

APPENDIX-1

PILOT PROJECT

MANUAL FOR MOBILE PLANTS

This manual is intended to provide a guide to supply, treat and distribute water to the population in case of an emergency. The manual concentrates on the specific issues related to the deployment and operation of the water wells and the water treatment systems.

This manual has been made in addition to the conventional fixed type of water treatment facilities for the project by the JICA Study Team. By this, a mobile treatment facility composed of mobile water treatment plant (WTP), diesel generators, storage tanks, among others is experimentally proposed for Pilot Projects. If this method is proved more efficient than the fixed type WTP, this method will be employed for other projects proposed in Feasibility Study for the future.

1. Personnel in charge

(a) Emergency Planning at the local level

The Acueducto, in coordination with the city organisms, basically with DPAE (Dirección de Prevención y atención de Emergencias), should make local plans for preventing emergencies; reducing, controlling or mitigating the effects of emergencies; and taking other action in the event of emergencies.

These plans should draw on risk assessments and should have regard for the arrangements to warn, inform and advise the public at the time of an emergency. Plans should contain a procedure for determining whether an emergency has occurred; provision for training key staff; and provision for exercising the plan to ensure it is effective. Procedures should also be put in place to ensure that the plan is reviewed periodically and kept up to date.

(b) Acueducto Personnel

At least two trained personnel and two shifts with experience in the purification and distribution of potable water shall be assigned to each site depending where the emergency has occurred. Personnel on holidays or leave will be recalled for emergency duty. These technicians or engineers will coordinate the personnel from the DPAE and volunteers from the Red Cross and other organizations.

(c) Training for personnel

Acueducto must prepare the training program for the personnel who will always be ready to attend the emergencies and should test the effectiveness of their emergency plans by carrying out exercises, ensuring that key staff involved in the planning for response to an emergency, receive appropriate training. Training plans should also consider other people who have a role in the emergency plans such as contractors and concession operators. The plans themselves should explicitly identify the nature and frequency of training and exercising required.

Technicians will be trained and drilled in the operation of the pumps, electric generators, mobile disinfection units, mobile water treatment plants (MWTP's) and the handling of hoses, plastic storage tanks and pillow tanks.

On site practices must be organized on a regular basis to understand and remember the procedures when the emergency arrives. It is important that even though a specific site is allotted to two personnel, all of them are properly trained and know how to proceed in any site proposed in this study. If possible, the selected personnel should live on the same Acueducto Zone where their site is located, so they are as near as possible to the well which they need to operate in emergency.

An inventory shall be made of all equipment and supplies sent to each site. Operators will keep tools and spare parts in a box where they are safe and cannot be stolen. They will be held responsible for the safe keeping and correct use of equipment and tools which could be stored temporarily in the south area at El Dorado WTP or in Vitelma WTP. In the North area they could be stored in Wiesner WTP, Tibitoc WTP or in La Salle (Pilot Project area). The last one will indicate a need in extra security guard system.

(d) Inter-agency Coordination

DPAE should coordinate its activities with Acueducto, DAPD (Administrative Department of District Planning), CLOPAD (Local Committee for prevention and attention of disasters) CREPAD (Regional Committee for the Prevention and Attention of Disasters) and the Colombian Red Cross, among other entities.

2. Mobile Accessories

The JICA study recommends the use of Mobile Water Treatment Plants (MWTP's) and Mobile Water Disinfection Units to condition water from those wells and to distribute the water to the population. These MWTP's will also be able to treat contaminated water from the city main pipes.

These items include:

- Trailer mounted double filtration systems
- Trailer mounted diesel electric generator sets
- Trailer mounted disinfection units
- Mobile pillow water storage tanks
- Plastic water storage tanks
- Trailer mounted diesel pumping units
- Layflat quick connect pipes

The emergency water treatment equipment may be used in any combination, according to need in each situation. The deployment of these units will be decided by the Emergency Committee of Acueducto. Some examples of possible scenarios are depicted in the following Figures:

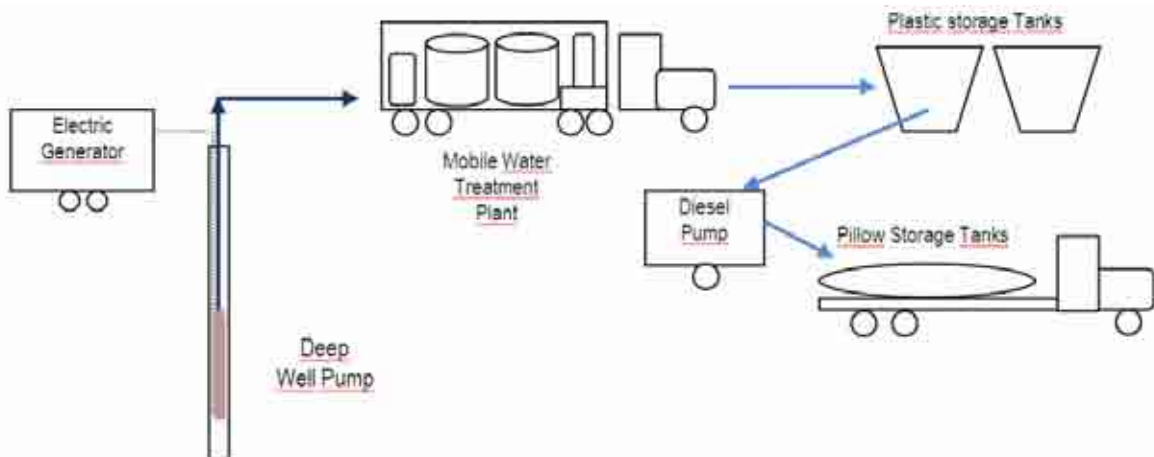


Figure-1 Water treatment from deep well (when aeration is not required)

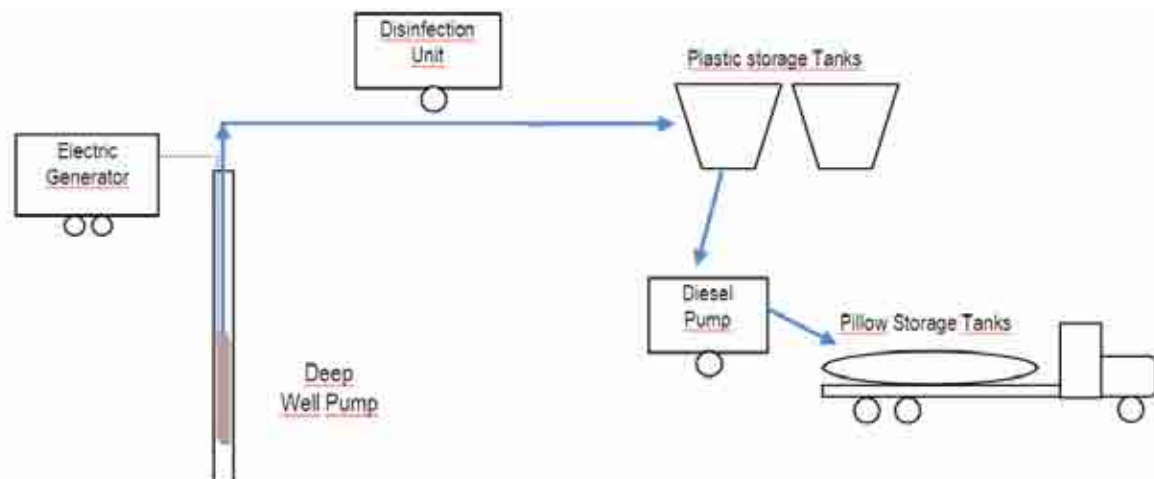


Figure-2 Water treatment from well with low turbidity and color, no iron or manganese:

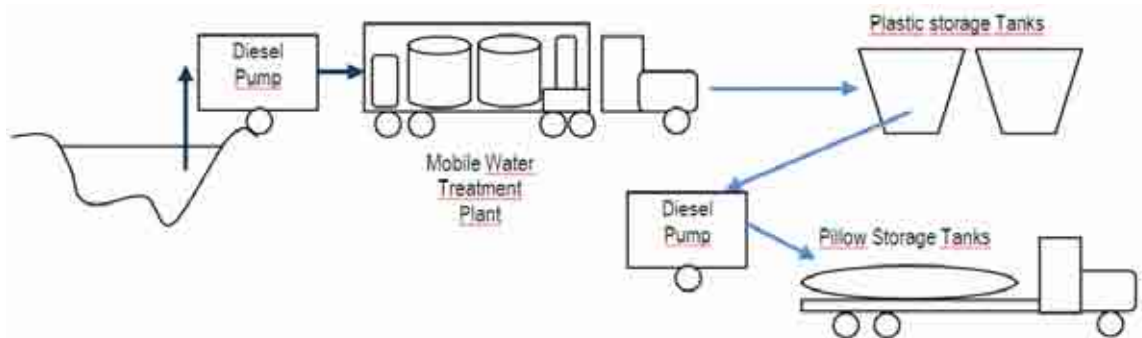


Figure-3 Water treatment from surface creek

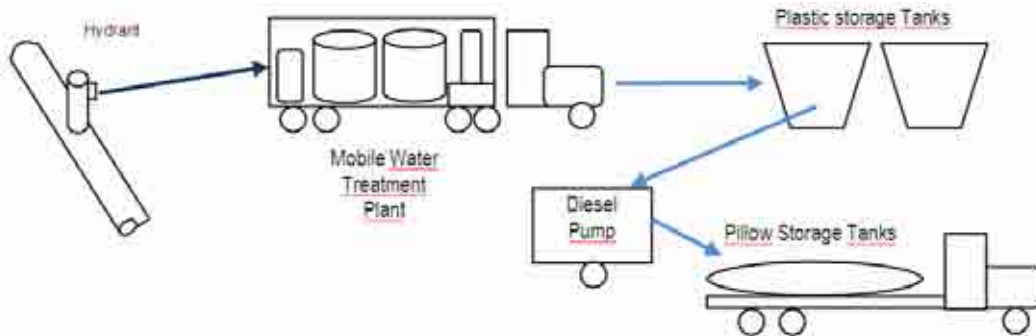


Figure-4 Water treatment from contaminated city main pipe using fire hydrants

3. Emergency Procedures

The assigned personnel will act as operators in emergency. The two operators will arrive to the site with the mobile treatment plant, mobile generator, submersible pump, drop pipe, sludge storage tank, required tools and water accessories, among others. The two operators must know in which exact location all these items are stored inside Acueducto. For an efficient transportation, it is recommended to store everything described above altogether at the same place. By this way in cases of emergency the operators just have to check that they have everything with them and proceed for its transportation on the trailer or truck.

It is responsibility of the personnel in charge to have with them all the corresponding keys of their site. These keys correspond to the well cover, accessing the site, accessing the hydrants, among others.

Operators will make sure they have all the necessary tools and equipment to produce and distribute water from their assigned site.

The main procedures that have to be considered in order to have these systems ready operationally when an emergency does arrive are the following:

(a) Equipment storage

All equipment must be stored after ensuring it is in operating condition and that all the tools and ancillary equipment required for proper operation and maintenance are included.

Supplies to operate the equipment like fuel, coagulants, disinfectants and a basic stock of spare parts should also be stored properly.

All of these items must be inventoried and a central database should be kept locating where equipment and supplies are at all times.

Access to the store rooms should be accessible to authorized personnel. Electronic access or PIN code locks should be used.

A check list of the equipment required for each site will be available as shown in Table-1.

(b) Equipment deployment and startup

Equipment will be deployed into the field as decided by the Emergency Committee of the Acueducto. It is better to delay deployment until damage assessment and evaluation are carried out and the Committee has a clear picture of the needs of each sector are evaluated and the best use of the available equipment is determined.

Trained personnel in the transportation and deployment of the equipment shall be used.

The road conditions to each site and the load bearing capacity of roads and bridges will be previously inspected and assessed using small vehicles, before sending any heavy trucks or trailers.

Startup will be supervised by trained engineers. Chemical dosing and water conditioning shall be adjusted and the water quality shall be analyzed to make sure it complies with the safe water standards.

(c) Equipment Operation

Suppliers of equipment must provide simple to follow instructions for their equipment. Equipment must be properly labeled for easy operation.

The pilot plant must be very well instrumented, so information can be gathered to improve future models.

Submersible Pumps

Deep wells will normally have the pump already installed. If a pump has to be installed in the well, trained personnel and specialized equipment are required to install the submersible pump and connect them to the drop pipe. The recommended drop pipe is made of carbon steel schedule 40, 90-120 m long and 4" diameter. A plastic hose resistant to high pressures will be connected to the top of drop pipe and transport the water to the mobile treatment plant when required. The operator needs to check the pressure gauges and flow meter have been properly installed. The two operators must have received training on how to install the submersible pump, motor, drop pipe and conveyance hose to the mobile treatment plant.

Water Treatment Plants (WTP)

The mobile water treatment plant for each site will be selected according to the water quality of the well. For the Cretaceous aquifer wells studied, the water treatment required may range from simple chlorination, to adsorption clarification using filtration and chlorination or to oxidation of iron and manganese and removal using greensand filtration. Equipment shall be available for any of these treatment requirements.

The proposed portable plant must be efficient in energy consumption, because there will be a limitation in case of emergency

Preparation of chemical reactant

The operators will have to transport the storage tanks for chemical reactants (coagulation and disinfection) if these are not yet installed on site. The capacity of these tanks should be for at least 30 days of operation. Besides the storage tanks, the operator will need extra tanks for preparing coagulation and disinfection solutions.

Backwash

If filtration is required, filters have to be backwashed periodically. Automatic backwash systems are required. The best indication is an increase in effluent turbidity or pressure loss across the filters. Pressure gages are installed for this purpose. The backwash sludge will be sent to a settling tank. The produced sludge must be taken away by a vacuum truck or disposed into the sewerage only if its characteristics comply with the law. If the filters have manganese green sand, this material should be regenerated every once in a while.

If the plant has been in use for a short period, before the storage of the WTP, backwash must be done by the operators to guarantee a proper performance at the next time of emergency use.

The treatment system must be very efficient in the use of water for filter backwashing as well as energy requirements, as fuel will be a precious commodity.

The treatment system must be very efficient in the filters backwashing using the minimum amount of water for washing

Automatic operation of Plant

The plant must have an automatic operation. It must turn on/off automatically depending on the flow availability of well and on the water level of the treated water in the storage tanks. The plant also must have the possibility of manual operation in case of a system failure.

The pilot plant must be properly instrumented and must be of automatic operation, including the filters washing. One operator will be required for the chemical solutions preparation and supervising the process.

Hose connection

Quick-connect lay-flat hoses will be used mostly.

Monitoring of residual chlorine and others

The operators must measure concentration of residual chlorine in the treated water, and control the concentration to be more than 2 ppm-because in an emergency the containers used by the people to pick and transport the water are not necessarily clean.

Besides residual chlorine, other variables of the treated water that must be monitored and controlled by operators are: Flow rate and accumulated volume, pressure, turbidity by using a multi parameter sonde. When there is a treatment plant there must be an additional monitoring and control of the flow and pressure of the intake into the treatment plant.

A portable test kit must be taken by the operators with which parameters such as pH, color, conductivity, turbidity, iron, manganese, alkalinity and hardness can be measured on site.

Case where Electricity is available

The electric cable from the submersible pump must be as long as the drop pipe with additional 20 to 30 meters to be able to reach the control panel from the well. If electricity is available, proper connections must be done from the electric pole to the transformer with all the required wiring and connections to provide the pump with electricity. A control center must be provided on site with electric manual transference to diesel electricity.

Case where electricity is not available

When electricity is not available, the diesel mobile generator plant will be used. The generator should be able to power the submersible pump. It is recommended to transport a storage diesel tank with capacity of 30 days. Smaller generators may be used for the chemical dosing pumps.

Mobile generator and control panel

Generators for emergency operation of wells should be prepared not for entire wells (=64) but only for around 30% of the wells. The generators need ordinary maintenance. So it is not recommendable to set the generators at wells sites without any maintenance and operation for a long period of time. Therefore, generators should be stored and maintained not at site but at storehouse of specified contractor, and should be delivered to the site when it is necessary

Communication

Acueducto must provide radio communication with their emergency response teams and ideally it should be compatible with the communication systems of the other agencies.

(d) Water Distribution logistics.

The basic ration of water per person is from 5 liters for cooking and drinking to 30 liters for bathing and washing some clothes. The rationing and distribution scheme will be decided by the personnel on site, according to the availability and needs of potable water amongst the population. Hoarding is a problem that will most probably have to be dealt with. Police collaboration may be required if there is a chronic shortage of water.

Distribution using flatbed trucks and pillow tanks is very effective. Pillow tanks need a small gasoline driven pump to distribute water to containers. Containers should be inspected, washed and disinfected before filling. Operators should smell containers to ensure gasoline or other substances have not been stored in the containers.

When possible, water distribution should also be arranged by Acueducto to be in special plastic bags of 1 Lt each.

(e) Material supply logistics.

The main items that have to be supplied to each site are:

- Coagulant and disinfectant
- Diesel and gasoline fuel,
- Water containers and bags
- Food and supplies for the operators. If possible catering and supplies for the operators should be arranged with the local residents, so that the burden on the emergency response system is minimized.
- Spare parts for each piece of equipment.
- Equipment should be sent to the site with at least a 15 day supply of chemicals and fuel.
- Equipment operators must report their daily consumption, current stock and needs, so that supply shipments can be programmed.

(f) Technical support during deployment, startup and operation

The Acueducto will have a group of experienced senior engineers and technicians as advisors to support local operators with specific problems in the operation of the equipment or the distribution of water. They will be available for consultation over the phone or radio and shall visit the sites when required to do so.

(g) Equipment overhaul and preparation for next emergency.

A serious problem with emergency equipment and supplies is vandalizing of the equipment, its tools and spare parts once the emergency is over. Operators must be held responsible for these items.

Operators must fill a complete report of the status of the equipment and any malfunctions, so that they can be fixed.

A complete inventory and overhaul of each piece of equipment has to be made before storing it and leaving it ready for the next emergency. A seal must be applied, certifying that the equipment has been inspected

4. Pilot Project - La Salle

The water quality at La Salle is excellent requiring only disinfection for water supply.

Water treatment-Chlorine Injection

- The treatment system for La Salle will consist of a portable unit on a trailer for the liquid sodium hypochlorite injection. The injection must be connected to the storage tank by the operators.
- The disinfection portable unit must be able to operate automatically for at least six days. It must have a small power generator with its fuel storage tank, a dosage pump, stand-by-pump and a chemical storage tank to inject the solution before the treated water storage tank. However the equipments must operate with electricity from the net and have manual transference to be able to work with other available sources.

- It is required that the operators prepare the solution of sodium hypochlorite on the appropriate tank and from this tank connect the injection system to the storage tank.

In La Salle, the chlorination system facility and the generator can be installed on the same trailer. This trailer must be located by the operators on the selected parking spot which is between to the well and the water supply tanks. The mixing of chlorine with water must be done between the WTP and the storage tank at the opposite end for enough contact time. Besides the indicated parking spots, there will be 280 m² available spaces in La Salle for extra parking if necessary.

Mobile tank

For La Salle site, five mobile tanks each of 20 m³ for treated water should be transported and properly connected to the pipelines and hoses before starting operation. The operator must open or close the corresponding valves for operation.

Pump for water distribute on site

An electric centrifugal pump and a diesel centrifugal pump must be installed on La Salle to be able to pump water with enough pressure from the treated water storage tank to the water wagons. Around 1 m³/min must be filled into the three water wagons through three hydrants at the same time.

Pipe connection among facilities

The connection from the well top to the WTP and from the WTP to the storage tank must be arranged and checked by the operators using the corresponding and labeled hoses.

Location of water hydrants and taps

- The water supply for the people who can access La Salle for tap water will be done at a separate area than from the water wagons. The operators will have to guide the people and control the situation.
- Hydrants installed at sidewalks on the external area along La Salle site will be able to fill three water wagons at the same time. For this, the operators must check that the centrifugal pump at their storage room is properly working by generating the necessary head. Three hoses with their headers must be connected at the installed hydrants to fill the water wagons.
- For night operation the operators must know where the switches are installed.

5. Pilot Project – Vitelma

Treatment Mobile Unit

- The two operators in charge of Vitelma site will be handling a modular treatment plant with initial treatment capacity of 2000 m³/d. This plant will be mounted over a trailer for its transportation and movement. The location of the WTP is inside Vitelma WTP near the Casino.
- The mobile water treatment unit must have systems of easy and fast energy connection. Raw water, treated water and backwash water must be connected smoothly for operation in a maximum of three hours. "
- Because of Vitelma water quality, this site requires pressure filtration for treating Iron and Manganese and disinfection. The pressure filtration will be done with manganese green sand filtering media. Water will also be dosage with coagulant and sodium hypochlorite.
- The treatment portable unit must include at least a diesel generator for the electric pump that allow doing the treatment and the filters backwashing.
- Night illumination must be available which should work with the same control panel than the electric pump.
- Drain valves for the tanks and containers must be installed to be able to transport the plant without the water weight. In case that the plant weight in operation exceeds the permissible load for the

trailer, adjustable supports with hydraulic actuators must be installed that will release the weight from the tires.

Power supply

At the well site (Delirio), electricity source can be used if available. If electricity is not accessible a mobile diesel generator must be taken to this site by the operators. Delirio is about 1.5 Km away from Vitelma WTP. Fuel for power supply can be stored in the existing building by the side of sedimentation ponds. This building is currently for the guards to stay.

Filter Cleaning

The filters will start their cleaning system automatically, ideally by pressure increase caused by clogging of filter media.

6. Check list

A check list is shown in Table-1. The idea is to go through the check list site by site and confirm the required items are ready for use in emergencies.

Table- 1 Check List for emergency Water Supply

CHECK LIST		
Description\Site	La Salle	Vitelma
Mobile WTP	Chlorination	Filtration/Chlorination
Submersible Pump	Installed	Installed
Submersible Motor with electric cable	Installed	Installed
Drop Pipeline	Installed	Installed
Flow Meter	1	1
Pressure Gauges	1	1
Header	1	1
Extra Pipeline/Hose Connections		
Hose from Header to WTP		
Hose from WTP to storage tank		
Tool Box		
Mobile Diesel Generator	1	1
Control Panel	1	1
Set of Keys		
Sludge Tank	Not Necessary	1
Coagulant storage Tank	Not Necessary	1
Disinfection storage Tank for 30 days	1	1
Coagulant dosage pump	Not Necessary	1
Disinfection dosage pump	1	1
Stand by dosage pump	1	1
Diesel storage Tank	1	1
Tank for disinfectant dilution for 7 days	1	1
Tank for coagulation dilution for 7 days	Not Necessary	1
Mobile Laboratory Kit (measuring residual chlorine, turbidity)	1	1
Electric centrifugal pump	1	Not Necessary
Diesel centrifugal pump	1	Not Necessary
Hoses with headers for filling water wagons	3	3
Mobile storage tanks in vinyl	5	Not Necessary
Mobile WTP Trailer	1	1
Mobile Diesel Generator Trailer	Not Necessary	1
Mobile Toilets	1	Not Necessary
Vacuum Truck	Not Necessary	1

7. Emergency Stages

Depending on damages by natural disasters, emergency stages must be considered in which potable water supply standards must be different for each stage. It is recommendable to Acueducto together with the other agencies modifies the current potable water standards with the corresponding governmental ministry and issue a special standard for safe water in an emergency situation.

Table-2 Emergency Stages

Stage	Period of Stage
First Stage	Right After the earthquake lasting from one to two weeks
Second Stage	Immediately after first stage lasting from one to two months.
Third Stage	Reconstruction stage which can last for a year or more

Source: Presentation Mr. Jorge Arboleda, JICA Seminar 21-01-2009

Lower Standards Guidelines for Safe Water During Emergencies

Initially, the recommended standards for cases of emergency are:

Table-3 Water Quality Standards for Emergencies

Microbiology	Max Value in Emergency	Resolution 2115 of 2207	Notes
Bacteria	0 CFU/100 cm ³	0 CFU/100 cm ³	Always requires decontamination treatment for the three stages
Physical Chemical			
Arsenic	0.1 mg/L	0.01 mg/L	
Mercury	0.01 mg/L	0.001 mg/L	
Lead	0.10 mg/L	0.01 mg/L	
Cyanide	0.50 mg/L	0.05 mg/L	
THM	0.2 mg/L	2 mg/L	
Alkalinity	-	200 mg/L	
Chlorine	500 mg/L	250 mg/L	
Hardness	500 mg/L	300 mg/L	
Total Iron	1.5 mg/L	0.3 mg/L	
Manganese	1 mg/L	0.1 mg/L	
Turbidity	5 UNT	2 UNT	
Residual chlorine	3 mg/L	2 mg/L	
Others			
DBO	10 mg/L		
DO	5 mg/L		

Source: Presentation Mr. Jorge Arboleda, JICA Seminar 21-01-2009

10. Emergency Scenarios

Different scenarios have been projected with an approximate cost as shown on Table-4.

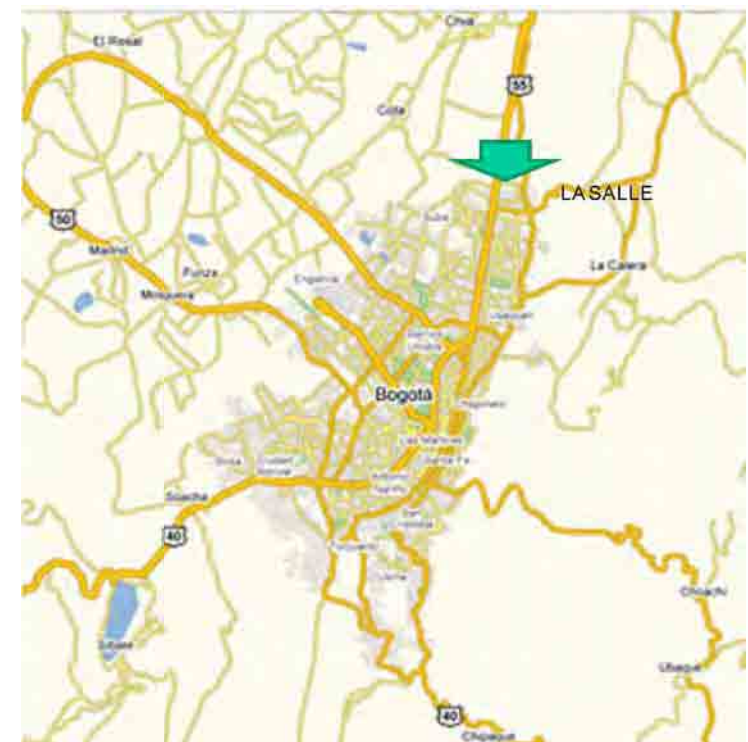
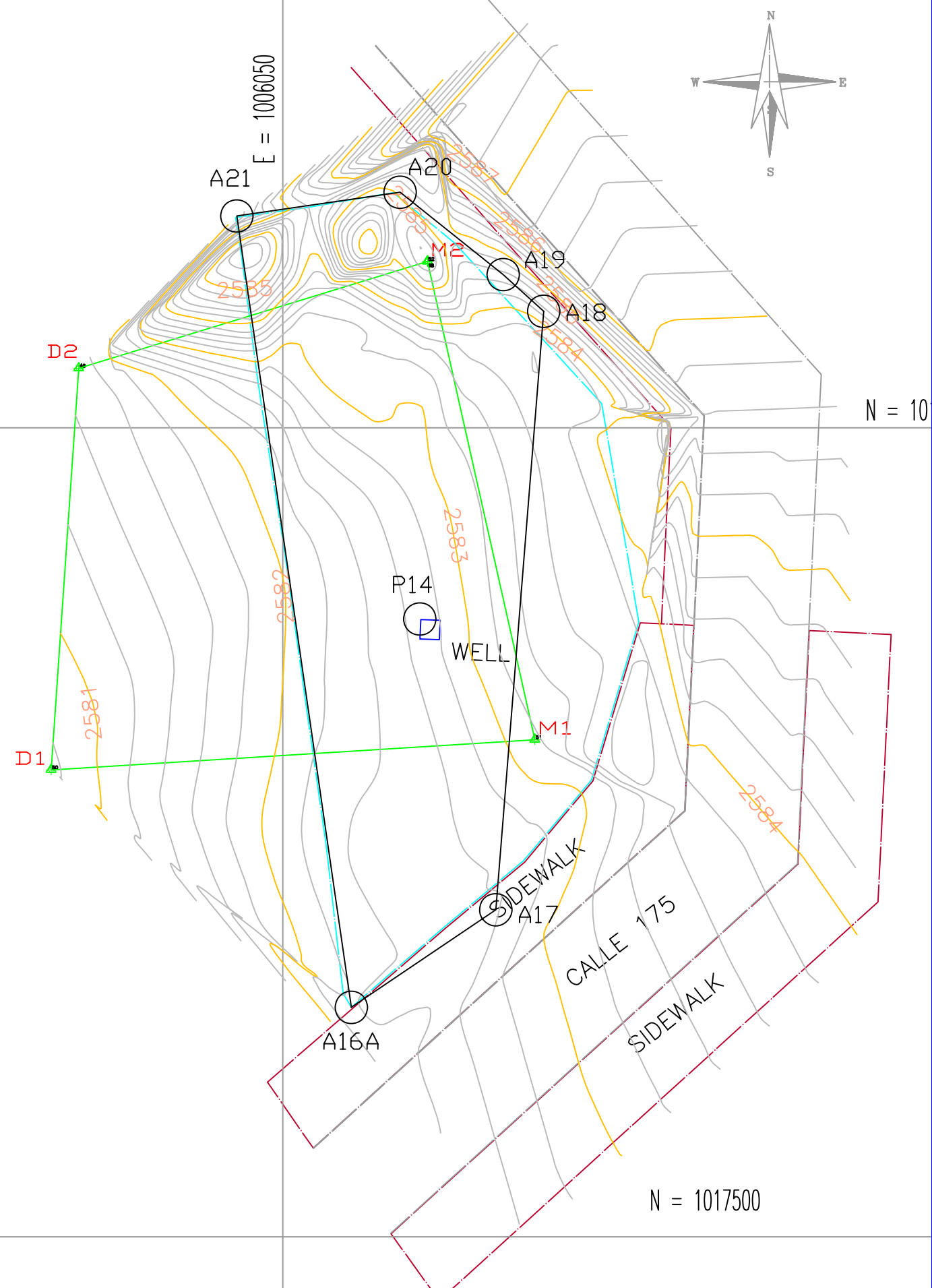
Table-4 Scenarios Costs

Escenario	1	2 (La Salle & Vitelma)	3	4	5	6	TOTAL
Año Objetivo	2000-2008	2009-2010	2011	2013	2015	2020	
Pozos Perforados	7	2	1	10	20	24	64
Pozos en Producción	0	2	3	5	10	10	30
Infraestructura y adecuación de predios para el suministro (Vias, Cerramiento, Casa O&M)	0	2	3	5	5	5	20
Instalaciones Hidraulicas	0	2	3	5	5	5	20
Unidad Movil de Cloracion	0	1	1	2	2	2	8
2 Plantas de 12,5 Lt/Seg. Modulares	0	1	2	3	3	3	12
COSTO ESCENARIO	\$ 3.974.690.370	\$ 2.880.878.538	\$ 3.503.791.987	\$ 10.359.360.895	\$ 16.777.859.995	\$ 19.049.111.635	\$ 56.545.693.419

Note: 1) Estimation does not include land acquisition cost. 2) Prices of year 2009.

APPENDIX-2

DRAWINGS FOR PILOT PROJECTS



The Study on Sustainable Water Supply for the Bogotá City and its Surrounding Area Based on the Integrated Water Resources Management in the Republic of Colombia

TOPOGRAPHIC SURVEY
 Surveyor: Andrés Esneider Vera
 Register: 01-10885

Signature

No.	Revision/Issue	Date
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Project Name and Address		
LA SALLE		
Calle 175 No. 6-67		
Bogotá		
Project	LA SALLE	Sheet
Date	Sep. 2008	1 / 1
Scale	1/500	



LOGOTIPO FIRMA URBANIZADORA
 NÚMERO DE CONTRATO O NÚMERO CARTA DE COMPROMISO

DISEÑADOR :
 Nombre: _____
 Matrícula Profesional: _____

REPRESENTANTE LEGAL
 O PROPIETARIO
 Nombre: _____
 C.C. O NIT: _____

REVISION		ACUEDUCTO:	
REVISO:	INGENIERO: M.P. No.:	RECIBO:	INGENIERO: REGISTRO No.:
APROBO:	INGENIERO: M.P. No.:	Vo.Bo.	INGENIERO: REGISTRO No.:

LOCALIZACION
 ESC:

PUNTO DE AMARRE
 IGAC
 NORTE:
 ESTE:
 COTA:
 Coordenadas Medias
 E N
 PLANCHA

MODIFICACIONES			
FECHA	MODIFICACION	NOMBRE ING. RESPONSABLE	FIRMA

acueducto
 AGUA Y ALCANTARILLADO DE BOGOTÁ

GERENCIA -----

DIRECCION -----

PLANO DE DISEÑO DE REDES DE ACUEDUCTO

NOMBRE DE LA OBRA/URBANIZACION/BARRIO
 LOCALIDAD

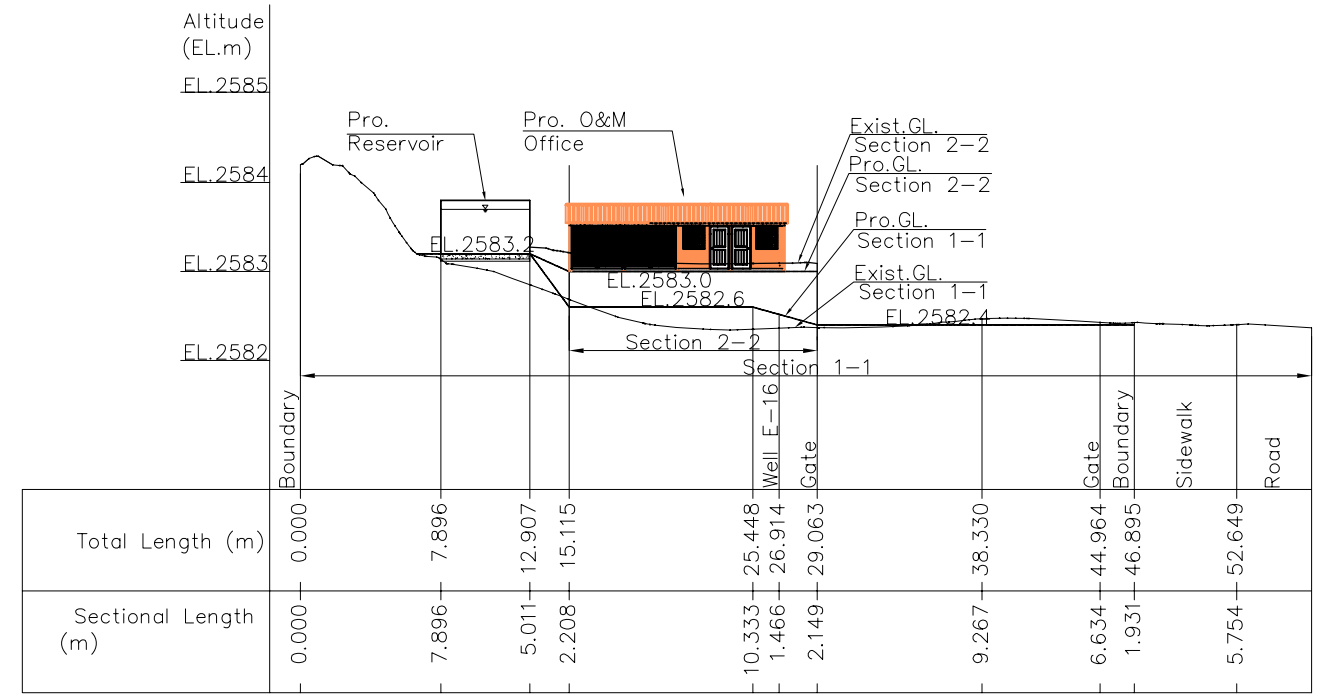
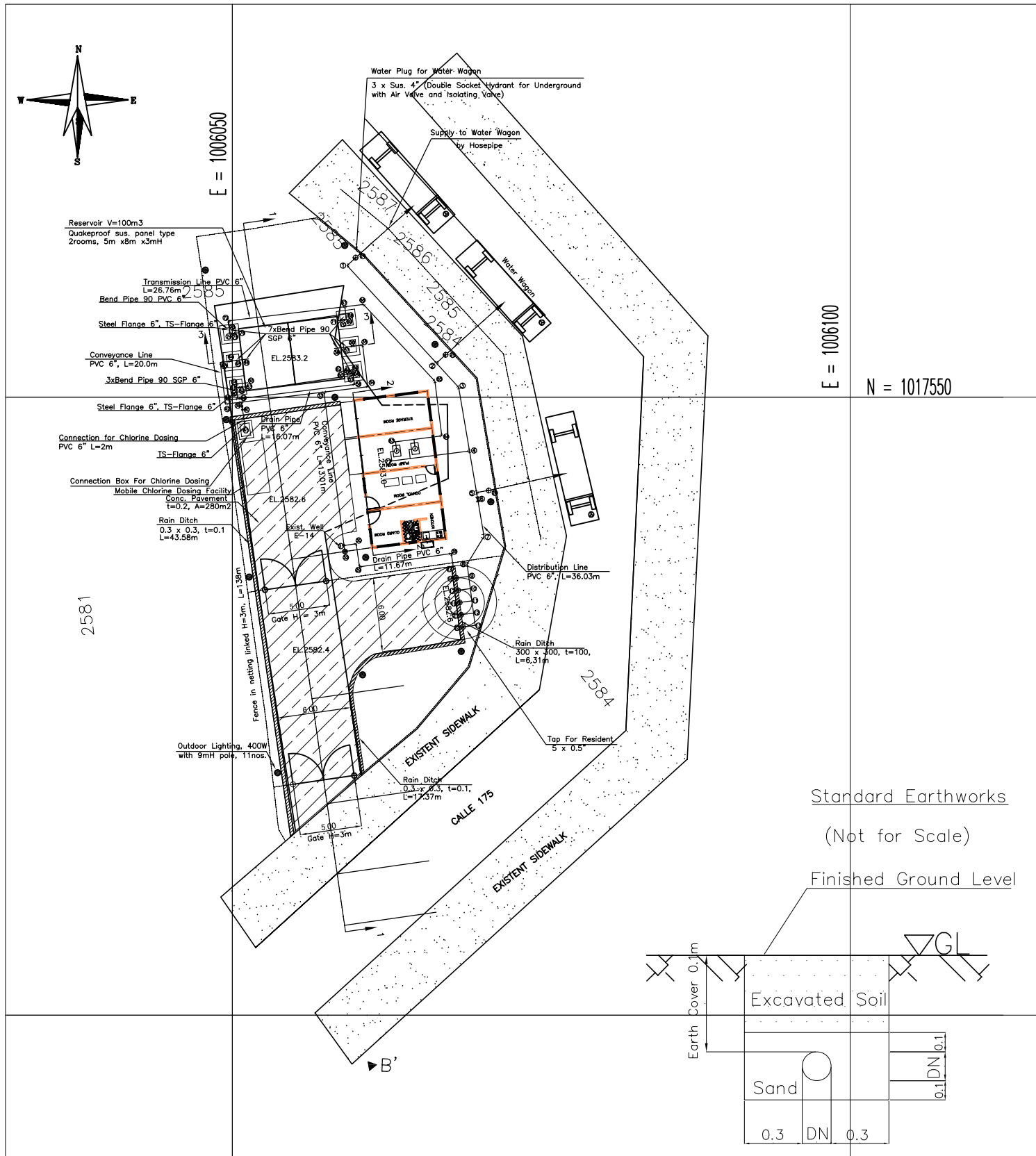
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 PLANT OF LA SALLE

ESCALA: S.E. NOMBRE DEL ARCHIVO: LA SALLE

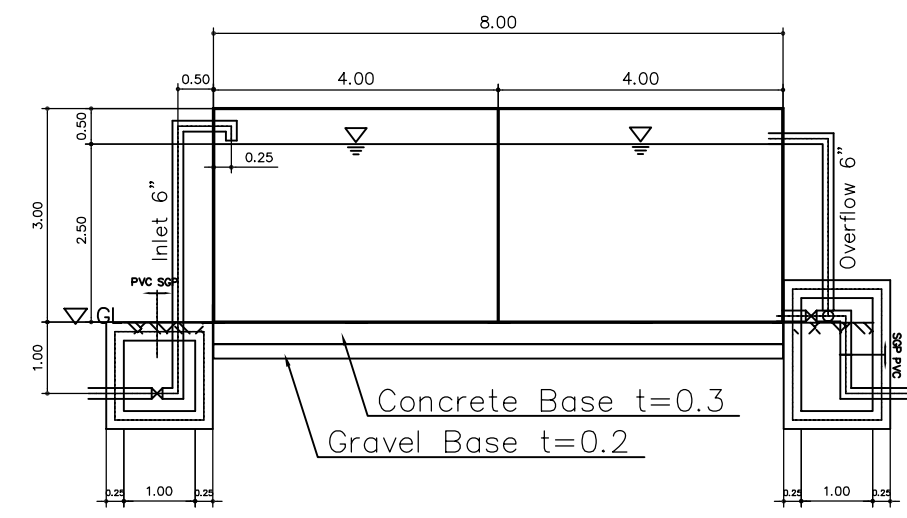
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FECHA: JANUARY 2009

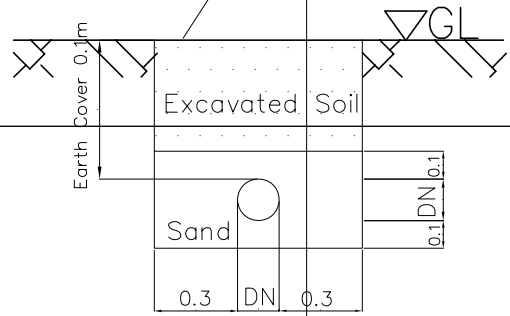
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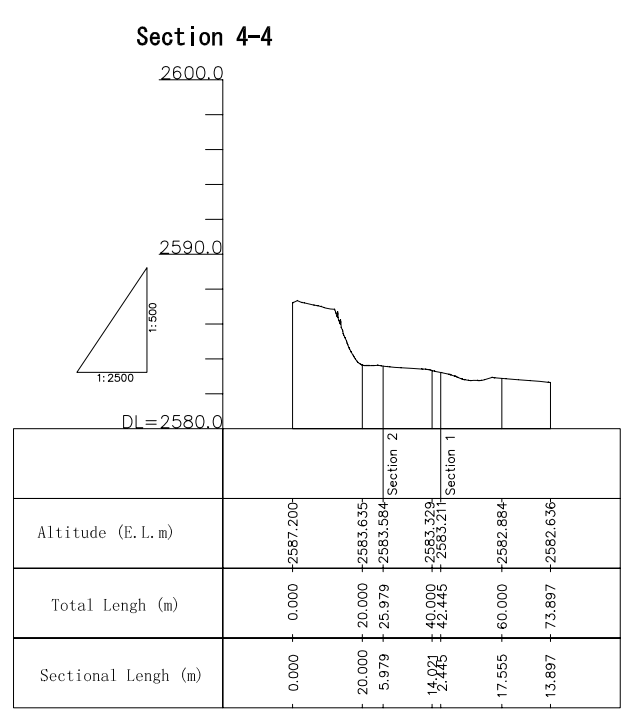
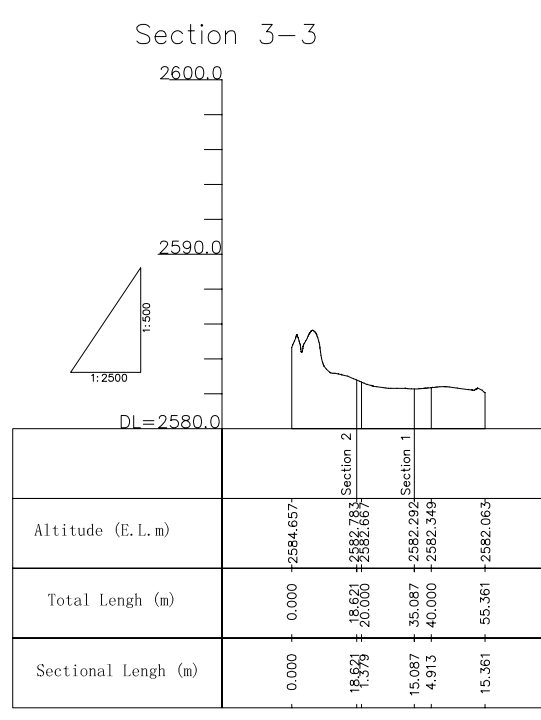
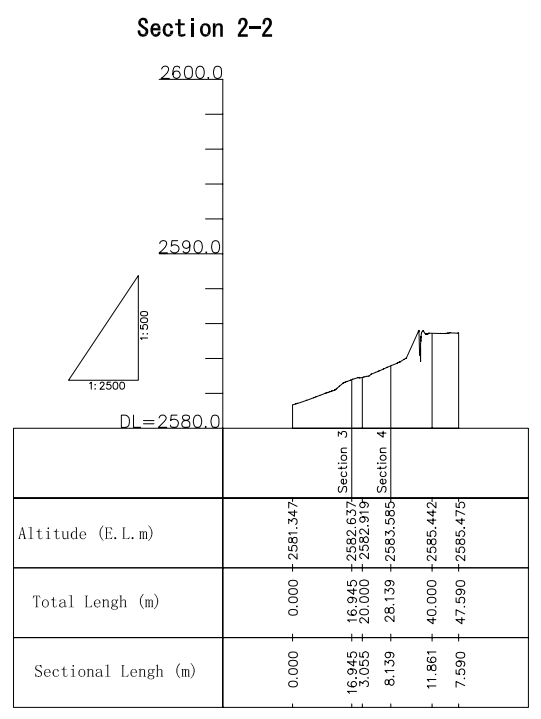
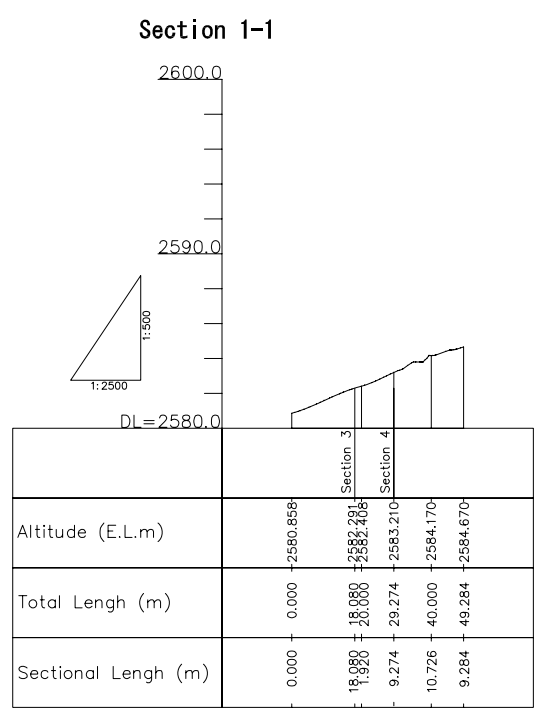
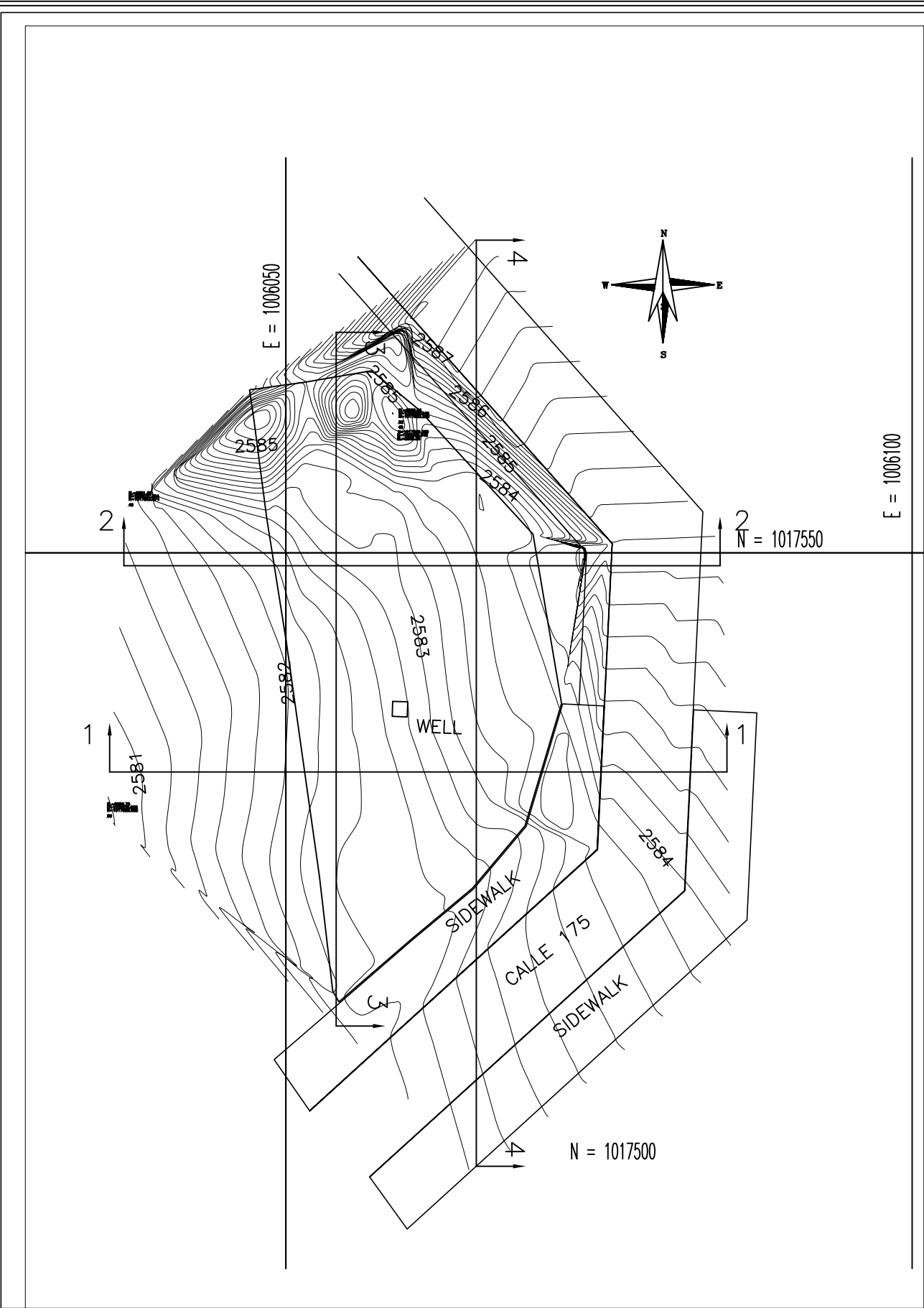
Section 1-1 & 2-2



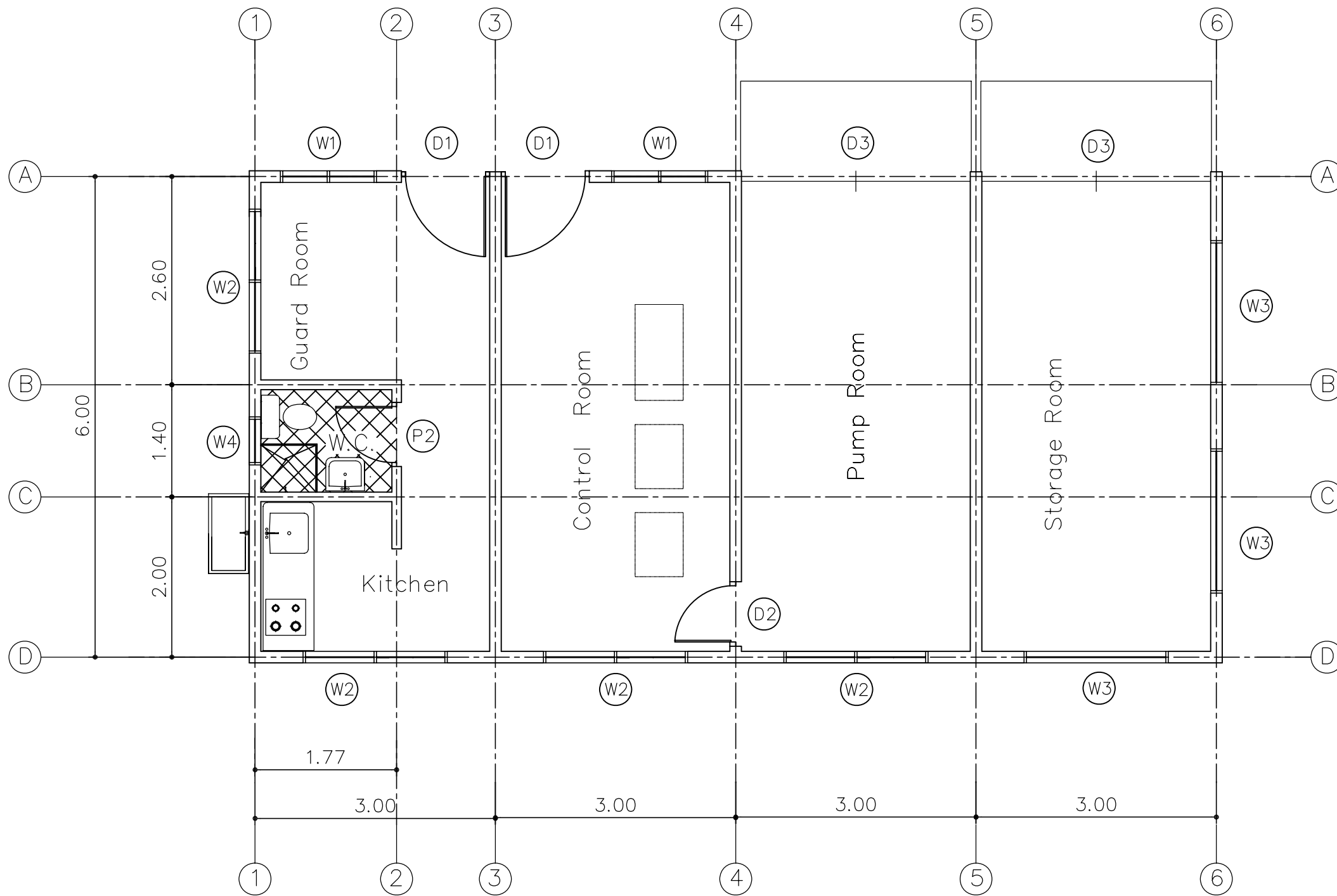
Standard Earthworks
(Not for Scale)
Finished Ground Level



LOGOTIPO FIRMA URBANIZADORA NÚMERO DE CONTRATO O NÚMERO CARTA DE COMPROMISO DISEÑADOR : Nombre: Matrícula Profesional: REPRESENTANTE LEGAL O PROPIETARIO Nombre: C.C. O NIT:	acueducto AGUA Y ALCANTARILLADO DE BOGOTÁ REVISION ACUEDUCTO: REVISOR: INGENIERO M.P. No.: RECIBIDO: INGENIERO REGISTRO No.: APROBO: INGENIERO M.P. No.: Vo.Bo. INGENIERO REGISTRO No.:		LOCALIZACION ESC: PUNTO DE AMARRE IGAC NORTE: ESTE: COTA: Coordenadas Medias E N PLANCHA	MODIFICACIONES <table border="1"> <thead> <tr> <th>FECHA</th> <th>MODIFICACION</th> <th>NOMBRE ING. RESPONSABLE</th> <th>FIRMA</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table>	FECHA	MODIFICACION	NOMBRE ING. RESPONSABLE	FIRMA									 acueducto AGUA Y ALCANTARILLADO DE BOGOTÁ GERENCIA ----- DIRECCION ----- PLANO DE DISEÑO DE REDES DE ACUEDUCTO	NOMBRE DE LA OBRA/URBANIZACION/BARRIO LOCALIDAD CONTIENE: PLAN AND SECTION FOR LA SALLE ESCALA: Unscaled NOMBRE DEL ARCHIVO: LA SALLE	PROYECTO N° : FECHA: JANUARY 2009 PLANO No. 1/2
	FECHA	MODIFICACION	NOMBRE ING. RESPONSABLE	FIRMA															
(Appendix-2-3)																			



LOGOTIPO, FIRMA URBANIZADORA NÚMERO DE CONTRATO O NÚMERO CARTA DE COMPROMISO		acueducto AGUA Y ALCANTARILLADO DE BOGOTÁ		LOCALIZACIÓN ESC:		PUNTO DE AMARRE IGAC		MODIFICACIONES		 AGUA Y ALCANTARILLADO DE BOGOTÁ GERENCIA ----- DIRECCION ----- PLANO DE DISEÑO DE REDES DE ACUEDUCTO		NOMBRE DE LA OBRA/URBANIZACIÓN/BARRIO LOCALIDAD		PROYECTO N°:	
DISEÑADOR:		REVISIÓN		ACUEDUCTO:		NORTE:		FECHA		CONTIENE:		FECHA: JANUARY 2009			
REPRESENTANTE LEGAL O PROPIETARIO		INGENIERO: M.P. No.:		INGENIERO: REGISTRO No.:		ESTE:		MODIFICACION		TOPOGRAFIC MAP AND SECTIONS FOR LA SALLE		PLANO No. 2/2			
INGENIERO: M.P. No.:		INGENIERO: REGISTRO No.:		COTA:		COORDENADAS MEDIAS E		NOMBRE ING. RESPONSABLE		ESCALA:		NOMBRE DEL ARCHIVO: LA SALLE			
INGENIERO: M.P. No.:		INGENIERO: REGISTRO No.:		PLANCHA		FIRMA									

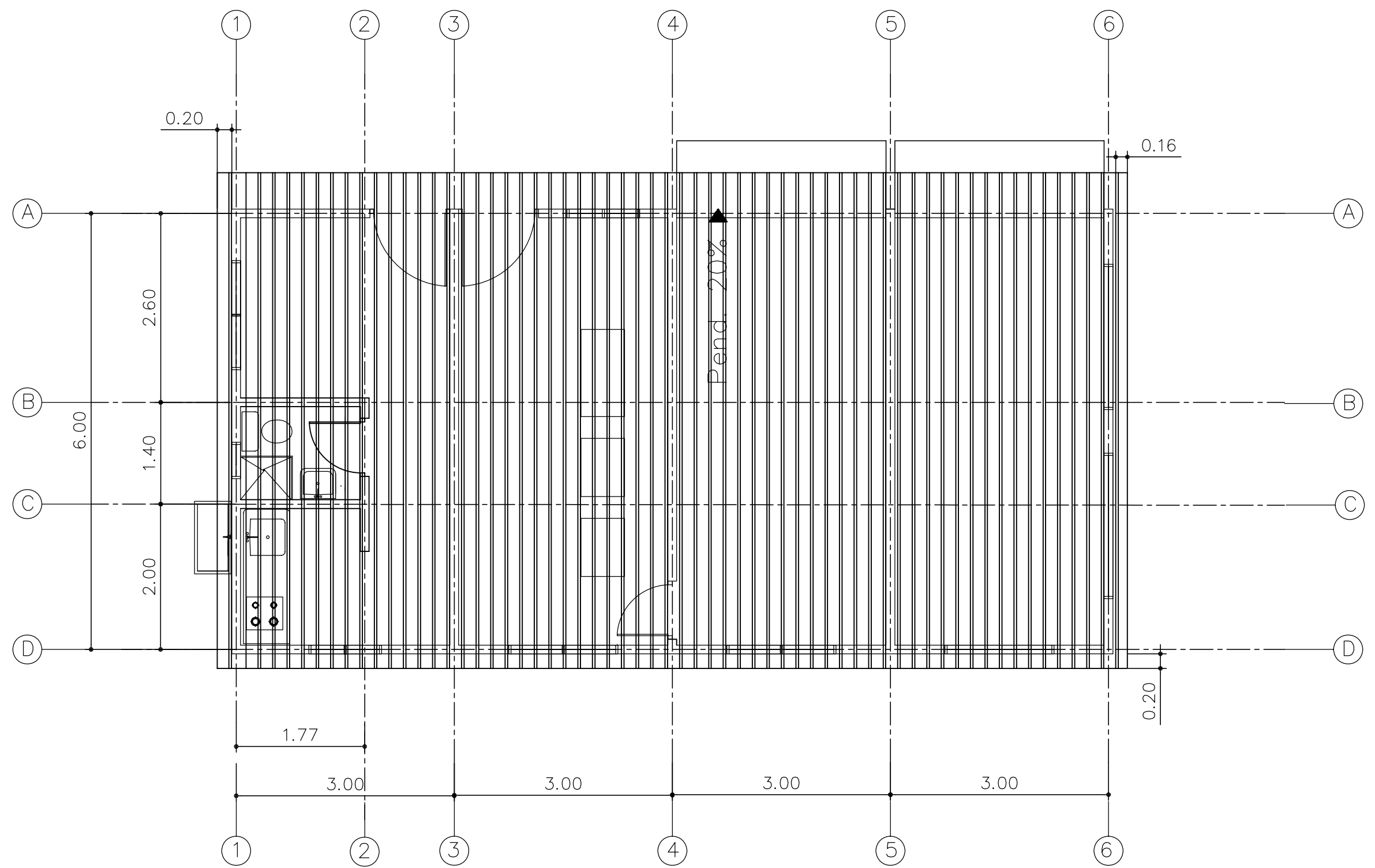


FLOOR PLAN
SCALE: 1:100

FITTING SCHEDULE

MARK	SPECIFICATIONS
(D1)	single swing steel door 1.00 x 2.40
(D2)	single swing steel door 0.7 x 2.10
(D3)	Rolling Door 3,00 x 2.4 manually operated
(W1)	Aluminum window with grille 1.20 x 1.30 Vidrio t=5
(D2)	Aluminum window with grille 1.80W x 1.30H Vidrio t=5
(W3)	Aluminum window with grille 1.80 x 0.4 Vidrio t=5
(W4)	Aluminum window with grille 0.60 x 0.40 Vidrio t=5

LOGOTIPO, FIRMA URBANIZADORA NÚMERO DE CONTRATO O NÚMERO CARTA DE COMPROMISO		acueducto AGUA Y ALCANTARILLADO DE BOGOTÁ		LOCALIZACIÓN ESC:	PUNTO DE AMARRE IGAC NORTE: ESTE: COTA: Coordenadas Medias E PLANCHA	MODIFICACIONES			acueducto AGUA Y ALCANTARILLADO DE BOGOTÁ GERENCIA ----- DIRECCION ----- PLANO DE DISEÑO DE REDES DE ACUEDUCTO	NOMBRE DE LA OBRA/URBANIZACIÓN/BARRIO LOCALIDAD		PROYECT N°:
DISEÑADOR:	REVISIÓN	ACUEDUCTO:	RECIBIDO:	FECHA	MODIFICACION	NOMBRE ING. RESPONSABLE	FIRMA	CONTIENE:		FLOOR PLAN		DATE: JANUARY 2009
REPRESENTANTE LEGAL O PROPIETARIO	APROBO:	Vo.Bo.	INGENIERO: REGISTRO No.							ESCALA: 1:100	NOMBRE DEL ARCHIVO: LA SALLE	PLANO No. 1/5



ROOF PLAN
SCALE: 1:100

LOGOTIPO, FIRMA URBANIZADORA
NÚMERO DE CONTRATO O NÚMERO CARTA DE COMPROMISO

DISEÑADOR :
Nombre: _____
Matrícula Profesional: _____

REPRESENTANTE LEGAL
O PROPIETARIO Nombre: _____
C.C. O NIT: _____

REVISION	ACUEDUCTO:
REVISO: INGENIERO: M.P. No.:	RECIBIO: INGENIERO: REGISTRO No.:
APROBO: INGENIERO: M.P. No.:	Vo.Bo. INGENIERO: REGISTRO No.:

LOCALIZACION
ESC:

PUNTO DE AMARRE
IGAC
NORTE:
ESTE:
COTA:
Coordenadas Medias
E N
PLANCHA

MODIFICACIONES		
FECHA	MODIFICACION	NOMBRE ING. RESPONSABLE

acueducto
AGUA Y ALCANTARILLADO DE BOGOTÁ

GERENCIA -----

DIRECCION -----

PLANO DE DISEÑO DE REDES DE ACUEDUCTO

NOMBRE DE LA OBRA/URBANIZACION/BARRIO LOCALIDAD

CONTIENE:
ROOF PLAN

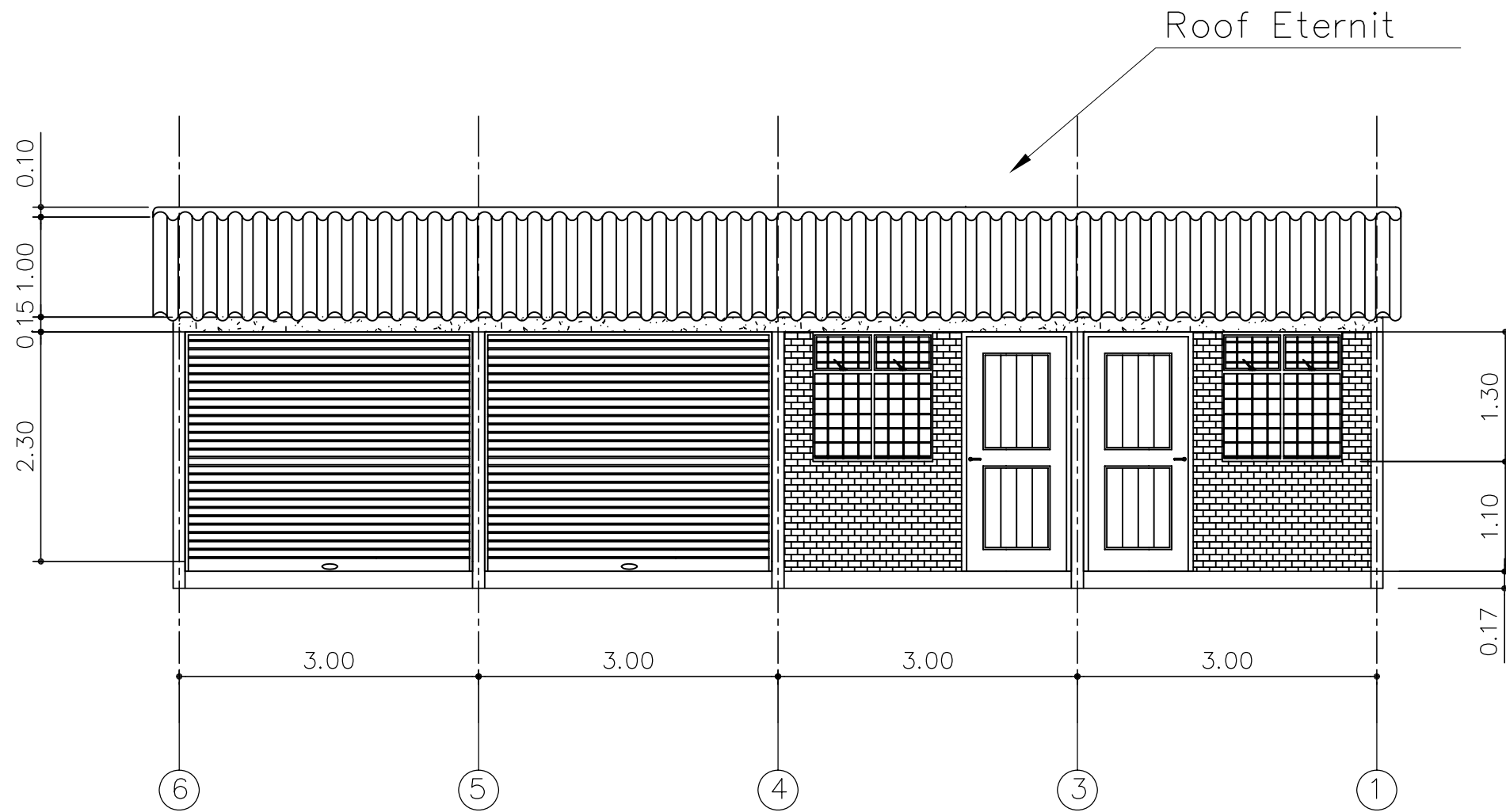
ESCALA: 1:100

NOMBRE DEL ARCHIVO: LA SALLE

PROYECTO N° :

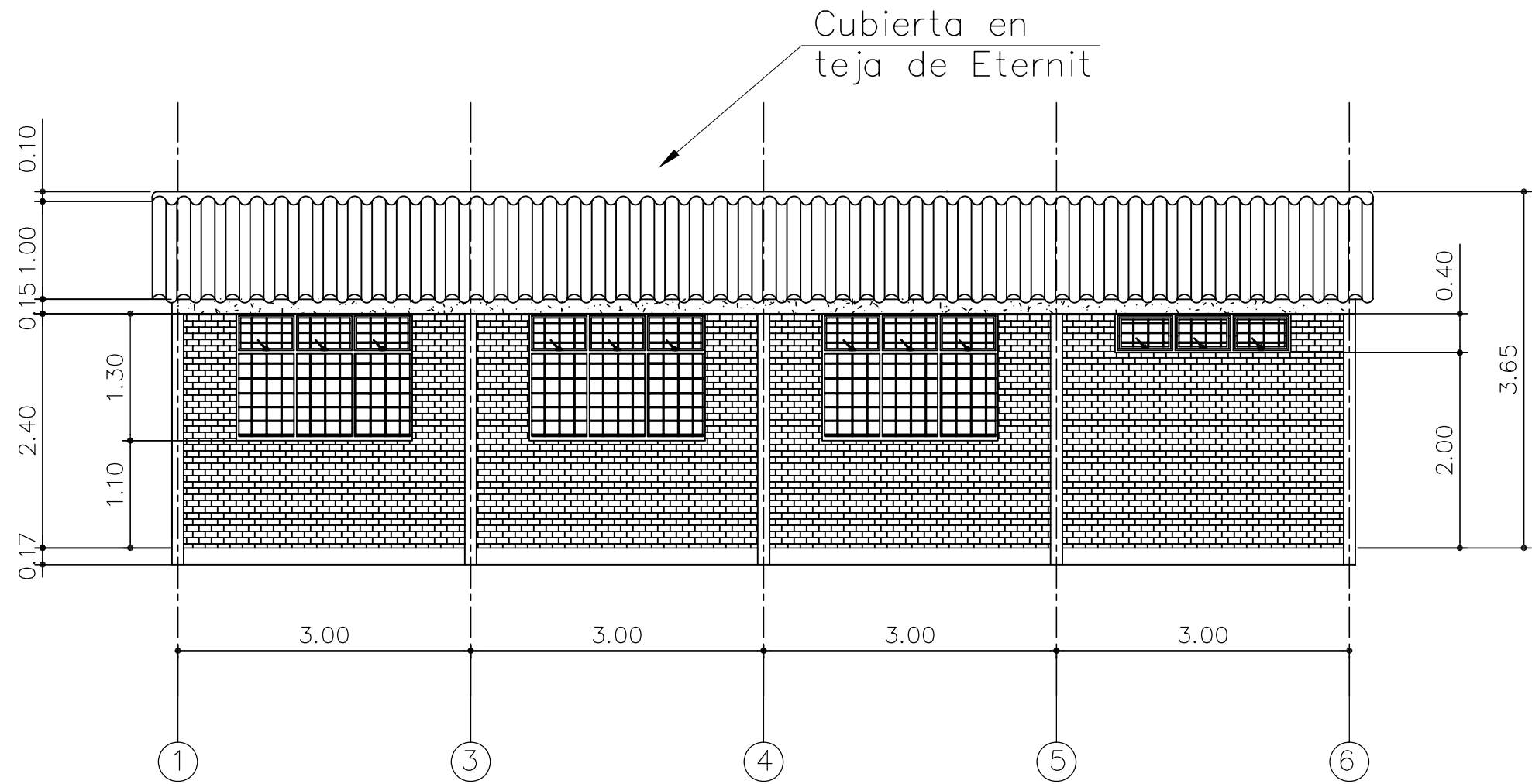
FECHA: JANUARY 2009

PLANO No. 2/5



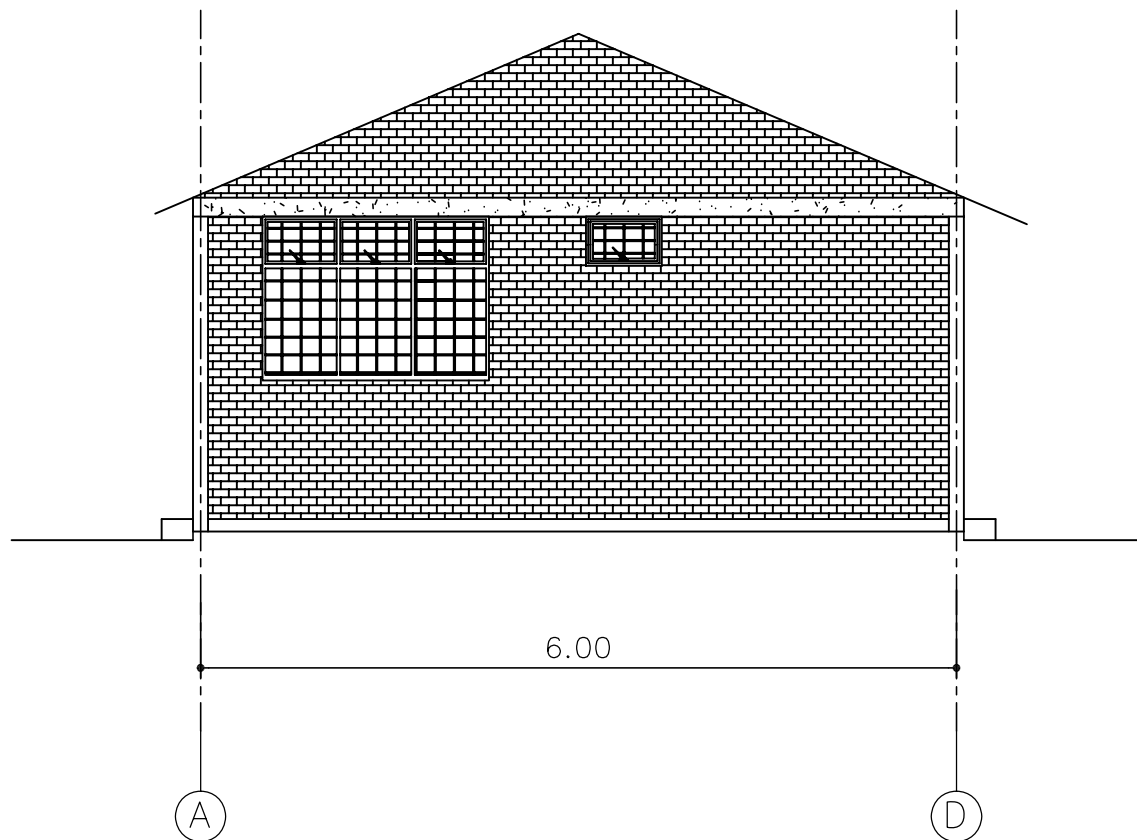
SECTION A-A
SCALE: 1:100

LOGOTIPO, FIRMA URBANIZADORA NÚMERO DE CONTRATO O NÚMERO CARTA DE COMPROMISO DISEÑADOR : Nombre: _____ Matrícula Profesional: _____ REPRESENTANTE LEGAL O PROPIETARIO Nombre: _____ C.C. O NIT: _____	acueducto AGUA Y ALCANTARILLADO DE BOGOTÁ		LOCALIZACIÓN ESC: _____	PUNTO DE AMARRE IGAC NORTE: _____ ESTE: _____ COTA: _____ E N PLANCHA	MODIFICACIONES <table border="1"> <thead> <tr> <th>FECHA</th> <th>MODIFICACION</th> <th>NOMBRE ING. RESPONSABLE</th> <th>FIRMA</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	FECHA	MODIFICACION	NOMBRE ING. RESPONSABLE	FIRMA													acueducto AGUA Y ALCANTARILLADO DE BOGOTÁ GERENCIA ----- DIRECCION ----- PLANO DE DISEÑO DE REDES DE ACUEDUCTO	NOMBRE DE LA OBRA/URBANIZACIÓN/BARRIO LOCALIDAD CONTIENE: SECTIONS ESCALA: 1:100 NOMBRE DEL ARCHIVO: LA SALLE	PROYECTO N° : FECHA: JANUARY 2009 PLANO No. 3/5
	FECHA	MODIFICACION	NOMBRE ING. RESPONSABLE	FIRMA																				
REVISION REVISO: INGENIERO: _____ M.P. No.: _____ APROBO: INGENIERO: _____ M.P. No.: _____	ACUEDUCTO: RECIBIO: INGENIERO: _____ REGISTRO No. _____ Vo.Bo. INGENIERO: _____ REGISTRO No. _____																							

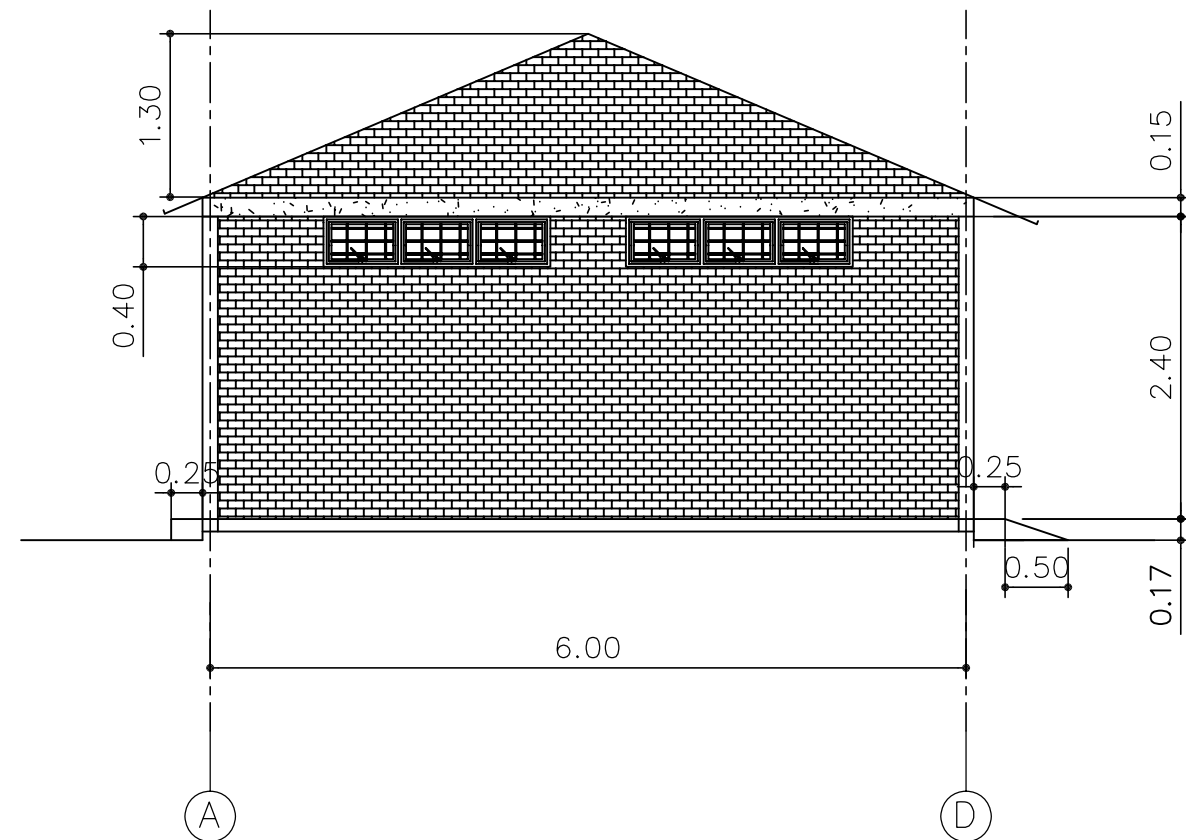


SECTION D-D
 ESCALA: 1:100


LOGOTIPO, FIRMA URBANIZADORA NÚMERO DE CONTRATO O NÚMERO CARTA DE COMPROMISO DISEÑADOR : Nombre: _____ Matrícula Profesional: _____ REPRESENTANTE LEGAL O PROPIETARIO Nombre: _____ C.C. O NIT: _____	acueducto AGUA Y ALCANTARILLADO DE BOGOTÁ		LOCALIZACIÓN ESC: _____	PUNTO DE AMARRE IGAC NORTE: _____ ESTE: _____ COTA: _____ Coordenadas Medias E N PLANCHA	MODIFICACIONES <table border="1"> <thead> <tr> <th>FECHA</th> <th>MODIFICACION</th> <th>NOMBRE ING. RESPONSABLE</th> <th>FIRMA</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	FECHA	MODIFICACION	NOMBRE ING. RESPONSABLE	FIRMA													acueducto AGUA Y ALCANTARILLADO DE BOGOTÁ GERENCIA ----- DIRECCION ----- PLANO DE DISEÑO DE REDES DE ACUEDUCTO	NOMBRE DE LA OBRA/URBANIZACIÓN/BARRIO LOCALIDAD CONTIENE: SECTIONS ESCALA: 1:100 NOMBRE DEL ARCHIVO: LA SALLE	PROYECTO N° : FECHA: JANUARY 2009 PLANO No. 4/5
	FECHA	MODIFICACION	NOMBRE ING. RESPONSABLE	FIRMA																				
REVISION INGENIERO: M.P. No.: _____ APROBO: INGENIERO: M.P. No.: _____	ACUEDUCTO: INGENIERO: REGISTRO No. _____ Vo.Bo. INGENIERO: REGISTRO No. _____																							



SECTION 1-1
SCALE: 1:100



SECTION 6-6
SCALE: 1:100

LOGOTIPO, FIRMA URBANIZADORA NÚMERO DE CONTRATO O NÚMERO CARTA DE COMPROMISO DISEÑADOR : Nombre: _____ Matrícula Profesional: _____ REPRESENTANTE LEGAL O PROPIETARIO Nombre: _____ C.C. O NIT: _____	acueducto AGUA Y ALCANTARILLADO DE BOGOTÁ		LOCALIZACIÓN ESC: _____	PUNTO DE AMARRE IGAC NORTE: _____ ESTE: _____ COTA: _____ Coordenadas Medias E N PLANCHA	MODIFICACIONES <table border="1"> <thead> <tr> <th>FECHA</th> <th>MODIFICACION</th> <th>NOMBRE ING. RESPONSABLE</th> <th>FIRMA</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	FECHA	MODIFICACION	NOMBRE ING. RESPONSABLE	FIRMA													 acueducto AGUA Y ALCANTARILLADO DE BOGOTÁ GERENCIA ----- DIRECCION ----- PLANO DE DISEÑO DE REDES DE ACUEDUCTO	NOMBRE DE LA OBRA/URBANIZACIÓN/BARRIO LOCALIDAD CONTIENE: SECTIONS ESCALA: 1:100 NOMBRE DEL ARCHIVO: LA SALLE	PROYECTO N° : FECHA: JANUARY 2009 PLANO No. 5/5
	FECHA	MODIFICACION	NOMBRE ING. RESPONSABLE	FIRMA																				
REVISION INGENIERO: _____ M.P. No.: _____ APROBO: INGENIERO: _____ M.P. No.: _____	ACUEDUCTO: RECIBIO: INGENIERO: _____ REGISTRO No. _____ Vo.Bo. INGENIERO: _____ REGISTRO No. _____																							