, with the assistance of ERM
- PROJECT OF SUPPLYING PART OF THE WATER DEMAND OF DAMASCUS CITY  
FROM THE SYRIAN COASTAL AREA WATER SUPPLY, ENVIRONMENTAL  
IMPACT ASSESSMENT, PHASE II  
DAWSSA, July 2003  
IBG, DHV
- Law No.50  
Republic President, Pursuant to the constitution provisions, June 2002

### (2) 地図類

- Topo-map (covering all study area) 1:50,000. x 1 sheet  
Topo-map (covering all study area) 1:25,000. x 4 sheets  
Digital map (covering Dimas area) 1:5,000. x 1 sheet  
GEOLOGICAL MAP OF SYRIA (covering Zabadani to Yafour)  
1:50,000. Sheet I-37-VII-3a,c USSR, 1962

A Part of Geological Map of Syria (covering all study areas) 1:250,000. (年次不明)  
Carte Geologique de la partie Nord du massif de l'Anti-Leban Bassin versant de la Source  
Fiegh  
ETUDE HYDROLOGIQUE ET HYDROGEOLOGIQUE DE LA SOURCE FIGEH  
GRENOBIT, France, 1:200,000. R II 442-101、(年次不明)  
Digital map of Damascus (by CD-R)  
高速道路計画平面図 8 sheet

(3) 水理地質関連雑資料・情報類

Results of Pumping Test (by MOI)  
Well Log of Monitoring wells (by MOI)  
A Part of Haramon Project Report  
Groundwater Hydrograph of Monitoring Wells (WRIC)  
Information on Wadi Marwa Well Field  
Groundwater Hydrograph of production wells (DAWSSA)  
Results of Water Quality Analysis (DAWSSA)

(4) ダマスカス市給水関連資料

Water Production Data (2002) by DAWSSA  
Studies and Design of Works Concerning Rehabilitation and Expansion of the Water  
Supply System of Damascus City and its Surroundings (Project primary report Vol. 1/3  
and 2.3)  
Project of Supplying Part of the Water Demand of Damascus City and its Countryside  
from the Syrian Coastal Area Water Supply, Evaluation of Water Demand (Phase I),  
February 2003

## 資料-7. その他の資料

- (1) DAWSSA による漏水削減計画と緊急水源開発計画
  - 表 7-1-1 漏水削減計画
  - 表 7-1-2 水源開発計画
- (2) 将来人口と需要量の予測および水源開発計画とのバランス
  - 表 7-2-1 人口および需要量の予測
  - 表 7-2-2 水源開発計画と需要量
- (3) 住宅建設省組織図 (図 7-3)
- (4) 集水管水理計算書
  - 表 7-4 集水管水理計算表
  - 図 7-4 Yaboos 地区集水管模式図
- (5) 導水管水理計算書
  - 表 7-5-1 導水管水理計算表 (井戸本数 19 本)
  - 図 7-5-1 簡易縦断図 (井戸本数 19 本)
  - 表 7-5-2 導水管水理計算表 (井戸本数 32 本)
  - 図 7-5-2 簡易縦断図 (井戸本数 32 本)
- (6) 水中ポンプ全揚程の計算 (表 7-6)
- (7) 灌漑省モニタリング井戸水位記録
  - 図 7-7-1 灌漑省モニタリング井戸位置図
  - 図 7-7-2 モニタリング井戸水位変化図
  - 表 7-7-1 モニタリング水位記録
- (8) 群井揚水試験結果概要
  - 図 7-8-1 群井揚水試験位置図
  - 図 7-8-2 群井揚水試験結果 (生産井)
  - 図 7-8-3 群井揚水試験結果 (私設井戸)
  - 表 7-8-1 群井揚水試験観測記録
- (9) 本計画関連レター
  - 図 7-9-1.2. レバノン側からの Letter (Original) 1、および 2
  - 資料 7-9-3. 同上、英訳版
- (10) 水質試験結果と、シリア国水質基準
- (11) ステークホルダーミーティング議事
- (12) EIA レポート目次および要約
- (13) ベースライン調査結果



表7-1-2 水源開発計画

Name of Wellfield	Expected Average Capacity		Year												Remarks			
	(l/s)	(m <sup>3</sup> /d)	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007		2008	2009	2010
1. Existing Water Sources																		
Figeh spring	5,800	507,000																
Barada Spring	1,100	95,000																
Wellfields in Damascus City	1,900	164,000																
Sub-Total	8,860	771,220																
2. Figeh Spring																		
Protection of Figeh spring																		
Reinforcement of Ain Figeh areas																		
3. Barada Spring																		
Reinforcement of Barada and Al Sahl	950	81,600																
Barada group 1,2 & 3 wellfields	365	31,600		2		1	3											
4. Wellfields in Damascus City																		
Takadam wellfield	140	12,100																
* Tishreen & Kywan 1, 2 & 3 wellfield	250	21,600			1		2											
* Jaramana wellfield		13,000																
Kadam Store wellfield	170	14,700																
Dummar wellfield	100	8,600																
Ibn Assaker wellfield	120	10,200																
Kadam Railway wellfield	115	9,300																
Fringe wells	110	9,600																
* Kafar Souseh wellfield	80	6,900																
* Shokry Al Qouwatly wellfield	170	14,700																
* Kanawat Gardens wellfield		16,000																
New Kaboon 1 & 2 wellfield		2,000																
Bisstant Al Dour		9,000																
Mokhayam		10,000																
5. Wellfields outside Damascus City																		
Wadi Marwan wellfield	185	16,000																
* Deir Al Ashayer		10,000																
Yaboos		15,000																
Maadar I		20,000																
Maadar II		10,000																
Talaeh (near Barada spring)		40,000																
Yafour		10,000																
Bassime		2,000																
Al Arrad		1,000																
Sub-Total (2 - 5)	2,755	394,900																
Total	11,615	1,166,120																

\* : JICA開発調査「ダマスカス市給水システム改善拡充計画調査」にて提案されている水源。なお、水源水量はDAWSSAによる推定値である。

表 7-2-1 人口及び需要量の予測

年	ダマスカス市内		ダマスカス郊外		計	
	人口 (千人)	需要量 (千m <sup>3</sup> /日)	人口 (千人)	需要量 (千m <sup>3</sup> /日)	人口 (千人)	需要量 (千m <sup>3</sup> /日)
2000	2,617	667.3	1,899	313.3	4,516	980.6
2005	2,876	733.4	2,355	388.6	5,231	1,122.0
2010	3,161	806.1	2,921	482.0	6,082	1,288.1
2015	3,474	885.9	3,622	597.6	7,096	1,483.5
2020	3,817	973.3	4,493	741.3	8,310	1,714.6
2040	5,569	1,420.1	8,074	1,332.2	13,643	2,752.3

出典：DAWSSA より入手。

注)・ダマスカス市内とはダマスカス市給水地域を示し、ダマスカス郊外とはホーム～ダマスカス区間の136村落を含む。また、需要量の中には、漏水量も含まれる。

表 7-2-2 水源開発計画と需要量

単位：千m<sup>3</sup>/日

水源地名	2004年	2007年	2010年	2015年	2020年	2040年	備考
1. 既存水源							
Figeh Spring	397.4	397.4	397.4	397.4	397.4	397.4	
Barada Spring	95.0	95.0	95.0	95.0	95.0	95.0	
Well fields in Damascus	73.4	73.4	73.4	73.4	73.4	73.4	
小計	565.8	565.8	565.8	565.8	565.8	565.8	*1
2. 進行中のプロジェクト							
Wadi Marwan well field	14.5	17.3	17.3	17.3	17.3	17.3	
New Kaboon well field			1.7	1.7	1.7	1.7	
Kanawat garden			15.6	15.6	15.6	15.6	
Bisstant Al Dour			9.5	9.5	9.5	9.5	
Jaramana well field		4.3	4.3	4.3	4.3	4.3	
Yarmouk		9.5	9.5	9.5	9.5	9.5	
Jobar extention			4.9	4.9	4.9	4.9	
小計	14.5	31.1	62.8	62.8	62.8	62.8	
3. 新規水源							
Maadar I + Sergaya			12.0	12.0	12.0	12.0	
Maadar II			13.0	13.0	13.0	13.0	
Yaboos			14.0	14.0	14.0	14.0	
Deir AL Ashayer			13.0	13.0	13.0	13.0	
Deir AL Ashayer South			15.6	15.6	15.6	15.6	
Yafoor			8.6	8.6	8.6	8.6	
Bassime		7.0	7.0	7.0	7.0	7.0	
Al Arrad			1.3	1.3	1.3	1.3	
小計		7.0	84.5	84.5	84.5	84.5	
水源水量の合計	580.3	603.9	713.1	713.1	713.1	713.1	
需要量	719.7	761.6	806.1	885.9	973.3	1,420.1	
差	139.4	157.7	93.0	172.8	260.2	707.0	

出典：DAWSSA より入手。

\*1：18年間の平均は522.7x1,000m<sup>3</sup>/日



図7-3 住宅建設省組織図

## Organizational chart of the ministry of housing and construction

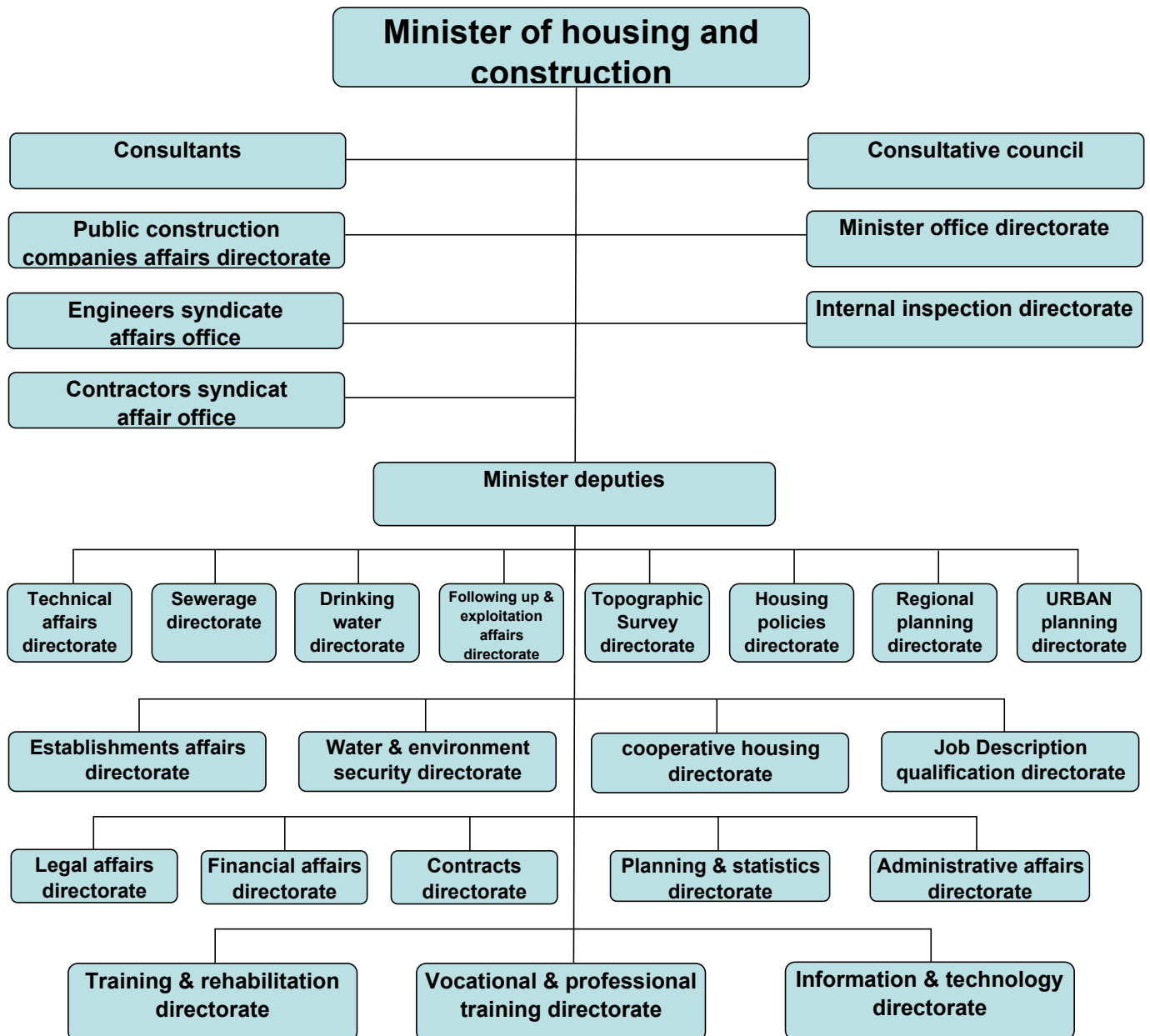


表 7-4 集水管水理計算 (Yaboos)

路線名	区間	距離 (m)	単流量 (l/s)	累加流量 (m <sup>3</sup> /s)	標高 (E.L. m)	管径 (mm)	流速 (m/s)	損失水頭 (m)	動水位 (E.L. m)	有効水頭 (m)	ポンプ揚程 (m)	備考
高速道路西側												
1	Y-1 - 節点1	67.0	13.9	0.0139	1,280.6	150	0.786	0.45	1,311.7	31.1		
2	Y-2 - 節点1	85.0	13.9	0.0139	1,285.3	150	0.786	0.57	1,311.9	26.6		
3	節点1 - 節点2	21.0		0.0278	1,278.4	200	0.885	0.13	1,311.3	32.9		
4	Y-3 - 節点2	5.0	13.9	0.0139	1,277.7	150	0.786	0.03	1,311.2	33.5		
5	節点2 - 節点3	26.0		0.0417	1,278.3	200	1.327	0.33	1,311.2	32.9		
6	Y-4 - 節点4	16.0	13.9	0.0139	1,308.6	150	0.786	0.11	1,312.0	3.4		
7	節点4 - 節点3	183.0		0.0278	1,292.6	200	0.885	1.09	1,311.9	19.3		
8	節点3 - 節点5	211.0		0.0694	1,277.3	300	0.983	0.95	1,310.8	33.5		将来計画井戸1本接続
9	Y-12 - 節点5	41.0	13.9	0.0139	1,276.9	150	0.786	0.28	1,310.2	33.3		
10	節点5 - 節点7	315.0		0.0833	1,276.1	300	1.180	1.99	1,309.9	33.8		
11	Y-5 - 節点6	147.0	13.9	0.0139	1,282.1	150	0.786	0.99	1,309.4	27.3		
12	Y-13 - 節点6	11.0	13.9	0.0139	1,275.4	150	0.786	0.07	1,308.5	33.1		
13	節点6 - 節点7	86.0		0.0278	1,275.5	200	0.885	0.51	1,308.4	32.9		
14	節点7 - 節点8	61.0		0.1111	1,269.5	350	1.155	0.31	1,307.9	38.4		
15	Y-6 - 節点8	107.0	13.9	0.0139	1,268.5	150	0.786	0.72	1,308.3	39.8		
16	節点8 - 節点9	239.0		0.1250	1,268.1	350	1.300	1.51	1,307.6	39.5		
高速道路東側												
17	Y-11 - 節点10	91.0	13.9	0.0139	1,308.0	150	0.786	0.61	1,309.6	1.6		
18	Y-10 - 節点10	17.0	13.9	0.0139	1,299.4	150	0.786	0.11	1,309.2	9.8		
19	節点10 - 節点11	74.0		0.0278	1,296.6	200	0.885	0.44	1,309.0	12.4		
20	節点11 - 節点12	17.0		0.0417	1,289.4	200	1.327	0.22	1,308.6	19.2		将来計画井戸3本接続
21	Y-9 - 節点12	7.0	13.9	0.0139	1,287.2	150	0.786	0.05	1,308.4	21.2		
22	節点12 - 節点13	114.0		0.0556	1,287.7	250	1.132	0.83	1,308.4	20.7		
23	Y-8 - 節点13	9.0	13.9	0.0139	1,281.2	150	0.786	0.06	1,307.6	26.4		
24	節点13 - 節点14	136.0		0.0694	1,280.6	250	1.415	1.49	1,307.6	27.0		
25	Y-7 - 節点14	21.0	13.9	0.0139	1,272.1	150	0.786	0.14	1,306.2	34.1		
26	節点14 - 節点9	40.0		0.0833	1,271.1	250	1.699	0.62	1,306.1	35.0		
27	節点9 - 受水槽	7.0		0.2083	1,269.7	400	1.659	0.06	1,306.1	36.4		
	受水槽				1,269.5				1,306.0	36.5		
合計		2,154.0										

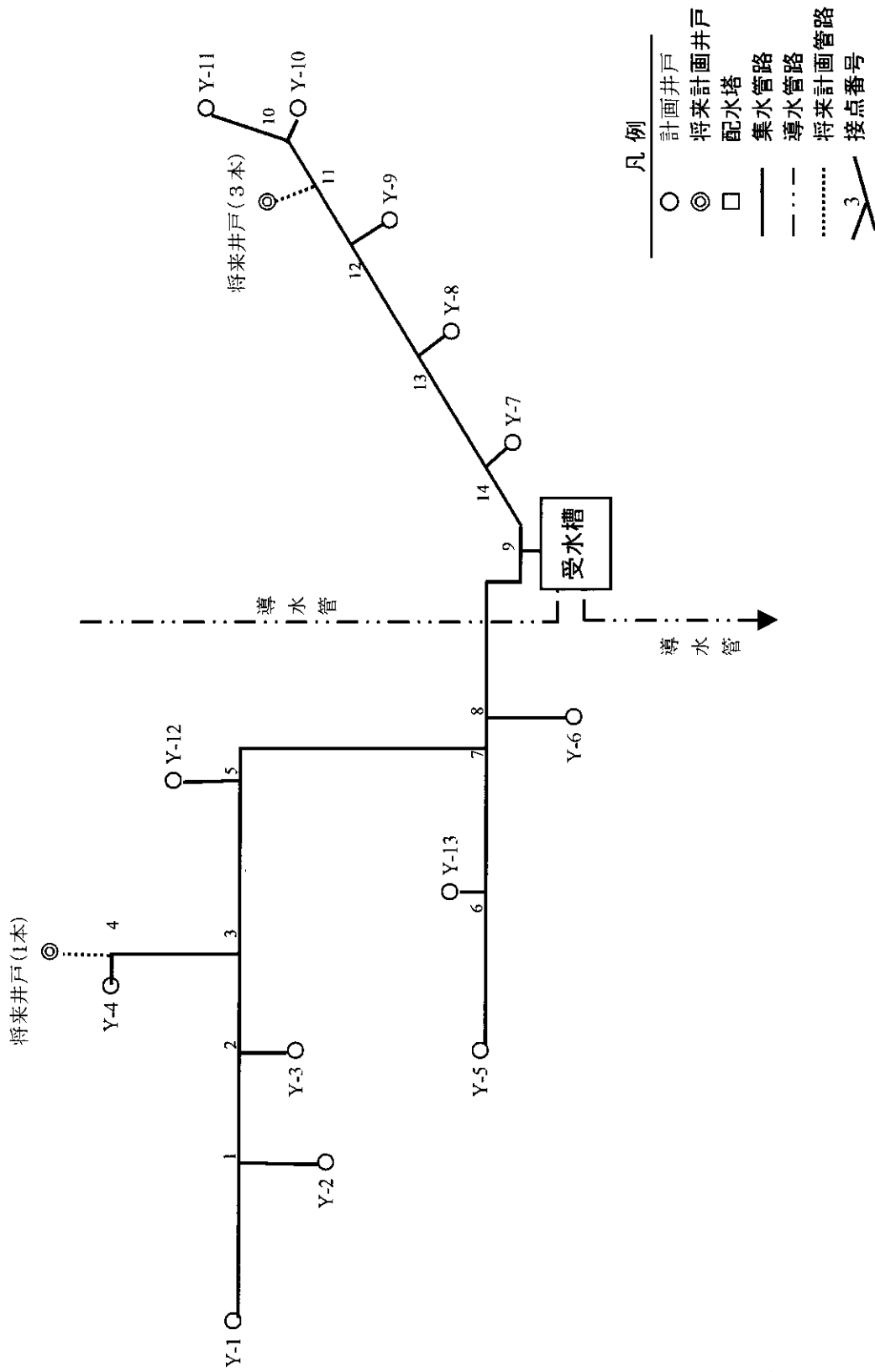


图 7-4 Yaboos 地区集水管模式图

表 7-5-1 マーダル/ヤブース導水管水理計算表 (要請本数: 井戸19本)

測点	場所 異形管等 マーダル流入	区間距離 m	通過距離 ① m	通過距離 ② m	地盤高 EL m	口径 mm	土被り m	管中心高 EL m	流量Q m <sup>3</sup> /sec	流速V m/sec	動水勾配 m/1000m	損失水頭 m	動水頭 EL m	動水圧 m	静水頭 EL m	静水圧 m	備考
0	受水槽 1	0.00	0.00	0.00	1,190.00	350	1.0	1188.83	0.097	1.011	3.97356	0.00	1190.0	1.2	1193.0	4.2	井戸7本
-50		750.24	750.24	750.24	1,117.45	350	1.0	1116.28	0.097	1.011	3.97356	2.98	1187.0	70.7	1193.0	76.7	
-41		345.49	1,095.73	1,095.73	1,090.88	350	1.0	1089.71	0.097	1.011	3.97356	1.37	1185.6	95.9	1193.0	103.3	
-32	最低点	538.87	1,634.60	1,634.60	1,050.53	350	1.0	1049.36	0.097	1.011	3.97356	2.14	1183.5	134.1	1193.0	143.6	
-21	加圧ポンプ	1,115.06	2,749.66	2,749.66	1,170.20	350	1.0	1169.03	0.097	1.011	3.97356	4.43	1179.1	10.0	1193.0	24.0	
-21	加圧ポンプ	611.29	2,234.05	2,749.66	1,170.20	350	1.0	1169.03	0.097	1.011	3.97356	2.43	1372.9	203.8	1361.0	192.0	
-15		509.02	1,622.76	3,360.95	1,244.81	350	1.0	1243.64	0.097	1.011	3.97356	2.02	1370.4	126.8	1361.0	117.4	
-10		510.06	1,113.74	3,869.97	1,292.19	350	1.0	1291.02	0.097	1.011	3.97356	2.03	1368.4	77.4	1361.0	70.0	
-5		603.68	603.68	4,380.03	1,334.49	350	1.0	1333.32	0.097	1.011	3.97356	2.40	1366.4	33.1	1361.0	27.7	
1	受水槽 2	0.00	0.00	4,983.71	1,360.85	350	1.0	1359.68	0.097	1.011	3.97356	0.00	1364.0	4.3	1361.0	1.3	
1	受水槽 2	0.00	0.00	4,983.71	1,360.85	350	1.0	1359.68	0.111	1.155	5.08704	0.00	1361.0	1.3	1364.0	4.3	井戸1本
6		500.80	500.80	5,484.51	1,325.60	350	1.0	1324.43	0.111	1.155	5.08704	2.55	1358.5	34.0	1364.0	39.6	
12	最低点	599.88	1,100.68	6,084.39	1,315.30	350	1.0	1314.13	0.111	1.155	5.08704	3.05	1355.4	41.3	1364.0	49.9	
20		799.93	1,900.61	6,884.32	1,318.06	350	1.0	1316.89	0.111	1.155	5.08704	4.07	1351.3	34.4	1364.0	47.1	
28+50m	マーダルI流入	850.54	2,751.15	7,734.86	1,328.29	350	1.0	1327.04	0.111	1.155	5.08704	4.33	1347.0	19.9	1364.0	36.9	
"	"	0.00	2,751.15	7,734.86	1,328.29	500	1.0	1327.04	0.111	0.566	0.89556	0.00	1347.0	20.0	1364.0	37.0	
32	高点	349.93	3,101.08	8,084.79	1,330.48	500	1.0	1329.23	0.111	0.566	0.89556	0.31	1346.7	17.5	1364.0	34.8	
40		799.97	3,901.05	8,884.76	1,320.74	500	1.0	1319.49	0.111	0.566	0.89556	0.72	1346.0	26.5	1364.0	44.5	
50		999.93	4,900.98	9,884.69	1,303.40	500	1.0	1302.15	0.111	0.566	0.89556	0.90	1345.1	42.9	1364.0	61.8	
60		999.97	5,900.95	10,884.66	1,297.93	500	1.0	1296.68	0.111	0.566	0.89556	0.90	1344.2	47.5	1364.0	67.3	
70		1,000.36	6,901.31	11,885.02	1,290.71	500	1.0	1289.46	0.111	0.566	0.89556	0.90	1343.3	53.8	1364.0	74.5	
83	高速道入口	1,300.30	8,201.61	13,185.32	1,290.29	500	1.2	1288.84	0.111	0.566	0.89556	1.16	1342.1	53.3	1364.0	75.2	
90		700.17	8,901.78	13,885.49	1,286.07	500	1.2	1284.62	0.111	0.566	0.89556	0.63	1341.5	56.9	1364.0	79.4	
103	ヤブース水源③	1,300.04	10,201.82	15,185.53	1,269.73	600	1.2	1268.28	0.111	0.566	0.89556	1.16	1340.3	72.1	1364.0	95.7	
"	(減圧施設1)	0.00	10,201.82	15,185.53	1,269.73	600	1.2	1268.28	0.264	0.934	1.82582	0.00	1269.0	0.8	1272.0	3.8	井戸11本
110		714.52	10,916.34	15,900.05	1,263.55	600	1.2	1262.05	0.264	0.934	1.82582	1.30	1267.7	5.6	1272.0	10.0	
120		1,000.56	11,916.90	16,900.61	1,247.53	600	1.2	1246.03	0.264	0.934	1.82582	1.83	1265.9	19.8	1272.0	26.0	
130		1,002.00	12,918.90	17,902.61	1,229.62	600	1.2	1228.12	0.264	0.934	1.82582	1.83	1264.0	35.9	1272.0	43.9	
140		1,003.18	13,922.08	18,905.79	1,200.35	600	1.2	1198.85	0.264	0.934	1.82582	1.83	1262.2	63.4	1272.0	73.2	
L16	水路分岐点	1,209.38	15,131.46	20,115.17	1,173.09	600	1.2	1171.59	0.264	0.934	1.82582	2.21	1260.0	88.4	1272.0	100.4	
"	(減圧施設2)	0.00	15,131.46	20,115.17	1,173.09	600	1.2	1171.59	0.264	0.934	1.82582	0.00	1174.0	2.4	1177.0	5.4	
164	高速道分岐	1,228.64	16,360.10	21,343.81	1,152.26	600	1.2	1150.76	0.264	0.934	1.82582	2.24	1171.8	21.0	1177.0	26.2	
178	サルサル湖	1,401.49	17,761.59	22,745.30	1,144.66	600	1.0	1143.36	0.264	0.934	1.82582	2.56	1169.2	25.8	1177.0	33.6	
186	最低点	799.43	18,561.02	23,544.73	1,132.36	600	1.0	1131.06	0.264	0.934	1.82582	1.46	1167.7	36.7	1177.0	45.9	
191	最高点	499.68	19,060.70	24,044.41	1,152.16	600	1.0	1150.86	0.264	0.934	1.82582	0.91	1166.8	16.0	1177.0	26.1	
193	小道分岐	399.35	19,260.75	24,244.46	1,144.98	600	1.0	1143.68	0.264	0.934	1.82582	0.37	1166.5	22.8	1177.0	33.3	
197	コナト橋	200.00	19,660.10	24,643.81	1,112.16	600	1.0	1110.86	0.264	0.934	1.82582	0.73	1165.7	54.9	1177.0	66.1	
211	幹線道路分岐	1,395.13	21,055.23	26,038.94	1,092.61	600	1.0	1091.31	0.264	0.934	1.82582	2.55	1163.2	71.9	1177.0	85.7	
216	鉄道交差点	499.58	21,554.81	26,538.52	1,088.56	600	1.0	1087.26	0.264	0.934	1.82582	0.91	1162.3	75.0	1177.0	89.7	
G	EP 既設水槽	144.91	21,699.72	26,683.43	1,091.58	600	1.0	1090.28	0.264	0.934	1.82582	0.26	1162.0	71.7	1177.0	86.7	

7-5-1 Profile for Maadar/Yaboos - Takea (Well number = 19)

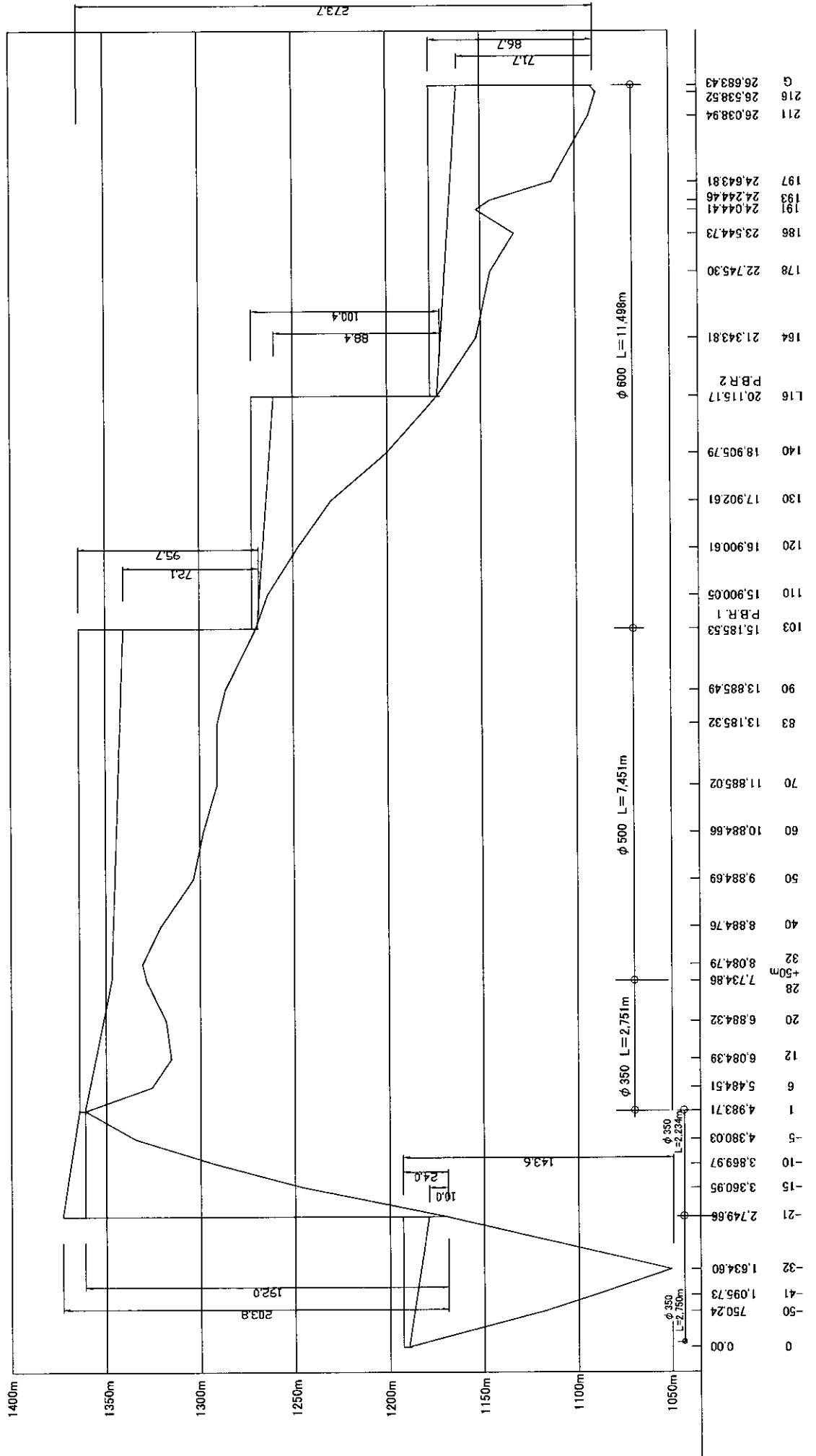


表 7-5-2 マーダル/ヤブース導水管水理計算表

(計画本数: 井戸32本)

測点	場所 異形管等 マーダル流入	区間距離 m	通過距離 ① m	通過距離 ② m	地盤高 EL m	口径 mm	土被り m	管中心高 EL m	流量Q m <sup>3</sup> /sec	流速V m/sec	動水勾配 m/1000m	損失水頭 m	動水頭 EL m	動水圧 m	静水頭 EL m	静水圧 m	備考
0	受水槽 1	0.00	0.00	0.00	1,190.00	350	1.0	1188.83	0.111	1.155	5.08704	0.00	1190.0	1.2	1193.0	4.2	井戸8本
-50		750.24	750.24	750.24	1,117.45	350	1.0	1116.28	0.111	1.155	5.08704	3.82	1186.2	69.9	1193.0	76.7	
-41		345.49	1,095.73	1,095.73	1,090.88	350	1.0	1089.87	0.111	1.155	5.08704	1.76	1184.4	94.7	1193.0	103.3	
-32	最低点	538.87	1,634.60	1,634.60	1,050.53	350	1.0	1049.36	0.111	1.155	5.08704	2.74	1181.7	132.3	1193.0	143.6	
-21	加圧ポンプ	1,115.06	2,749.66	2,749.66	1,170.20	350	1.0	1169.03	0.111	1.155	5.08704	5.67	1176.0	7.0	1193.0	24.0	
-21	加圧ポンプ	611.29	2,234.05	2,749.66	1,170.20	350	1.0	1169.03	0.111	1.155	5.08704	3.11	1375.4	206.3	1361.0	192.0	
-15		509.02	1,622.76	3,360.95	1,244.81	350	1.0	1243.64	0.111	1.155	5.08704	2.59	1372.3	128.6	1361.0	117.4	
-10		510.06	1,113.74	3,869.97	1,292.19	350	1.0	1291.02	0.111	1.155	5.08704	2.59	1369.7	78.6	1361.0	70.0	
-5		603.68	603.68	4,380.03	1,334.49	350	1.0	1333.32	0.111	1.155	5.08704	3.07	1367.1	33.8	1361.0	27.7	
1	受水槽 2	0.00	0.00	4,983.71	1,360.85	350	1.0	1359.68	0.111	1.155	5.08704	0.00	1364.0	4.3	1361.0	1.3	
1	受水槽 2	0.00	0.00	4,983.71	1,360.85	350	1.0	1359.68	0.153	1.589	9.16907	0.00	1361.0	1.3	1364.0	4.3	井戸3本
6		500.80	500.80	5,484.51	1,325.60	350	1.0	1324.43	0.153	1.589	9.16907	4.59	1356.4	32.0	1364.0	39.6	
12	最低点	599.88	1,100.68	6,084.39	1,315.30	350	1.0	1314.13	0.153	1.589	9.16907	5.50	1350.9	36.8	1364.0	49.9	
20		799.93	1,900.61	6,884.32	1,318.06	350	1.0	1316.89	0.153	1.589	9.16907	7.33	1343.6	26.7	1364.0	47.1	
28+50m	マーダル I 流入	850.54	2,751.15	7,734.86	1,328.29	350	1.0	1327.12	0.153	1.589	9.16907	7.80	1335.8	8.7	1364.0	36.9	井戸6本
"	"	0.00	2,751.15	7,734.86	1,328.29	500	1.0	1327.04	0.236	1.203	3.61166	1.26	1334.5	5.3	1364.0	34.8	
32	高点	349.93	3,101.08	8,084.79	1,330.48	500	1.0	1329.23	0.236	1.203	3.61166	2.89	1331.6	12.1	1364.0	44.5	
40		799.97	3,901.05	8,884.76	1,320.74	500	1.0	1319.49	0.236	1.203	3.61166	2.89	1328.0	25.9	1364.0	61.8	
50		999.93	4,900.98	9,884.69	1,303.40	500	1.0	1302.15	0.236	1.203	3.61166	3.61	1328.0	27.7	1364.0	67.3	
60		999.97	5,900.95	10,884.66	1,297.93	500	1.0	1296.68	0.236	1.203	3.61166	3.61	1324.4	31.3	1364.0	74.5	
70		1,000.36	6,901.31	11,885.02	1,290.71	500	1.0	1289.46	0.236	1.203	3.61166	3.61	1320.8	27.2	1364.0	75.2	
83	高速道入口	1,300.30	8,201.61	13,185.32	1,290.29	500	1.2	1288.84	0.236	1.203	3.61166	4.70	1316.1	28.9	1364.0	79.4	
90		700.17	8,901.78	13,885.49	1,286.07	500	1.2	1284.62	0.236	1.203	3.61166	2.53	1313.6	28.9	1364.0	95.7	
103	ヤブース水源③	1,300.04	10,201.82	15,185.53	1,269.73	500	1.2	1288.28	0.236	1.203	3.61166	4.70	1308.9	40.6	1364.0	95.7	井戸15本
"	(減圧施設1)	0.00	10,201.82	15,185.53	1,269.73	600	1.2	1288.23	0.444	1.573	4.78951	0.00	1269.0	0.8	1272.0	3.8	
110		714.52	10,916.34	15,900.05	1,263.55	600	1.2	1282.05	0.444	1.573	4.78951	3.42	1265.6	3.5	1272.0	10.0	
120		1,000.56	11,916.90	16,900.61	1,247.53	600	1.2	1246.03	0.444	1.573	4.78951	4.79	1260.8	14.8	1272.0	26.0	
130		1,002.00	12,918.90	17,902.61	1,229.62	600	1.2	1228.12	0.444	1.573	4.78951	4.80	1256.0	27.9	1272.0	43.9	
140		1,003.16	13,922.08	18,905.79	1,200.35	600	1.2	1198.85	0.444	1.573	4.78951	4.80	1251.2	52.3	1272.0	73.2	
L16	水路分岐点	1,209.38	15,131.46	20,115.17	1,173.09	600	1.2	1171.59	0.444	1.573	4.78951	5.79	1245.4	73.8	1272.0	100.4	
"	(減圧施設2)	0.00	15,131.46	20,115.17	1,173.09	600	1.2	1171.59	0.444	1.573	4.78951	0.00	1174.0	2.4	1177.0	5.4	
164	高速道分岐	1,228.64	16,360.10	21,343.81	1,152.26	600	1.2	1150.76	0.444	1.573	4.78951	5.88	1168.1	17.4	1177.0	26.2	
178	サルバル湖	1,401.49	17,761.59	22,745.30	1,144.66	600	1.0	1143.36	0.444	1.573	4.78951	6.71	1161.4	18.0	1177.0	33.6	
186	最低点	799.43	18,561.02	23,544.73	1,132.36	600	1.0	1131.06	0.444	1.573	4.78951	3.83	1157.6	26.5	1177.0	45.9	
191	最高点	499.68	19,060.70	24,044.41	1,152.16	600	1.0	1150.86	0.444	1.573	4.78951	2.99	1155.2	4.3	1177.0	26.1	
193	小道分岐	200.05	19,260.75	24,244.46	1,144.98	600	1.0	1143.68	0.444	1.573	4.78951	0.96	1154.2	10.5	1177.0	33.3	
197	コンクリート橋	399.35	19,660.10	24,643.81	1,112.16	600	1.0	1110.86	0.444	1.573	4.78951	1.91	1152.3	41.5	1177.0	66.1	
211	幹線道路分岐	1,395.13	21,055.23	26,038.94	1,092.61	600	1.0	1091.31	0.444	1.573	4.78951	6.68	1145.6	54.3	1177.0	85.7	
216	鉄道交差部	499.58	21,554.81	26,538.52	1,088.56	600	1.0	1087.26	0.444	1.573	4.78951	2.39	1143.2	56.0	1177.0	89.7	
G	EP 既設水櫃	144.91	21,699.72	26,683.43	1,091.58	600	1.0	1090.28	0.444	1.573	4.78951	0.69	1142.5	52.3	1177.0	86.7	

7-5-2 Profile for Maadar/Yaboos - Takea (Well number = 32)

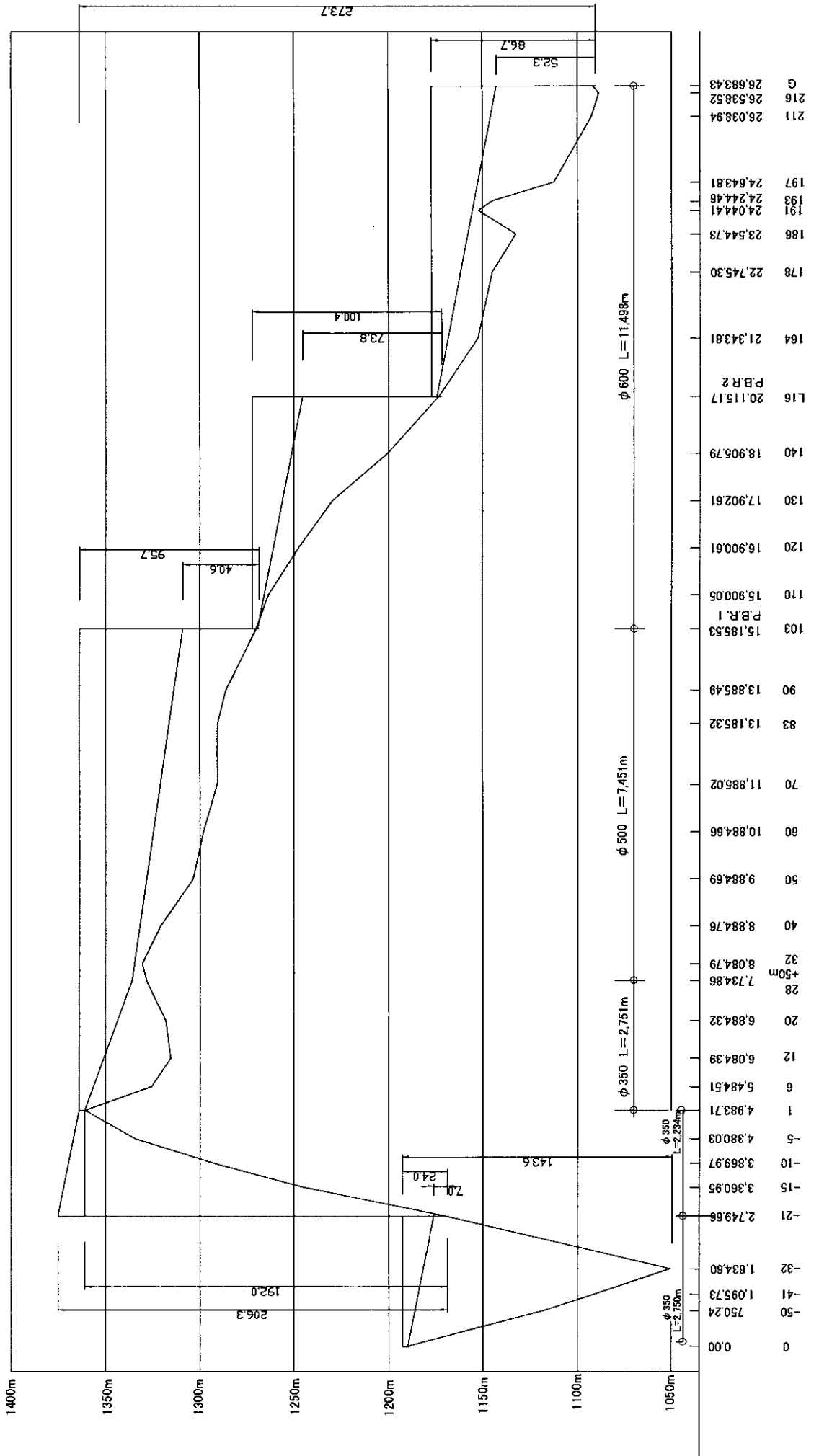


表7-6 水中ポンプ全揚程の計算

井戸No.	揚水量 (m <sup>3</sup> /min)	GL	静水位 GL- (m)	静水位～ 動水位 (m)	動水位 GL- (m)	集水管 圧力 (m)	実揚程 (m)	揚水管 口径 (mm)	揚水管 流速 (m/s)	C	f	揚水管 長さ (m)	揚水管 本数 (本)	揚水管 全長 (m)	管路 損失 (m)	全揚程 (m)	定格 全揚程 (m)	モータ出力 (kW)	盤～ポンプ 距離 (m)	ケーブル サイズ (mm <sup>2</sup> )	ケーブル 長さ (m)
YA1	0.83	1280.62	97.0	20.0	117.0	31.1	148.1	100	1.77	110	0.0302	6.00	20	120	5.78	154	160	37	130	38	260
YA2	0.83	1285.32	101.5	16.0	117.5	26.6	144.1	100	1.77	110	0.0302	6.00	20	120	5.78	150	160	37	130	38	260
YA3	0.83	1277.69	93.2	33.0	126.2	33.5	159.7	100	1.77	110	0.0302	6.00	22	132	6.36	167	170	45	142	38	284
YA4	0.83	1308.59	111.6	34.0	145.6	3.4	149.0	100	1.77	110	0.0302	6.00	25	150	7.23	157	160	37	160	38	320
YA5	0.83	1282.13	99.3	23.0	122.3	27.3	149.6	100	1.77	110	0.0302	6.00	21	126	6.07	156	160	37	136	38	272
YA6	0.83	1268.49	87.0	16.0	103.0	39.8	142.8	100	1.77	110	0.0302	6.00	18	108	5.20	149	160	37	118	38	236
YA7	0.83	1272.07	90.7	35.0	125.7	34.1	159.8	100	1.77	110	0.0302	6.00	22	132	6.36	167	170	45	142	38	284
YA8	0.83	1281.20	100.0	19.0	119.0	26.4	145.4	100	1.77	110	0.0302	6.00	21	126	6.07	152	160	37	136	38	272
YA9	0.83	1287.19	107.0	32.0	139.0	21.2	160.2	100	1.77	110	0.0302	6.00	24	144	6.94	168	170	45	154	38	308
YA10	0.83	1299.33	117.8	78.0	195.8	9.8	205.6	100	1.77	110	0.0302	6.00	33	198	9.54	216	220	55	208	60	416
YA11	0.83	1307.99	127.7	73.0	200.7	1.6	202.3	100	1.77	110	0.0302	6.00	34	204	9.83	213	220	55	214	60	428





注) グリッドは1km 間隔

図 7-7 灌漑省モニタリング井戸位置図 (対象地域近辺)

図7-7-2 モニタリング井戸水位変化図

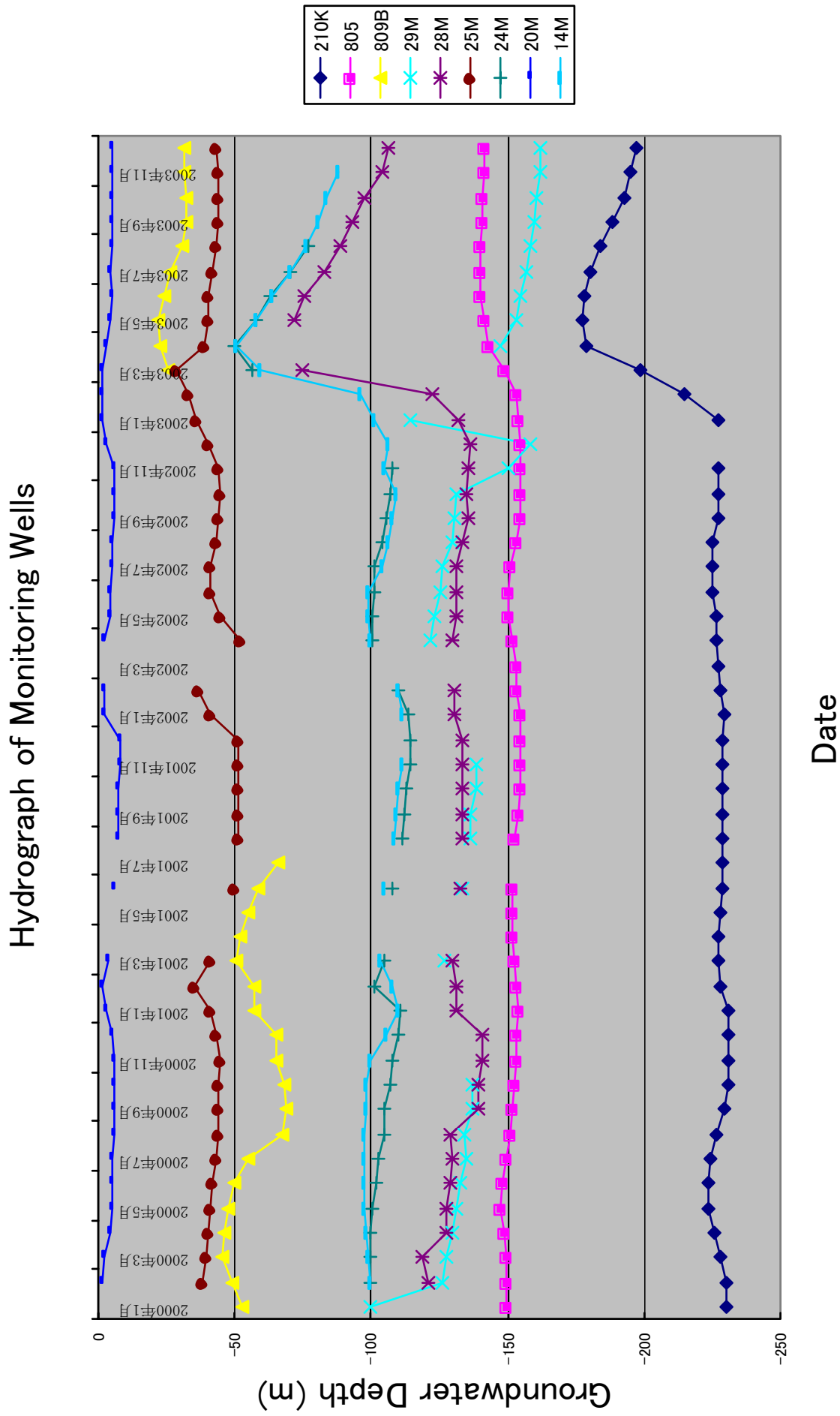


表7-7-1、灌漑省モニタリング井戸水位記録

Well	Location			2000											
	X	Y	Z	1	2	3	4	5	6	7	8	9	10		
210K	3717.370	3717.370	1341.58	230.26	230.15	228.05	226.10	223.83	223.85	224.50	226.90	229.54	230.96		
805	330.169	3716.450	965.98	149.40	149.85	149.77	149.10	147.52	148.30	149.75	151.30	151.85	152.42		
809B	342.010	3716.970	1191.19	53.00	49.05	45.49	45.99	47.70	50.00	55.05	67.50	69.03	68.13		
29M	336.709	3733.500	1387.83	99.50	126.20	127.70	130.00	131.48	132.85	135.07	134.20	137.03	137.10		
28M	338.475	3722.400	1242.42	121.20	121.20	118.75	127.56	127.54	128.80	130.00	128.70	139.18	139.35		
25M	339.490	3727.750	1372.46	37.80	37.80	39.30	40.40	40.70	41.60	43.30	43.87	44.00	44.20		
24M	336.890	3723.875	1276.64	99.50	99.50	99.70	100.00	100.41	101.75	102.34	104.50	104.55	107.26		
20M	337.230	3723.780	1272.65	1.68	1.68	2.20	4.36	4.85	5.00	5.28	5.84	5.80	6.08		
14M	337.730	3723.750	1268.92	99.88	99.88	98.70	98.00	97.20	97.80	97.85	97.70	97.90	98.20		
3M	336.200	3731.240	1359.65	194.40	194.40	193.20	192.60	192.65	192.80	193.10	193.53	193.95	194.10		
				Jan-00	Feb-00	Mar-00	Apr-00	May-00	Jun-00	Jul-00	Aug-00	Sep-00	Oct-00		
210K	1341.58	210K	210K	-230.26	-230.15	-228.05	-226.1	-223.83	-223.85	-224.5	-226.9	-229.54	-230.96		
805	965.98	805	805	-149.4	-149.85	-149.77	-149.1	-147.52	-148.3	-149.75	-151.3	-151.85	-152.42		
809B	1191.19	809B	809B	-53	-49.05	-45.49	-45.99	-47.7	-50	-55.05	-67.5	-69.03	-68.13		
29M	1387.83	29M	29M	-99.5	-126.2	-127.7	-130	-131.48	-132.85	-135.07	-134.2	-137.03	-137.1		
28M	1242.42	28M	28M		-121.2	-118.75	-127.56	-127.54	-128.8	-130	-128.7	-139.18	-139.35		
25M	1372.46	25M	25M		-37.8	-39.3	-40.4	-40.7	-41.6	-43.3	-43.87	-44	-44.2		
24M	1276.64	24M	24M		-99.5	-99.7	-100	-100.41	-101.75	-102.34	-104.5	-104.55	-107.26		
20M	1272.65	20M	20M		-1.68	-2.2	-4.36	-4.85	-5	-5.28	-5.84	-5.8	-6.08		
14M	1268.92	14M	14M		-99.88	-98.7	-98	-97.2	-97.8	-97.85	-97.7	-97.9	-98.2		
3M	1359.65	3M	3M		-194.4	-193.2	-192.6	-192.65	-192.8	-193.1	-193.53	-193.95	-194.1		
ELEVATION															
210K		210K	210K	1111.32	1111.43	1113.53	1115.48	1117.75	1117.73	1117.08	1114.68	1112.04	1110.62		
805		805	805	816.58	816.13	816.21	816.88	818.46	817.68	816.23	814.68	814.13	813.56		
809B		809B	809B	1138.19	1142.14	1145.7	1145.2	1143.49	1141.19	1136.14	1123.69	1122.16	1123.06		
29M		29M	29M	1288.33	1261.63	1260.13	1257.83	1256.35	1254.98	1252.76	1253.63	1250.8	1250.73		
28M		28M	28M		1121.22	1123.67	1114.86	1114.88	1113.62	1112.42	1113.72	1103.24	1103.07		
25M		25M	25M		1334.66	1333.16	1332.06	1331.76	1330.86	1329.16	1328.59	1328.46	1328.26		
24M		24M	24M		1177.14	1176.94	1176.64	1176.23	1174.89	1174.3	1172.14	1172.09	1169.38		
20M		20M	20M		1270.97	1270.45	1268.29	1267.8	1267.65	1267.37	1266.81	1266.85	1266.57		
14M		14M	14M		1169.04	1170.22	1170.92	1171.72	1171.12	1171.07	1171.22	1171.02	1170.72		
3M		3M	3M		1165.25	1166.45	1167.05	1167	1166.85	1166.55	1166.12	1165.7	1165.55		
				Jan-00	Feb-00	Mar-00	Apr-00	May-00	Jun-00	Jul-00	Aug-00	Sep-00	Oct-00		

2001														
	11	12	1	2	3	4	5	6	7	8	9	10	11	12
	230.96	230.99	231.00	228.30	227.47	227.37	228.35	228.40	228.70	228.85	228.95	228.60	228.60	228.60
	152.97	153.30	153.60	153.55	152.24	152.10	151.60	152.12		152.54	154.30	154.64	154.95	154.88
	65.25	65.45	57.45	56.82	50.25	52.00	54.95	58.90	66.08					
					126.70					136.26	136.57	138.20	138.85	
	140.63	140.56	131.00	131.00	129.70			133.11		133.40	133.46	133.46	133.45	133.40
	44.77	43.48	40.77	35.32	40.89			50.00		50.99	51.00	50.98	51.25	51.00
	107.65	110.18	110.78	101.30	105.10			107.82		111.14	112.20	113.10	114.35	114.25
	6.18	5.30	2.80	1.67	3.95			5.89		7.09	7.35	7.60	7.92	7.92
	100.04	105.30	110.20	107.50	103.20			105.15		108.30	109.40	110.12	111.25	
	194.48													
Nov-00	Dec-00	Jan-01	Feb-01	Mar-01	Apr-01	May-01	Jun-01	Jul-01	Aug-01	Sep-01	Oct-01	Nov-01	Dec-01	
-230.96	-230.99	-231	-228.3	-227.47	-227.37	-228.35	-228.4	-228.7	-228.85	-228.95	-228.6	-228.6	-228.6	-228.6
-152.97	-153.3	-153.6	-153.55	-152.24	-152.1	-151.6	-152.12	-66.08	-152.54	-154.3	-154.64	-154.95	-154.88	
-65.25	-65.45	-57.45	-56.82	-50.25	-52	-54.95	-58.9		-136.26	-136.57	-138.2	-138.85	-154.88	
				-126.7			-133.11		-133.4	-133.46	-133.46	-133.45	-133.4	
-140.63	-140.56	-131	-131	-129.7			-133		-50.99	-51	-50.98	-51.25	-51	
-44.77	-43.48	-40.77	-35.32	-40.89			-50		-111.14	-112.2	-113.1	-114.35	-114.25	
-107.65	-110.18	-110.78	-101.3	-105.1			-107.82		-7.09	-7.35	-7.6	-7.92	-7.92	
-6.18	-5.3	-2.8	-1.67	-3.95			-5.89		-108.3	-109.4	-110.12	-111.25		
-100.04	-105.3	-110.2	-107.5	-103.2			-105.15							
-194.48														
1110.62	1110.59	1110.58	1113.28	1114.11	1114.21	1113.23	1113.18	1112.88	1112.73	1112.63	1112.98	1112.98	1112.98	1112.98
813.01	812.68	812.38	812.43	813.74	813.88	814.38	813.86		813.44	811.68	811.34	811.03	811.1	
1125.94	1125.74	1133.74	1134.37	1140.94	1139.19	1136.24	1132.29	1125.11						
				1261.13			1254.72		1251.57	1251.26	1249.63	1248.98		
1101.79	1101.86	1111.42	1111.42	1112.72			1109.42		1109.02	1108.96	1108.96	1108.97	1109.02	1109.02
1327.69	1328.98	1331.69	1337.14	1331.57			1322.46		1321.47	1321.46	1321.48	1321.21	1321.46	1321.46
1168.99	1166.46	1165.86	1175.34	1171.54			1168.82		1165.5	1164.44	1163.54	1162.29	1162.39	1162.39
1266.47	1267.35	1269.85	1270.98	1268.7			1266.76		1265.56	1265.3	1265.05	1264.73	1264.73	1264.73
1168.88	1163.62	1158.72	1161.42	1165.72			1163.77		1160.62	1159.52	1158.8	1157.67		
1165.17														
Nov-00	Dec-00	Jan-01	Feb-01	Mar-01	Apr-01	May-01	Jun-01	Jul-01	Aug-01	Sep-01	Oct-01	Nov-01	Dec-01	

2002

	1	2	3	4	5	6	7	8	9	10	11	12	1	2
	229.75	227.92	227.12	226.90	226.50	225.15	225.20	225.26	227.10	227.60	227.54	154.95	227.41	214.49
	154.60	153.00	153.14	151.70	150.58	150.48	151.07	152.86	154.76	154.39	154.92	154.95	154.17	152.93
	130.67	130.67		121.70	123.32	125.00	126.22	129.53	130.30	131.30	150.07	158.64	114.73	
	41.40	36.43		130.00	130.90	130.98	131.33	133.46	135.43	134.70	135.86	136.24	132.09	122.26
	113.27	110.00		51.70	44.57	41.16	41.23	43.22	44.01	44.73	43.85	40.17	35.98	33.09
	1.9	1.96		100.35	100.80	101.20	101.50	103.80	105.34	106.74	107.96			
	111.10	109.83		2.20	4.50	4.05	4.95	5.42	5.80	6.08	6.18	3.15	1.69	1.71
				99.60	99.05	99.20	104.43	106.37	107.73	109.04	105.18	106.63	101.39	96.17

	Jan-02	Feb-02	Mar-02	Apr-02	May-02	Jun-02	Jul-02	Aug-02	Sep-02	Oct-02	Nov-02	Dec-02	Jan-03	Feb-03
	-229.75	-227.92	-227.12	-226.9	-226.5	-225.15	-225.2	-225.26	-227.1	-227.6	-227.54	-154.95	-227.41	-214.49
	-154.6	-153	-153.14	-151.7	-150.58	-150.48	-151.07	-152.86	-154.76	-154.39	-154.92	-154.95	-154.17	-152.93
				-121.7	-123.32	-125	-126.22	-129.53	-130.3	-131.3	-150.07	-158.64	-114.73	
	-130.67	-130.67		-130	-130.9	-130.98	-131.33	-133.46	-135.43	-134.7	-135.86	-136.24	-132.09	-122.26
	-41.4	-36.43		-51.7	-44.57	-41.16	-41.23	-43.22	-44.01	-44.73	-43.85	-40.17	-35.98	-33.09
	-113.27	-110		-100.35	-100.8	-101.2	-101.5	-103.8	-105.34	-106.74	-107.96			
	-1.9	-1.96		-2.2	-4.5	-4.05	-4.95	-5.42	-5.8	-6.08	-6.18	-3.15	-1.69	-1.71
	-111.1	-109.83		-99.6	-99.05	-99.2	-104.43	-106.37	-107.73	-109.04	-105.18	-106.63	-101.39	-96.17

	Jan-02	Feb-02	Mar-02	Apr-02	May-02	Jun-02	Jul-02	Aug-02	Sep-02	Oct-02	Nov-02	Dec-02	Jan-03	Feb-03
	1111.83	1113.66	1114.46	1114.68	1115.08	1116.43	1116.38	1116.32	1114.48	1113.98	1114.04	811.03	1114.17	1127.09
	811.38	812.98	812.84	814.28	815.4	815.5	814.91	813.12	811.22	811.59	811.06	811.03	811.81	813.05
				1266.13	1264.51	1262.83	1261.61	1258.3	1257.53	1256.53	1237.76	1229.19	1273.1	
	1111.75	1111.75		1112.42	1111.52	1111.44	1111.09	1108.96	1106.99	1107.72	1106.56	1106.18	1110.33	1120.16
	1331.06	1336.03		1320.76	1327.89	1331.3	1331.23	1329.24	1328.45	1327.73	1328.61	1332.29	1336.48	1339.37
	1163.37	1166.64		1176.29	1175.84	1175.44	1175.14	1172.84	1171.3	1169.9	1168.68			
	1270.75	1270.69		1270.45	1268.15	1268.6	1267.7	1267.23	1266.85	1266.57	1266.47	1269.5	1270.96	1270.94
	1157.82	1159.09		1169.32	1169.87	1169.72	1164.49	1162.55	1161.19	1159.88	1163.74	1162.29	1167.53	1172.75

	Jan-02	Feb-02	Mar-02	Apr-02	May-02	Jun-02	Jul-02	Aug-02	Sep-02	Oct-02	Nov-02	Dec-02	Jan-03	Feb-03
	1111.83	1113.66	1114.46	1114.68	1115.08	1116.43	1116.38	1116.32	1114.48	1113.98	1114.04	811.03	1114.17	1127.09
	811.38	812.98	812.84	814.28	815.4	815.5	814.91	813.12	811.22	811.59	811.06	811.03	811.81	813.05
				1266.13	1264.51	1262.83	1261.61	1258.3	1257.53	1256.53	1237.76	1229.19	1273.1	
	1111.75	1111.75		1112.42	1111.52	1111.44	1111.09	1108.96	1106.99	1107.72	1106.56	1106.18	1110.33	1120.16
	1331.06	1336.03		1320.76	1327.89	1331.3	1331.23	1329.24	1328.45	1327.73	1328.61	1332.29	1336.48	1339.37
	1163.37	1166.64		1176.29	1175.84	1175.44	1175.14	1172.84	1171.3	1169.9	1168.68			
	1270.75	1270.69		1270.45	1268.15	1268.6	1267.7	1267.23	1266.85	1266.57	1266.47	1269.5	1270.96	1270.94
	1157.82	1159.09		1169.32	1169.87	1169.72	1164.49	1162.55	1161.19	1159.88	1163.74	1162.29	1167.53	1172.75

2003

	3	4	5	6	7	8	9	10	11	12
199.04	178.96	177.40	177.85	180.71	184.17	188.72	193.14	195.07	197.10	
148.51	143.17	141.46	140.20	140.00	140.26	140.60	140.86	141.33	141.49	
25.32	22.80	21.91	24.38	26.70	30.90	32.48	32.24	31.86	31.19	
74.72	147.40	153.06	154.97	157.15	158.72	159.63	160.72	161.87	162.02	
28.82	38.55	40.51	40.57	41.60	43.44	43.80	43.88	43.70	43.23	
56.30	50.17	58.00	62.95	70.30	76.68					
1.70	2.61	4.72	5.01	4.69	4.89	5.09	5.22	5.20	5.17	
59.11	50.43	57.75	63.78	70.72	76.40	80.46	83.88	88.07		
Mar-03	Apr-03	May-03	Jun-03	Jul-03	Aug-03	Sep-03	Oct-03	Nov-03	Dec-03	
-199.04	-178.96	-177.4	-177.85	-180.71	-184.17	-188.72	-193.14	-195.07	-197.1	
-148.51	-143.17	-141.46	-140.2	-140	-140.26	-140.6	-140.86	-141.33	-141.49	
-25.32	-22.8	-21.91	-24.38	-26.7	-30.9	-32.48	-32.24	-31.86	-31.19	
-74.72	-147.4	-153.06	-154.97	-157.15	-158.72	-159.63	-160.72	-161.87	-162.02	
-28.82	-38.55	-40.51	-40.57	-41.6	-43.44	-43.8	-43.88	-43.7	-43.23	
-56.3	-50.17	-58	-62.95	-70.3	-76.68					
-1.7	-2.61	-4.72	-5.01	-4.69	-4.89	-5.09	-5.22	-5.2	-5.17	
-59.11	-50.43	-57.75	-63.78	-70.72	-76.4	-80.46	-83.88	-88.07		
1142.54	1162.62	1164.18	1163.73	1160.87	1157.41	1152.86	1148.44	1146.51	1144.48	
817.47	822.81	824.52	825.78	825.98	825.72	825.38	825.12	824.65	824.49	
1165.87	1168.39	1169.28	1166.81	1164.49	1160.29	1158.71	1158.95	1159.33	1160	
1167.7	1240.43	1234.77	1232.86	1230.68	1229.11	1228.2	1227.11	1225.96	1225.81	
1343.64	1333.91	1170.25	1166.67	1159.81	1153.52	1149.28	1144.87	1138.33	1136.4	
1220.34	1226.47	1218.64	1213.69	1206.34	1199.96	1328.66	1328.58	1328.76	1329.23	
1270.95	1270.04	1267.93	1267.64	1267.96	1267.76	1267.56	1267.43	1267.45	1267.48	
1209.81	1218.49	1211.17	1205.14	1198.2	1192.52	1188.46	1185.04	1180.85		
Mar-03	Apr-03	May-03	Jun-03	Jul-03	Aug-03	Sep-03	Oct-03	Nov-03	Dec-03	

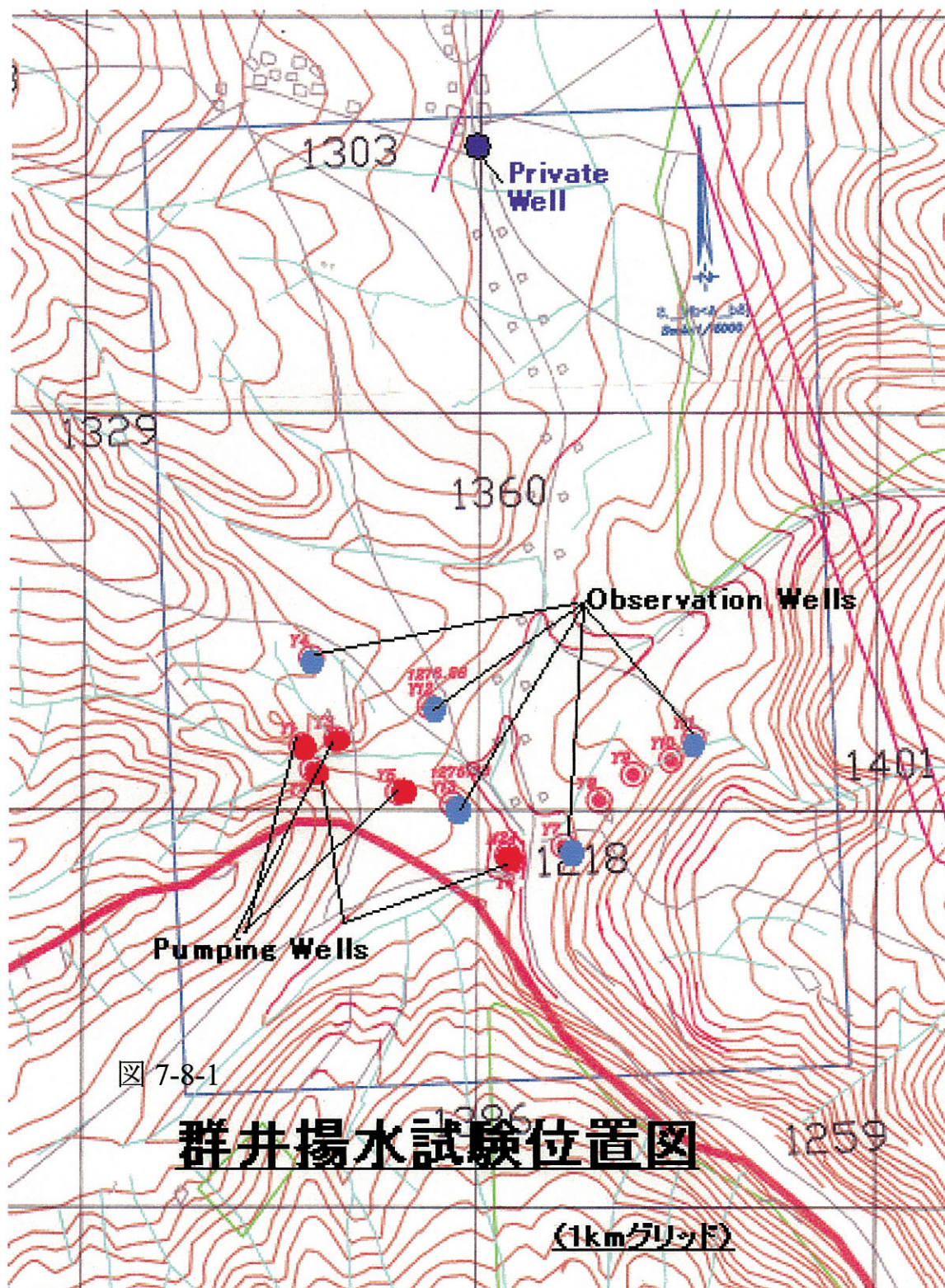


図 7-8-1

## 群井揚水試験位置図

(1kmグリッド)

注：図の Y1, Y2, Y3, …は、全て掘削済みの生産井。井戸番号は、次ページ水位変化図の well 1, well2, well 3, …と同じ。

图7-8-2 群井揚水試驗結果(生產井)

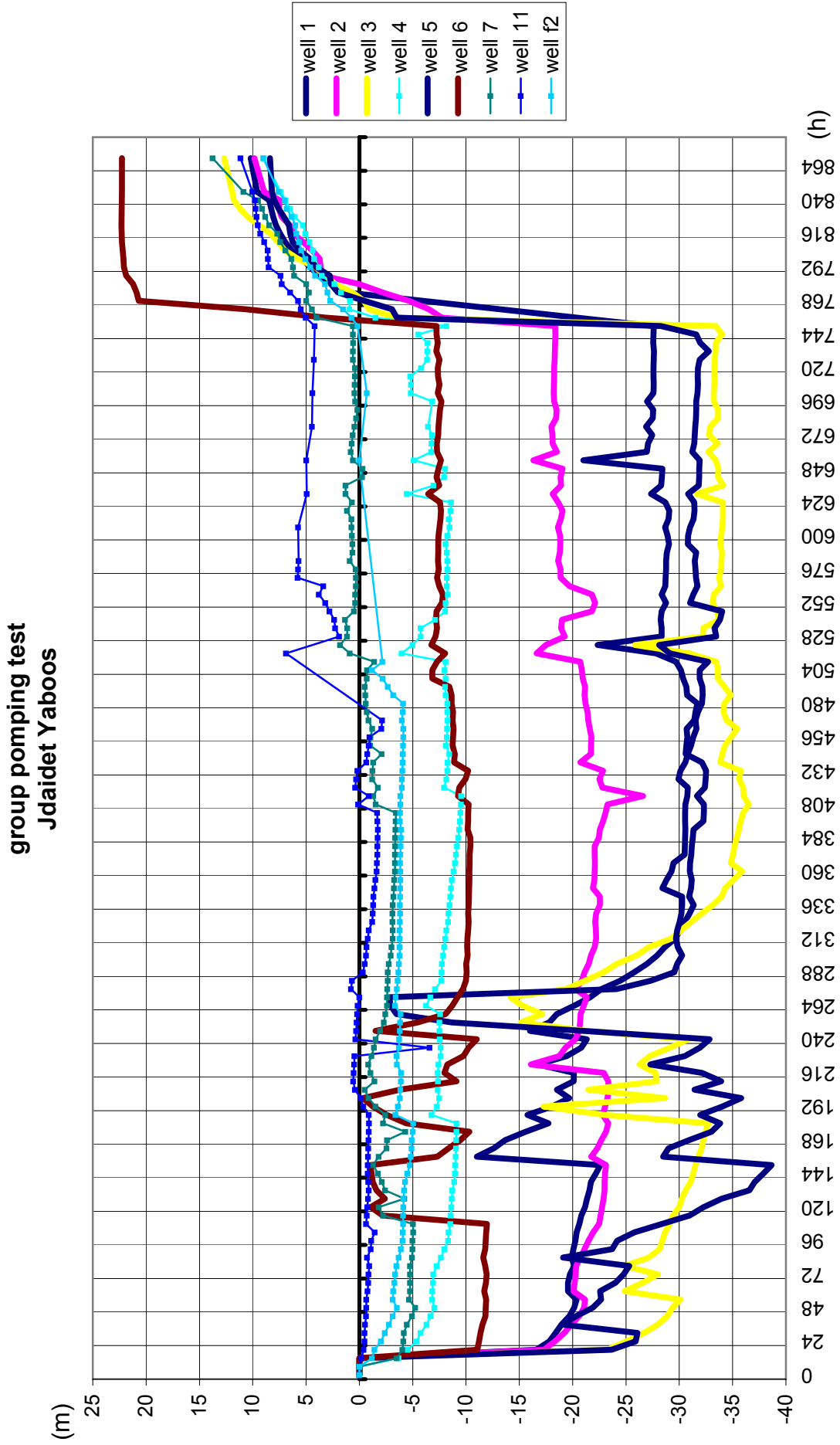




图7-8-3 群井揚水試驗結果(私設井戸)

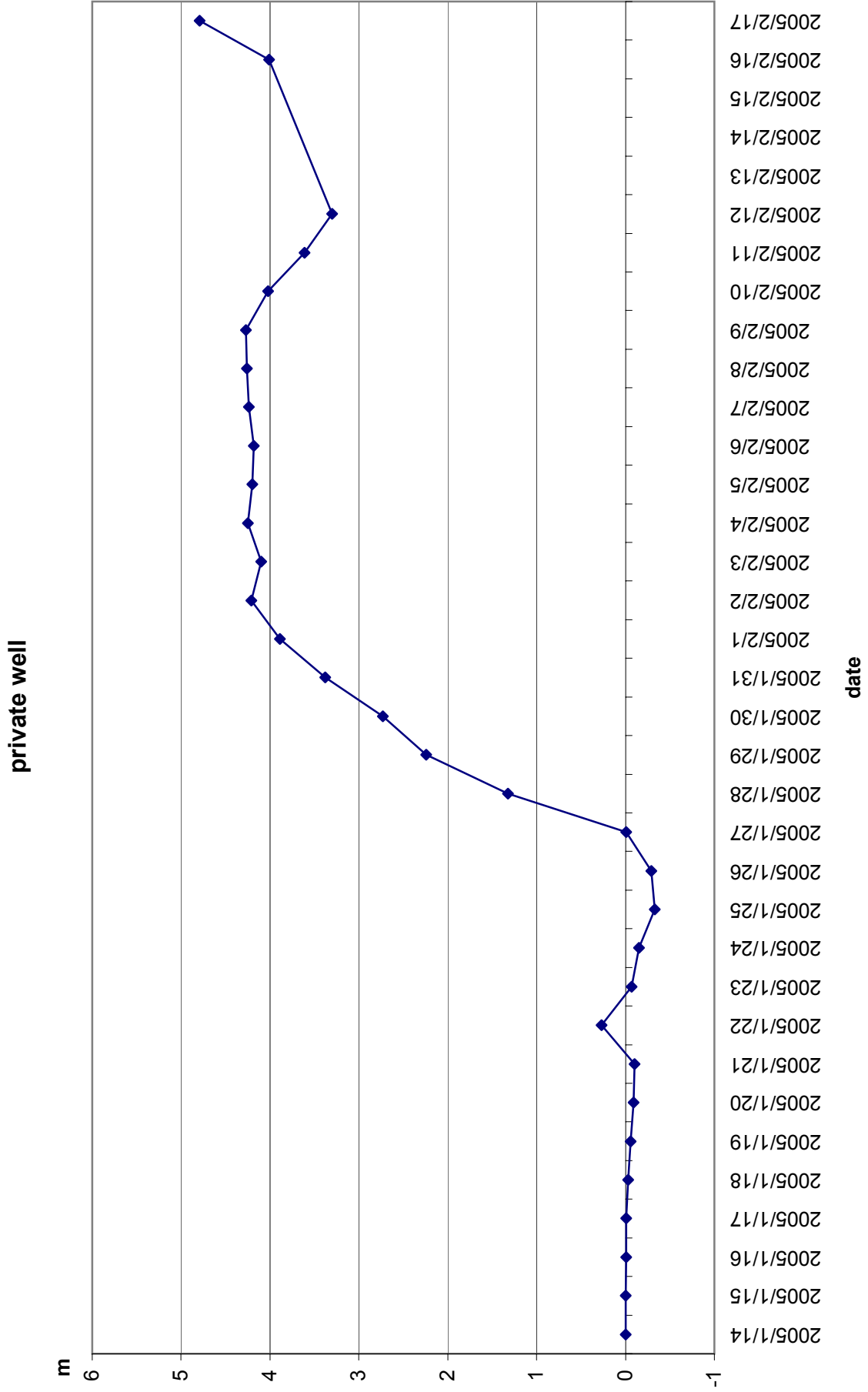


表7-8-1 群井揚水試験観測記録

date	Jdaidet	Yaboos	days	hours	水位観測記録(孔口からの深度m)												group pumping test	
					Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y11	Y12					
					0	0	0	0	0	0	0	0	0	0	0	0	0	
					6	0	0	0	0	0	0	0	0	0	0	0	0	
					12	0	0	0	0	0	0	0	0	0	0	0	0	
					18	0	0	0	0	0	0	0	0	0	0	0	0	
2005/1/16				24	-16.6	-17.32	-23.24	-23.24	-23.24	-23.65	-11.06	0	-3.5	-0.18	0	-1.18		
				30	-17.83	-18.33	-25.04	-25.04	-25.92	-25.92	-11.22	0	4.03	-0.39	0	-1.41		
				36	-18.4	-19.22	-26.7	-26.7	-26.07	-26.07	-11.36	0	4.17	-0.48	0	-2.03		
				42	-18.96	-19.87	-27.99	-27.99	-6.31	-19.02	-11.55	0	4.45	-0.54	0	-2.78		
2005/1/17				48	-19.71	-20.61	-28.88	-28.88	-6.67	-20.32	-11.82	0	4.95	-0.62	0	-3.13		
				54	-20.15	-21.06	-29.36	-29.36	-7.05	-21.89	-11.84	0	5.25	-0.66	0	-3.53		
				60	-20.38	-21.16	-30.1	-30.1	-6.81	-22.66	-11.9	0	4.65	-0.66	0	-3.13		
				66	-19.56	-20.08	-24.87	-24.87	-6.85	-22.58	-11.71	0	4.75	-0.77	0	-3.18		
2005/1/18				72	-19.57	-20.18	-26.59	-26.59	-6.91	-24.02	-11.87	0	4.75	-0.83	0	-3.3		
				78	-19.75	-20.27	-28	-28	-6.93	-24.78	-11.93	0	4.75	-0.87	0	-3.37		
				84	-20.15	-20.32	-24.89	-24.89	-7.25	-25.3	-11.79	0	4.75	-0.92	0	-3.48		
				90	-19.9	-20.74	-27.15	-27.15	-7.66	-19.09	-11.62	0	4.94	-0.72	0	-3.69		
2005/1/19	1			96	-20.07	-21.12	-28.16	-28.16	-7.98	-23.72	-11.79	0	4.98	-1.06	0	-3.89		
				102	-20.26	-21.49	-28.42	-28.42	-8.33	-24.18	-11.85	0	4.99	-1.12	0	-4.07		
				108	-20.37	-21.92	-28.67	-28.67	-8.38	-25.8	-11.88	0	5.05	-1.44	0	-4.09		
				114	-20.62	-22.48	-29.09	-29.09	-8.53	-28.37	-11.95	0	5.04	-0.63	0	-4.11		
2005/1/20	2			120	-20.81	-22.63	-29.4	-29.4	-8.58	-30.96	-12.18	0	2.22	-0.69	0	-4.1		
				126	-21.16	-22.75	-30	-30	-8.63	-32.28	-12.07	0	1.81	-0.74	0	-4.12		
				132	-21.34	-22.9	-30.24	-30.24	-8.67	-33.97	-12.38	0	4.22	-0.82	0	-4.15		
				138	-21.58	-22.98	-30.59	-30.59	-8.72	-36.58	-12.61	0	2.42	-0.88	0	-4.19		
2005/1/21	3			144	-21.72	-23	-31.09	-31.09	-8.91	-37.07	-12.26	0	2.11	-0.83	0	-4.3		
				150	-22.18	-23.04	-31.31	-31.31	-8.97	-37.88	-12.13	0	1.73	-0.8	0	-4.51		
				156	-22.59	-23.13	-31.53	-31.53	-9	-38.66	-12.05	0	1.28	-0.78	0	-4.72		
				162	-11.01	-21.73	-31.8	-31.8	-9.04	-28.48	-7.31	0	1.81	-0.82	0	-4.83		
				168	-12.62	-22.33	-32.1	-32.1	-9.06	-28.99	-8.36	0	2.55	-0.84	0	-4.89		
				174	-13.67	-22.68	-32.27	-32.27	-9.09	-30.92	-9.48	0	2.61	-0.86	0	-4.92		
				180	-15.59	-23.12	-32.46	-32.46	-9.11	-33.03	-10.31	0	4.32	-0.88	0	-5.01		
				186	-17.72	-23.34	-32.72	-32.72	-9.12	-33.83	-4.38	0	2.22	-0.9	0	-5.05		
				192	-15.76	-22.83	-22.94	-22.94	-6.76	-31.95	-2.57	0	2.44	-0.88	0	-3.39		
				198	-18.08	-23.04	-17.27	-17.27	-7.28	-34.05	-1.25	0	1.51	-0.38	0	-3.62		
				204	-19.68	-23.28	-28.67	-28.67	-7.48	-35.8	-0.35	0	0.85	-0.12	0	-3.81		
				210	-18.52	-23.38	-21.47	-21.47	-7.36	-31.42	-3.81	0	0.52	0.42	0	-3.85		
				216	-20.09	-23.35	-27.9	-27.9	-7.37	-33.93	-9.11	0	1.42	0.57	0	-3.89		
				222	-20.12	-22.93	-27.76	-27.76	-7.36	-32.13	-7.98	0	1.04	0.52	0	-3.91		
				228	-16.76	-16.08	-26.27	-26.27	-7.43	-27.28	-8.25	0	0.84	0.49	0	-3.52		
				234	-19.44	-18.74	-27.24	-27.24	-7.62	-30.53	-9.75	0	1.13	0.46	0	-3.51		
2005/1/25	7			240	-20.82	-19.33	-29.14	-29.14	-7.62	-31.94	-10.25	0	1.36	-0.59	0	-3.72		
				246	-21.32	-20.25	-30.85	-30.85	-7.53	-32.83	-11.01	0	1.53	0.37	0	-3.74		
				252	-15.99	-20.6	-21.27	-21.27	-7.51	-20.95	-1.51	0	1.94	0.3	0	-3.8		
				258	-17.79	-20.69	-15.14	-15.14	-7.52	-8.68	-5.48	0	2.29	0.26	0	-3.82		
				264	-18.52	-20.75	-17.14	-17.14	-7.59	-3.48	-8.09	0	2.43	0.21	0	-3.87		
				270	-20.16	-21.04	-15.27	-15.27	-6.26	-2.92	-8.71	0	2.59	0.17	0	-3.34		
				276	-21.64	-21.32	-14.163	-14.163	-6.66	-2.81	-9.21	0	2.61	0	0	-3.41		
				282	-22.68	-20.31	-19.37	-19.37	-7.1	-24.12	-9.71	0	2.63	0.78	0	-3.52		
				288	-24.47	-20.86	-21.16	-21.16	-7.69	-27.35	-10	0	2.66	0.7	0	-3.59		
				294	-25.78	-21.11	-22.9	-22.9	-7.71	-29.53	-10.05	0	2.67	-0.33	0	-3.66		
				300	-26.97	-21.51	-24.14	-24.14	-7.74	-29.81	-10.02	0	2.76	-0.52	0	-3.72		
				306	-27.92	-21.71	-26	-26	-7.86	-30.26	-10.15	0	2.94	-0.62	0	-3.79		
				312	-28.65	-22.06	-27.16	-27.16	-7.96	-29.84	-10.11	0	3.02	-0.68	0	-3.77		
				318	-29.63	-22.21	-29.24	-29.24	-8.06	-29.68	-10.13	0	3.14	-0.8	0	-3.78		
				324	-30.06	-22.18	-30.17	-30.17	-8.16	-29.8	-10.2	0	3.13	-0.88	0	-3.79		
				330	-30.52	-22.11	-31.13	-31.13	-8.32	-30.04	-10.25	0	3.1	-1.22	0	-3.81		
2005/1/29	11			336	-30.96	-22.21	-32.12	-32.12	-8.38	-30.19	-10.21	0	3.11	-1.25	0	-3.82		
				342	-31.35	-22.54	-33.14	-33.14	-8.46	-30.26	-10.24	0	3.14	-1.3	0	-3.81		
				348	-30.91	-22.56	-33.97	-33.97	-8.54	-30.27	-10.28	0	3.19	-1.33	0	-3.82		
				354	-31.1	-21.91	-34.29	-34.29	-8.59	-28.41	-10.29	0	3.24	-1.42	0	-3.83		
2005/1/30	12			360	-31.16	-22.05	-35.08	-35.08	-8.66	-28.81	-10.31	0	3.27	-1.52	0	-3.84		
				366	-30.98	-22.06	-35.9	-35.9	-8.84	-29.26	-10.32	0	3.33	-1.63	0	-3.84		
				372	-31	-22.08	-34.83	-34.83	-8.96	-29.45	-10.33	0	3.33	-1.66	0	-3.83		
				378	-31.12	-22.06	-35.05	-35.05	-9.06	-30.51	-10.35	0	3.34	-1.7	0	-3.85		
2005/1/31	13			384	-31.17	-22.07	-35.18	-35.18	-9.16	-30.53	-10.4	0	3.36	-1.7	0	-3.87		
				390	-31.26	-22.45	-35.4	-35.4	-9.28	-30.54	-10.41	0	3.37	-1.72	0	-3.89		
				396	-31.34	-22.56	-35.59	-35.59	-9.37	-30.56	-10.15	0	3.39	-1.73	0	-3.92		
				402	-32.25	-22.86	-35.76	-35.76	-9.44	-30.54	-10.19	0	3.41	-1.69	0	-3.81		
				408	-32.3	-23.09	-35.98	-35.98	-9.48	-30.55	-10.2	0	3.44	-1.68	0	-3.83		
				414	-32.31	-23.26	-36.53	-36.53	-9.53	-30.56	-10.24	0	1.53	0.12	0	-3.84		
				420	-31.65	-26.61	-36.03	-36.03	-9.56	-30.76	-9.24	0	1.31	-0.89	0	-3.85		
				426	-32.4	-22.78	-35.98	-35.98	-7.95	-30.81	-9.36	0	1.75	0.39	0	-3.98		
2005/2/2	15			432	-32.47	-22.51	-35.63	-35.63	-8.17	-29.91	-9.94	0	1.2	0.29	0	-4		
				438	-32.52	-22.86	-35.76	-35.76	-8.25	-30.11	-10.2	0	1.24	0.19	0	-4.04		
				444	-32.11	-20.71	-33.83	-33.83	-8.28	-30.56	-8.89	0	1.3	-0.66	0	-4.06		
				450	-30.6	-21.71	-34.04	-34.04	-8.45	-30.81	-8.94	0	2.1	-0.74	0	-4.09		
				456	-30.65	-21.72	-34.28	-34.28	-8.12	-31.11	-8.74	0	1.02	-0.88	0	-4.1		
				462	-30.75	-21.76	-34.85	-34.85	-8.2	-31.31	-8.79	0	1.05	-0.95	0	-4.12		
				468	-30.68	-21.61	-35.43	-35.43										

date	days	hours	水位観測記録(孔口からの深度.m)												group pumping test	
			Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y11	Y12					
			510	-30.15	-20.86	-33.63	-8	-31.91	-6.84	-0.73						
			516	-29.69	-20.71	-33.47	-8.1	-32.71	-7.28	-1.39						
			522	-27.82	-16.61	-30.93	-3.97	-29.11	-8.04	0.9						
	19		528	-22.35	-17.51	-25.83	-4.98	-28.11	-6.74	1.8						
			534	-28.35	-19.26	-32.23	-5.75	-33.46	-7.14	1.15						
			540	-28.35	-18.91	-32.23	-5.75	-33.31	-7.29	1.13						
			546	-28.25	-19.01	-33.73	-7.1	-33.81	-7.19	1.35						
	20		552	-28.35	-21.81	-33.53	-8.05	-34.01	-7.24	0.51						
			558	-28.75	-22.11	-33.13	-8.1	-31.01	-7.74	0.4						
			564	-28.35	-21.81	-33.23	-8.3	-31.31	-7.84	0.4						
			570	-28.7	-19.71	-33.93	-8.2	-31.71	-7.49	0.32						
	21		576	-28.72	-18.86	-33.72	-8.21	-31.56	-7.29	0.33						
			582	-28.75	-18.86	-33.93	-8.25	-31.51	-7.44	0.35						
			588	-28.77	-18.64	-33.96	-8.26	-31.46	-7.37	0.9						
			594	-28.84	-18.79	-33.99	-8.2	-31.59	-7.39	0.65						
	22		600	-29.03	-18.84	-33.84	-8.1	-30.79	-7.39	0.65						
			606	-28.91	-18.82	-33.92	-8.26	-30.82	-7.42	0.69						
			612	-28.67	-18.62	-34.02	-8.46	-31.02	-7.52	0.74						
			618	-29	-18.9	-34.09	-8.4	-31.34	-7.61	0.74						
	23		624	-29.06	-19.06	-34.08	-8.56	-31.42	-7.65	1.15						
			630	-28.7	-18.63	-34.08	-8.6	-31.41	-7.56	0.7						
			636	-27.34	-18.12	-31.64	-4.46	-30.82	-6.45	1.29						
	24		642	-28.3	-18.91	-34.13	-6.95	-31.81	-7.48	1.3						
			648	-28.37	-18.86	-33.63	-7.95	-31.86	-7.24	-0.25						
			654	-28.41	-19.06	-33.68	-8.05	-31.86	-7.41	-0.3						
			660	-21	-16.31	-33.43	-5.1	-31.91	-7.65	0.59						
			666	-26.96	-18.52	-32.72	-6.74	-31.22	-7.27	0.81						
	25		672	-27.06	-18.12	-33.61	-6.76	-31.4	-7.25	0.71						
			678	-27.47	-18.1	-32.76	-6.81	-31.46	-7.39	0.62						
			684	-26.88	-18.02	-32.92	-6.45	-31.5	-7.43	0.46						
			690	-27.52	-18.46	-33.63		-31.56	-7.49	0.29						
	26		696	-27.56	-18.49	-33.64		-31.59	-7.55	0.19						
			702	-26.98	-18.26	-33.23	-6.85	-31.59	-7.69	0.39						
			708	-27.58	-18.22	-33.23	-4.83	-31.71	-7.34	0.45						
			714	-27.6	-18.25	-33.28	-4.84	-31.76	-7.5	0.44						
	27		720	-27.58	-18.27	-33.3	-4.77	-31.72	-7.37	0.42						
			726	-27.59	-18.26	-33.28	-5.8	-31.74	-7.34	0.42						
			732	-27.6	-18.31	-33.33	-6.35	-31.91	-7.51	0.59						
			738	-27.62	-18.33	-33.4	-6.38	-32.76	-7.2	0.6						
	28		744	-27.56	-18.35	-33.42	-6.39	-31.95	-7.36	0.58						
			750	-27.59	-18.39	-34.03	-5.55	-31.58	-7.23	0.59						
			756	-27.61	-18.35	-33.41	-8.17	-28.27	-7.23	0.6						
			762		-7.73	-3.48	-1.52	-3.51	3.16	4.01						
	29		768		-6.51	-0.88	0.95	-3.06	10.69	4.45						
			774		-4.64	-0.41	0.88	-0.46	20.7	4.99						
			780	1.26	-2.16	0.64	1.71	2.01	20.89	4.72						
			786	2.49	0.05	2.29	2.33	2.65	21.23	4.99						
	30		792	3.74	3.47	3.19	3.53	2.78	21.88	6.11						
			798	4.62	3.63	4.11	3.8	4.08	22.07	6.23						
			804	5.36	3.73	5.76	4.23	4.62	22.13	6.38						
			810	6.34	4.42	7	4.37	5.6	22.19	6.93						
	31		816	6.98	5.27	7.63	4.68	6.25	22.27	7.42						
			822	7.43	6.18	8.35	5.07	6.48	22.28	7.68						
			828	7.83	6.52	9.38	5.28	6.61	22.31	8.46						
			834	8.09	7.29	10.47	6.05	7.09		8.82						
	32		840	8.26	7.54	11.18	6.5	7.57		9.12						
			846	8.45	7.49	11.77	6.9	7.99		9.5						
			852	9.6	8.94	11.92	7.4	8.19	22.26	10.86						
			858													
	33		864													
			870													
			876	10.2	9.84	12.67	8.95	8.39	22.26	13.75						
	34		882													
			888													



صدر

المجلس الأعلى السوري اللبناني  
الأمانة العامة  
مكتب الأمين العام

بإحسان السيد  
[Signature]

الرقم:

٢٠٠٥/١٩٢

التاريخ:

٢٠٠٥/١/٢٤

جانب وزارة الري في الجمهورية العربية السورية  
السيد معاون وزير الري للشؤون الفنية المحترم

تحية وبعد

نشرف بأن نحيل إليكم ربطا نسخة عن الكتاب الوارد إلينا من وزارة الطاقة والمياه في لبنان تحت رقم ٢٢/ص ٢ تاريخ ٢٠٠٥/١/١٨، والمتضمن بأنه لا مانع لدى المديرية العامة للموارد المائية والكهربائية من إجراء عملية الضخ في منطقة الحوض المائي المشترك داخل الحدود السورية وذلك بالتنسيق والتعاون الكامل بين إدارة المؤسسة العامة لمياه الشرب والصرف الصحي بدمشق والمديرية العامة للموارد المائية والكهربائية في وزارة الطاقة والمياه في لبنان، وقد تم تكليف المهندس حسن جعفر للمشاركة في إجراء تجارب الضخ للتأكد من عدم تأثير هذه الأبار على مناسيب المياه الجوفية.

نأمل التكرم بالإطلاع وإجراء ما يلزم لجهة إبلاغ المهتمس المنكور أعلاه بمواعيد التجارب.

وبانتظار جوابكم، تفضلوا بقبول الاحترام.



ر ش

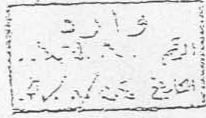
فائق

图7-9-1.レバノン側からのLetter(1)

٢٠٠٥/١/٢٤

دمشق - شارع بشار - ساحة التحرير - مبنى كلية الحقوق سابقاً - هاتف: ٤٤١٢٨٠٨ - ٤٤١١٨١٩ - ٤٤١١٨١٦ - فاكس: ٤٤١٢٤٠٤ - دمشق - ص.ب. ٢٥٢٥٣  
البريد الإلكتروني: SL SG@mail.sy - بيروت - ص.ب. ١١٣ - الجيزة

图 7-9-1. レバノン側からの Letter (1)



الجمهورية اللبنانية  
وزارة الطاقة والمياه  
المديرية العامة للموارد المائية والكهربائية

جانب معاون الوزير الفني  
المهندس سليمان رباح

Handwritten signature or initials.

Handwritten text, possibly a date or reference number.

عطفًا على كتابكم الموجه إلينا بتاريخ ٢٠٠٥/١/١٢ والمتضمن حاجة المؤسسة العامة  
لسيّاه الشرب والصرف الصحي بدمشق - وزارة الاسكان والتعمير، الى حفر بعض الآبار  
قرب المنطقة الحدودية، نحيطكم علماً بأنه لا مانع لدى المديرية العامة للموارد المائية  
والكهربائية من اجراء عملية الحفر في منطقة الحوض المائي المشترك داخل الحدود السورية  
وذلك بالتنسيق والتعاون الكامل بين ادارة مؤسستكم والمديرية العامة للموارد المائية  
والكهربائية في وزارة الطاقة والمياه في لبنان. وقد تمّ تكليف المهندس حسن جعفر للمشاركة  
في اجراء تجارب الضخ للتأكد من عدم تأثير هذه الآبار على مناسيب المياه الجوفية ؛  
لذلك

يرجى ابلاغه بمواعيد التجارب.

بيروت في ١٤ كانون الثاني ٢٠٠٥

المدير العام للموارد المائية والكهربائية بالانابة



حسن جعفر

图 7-9-2 レバノン側からの Letter (2)

資料 7-9-3. レバノン側からの Letter、英訳  
(1) 国境近辺での揚水試験共同開催の了解レター

*Translation*

**The Supreme Syrian Lebanese Council**  
**The General Secretariat**  
**The Secretary General Office**

N° :192/2005  
Date: 24/1/2005

**To: The Ministry of Irrigation in the Syrian Arab republic**  
**Your Excellency, Deputy Minister of Irrigation for Technical Affairs**

We have the honor to forward to you attached copy of the letter we have received from the Ministry Energy & Water Resources in Lebanon, under number 32/o2 dated 18/1/2005, indicating that the General Directorate of Electric & Water Resources has no objection to your carrying out drilling works in area of the Lebanese-Syrian shared aquifers inside the Syrian borders. However, this is to be done in full coordination & collaboration between the Damascus Water Supply and Sewerage Authority and the General Directorate of Electric & Water Resources in the Ministry of Energy & Water Resources in Lebanon. Eng. Hasan Jaafar is already assigned for the task of participating in carrying out the pumping tests, in order to verify their not affecting the levels of the groundwater.

You will please be informed and proceed as necessary to notify the name engineer of the timing of these pumping tests.

Waiting for your reply, with our respect.

Director of the Secretary General Office  
*(signature & seal)*

(2) シリア国DAWSSAが国境近くで水源開発を行うことへの了解レター

**Republic of Lebanon**  
**Ministry of Energy & Water Resources**  
**General Directorate of Electric & Water Resources**

N° : 32/o2  
Date: 18/1/2005

To: **Deputy Minister of Irrigation for Technical Affairs**  
**Dr. Eng. Sulaiman Rammah**

Reference is made to your letter of 12/1/2005, explaining the need of the Damascus Water Supply and Sewerage Authority – Ministry of Housing & Construction – to drill some wells near the bordering area. We would like to inform you that we have no objection to carrying out drilling works in area of the Lebanese-Syrian shared aquifers inside the Syrian borders. However, this is to be done in full coordination & collaboration between the Damascus Water Supply and Sewerage Authority and the General Directorate of Electric & Water Resources in the Ministry of Energy & Water Resources in Lebanon. We have already assigned Eng. Hasan Jaafar with the task of participating in carrying out the pumping tests, in order to verify their not affecting the levels of the groundwater. Therefore, would you please notify him of dates of carrying out these tests.

Beirut, 18/01/2005

For/General Director of Electric & Water Resources  
Eng. Hasan Jaafar  
(signature & seal)

*Translated; Amal Mouradi*

資料7-10 水質試験結果とシリア国水質基準

項目	単位	ヤブース地区				シリア国
		M37	No.7	M40	平均	水質基準
A. 現位置試験						
水温	°C	15.8	16.0	16.1	16.0	—
EC	μ S/cm	37.5	35.8	36.2	36.5	—
pH		7.46	7.76	7.71	7.6	—
B. 試験室試験						
飲料水項目						
1 濁度	NTU	3.5	2.5	4	3.3	5
2 色度	度	n	n	n	n	15
3 味	TT	n	n	n	n	—
4 臭気	TON	n	n	n	n	—
5 総硬度	mg/ℓ	21	24	22	22.3	500
6 蒸発残留物	ppm	235	260	235	243.3	1,000
7 残留塩素	ppm	0	0	0	0.0	—
8 pH		7.7	7.5	7.7	7.6	6.5 - 8.5
理化学項目						
9 Ca	mg/ℓ	72	80	80	77.3	—
10 Mg	mg/ℓ	7	10	5	7.3	—
11 Na	mg/ℓ	5	4	4	4.3	200
12 K	mg/ℓ	0.5	0.5	0.5	0.5	—
13 HCO3	mg/ℓ	232	268	224	241.3	—
14 CO3	mg/ℓ	0	0	0	0.0	—
15 SO4	mg/ℓ	16	14	18	16.0	—
16 Cl	mg/ℓ	8	8	6	7.3	250
17 NO3	mg/ℓ	7	6	7	6.7	40
18 NO2	mg/ℓ	0	0	0	0.0	0.01
19 NH4	mg/ℓ	0	0	0	0.0	0.05
重金属						
20 Zn	mg/ℓ	n	n	n	n	3
21 Fe	mg/ℓ	n	n	n	n	0.3
22 Cu	mg/ℓ	n	n	n	n	—
Hg	mg/ℓ					0.001
Pb	mg/ℓ					0.01
Cd	mg/ℓ					0.005
Cr	mg/ℓ					0.05
23 Mn	mg/ℓ	n	n	n	n	—
衛生項目						
24 大腸菌	個/100ml	100	200	500	266.7	100
25 一般細菌	個/100ml	2000	500	6000	2833.3	100



## 資料 7-11 . ステークホルダーミーティング議事録 ( 1 )

### 第 1 回ミーティング

#### a) Invitation

##### TO

- Japan Embassy in Damascus
- Office of Japanese international cooperation agency (JICA) in Damascus
- Ministry of Housing and Building
- Ministry of local Administration and Environment
- Mouhafaz Damascus – Environment Directorate
- Ministry of Transportation
- Ministry of Irrigation
- Ministry of agriculture
- Water Information Center
- Germany Lamayeir Company in Damascus
- Farmers Union
- Damascus friends association
- Syrian association of Environment
- Environment friends association
- Environment Protection and Sustainable Developing Association

#### **Project name : Study of Environmental Impact for Project Utilization of Water in : Maadar – Yabous – Deir al ashaeer**

Since population growth ,limited water resources, extensions of random housing areas from the beginning of last century ,Damascus suffers from deficient of drinking water specially in dry seasons .

So, the capacity of all water basins in Syria has been studied to utilize from them to bring alternative quantities of water to support water resources in Damascus , and also the studies for determination drinking water resources in extensions of Qudsaia town have been done .

For this purpose and cooperation with Barada and Awaj basin directorate some of necessary studies had been done:

diagrams show wells positions in this area and water level in them , quantities of water, discharge , depth of wells .....

these studies had been done in the same time with other studies which were made by Dawssa to supply water to Damascus and to its rural area :

- Project of Study Traction Syrian Coastal water to Damascus city
- Project of Rehabilitation Damascus city net until 2040
- Project of Replacement old pipes in the net

So, Dawssa determined counterpart group for Japanese experts to prepare all needed studies , which include important part ( preparing estimation of environmental impact for this project and study effects of it on all activities in this area) , to accomplish this,

Dawssa prepared all needed information which are relevant with:

- Environmental legislations in Syrian Arab Republic
- How we make aquatic environmental study in Syrian Arab Republic

- How we make aquatic environmental study in Dawssa
- The followed-up agricultural procedures in studied project area
- Social study for project area( populations ,houses ,hospitals.....)
- Irrigation methods in studied areas
- Information about wells and springs in studied areas
- The area of agricultural land in studied areas
- The kind of agricultural productive
- The kind of animals
- The nets of wastewater
- The average of precipitation
- Study of pull lines from wells to assemblage tanks in these areas

So, the study plan of progress the project to estimate environmental effects has been determined according to :

- General introduction
- Project goal
- Project components
- Policy and Low of environmental system management
- Effect of this project on agricultural lands
- Procedures and recommendations for farmers relevant to policy of save water and follow-up the modern systems in irrigation and using fertilizers and pesticides
- Observation and Protection system for project wells
- General Recommendations
- Project Damages
- Project Benefits

**The Aim of first workshop :**

General discussion with all involved sides in this project was about : the project , its aims , its environmental impacts , and discussion about referential conditions for study which has been done by Dawssa

The program of workshop:

- 10:00 – 10:10 welcome introduction ( general director of Dawssa : Mouafk Khalouf )
- 10:10 – 10:20 JICA experts legation speech ( Mr. Kawasaki )
- 10:20 – 10:50 General explanation about the project ( general director deputy : Eng .Khaled Al shalaq
- 10:50 – 11:15 Speech of Environmental directorate and Aquatic study directorate in Dawssa
- 11:15 – 11:25 Break
- 11:25 – 12:25 The discussion and dialogue
- 12:25 – 12:30 The close

We hope to prepare your queries about this study to discuss during workshop :

7/4/2004 visit to the sites of projects at 10:00

8/4/2004 meeting for discussion in meeting hall in Dawssa at 10:00

Thank you for your corporation and participation

General Director  
Eng . Mouafak Makhoulf

**Damascus City Water Supply and Sewerage Authority**  
Environmental Work shop about project of Traction water from areas: Maadar – Yabous  
– Deir al ashaer

b) 出席者リスト

Attendants List (1)

Names of attendances (8/4/2004) :

Number	Name	Position and Agency	Phone - Fax
1	Eng.Suad Obeid	WRIC/ministry of irrigation	31399023/4
2	Izumi Kato	Jica study team	
3	Franswa Krabet	Teacher /Damascus univirsity	5422504
4	Dr.Ziad Alloush	General council of Agriculture scientific research	5743045/3225 267
5	Eng.Nabeel Abo Tarab	Dawssa	4626780
6	Eng .Ayman Nser	Director of Rasheed Office	2392376
7	R.Kawasaki	Jica study team	
8	N.Kimata	Jica study team	
9	Eng.Waleed Hahey	Dawssa/Director of demanded wells	2392219
10	Eng.George Al ain	Agriculture scientific research	6822428
11	Abdlnaser Hassn	Geologist in Dawssa	2392316
12	Sameer Al Safadi	Syrian association of Environment	6244611
13	Eng.Mouhamad kher al asadi	General council of Agriculture scientific research	6519426
14	Eng.Bassam Msekreh	Distribution Director in Dawssa	2238757
15	Eng.Ahmad Kutaish	Director of Interior Censorship	2222374
16	Faten Kutaeini	Environmental Studies /Dawssa	
17	Eng.Yasair Al Madi	Environment Directorate in Dawssa	
18	Sakher Maresheh	Corporation Programs in Jica	3339359
19	Muna Taefour	Environment Directorate	4610817
20	Dr.Muhamad Shfeek al safadi	Damascus Friends association	3324819
21	Eng.Samah Rislán	Ministry of Local Administration and Environment	4461076
22	Eng.Suha Mirae	Ministry of Local Administration and Environment	4461076
23	Dena Rislán	EIA Assistant	3730771
24	Dr.Anuar al Khateeb	Damascus Friends association	3718341
25	Eng.Rawaa al Saadi	Independent Consultant	093404402
26	Eng. Khaled Tarabishi	Damascus Muhafaza	3330325
27	Razan Hawari	Dawssa	2392324
28	Eng.Leen Khabbaz	Ministry of	3336027

		Local Administration and Environment	
29	Dr.Muna Basaleh	Syrian Association of Environment	4444037 4426822
30	Eng.Reem Tahair	Environment Directorate	4110813
31	Dr.Muhamad Kayal	Damascus University	2218490
32	Waleed al Ataar	Syrian Association of Wild life protection	4410359
33	Zaher Raheem	Translator in Jica	

### Attendants List (2)

#### Damascus City Water Supply and Sewerage Authority Names of attendances (8/4/2004) :

Number	Name	Position and Agency	Phone - Fax
1	Eng.Suad Obeid	WRIC/ministry of irrigation	31399023/4
2	Izumi Kato	Jica study team	
3	Franswa Krabet	Teacher /Damascus univirsity	5422504
4	Dr.Ziad Alloush	General council of Agriculture scientific research	5743045/3225 267
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33	Zaher Raheem	Translator in Jica	

c) 議事録

**EIA Workshop for Development of New Water Resources  
for  
Damascus City in Syrian Arab Republic**

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**Venue:** Nasr Street – D.A.W.S.S.A Building – Meeting Hall – Second floor

**Date :** April 8, 2004

**Time :** 1.00 – 12.30

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**Objectives:** the project , its aims , its environmental impacts , and discussion about referential conditions for study which has been done by D.A.W.S.S.A

**Chairman:**

**Participants:** 33 participants as shown in attached list.

---

The workshop began at 10.00 a.m. there was an exchange of introduction, each participant (study team members as well as the invitees) introducing oneself. Next, Mr. Khaled Al Shalak (general director deputy) invited Mr. Mouafak Khalouf (general director of D.A.W.S.S.A) to say his welcome introduction. Next, he invited Mr. Kawasaki (JICA expert).

Mr. Kawasaki talked about ODA and its types:

- Grant Aid Scheme.
- ODA Budget of Major Donors.
- Bilateral Assistance for the world.

Then he talked about the project: project areas (the routes), project components (well construction, submersible pumps, transmission pipeline, booster pumping station, receiving tank, and pressure breaker tanks), field investigation, well pumping test, water quality, works schedule of JICA study team, possible major environmental impacts, current groundwater balance of the Barada and Awaji basins, and groundwater hydrographs of Damascus area.

At the end he mentioned that the Japanese side accept this project temporarily, until getting water from the coastal basin and Al Furat basin, because this project effects on the groundwater level.

Next, Mr. Khaled Al Shalak presented general explanation about the project.

Since population growth ,limited water resources, extensions of random housing areas from the beginning of last century ,Damascus suffers from deficient of drinking water specially in dry seasons. So we are studying the project of development of new resources for Damascus city (Maadar, Jdeidet Yabous, and Deir Al Ashaeer), then he talked about the information that D.A.W.S.S.A prepared, which relevant with:

- Environmental legislations in Syrian Arab Republic
- How we make aquatic environmental study in Syrian Arab Republic
- How we make aquatic environmental study in Dawssa
- The followed-up agricultural procedures in studied project area
- Social study for project area( populations ,houses ,hospitals.....)
- Irrigation methods in studied areas
- Information about wells and springs in studied areas

- The area of agricultural land in studied areas
- The kind of agricultural productive
- The kind of animals
- The nets of wastewater
- The average of precipitation
- Study of pull lines from wells to assemblage tanks in these areas.

Then he talked about the future plan to transmit the water from the coastal basin and Al Furat basin.

Next, Mr. Ahmad hadaya was invited (Environmental directorate Manager).

He talked about the purpose of the environmental study and environmental impact assessment (EIA). There will be three workshop for this study, then he presented the purpose of the first workshop (collecting the required information for the study, accomplishment date of the environmental study, defining reference conditions to study the rectification of the environmental impact, the mechanism of environmental information study, the requirement procedures to protect wells water and project area from the pollution).

Then, there was discussion about the positive impacts and the negative impacts as summarized below:



### Summary of EIA Workshop

- **Positive impacts:**

- Groundwater extraction in the Project area and water conveyance to Damascus mitigates expected water crisis that will be caused in dry year in Damascus.
- The Project is well supported with national development plan for Damascus city, that includes expansion of urban area till 2020 and 2040.

- **Negative impacts (stakeholders comments):**

- Change of water balance and drop of groundwater level with Barada Awaj Basin. Groundwater extraction causes lowering groundwater level and drying-up agriculture wells as wells domestic wells.
- Hindrance to water resource usages by private wells around the new water sources.
- Influence of the existing water usage in the border area of Lebanon side. DAWSSA should contact Lebanon government to notice Project activity through international meeting.
- Social problem will be happened at Dir Alshaher due upon Project pumping. DAWSSA is required to provide adequate mitigation plan for local farmers through EIA survey.
- Project well field in Yaboos will be affected by stony and irony factories. DAWSSA should take action to avoid undesirable industrial impact form them.
- Project well fields in Yaboos will be affected by the contamination form polluted rain/surface water. DAWSSA has to have necessary protection plan before the construction.

- **Other comments:**

- Legislation procedure for this EIA survey is to be confirmed in scoping and ToR report.
- Vegetation Map (1:25,000) is to be prepared around the Project sites before the commencement of construction to evaluate environmental impact.
- Method of siting and drilling is considered in environmental, hydrogeological of point of view to construct economical and safety wells.
- Protection zones for well fields is considered for maintaining safe water provision.
- Global environmental issues are to be included in ToR of this EIA.
- Capacity building in terms of environmental studies is required to accomplish the EIA survey by DAWSSA, consequently at least 15 personnel is to be trained for respective specialties.

## 資料-7 . (12) EIA レポート、目次および要約

### a) 目次

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b) 要約

1) Introduction : この導入部で、シリア政府の要請によって JICA がダマスカス市新規水源開発計画の基本設計調査を行ったこと、この中でシリア国内法に則って DAWSSA が EIA プロセスを実施すること、これを日本側は支援すること、シリア側の EIA プロセスは日本政府による本計画の実施以前に完了すること、等が日-シ両国間で合意されたことを述べている。

2) Policies, Institutional Setting and Legislative Framework: ここで本件に係る EIA がシリア国内法 - (Draft) National EIA Decree (1995) および、draft-National EIA Guideline for Syrian Arab Republic (1995) - に沿って行われ、その Item は No.9 Water Supply, 9.1 Groundwater/water well, に分類されることなどを述べている。

3) Description of Project: ここでは、a) Title and Project Proponent, b) ダマスカス市の給水の現状、c) 計画の内容と位置、d) 計画の具体的な内容と必要な EIA プロセスとが述べられている。

4) Information on Baseline Environment: ここで計画対象地域を取り巻く基本的な環境条件を記述している。具体的には a) 気候および物理環境(地質・土壌・基盤岩・水源・地下水位等)、b) 群井揚水解析による水位降下予測(調査団の解析結果をそのまま利用)、c) 地下水水質、d) 生物環境(植生・生物分布)、e) 社会文化環境(集落分布、文化遺跡等)、および f) 計画の将来の拡張計画等が、かなり細かく検討されている。

5) Significant Environmental Impact: ここから具体的な環境影響評価に入る。まずここで評価の方法論を述べ、また計画の実施を I. 計画段階、II. 建設段階、III. 運用段階の 3 段階に分け、それぞれの段階で考えられる環境影響を拾い上げ、全てを一覧できるマトリックスに纏め上げている。その上で、各環境影響を数値化してマトリックスに書き込み、各段階で最も大きな影響を及ぼすのが何なのかを一目で判るようにした。

6) Analysis of Alternatives: ここでは、本計画で取り上げられている各事業内容を、Zero-Alternative、つまり何もしないことをも含めてその代替案を挙げ、現計画との比較を行い、結局この計画がベストであるという結論を得ている。

7) Mitigation Plan: ここでは、第 5 章で述べた各段階での環境影響について、そのミティゲーション・プランを論じている。主要なテーマは、地下水資源量、地下水水質、森林および植生、公衆衛生、および土地利用である。

8) Monitoring Program: この章では、前章で挙げた各テーマに関する長期的なモニタリングの必要性を述べ、またその方法を論じている。

9) Environmental Management & Training: 本章でも、やはり第 5 章で挙げた、環境に与える悪い影響をどのようにモニターし、その結果からどのようにそれらを管理していくかということが討議されている。

10) Public Participation: ここでは EIA プロセスの中で住民参加が重要であることを述べ、第 1 回から第 3 日までのステークホルダーミーティングの要約が述べられている。

11) References: ここには主に DAWSSA が提供した水源開発関連の図表類、情報、等が挙げられている。

## 資料7-(13) ベースライン調査結果

### 1. 調査の目的

本ベースライン調査は、ダマスカス市上下水道公社(DAWSSA)が給水している区域内の社会状況および給水状況を把握し、本計画の妥当性を検討するための指標を策定する参考資料にするものである。

### 2. 調査対象地域とサンプル数

本調査は1997年に行われた「ダマスカス市給水システム改善拡充計画調査」(以下、「開発調査」とする)にて同類の調査が行なわれているため、これを参考にしてダマスカス市内を収入別に3階層に区分し、さらに水道料金を支払っていない市内の不法居住地区とダマスカス市外の給水対象村落を加えた5地区に区分した。

現在、DAWSSAは約35万戸数に給水しているが、これらの数値は台帳上の数値であり、不法居住地区は含まれていない。サンプル数は対象戸数の1%を採用しても、その数は最低3,500戸数となる。しかし、現地調査期間が1ヶ月という限られた期間であり、上記開発調査においても、サンプル数は600戸数であった。これらのことより、サンプル数は対象戸数の0.1%以上である500戸数とした。

給水対象地域全体の状況を調査するために、調査対象地域を5地区に区分し、各地区で概ね100世帯を標準とし全体で500サンプルを調査した。調査対象区分は以下のとおりである。

表-1 調査対象区分とサンプル数

区分	対 象	サンプル数	備 考
1	月収 25,000 シリアポンド <sup>*</sup> 以上	105 戸数	
2	月収 25,000 ~ 10,000 シリアポンド <sup>*</sup>	105 戸数	
3	月収 10,000 シリアポンド <sup>*</sup> 以下	105 戸数	
4	不法居住地区	105 戸数	
5	ダマスカス市外の村落	80 戸数	1 村落当たり 10 戸数
	計	500 戸数	

### 3. 調査手法と調査期間

調査は質問表によるインタビュー形式により実施した。インタビュー調査は2004年3月27日～4月12日までの期間、1組2人の全5組で実施した。

### 4. 調査結果

調査結果は以下の通りである。

#### (1) 調査対象家庭のアクセス状況

ほとんど主要道路沿いに住んでいる。区分1～3は0.5km以内であるが、区分4および5では2km以内となる。

(2) 電気・電話状況

給水対象地域の月平均停電回数は 4.2 回である。また、電話の保有台数は 1 世帯 1 台であり、携帯電話も普及してきており 1 世帯 0.6 台の割合となっている。

表-2 電気・電話状況

項目	単位	区分					平均	備考
		1	2	3	4	5		
停電回数	回数/月	0.39	2.41	3.10	10.23	5.08	4.20	
電話保有台数	台/世帯	1.36	0.98	0.83	0.57	1.20	0.98	
携帯電話保有台数	台/世帯	1.68	0.56	0.33	0.10	0.45	0.63	

(3) 家族状況

1 世帯当たりの家族構成は、下表の通りである。開発調査時では 1 世帯当り 6 人であったが、現在は 5.5 人となっており、若干少なくなっている。

表-3 家族構成

項目	単位	区分					平均	備考
		1	2	3	4	5		
1 世帯当たり人数	人/世帯	3.96	6.15	5.91	5.62	6.13	5.53	
学生・幼児の割合	%/世帯	38.2	40.1	38.5	46.4	35.3	39.9	
大学卒・大学生割合	%	43.3	22.9	8.1	5.6	9.2	18.3	短大含む

(4) 就農割合

ダマスカス市内では農業の就労割合がほとんどないが、ダマスカス市外においても約 9 %と低い割合である。

表-4 就農割合

項目	単位	区分					備考
		1	2	3	4	5	
就農割合	%	0	1.9	0	0	8.6	

(5) 世帯当たり収入および支出

世帯当たり収入調査では、区分 3 (月収 10,000 シアット以下) および区分 4 (ダマスカス市内不法居住地区) の平均月収は 5,000 シアットと想定され、区分 5 (ダマスカス市外の村落) では平均月収の 9,000 シアット程度と思われる。一方、世帯当たり月別支出は表-6 に示すとおりであり、収入による調査結果と大きく異なるのは区分 1 と 3 であった。区分 1 の場合は上限を 100,000 シアットと仮定したためと想定されるが、区分 3 に関しては原因が不明である。また、この推定では平均収入が支出より下回っているが、これも区分した収入割合の平均値を採用したためと考えられる。

区分 2 でエンゲル係数が大きい値となっているが、これは表-3 の家族構成や学生・幼児の割合が大きいことと関連しているように思われる。

表-5 世帯当たり収入

月当たり収入割合	単位	区 分					備 考
		1	2	3	4	5	
1,000 ~ 3,000 SP	%	0.0	0.0	2.86	2.86	2.50	
3,000 ~ 5,000 SP	%	0.0	0.0	51.43	54.29	32.50	
5,000 ~ 10,000 SP	%	0.0	0.0	45.71	40.95	36.25	
10,000 ~ 25,000 SP	%	0.0	100.0	0.0	1.90	28.75	
25,000 ~ 50,000 SP	%	38.10	0.0	0.0	0.0	0.0	
50,000 SP 以上	%	61.90	0.0	0.0	0.0	0.0	
平均収入（収入割合の 平均値を採用して算出）	千 SP/月	76.19	17.50	5.54	5.30	9.10	

表-6 月当たり支出

項 目	区 分					備 考
	1	2	3	4	5	
食 費	20,981	11,508	4,366	3,949	5,964	単位：SP
医療費	4,512	1,322	963	852	936	
交通費	9,458	2,179	823	822	1,024	
教育費	17,867	1,221	598	386	787	
電気代	3,264	964	482	258	561	
水道代	444	247	239	0	280	
その他	14,073	904	529	331	829	
合 計	70,599	18,345	8,000	6,598	10,381	
インゲル係数	29.7	62.7	54.6	59.9	57.5	単位：%

## (6) 健康状況

主な病気は下表のとおりであり、水因性疾患(水因性伝染病、皮膚炎、涙壺炎等)では区分3が多くなる。

表-7 健康状況

項 目	単位	区 分					備 考	
		1	2	3	4	5		
月当り病院回数	回	2.1	1.9	1.7	2.6	1.6		
主要な病気	神経系統	世帯	5	3	6	2	-	
	喘息	世帯	2	6	-	-	1	
	心臓病	世帯	15	9	7	3	6	
	糖尿病	世帯	17	5	11	10	8	
	高血圧	世帯	29	16	19	16	5	
	水因性伝染病	世帯	11	14	19	31	14	
	眼病	世帯	1	3	2	-	-	
	皮膚炎	世帯	1	8	4	24	-	
	肝臓石	世帯	3	14	10	6	3	
	涙壺炎	世帯	-	2	1	30	-	

## (7) 給水状況

対象地区の

給水状況は、以下のとおりであった。

表-8-1 給水源状況

項 目	単 位	区 分					平均	備 考
		1	2	3	4	5		
個別	%	100.0	100.0	96.19	3.81	93.75	78.00	
共同	%	0.0	0.0	0.95	0.0	1.25	0.40	
井戸	%	0.0	0.0	2.86	14.29	5.00	4.40	
その他	%	0.0	0.0	0.0	81.90	0.0	17.20	

表-8-2 給水状況

項 目	単 位	区 分					平均	備 考	
		1	2	3	4	5			
雨 季	良い	%	100.0	93.33	87.62	29.52	92.50	80.00	
	普通	%	0.0	6.67	9.52	8.57	6.25	6.20	
	悪い	%	0.0	0.0	2.86	61.90	1.25	13.80	
	給水時間	/日	23.8	22.3	21.3	15.2	21.4	20.8	
	給水日数	/週	7.0	6.9	6.8	4.94	6.9	6.5	
乾 季	良い	%	96.19	88.57	77.14	29.52	87.50	75.20	
	普通	%	3.81	10.48	18.10	8.57	10.00	10.20	
	悪い	%	0.0	0.95	4.76	61.90	2.50	14.60	
	給水時間	/日	23.5	20.3	18.9	13.9	20.5	19.4	
	給水日数	/週	7.0	6.6	6.5	4.3	6.8	6.2	
満足度	良い	%	79.05	54.29	50.48	4.76	52.50	48.00	
	普通	%	2.86	20.95	7.62	2.86	25.0	11.20	
	悪い	%	18.10	24.76	41.90	92.38	22.5	40.80	
悪い状況 (× : 50%以上) ( : 50%未満)	水 質		×	×	×	×	×		
	水 量					×			
	水 圧					×			
	水道料金					×			
	安定性					×			

表-8-3 水道料金状況

項 目	単 位	区 分					平均	備 考	
		1	2	3	4	5			
満足度	高い	%	5.71	32.38	50.48	82.86	43.75	43.00	
	普通	%	92.38	66.67	48.57	17.14	55.00	56.00	
	安い	%	1.90	0.95	0.95	0.0	1.25	1.00	
月当たり水道料金	SP		444	247	238	0	280	240	
月当たり消費量	m <sup>3</sup> /hr		87.45	40.48	48.59	22.23	52.87	50.21	
月当たり需要量	m <sup>3</sup> /hr		88.72	48.75	50.59	44.95	92.65	63.76	

表-8-4 将来の水道に関し

項 目	単 位	区 分					平均	備 考	
		1	2	3	4	5			
拡張の必要性	%	31.43	58.10	60.00	97.14	58.75	61.20		
料金値上げの必要性	%	57.58	24.59	7.94	58.82	12.77	33.32		
支払い可能水道料金	SP		416	321	150	238	300	284	