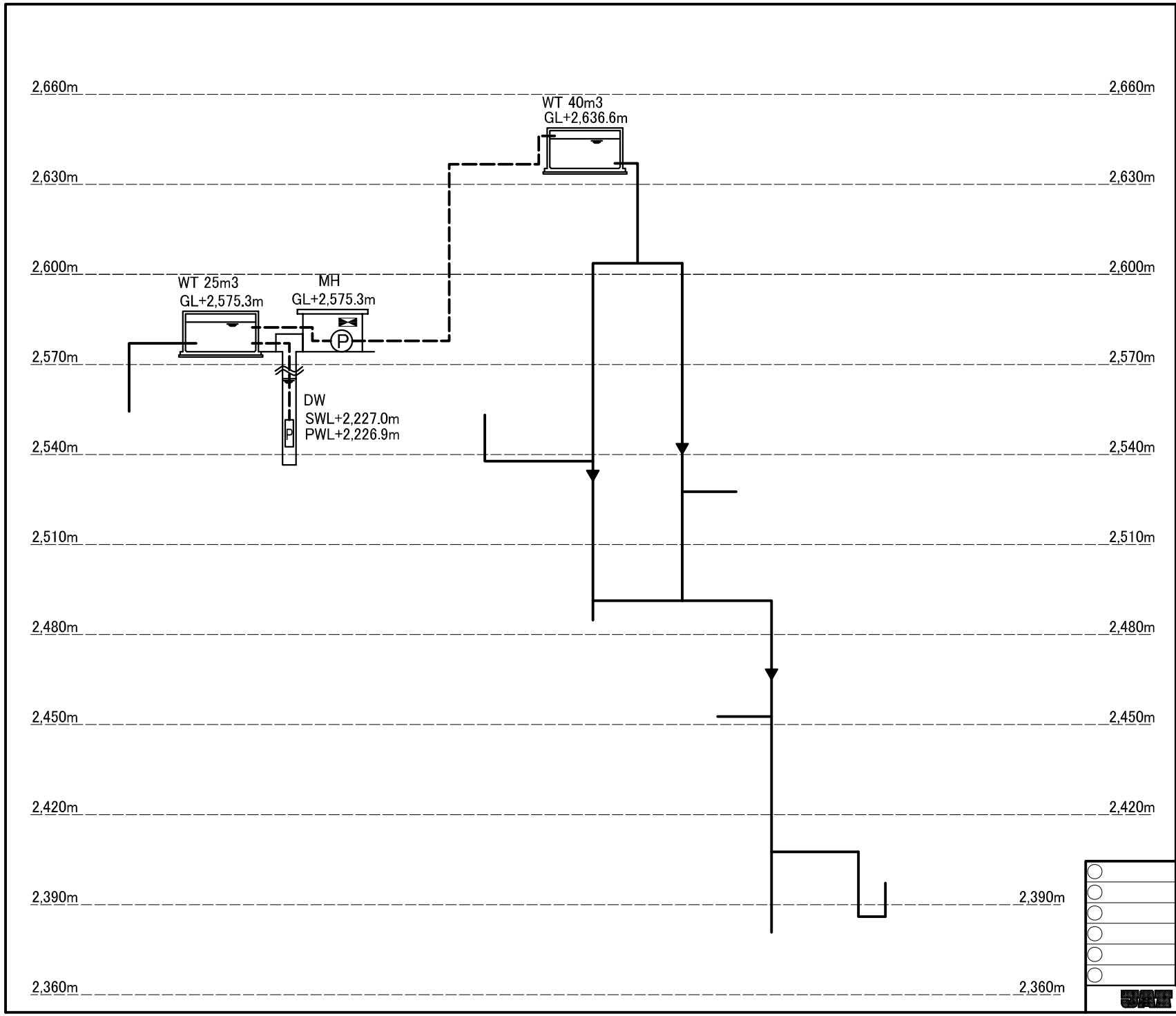
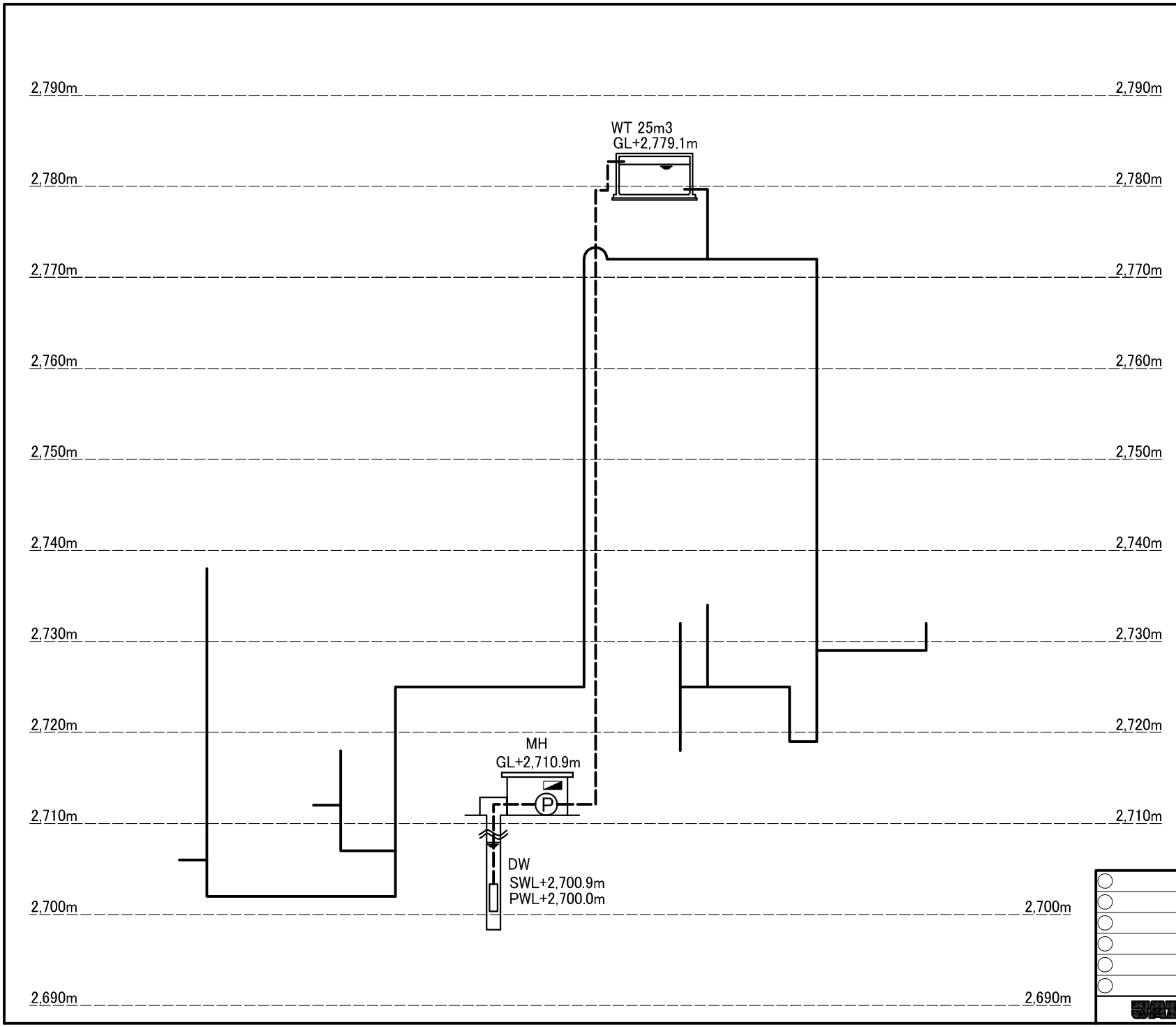

2,660m
2,630m
2,600m
2,570m
2,540m
2,510m
2,480m
2,450m
2,420m
2,390m
2,360m
WT 40m3
GL+2,636.6m
WT 25m3
GL+2,575.3m
MH
GL+2,575.3m
DW
SWL+2,227.0m
PWL+2,226.9m
LEGEND
Pumping and Transmission Pipe
Distribution Pipe
Existing Facilities
Rehabilitation Facilities
Pumping Equipment
Generator
Diesel Engine
Pressure Reducing Facilities
DW Deep Well
WT Water Tank
EWT Existing Water Tank
MH Machinery House
EMH Existing Machinery House
※Distribution pipe is shown only main line.
THE PREPARATORY SURVEY
ON THE PROJECT FOR RURAL WATER SUPPLY
IN THE REPUBLIC OF YEMEN
WATER SUPPLY SYSTEM :
S-02 JARBAN
-
FIG. 2-35
JAPAN TECHNO



LEGEND

----	Pumping and Transmission Pipe
———	Distribution Pipe
·····	Existing Facilities
—·—·—	Rehabilitation Facilities
	Pumping Equipment
	Generator
	Diesel Engine
	Pressure Reducing Facilities
DW	Deep Well
WT	Water Tank
EWT	Existing Water Tank
MH	Machinery House
EMH	Existing Machinery House

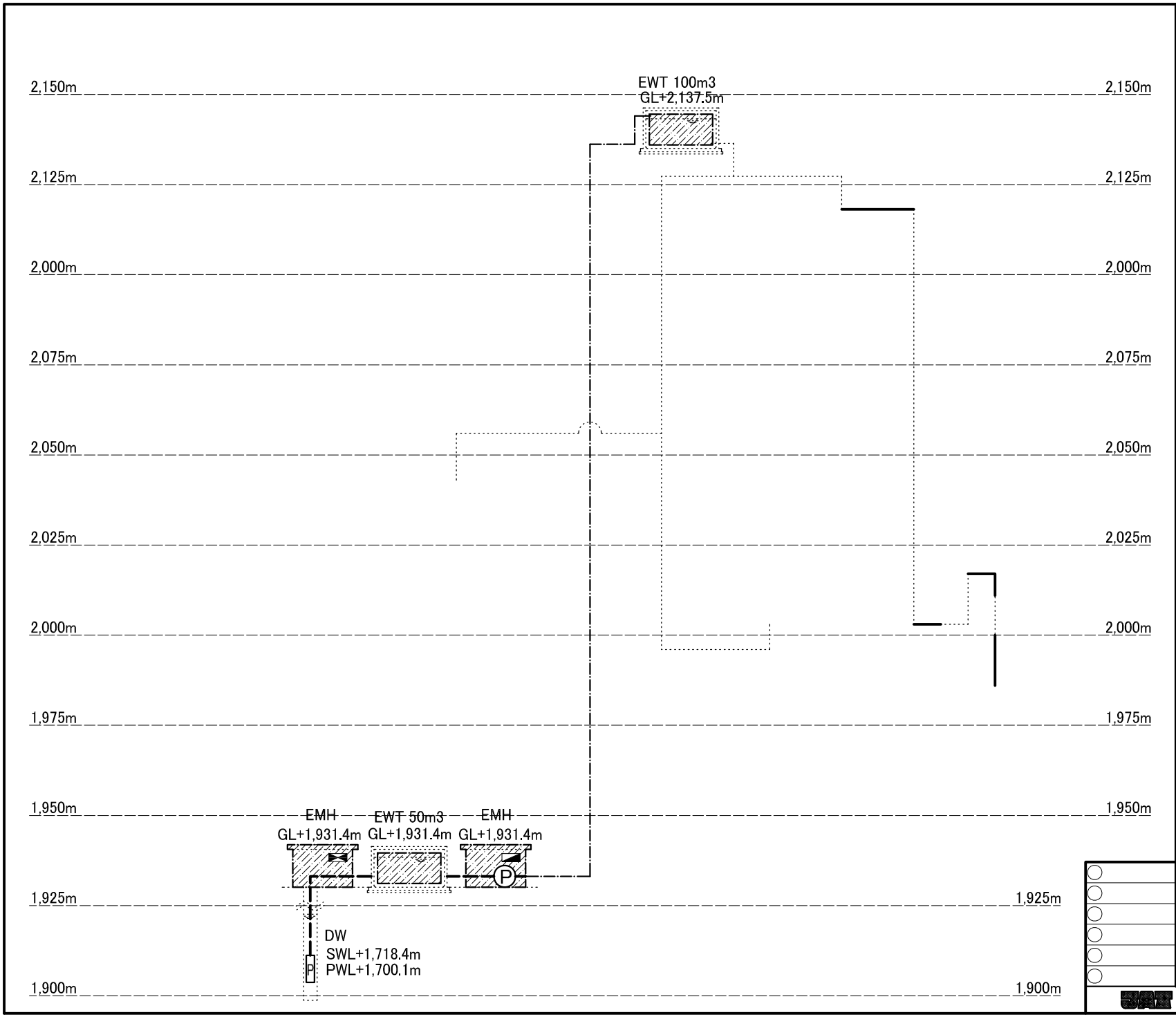
※Distribution pipe is shown only main line.

THE PREPARATORY SURVEY
ON THE PROJECT FOR RURAL WATER SUPPLY
IN THE REPUBLIC OF YEMEN

WATER SUPPLY SYSTEM :
S-04 QAMLAN – BAIT AL NAJRANI

– | FIG. 2-36

JAPAN TECHNO



LEGEND

----	Pumping and Transmission Pipe
———	Distribution Pipe
·····	Existing Facilities
—·—·—	Rehabilitation Facilities
P Ⓟ	Pumping Equipment
⋈	Generator
◢	Diesel Engine
▼	Pressure Reducing Facilities
DW	Deep Well
WT	Water Tank
EWT	Existing Water Tank
MH	Machinery House
EMH	Existing Machinery House

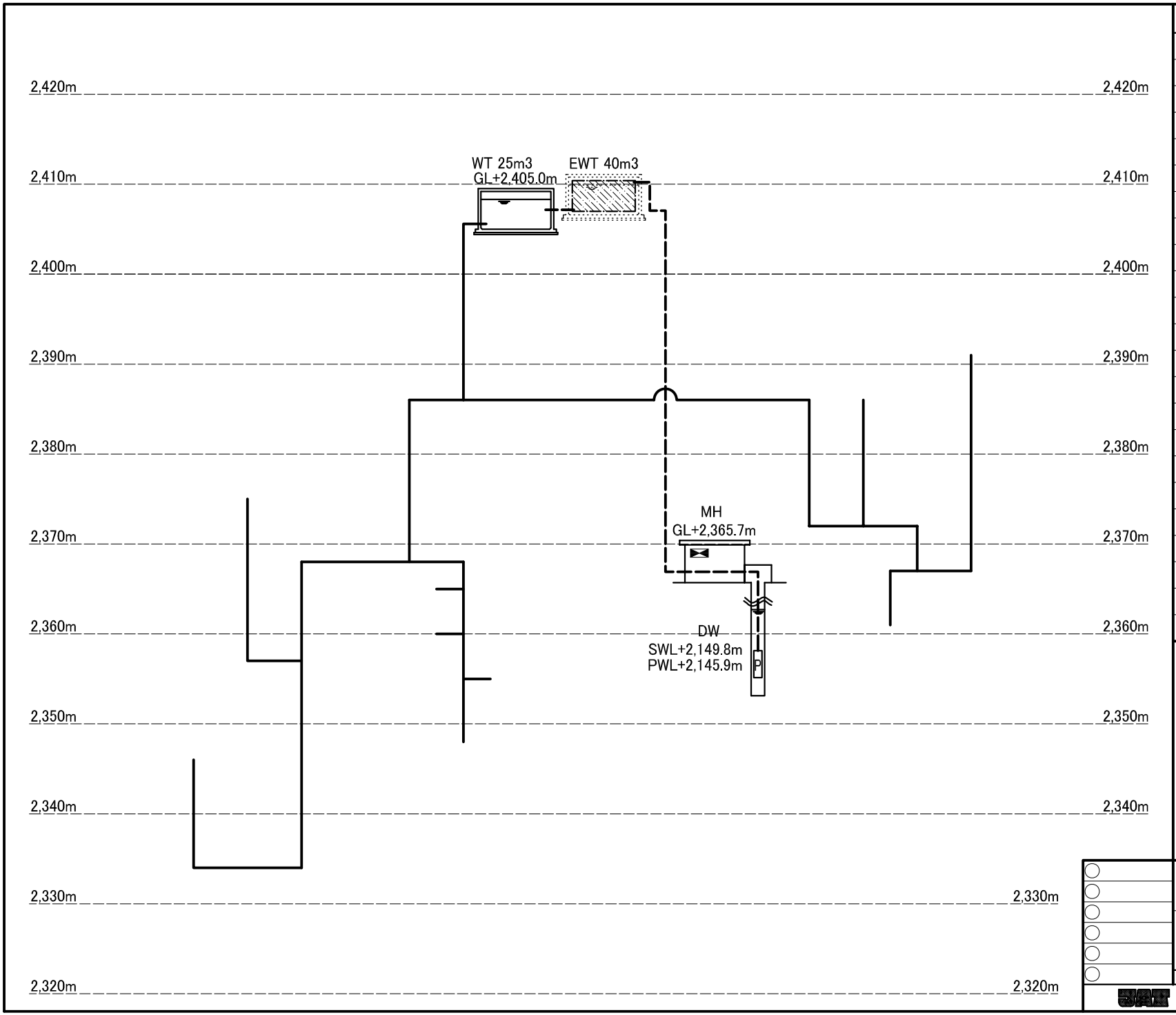
※Distribution pipe is shown only main line.

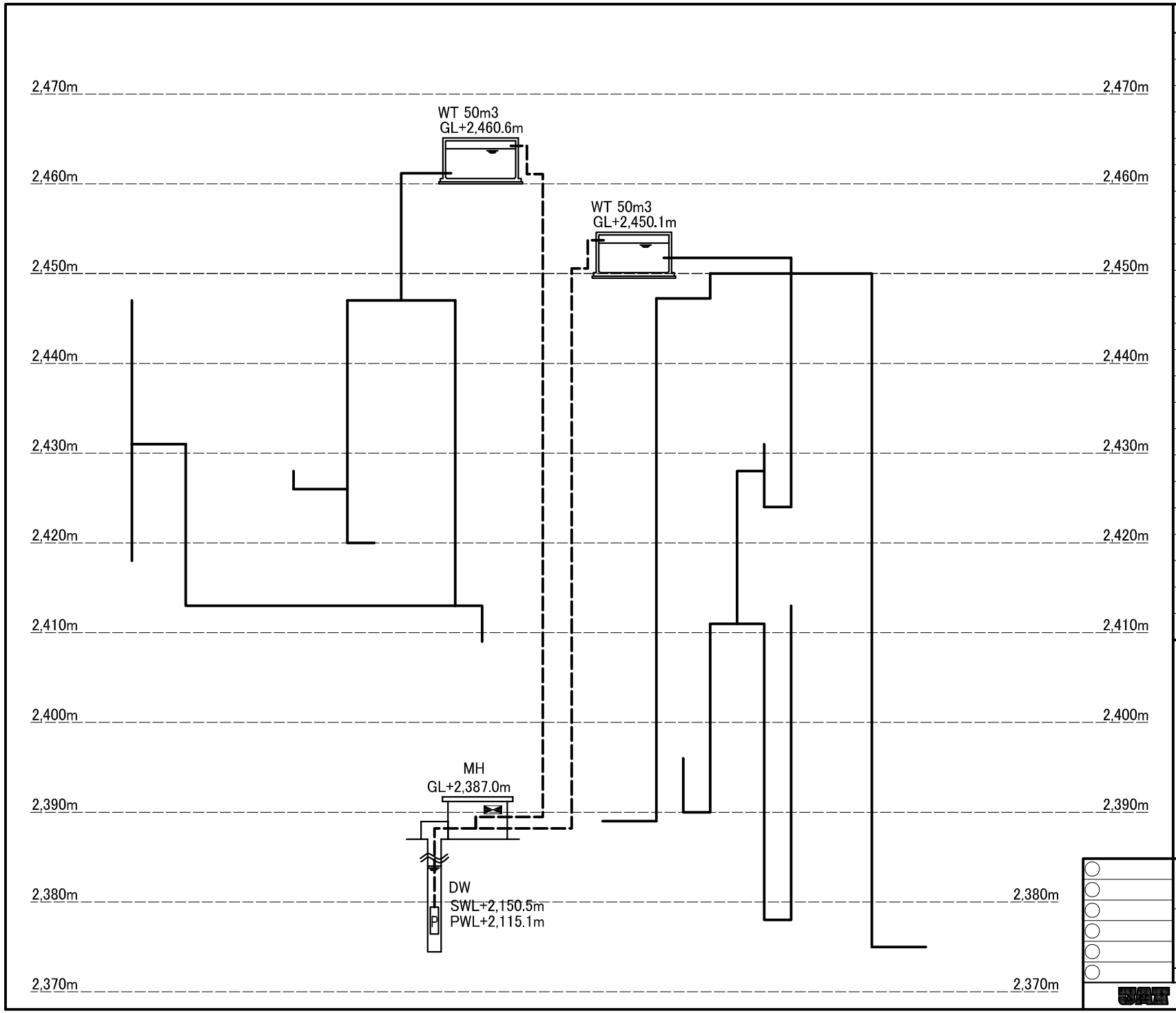
THE PREPARATORY SURVEY
ON THE PROJECT FOR RURAL WATER SUPPLY
IN THE REPUBLIC OF YEMEN

WATER SUPPLY SYSTEM :
S-05 AFESH

– | FIG. 2-37

JICA JAPAN TECHNO


2,420m
2,410m
2,400m
2,390m
2,380m
2,370m
2,360m
2,350m
2,340m
2,330m
2,320m
WT 25m3
GL+2,405.0m
EWT 40m3
MH
GL+2,365.7m
DW
SWL+2,149.8m
PWL+2,145.9m
LEGEND
Pumping and Transmission Pipe
Distribution Pipe
Existing Facilities
Rehabilitation Facilities
Pumping Equipment
Generator
Diesel Engine
Pressure Reducing Facilities
DW Deep Well
WT Water Tank
EWT Existing Water Tank
MH Machinery House
EMH Existing Machinery House
※Distribution pipe is shown only main line.
THE PREPARATORY SURVEY
ON THE PROJECT FOR RURAL WATER SUPPLY
IN THE REPUBLIC OF YEMEN
WATER SUPPLY SYSTEM :
S-07 BAIT AL HADRAMI
-
FIG. 2-38
JAPAN TECHNO



LEGEND

----	Pumping and Transmission Pipe
———	Distribution Pipe
·····	Existing Facilities
—·—·—	Rehabilitation Facilities
P Ⓟ	Pumping Equipment
⋈	Generator
◢	Diesel Engine
▼	Pressure Reducing Facilities
DW	Deep Well
WT	Water Tank
EWT	Existing Water Tank
MH	Machinery House
EMH	Existing Machinery House

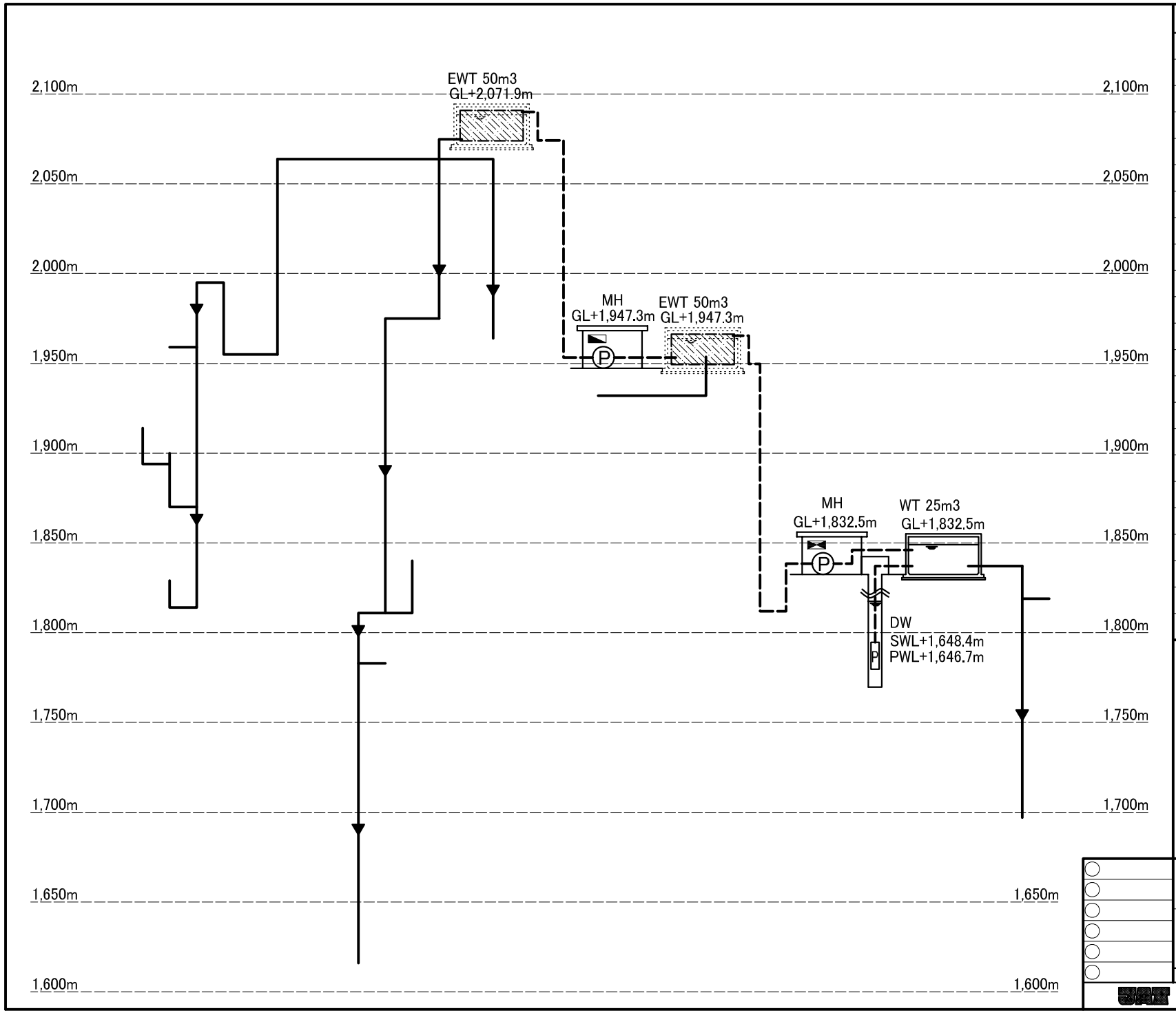
※Distribution pipe is shown only main line.

THE PREPARATORY SURVEY
ON THE PROJECT FOR RURAL WATER SUPPLY
IN THE REPUBLIC OF YEMEN

WATER SUPPLY SYSTEM :
S-09 RUHM

– | FIG. 2-39

JAPAN TECHNO



LEGEND

	Pumping and Transmission Pipe
	Distribution Pipe
	Existing Facilities
	Rehabilitation Facilities
	Pumping Equipment
	Generator
	Diesel Engine
	Pressure Reducing Facilities
DW	Deep Well
WT	Water Tank
EWT	Existing Water Tank
MH	Machinery House
EMH	Existing Machinery House

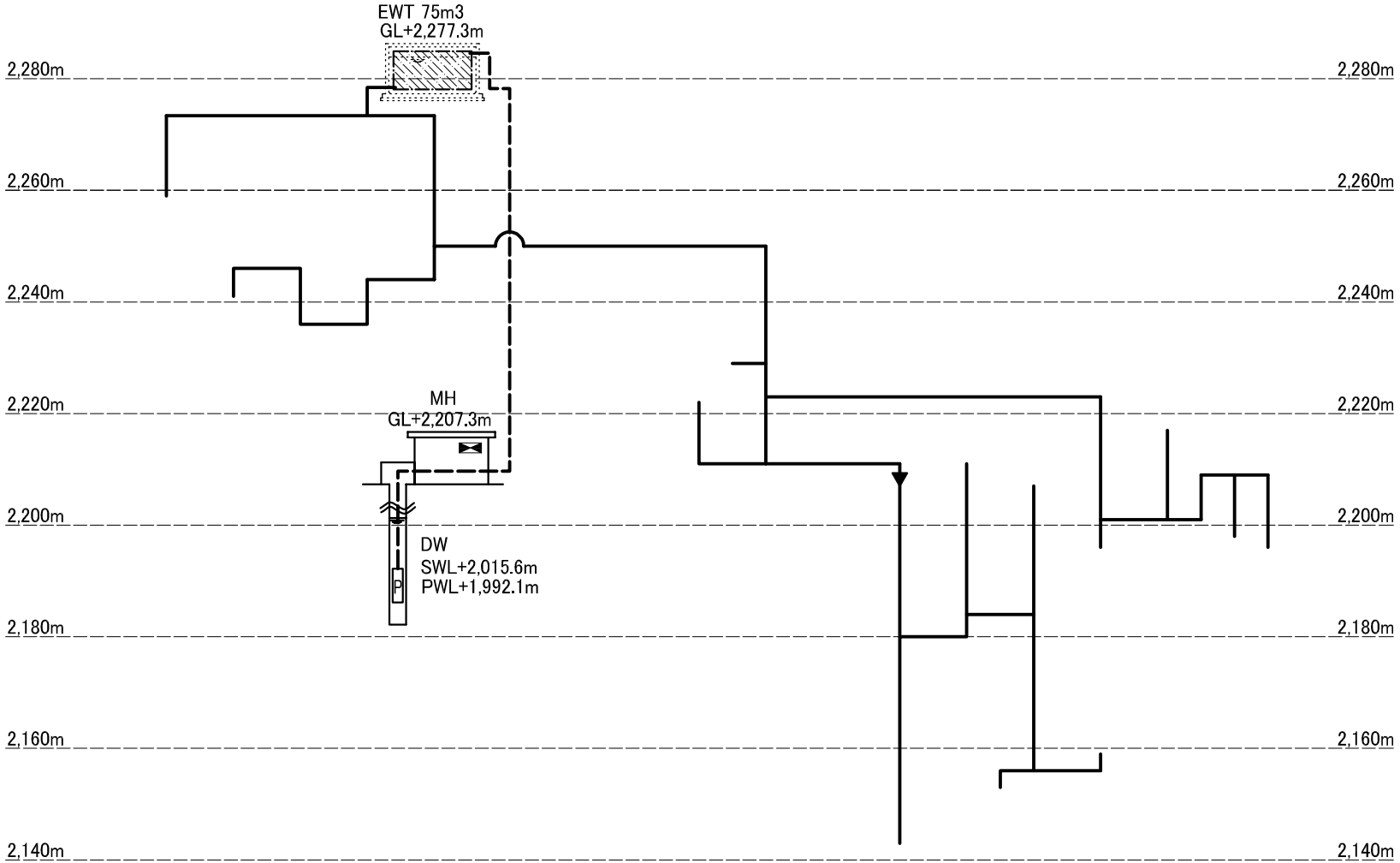
※Distribution pipe is shown only main line.

THE PREPARATORY SURVEY
ON THE PROJECT FOR RURAL WATER SUPPLY
IN THE REPUBLIC OF YEMEN

WATER SUPPLY SYSTEM :
D-01 ELOW AL MIKHLAF

– | FIG. 2-40

JAPAN TECHNO



LEGEND	
	Pumping and Transmission Pipe
	Distribution Pipe
	Existing Facilities
	Rehabilitation Facilities
P	Pumping Equipment
	Generator
	Diesel Engine
	Pressure Reducing Facilities
DW	Deep Well
WT	Water Tank
EWT	Existing Water Tank
MH	Machinery House
EMH	Existing Machinery House

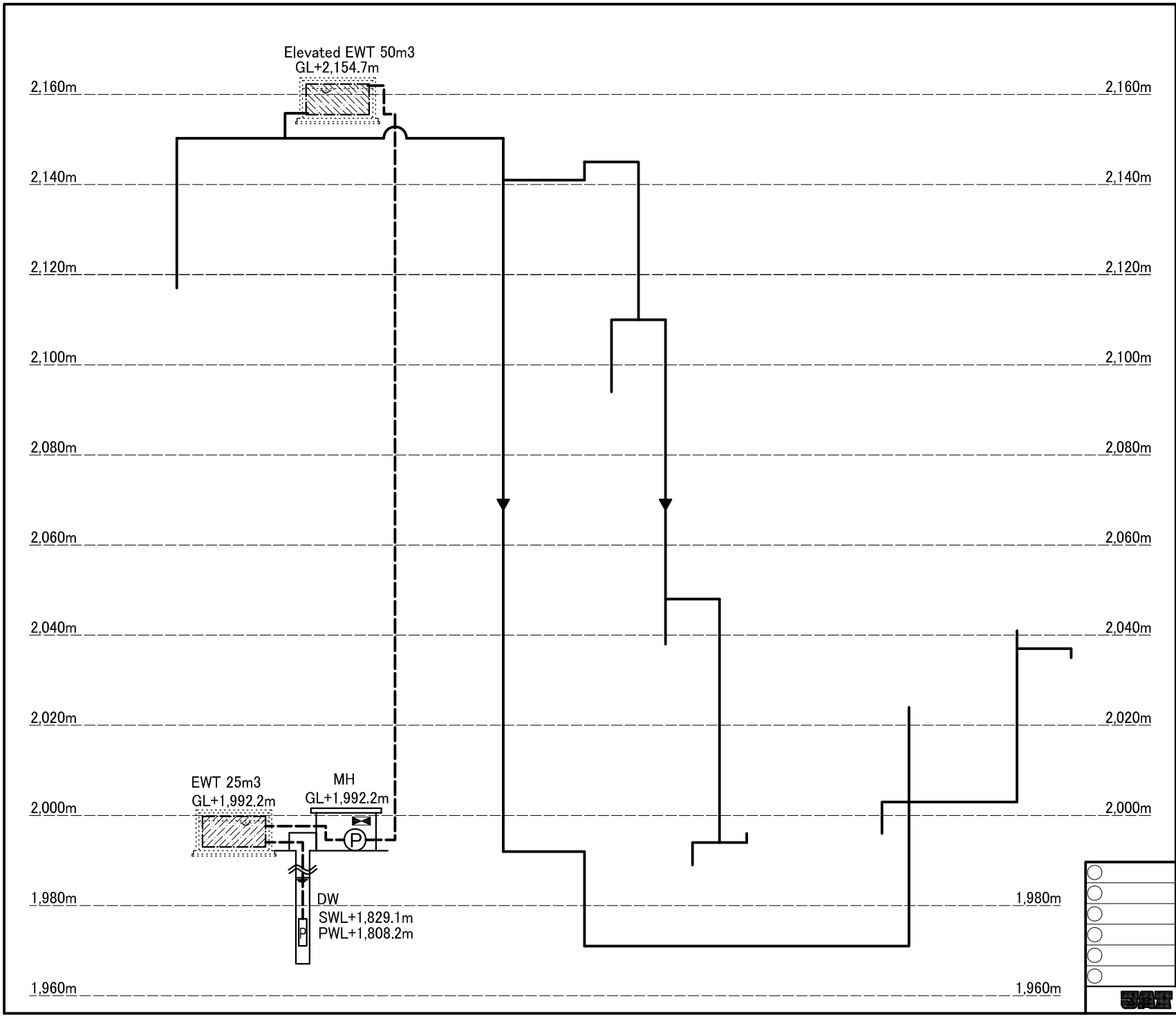
※Distribution pipe is shown only main line.

THE PREPARATORY SURVEY
ON THE PROJECT FOR RURAL WATER SUPPLY
IN THE REPUBLIC OF YEMEN

WATER SUPPLY SYSTEM :
D-02 HAMAL BAIT AL JABAR

– | FIG. 2-41

JAPAN TECHNO



LEGEND

	Pumping and Transmission Pipe
	Distribution Pipe
	Existing Facilities
	Rehabilitation Facilities
	Pumping Equipment
	Generator
	Diesel Engine
	Pressure Reducing Facilities
DW	Deep Well
WT	Water Tank
EWT	Existing Water Tank
MH	Machinery House
EMH	Existing Machinery House

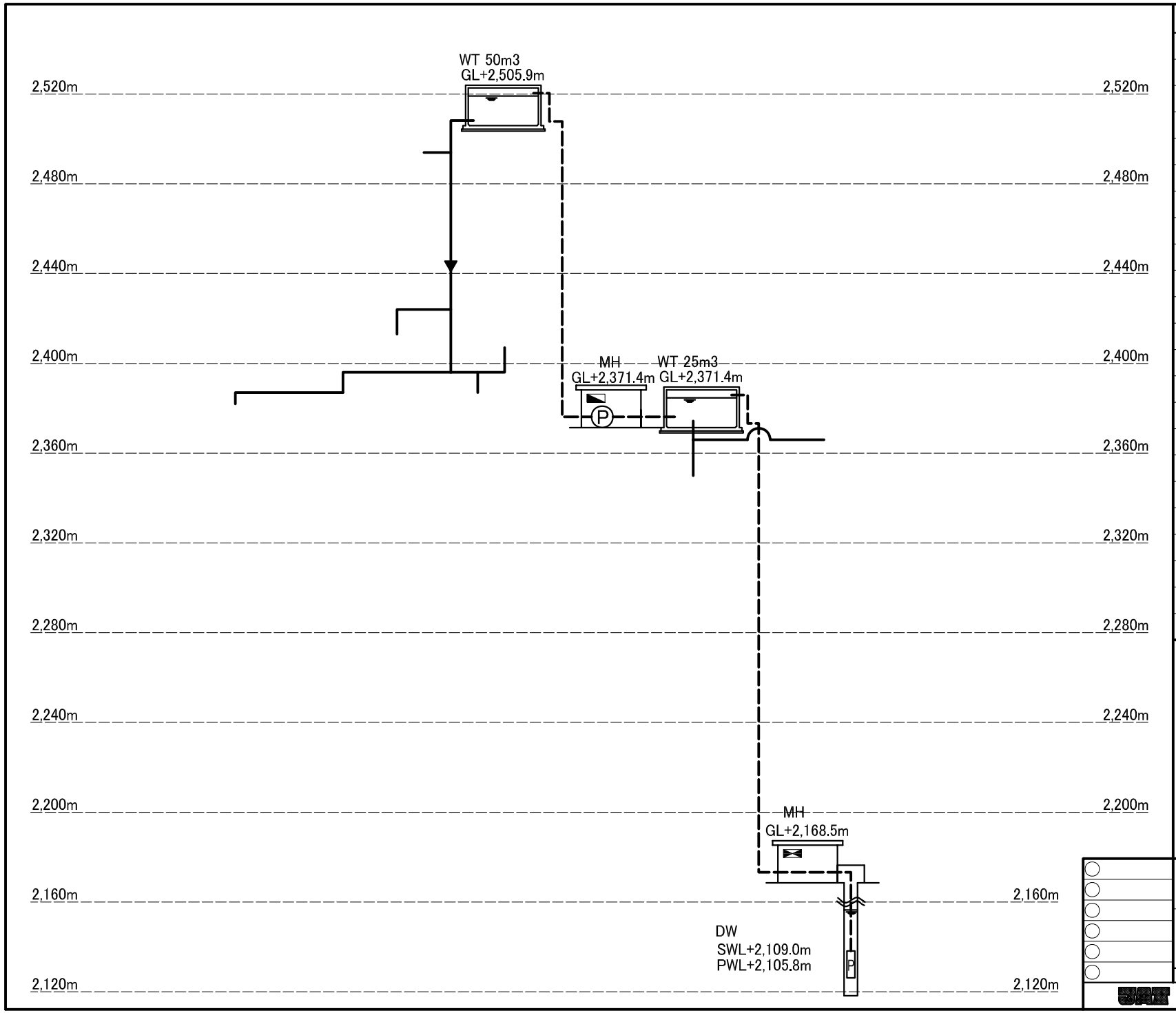
※Distribution pipe is shown only main line.

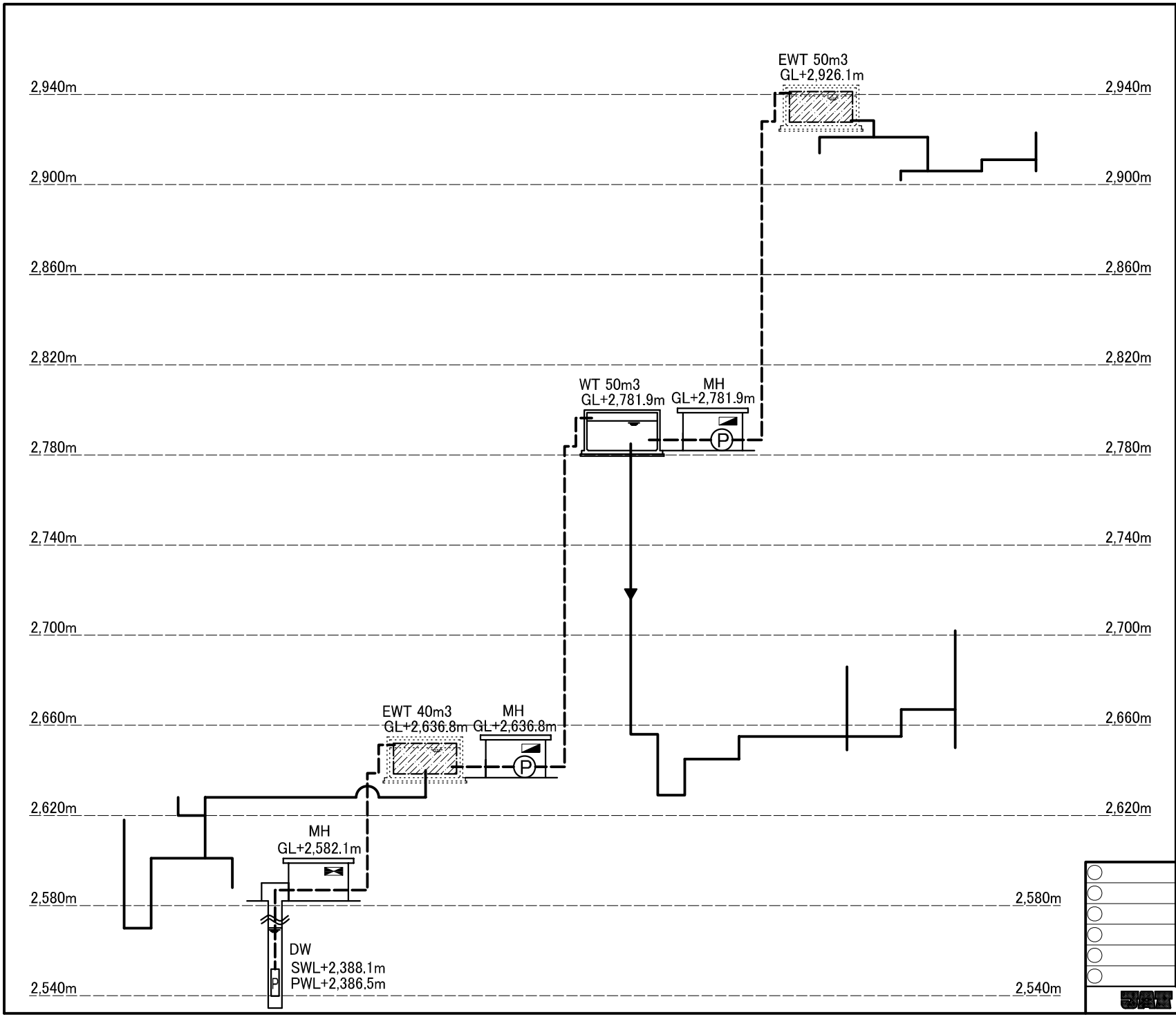
THE PREPARATORY SURVEY
ON THE PROJECT FOR RURAL WATER SUPPLY
IN THE REPUBLIC OF YEMEN

WATER SUPPLY SYSTEM :
D-03 HEGRAT AL A'ASHAM

– | FIG. 2-42

JAPAN TECHNO


WT 50m3
GL+2,505.9m
2,520m
2,480m
2,440m
2,400m
2,360m
2,320m
2,280m
2,240m
2,200m
2,160m
2,120m
MH
GL+2,371.4m
WT 25m3
GL+2,371.4m
MH
GL+2,168.5m
DW
SWL+2,109.0m
PWL+2,105.8m
LEGEND
Pumping and Transmission Pipe
Distribution Pipe
Existing Facilities
Rehabilitation Facilities
Pumping Equipment
Generator
Diesel Engine
Pressure Reducing Facilities
DW Deep Well
WT Water Tank
EWT Existing Water Tank
MH Machinery House
EMH Existing Machinery House
※Distribution pipe is shown only main line.
THE PREPARATORY SURVEY
ON THE PROJECT FOR RURAL WATER SUPPLY
IN THE REPUBLIC OF YEMEN
WATER SUPPLY SYSTEM :
D-05 MAYFA'AT YAER
FIG. 2-43
JAPAN TECHNO



LEGEND

----	Pumping and Transmission Pipe
———	Distribution Pipe
·····	Existing Facilities
—·—·—	Rehabilitation Facilities
P	Pumping Equipment
	Generator
	Diesel Engine
▼	Pressure Reducing Facilities
DW	Deep Well
WT	Water Tank
EWT	Existing Water Tank
MH	Machinery House
EMH	Existing Machinery House

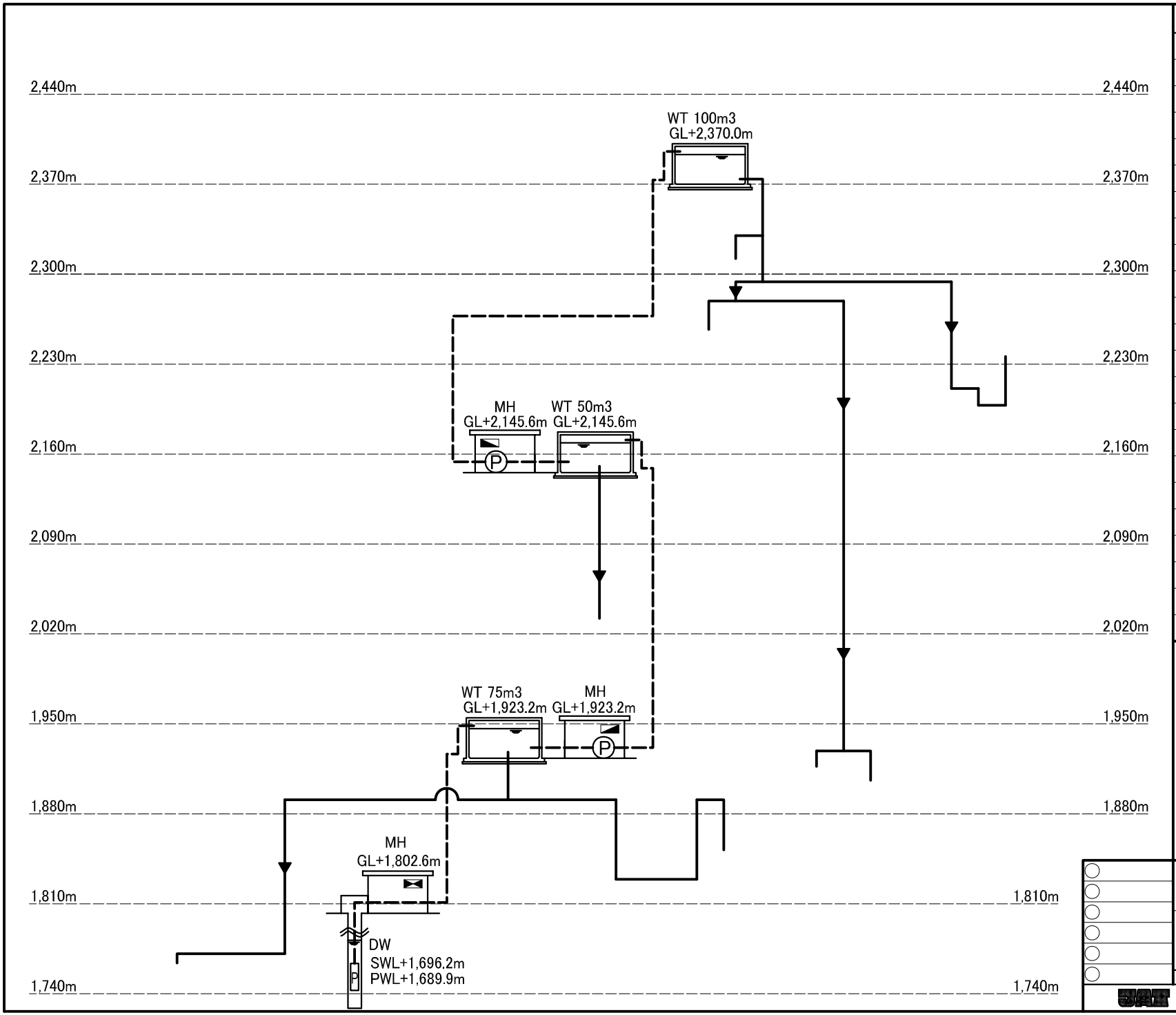
※Distribution pipe is shown only main line.

THE PREPARATORY SURVEY
ON THE PROJECT FOR RURAL WATER SUPPLY
IN THE REPUBLIC OF YEMEN

WATER SUPPLY SYSTEM :
D-07 AL ASAKERA

– | FIG. 2-44

JAPAN TECHNO



LEGEND

----	Pumping and Transmission Pipe
———	Distribution Pipe
·····	Existing Facilities
—·—·—	Rehabilitation Facilities
P	Pumping Equipment
	Generator
	Diesel Engine
▼	Pressure Reducing Facilities
DW	Deep Well
WT	Water Tank
EWT	Existing Water Tank
MH	Machinery House
EMH	Existing Machinery House

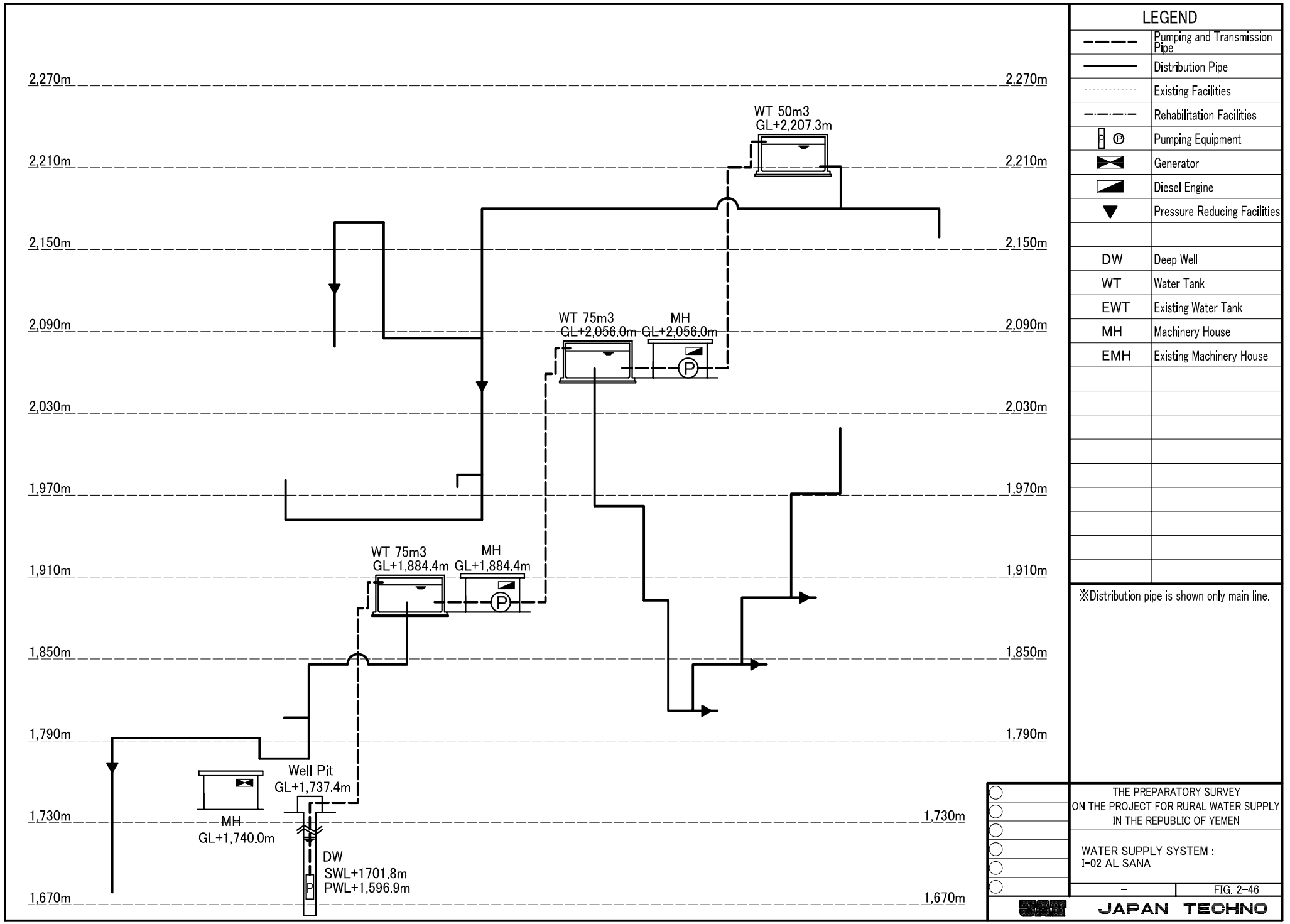
※Distribution pipe is shown only main line.

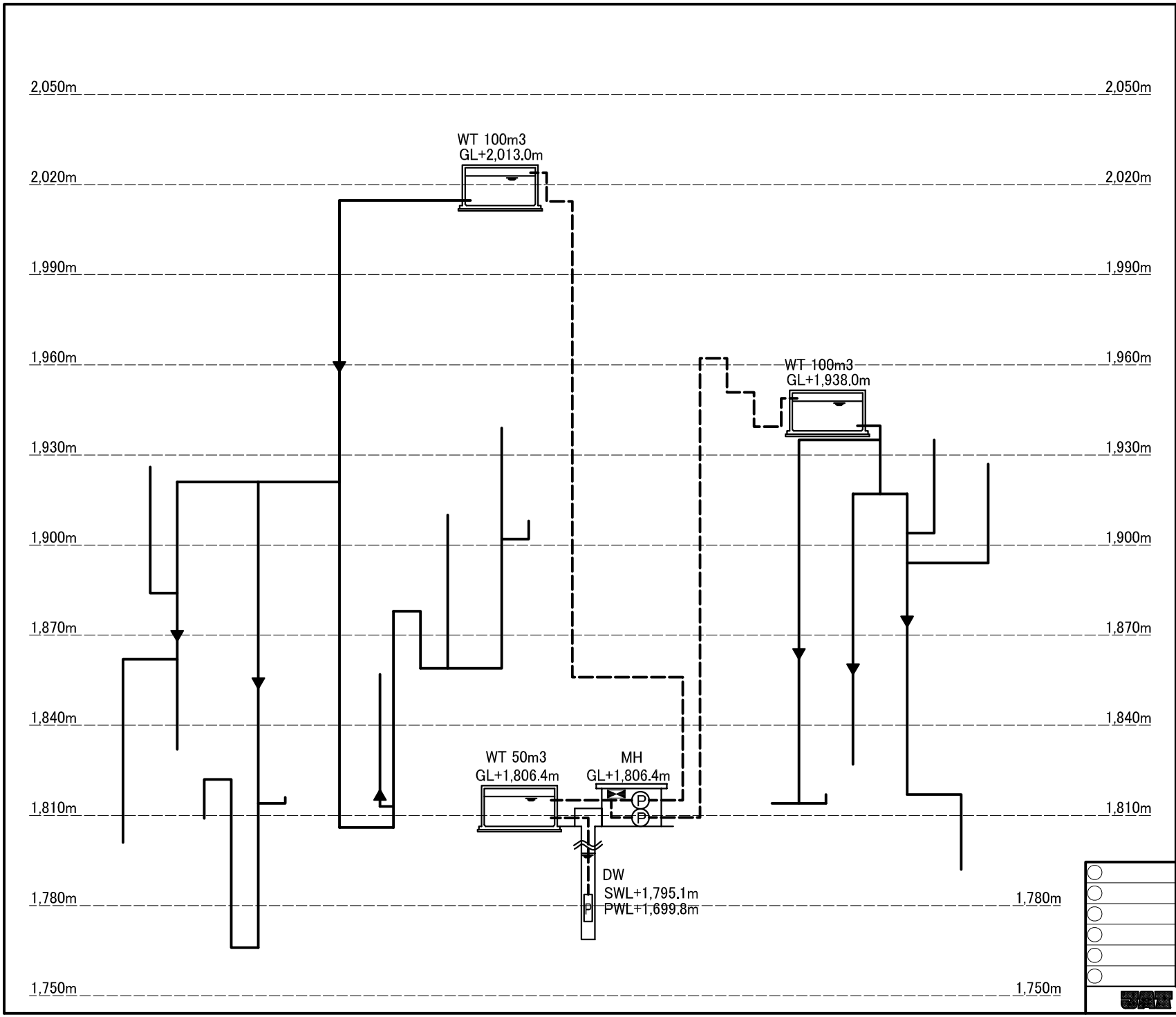
THE PREPARATORY SURVEY
ON THE PROJECT FOR RURAL WATER SUPPLY
IN THE REPUBLIC OF YEMEN

WATER SUPPLY SYSTEM :
I-01 ASFAL BANI SABA

– | FIG. 2-45

JAPAN TECHNO


2,270m
2,210m
2,150m
2,090m
2,030m
1,970m
1,910m
1,850m
1,790m
1,730m
1,670m
WT 50m3
GL+2,207.3m
WT 75m3
GL+2,056.0m
MH
GL+2,056.0m
WT 75m3
GL+1,884.4m
MH
GL+1,884.4m
Well Pit
GL+1,737.4m
MH
GL+1,740.0m
DW
SWL+1701.8m
PWL+1,596.9m
LEGEND
Pumping and Transmission Pipe
Distribution Pipe
Existing Facilities
Rehabilitation Facilities
Pumping Equipment
Generator
Diesel Engine
Pressure Reducing Facilities
DW Deep Well
WT Water Tank
EWT Existing Water Tank
MH Machinery House
EMH Existing Machinery House
※Distribution pipe is shown only main line.
THE PREPARATORY SURVEY
ON THE PROJECT FOR RURAL WATER SUPPLY
IN THE REPUBLIC OF YEMEN
WATER SUPPLY SYSTEM :
I-02 AL SANA
-
FIG. 2-46
JAPAN TECHNO



LEGEND

----	Pumping and Transmission Pipe
———	Distribution Pipe
·····	Existing Facilities
—·—·—	Rehabilitation Facilities
P Ⓟ	Pumping Equipment
	Generator
	Diesel Engine
▼	Pressure Reducing Facilities
DW	Deep Well
WT	Water Tank
EWT	Existing Water Tank
MH	Machinery House
EMH	Existing Machinery House

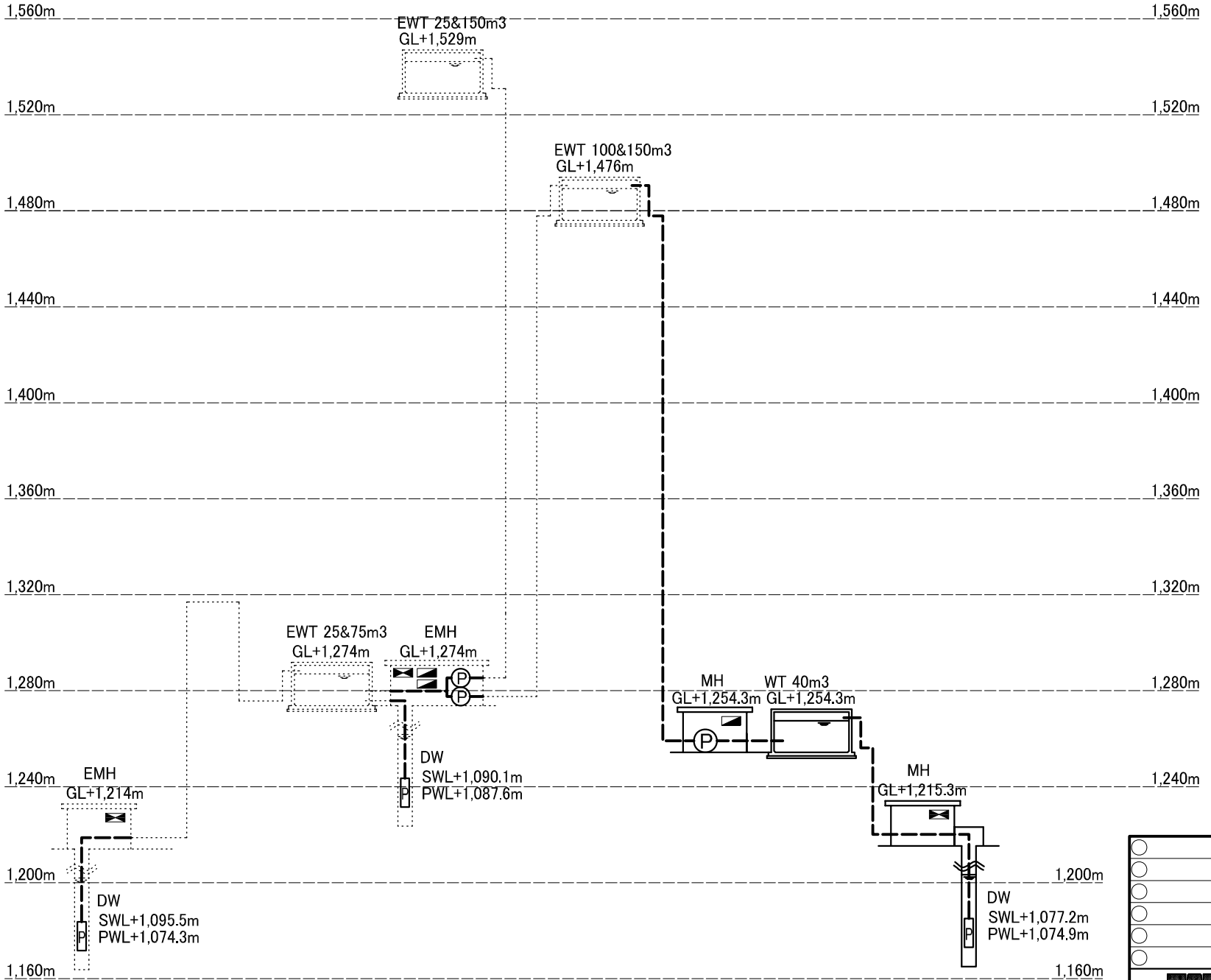
※Distribution pipe is shown only main line.

THE PREPARATORY SURVEY
ON THE PROJECT FOR RURAL WATER SUPPLY
IN THE REPUBLIC OF YEMEN

WATER SUPPLY SYSTEM :
I-04 AL JAHLAH & AL MESHRAQ

– | FIG. 2-47

JAPAN TECHNO



LEGEND

	Pumping and Transmission Pipe
	Distribution Pipe
	Existing Facilities
	Rehabilitation Facilities
	Pumping Equipment
	Generator
	Diesel Engine
	Pressure Reducing Facilities
DW	Deep Well
WT	Water Tank
EWT	Existing Water Tank
MH	Machinery House
EMH	Existing Machinery House

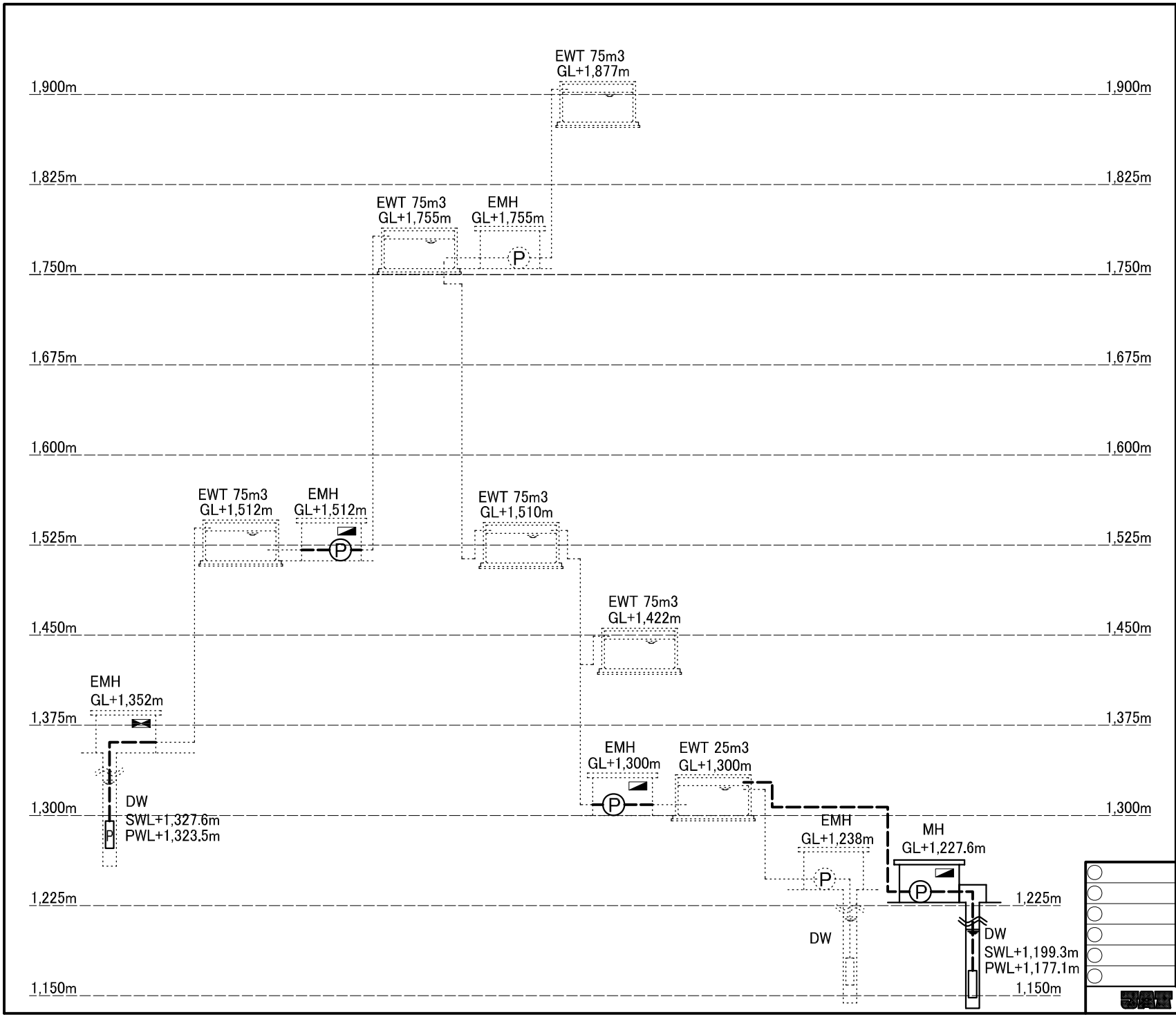
※Distribution pipe is shown only main line.

THE PREPARATORY SURVEY
ON THE PROJECT FOR RURAL WATER SUPPLY
IN THE REPUBLIC OF YEMEN

WATER SUPPLY SYSTEM :
T-02 BANI AL SUROR

– | FIG. 2-48

JAPAN TECHNO



LEGEND

	Pumping and Transmission Pipe
	Distribution Pipe
	Existing Facilities
	Rehabilitation Facilities
	Pumping Equipment
	Generator
	Diesel Engine
	Pressure Reducing Facilities
DW	Deep Well
WT	Water Tank
EWT	Existing Water Tank
MH	Machinery House
EMH	Existing Machinery House

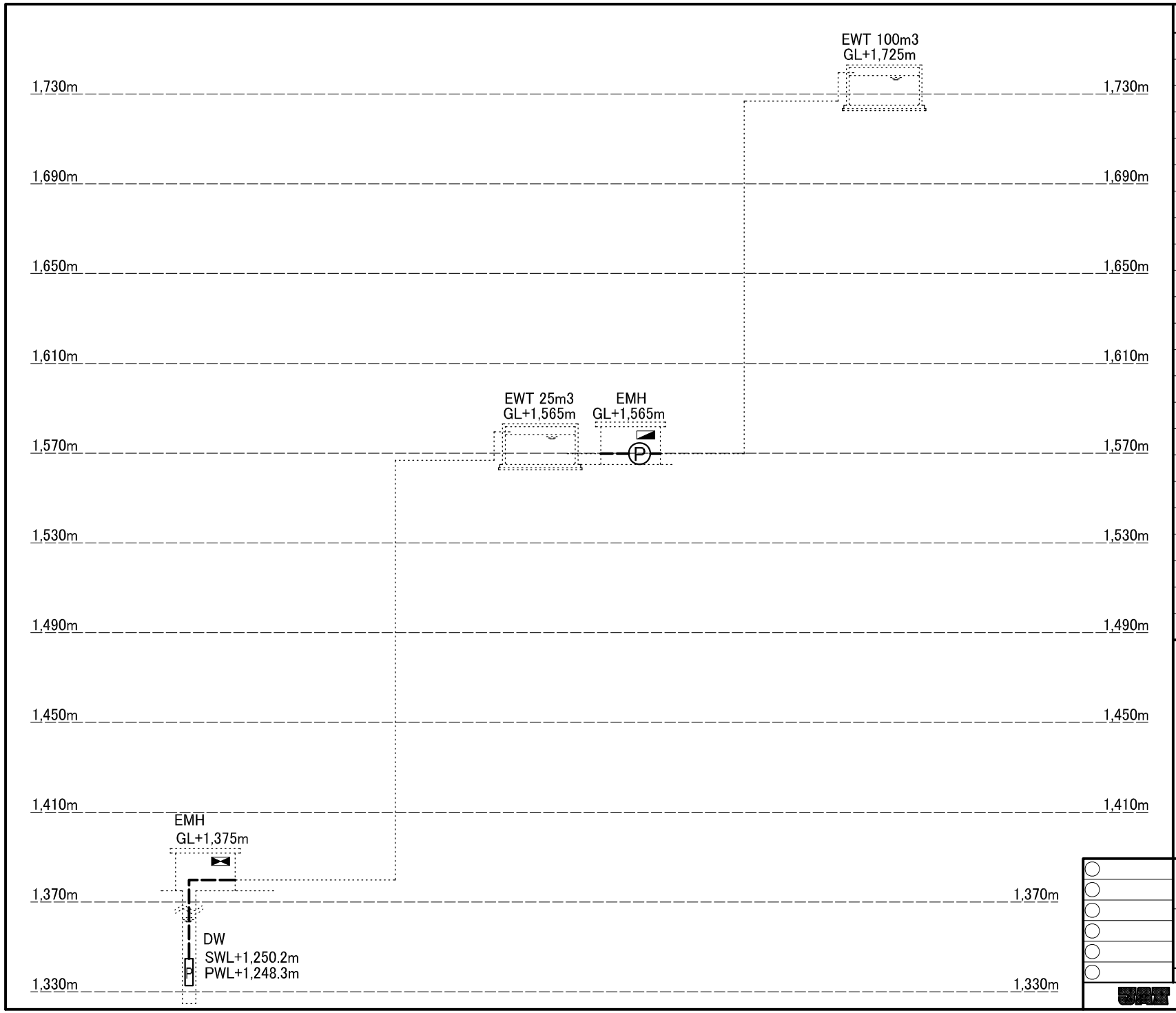
※Distribution pipe is shown only main line.

THE PREPARATORY SURVEY
ON THE PROJECT FOR RURAL WATER SUPPLY
IN THE REPUBLIC OF YEMEN

WATER SUPPLY SYSTEM :
T-03 SHEB HUMRAN

– | FIG. 2-49

JAPAN TECHNO



LEGEND

	Pumping and Transmission Pipe
	Distribution Pipe
	Existing Facilities
	Rehabilitation Facilities
	Pumping Equipment
	Generator
	Diesel Engine
	Pressure Reducing Facilities
DW	Deep Well
WT	Water Tank
EWT	Existing Water Tank
MH	Machinery House
EMH	Existing Machinery House

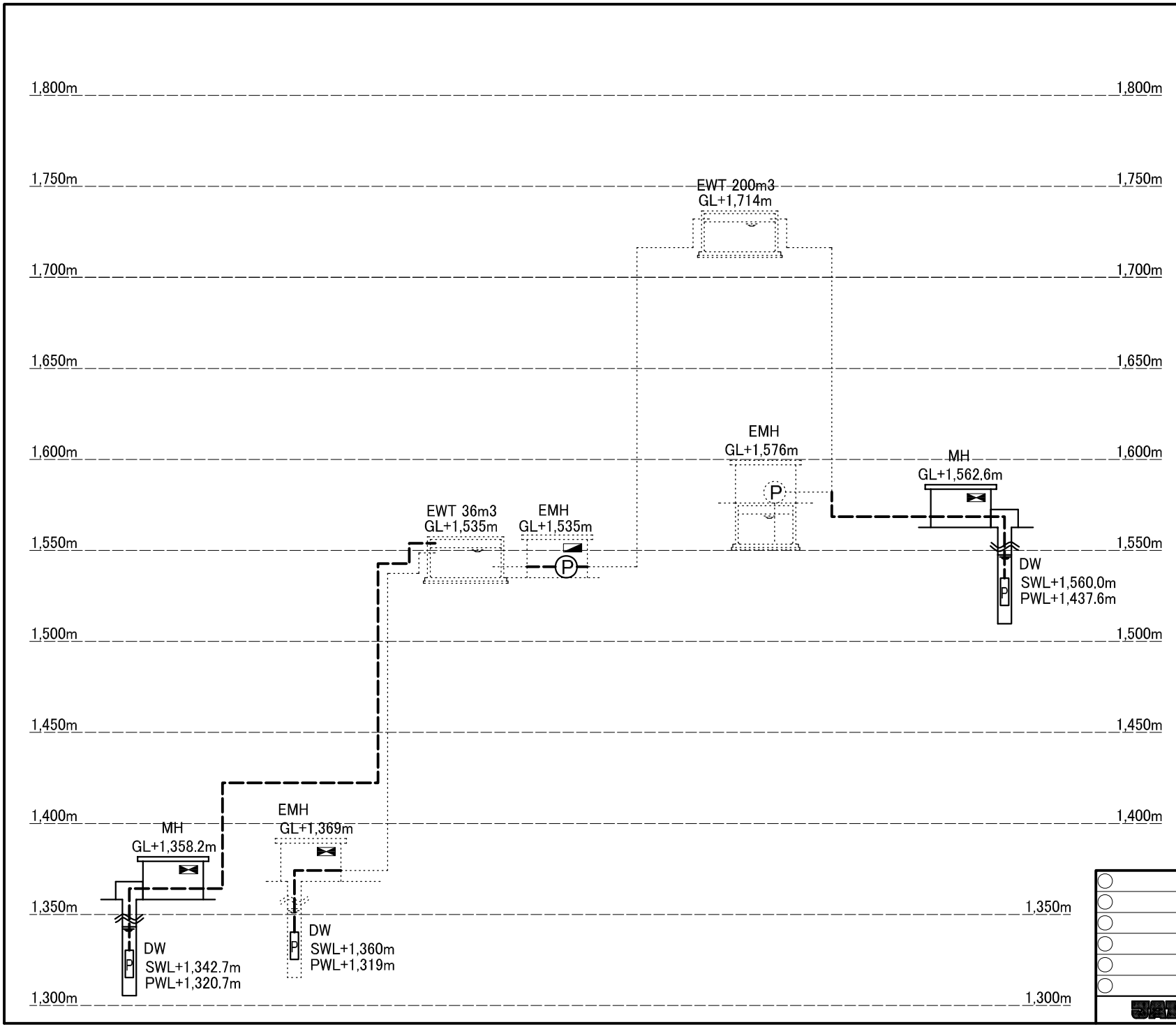
※Distribution pipe is shown only main line.

THE PREPARATORY SURVEY
ON THE PROJECT FOR RURAL WATER SUPPLY
IN THE REPUBLIC OF YEMEN

WATER SUPPLY SYSTEM :
T-04 YAFOQ BANI HAMAD

– | FIG. 2-50

JAPAN TECHNO



LEGEND	
	Pumping and Transmission Pipe
	Distribution Pipe
	Existing Facilities
	Rehabilitation Facilities
	Pumping Equipment
	Generator
	Diesel Engine
	Pressure Reducing Facilities
DW	Deep Well
WT	Water Tank
EWT	Existing Water Tank
MH	Machinery House
EMH	Existing Machinery House

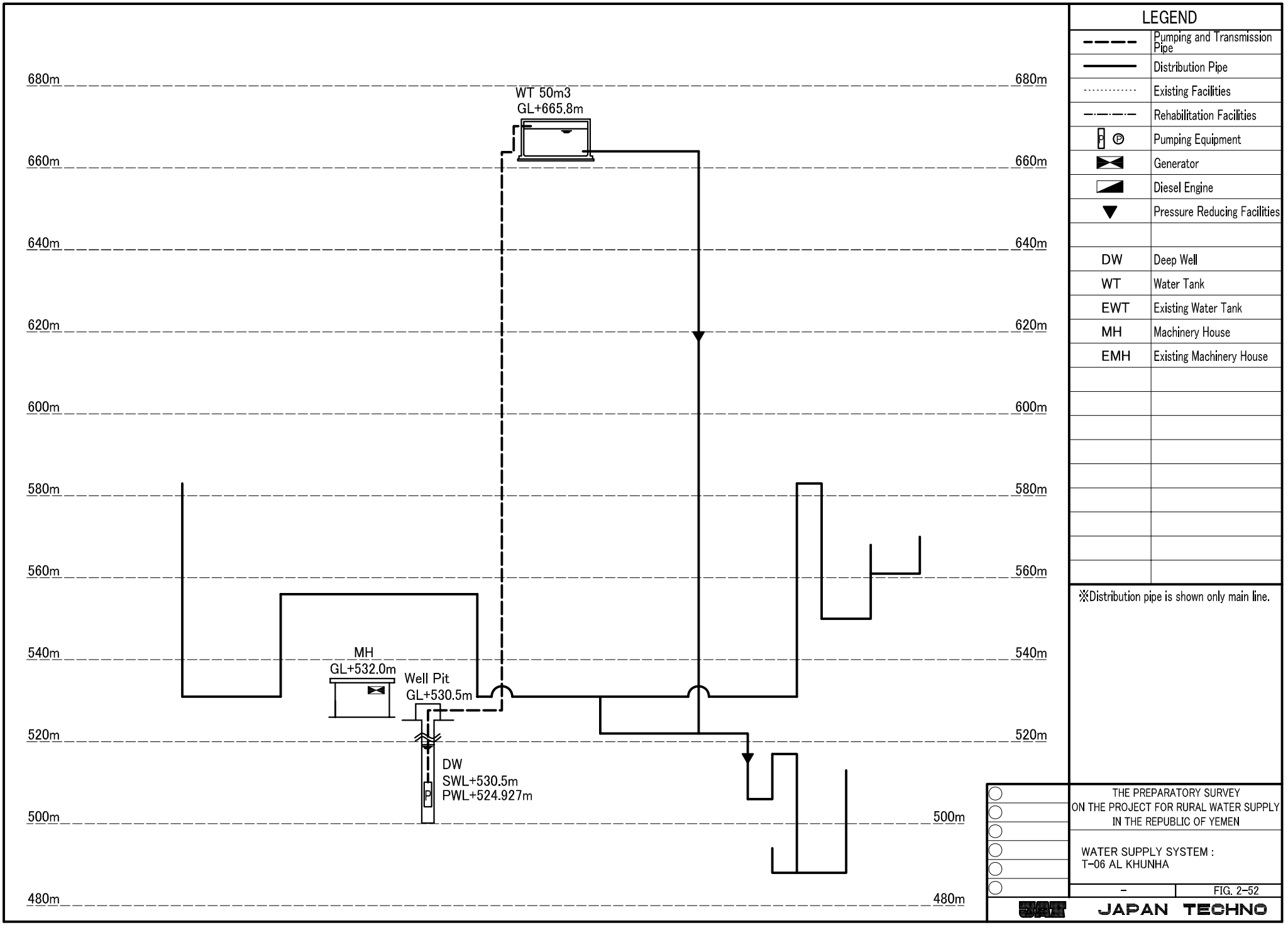
※Distribution pipe is shown only main line.

THE PREPARATORY SURVEY
ON THE PROJECT FOR RURAL WATER SUPPLY
IN THE REPUBLIC OF YEMEN

WATER SUPPLY SYSTEM :
T-05 AL AZAEZ

– | FIG. 2-51

JAPAN TECHNO


680m
660m
640m
620m
600m
580m
560m
540m
520m
500m
480m
WT 50m3
GL+665.8m
MH
GL+532.0m
Well Pit
GL+530.5m
DW
SWL+530.5m
PWL+524.927m
LEGEND
Pumping and Transmission Pipe
Distribution Pipe
Existing Facilities
Rehabilitation Facilities
Pumping Equipment
Generator
Diesel Engine
Pressure Reducing Facilities
DW Deep Well
WT Water Tank
EWT Existing Water Tank
MH Machinery House
EMH Existing Machinery House
※Distribution pipe is shown only main line.
THE PREPARATORY SURVEY
ON THE PROJECT FOR RURAL WATER SUPPLY
IN THE REPUBLIC OF YEMEN
WATER SUPPLY SYSTEM :
T-06 AL KHUNHA
-
FIG. 2-52
JAPAN TECHNO

2-2-4 Implementation Plan

2-2-4-1 Implementation Policy

As this Project will be implemented as a Japanese general grant aid cooperation project, the main contractor will be a Japanese company, which will undertake completely the procurement of equipment and materials and the construction of water supply facilities under the supervision by a Japanese consultant at individual sites within the specified period in accordance with the contract agreement. In making up the implementation plan, it is necessary to take the grant aid cooperation system into full consideration and set up an appropriate project implementation system and the work schedule. The project implementation system in this Project is shown in Fig. 2-53.

The implementing agency for this Project is MWE/GARWSP, which will be responsible for all the processes ranging from the detailed design and construction of the facilities to the operation and maintenance of the facilities. The GARWSP headquarters and the responsible person of its branch office in each Governorate will be responsible for the implementation of the works until the completion of the works and the Water Use Committee to be set up at each site will be responsible for the operation and maintenance of the rural water supply facilities after the completion thereof.

After the both Governments entered into the E/N (Exchange of Notes) and the Grant Agreement (G/A) signed between the Yemeni Government and JICA, the consultant from Japan assigned to this Project will be recommended by JICA to the Government of Yemen. After that, the recommended consultant will conclude the Agreement with the implementing agency concerning the support in preparing the tender documentation, the tendering procedure, and the supervision of procurement and implementation. Based on the tendering and its results, the contractor will be selected.

2-2-4-2 Implementation Conditions

The construction of facilities and procurement of equipment and materials in this Project will be executed in accordance with the following conditions:

1) The supervision system for this Project will be organized by one resident supervisor of the consultant from Japan and the local engineers as many as possible assigned to this Project in order to maintain a given level of construction quality and execute the works efficiently

without delay at the target sites that are distributed in a wide range in Yemen. In addition, the work districts will be concentrated as much as possible within a given area to perfectly supervise the works at each site, so that any unexpected problem or trouble can be coped with by the Japanese and local supervisors quickly.

2) The accesses to each target site and the road conditions will be confirmed accurately and the detailed work schedules will be formulated.

3) The works in the rainy seasons will be done taking into account a dangerous flash flood that may occur in a wadi.

4) It is a custom in Yemen that they take the vacation for about one month during the Ramadhan period, but the works will not be suspended during this period, but will be continued to make progress in a slower pace.

5) In using the materials to be locally procured, the quality and the supply capacity of those materials will be fully checked for stable procurement.

6) In recent years, there is a fear that the security conditions in Yemen is getting more serious. In close communications with the Government of Yemen, the up-to-date security information will be acquired at all times. An appropriate safety measure will be taken, eventually by requesting a policeman in Yemen to accompany the engineers going to a site for supervising the work.

7) In this Project, it is considered that no materials containing asbestos will be adopted or procured for the plans and works of construction of facilities. This is the same for procurement of equipment, which shall not contain asbestos. In this Project, it is planned to rehabilitate or modify the distribution reservoirs and machinery houses, which shall not contain asbestos.

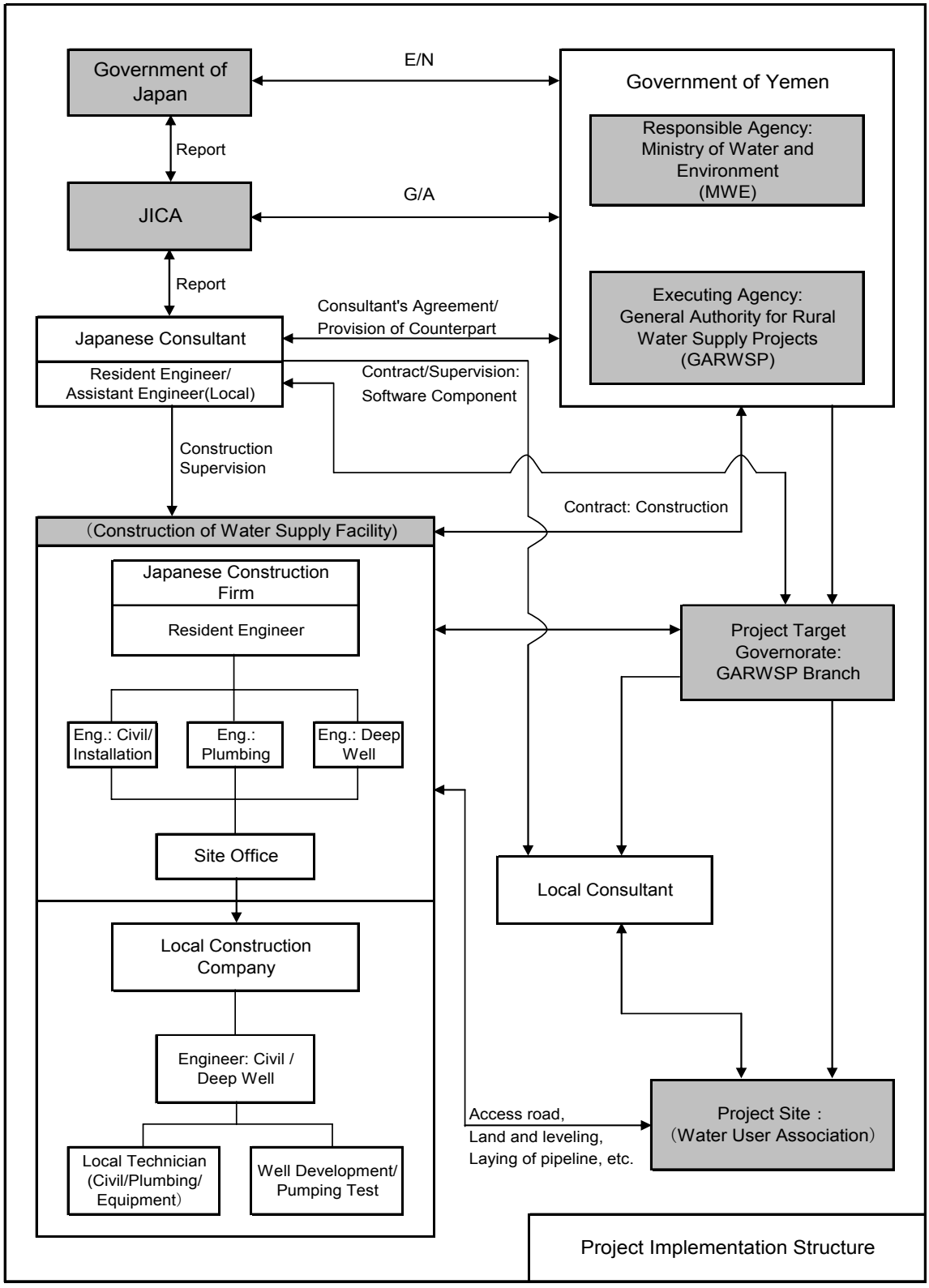


Fig. 2-53 Project Implementation Structure

2-2-4-3 Scope of Works

The scope of works in this Project that the Yemen side and the Japan side will share will be described below.

(1) Responsibilities of Yemen side

1) For construction of water supply facilities
   ① Acquisition and leveling of the land for deep wells, machinery houses and distribution reservoirs for construction of water supply facilities
   ② Construction and rehabilitation or eventual expansion works of access roads to target sites
   ③ Transportation of piping materials in areas which is not dangerous to the villagers.
   ④ Acquisition and leveling of the land for base and sub-base camps.
   ⑤ Provision of counterpart personnel to be assigned to the construction works
   ⑥ Installation of house connection pipes and water meters (materials and labor) from the distribution main.
   ⑦ Sustainable operation and maintenance of the constructed water supply facilities

2) Soft components
   Of the soft components, the costs of activities for which the Yemen side is responsible, the acquisition of personnel and their per-diems will be borne by the Yemen side. The details will be described later on.

For others than the above scope of works to be shared by the Yemen side, refer to Chapter 3. "Obligations of Recipient Country"

(2) Responsibilities of Japan side

1) For construction of facilities
   Construction of water supply facilities at 19 sites in Al Mahweet, Sana'a, Dahmar, Ibb and Taiz Governorates.

2) For soft components
   To organize the water user association at each target site and make the hygiene education activities for the target communities.

In this Project, the construction under the Japanese side will be until the main distribution pipe. As mentioned above, the house connection and water meter shall be under the Yemeni side responsibility.

2-2-4-4 Consultant Supervision

This Project will be implemented as a general grant aid cooperation project, and the consultant company from Japan will undertake all the processes from the detailed design to the supervision of the works to be executed. The items of these works are shown in the next table.

Table 2-12 Items of works by Japanese consultant

1.	Detailed design	Detailed design study Preparation of tender document Support the tendering procedures Evaluation of tendering results Support of contracting
2.	Construction/ procurement stages	Work supervision Preparation of reports, etc.

In the detailed design study, the consultant will confirm the conditions of each target site. In particular, it is necessary to request the implementing agency and the Governorate office at each site for their cooperation in negotiating with the local residents at each site to obtain their acceptance to ensure that no land problem occurs regarding the construction of the facilities (deep wells, machinery houses, reservoirs and pipeline routes) during the construction work. As the result of the detailed design study, the tender documentation will be prepared and the tender date will be determined through the discussions with the related agencies. In the tendering procedure, the consultant will act for the implementing agency to do the tender and assess the results of biddings, as well as support the activities for the contracts between the implementing agency and the selected constructor.

In the construction stage, the consultant will appoint one supervising resident engineer in charge of supervision work in Yemen for the integrity of all the works in this Project, who will make the supervision of the work quality, schedule and safety in making coordination with the related agencies including the implementing agency. The supervision of pipeline routes, construction of facilities and rehabilitation works will be undertaken by the resident supervising engineer and the assistant engineers locally employed. In the soft component activities, the resident supervising engineer and the personnel in charge of operation and maintenance will make spot

supervision at each site. The consultant personnel engaged in the detailed design study and work supervision and items of such activities are shown in Table 2-13 and in Table 2-14.

Table 2-13 Consultant personnel for detailed design study

Personnel	Description of activity (Detailed Design)
Project Manager(PM)/ Water Supply Plan	The Project Manager will take the lead in this Project to control the discussions with the implementing agency, the detailed design study (final verification study) at each site, the preparation of tender documentation, the checking of local documents, and the tender supervision. In addition, the PM will make up the final water supply plan including the water supply range, facility scales and facility design standards, and acquire the approval by the implementing agency.
Facility Design	The Design Engineer will assist the PM and make the final verification of the layouts of the water intake/distribution reservoir, main pipeline route and public taps, and make the detailed design of each facility. The Design Engineer will prepare the tender documentation (including the design drawings and the specifications) based on the facility design and supervise the tender (technical assessment).
Groundwater development	The Groundwater Development Engineer will make the water source deep well study, the deep well cleaning and the pumping test except for 7 deep wells that are used at present. The Engineer will also make the analysis of the pumping test results of the deep wells in which the lowering of the water level is concerned, and of the existing water source data. He will also make the field reconnaissance surveys to determine the appropriate pumping rate and pump installation depth at each site.
Cost Estimations/ Procurement Plan	Will be responsible for the study of checking the distribution conditions of locally available equipment and materials, the prices of those equipment and materials, the detailed design estimation work and the work of checking the equipment and material procurement plan, and also for the preparation of the tender documentation.
Construction Plan/ Tender Documentation	Will formulate the detailed construction plan based on the field surveys and assist in facility design for the layout of water intakes/distribution reservoirs, main pipeline routes and public taps, and prepare the detailed design of each facility and tender documentation (design drawings and specifications).

Table 2-14 Main works of main personnel engaged in work supervision

Personnel	Description (Work Supervision)
Resident Engineer (Supervisor)	・The Supervisor will be stationed in Yemen in the construction/rehabilitation stage to make the supervision of the works and procurement of equipment and materials at sites. ・In addition, will supervises all the activities including the regular reporting to the implementing agency, the regular meetings with contractors, the quality and safety control during the construction period and also the regular reporting to Tokyo.
Groundwater Development (Spot Supervision)	・Will be dispatched to Yemen in the initial stage of the construction works to make the supervision of the cleaning of deep wells, the pumping test and water quality test at each deep well. ・Will also determine the appropriate pumping rate at each deep well based on the above test results, check the deep well pump specifications and finally determine the pump installation points.
Facility Design (Sport Supervision)	・Will be dispatched to Yemen one year after the hand-over based on the commissioning test results in order to make inspection of any faults in this Project. ・He will wrap up the inspection results and report on them to the related agencies including the implementing agency.
【Local Employment】	
Assistant supervisor (Civil Work)	The assistant supervisor will be divided into 2 groups to assist mainly in the supervision of civil works to be done simultaneously at 5 sites at maximum.
Assistant Supervisor (Plumbing Work)	The assistant supervisor will be divided into 2 groups to assist mainly in the supervision works for the piping works to be done at 5 sites at maximum.

2-2-4-5 Quality Control Plan

The quality control method of construction works, material and equipment is as described below.

1) Quality control and confirmation of material and equipment

The materials and equipment expected to be used in this Project, such as cement, concrete block and aggregates can be found locally, and steel materials are imported.

Therefore, for the quality control, the following procedure will be taken:

a) The in charge staff for procurement from the Contractor, will purchase the equipment and materials, after the confirmation on the quality.
b) When the material and equipments arrives at the site, the civil and construction engineer of the Contractor will inspect those products.
c) The resident engineer of the Consultant, will inspect those products before the construction, placement and installation.
d) The Contractor will submit to the Consultant all the relevant data and result of factory tests of the equipment and materials for the quality control purpose.

2) Concrete works

The compressive strength test for concrete works of the facilities is as shown in the following table.

Table 2-15 Number of Concrete Compressive Strength Tests

Facility	Areas Subject to Testing	Number of Tests
Reservoir	Foundation, Base plate, Side walls, Top plate	3 times (3 samples each time)
Machinery Room	Foundation, Pillars	2 times (3 samples each time)

Concrete will be mixed on site because most facilities are located in mountainous areas which have difficult access. Blending and measurement of concrete will be done manually and a portable mixer will be basically used for mixing. A slump test and a chloride concentration test will be conducted for the concrete which is mixed on site. And, regarding aggregates, a sieve analysis test and a density test will be conducted per batch.

3) Reinforcement work

As for the quality control of reinforcement placing works, the prime contractor will be requested to submit the followings:

(1) Class, type and manufacturer' name of reinforcing steel
(2) Certificate of quality (mill sheet) or certificate of a tensile test

4) Piping

Inspection of the piping material including joints and valves will be performed by visual inspection and/or trial joining in all numbers. After pipe laying, a hydraulic pressure test will be conducted to check if there is any leakage. Particularly, special attention is

required to ensure to get the certificate of origin and the certificate of quality because it is planed under this project to use high-pressure pipes which are not well marketed in Yemen.

2-2-4-6 Procurement Plan

As above-mentioned, it is the policy of this project that construction and improvement works of the water supply facilities will be carried out by procuring construction material and equipment locally or from third countries unless there is any problem about quality and/or quantity. As a result of investigation for procurement of the material and equipment, it has been found that cement, concrete blocks and aggregates are locally produced. The places where the main material and equipment for this project will be procured are as shown in the table below.

Steel pipes and high-pressure pipes for water supply which are main piping material, power generators and pumping equipment are not locally produced, however, imported products from neighboring countries are locally circulated. Procurement of such products for similar projects supported by other donors is also done by obtaining locally-marketed products or through dealers in Yemen.

Table 2-16 Classification of material and equipment procurement origin

Material and Equipment	Procurement Origin			Remarks
	Yemen	Japan	Third Country	
[Construction Material and Equipment]				
Cement, Aggregates, Concrete Blocks, etc.	○			
Fine Aggregates	○			
Reinforcing Steel	○		○	While locally-made products will be considered, procurement of imported products and/or procurement in third countries are anticipated because there is no factory
Power Generators	○	○	○	
Pumping Equipment	○	○	○	

Steel Pipe, High-pressure Pipes, Valves, Accessories, etc.	○	○	○	or only a limited number of factories which can manufacture these material and equipment in Yemen.

2-2-4-7 Soft Component (Technical Assistant) Plan

In order to achieve the project purpose of this project, "Safe and sustainable water is supplied to the residents of the Project area (19 sites in 5 Governorates).", it is important that not only maintenance of water supply facility (Construction of new water supply facilities and Rehabilitation and expansion of existing water supply facilities) , but also operation and maintenance system for water supply facilities is adjusted and those facilities is running sustainably.

Also, in the project for rural water supply in Yemen, it is requested to conduct establishment of WUA and corporate registration to Local Authority for the purpose of implementing operation and maintenance of water supply facilities by the residents in the target sites independently.

Furthermore, the Study and this Project implemented the investigation concerning the target sites in the project for the community associations with running or not-running water supply facility. As the result of this survey, the situations on operation and maintenance of the existing water supply facilities are cleared as follows:

(1) Critical successful factors / unsuccessful factors on Operation and Maintenance

[Critical Successful Factor]

a Progress of Accountability (Account and Decision-making) for facility users
  - Community election for Executive Committee members of WUA
  - Preparation for bylaws/regulations, registration of organization and accounting report to users
  - Decision of important matters in General Assembly of users

b Effective and financially sound operation and maintenance of facilities

c Equipment of water meter and save of financially necessary income according to introduction of a setup of water charge at a metered rate

[Critical Unsuccessful Factor]

a Patripotestal management System by village head

b Shortage of financially necessary income due to a setup of water charge at low level

(2) Necessity for establishment of process on community-based decision making

For the facility to be planned in this project, 1) operation at the proper pumping discharge and 2) prohibition of new groundwater development in the intervention range are preconditions of the project. Therefore, community association is obligated to keep those conditions responsibly.

However, there are some sites where organized operation and maintenance is not still conducted due to patripotestal management system by village head or where ownership by residents concerning operation and maintenance system is low due to ownership is owned by village head. In such case, it is necessary to establish decision making process by residents mainly in order to meet the above preconditions responsibly.

(3) Necessity for activities to increase awareness on water and sanitation for effective use of sustainably safe water effectively through the water supply facilities constructed / rehabilitated in the project

In order that residents in the sites utilise safe and sustainable water effectively through the maintained water supply facilities, it is necessary for them to prepare for knowledge, attitude and habit on sanitation. Therefore, the improvement of their awareness and habit concerning sanitation should be promoted.

Under such situations, it is justified appropriate to implement soft component (technical assistant) for the purpose of establishment and maintenance of sustainable operation and maintenance system by WUAs, consists of mainly residents in sites, which were established in all the target sites in order to achieve the project purpose. Soft component (technical assistant) plan will be mentioned at the appendix.

2-2-4-8 Implementation Schedule

This project will be executed as a grant aid project and the execution schedule are as follows:

1) Detailed design
   (1) Exchange of Notes (E/N)
   (2) Grant Agreement (G/A)
   (3) Consultant Agreement
   (4) Detailed design study and soft component
   (5) Preparation and approval of tender documents

2) Construction works
   (1) Exchange of Notes (E/N)
   (2) Grant Agreement (G/A)
   (3) Consultant Agreement
   (4) Tendering and signing of contract with selected Contractor
   (5) Construction of water supply facilities and soft component
   (6) Completion and hand-over

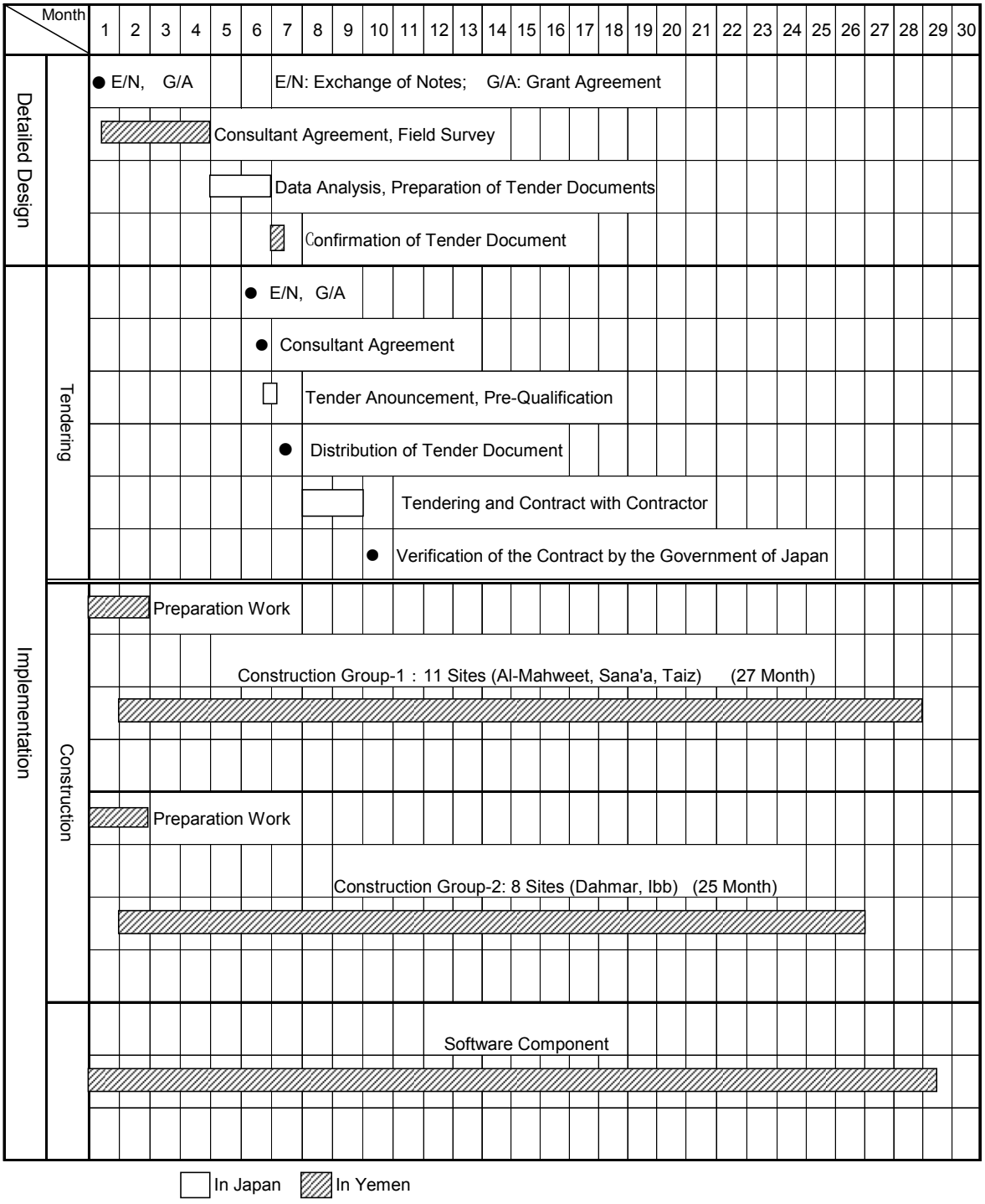
The implementation processes of this project require 6 months for detailed design and 33.5 months for bidding-related works, improvement of deep wells, installation/improvement of pumping and water-conveying equipment, construction/improvement of machine rooms, construction/improvement of distribution reservoirs, and laying and improvement of pipes for the main works. The envisioned work schedule at present is as shown in the table below.

Table 2-17　Work schedule

i.	Signing on E/N (detailed design), Signing on G/A, Consultant contract, Detailed design, BD/DD comparison, Preparation of bidding documents	6.5 months
ii.	Signing on E/N (main works), Signing on G/A, Consultant contract, Bid announcement, Bidding-related works, Signing on with contractors, etc.	3.5 months
iii.	Water source works, Machine rooms, Distribution reservoirs, Piping works, Public standpipes, Technical assistance, Final inspection, Delivery	30.0 months (from commencement of works)
Total		40.0 months

The work schedule of the project which is developed based on the above-mentioned is as shown in the next table:

Table 2-18 Implementation Schedule



2-3 Obligation of Recipient Country

If the Government of Japan decides to implement this Project under the scheme of grant aid, the Government of Yemen must confirm undertaking the following responsibilities in order for the Project to proceed in a smooth manner.

- To allocate a project manager from the Implementing Agency to the target sites in line with the implementation of this Project and bear the expenses.
- To secure the land necessary to build facilities at each target site and level the ground. Especially, regarding piping routes, to keep close contact with the branch office in each state to avoid land issues, taking into consideration the results of the pilot project construction of the development study.
- To provide land and level the ground for the base camps and stock yards to be set up within the Governorates and target construction sites during construction works.
- To improve the access roads necessary for construction of water supply facilities.
- To promptly perform customs clearance procedures and domestic transport-related procedures of procured material and equipment.
- To exempt Japanese nationals from customs duties and internal taxes which will be imposed in the recipient country with respect to the supply of the equipment, materials and services under the verified contracts.
- To ensure that the water supply facilities to be constructed under this Project will be appropriately and effectively maintained, managed and used, and secure the personnel necessary for that.
- To bear the advising commission for Authorization to Pay (A/P) and the payment commission to the Bank.
- To bear all expenses necessary to implement this Project such as maintenance and operation expenses, except the expenses to be covered by the Grant Aid.
- To ensure safety of the Japanese personnel when they are engaged in any of the local activities including detailed design study to be conducted after the E/N and G/A, facility construction and soft component activities at the target sites of this Project. And, to arrange police officers to accompany according to the necessity and bear the necessary expenses.

2-4 Project Operation Plan

2-4-1 Operation and Maintenance Plan

As for the operation and maintenance of water supply facilities in rural areas, the principle that the residents should bear the costs through proactive participation of local community organizations has been adopted and the provision of technical support by local governments having GARWSP at their center to the local residents has been practiced. The local residents are encouraged to form self-ruled organizations which are in charge of operation and maintenance of improved water supply facilities as well as improve the capacities necessary for such operation and maintenance. On the other hand, the local governments having GARWSP at their center are responsible for providing training and monitoring to the local residents with the aim of development of the operation and maintenance capacities of the local residents. Thus, the basic policy of the operation and maintenance plan for this Project includes 1) promotion of operation and management through proactive participation of local community organizations, and 2) enhancement of technical support by the local governments.

Based on the issues about the operation and maintenance of the existing water supply facilities in the target sites of this Project, which were revealed through the development study and the basic design study, what should be particularly focused on as approach for the operation and maintenance plan are as follows:

1) Adoption of "Demand Responsible Approach (DRA)" in forming an operation and maintenance system
2) Clarification of the responsibilities of the local organizations (GARWSP branch offices and Provincial Government and District Governorate) in line with the decentralization strategy to implement the rural water supply project
3) Improvement of the community-based operation and maintenance system
4) Establishment of a management system at the local government/village level, including not only "use" but also "conservation" and "monitoring" of groundwater

1) Adoption of Demand Responsive Approach (DRA)

For development of a rural water supply sector in Yemen, it is an important strategy to adopt the Demand Responsible Approach (DRA) in building an operation and maintenance system of the rural water supply facilities. The sustainability of the project should be secured by clarifying the sharing of responsibilities for facility construction and operation and maintenance, raising the awareness of ownership among the community, and forming a community-centered

operation and maintenance organization and developing the capabilities for that though dialogues with the community. In the pilot project carried out as part of the development study which was conducted previously, DRA was introduced in building a local resident-centered operation and maintenance system and its effectiveness was confirmed; the concept and techniques of DRA have been compiled in a manual. When implementing this Project, an operation and maintenance system will be created incorporating the DRA techniques which were identified by the development study.

2) Clarification of responsibilities of local organizations in line with the decentralization strategy for implementation of rural water supply project

Under the decentralization policy of Yemen, the transfer of the authority from the headquarters of GARWSP to the branch offices in the Governorates is being promoted even when implementing the rural water supply project. With the decentralization, GARWSP is trying to clarify the responsibilities of their branch offices, the Governorate and county governments and the communities at each stage of planning, implementation, operation and maintenance and monitoring of the rural water supply project, however, the capacity assessment of the development study which was carried out previously found that the capacities of the respective organization (human resources, technical capabilities, organizational structure, financial resource, project implementation and management capabilities) were not sufficient enough. Especially, many issues about the branch offices of GARWSP which will be the main actors of implementation of the rural water supply project were pointed out, including development of mid-term development and investment plans for the regions in charge, securing and distribution of development funds, development of project plans, bidding management, and procurement/implementation management, software techniques such as adoption of DRA, and formation and development of a social mobilization team.

In this project the responsibilities of local organizations were clarified again after confirmation of the above situations. Results of the clarification are shown as follows. O&M system would be established, referred to the defined scope of the responsibilities of each stakeholder.

Table 2-19 Clarification of the responsibility for rural water supply project concerning Capacity Development Action Plan

Stakeholder	Work Allocation
GARWSP Headquarter	Implementation supervision
	Project coordination
GARWSP Branch Office ／Local Authorities	・ Formation of water user association (support on the registration to the Ministry of Local Administration, approval, etc.) ・ Strengthening the existing water user association ・ Sensitization on the groundwater conservation ・ Capacity Building of O&M to communities through hygiene education
Communitiy	Operation and Maintenance
GARWSP Branch Office ／Local Authorities	Monitoring
	Follow-up

3) Improvement of community-centered operation and maintenance system

The traditional tribal leader Sheikh and the local big figure Auil are usually the key players for operation and maintenance of the rural water supply facilities in the target sites. However, the operation and improvement of the water supply facilities are largely influenced by the abilities and financial power of the Sheikh and the Auil under such traditional operation and maintenance system. In addition, it is often understood that the ownership of the facilities belongs to the Sheikh and the like, and thus it can be a hindrance to foster the sense of ownership among the users. This Study proposes to improve the organizational form and raise the sense of ownership among the users by implementing the formation of the Water User Association (WUA) which is a community organization, through selection of executives by the users, development of the rules of the organization and operation of facilities, and legal registration of the organization. The formation process of the WUA will require coproduction between the GARWSP branch offices and the local governments. And, for establishment of the community-centered operation and maintenance system, it is necessary to provide the target communities with technical consultation for operation and maintenance and check and also with consultation and monitoring for organizational and financial management. The consultation and monitoring of the former should be carried out by the GARWSP branch offices and the latter should be provided by the local governments, however, because it is assumed that the capabilities of the branch offices and the local governments are limited, activities will be conducted by utilizing soft component (technical assistance) and at the same time technology transfer to the branch offices and the local governments will be carried out. In consideration of the above-mentioned current situations and issues, enhancement of the maintenance capabilities of the beneficiary organization of the local residents will be the basis to develop the operation

and maintenance plan, and soft component-related activities will be developed in accordance with the basic policy that focus will be placed on establishment of the village-based WUA.

4) Establishment of operation and maintenance system including conservation and monitoring of groundwater at local government/and village level

In spite of the water and geological conditions in Yemen where the rainfalls are very limited and little groundwater recharge is available from other regions, the groundwater of the target areas is excessively pumped up to meet the increased demands for daily life water due to population increase and for agricultural water due to rapid expansion of irrigated farm land. It is said that Yemen will be the first country in the world to face "water crisis" due to groundwater depletion. The areas along the River Sana'a and the River Taiz which are part of the target areas of this Project are the areas where recharge storage is seriously decreasing. The government of Yemen has designated the areas along the rivers as "Specially Protected Areas for Groundwater Development" by law, basically prohibiting new groundwater development for irrigated agriculture and industrial use and trying to control excessive pumping of the existing wells through introduction of a licensing system.

Although the wells used for daily life water are not subject to the aforementioned law because the amount used is small, it is necessary to practice pumping of the proper amount of water within the limited groundwater potential and prevent diversion of the water for irrigation use at the stage of operation and maintenance of this Project. And, it is essential to constrain further development of the groundwater near the resource wells and establish an operation and maintenance system including not only "use" but also "conservation" and "monitoring" of well water. As part of establishment of a community-centered operation and maintenance system, while the formation of the WUA and its legal registration are proposed under this Project as above-mentioned, it will encourage the communities to specify the maximum pumping amount and build consensus about prohibition of diversion of the water for irrigation use, observe the facility operation rules necessary for registration and study about establishment of a regular monitoring system by the local governments who are the regulators.

In the light of the above-mentioned important items, with regard to operation and maintenance of the water supply facilities to be constructed under this Project, Water Use Committee which is normal in Yemen will be established and a resident-centered operation and maintenance system will be established. The conceptual diagram of the operation and maintenance structure of this Project is as shown in Figure 2-54:

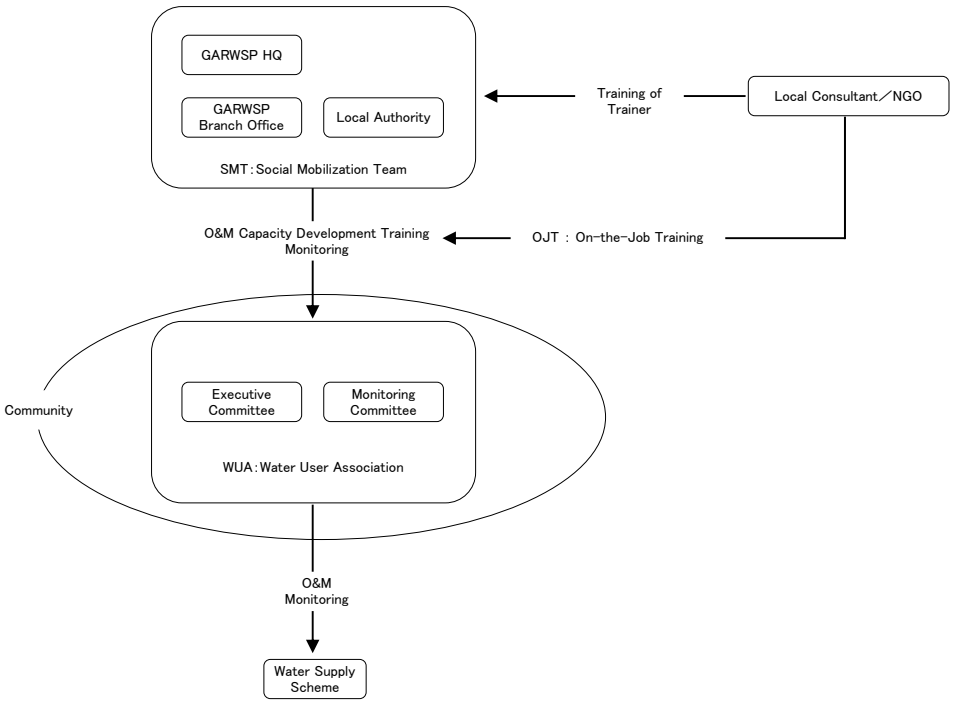


Figure 2-54　Operation and Maintenance Structure

2-4-2 Operation and Maintenance Cost

User-Pay-Principle (UPP) is introduced in the Operation and Maintenance in this project.

O&M cost of water supply scheme was estimated with 1) Daily maintenance cost (fuel), 2) labor cost on O&M, 3) Spare parts cost necessary for repair and 4) updated cost on pump and pipe. Furthermore, on the basis of the result of socio-economic survey in this survey, Affordability-to-Pay" (ATP) of community residents was considered after percentage of the estimated O&M costs in income per capita was studied. The results of those considerations are shown in the next figure:

Table 2-20 Analysis of O&M Cost and ATP

Site No.	Site Name	Average Income ／month／ person （YR）	O&M Cost ／month／person （YR）	% of O&M Cost in Income （%）
A-03	Ozlat Al Jaradi	11,955	77	0.6%
S-02	Jarban	12,117	281	2.3%
S-04	Qamlan-Bait Al Najrani	8,291	218	2.6%
S-05	Afesh	8,291	161	1.9%
S-07	Bait Al Hadrami	13,074	100	0.8%
S-09	Ruhm	8,929	88	1.0%
D-01	Elow Al Mikhlaf	6,330	295	4.7%
D-02	Hamal-Bait Al Jabar	12,660	101	0.8%
D-03	Hegrat Al A'asham	7,610	164	2.1%
D-05	Mayfa'at Yaer	10,669	155	1.4%
D-07	Al Asakera	21,337	246	1.0%
I-01	Asfal Bani Saba	9,870	83	0.8%
I-02	Al Sana	9,294	114	1.2%
I-04	Al Jahlah & Al Meshraq	7,925	66	0.8%
T-02	Bani Al Suror	7,704	134	1.7%
T-03	Sheb Humran	6,163	72	1.2%
T-04	Yafoq Bani Hamad	6,163	101	1.6%
T-05	Al Azaez	6,934	102	1.5%
T-06	Al Khunha	4,622	176	3.8%

As is shown in the above figure, O&M costs per capita in all targeted sites are below 4% of income. Therefore, from a viewpoint of ATP of community residents, O&M cost is considered proper.

2-5 Project Cost Estimation

2-5-1 Cost Borne by the Government of Yemen

Total YR160,534,234(JPY76.7million)

Cost Item	Total	Calculation	Remarks
Access road within the site	—	-	To be done by the villagers
Land and leveling for the facilities constructions	-	-	To be donated by the villagers
House connection work (pipe + water meter)	(*1)YR156,938,000	-Pipe: 30m/house -Water Meter: 1 No./house	Materials and Installation by the villagers
Advising Commission for Authorization to Pay(A/P)	(*2)YR46,024	YR12,552×3 回 YR8,368×1 回	A/P：JPY6,000/time A/P Amendment：JPY4,000/time
Payment Commission to Bank	(*2)YR3,550,210	JPY1,697,000 （may vary）	
Total	(*1)YR156,938,000	Under the responsibility of the Villagers as a policy of Yemen	
	(*2)YR3,596,234	Government of Yemen	

2-5-2 Condition for Estimation

1) Estimation base	May 2009
2) Exchange rate	US$1.00＝JPY95.77 US$1.00＝YR200.31 YR1.00＝JPY0.478
3) Period of construction and procurement	31 month after the E/N. For more detail, see table 2-17.
4) Others	This Project is to be implemented in accordance with the guidelines for Grant Aid Assistance of the Japanese Government.

2-5-3 Operation and Maintenance Cost

1) Conditions for the cost estimation

For the estimation of the operation and maintenance cost, the following conditions were adopted.

a) Cost for daily operation (fuel cost)
b) Personnel cost for the operation and maintenance
c) Cost necessary for spare parts
d) Renewal cost for pumping equipment and pipelines

2) Operation and maintenance cost

As mentioned in above paragraph, the cost for operation and maintenance per person is from YR66 to YR295/month/person, and it is about 4% of the income. Therefore, it can be considered that the operation and maintenance cost is appropriate from the point of view of capability to pay.

CHAPTER 3
PROJECT EVALUATION AND RECOMMENDATIONS

CHAPTER 3 PROJECT EVALUATION AND RECOMMENDATIONS

3-1 Project Effect

The effects and improvements expected to be achieved by this project are shown below.

Table 3-1 Effects and improvements due to this project

Current Status and Problems	Action Taken in the Project	Direct Effects and Level of Improvement	Indirect Effects and Level of Improvement
• Because of the insufficient water supply facilities, accessibility to safe water in the Project sites in 5 Governances remains low at 49%. • Purchasing water from vender sold by water tank truck costs about 3 to 4 times as much as ordinal tariffs of water reticulation system. Since this is heavy burden for household budget, villagers can't help depending on unsafe water of unprotected well, spring or pooled rainwater for domestic use. • Using unsafe water affects villagers on economic activities, education and health, such as increasing water borne disease rate and burden of women and children in fetching water from the bottom of valley with taking more than one hour.	• Water supply facilities sourcing groundwater in 19 Project target sites in 5 Governances will be constructed and rehabilitated.	• Enabling to secure the safe and stable water supply through groundwater and improvement of life and sanitation environment to approximately 16.8 thousand people(2019) in the target site. • Enabling to supply water 20 – 40litter/cap/day from the improved facilities to 16.8 thousand villagers. • Women's and children's labour for fetching water will be reduced by providing safe and stable water in mountainous area of severe condition.	• Using safe and stable water, will improve the sanitary condition. In consequence, the water borne disease rate will be reduced. • Reducing Women's and children's labour for fetching water and saving their time will bring improvement of life condition such as economic activities, education and health and poverty reduction.
• Sheikh centred traditional operation and maintenance method in many village is not functioning adequately. • Villagers have inadequate sanitary and hygiene conscious and behaviour shown in hand-washing practice and night soil treatment. This has a risk to be cause of water born disease.	• Operation and Maintenance system will be reinforced through Software Component Programme targeting villagers in the sites. • Sanitation and Hygiene awareness campaign, which provides villagers with knowledge, attitude and behaviour on sanitation and hygiene, will be launched so that they use supplied stable and safe water properly.	• With the implementation of soft-component, WUA will be formed and reinforced, with participatory operation and maintenance system by the villagers. And villagers based sensitization activity for sanitation will be improved through this.	• Establishing WUA, villagers based operation and maintenance system will be improved. As a result, the water supply system will be operated and maintained efficiently and effectively. • Improved Villagers conscious about health and sanitation, water will be used properly and water borne disease will be reduced.

3-2 Recommendation

3-2-1 Recommendation for the Yemeni side

(1) Villager-based operation and maintenance system for water supply facility

In Yemen, since a lot of villages have patriarchal management system led by Sheikh or village leader, organizational operation and maintenance system are not active and villagers have a slight sense of ownership to the facilities. Therefore, in establishing operation and maintenance system for the rural water supply, the following subjects are necessary through the dialogue with villagers; to clarify each responsibility for the operation and maintenance, to strengthen beneficiary's sense of ownership toward facility, to build beneficiaries based decision making process.

(2) Building of supporting and supervision structure from the Yemeni Governmental Institution to the WUAs

Concerning the capacity on the facilities operation and maintenance, finance and technical issues, it is necessary the support from GARWSP headquarter and branches, as well as from the Local Authorities(Governorates and Districts). Therefore, it is expected that GARWSP headquarter and branches as well as the Local Authorities build a structure for the continuous support to the WUAs.

(3) Implementation structure for the groundwater conservation

A decrease in potential groundwater is serious problem in Yemen. In particular, with rapid expansion of agricultural irrigations, over pumping groundwater for agriculture is one of the causes of this problem. In this Project, from the point of view of groundwater conservation, WUA will execute the following subjects: operating the Project deep well within the recommended discharge rate; not to develop new deepwells within the interference area of the Project well; measurement of water level of the Project well periodically. Those information will be monitored and reported periodically to GARWSP.

GARWSP, through the periodical report submitted by the WUAs, will verify its contents, and it is expected that GARWSP will take necessary measures for the regulation on the groundwater resources development and monitoring of the existing water supply facilities for the groundwater conservation through close coordination with the Governorates and Districts of the Project area.

3-2-2 Technical Assistance and Cooperation with Other Donors

The Government of Yemen promotes the decentralization, and GARWSP also enforces the organizational reform to transfer a portion of the authorities from the headquarters to branch offices. After the completion of construction work under the Project, the responsibility in terms of ownership and operation and maintenance of the facilities will be undertaken by WUAs. As mentioned in 3-2-1

above, for the proper operation and maintenance of the facilities, assistance from GARWSP headquarter, its branch and local authorities, and involvement in setting up and training WUA are indispensable. Following up existing facilities by GARWSP is regarded to contribute to improvement of the water coverage rate, especially by handling broken equipment and necessary replacement.

Technical cooperation, which shows the role of GARWSP branch to be played in the decentralization, is expected to produce synergetic effects with this grant aid cooperation project as model.

3-3 Justification of Project

Construction and rehabilitation of water supply facilities in 19 sites in 5 Governorates will secure the safe and stable water supply and improvement of life and sanitation environment to approximately 168,000 inhabitants. As mentioned above, the Project will contribute to the achievement of overall goal of National Water Sector Strategy and Investment Program. Furthermore, supplying safe water continuously in 19 sites in 5 Governorates is supposed to improve the various aspects like villager's economic activity, education and health of villagers.
Under this circumstance, it is justified to implement the Project under the Japan grand aid by the following respects.

(1) Construction water supply facilities in 19 sites in 5 Governorates will enable approximately 16.8 thousand villagers (2019) to access to the safe and stable water.
(2) Women's and children's burden in water fetching, which takes 3.8hour per day on average, will be reduced.
(3) The Project will contribute to fulfilment of National Water Sector Strategy and Investment Program(2008 – 2015) setting the goal to improve water coverage rate.
(4) With the implementation of "Soft Component", will be formed the WUAs which will lead to appropriate operation and maintenance of the water supply facilities. Also, after the commencement of supply of safe water, for the appropriate use of water, the structure of community sensitization on sanitation by the residents will be implemented.
(5) The water supply facilities will be constructed in the mountainous area and rural local area where the large numbers of people are living at the poverty level. After completion of the facilities construction, a minimum amount of water fee will be charged based on the operation and maintenance of the facilities which includes fuel, salary, spare parts and renewal costs. It is not profitable and is an amount that will be possible to be paid by the actual villager income.
(6) The water supply facilities to be constructed under the Project are of small scale so that they will not give considerable negative impact on environment.
(7) The Project will be implemented smoothly without any particular difficulties under the scheme of Japanese grant aid.

3-4 Conclusion

This Project, will construct and rehabilitate water supply facilities in Yemen for the purpose of supplying stable and safe water to the inhabitants in the rural areas. Thereby, will contribute for the improvement of water coverage ratio in the rural areas, and also to improve the living standard, economic activity, education, and health of the residents in the mountainous area, which is one of the aims of the Government of Yemen. Therefore, it can be judged that the present Project be implemented as a Grant Aid Assistance of Japan. Moreover, with the “Soft Component” activity, community led WUAs will be forming and strengthening, and with the implementation of sensitization to the residents, a continuous and sanitary operation and maintenance of the constructed water supply facility will be built.

Also, if considering the Project target governorates as a model case, the implementation of a technical cooperation having as counterpart GARWSP headquarter and branches, synergistic effect can be expected to built a model of implementation structure for the promotion, assistance and management of WUAs in each area in close coordination with GARWSP and local authorities(Governorates and Districts).