Data 10. Study of Existing Pressure Reducing Equipments

The current condition of the existing pressure reducing equipments were studied and the result in below is obtained.

1) Current usage condition

Area: WAJ Ma'an branch office
Water supply system: The system was constructed in 2000, designed by CDM, USA and funded by USAID.
Pressure reducing method:

Pressure reducing tank: 4
Pressure reducing valve: 10

The price of water level control valve with diameter of 100mm for pressure reducing tank is USD 3,000.
The price of pressure reducing valve with diameter of 100mm is USD 10,000 (Switzerland CLA VAL).
Useful life:

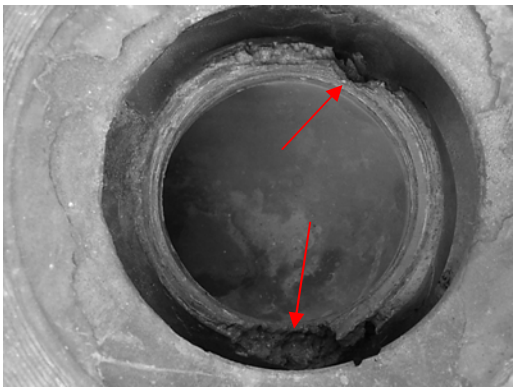
Water level control valve for pressure reducing tank: 3 years
(The price of water level control valve (Pilot valve) is JD500 (Approx. USD 700).
Pressure reducing valve: 3 to 4 years (Cavitations erosion of the internal valve seat)

Comparison table of pressure reducing equipments with diameter of 100mm

Items	Pressure reducing valve	Pressure reducing tank
（1） Components	Pressure reducing valve (φ100mm)	Tank (L7.4 x W2.7 x H2.75) + Water level control valve (φ100mm)
（2） Installation location	Any (Under the road or frontage road)	Same as left
（3） Required area for installation (Valve box)	Approx. $7m^2$	Approx. $27m^2$
（4） Primary pressure	12～20Bar.	Same as left
（4） Secondary adjusted pressure	Less than 5Bar.	0 Bar.
（5） Useful life	Approx. 3 to 4 years	Approx. 3 to 4 years Water level control valve is approx. 3 years.
（6） Operation and maintenance technology	Adjustment of pilot valve	Same as left

The causes of damage for pressure reducing valve and pressure reducing tank are severe erosion of the internal valve seat by cavitations and these equipments become unavailable. There are the places where CDM designed to install Orifice in front of valves, however, at the moment, it has been removed by occurrence of vibration in pipelines by installation of Orifice.

Picture 1: Cavitation erosion (1)



Picture 2: Cavitation erosion (2)

2) Study of pressure reducing equipment

The problem which should consider mainly in the Project is countermeasure of cavitation. Generally, cavitation coefficient (σ) is calculated by following formula.

$\sigma = (H_2+10/((H_1 - H_2)+ (v^2/2g))$

H_1: Primary head of valve (m)

H_2: Secondary head of valve (m)

V: Flow velocity in pipeline (m/s)

g: Gravitational acceleration (9.8m/s^2)

There is not only cavitation coefficient (σ) by above formula, but also the natural cavitation coefficient (σ_2). In case that "σ" is more than "σ_2", cavitation doesn't occur. In Petra water supply system, the pressure reducing facilities of 10 pressure reducing valves (Dia. 100mm: 8 valves, Dia. 150mm: 2 valves) and 5 pressure reducing tanks (Dia. 100mm: 2 valves, Dia. 150mm: 3 valves) are currently working. The result of hearing survey for the pressure reducing facilities and operation condition are shown in below.

Pressure reducing equipments in Petra water supply system

Pressure reducing equipments	Primary head (m)	Secondary head (m)	Pressure difference (m)	Cavitation coefficient (σ)	Damage by cavitation
Valve 100mm	150	90	60	1.67	I
Valve 100mm	220	60	160	0.44	III
Valve 100mm	170	100	70	1.57	I
Valve 100mm	130	30	100	0.40	II
Tank (Inlet dia. 150mm)	200	0	200	0.05	III

Note) Damage condition by cavitation
III: Large II: Medium I: Small

The damage by cavitation is mainly occurred in the internal valve seat (refer to pictures). In above table, it is large damage, if the valve becomes unavailable. The average of annual maintenance fee for replacement of spare parts etc. without labour cost is JD 6,000. In order to replace to new product, in

case that pressure reducing valve manufactured by Cra Val company (Switzerland) which has best past record and performance, the cost of USD 10,000 will be required.

3) Conclusion

In case of pressure reducing tank, since the secondary head is 0m, the pressure difference is much more than pressure reducing valve's one and it has many cases that cavitation coefficient is lower than natural cavitation coefficient. In Petra water supply system, if primary head is over 100m, σ_2 becomes fractional part and cavitation certainly occurs. Therefore, the adoption of pressure reducing tank should avoid in case of high primary pressure.

In Petra water supply system, pressure reducing valve and pressure reducing tank is assumed to be planned without consideration of cavitation coefficient. In the Project, the limitation of cavitation coefficient (σ_2) is 0.5 and design coefficient is defined more than 0.7. As for the appropriate valve opening position is determined by flow and pressure difference.

Data 11. Cost Estimation for Jordanian Side Cost Obligation (Laying Cost of pipelines)

Estimation of Construction Length for each Area and each Diameter (m)

Diameter	Type	Tafieleh City	Bsaira	Gharandal	Qhadesiyeh	Total
63mm (Outside diameter)	Only construction	14,640	14,410	9,610	11,440	50,100
25mm (Inside diameter)	Procurement of materials and construction	17,000	9,970	8,640	13,540	49,150
20mm (Inside diameter)	Procurement of materials and construction	30,616	16,730	8,330	13,450	69,126
Total		47,616	26,700	16,970	26,990	118,276

Cost Estimation of Replacement of Distribution Pipelines for Jordanian side (thousand JD)

Diameter	Type	Tafieleh City	Bsaira	Gharandal	Qhadesiyeh	Total
63mm (Outside diameter)	Only construction	702.7	691.7	461.3	549.1	2,405
25mm (Inside diameter)	Procurement of materials and construction	714.0	418.7	362.9	568.7	2,064.3
20mm (Inside diameter)	Procurement of materials and construction	1,224.6	669.2	333.2	538.0	2,765.0
Total		2,641.3	1,779.6	1,157.4	1,655.8	7,234.1

Data 12. Outline Design in the Target Area of Ma'an Governorate

1. Design Policy

(1) Basic Policy

Basic policy is basically same as Tafieleh governorate's basic policy. Additional basic policy is shown in the following.

1) Establishment of system for effective distribution management and non-revenue water control in each target area

The served area of water supply in Ma'an city, the target area in Ma'an governorate, is located at flat area, therefore, pressure difference is not large except for the distribution area supplied by pump. In order to reduce water leakage, implement appropriate distribution management and improve water supply condition, the following policy is adopted.

① Water distribution zones are divided to facilitate non-revenue control and distribution management.
② Distribution monitoring system is established to facilitate non-revenue control and distribution management.

(2) Policy on operations and maintenance capability of the implementing organization

Ma'an branch of Aqaba Water Company (AWC) is the implementing agency for this project, and will be responsible for the operation and maintenance after this project is completed. AWC is a company, a major share folder of which is WAJ. It took over the responsibility of operations and maintenance at the WAJ Ma'an Office from July 2010.

2. Basic Policy (Construction Plan/ Equipment Plan)

(1) Design conditions

In addition to design conditions for Tafieleh governorate, the additional defined design condition is shown in below.

1) Planned total population and served population

Table 1 Estimated Population Growth Rates in the Future for Ma'an Governorate

	2009-2010	2011-2015	2016-2020	2021-2025
Ma'an Governorate	2.0%	2.0%	1.7%	1.5%

Table 2 Estimated Population in the Future in Ma'an Governorate

Item	2010	2015	2020	2025
Ma'an Governorate	116,000	128,100	139,400	150,200

Table 3 Estimated Population in the Future in the Project Areas in Ma'an Governorate

Item	2010	2015	2020	2025
Project area in Ma'an Governorate (Ma'an city)	32,800	36,200	39,400	42,500

Table 4 Served Population Ratio According to the 2004 Census (%)

Governorate	Urban area	Rural area	Total
Ma'an Governorate	95.7	87.4	91.2

Table 5 Estimated Served Population in the Future in the Project Areas in Ma'an Governorate

Item	2010	2015	2020	2025
Target served population ratio	100 %	100 %	100 %	100 %
Served population				
Project area in the Ma'an Governorate (Ma'an city)	32,800	36,200	39,400	42,500

2) Planned non-revenue water ratio and leakage ratio

Table 6 Non-revenue Water Ratio and its Variation in the Ma'an Governorate

Governorate	2007	2008	Non-revenue water ratio and its variation in 2007-2008
Ma'an Governorate	53.4%	57.4%	4.0%

Based on the total produced water amount (total water supply volume) and the total water amount measured by water meter (revenue water) from 2007 to 2009 in the Ma'an city in Ma'an Governorate, the daily average water supply amount, the non-revenue water volume and the non-revenue water ratio were calculated. Moreover, the daily average water supply amount per capita and the revenue water amount were calculated from the estimated population. The non-revenue water ratio for 2009 was calculated as 61%. Planned leakage ratio, planned non-revenue water ratio and administrative loss rate in the pipe renewal area and non-renewal area is shown in Table 8.

Table 7 Total Produced Water Amount (Total Water Supply Amount) in the Ma'an Governorate Target Areas and Analysis of Total Water Amount (Revenue Water) Estimated from Water Meters

Year	Annual total water supply amount	Daily average water supply amount	Revenue water amount	Non-revenue water amount	Non-revenue water ratio	Estimated population	Daily average water supply amount per capita	Daily average revenue water volume per capita
	(m^3/year)	(m^3/day)	(m^3/year)	(m^3/year)	(%)	-	L/person/day	L/person/day
2007	2,916,421	7,990	1,139,493	1,776,928	61	30,803	259	101
2008	3,285,435	9,001	1,247,515	2,037,920	62	31,450	286	109
2009	3,420,899	9,372	1,330,300	2,090,599	61	32,170	291	113
Average	3,207,585	8,788	1,239,103	1,968,482	61	31,474	279	108

Table 8 Planned Leakage Ratio, Planned Non-Revenue Water Ratio and Administrative Loss Rate in the Pipe Renewal Area and Non-Renewal Area

(Units: %)

Item	Current	Distribution network renewal area			Distribution network non-renewal area		
	2010	2015	2020	2025	2015	2020	2025
1. Planned leakage ratio	30	15	15	15	25	22.5	20
2. Planned non-revenue water ratio	61	40	35	25	50	40	25

3) Planned average daily water consumption per capita and water supply amount

The existing consumption amount in the project area of Ma'an Governorate is 204 L, which well exceeds the target water supply amount. This is attributed to the high temperature in summer and the extremely dry climate here and unique water use behavior. Reduced consumption and efficient use of water are needed in Jordan, where water resources are meager. The existing behavioral patterns of water consumption cannot be changed radically very soon, but it can be changed over the long term. Accordingly, the average daily water consumption per capita in the project area of the Ma'an Governorate is taken as 200 L for 2015 for this project. The plan is to reduce this amount by approximately 10 L over a five-year period thereafter. The planned daily average water supply amount per capita and the planned average daily water consumption per capita in the distribution network renewal areas from 2010 to 2025 in this project are as given in the table below.

Table 9 Planned Average Daily Water Consumption Per Capita and Water Supply Amount in the Pipeline Renewal Area

Item	Units	2010	2015	2020	2025
Ma'an					
Planned daily average water supply amount per capita	L/person/day	204	200	190	180
Planned daily average water supply amount per capita	L/person/day	291	235	224	212

4) Planned daily maximum coefficient (1/load factor) and capacity of distribution reservoir

The planned daily maximum coefficient and planned storage hours of distribution reservoir for deciding the capacity of the facility are set as given below.

a) Planned daily maximum coefficient due to seasonal change （1/daily maximum coefficient）

The maximum values of the coefficient of monthly variation (daily maximum coefficient) of Ma'an are 1.40. The daily maximum coefficient (1/load factor) of this project, is taken as 1.5 along with Tafieleh governorate.

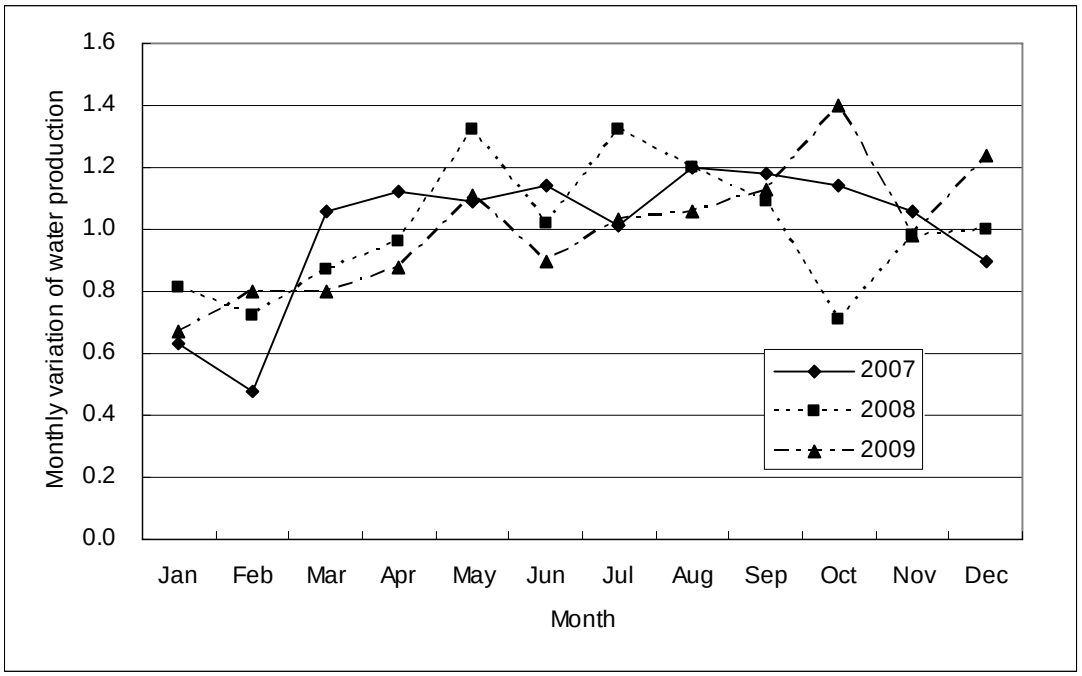


Figure 1 Annual Variation of the Value of Average Water Supply Amount by Month Divided by the Average Water Supply Amount by Year (Ma'an city)

b) Planned hourly maximum coefficient

The design value of the Study and Design Directorate, WAJ is in the range of 1.5 to 2.0. In Ma'an governorate, limited water supply was implemented in summer season and the accurate time coefficient is not calculated, therefore, actual value on December without water rationing is adopted. Accordingly, the time coefficient is set as 2.0 based on the design values of WAJ and referring to the actually-measured values in the pilot project area.

Table.10 Time Coefficient Estimated from the Pilot Project

Governorate	Measured month	Time coefficient
Ma'an	Dec. 2006	2.06

Source: JICA Technical Cooperation Project and JICA Development Study Report

5) Summary of planned conditions for water demand

The planned conditions for water demand in the various target areas are summarized in the table below.

Table 11 Planned Conditional Values for Water Demand in the Target Area of Ma'an Governorate

Item	Units	Existing	Distribution network renewal area			Distribution network non-renewal area		
		2010	2015	2020	2025	2015	2020	2025
Planned average daily water consumption per capita	L/person/day	204	200	190	180	204	200	190
Planned average daily water supply amount per capita	L/person/day	291	235	224	212	272	258	238
Planned maximum water demand per capita	L/person/day	437	353	335	318	408	387	356
Planned leakage ratio	—	0.30	0.15	0.15	0.15	0.250	0.225	0.200
Planned load factor	—	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Time coefficient	—	2	2	2	2	2	2	2

(2) Water distribution zoning plan and planned water demand

1) Water distribution zone plan

The water supply sources of Ma'an city are the Tahoonah wells and the Samneh wells. The water supply areas can be broadly classified into 3 distribution areas, which are supplied from these sources.

- Gravity flow distribution areas from the Tahoonah new distribution reservoir: Ma'an city center zone, Ma'an city central zone and northern zone
- Pump distribution zones from the Tahoonah new distribution reservoir pumping plant: Odrah zone and a part of the central zone
- Gravity flow and pump distribution from the Samneh distribution reservoir: Ma'an city southern zone, western zone and a part of the central zone

The existing water distribution zones are shown in Table 12 together with the distribution reservoirs of the supply sources and pumping plants. The elevation of the distribution reservoirs in the project area are shown in the Table 13.

Table 12 Capacity and Elevation of Existing Distribution Reservoirs of Ma'an City

Existing reservoir /pumping station	Elevation of base of reservoir (m)	Elevation of top of reservoir (m)	Capacity (m^3)
Tahoonah distribution reservoir	1170	1175.6	4,500
Samneh distribution reservoir	1,197 (obtained from the satellite photo)	—	2,000

Table 13 Existing Distribution Areas and Water Transmission and Distribution Method in Ma'an City

Distribution areas	Existing reservoir /pumping station	Elevation of base of reservoir (m)	Elevation of water distribution zone	Difference in elevation (m)	Planned water transmission and distribution method
Odruh	Tahoonah pumping station	1170.4	1125-1145	20	Direct pump distribution from the pumping station at the Tahoonah reservoir
Central part of city	Tahoonah distribution reservoir	1170.4	1095-1120	25	Water distributed by gravity flow from the Tahoonah reservoir
	Tahoonah distribution water pumping station	1170.4	1105-1140	25	Water pumped and distributed directly from the pumping station at Tahoonah reservoir through the Odruh zone
	Samneh distribution water pumping station	1197	1130-1150	20	Direct pump distribution from the pumping station at the Samneh reservoir
Old part of city	Tahoonah distribution reservoir	1170.4	1090-1120	30	Water distributed by gravity flow from the Tahoonah reservoir
Northern part of city	Tahoonah distribution reservoir	1170.4	1105-1120	15	Water distributed by gravity flow from the Tahoonah reservoir
Western part of city	Samneh distribution water pumping station	1197	1135-1150	15	Direct pump distribution from the pumping station at the Samneh reservoir
Southern part of city	Samneh distribution water pumping station	1197	1065-1150	85	Distribution either by gravity flow or directly by pump from the pumping station at the Samneh reservoir

The planned water distribution zones of each water source are taken as almost the same as the existing zone considering the existing distribution areas and the arrangement of existing distribution mains.

Distribution network calculations were made, and increase in distribution mains and detailed division of water distribution zones were studied. The results showed that if the water supply of the Tahoonah water sources is increased above the present level, additional installation of large diameter of distribution mains will be required from the reservoir to the city. To avoid large investment, the distribution amount of Samneh water source will be increased as far as possible without increasing the water supply amount of the Tahoonah water source.

Furthermore, the Samneh distributed water pumping station is under construction now, but in areas where distribution capacity of the central zone of the city is inadequate, pump distribution will be

necessary during months when water demand is high; however, in other zones, particularly in the southern part of city center zone, water can be distributed by gravity flow from the Samneh reservoir. Consequently, zones with pumped water distributed from the Samneh reservoir are to be set, in addition to the pump distribution in the Odruh zone from the Tahoonah reservoir. The division of the water distribution zones is shown below.

Tahoonah water distribution zones

- Tahoonah pump distribution: Odruh zone and a part of the central zone
- Tahoonah gravity flow: A part of the central zone and the northern zone
- Tahoonah gravity flow to city center zone: City center

Samneh water distribution zones

- Samneh gravity flow distribution: A part of the city center and south-eastern part of the city
- Samneh pump distribution: Western part of city, south-western part of city, and a part of the central zone of the city

Table 14 Division of Planned Water Distribution Zones and Water Transmission and Distribution Method in Ma'an city

Water distribution zone	Details of area	Existing reservoir /pumping station	Elevation of base of reservoir (m)	Elevation of water distribution zone	Difference in elevation (m)	Planned water transmission and distribution method
Tahoonah pump distribution zone:	- Odruh - Central part	Tahoonah pumping station	1170	1125-1145 1105-1140	20 35	Direct pump distribution from the pumping station at the Tahoonah distribution reservoir
Tahoonah gravity distribution (north and central zones)	- Central part - Northern part	Tahoonah reservoir		1095-1120 1105-1120	25 15	Water distributed by gravity flow from the Tahoonah distribution reservoir
Tahoonah gravity distribution (city center zone)	- Southern part of city center	Tahoonah reservoir		1090-1120	30	Water distributed by gravity flow from the Tahoonah distribution reservoir
Samneh pump distribution zones	- Central part - Part of city center	Samneh reservoir	1197	1115-1135 1105-1120	20 15	Gravity distribution from reservoir
Samneh gravity distribution zones	- Western part - Southern part of city	Samneh pumping station		1125-1150 1065-1150	25 85	Direct pump distribution from the pumping station at the Samneh

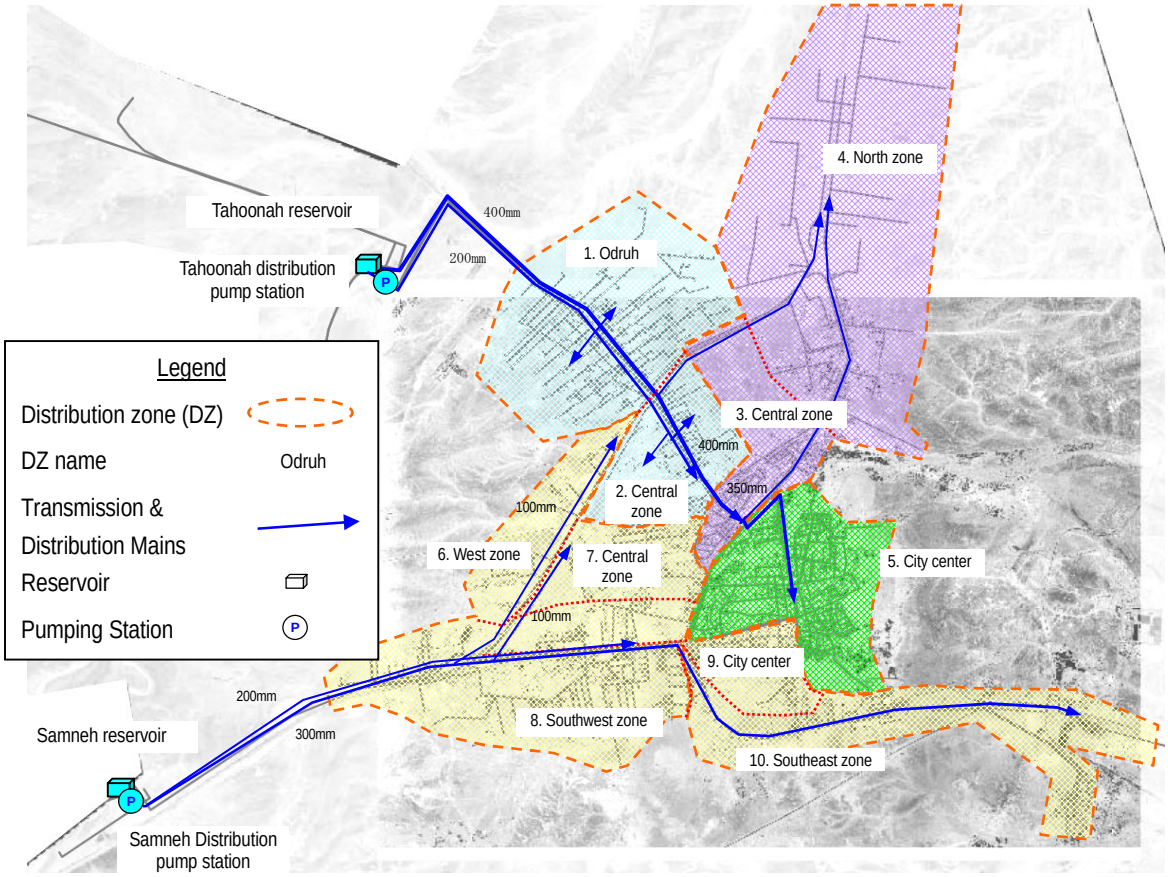


Figure 2 Existing Water Transmission and Distribution System and Water Distribution Areas of Ma'an Governorate Project Area

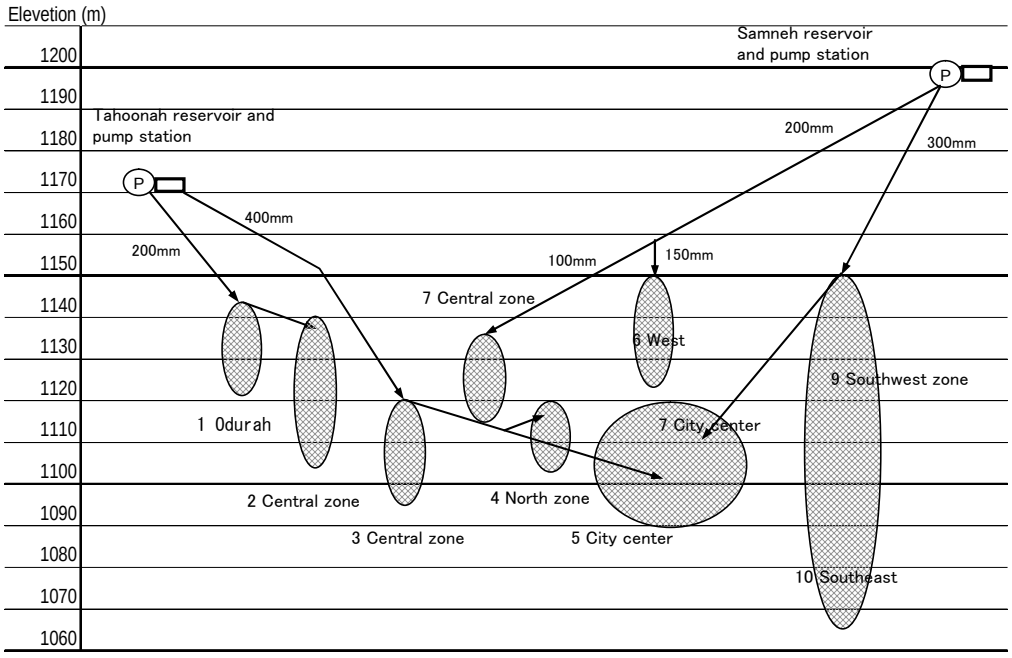


Figure 3 Schematic Layout of Planned Water Distribution Zones and Existing Distribution System

2) Planned served population by water distribution zone and planned water supply amount

The future planned population by water distribution zone in the target area of Ma'an Governorate is shown in the table below.

Table 15 Planned Future Population by Area in Ma'an City

Distribution area	Area details	2010	2015	2020	2025
Tahoonah source					
Tahoonah pumping station	1 Odruh	2,073	2,332	2,586	2,840
	2 Central part	1,742	1,955	2,164	2,373
Tahoonah central and north	3 Central part	2,359	2,647	2,929	3,211
	4 North part	1,691	1,910	2,118	2,326
Tahoonah city center	5 City center	12,001	12,951	13,851	14,652
Samneh source					
Samneh southwest	6 West part	248	282	315	348
	7 Central part	1,578	1,773	1,962	2,151
	8 Southwest	4,036	4,528	5,014	5,500
Samneh southeast	9 City center	3,941	4,305	4,563	4,820
	9 Southeast	3,131	3,517	3,898	4,279
Total		32,800	36,200	39,400	42,500

Table 16 Planned Future Population by Distribution Area in Ma'an City

Distribution zones	2010	2015	2020	2025
Tahoonah DZs				
Tahoonah Odruh Central	3,815	4,287	4,750	5,213
Tahoonah Central North	4,050	4,557	5,047	5,537
Tahoonah City center	12,001	12,951	13,851	14,652
Sub-total	19,866	21,795	23,648	25,402
Samneh DZs				
Samneh Southwest	5,862	6,583	7,291	7,999
Samneh Southeast	7,072	7,822	8,461	9,099
Sub-total	12,934	14,405	15,752	17,098
Total	32,800	36,200	39,400	42,500

The planned daily average water supply amount and the maximum water supply amount in each water distribution zone are shown below. The planned daily maximum water supply amount in 2015 is 8,124 m^3/day for the Tahoonah source, and is 5,567 m^3/day for the Samneh source.

Table 17 Planned Water Supply Amount by Water Distribution Zone

(m^3/day)

Water distribution zone	Planned average daily water supply amount				Planned daily maximum water supply amount			
	2010	2015	2020	2025	2010	2015	2020	2025
Tahoonah								
Tahoonah pump distribution zone	1,111	1,143	1,165	1,173	1,668	1,719	1,749	1,761
North and central water distribution zones of Tahoonah city	1,179	1,216	1,237	1,247	1,772	1,827	1,857	1,871
Tahoonah old city water distribution zones	3,497	3,051	3,100	3,105	5,247	4,578	4,651	4,658
Sub-total	5,787	5,410	5,502	5,525	8,687	8,124	8,257	8,290
Samneh								
Samneh pump distribution zone	1,707	1,756	1,787	1,800	2,565	2,637	2,684	2,702
Samneh gravity flow distribution zone	2,060	1,951	1,976	1,984	3,093	2,930	2,967	2,978
Sub-total	3,767	3,707	3,763	3,784	5,658	5,567	5,651	5,680
Total	9,554	9,117	9,265	9,309	14,345	13,691	13,908	13,970

(3) Evaluation of Water Resources

Planned average daily water supply amount in Ma'an is 9,117 m^3/day. The result of well pumping test in Hasa wells where are water resources in this area, is shown in Data 4. Based on the hourly yield obtained from the test result, the capacity of water resource is estimated as 20,200m^3/day (Tahoonah water resource: 14,980m^3/day, Samneh water resource: 6,420m^3/day) with 20 hours operation of pump. The estimated capacity of water resource exceeds planned average daily water supply amount and can cover water demand in the target area by the existing water resources.

(4) Replacement Plan of Distribution Network

1) Prioritization of replacement of distribution network

The target areas are spread over very wide area and it is not possible to implement entire network replacement within limited budget. To focus more suitable and limited area for replacement by Japanese side, the priority is given to the area for selection. The selection criteria are shown below.

- Population scale and density: cost-effectiveness, the number of beneficiaries.
- Pipe age: non-revenue water reduction
- Frequency of leaks: non-revenue water reduction
- Water supply pressure: non-revenue water reduction

2) Population scale and density

Table18　Estimated Population and Population Density in Ma'an in 2015

Area	Estimated population	Rank	Population density (p/ha)	Rank
Odruh	2,332	4	13	5
Central part	6,375	3	35	2
Northern part	1,910	5	28	4
City center	17,256	1	98	1
Southern part	8,045	2	30	3
Total/average	36,103		40	

3)　Age of distribution network

The average of Ma'an city is 17.8 years but the pipe in Ma'an city center is older with 23 years in Ma'an city.

4)　Frequency of leakage

According to WAJ staff, many leakage in Ma'an city center including Shamiyyeh area occurs.

5)　First Screening of Pipe Replacement Area

The following table shows a summary of the values of criteria stated above. Ma'an city center, where has large beneficiary population, big population density and high frequency of leakage, is selected as the target area for pipe replacement.

Table 19 Comparison of Area for Pipe Replacement

Area	Population in 2015	Pop density (p/ha)	Average pipe area (years)	Frequency of leaks	Water pressure	Request from Jordan	Selection
Ma'an							
Ma'an city center	17,256●	98●	22.3	●		●	●
Ma'an city excluding city center	18,847●	27	(17.8)			●	

Note: ● indicates priority area for replacement。
Nemta is excluded as it is very small area.

(5)　Pipeline Plan

1)　Replacement of Distribution Network

The diameter and length of the planned distribution network is calculated as shown in table below based on network analysis.

Table 20 Planned Distribution Pipeline

(m)

Diameter	Total
350mm	500
300mm	900
250mm	1,330
200mm	760
150mm	1,740
100mm	7,560
合計	12,790

2) Corrosion Protection

As a result of field survey, high corrosion soil was found along planned pipeline route in Ma'an city. The estimation result by criteria of ANSI/AWWA C105/A21.5-1999 show that corrosion degree is high and corrosion protection for pipelines is required. The result of study and data is show in "Data 8". Polyethylene sleeve protection, which is the most economical and easiest way for corrosion protection, is selected as corrosion protection for pipe.

(6) Monitoring System for Water Supply System

1) Facilities to be monitored

The facilities to be monitored by the monitoring system in Ma'an are shown below.

Ma'an Area
・ Outlet of reservoir and pumping station in reservoir：2 (4 flow meters) ・ Inlet of DMA：1 (1 flow meters and 1 pressure meters)

Flow meters are planned to install in all locations, but, the location of pressure meter is only in the inlet of DMA. Details for the facilities to be monitored are shown in Figure 4.

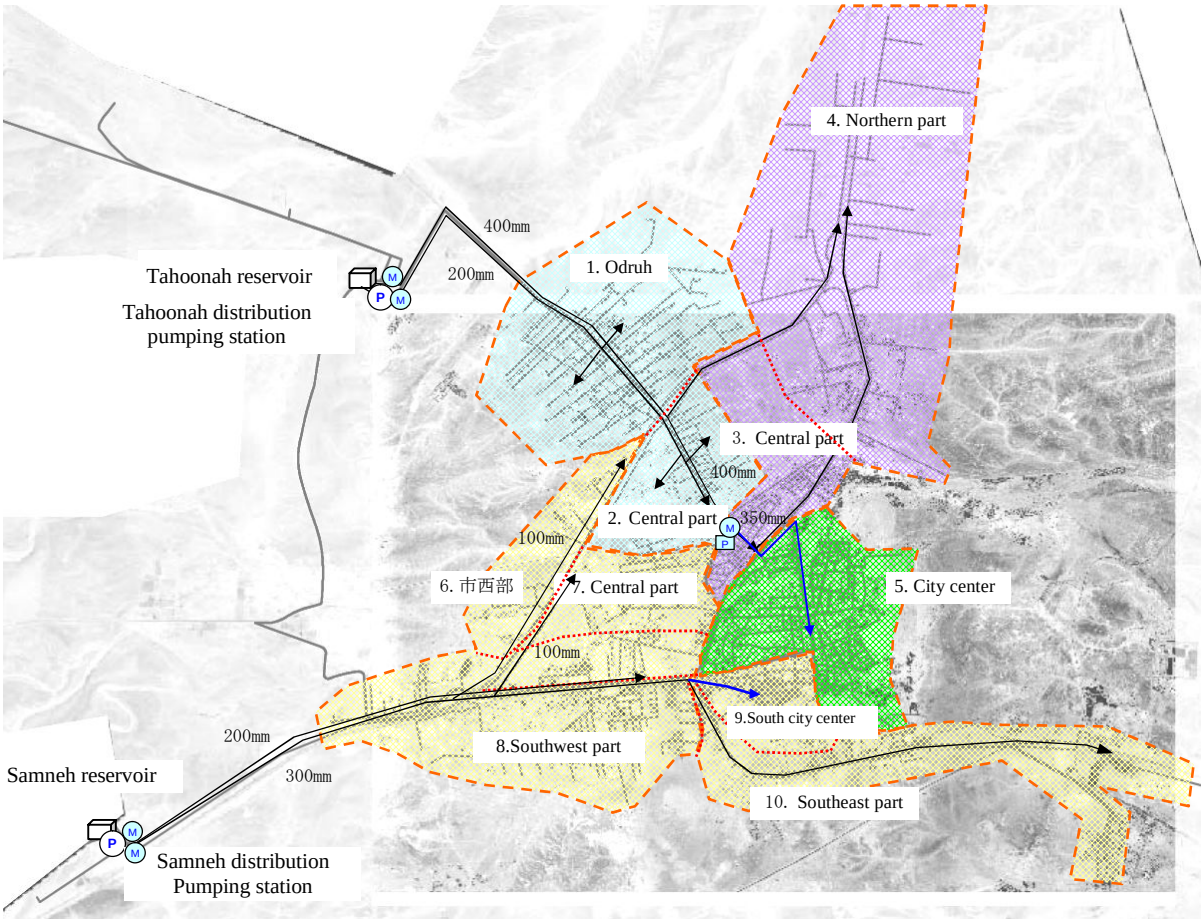


Figure 4 Location of Field Equipment for Monitoring in Ma'an Area

2) Monitoring System

The central monitoring stations are located at AWC Ma'an office in Ma'an area and receive, analyze and accumulate pressure flow data transmitted from the facilities to be monitored.

3) Location and Quantity of Equipment

Location and quantity of central monitoring system and field equipment is shown in following table.

Table 21 Central Monitoring System

Installation place	TFT	Server	Printer	GPRS Router	UPS	Power supply unit
AWC Ma'an office	1	1	1	1	1	1

Table22 Field Equipment

Location	Flow meter	Pressure Transmitter	GPRS Router	UPS	Interface Panel
Ma'an					
1. Tahoonah reservoir	2		1	1	1
2. DMA (Inlet of city center)	1	1	1	1	1
4. Samneh reservoir and pumping station	2		1	1	1
Total	5	1	3	3	3

(7) Summary of Facility Plan

Facilities	Specification/capacity/quantity	
Distribution pipeline	Ma'an city（12,790m）	DIP 100mm x 7,560m DIP 150mm x 1,740m DIP 200mm x 760m DIP 250mm x 1,330m DIP 300mm x 900m DIP 350mm x 500m
Distribution monitoring system	Ma'an city	Central monitoring system: 1 set Flow meter (Reservoir and Pumping station): 4 sets Flow meter and Pressure meter（DMA）: 1 set

Hydraulic calculation result of distribution system in Ma’an

NODE	Ma'an city				LINK	Ma'an city						
ID	Elevation m	Head m	Demand m3/d	Pressure m	ID	Length m	Diameter mm	Roughness	Flow m3/d	Velocity m/s	Unit head loss m/km	Status
Junc 1	1125.0	1168.2	9.2	43.2	Pipe 1	306.38	50	100	−9.2	0.05	0.2	Open
Junc 2	1125.0	1168.2	2.9	43.2	Pipe 2	5.09	20	100	2.8	0.1	1.93	Open
Junc 3	1110.0	1143.6	6.4	33.6	Pipe 3	15.45	20	100	2.1	0.08	1.13	Open
Junc 4	1110.0	1143.6	6.4	33.6	Pipe 4	47.45	20	100	0.7	0.03	0.15	Open
Junc 5	1115.0	1142.8	11.0	27.8	Pipe 5	7.37	20	100	−0.7	0.03	0.15	Open
Junc 6	1110.0	1142.8	11.0	32.8	Pipe 6	12.9	100	100	−3.5	0.01	0	Open
Junc 7	1110.0	1142.9	11.0	32.9	Pipe 7	160.59	100	100	−4.2	0.01	0	Open
Junc 8	1110.0	1142.9	11.0	32.9	Pipe 8	9.63	100	100	616.9	0.91	16.6	Open
Junc 9	1110.0	1143.5	6.4	33.5	Pipe 9	17.75	100	100	520.3	0.77	12.11	Open
Junc 10	1110.0	1143.5	6.4	33.5	Pipe 10	10.69	20	100	−1.7	0.06	0.77	Open
Junc 11	1115.0	1143.0	9.8	28.0	Pipe 11	152.22	20	100	6	0.22	7.91	Open
Junc 12	1115.0	1143.5	9.8	28.5	Pipe 12	4.5	50	100	83	0.49	11.84	Open
Junc 13	1120.0	1143.3	9.2	23.3	Pipe 13	9.15	63	100	81.3	0.3	3.69	Open
Junc 14	1115.0	1143.1	9.2	28.1	Pipe 14	13.65	20	100	−1.7	0.06	0.76	Open
Junc 15	1115.0	1143.7	2.9	28.7	Pipe 15	11.52	20	100	27.6	1.02	133.62	Open
Junc 16	1115.0	1143.2	2.9	28.2	Pipe 17	10.12	20	100	9.2	0.34	17.46	Open
Junc 17	1115.0	1140.9	9.2	25.9	Pipe 18	5.55	20	100	9.2	0.34	17.47	Open
Junc 18	1115.0	1141.5	9.2	26.5	Pipe 19	21.56	20	100	−1.7	0.06	0.77	Open
Junc 19	1115.0	1143.0	11.8	28.0	Pipe 20	10.81	20	100	−1.7	0.06	0.76	Open
Junc 20	1115.0	1142.1	6.4	27.1	Pipe 21	24.94	20	100	−1.7	0.06	0.76	Open
Junc 21	1115.0	1142.5	6.4	27.5	Pipe 22	7.72	20	100	1.7	0.06	0.76	Open
Junc 22	1115.0	1143.0	6.4	28.0	Pipe 24	33.36	63	100	−1.7	0.01	0	Open
Junc 23	1115.0	1143.0	2.9	28.0	Pipe 25	160.07	63	100	12.1	0.04	0.11	Open
Junc 24	1115.0	1143.1	2.9	28.1	Pipe 26	82.04	63	100	8.7	0.03	0.06	Open
Junc 25	1110.0	1140.7	11.0	30.7	Pipe 27	72.77	63	100	−5.3	0.02	0.02	Open
Junc 26	1110.0	1142.3	11.0	32.3	Pipe 28	13.73	63	100	−5.3	0.02	0.02	Open
Junc 27	1110.0	1140.8	11.0	30.8	Pipe 29	75.33	63	100	−34.3	0.13	0.75	Open
Junc 28	1110.0	1142.0	11.0	32.0	Pipe 30	32.49	63	100	−71.1	0.26	2.88	Open
Junc 29	1110.0	1142.1	11.0	32.1	Pipe 31	82.68	63	100	−74.5	0.28	3.14	Open
Junc 30	1115.0	1142.6	2.9	27.6	Pipe 32	123.55	63	100	−77.9	0.29	3.41	Open
Junc 31	1110.0	1142.6	9.2	32.6	Pipe 33	530.82	100	100	490.5	0.72	10.86	Open
Junc 32	1115.0	1142.4	9.2	27.4	Pipe 34	16.06	20	100	−5.3	0.2	6.29	Open
Junc 33	1115.0	1143.1	9.2	28.1	Pipe 35	7.99	20	100	−19.8	0.73	72.23	Open
Junc 34	1110.0	1141.4	13.3	31.4	Pipe 36	39.92	20	100	−5.3	0.2	6.29	Open
Junc 35	1110.0	1142.9	11.0	32.9	Pipe 37	12.5	20	100	1.7	0.06	0.77	Open
Junc 36	1110.0	1142.6	6.4	32.6	Pipe 38	12.07	20	100	1.7	0.06	0.76	Open
Junc 37	1115.0	1143.2	9.2	28.2	Pipe 39	12.98	20	100	1.7	0.06	0.77	Open
Junc 38	1120.0	1142.5	9.2	22.5	Pipe 40	19.51	20	100	−2.5	0.09	1.56	Open
Junc 39	1120.0	1142.2	9.2	22.2	Pipe 41	20.21	20	100	−2.5	0.09	1.56	Open
Junc 40	1110.0	1143.5	6.4	33.5	Pipe 42	19.79	20	100	2.5	0.09	1.56	Open
Junc 41	1110.0	1143.2	6.4	33.2	Pipe 43	15.17	20	100	2.5	0.09	1.56	Open
Junc 42	1110.0	1143.2	6.4	33.2	Pipe 44	13.63	20	100	2.5	0.09	1.57	Open
Junc 43	1115.0	1138.3	11.8	23.3	Pipe 45	59.07	100	100	721.3	1.06	22.17	Open
Junc 44	1115.0	1139.1	11.8	24.1	Pipe 46	67.16	100	100	693.9	1.02	20.64	Open
Junc 45	1115.0	1141.9	11.8	26.9	Pipe 47	198.38	25	100	10.9	0.26	8.06	Open
Junc 46	1115.0	1141.1	11.8	26.1	Pipe 48	21.07	25	100	7.5	0.18	4.04	Open
Junc 47	1115.0	1140.3	11.8	25.3	Pipe 49	21.55	25	100	4.1	0.1	1.32	Open
Junc 48	1120.0	1143.3	9.2	23.3	Pipe 50	118.3	25	100	0.7	0.02	0.05	Open
Junc 49	1120.0	1142.2	9.2	22.2	Pipe 51	352.68	25	100	−0.7	0.02	0.05	Open
Junc 50	1120.0	1141.9	9.2	21.9	Pipe 52	26.59	100	100	928.4	1.37	35.39	Open
Junc 51	1120.0	1141.6	9.2	21.6	Pipe 53	51.51	100	100	927.7	1.37	35.34	Open
Junc 52	1125.0	1168.2	2.9	43.2	Pipe 54	50.48	100	100	922.1	1.36	34.94	Open
Junc 53	1125.0	1168.1	2.9	43.1	Pipe 55	49.11	100	100	853.6	1.26	30.29	Open
Junc 54	1110.0	1143.5	11.0	33.5	Pipe 56	51.7	100	100	842.8	1.24	29.58	Open
Junc 55	1110.0	1143.3	11.0	33.3	Pipe 57	52.42	100	100	805	1.19	27.17	Open
Junc 56	1120.0	1143.3	2.9	23.3	Pipe 58	78.35	100	100	784.1	1.16	25.88	Open
Junc 57	1115.0	1143.4	2.9	28.4	Pipe 59	33.68	20	100	−0.7	0.03	0.15	Open
Junc 58	1115.0	1143.1	6.4	28.1	Pipe 60	22.47	50	100	−0.7	0	0	Open
Junc 59	1115.0	1143.1	6.4	28.1	Pipe 61	102.12	50	100	−2.1	0.01	0.01	Open
Junc 60	1115.0	1142.0	11.8	27.0	Pipe 62	44.44	50	100	−7.1	0.04	0.12	Open
Junc 61	1115.0	1141.0	11.8	26.0	Pipe 63	22.4	50	100	−12.1	0.07	0.34	Open
Junc 62	1105.0	1143.1	13.3	38.1	Pipe 64	27.74	50	100	−17.1	0.1	0.64	Open
Junc 63	1110.0	1142.0	13.3	32.0	Pipe 65	67.7	50	100	−22.1	0.13	1.02	Open
Junc 64	1110.0	1143.5	6.4	33.5	Pipe 66	48.82	50	100	−27.1	0.16	1.49	Open
Junc 65	1115.0	1143.5	9.8	28.5	Pipe 67	66.16	200	100	3334.5	1.23	12.91	Open
Junc 66	1110.0	1158.3	9.6	48.3	Pipe 68	161.6	200	100	2465.9	0.91	7.38	Open
Junc 67	1120.0	1158.9	13.2	38.9	Pipe 69	83.64	200	100	1536.8	0.57	3.08	Open
Junc 68	1120.0	1159.5	13.2	39.5	Pipe 70	346.86	25	100	6.8	0.16	3.37	Open
Junc 69	1120.0	1168.4	10.5	48.4	Pipe 71	26.64	20	100	3.4	0.13	2.77	Open
Junc 70	1120.0	1162.0	10.5	42.0	Pipe 72	61.07	20	100	−3.4	0.13	2.76	Open
Junc 71	1115.0	1137.5	23.6	22.5	Pipe 73	167.61	25	100	−6.8	0.16	3.37	Open
Junc 72	1115.0	1140.5	23.6	25.5	Pipe 74	27.23	20	100	−3.4	0.13	2.77	Open
Junc 73	1115.0	1140.0	9.6	25.0	Pipe 75	13.95	20	100	−5.3	0.2	6.29	Open
Junc 74	1115.0	1156.9	9.6	41.9	Pipe 76	43.81	25	100	−13.6	0.32	12.15	Open
Junc 75	1115.0	1157.9	23.6	42.9	Pipe 77	139.31	25	100	−24.2	0.57	35.32	Open
Junc 76	1120.0	1155.6	11.2	35.6	Pipe 78	11.53	20	100	−3.4	0.13	2.76	Open
Junc 77	1115.0	1155.8	23.6	40.8	Pipe 79	11.49	20	100	−3.4	0.13	2.77	Open
Junc 78	1115.0	1158.0	9.6	43.0	Pipe 80	9.06	20	100	−3.4	0.13	2.77	Open
Junc 79	1115.0	1158.7	23.6	43.7	Pipe 81	10.45	20	100	−3.4	0.13	2.76	Open
Junc 80	1115.0	1157.5	9.6	42.5	Pipe 82	26.3	25	100	−3.4	0.08	0.93	Open
Junc 81	1115.0	1159.3	10.5	44.3	Pipe 83	99.08	50	100	−6.8	0.04	0.11	Open
Junc 82	1130.0	1177.6	0.0	47.6	Pipe 84	31.69	50	100	−13.6	0.08	0.42	Open
Junc 83	1130.0	1171.8	26.5	41.8	Pipe 85	14.65	50	100	−20.4	0.12	0.88	Open
Junc 84	1130.0	1177.7	0.0	47.7	Pipe 86	14.13	50	100	−27.2	0.16	1.5	Open
Junc 85	1120.0	1168.8	13.2	48.8	Pipe 87	234.11	50	100	−34	0.2	2.27	Open

NODE	Ma'an city				LINK	Ma'an city						
ID	Elevation m	Head m	Demand m3/d	Pressure m	ID	Length m	Diameter mm	Roughness	Flow m3/d	Velocity m/s	Unit head loss m/km	Status
Junc 86	1120.0	1161.0	13.2	41.0	Pipe 88	28.58	20	100	−2.5	0.09	1.56	Open
Junc 87	1120.0	1159.3	7.7	39.3	Pipe 89	45.64	50	100	−39	0.23	2.92	Open
Junc 88	1120.0	1160.1	7.7	40.1	Pipe 90	35.51	20	100	−4.8	0.18	5.23	Open
Junc 89	1120.0	1159.3	7.7	39.3	Pipe 91	36.56	25	100	4.8	0.11	1.76	Open
Junc 90	1120.0	1160.2	7.7	40.2	Pipe 92	138.37	25	100	−14.4	0.34	13.51	Open
Junc 91	1120.0	1157.8	13.2	37.8	Pipe 93	13.49	63	100	−16.9	0.06	0.2	Open
Junc 92	1120.0	1160.4	13.2	40.4	Pipe 94	47.1	63	100	42.5	0.16	1.11	Open
Junc 93	1120.0	1160.0	7.7	40.0	Pipe 95	13.21	20	100	−2.5	0.09	1.57	Open
Junc 94	1120.0	1169.4	15.2	49.4	Pipe 96	28.1	63	100	37.5	0.14	0.88	Open
Junc 95	1120.0	1168.2	15.2	48.2	Pipe 97	10.57	20	100	−2.5	0.09	1.56	Open
Junc 96	1125.0	1170.4	17.1	45.4	Pipe 98	142.76	100	100	625.3	0.92	17.02	Open
Junc 97	1125.0	1171.8	17.1	46.8	Pipe 99	289.78	50	100	−3.8	0.02	0.04	Open
Junc 98	1125.0	1172.1	17.1	47.1	Pipe 100	41.88	50	100	−7.6	0.04	0.14	Open
Junc 99	1120.0	1169.6	30.2	49.6	Pipe 101	53.98	50	100	−11.4	0.07	0.3	Open
Junc 100	1120.0	1168.2	15.2	48.2	Pipe 102	85.6	100	100	−563.4	0.83	14.03	Open
Junc 101	1120.0	1158.8	13.2	38.8	Pipe 103	22.65	20	100	−1.9	0.07	0.94	Open
Junc 102	1115.0	1164.7	16.4	49.7	Pipe 104	21.48	20	100	−1.9	0.07	0.94	Open
Junc 103	1115.0	1167.0	36.9	52.0	Pipe 105	143.23	63	100	32.5	0.12	0.68	Open
Junc 104	1115.0	1166.8	7.4	51.8	Pipe 106	4.82	50	100	30	0.18	1.81	Open
Junc 105	1115.0	1166.9	7.4	51.9	Pipe 107	29.41	63	100	17.5	0.06	0.21	Open
Junc 106	1120.0	1160.8	16.4	40.8	Pipe 108	30.54	63	100	12.5	0.05	0.12	Open
Junc 107	1120.0	1167.0	36.9	47.0	Pipe 109	23.06	63	100	2.5	0.01	0.01	Open
Junc 108	1120.0	1160.8	16.4	40.8	Pipe 110	6.92	20	100	7.5	0.28	11.96	Open
Junc 109	1120.0	1159.7	16.4	39.7	Pipe 111	58.86	20	100	2.5	0.09	1.57	Open
Junc 110	1120.0	1167.1	36.9	47.1	Pipe 112	8.54	20	100	2.5	0.09	1.57	Open
Junc 111	1120.0	1167.1	16.4	47.1	Pipe 113	7.33	20	100	−2.5	0.09	1.56	Open
Junc 112	1120.0	1160.0	16.4	40.0	Pipe 114	10.4	20	100	−2.5	0.09	1.56	Open
Junc 113	1120.0	1158.7	16.4	38.7	Pipe 115	3.24	20	100	2.5	0.09	1.56	Open
Junc 114	1115.0	1143.5	7.4	28.5	Pipe 116	37.02	20	100	−2.5	0.09	1.56	Open
Junc 115	1115.0	1143.5	7.4	28.5	Pipe 117	2.46	63	100	−2.8	0.01	0	Open
Junc 116	1115.0	1166.9	7.4	51.9	Pipe 118	23.68	63	100	−8.4	0.03	0.06	Open
Junc 117	1120.0	1167.1	16.4	47.1	Pipe 119	43.82	63	100	−14	0.05	0.14	Open
Junc 118	1110.0	1145.4	5.7	35.4	Pipe 120	16.41	63	100	−19.3	0.07	0.26	Open
Junc 119	1110.0	1145.2	5.7	35.2	Pipe 121	1.09	100	100	−21.8	0.03	0	Open
Junc 120	1110.0	1144.8	20.1	34.8	Pipe 122	12.31	50	100	−24.3	0.14	1.22	Open
Junc 121	1110.0	1147.0	5.7	37.0	Pipe 123	24.04	50	100	−29.3	0.17	1.72	Open
Junc 122	1110.0	1146.8	5.7	36.8	Pipe 124	17.87	50	100	−34.3	0.2	2.3	Open
Junc 123	1110.0	1147.3	5.7	37.3	Pipe 125	9.03	50	100	−39.3	0.23	2.97	Open
Junc 124	1110.0	1146.1	5.7	36.1	Pipe 126	7.12	50	100	−46.8	0.28	4.09	Open
Junc 125	1110.0	1146.4	5.7	36.4	Pipe 127	44.68	50	100	−51.8	0.31	4.94	Open
Junc 126	1110.0	1145.1	5.7	35.1	Pipe 128	33.72	50	100	−56.8	0.33	5.86	Open
Junc 127	1110.0	1147.3	5.7	37.3	Pipe 129	10.4	20	100	−2.5	0.09	1.56	Open
Junc 128	1115.0	1147.1	26.7	32.1	Pipe 130	15.05	20	100	−2.5	0.09	1.56	Open
Junc 129	1110.0	1129.8	26.7	19.8	Pipe 131	9.61	20	100	−2.5	0.09	1.56	Open
Junc 130	1110.0	1147.3	5.7	37.3	Pipe 132	21.36	20	100	−2.5	0.09	1.56	Open
Junc 131	1110.0	1147.1	26.7	37.1	Pipe 133	5.12	20	100	−5	0.18	5.65	Open
Junc 132	1110.0	1147.0	20.1	37.0	Pipe 134	9.08	20	100	−2.5	0.09	1.57	Open
Junc 133	1105.0	1145.3	8.8	40.3	Pipe 135	22.2	20	100	−2.5	0.09	1.57	Open
Junc 134	1110.0	1146.6	5.7	36.6	Pipe 136	8.09	20	100	−2.5	0.09	1.56	Open
Junc 135	1110.0	1143.5	6.4	33.5	Pipe 137	14.23	20	100	−2.8	0.1	1.93	Open
Junc 136	1115.0	1143.1	6.4	28.1	Pipe 138	10.39	20	100	−2.8	0.1	1.93	Open
Junc 137	1160.0	1223.5	23.9	63.5	Pipe 139	11.4	20	100	−2.8	0.1	1.93	Open
Junc 138	1165.0	1223.5	23.9	58.5	Pipe 140	55.45	50	100	−61.8	0.36	6.85	Open
Junc 139	1145.0	1225.8	23.1	80.8	Pipe 143	4.89	50	100	35.6	0.21	2.47	Open
Junc 140	1145.0	1223.8	23.1	78.8	Pipe 144	9.83	25	100	33.7	0.79	65.22	Open
Junc 141	1115.0	1158.3	34.2	43.3	Pipe 145	9.44	25	100	29	0.68	49.39	Open
Junc 142	1140.0	1213.8	20.7	73.8	Pipe 146	13.87	25	100	24.3	0.57	35.6	Open
Junc 143	1145.0	1213.6	71.4	68.6	Pipe 147	6.96	25	100	19.6	0.46	23.91	Open
Junc 144	1115.0	1175.3	2.9	60.3	Pipe 148	46.46	25	100	14	0.33	12.82	Open
Junc 145	1125.0	1168.2	2.9	43.2	Pipe 149	10.46	25	100	8.4	0.2	4.98	Open
Junc 146	1125.0	1172.0	17.1	47.0	Pipe 150	39.45	20	100	−1.9	0.07	0.94	Open
Junc 147	1125.0	1173.1	0.0	48.1	Pipe 151	36.76	20	100	−2.8	0.1	1.93	Open
Junc 148	1125.0	1170.8	67.1	45.8	Pipe 152	7.83	20	100	2.8	0.1	1.93	Open
Junc 149	1065.0	1139.9	222.2	74.9	Pipe 153	35.2	20	100	2.8	0.1	1.93	Open
Junc 150	1085.0	1143.9	58.8	58.9	Pipe 154	13.92	25	100	2.8	0.07	0.65	Open
Junc 151	1105.0	1141.9	63.8	36.9	Pipe 155	7.58	20	100	2.8	0.1	1.92	Open
Junc 152	1100.0	1141.3	85.7	41.3	Pipe 156	45.11	20	100	−2.8	0.1	1.93	Open
Junc 153	1135.0	1191.9	11.2	56.9	Pipe 157	66.07	63	100	−38	0.14	0.9	Open
Junc 154	1120.0	1191.9	13.1	71.9	Pipe 159	16.35	63	100	34.2	0.13	0.74	Open
Junc 155	1130.0	1192.1	32.2	62.1	Pipe 160	22.61	63	100	30.4	0.11	0.6	Open
Junc 156	1135.0	1193.0	2.9	58.0	Pipe 161	13.98	63	100	26.6	0.1	0.47	Open
Junc 157	1115.0	1143.6	2.9	28.6	Pipe 162	9.41	63	100	22.8	0.08	0.35	Open
Junc 158	1105.0	1143.1	13.3	38.1	Pipe 163	6.97	63	100	19	0.07	0.26	Open
Junc 159	1105.0	1142.5	13.8	37.5	Pipe 164	57.13	63	100	15.2	0.06	0.17	Open
Junc 160	1115.0	1142.6	6.4	27.6	Pipe 165	182.78	63	100	11.4	0.04	0.1	Open
Junc 161	1115.0	1143.0	6.4	28.0	Pipe 166	24.93	63	100	3.8	0.01	0.01	Open
Junc 162	1125.0	1172.0	113.3	47.0	Pipe 167	24.68	20	100	−3.8	0.14	3.4	Open
Junc 163	1130.0	1172.8	0.0	42.8	Pipe 168	16.23	20	100	−1.9	0.07	0.94	Open
Junc 164	1130.0	1172.8	26.5	42.8	Pipe 169	20.52	20	100	−1.9	0.07	0.94	Open
Junc 165	1115.0	1143.5	7.4	28.5	Pipe 170	18.81	20	100	1.9	0.07	0.94	Open
Junc 166	1100.0	1141.0	40.5	41.0	Pipe 171	12.68	20	100	−1.9	0.07	0.94	Open
Junc 167	1105.0	1140.5	38.4	35.5	Pipe 172	8.63	20	100	−1.9	0.07	0.95	Open
Junc 168	1135.0	1149.5	1.0	14.5	Pipe 173	9.94	20	100	−1.9	0.07	0.94	Open
Junc 169	1120.0	1145.3	2.9	25.3	Pipe 174	11.34	20	100	−1.9	0.07	0.94	Open
Junc 170	1120.0	1139.4	58.6	19.4	Pipe 175	18.84	20	100	−1.9	0.07	0.94	Open

NODE	Ma'an city				LINK	Ma'an city						
ID	Elevation m	Head m	Demand m3/d	Pressure m	ID	Length m	Diameter mm	Roughness	Flow m3/d	Velocity m/s	Unit head loss m/km	Status
Junc 171	1120.0	1139.3	58.6	19.3	Pipe 176	87.77	63	100	−14	0.05	0.14	Open
Junc 172	1115.0	1141.9	11.8	26.9	Pipe 177	67.65	63	100	−21.6	0.08	0.32	Open
Junc 173	1120.0	1168.4	10.5	48.4	Pipe 178	69.93	63	100	−27.9	0.1	0.51	Open
Junc 174	1120.0	1167.8	10.5	47.8	Pipe 179	87.6	63	100	−32.9	0.12	0.69	Open
Junc 175	1075.0	1141.9	70.6	66.9	Pipe 180	69.59	63	100	−37.9	0.14	0.9	Open
Junc 176	1060.0	1122.6	553.6	62.6	Pipe 181	26.16	63	100	−42.9	0.16	1.13	Open
Junc 177	1115.0	1139.3	0.0	24.3	Pipe 182	21.16	63	100	−47.9	0.18	1.39	Open
Junc 178	1115.0	1139.3	1.9	24.3	Pipe 183	70.34	63	100	−52.9	0.2	1.67	Open
Junc 179	1115.0	1139.6	0.0	24.6	Pipe 184	23.17	20	100	−3.8	0.14	3.39	Open
Junc 180	1110.0	1139.6	5.8	29.6	Pipe 185	21.07	20	100	−3.8	0.14	3.4	Open
Junc 181	1115.0	1158.3	9.6	43.3	Pipe 186	27.87	20	100	−2.5	0.09	1.56	Open
Junc 182	1140.0	1164.9	1.8	24.9	Pipe 187	20.18	20	100	−2.5	0.09	1.56	Open
Junc 183	1130.0	1168.9	62.6	38.9	Pipe 188	20.13	20	100	−2.5	0.09	1.56	Open
Junc 184	1135.0	1147.8	33.8	12.8	Pipe 189	9.6	20	100	−2.5	0.09	1.57	Open
Junc 185	1120.0	1150.1	21.8	30.1	Pipe 190	11.11	20	100	−2.5	0.09	1.57	Open
Junc 186	1115.0	1166.9	7.4	51.9	Pipe 191	18.57	20	100	−2.5	0.09	1.56	Open
Junc 187	1115.0	1163.3	12.6	48.3	Pipe 192	1.65	63	100	−56.7	0.21	1.89	Open
Junc 188	1140.0	1193.4	10.2	53.4	Pipe 193	3.89	63	100	−60.5	0.22	2.14	Open
Junc 189	1140.0	1200.9	4.4	60.9	Pipe 194	5.05	63	100	−70	0.26	2.8	Open
Junc 190	1140.0	1218.5	23.1	78.5	Pipe 195	15.67	63	100	−73.8	0.27	3.09	Open
Junc 191	1115.0	1143.7	2.9	28.7	Pipe 197	14.36	20	100	−1.9	0.07	0.94	Open
Junc 192	1110.0	1143.5	6.4	33.5	Pipe 198	7.51	20	100	−1.9	0.07	0.94	Open
Junc 193	1135.0	1168.3	33.8	33.3	Pipe 199	6.74	20	100	1.9	0.07	0.95	Open
Junc 194	1120.0	1150.0	21.8	30.0	Pipe 200	6.18	20	100	−1.9	0.07	0.94	Open
Junc 195	1120.0	1150.5	21.8	30.5	Pipe 201	11.4	20	100	−7.6	0.28	12.26	Open
Junc 196	1115.0	1143.7	2.9	28.7	Pipe 202	20.4	20	100	1.9	0.07	0.94	Open
Junc 197	1095.0	1141.1	55.7	46.1	Pipe 203	15.54	20	100	1.9	0.07	0.94	Open
Junc 198	1110.0	1141.4	61.4	31.4	Pipe 204	65.82	20	100	1.9	0.07	0.94	Open
Junc 199	1110.0	1141.2	11.4	31.2	Pipe 205	25.19	20	100	−1.9	0.07	0.94	Open
Junc 200	1105.0	1141.1	13.8	36.1	Pipe 207	106.15	63	100	52.5	0.19	1.64	Open
Junc 201	1105.0	1141.1	28.1	36.1	Pipe 208	218.31	63	100	40.9	0.15	1.03	Open
Junc 202	1105.0	1141.2	13.8	36.2	Pipe 209	19.03	63	100	35.9	0.13	0.81	Open
Junc 203	1115.0	1143.5	7.4	28.5	Pipe 210	28.18	63	100	30.9	0.11	0.62	Open
Junc 204	1115.0	1143.5	11.8	28.5	Pipe 211	23.68	63	100	18.4	0.07	0.24	Open
Junc 205	1120.0	1168.4	10.5	48.4	Pipe 212	19.92	63	100	13.4	0.05	0.13	Open
Junc 206	1110.0	1158.2	9.6	48.2	Pipe 213	5.31	63	100	−6.7	0.02	0.03	Open
Junc 207	1110.0	1147.4	5.7	37.4	Pipe 214	34.49	25	100	4.2	0.1	1.38	Open
Junc 208	1105.0	1141.4	13.8	36.4	Pipe 215	21.75	20	100	−4.2	0.15	4.09	Open
Junc 209	1105.0	1141.4	13.8	36.4	Pipe 216	21.4	20	100	−2.5	0.09	1.56	Open
Junc 210	1105.0	1139.2	13.8	34.2	Pipe 217	6.29	20	100	−2.5	0.09	1.56	Open
Junc 211	1105.0	1139.4	13.8	34.4	Pipe 218	5.91	20	100	−5	0.18	5.65	Open
Junc 212	1105.0	1137.4	13.8	32.4	Pipe 219	19.17	20	100	−2.5	0.09	1.56	Open
Junc 213	1105.0	1140.9	28.1	35.9	Pipe 220	19.91	20	100	−10	0.37	20.38	Open
Junc 214	1105.0	1140.4	28.1	35.4	Pipe 221	29.77	20	100	−2.5	0.09	1.56	Open
Junc 215	1100.0	1134.0	18.0	34.0	Pipe 222	11.95	20	100	−2.5	0.09	1.57	Open
Junc 216	1105.0	1138.6	13.8	33.6	Pipe 223	33.02	20	100	−2.9	0.11	2.06	Open
Junc 217	1105.0	1142.1	53.8	37.1	Pipe 224	17.48	20	100	8.7	0.32	15.75	Open
Junc 218	1105.0	1136.5	13.8	31.5	Pipe 225	9.58	20	100	−2.9	0.11	2.06	Open
Junc 219	1105.0	1134.5	13.8	29.5	Pipe 226	85.44	50	100	−10.2	0.06	0.24	Open
Junc 220	1110.0	1139.3	11.4	29.3	Pipe 227	34.83	50	100	−14.4	0.08	0.46	Open
Junc 221	1110.0	1140.2	11.4	30.2	Pipe 228	44.78	50	100	−22.8	0.13	1.08	Open
Junc 222	1110.0	1141.2	11.4	31.2	Pipe 229	33.07	50	100	−31.2	0.18	1.93	Open
Junc 223	1110.0	1142.7	13.3	32.7	Pipe 230	234.52	50	100	−39.6	0.23	3	Open
Junc 224	1110.0	1141.7	13.3	31.7	Pipe 231	18.96	50	100	−45.4	0.27	3.87	Open
Junc 225	1110.0	1140.8	11.4	30.8	Pipe 232	19.21	20	100	−4.2	0.15	4.09	Open
Junc 226	1110.0	1142.7	11.4	32.7	Pipe 233	14.3	20	100	−4.2	0.15	4.09	Open
Junc 227	1110.0	1142.7	11.4	32.7	Pipe 234	8.62	20	100	−4.2	0.15	4.09	Open
Junc 228	1110.0	1141.7	11.4	31.7	Pipe 235	6.45	50	100	−51.2	0.3	4.85	Open
Junc 229	1110.0	1141.3	11.4	31.3	Pipe 236	3.3	50	100	−57	0.34	5.89	Open
Junc 230	1115.0	1142.1	15.1	27.1	Pipe 237	8.15	20	100	2.9	0.11	2.05	Open
Junc 231	1115.0	1142.1	15.1	27.1	Pipe 238	12.68	20	100	−2.9	0.11	2.06	Open
Junc 232	1115.0	1142.1	15.1	27.1	Pipe 239	6.85	20	100	−2.9	0.11	2.06	Open
Junc 233	1115.0	1143.0	11.0	28.0	Pipe 240	32.61	20	100	−2.9	0.11	2.06	Open
Junc 234	1115.0	1143.0	11.0	28.0	Pipe 241	21.82	20	100	−8.7	0.32	15.75	Open
Junc 235	1115.0	1143.2	2.9	28.2	Pipe 242	41.68	20	100	2.9	0.11	2.06	Open
Junc 236	1115.0	1141.7	11.0	26.7	Pipe 243	109.36	50	100	−68.6	0.4	8.31	Open
Junc 237	1115.0	1142.8	11.0	27.8	Pipe 244	85.4	50	100	−74.4	0.44	9.66	Open
Junc 238	1110.0	1143.1	11.0	33.1	Pipe 245	9.26	20	100	−2.9	0.11	2.06	Open
Junc 239	1110.0	1141.6	11.0	31.6	Pipe 246	95.93	100	100	214.6	0.32	2.35	Open
Junc 240	1110.0	1142.1	11.0	32.1	Pipe 247	28.97	20	100	−1.8	0.07	0.85	Open
Junc 241	1110.0	1142.9	11.0	32.9	Pipe 248	120.56	20	100	1.8	0.07	0.85	Open
Junc 242	1110.0	1142.8	13.3	32.8	Pipe 249	21.97	20	100	−1.8	0.07	0.85	Open
Junc 243	1110.0	1142.9	13.3	32.9	Pipe 250	5.19	20	100	−1.8	0.07	0.86	Open
Junc 244	1110.0	1141.7	13.3	31.7	Pipe 251	6.2	20	100	−3.6	0.13	3.07	Open
Junc 245	1110.0	1140.5	13.3	30.5	Pipe 252	8.03	20	100	−1.8	0.07	0.85	Open
Junc 246	1115.0	1143.5	2.9	28.5	Pipe 253	7.91	20	100	−7.2	0.27	11.09	Open
Junc 247	1115.0	1143.1	9.2	28.1	Pipe 254	8.03	20	100	−1.8	0.07	0.85	Open
Junc 248	1110.0	1143.1	6.4	33.1	Pipe 255	9.16	20	100	−1.8	0.07	0.85	Open
Junc 249	1115.0	1143.1	9.2	28.1	Pipe 256	7.76	20	100	−1.8	0.07	0.85	Open
Junc 250	1115.0	1143.1	9.2	28.1	Pipe 257	6.05	20	100	−1.8	0.07	0.86	Open
Junc 251	1115.0	1142.5	9.2	27.5	Pipe 258	56.47	63	100	1	0	0	Open
Junc 252	1115.0	1142.3	9.2	27.3	Pipe 259	7.35	63	100	−4.6	0.02	0.01	Open
Junc 253	1115.0	1143.1	6.4	28.1	Pipe 260	64.77	50	100	−6.4	0.04	0.1	Open
Junc 254	1115.0	1143.1	6.4	28.1	Pipe 261	19.39	50	100	52.2	0.31	5.01	Open
Junc 255	1115.0	1143.1	6.4	28.1	Pipe 262	48.12	50	100	48.6	0.29	4.39	Open

NODE	Ma'an city				LINK	Ma'an city						
ID	Elevation m	Head m	Demand m3/d	Pressure m	ID	Length m	Diameter mm	Roughness	Flow m3/d	Velocity m/s	Unit head loss m/km	Status
Junc 256	1115.0	1141.9	6.4	26.9	Pipe 263	30.35	50	100	45	0.27	3.81	Open
Junc 257	1115.0	1142.1	9.8	27.1	Pipe 264	7.45	20	100	−1.8	0.07	0.85	Open
Junc 258	1115.0	1140.3	11.8	25.3	Pipe 265	13.77	50	100	−41.4	0.24	3.26	Open
Junc 259	1115.0	1139.7	11.8	24.7	Pipe 266	15.27	50	100	37.8	0.22	2.75	Open
Junc 260	1115.0	1142.1	11.8	27.1	Pipe 268	71.58	20	100	−2.9	0.11	2.06	Open
Junc 261	1115.0	1140.5	11.8	25.5	Pipe 269	7.17	20	100	−2.9	0.11	2.05	Open
Junc 262	1115.0	1139.2	11.8	24.2	Pipe 270	97.75	20	100	−8.7	0.32	15.75	Open
Junc 263	1115.0	1142.4	11.8	27.4	Pipe 271	16.62	20	100	−2.1	0.08	1.13	Open
Junc 264	1115.0	1141.2	11.8	26.2	Pipe 272	176.84	20	100	−2.91	0.11	2.07	Open
Junc 265	1115.0	1142.6	11.8	27.6	Pipe 273	19.27	20	100	−1.29	0.05	0.46	Open
Junc 266	1115.0	1139.1	11.8	24.1	Pipe 274	125.28	20	100	1.85	0.07	0.89	Open
Junc 267	1115.0	1137.2	11.8	22.2	Pipe 275	13.55	20	100	−2.35	0.09	1.39	Open
Junc 268	1115.0	1142.3	11.8	27.3	Pipe 276	101.23	20	100	12.6	0.46	31.27	Open
Junc 269	1115.0	1140.6	11.8	25.6	Pipe 277	40.23	20	100	4.2	0.15	4.09	Open
Junc 270	1115.0	1139.8	11.8	24.8	Pipe 278	14.05	20	100	−4.2	0.15	4.09	Open
Junc 271	1110.0	1143.5	6.4	33.5	Pipe 279	10.27	20	100	−2.1	0.08	1.13	Open
Junc 272	1110.0	1142.6	6.4	32.6	Pipe 280	13.24	20	100	−2.1	0.08	1.14	Open
Junc 273	1115.0	1141.6	9.8	26.6	Pipe 282	8.11	100	100	1	0	0	Open
Junc 274	1115.0	1143.5	9.8	28.5	Pipe 283	69.61	32	100	28.6	0.41	14.46	Open
Junc 275	1115.0	1142.0	9.8	27.0	Pipe 284	153.95	32	100	26.6	0.38	12.64	Open
Junc 276	1115.0	1141.4	9.8	26.4	Pipe 285	4.12	32	100	22.8	0.33	9.5	Open
Junc 277	1115.0	1141.9	9.8	26.9	Pipe 286	54.98	32	100	5.7	0.08	0.73	Open
Junc 278	1115.0	1143.5	9.8	28.5	Pipe 287	47.59	20	100	1.9	0.07	0.94	Open
Junc 279	1115.0	1142.1	11.8	27.1	Pipe 288	44.12	25	100	15.2	0.36	14.93	Open
Junc 280	1115.0	1141.7	7.4	26.7	Pipe 289	11.64	25	100	11.4	0.27	8.76	Open
Junc 281	1120.0	1167.6	7.7	47.6	Pipe 290	15.83	25	100	7.6	0.18	4.14	Open
Junc 282	1120.0	1167.5	7.7	47.5	Pipe 291	7.46	25	100	1.9	0.04	0.32	Open
Junc 283	1120.0	1166.9	7.7	46.9	Pipe 292	7.44	20	100	1.9	0.07	0.94	Open
Junc 284	1120.0	1161.0	10.5	41.0	Pipe 293	6.3	20	100	−1.9	0.07	0.94	Open
Junc 285	1120.0	1166.5	10.5	46.5	Pipe 294	9.38	20	100	−3.8	0.14	3.4	Open
Junc 286	1120.0	1166.4	7.7	46.4	Pipe 295	13.46	20	100	−1.9	0.07	0.94	Open
Junc 287	1110.0	1158.3	9.6	48.3	Pipe 296	8.97	20	100	−1.9	0.07	0.95	Open
Junc 288	1115.0	1158.0	34.2	43.0	Pipe 297	98.34	32	100	−1.9	0.03	0.1	Open
Junc 289	1115.0	1139.4	19.3	24.4	Pipe 298	789.29	100	100	−11.2	0.02	0.01	Open
Junc 290	1115.0	1138.8	70.6	23.8	Pipe 299	211.17	25	100	13.1	0.31	11.34	Open
Junc 291	1110.0	1138.7	0.0	28.7	Pipe 300	19.82	20	100	−2.5	0.09	1.57	Open
Junc 292	1105.0	1128.9	12.6	23.9	Pipe 301	13.27	20	100	1.9	0.07	0.94	Open
Junc 293	1105.0	1128.9	0.0	23.9	Pipe 302	12.69	20	100	6.9	0.25	10.25	Open
Junc 294	1110.0	1133.0	5.8	23.0	Pipe 303	27.71	20	100	−2.5	0.09	1.56	Open
Junc 295	1100.0	1133.0	0.0	33.0	Pipe 304	28.43	20	100	−2.5	0.09	1.56	Open
Junc 296	1110.0	1136.6	0.0	26.6	Pipe 305	6.85	20	100	−11.3	0.42	25.56	Open
Junc 297	1110.0	1136.6	0.0	26.6	Pipe 306	44.23	20	100	15.7	0.58	47	Open
Junc 298	1115.0	1139.6	0.0	24.6	Pipe 307	26.22	20	100	−1.9	0.07	0.94	Open
Junc 299	1115.0	1139.4	0.0	24.4	Pipe 308	46.68	20	100	19.5	0.72	70.22	Open
Junc 300	1105.0	1139.0	18.4	34.0	Pipe 309	4.78	50	100	−21.4	0.13	0.97	Open
Junc 301	1115.0	1139.3	0.0	24.3	Pipe 310	95.23	63	100	−23.3	0.09	0.36	Open
Junc 302	1105.0	1139.3	5.8	34.3	Pipe 311	14.35	63	100	28.6	0.11	0.53	Open
Junc 303	1115.0	1139.3	1.9	24.3	Pipe 312	24.37	63	100	23.8	0.09	0.38	Open
Junc 304	1115.0	1139.1	17.4	24.1	Pipe 313	42.46	63	100	20	0.07	0.28	Open
Junc 305	1120.0	1144.4	8.7	24.4	Pipe 314	4.96	50	100	17.5	0.1	0.66	Open
Junc 306	1120.0	1143.7	18.4	23.7	Pipe 315	23.41	50	100	15	0.09	0.5	Open
Junc 307	1120.0	1139.3	9.4	19.3	Pipe 316	26.73	50	100	10	0.06	0.23	Open
Junc 308	1120.0	1138.2	9.4	18.2	Pipe 317	27.94	50	100	5	0.03	0.07	Open
Junc 309	1120.0	1139.3	9.4	19.3	Pipe 318	35.47	20	100	2.5	0.09	1.56	Open
Junc 310	1110.0	1136.3	53.2	26.3	Pipe 319	14.61	20	100	−2.5	0.09	1.56	Open
Junc 311	1120.0	1139.3	9.4	19.3	Pipe 320	15.98	20	100	−2.5	0.09	1.56	Open
Junc 312	1120.0	1138.3	9.4	18.3	Pipe 321	16.79	20	100	−1.9	0.07	0.94	Open
Junc 313	1120.0	1139.3	11.5	19.3	Pipe 322	17.75	20	100	−2.9	0.11	2.06	Open
Junc 314	1120.0	1137.3	11.5	17.3	Pipe 323	47.67	20	100	1.9	0.07	0.94	Open
Junc 315	1120.0	1137.6	28.6	17.6	Pipe 324	18.35	50	100	33	0.19	2.15	Open
Junc 316	1120.0	1137.6	11.5	17.6	Pipe 325	21.78	20	100	−2.5	0.09	1.56	Open
Junc 317	1120.0	1135.9	23.1	15.9	Pipe 326	13.39	25	100	−5	0.12	1.91	Open
Junc 318	1118.0	1135.2	13.1	17.2	Pipe 327	58.06	25	100	−10	0.24	6.87	Open
Junc 319	1115.0	1135.4	10.2	20.4	Pipe 328	24.86	50	100	−11.8	0.07	0.32	Open
Junc 320	1115.0	1135.4	0.0	20.4	Pipe 329	22.79	50	100	−13.6	0.08	0.41	Open
Junc 321	1115.0	1135.4	20.2	20.4	Pipe 330	21.42	50	100	−17.2	0.1	0.64	Open
Junc 322	1115.0	1133.1	11.2	18.1	Pipe 331	9.87	20	100	−1.8	0.07	0.85	Open
Junc 323	1120.0	1139.3	11.5	19.3	Pipe 332	8.92	20	100	−1.8	0.07	0.85	Open
Junc 324	1120.0	1139.2	15.8	19.2	Pipe 333	10.33	20	100	−2.5	0.09	1.57	Open
Junc 325	1120.0	1137.0	6.9	17.0	Pipe 334	64.03	25	100	5	0.12	1.9	Open
Junc 326	1120.0	1136.2	6.9	16.2	Pipe 335	9.33	20	100	2.5	0.09	1.56	Open
Junc 327	1120.0	1135.7	5.5	15.7	Pipe 336	7.46	20	100	−1.8	0.07	0.85	Open
Junc 328	1120.0	1136.2	6.9	16.2	Pipe 337	20.31	25	100	−8.6	0.2	5.2	Open
Junc 329	1120.0	1135.8	22.0	15.8	Pipe 338	317.57	200	100	−1532.9	0.56	3.06	Open
Junc 330	1120.0	1135.6	5.8	15.6	Pipe 339	10.06	20	100	−1	0.04	0.29	Open
Junc 331	1120.0	1136.8	7.9	16.8	Pipe 340	1287.67	100	100	341.2	0.5	5.54	Open
Junc 332	1120.0	1136.4	7.9	16.4	Pipe 341	93.87	400	100	12833.61	1.18	5.35	Open
Junc 333	1115.0	1136.8	18.4	21.8	Pipe 342	72.99	400	100	12645.5	1.16	5.21	Open
Junc 334	1115.0	1136.7	27.9	21.7	Pipe 343	400.91	400	100	12546.3	1.16	5.13	Open
Junc 335	1120.0	1136.7	25.5	16.7	Pipe 344	122.08	200	100	−588.26	0.22	0.52	Open
Junc 336	1115.0	1139.7	45.5	24.7	Pipe 345	291.47	200	100	−719.26	0.26	0.75	Open
Junc 337	1105.0	1127.3	120.8	22.3	Pipe 346	145.22	50	100	−101.8	0.6	17.27	Open
Junc 338	1105.0	1140.4	20.5	35.4	Pipe 347	146.27	50	100	−81.1	0.48	11.34	Open
Junc 339	1085.0	1140.8	10.0	55.8	Pipe 348	82.95	25	100	−21.1	0.5	27.4	Open
Junc 340	1110.0	1139.8	38.4	29.8	Pipe 349	217.61	200	100	477.96	0.18	0.35	Open

NODE	Ma'an city				LINK	Ma'an city						
ID	Elevation m	Head m	Demand m3/d	Pressure m	ID	Length m	Diameter mm	Roughness	Flow m3/d	Velocity m/s	Unit head loss m/km	Status
Junc 341	1110.0	1140.0	58.4	30.0	Pipe 350	94.03	200	100	5.8	0	0	Open
Junc 342	1110.0	1136.9	18.4	26.9	Pipe 351	157.87	200	100	2.9	0	0	Open
Junc 343	1120.0	1144.5	0.0	24.5	Pipe 352	9.48	350	100	-3294.8	0.4	0.83	Open
Junc 344	1120.0	1144.1	2.9	24.1	Pipe 353	219.37	400	100	-12546.3	1.16	5.13	Open
Junc 345	1095.0	1139.4	20.5	44.4	Pipe 354	310.21	25	100	-20.2	0.48	25.28	Open
Junc 346	1120.0	1138.6	25.5	18.6	Pipe 355	747.44	100	110	2.9	0	0	Open
Junc 347	1135.0	1148.6	11.2	13.6	Pipe 356	83.03	50	100	311.06	1.83	136.67	Open
Junc 348	1135.0	1147.4	61.0	12.4	Pipe 357	69.13	50	100	213.96	1.26	68.34	Open
Junc 349	1125.0	1145.0	6.6	20.0	Pipe 358	53.73	50	100	101.56	0.6	17.19	Open
Junc 350	1125.0	1148.6	0.0	23.6	Pipe 359	8.4	50	100	72.36	0.43	9.18	Open
Junc 351	1130.0	1172.4	34.0	42.4	Pipe 360	64.91	50	100	11.86	0.07	0.32	Open
Junc 352	1110.0	1148.7	31.3	38.7	Pipe 361	72.77	50	100	-48.64	0.29	4.4	Open
Junc 353	1120.0	1170.0	16.0	50.0	Pipe 362	71.5	50	100	-138.34	0.82	30.48	Open
Junc 354	1115.0	1167.8	16.0	52.8	Pipe 363	69.72	50	100	-201.54	1.19	61.18	Open
Junc 355	1115.0	1158.7	81.1	43.7	Pipe 364	57.87	50	100	-269.54	1.59	104.82	Open
Junc 356	1105.0	1157.2	16.0	52.2	Pipe 365	62.25	50	100	-337.54	1.99	159	Open
Junc 357	1110.0	1154.0	81.1	44.0	Pipe 366	172.36	50	100	34	0.2	2.27	Open
Junc 358	1110.0	1152.3	31.3	42.3	Pipe 367	172.03	50	100	34	0.2	2.27	Open
Junc 359	1115.0	1153.0	29.2	38.0	Pipe 368	170.24	50	100	34	0.2	2.27	Open
Junc 360	1110.0	1143.8	31.3	33.8	Pipe 369	169.61	50	100	31.3	0.18	1.94	Open
Junc 361	1120.0	1144.8	0.0	24.8	Pipe 370	160.96	25	100	31.3	0.74	56.88	Open
Junc 362	1115.0	1153.3	58.4	38.3	Pipe 371	161.96	50	100	31.3	0.18	1.94	Open
Junc 363	1115.0	1152.9	31.3	37.9	Pipe 372	136.53	25	100	16	0.38	16.42	Open
Junc 364	1120.0	1155.5	29.2	35.5	Pipe 373	89.3	25	100	16	0.38	16.42	Open
Junc 365	1120.0	1155.1	34.0	35.1	Pipe 374	852.11	50	100	31.3	0.18	1.94	Open
Junc 366	1125.0	1159.7	34.0	34.7	Pipe 375	416.75	25	100	-31.3	0.74	56.88	Open
Junc 367	1120.0	1159.3	34.0	39.3	Pipe 376	20.54	50	100	0	0	0	Closed
Junc 368	1130.0	1165.8	34.0	35.8	Pipe 377	199.21	50	100	99.3	0.59	16.49	Open
Junc 369	1125.0	1165.4	34.0	40.4	Pipe 378	39.11	50	100	34	0.2	2.27	Open
Junc 370	1115.0	1155.9	34.2	40.9	Pipe 379	86.09	50	100	88	0.52	13.19	Open
Junc 371	1120.0	1155.7	34.2	35.7	Pipe 380	262.14	20	100	6.6	0.24	9.44	Open
Junc 372	1115.0	1154.4	166.0	39.4	Pipe 381	474.37	50	100	0	0	0	Open
Junc 373	1115.0	1154.4	14.4	39.4	Pipe 382	541.58	50	100	20.4	0.12	0.88	Open
Junc 374	1120.0	1153.9	166.0	33.9	Pipe 383	68.67	25	100	2.1	0.05	0.38	Open
Junc 375	1120.0	1151.2	166.0	31.2	Pipe 384	3.58	25	100	12.1	0.29	9.79	Open
Junc 376	1120.0	1152.3	29.2	32.3	Pipe 385	40.02	63	100	-13.1	0.05	0.12	Open
Junc 377	1120.0	1152.3	29.2	32.3	Pipe 386	10.17	20	100	9	0.33	16.77	Open
Junc 378	1115.0	1151.5	29.2	36.5	Pipe 387	28.37	20	100	5	0.18	5.65	Open
Junc 379	1115.0	1151.4	29.2	36.4	Pipe 388	18.45	20	100	1	0.04	0.29	Open
Junc 380	1115.0	1149.7	35.7	34.7	Pipe 389	19.16	20	100	-1	0.04	0.29	Open
Junc 381	1120.0	1149.6	36.4	29.6	Pipe 390	36.51	20	100	3	0.11	2.19	Open
Junc 382	1115.0	1149.0	135.7	34.0	Pipe 391	63.91	20	100	1	0.04	0.29	Open
Junc 383	1120.0	1145.8	27.2	25.8	Pipe 392	13.31	20	100	-1	0.04	0.29	Open
Junc 384	1115.0	1148.5	0.0	33.5	Pipe 393	31.6	20	100	-1	0.04	0.29	Open
Junc 385	1115.0	1148.1	28.8	33.1	Pipe 394	20.68	20	100	3	0.11	2.19	Open
Junc 386	1115.0	1148.1	28.8	33.1	Pipe 395	9.06	100	100	-1.8	0	0	Open
Junc 387	1115.0	1148.0	0.0	33.0	Pipe 396	35.91	100	100	-16.7	0.02	0.02	Open
Junc 388	1115.0	1147.9	26.7	32.9	Pipe 397	3.94	63	100	11.7	0.04	0.09	Open
Junc 389	1115.0	1147.8	26.7	32.8	Pipe 398	30.38	63	100	6.7	0.02	0.04	Open
Junc 390	1110.0	1147.6	26.7	37.6	Pipe 399	14.34	50	100	4.2	0.02	0.05	Open
Junc 391	1110.0	1147.5	26.7	37.5	Pipe 400	11.47	20	100	2.1	0.08	1.14	Open
Junc 392	1105.0	1147.5	5.7	42.5	Pipe 401	50.34	20	100	2.5	0.09	1.56	Open
Junc 393	1105.0	1147.0	5.7	42.0	Pipe 402	14.69	20	100	-2.1	0.08	1.13	Open
Junc 394	1100.0	1146.7	5.7	46.7	Pipe 403	13.61	20	100	-2.1	0.08	1.13	Open
Junc 395	1115.0	1144.2	28.8	29.2	Pipe 404	11.64	50	100	-4.2	0.02	0.04	Open
Junc 396	1115.0	1158.8	10.5	43.8	Pipe 405	81.49	50	100	-8.4	0.05	0.17	Open
Junc 397	1120.0	1157.4	10.5	37.4	Pipe 406	21.25	50	100	35.4	0.21	2.44	Open
Junc 398	1115.0	1158.7	23.6	43.7	Pipe 407	69	50	100	22.8	0.13	1.08	Open
Junc 399	1115.0	1152.4	23.6	37.4	Pipe 408	26.45	50	100	18.6	0.11	0.74	Open
Junc 400	1115.0	1149.4	23.6	34.4	Pipe 409	18.21	50	100	14.4	0.08	0.46	Open
Junc 401	1120.0	1169.5	30.2	49.5	Pipe 410	23.95	50	100	10.2	0.06	0.25	Open
Junc 402	1120.0	1165.1	24.4	45.1	Pipe 411	14.25	50	100	3.6	0.02	0.04	Open
Junc 403	1120.0	1165.2	24.4	45.2	Pipe 412	9.67	20	100	2.1	0.08	1.13	Open
Junc 404	1120.0	1165.4	24.4	45.4	Pipe 413	8.19	20	100	-2.1	0.08	1.14	Open
Junc 405	1120.0	1160.6	8.9	40.6	Pipe 414	7.31	20	100	-2.1	0.08	1.14	Open
Junc 406	1120.0	1167.9	34.4	47.9	Pipe 415	9.8	20	100	-2.1	0.08	1.13	Open
Junc 407	1125.0	1162.8	8.9	37.8	Pipe 416	5.29	20	100	-2.1	0.08	1.14	Open
Junc 408	1120.0	1164.9	20.4	44.9	Pipe 417	4.71	20	100	-2.1	0.08	1.14	Open
Junc 409	1120.0	1165.1	24.4	45.1	Pipe 418	6.96	20	100	-10.5	0.39	22.3	Open
Junc 410	1120.0	1164.5	20.4	44.5	Pipe 419	62.36	20	100	-4.5	0.17	4.65	Open
Junc 411	1120.0	1164.5	20.4	44.5	Pipe 420	6.44	20	100	6.3	0.23	8.67	Open
Junc 412	1120.0	1164.4	20.4	44.4	Pipe 421	41.32	20	100	2.1	0.08	1.13	Open
Junc 413	1115.0	1163.3	12.6	48.3	Pipe 422	7.55	20	100	-2.1	0.08	1.13	Open
Junc 414	1120.0	1163.2	20.4	43.2	Pipe 423	8.96	20	100	-4.2	0.15	4.09	Open
Junc 415	1125.0	1171.3	17.1	46.3	Pipe 424	18.66	20	100	-6.3	0.23	8.66	Open
Junc 416	1125.0	1158.4	16.7	33.4	Pipe 425	63.25	50	100	-8.4	0.05	0.17	Open
Junc 417	1130.0	1172.8	12.7	42.8	Pipe 426	30.01	63	100	67.3	0.25	2.6	Open
Junc 418	1130.0	1171.7	16.7	41.7	Pipe 427	73.07	50	100	64.8	0.38	7.48	Open
Junc 419	1130.0	1171.7	12.7	41.7	Pipe 428	46.29	50	100	60.6	0.36	6.61	Open
Junc 420	1130.0	1171.6	16.7	41.6	Pipe 429	13.85	50	100	56.4	0.33	5.79	Open
Junc 421	1130.0	1172.2	12.7	42.2	Pipe 430	10.91	20	100	2.1	0.08	1.13	Open
Junc 422	1130.0	1172.2	12.7	42.2	Pipe 431	10.28	20	100	2.1	0.08	1.14	Open
Junc 423	1130.0	1172.8	0.0	42.8	Pipe 432	65.49	100	100	-30.9	0.05	0.06	Open
Junc 424	1130.0	1172.8	12.7	42.8	Pipe 433	83.99	100	100	-100.7	0.15	0.58	Open
Junc 425	1130.0	1172.7	12.7	42.7	Pipe 434	99.15	20	100	3	0.11	2.19	Open

NODE	Ma'an city				LINK	Ma'an city						
ID	Elevation m	Head m	Demand m3/d	Pressure m	ID	Length m	Diameter mm	Roughness	Flow m3/d	Velocity m/s	Unit head loss m/km	Status
Junc 426	1130.0	1171.9	12.7	41.9	Pipe 435	28.74	20	100	1.5	0.06	0.61	Open
Junc 427	1130.0	1171.9	12.7	41.9	Pipe 436	67.76	50	100	−45.9	0.27	3.95	Open
Junc 428	1130.0	1182.0	26.5	52.0	Pipe 437	4.38	100	100	−194.6	0.29	1.95	Open
Junc 429	1130.0	1181.9	26.5	51.9	Pipe 438	38.44	63	100	137.4	0.51	9.76	Open
Junc 430	1135.0	1187.7	2.9	52.7	Pipe 439	12.28	50	100	134.9	0.8	29.09	Open
Junc 431	1135.0	1187.7	2.9	52.7	Pipe 440	22.48	50	100	129.9	0.77	27.12	Open
Junc 432	1130.0	1192.1	12.2	62.1	Pipe 441	22.81	50	100	124.9	0.74	25.22	Open
Junc 433	1135.0	1190.7	5.8	55.7	Pipe 442	53.57	50	100	119.9	0.71	23.38	Open
Junc 434	1130.0	1185.6	17.2	55.6	Pipe 443	6.54	50	100	115.3	0.68	21.74	Open
Junc 435	1145.0	1183.0	7.6	38.0	Pipe 444	40.9	50	100	110.7	0.65	20.17	Open
Junc 436	1125.0	1162.1	26.8	37.1	Pipe 445	32.17	50	100	106	0.62	18.61	Open
Junc 437	1125.0	1162.1	5.8	37.1	Pipe 446	29.95	50	100	100.8	0.59	16.95	Open
Junc 438	1125.0	1159.5	7.3	34.5	Pipe 447	8.2	50	100	95.6	0.56	15.37	Open
Junc 439	1125.0	1159.4	16.7	34.4	Pipe 448	9.45	50	100	90.4	0.53	13.86	Open
Junc 440	1120.0	1137.0	48.0	17.0	Pipe 449	46.16	50	100	80	0.47	11.05	Open
Junc 441	1125.0	1157.3	16.7	32.3	Pipe 450	5.28	50	100	72.2	0.43	9.13	Open
Junc 442	1125.0	1159.4	7.3	34.4	Pipe 451	6.07	50	100	67	0.39	7.97	Open
Junc 443	1125.0	1159.4	7.3	34.4	Pipe 452	52.95	50	100	61.8	0.36	6.85	Open
Junc 444	1120.0	1154.2	20.4	34.2	Pipe 453	58.09	50	100	56.6	0.33	5.82	Open
Junc 445	1120.0	1155.6	48.0	35.6	Pipe 454	27.45	50	100	52	0.31	4.98	Open
Junc 446	1120.0	1163.0	12.6	43.0	Pipe 455	6.69	50	100	48	0.28	4.29	Open
Junc 447	1120.0	1161.7	60.4	41.7	Pipe 456	20.92	50	100	44	0.26	3.65	Open
Junc 448	1115.0	1163.2	12.6	48.2	Pipe 457	5.63	50	100	6	0.04	0.09	Open
Junc 449	1115.0	1162.4	12.6	47.4	Pipe 458	9.78	50	100	−2	0.01	0.02	Open
Junc 450	1125.0	1152.9	20.4	27.9	Pipe 459	9.81	20	100	−2	0.07	1.04	Open
Junc 451	1120.0	1149.5	21.8	29.5	Pipe 460	10.54	20	100	−2	0.07	1.03	Open
Junc 452	1115.0	1146.3	67.8	31.3	Pipe 461	13.67	20	100	−2	0.07	1.03	Open
Junc 453	1125.0	1151.3	20.4	26.3	Pipe 462	15.18	20	100	−2	0.07	1.03	Open
Junc 454	1125.0	1149.2	63.8	24.2	Pipe 463	14.2	20	100	−2.6	0.1	1.68	Open
Junc 455	1125.0	1147.1	43.8	22.1	Pipe 464	23.65	20	100	−2.6	0.1	1.68	Open
Junc 456	1130.0	1146.9	3.8	16.9	Pipe 465	20.32	20	100	−2.6	0.1	1.68	Open
Junc 457	1115.0	1135.9	57.8	20.9	Pipe 466	19.74	20	100	5.2	0.19	6.07	Open
Junc 458	1130.0	1147.9	33.8	17.9	Pipe 467	32.53	20	100	2.6	0.1	1.68	Open
Junc 459	1135.0	1147.6	33.8	12.6	Pipe 468	9.4	20	100	−2.6	0.1	1.68	Open
Junc 460	1125.0	1161.0	20.2	36.0	Pipe 469	12.01	20	100	7.8	0.29	12.87	Open
Junc 461	1135.0	1168.6	32.6	33.6	Pipe 470	21.69	20	100	2.6	0.1	1.68	Open
Junc 462	1120.0	1175.3	2.9	55.3	Pipe 471	11.86	20	100	2.6	0.1	1.68	Open
Junc 463	1120.0	1175.3	92.0	55.3	Pipe 472	10.92	20	100	−2.6	0.1	1.68	Open
Junc 464	1120.0	1173.1	21.1	53.1	Pipe 473	12.38	20	100	2.6	0.1	1.68	Open
Junc 465	1130.0	1189.5	13.1	59.5	Pipe 474	16.47	20	100	2.6	0.1	1.68	Open
Junc 466	1130.0	1191.9	7.3	61.9	Pipe 475	12.32	20	100	2.5	0.09	1.56	Open
Junc 467	1125.0	1191.9	7.3	66.9	Pipe 476	44.71	20	100	−2.1	0.08	1.13	Open
Junc 468	1130.0	1191.9	0.0	61.9	Pipe 477	19.16	20	100	−2.5	0.09	1.57	Open
Junc 469	1125.0	1191.8	11.6	66.8	Pipe 478	11.62	20	100	2.5	0.09	1.56	Open
Junc 470	1135.0	1192.8	2.9	57.8	Pipe 479	23.11	20	100	−2.5	0.09	1.56	Open
Junc 471	1140.0	1200.6	5.8	60.6	Pipe 480	576.84	50	100	−91.4	0.54	14.14	Open
Junc 472	1140.0	1216.3	20.7	76.3	Pipe 481	21.47	20	100	−2	0.07	1.03	Open
Junc 473	1140.0	1216.3	0.0	76.3	Pipe 482	11.21	20	100	−2	0.07	1.04	Open
Junc 474	1145.0	1218.3	18.6	73.3	Pipe 483	5.74	50	100	27.6	0.16	1.54	Open
Junc 475	1145.0	1223.8	23.1	78.8	Pipe 484	8.78	20	100	2	0.07	1.03	Open
Junc 476	1145.0	1223.7	18.6	78.7	Pipe 485	8.14	50	100	−6	0.04	0.09	Open
Junc 477	1145.0	1223.7	2.9	78.7	Pipe 486	124.02	50	100	17.6	0.1	0.67	Open
Junc 478	1145.0	1223.7	2.9	78.7	Pipe 487	14.31	20	100	16.2	0.6	49.81	Open
Junc 479	1150.0	1223.7	2.9	73.7	Pipe 488	24.67	20	100	9.2	0.34	17.47	Open
Junc 480	1145.0	1223.7	2.9	78.7	Pipe 489	12.27	20	100	−1.4	0.05	0.53	Open
Junc 481	1150.0	1223.6	2.9	73.6	Pipe 490	24.21	20	100	6.4	0.24	8.92	Open
Junc 482	1145.0	1223.4	17.4	78.4	Pipe 491	12.47	20	100	−1.4	0.05	0.54	Open
Junc 483	1160.0	1221.3	23.9	61.3	Pipe 492	10.42	20	100	−2.8	0.1	1.93	Open
Junc 484	1135.0	1180.1	71.4	45.1	Pipe 493	13.29	20	100	−1.4	0.05	0.53	Open
Junc 485	1130.0	1179.8	20.4	49.8	Pipe 494	14.04	20	100	−5.6	0.21	6.96	Open
Junc 486	1140.0	1167.1	102.6	27.1	Pipe 495	266.1	50	100	61.8	0.36	6.85	Open
Junc 487	1135.0	1178.0	23.0	43.0	Pipe 496	56.24	20	100	3.2	0.12	2.47	Open
Junc 488	1130.0	1177.6	20.4	47.6	Pipe 497	38.1	63	100	−18.7	0.07	0.24	Open
Junc 489	1130.0	1175.7	23.0	45.7	Pipe 498	23.64	63	100	39.9	0.15	0.99	Open
Junc 490	1130.0	1175.7	2.9	45.7	Pipe 499	82.85	63	100	33.5	0.12	0.72	Open
Junc 491	1130.0	1174.9	46.1	44.9	Pipe 500	90.59	63	100	17.6	0.07	0.22	Open
Junc 492	1130.0	1174.9	2.9	44.9	Pipe 501	12.7	63	100	8.8	0.03	0.06	Open
Junc 493	1130.0	1173.6	46.1	43.6	Pipe 502	17.33	20	100	4.4	0.16	4.46	Open
Junc 494	1125.0	1173.6	2.9	48.6	Pipe 503	18.07	20	100	4.4	0.16	4.46	Open
Junc 495	1125.0	1173.0	0.0	48.0	Pipe 504	25.13	20	100	−3.2	0.12	2.47	Open
Junc 496	1125.0	1169.1	71.0	44.1	Pipe 505	17.03	20	100	3.2	0.12	2.47	Open
Junc 497	1125.0	1172.4	12.6	47.4	Pipe 506	34.29	20	100	3.2	0.12	2.47	Open
Junc 498	1125.0	1169.0	71.0	44.0	Pipe 507	30.76	25	100	12.7	0.3	10.7	Open
Junc 499	1125.0	1172.1	12.6	47.1	Pipe 508	139.55	25	100	6.3	0.15	2.92	Open
Junc 500	1125.0	1168.2	71.0	43.2	Pipe 509	51.15	25	100	1.8	0.04	0.29	Open
Junc 501	1125.0	1172.0	12.6	47.0	Pipe 510	12.73	20	100	0.9	0.03	0.23	Open
Junc 502	1125.0	1170.2	40.1	45.2	Pipe 511	21.68	25	100	3.6	0.08	1.04	Open
Junc 503	1125.0	1170.1	40.1	45.1	Pipe 512	19.41	25	100	1.8	0.04	0.29	Open
Junc 504	1120.0	1160.0	7.7	40.0	Pipe 513	14.17	20	100	0.9	0.03	0.24	Open
Junc 505	1120.0	1159.2	41.6	39.2	Pipe 514	19.69	20	100	−0.9	0.03	0.24	Open
Junc 506	1120.0	1152.6	41.6	32.6	Pipe 515	36.75	25	100	15.5	0.37	15.48	Open
Junc 507	1120.0	1157.2	41.6	37.2	Pipe 516	154.08	25	100	9.1	0.21	5.77	Open
Junc 508	1120.0	1153.2	14.4	33.2	Pipe 517	30.9	25	100	2.7	0.06	0.61	Open
Junc 509	1120.0	1156.3	31.6	36.3	Pipe 518	12.82	25	100	0.9	0.02	0.08	Open
Junc 510	1125.0	1155.4	5.0	30.4	Pipe 519	20.6	20	100	−0.9	0.03	0.24	Open

NODE	Ma'an city				LINK	Ma'an city						
ID	Elevation m	Head m	Demand m3/d	Pressure m	ID	Length m	Diameter mm	Roughness	Flow m3/d	Velocity m/s	Unit head loss m/km	Status
Junc 511	1120.0	1155.9	21.6	35.9	Pipe 520	18.8	20	100	−3.2	0.12	2.47	Open
Junc 512	1130.0	1154.9	5.0	24.9	Pipe 521	39.97	50	100	100.3	0.59	16.8	Open
Junc 513	1125.0	1155.7	13.3	30.7	Pipe 522	16.93	50	100	97.8	0.58	16.03	Open
Junc 514	1135.0	1154.3	5.0	19.3	Pipe 523	16.83	50	100	92.8	0.55	14.55	Open
Junc 515	1145.0	1213.6	18.6	68.6	Pipe 524	64.51	50	100	86.2	0.51	12.69	Open
Junc 516	1120.0	1160.9	10.5	40.9	Pipe 525	46.7	50	100	81.8	0.48	11.52	Open
Junc 517	1105.0	1127.2	67.8	22.2	Pipe 526	17.77	50	100	77.4	0.46	10.4	Open
Junc 518	1115.0	1139.5	19.3	24.5	Pipe 527	29.44	50	100	73	0.43	9.33	Open
Junc 519	1120.0	1136.2	7.9	16.2	Pipe 528	11.44	50	100	68.6	0.4	8.31	Open
Junc 520	1115.0	1142.6	1.9	27.6	Pipe 529	10.25	50	100	61.6	0.36	6.81	Open
Junc 521	1115.0	1139.7	19.3	24.7	Pipe 530	19.89	50	100	56.4	0.33	5.78	Open
Junc 522	1120.0	1145.0	0.0	25.0	Pipe 531	26.4	50	100	51.2	0.3	4.84	Open
Junc 523	1130.0	1147.0	20.4	17.0	Pipe 532	10.38	50	100	46	0.27	3.96	Open
Junc 524	1130.0	1175.7	11.2	45.7	Pipe 533	19.96	50	100	40.8	0.24	3.18	Open
Junc 525	1130.0	1175.7	22.4	45.7	Pipe 534	25.53	50	100	35.6	0.21	2.47	Open
Junc 526	1130.0	1172.3	34.0	42.3	Pipe 535	34.89	50	100	30.4	0.18	1.84	Open
Junc 527	1115.0	1153.1	29.2	38.1	Pipe 536	24.57	50	100	20	0.12	0.85	Open
Junc 528	1135.0	1168.4	32.6	33.4	Pipe 537	122.12	50	100	14.8	0.09	0.49	Open
Junc 529	1125.0	1168.1	2.9	43.1	Pipe 538	13.88	50	100	10.4	0.06	0.25	Open
Junc 530	1115.0	1143.0	2.9	28.0	Pipe 539	21.76	50	100	4.2	0.02	0.04	Open
Junc 531	1115.0	1143.3	2.9	28.3	Pipe 540	23.32	50	100	1.4	0.01	0.01	Open
Junc 532	1135.0	1176.2	1.0	41.2	Pipe 541	24.17	20	100	1.4	0.05	0.54	Open
Junc 533	1130.0	1192.1	2.2	62.1	Pipe 542	14.1	20	100	2.2	0.08	1.23	Open
Junc 534	1125.0	1159.4	7.3	34.4	Pipe 543	6.43	20	100	−1.4	0.05	0.53	Open
Junc 535	1120.0	1154.2	21.8	34.2	Pipe 544	27.04	20	100	−2	0.07	1.03	Open
Junc 536	1120.0	1155.9	21.8	35.9	Pipe 545	25.52	20	100	−4.8	0.18	5.23	Open
Junc 537	1125.0	1163.3	7.3	38.3	Pipe 546	29.21	20	100	−2.6	0.1	1.68	Open
Junc 538	1120.0	1167.2	36.9	47.2	Pipe 547	5.94	20	100	−2.6	0.1	1.68	Open
Junc 539	1120.0	1159.5	16.4	39.5	Pipe 548	11.16	20	100	−7.8	0.29	12.86	Open
Junc 540	1120.0	1167.7	7.7	47.7	Pipe 549	14.6	20	100	−2.6	0.1	1.68	Open
Junc 541	1120.0	1162.0	21.6	42.0	Pipe 550	20.13	20	100	−2.6	0.1	1.68	Open
Junc 542	1120.0	1167.7	7.7	47.7	Pipe 551	13.15	20	100	−2.6	0.1	1.68	Open
Junc 543	1140.0	1166.8	1.9	26.8	Pipe 552	29.41	20	100	−2.6	0.1	1.68	Open
Junc 544	1110.0	1147.4	5.7	37.4	Pipe 553	11.99	20	100	−2.6	0.1	1.68	Open
Junc 545	1115.0	1148.7	0.0	33.7	Pipe 554	23.92	20	100	2.6	0.1	1.68	Open
Junc 546	1115.0	1148.0	0.0	33.0	Pipe 555	18.71	20	100	−2.6	0.1	1.68	Open
Junc 547	1110.0	1147.3	5.7	37.3	Pipe 556	12.04	20	100	4.4	0.16	4.46	Open
Junc 548	1110.0	1147.4	5.7	37.4	Pipe 557	8.26	20	100	2.2	0.08	1.23	Open
Junc 549	1110.0	1147.3	5.7	37.3	Pipe 558	14.16	20	100	2.2	0.08	1.23	Open
Junc 550	1110.0	1147.3	5.7	37.3	Pipe 559	16.8	20	100	−2.2	0.08	1.24	Open
Junc 551	1110.0	1147.3	20.1	37.3	Pipe 560	17.68	20	100	−2.2	0.08	1.24	Open
Junc 552	1110.0	1146.3	5.7	36.3	Pipe 561	18.24	20	100	−2.2	0.08	1.23	Open
Junc 553	1105.0	1147.4	5.7	42.4	Pipe 562	12.41	20	100	4.4	0.16	4.46	Open
Junc 554	1115.0	1156.0	23.6	41.0	Pipe 563	7.5	20	100	2.2	0.08	1.24	Open
Junc 555	1125.0	1155.7	8.3	30.7	Pipe 564	21	20	100	−2.5	0.09	1.56	Open
Junc 556	1125.0	1172.0	12.6	47.0	Pipe 565	104.02	100	100	−334.5	0.49	5.34	Open
Junc 557	1140.0	1213.6	0.0	73.6	Pipe 566	99.24	100	100	−437.3	0.64	8.78	Open
Junc 558	1125.0	1170.2	17.1	45.2	Pipe 567	100.02	100	100	−518.6	0.76	12.04	Open
Junc 559	1120.0	1167.8	36.4	47.8	Pipe 568	27.85	63	100	78.5	0.29	3.46	Open
Junc 560	1120.0	1164.4	20.4	44.4	Pipe 569	27.42	63	100	73.5	0.27	3.06	Open
Junc 561	1110.0	1141.2	11.4	31.2	Pipe 570	3.28	63	100	69.1	0.26	2.75	Open
Junc 562	1105.0	1140.9	28.1	35.9	Pipe 571	2.67	63	100	64.7	0.24	2.4	Open
Junc 563	1105.0	1141.4	13.8	36.4	Pipe 572	64.91	50	100	62.5	0.37	7	Open
Junc 564	1105.0	1133.0	13.8	28.0	Pipe 573	3.67	50	100	58.1	0.34	6.12	Open
Junc 565	1115.0	1143.2	2.9	28.2	Pipe 574	30.78	50	100	53.7	0.32	5.28	Open
Junc 566	1115.0	1142.1	15.1	27.1	Pipe 575	32.07	50	100	49.3	0.29	4.51	Open
Junc 567	1105.0	1135.8	13.8	30.8	Pipe 576	53.62	50	100	44.9	0.26	3.79	Open
Junc 568	1105.0	1119.3	28.1	14.3	Pipe 577	67.76	50	100	40.5	0.24	3.13	Open
Junc 569	1105.0	1135.3	28.1	30.3	Pipe 578	63.45	50	100	35.7	0.21	2.48	Open
Junc 570	1115.0	1141.2	9.8	26.2	Pipe 579	10.5	20	100	2.2	0.08	1.23	Open
Junc 571	1110.0	1142.4	6.4	32.4	Pipe 580	30.05	20	100	−2.6	0.1	1.68	Open
Junc 572	1110.0	1141.5	11.0	31.5	Pipe 581	26.6	20	100	2.2	0.08	1.23	Open
Junc 573	1110.0	1141.8	11.0	31.8	Pipe 582	10.53	20	100	2.2	0.08	1.24	Open
Junc 574	1110.0	1140.8	11.0	30.8	Pipe 583	17.85	20	100	2.8	0.1	1.93	Open
Junc 575	1110.0	1143.0	11.0	33.0	Pipe 584	26.03	20	100	−2.2	0.08	1.23	Open
Junc 576	1110.0	1140.4	13.3	30.4	Pipe 585	23.68	20	100	−2.2	0.08	1.23	Open
Junc 577	1110.0	1140.4	13.3	30.4	Pipe 586	15.01	20	100	2.2	0.08	1.23	Open
Junc 578	1110.0	1142.7	11.4	32.7	Pipe 587	10.61	20	100	−2.2	0.08	1.23	Open
Junc 579	1110.0	1138.7	13.3	28.7	Pipe 588	23.22	20	100	2.2	0.08	1.23	Open
Junc 580	1115.0	1143.0	9.8	28.0	Pipe 589	68.57	50	100	31.3	0.18	1.94	Open
Junc 581	1115.0	1139.8	11.8	24.8	Pipe 590	43.56	50	100	26.9	0.16	1.47	Open
Junc 582	1115.0	1139.4	11.8	24.4	Pipe 591	15.46	50	100	20.3	0.12	0.87	Open
Junc 583	1115.0	1139.4	11.8	24.4	Pipe 592	160.18	50	100	15.9	0.09	0.55	Open
Junc 584	1115.0	1137.9	11.8	22.9	Pipe 593	35.87	50	100	13.1	0.08	0.39	Open
Junc 585	1115.0	1142.4	6.4	27.4	Pipe 594	72.99	50	100	10.3	0.06	0.25	Open
Junc 586	1115.0	1141.9	9.2	26.9	Pipe 595	4.77	50	100	7.5	0.04	0.14	Open
Junc 587	1115.0	1143.1	6.4	28.1	Pipe 596	25.14	20	100	6.1	0.22	8.16	Open
Junc 588	1110.0	1143.1	6.4	33.1	Pipe 597	11.44	20	100	−1.4	0.05	0.53	Open
Junc 589	1140.0	1181.0	15.0	41.0	Pipe 598	12.33	20	100	−1.4	0.05	0.54	Open
Junc 590	1115.0	1141.1	9.8	26.1	Pipe 599	30.62	20	100	−1.4	0.05	0.53	Open
Junc 591	1115.0	1140.7	9.8	25.7	Pipe 600	30.99	20	100	−1.4	0.05	0.54	Open
Junc 592	1110.0	1142.3	6.4	32.3	Pipe 601	18.85	20	100	−2.2	0.08	1.24	Open
Junc 593	1095.0	1132.8	20.0	37.8	Pipe 602	27.23	20	100	4.4	0.16	4.45	Open
Junc 594	1140.0	1180.5	1.7	40.5	Pipe 603	13.19	20	100	2.2	0.08	1.23	Open
Junc 595	1140.0	1165.7	1.9	25.7	Pipe 604	11.82	20	100	2.2	0.08	1.23	Open

NODE	Ma'an city				LINK	Ma'an city						
ID	Elevation m	Head m	Demand m3/d	Pressure m	ID	Length m	Diameter mm	Roughness	Flow m3/d	Velocity m/s	Unit head loss m/km	Status
Junc 596	1020.0	1122.6	5.8	102.6	Pipe 605	121.09	20	100	3.3	0.12	2.62	Open
Junc 597	1080.0	1145.1	140.8	65.1	Pipe 606	209.96	25	100	1.9	0.04	0.32	Open
Junc 598	1065.0	1126.2	82.0	61.2	Pipe 607	30.88	20	100	−1.9	0.07	0.94	Open
Junc 599	1135.0	1190.8	10.2	55.8	Pipe 608	143.89	25	100	−3.8	0.09	1.15	Open
Junc 600	1130.0	1165.9	14.4	35.9	Pipe 609	161.22	25	100	−12.5	0.29	10.39	Open
Junc 601	1140.0	1178.5	4.4	38.5	Pipe 610	149.48	25	100	−20.1	0.47	25.05	Open
Junc 602	1120.0	1167.2	10.5	47.2	Pipe 611	101.02	25	100	−27.7	0.65	45.36	Open
Junc 603	1120.0	1168.4	10.5	48.4	Pipe 612	26.44	20	100	−3.8	0.14	3.4	Open
Junc 604	1120.0	1145.1	0.0	25.1	Pipe 613	16.07	20	100	7.5	0.28	11.97	Open
Junc 605	1125.0	1145.0	0.0	20.0	Pipe 614	8.52	20	100	2.5	0.09	1.56	Open
Junc 606	1120.0	1145.0	0.0	25.0	Pipe 615	31.85	20	100	2.5	0.09	1.56	Open
Junc 607	1125.0	1145.0	0.0	20.0	Pipe 616	25.45	20	100	−3.8	0.14	3.39	Open
Junc 608	1130.0	1180.4	9.2	50.4	Pipe 617	15.86	25	100	10.4	0.25	7.39	Open
Junc 609	1140.0	1180.4	1.7	40.4	Pipe 618	50.06	25	100	5.2	0.12	2.05	Open
Junc 610	1120.0	1145.9	46.9	25.9	Pipe 619	24.17	20	100	3.8	0.14	3.4	Open
Junc 611	1120.0	1146.1	20.4	26.1	Pipe 620	21.93	20	100	−3.8	0.14	3.4	Open
Junc 612	1135.0	1149.0	1.0	14.0	Pipe 621	39.16	63	100	−11.8	0.04	0.1	Open
Junc 613	1115.0	1153.0	29.2	38.0	Pipe 622	59.23	63	100	−13.2	0.05	0.13	Open
Junc 614	1110.0	1152.7	31.3	42.7	Pipe 623	54.12	63	100	19.8	0.07	0.27	Open
Junc 615	1115.0	1175.5	29.2	60.5	Pipe 624	48.96	63	100	18.4	0.07	0.24	Open
Junc 616	1120.0	1173.0	101.8	53.0	Pipe 625	215.15	63	100	27.7	0.1	0.5	Open
Junc 617	1115.0	1175.4	29.2	60.4	Pipe 626	120.31	20	100	1.87	0.07	0.91	Open
Junc 618	1115.0	1173.8	81.1	58.8	Pipe 627	17.28	20	100	−2.5	0.09	1.56	Open
Junc 619	1140.0	1177.1	2.5	37.1	Pipe 628	53.57	100	100	−609	0.9	16.21	Open
Junc 620	1140.0	1180.7	0.7	40.7	Pipe 629	10.75	63	100	74.27	0.28	3.13	Open
Junc 621	1140.0	1180.7	0.7	40.7	Pipe 630	35.2	63	100	68.67	0.25	2.7	Open
Junc 622	1110.0	1139.5	0.0	29.5	Pipe 631	22.86	63	100	63.07	0.23	2.31	Open
Junc 623	1120.0	1144.5	0.0	24.5	Pipe 632	18.21	50	100	60.27	0.36	6.54	Open
Junc 624	1120.0	1144.4	8.7	24.4	Pipe 633	18.02	20	100	2.8	0.1	1.93	Open
Junc 625	1115.0	1157.8	11.2	42.8	Pipe 634	12.91	20	100	−2.8	0.1	1.93	Open
Junc 626	1120.0	1157.7	11.2	37.7	Pipe 635	24.74	20	100	2.8	0.1	1.93	Open
Junc 627	1115.0	1157.8	11.2	42.8	Pipe 636	29.52	20	100	−2.8	0.1	1.93	Open
Junc 628	1120.0	1157.7	11.2	37.7	Pipe 637	17.28	50	100	54.67	0.32	5.46	Open
Junc 629	1115.0	1157.8	53.7	42.8	Pipe 638	186	50	100	49.07	0.29	4.47	Open
Junc 630	1120.0	1157.6	53.7	37.6	Pipe 639	11.68	50	100	46.27	0.27	4.01	Open
Junc 631	1120.0	1169.4	15.2	49.4	Pipe 640	69.97	50	100	43.47	0.26	3.57	Open
Junc 632	1120.0	1169.4	38.9	49.4	Pipe 641	49.06	50	100	40.67	0.24	3.16	Open
Junc 633	1120.0	1170.5	65.2	50.5	Pipe 642	5.73	50	100	37.87	0.22	2.75	Open
Junc 634	1120.0	1169.7	35.2	49.7	Pipe 643	7.88	20	100	−1.4	0.05	0.53	Open
Junc 635	1120.0	1169.5	65.2	49.5	Pipe 644	10.08	20	100	−1.4	0.05	0.53	Open
Junc 636	1125.0	1169.7	67.1	44.7	Pipe 645	10.09	20	100	−1.4	0.05	0.54	Open
Junc 637	1120.0	1169.5	41.6	49.5	Pipe 646	26.47	20	100	−1.4	0.05	0.53	Open
Junc 638	1135.0	1168.3	33.8	33.3	Pipe 647	46.18	50	100	36.47	0.21	2.58	Open
Junc 639	1125.0	1166.7	32.6	41.7	Pipe 648	8.18	50	100	32.87	0.19	2.13	Open
Junc 640	1135.0	1167.1	33.8	32.1	Pipe 649	39.33	50	100	30.07	0.18	1.81	Open
Junc 641	1135.0	1166.9	32.6	31.9	Pipe 650	8.1	20	100	−1.4	0.05	0.53	Open
Junc 642	1125.0	1156.3	20.4	31.3	Pipe 651	14.61	20	100	−2.2	0.08	1.24	Open
Junc 643	1120.0	1155.0	21.8	35.0	Pipe 652	33.21	50	100	25.67	0.15	1.35	Open
Junc 644	1120.0	1153.3	67.8	33.3	Pipe 653	20.17	50	100	21.27	0.13	0.95	Open
Junc 645	1120.0	1163.0	12.6	43.0	Pipe 654	28.79	50	100	19.07	0.11	0.78	Open
Junc 646	1140.0	1189.0	36.4	49.0	Pipe 655	60.37	50	100	14.37	0.08	0.46	Open
Junc 647	1140.0	1189.0	0.0	49.0	Pipe 656	16.6	50	100	9.37	0.06	0.21	Open
Junc 648	1145.0	1188.0	26.2	43.0	Pipe 657	10.14	20	100	2.5	0.09	1.56	Open
Junc 649	1120.0	1168.4	10.5	48.4	Pipe 658	100.13	20	100	6.87	0.25	10.16	Open
Junc 650	1140.0	1180.9	0.7	40.9	Pipe 659	10.66	50	100	−2.5	0.01	0.02	Open
Junc 651	1125.0	1154.8	16.7	29.8	Pipe 660	22.9	50	100	−7.5	0.04	0.14	Open
Junc 652	1110.0	1147.3	5.7	37.3	Pipe 661	25.38	50	100	−12.5	0.07	0.36	Open
Junc 653	1135.0	1162.7	1.0	27.7	Pipe 662	46.32	50	100	−17.2	0.1	0.64	Open
Junc 654	1135.0	1162.7	1.0	27.7	Pipe 663	6.43	50	100	−21.6	0.13	0.97	Open
Junc 655	1135.0	1162.7	1.0	27.7	Pipe 664	12.63	50	100	−26	0.15	1.38	Open
Junc 656	1135.0	1162.8	1.0	27.8	Pipe 665	24.93	50	100	−30.4	0.18	1.84	Open
Junc 657	1135.0	1162.8	1.0	27.8	Pipe 666	30.6	50	100	−34.8	0.21	2.37	Open
Junc 658	1135.0	1160.1	1.4	25.1	Pipe 667	37.79	50	100	−39.2	0.23	2.95	Open
Junc 659	1135.0	1159.9	1.4	24.9	Pipe 668	33.17	50	100	−43.6	0.26	3.59	Open
Junc 660	1135.0	1159.9	2.0	24.9	Pipe 669	13.99	20	100	−2.5	0.09	1.56	Open
Junc 661	1135.0	1159.9	1.4	24.9	Pipe 670	18.85	20	100	−2.5	0.09	1.56	Open
Junc 662	1140.0	1179.7	0.7	39.7	Pipe 671	20.6	20	100	−2.2	0.08	1.24	Open
Junc 663	1140.0	1179.4	0.7	39.4	Pipe 672	15.89	20	100	−2.2	0.08	1.24	Open
Junc 664	1140.0	1178.7	0.7	38.7	Pipe 673	9.63	20	100	−2.2	0.08	1.23	Open
Junc 665	1140.0	1181.7	0.7	41.7	Pipe 674	20.17	20	100	−2.2	0.08	1.24	Open
Junc 666	1140.0	1176.9	0.7	36.9	Pipe 675	18.28	20	100	−2.2	0.08	1.23	Open
Junc 667	1140.0	1175.1	0.7	35.1	Pipe 676	20.19	20	100	−2.2	0.08	1.23	Open
Junc 668	1140.0	1175.0	0.7	35.0	Pipe 677	9.53	20	100	−2.2	0.08	1.23	Open
Junc 669	1140.0	1173.7	0.7	33.7	Pipe 678	22.8	20	100	−2.2	0.08	1.23	Open
Junc 670	1140.0	1173.5	0.7	33.5	Pipe 679	8.12	20	100	2.2	0.08	1.24	Open
Junc 671	1140.0	1172.1	0.7	32.1	Pipe 680	6.85	20	100	−2.2	0.08	1.24	Open
Junc 672	1140.0	1172.1	1.9	32.1	Pipe 681	7.8	20	100	−2.2	0.08	1.23	Open
Junc 673	1140.0	1179.3	0.7	39.3	Pipe 682	63.38	50	100	48	0.28	4.29	Open
Junc 674	1140.0	1170.7	1.9	30.7	Pipe 683	2.46	50	100	−51.6	0.3	4.93	Open
Junc 675	1140.0	1170.4	1.9	30.4	Pipe 684	3.49	50	100	−53	0.31	5.14	Open
Junc 676	1140.0	1168.7	2.8	28.7	Pipe 685	17.94	20	100	−2.2	0.08	1.23	Open
Junc 677	1140.0	1166.7	2.8	26.7	Pipe 686	7.82	20	100	−1.4	0.05	0.53	Open
Junc 678	1140.0	1165.9	2.8	25.9	Pipe 687	98.25	50	100	−55.8	0.33	5.67	Open
Junc 679	1140.0	1176.5	0.7	36.5	Pipe 688	23.17	20	100	−1.4	0.05	0.53	Open
Junc 680	1135.0	1163.2	1.0	28.2	Pipe 689	198.53	50	100	−58.6	0.35	6.21	Open

NODE	Ma'an city				LINK	Ma'an city						
ID	Elevation m	Head m	Demand m3/d	Pressure m	ID	Length m	Diameter mm	Roughness	Flow m3/d	Velocity m/s	Unit head loss m/km	Status
Junc 681	1135.0	1163.1	1.0	28.1	Pipe 690	25.59	50	100	−60.8	0.36	6.65	Open
Junc 682	1135.0	1163.1	2.1	28.1	Pipe 691	7.13	50	100	−73.6	0.43	9.48	Open
Junc 683	1135.0	1163.2	1.8	28.2	Pipe 692	7.27	50	100	−79.2	0.47	10.85	Open
Junc 684	1135.0	1163.2	1.8	28.2	Pipe 693	57.27	63	100	−82	0.3	3.75	Open
Junc 685	1135.0	1163.2	2.5	28.2	Pipe 694	20.21	63	100	−87.6	0.33	4.24	Open
Junc 686	1135.0	1163.2	2.5	28.2	Pipe 695	7.44	20	100	−2.8	0.1	1.93	Open
Junc 687	1135.0	1163.2	2.5	28.2	Pipe 696	9.16	20	100	−2.8	0.1	1.93	Open
Junc 688	1135.0	1163.1	2.5	28.1	Pipe 697	8.1	20	100	−2.8	0.1	1.93	Open
Junc 689	1140.0	1163.2	2.5	23.2	Pipe 698	12.99	20	100	−2.2	0.08	1.24	Open
Junc 690	1135.0	1162.9	2.5	27.9	Pipe 699	13.53	20	100	10	0.37	20.38	Open
Junc 691	1140.0	1163.8	2.5	23.8	Pipe 700	36.31	20	100	4.4	0.16	4.46	Open
Junc 692	1135.0	1163.1	2.5	28.1	Pipe 701	50.29	63	100	48.2	0.18	1.4	Open
Junc 693	1140.0	1164.7	2.8	24.7	Pipe 702	15.78	63	100	42.6	0.16	1.12	Open
Junc 694	1135.0	1164.7	2.5	29.7	Pipe 703	36.93	50	100	39.8	0.23	3.03	Open
Junc 695	1130.0	1163.7	2.5	33.7	Pipe 704	47.35	50	100	36	0.21	2.52	Open
Junc 696	1130.0	1162.8	1.4	32.8	Pipe 705	37.31	50	100	32.2	0.19	2.05	Open
Junc 697	1130.0	1162.2	1.4	32.2	Pipe 706	8.7	50	100	28.4	0.17	1.63	Open
Junc 698	1135.0	1165.5	1.4	30.5	Pipe 707	12.14	50	100	24.6	0.15	1.24	Open
Junc 699	1135.0	1165.2	1.4	30.2	Pipe 708	20	50	100	20.8	0.12	0.91	Open
Junc 700	1135.0	1165.2	1.4	30.2	Pipe 709	4.14	50	100	13.2	0.08	0.4	Open
Junc 701	1135.0	1165.0	1.4	30.0	Pipe 710	17.2	50	100	9.4	0.06	0.21	Open
Junc 702	1140.0	1174.8	0.7	34.8	Pipe 711	15.9	20	100	7.5	0.28	11.97	Open
Junc 703	1135.0	1173.3	1.4	38.3	Pipe 712	40.54	20	100	4.2	0.15	4.09	Open
Junc 704	1135.0	1173.2	1.4	38.2	Pipe 713	5.96	20	100	1.4	0.05	0.54	Open
Junc 705	1135.0	1173.1	1.4	38.1	Pipe 714	23.09	20	100	1.4	0.05	0.53	Open
Junc 706	1135.0	1173.0	1.4	38.0	Pipe 715	10.5	20	100	−1.9	0.07	0.94	Open
Junc 707	1135.0	1173.0	1.4	38.0	Pipe 716	10.98	20	100	−1.9	0.07	0.94	Open
Junc 708	1135.0	1173.1	1.4	38.1	Pipe 717	12.18	20	100	−1.9	0.07	0.94	Open
Junc 709	1135.0	1172.9	1.4	37.9	Pipe 718	9.71	20	100	−5.7	0.21	7.2	Open
Junc 710	1135.0	1172.9	1.4	37.9	Pipe 719	11.19	20	100	−1.9	0.07	0.94	Open
Junc 711	1135.0	1172.8	1.4	37.8	Pipe 720	22.69	20	100	−1.9	0.07	0.94	Open
Junc 712	1135.0	1172.8	1.4	37.8	Pipe 721	8.21	20	100	1.9	0.07	0.94	Open
Junc 713	1135.0	1172.6	1.4	37.6	Pipe 722	79.94	20	100	1.9	0.07	0.94	Open
Junc 714	1135.0	1172.5	1.4	37.5	Pipe 723	13.78	20	100	1.9	0.07	0.94	Open
Junc 715	1135.0	1168.2	1.4	33.2	Pipe 724	10.63	20	100	1.9	0.07	0.95	Open
Junc 716	1135.0	1168.2	1.4	33.2	Pipe 725	12.7	20	100	2.8	0.1	1.93	Open
Junc 717	1135.0	1168.3	1.4	33.3	Pipe 726	40.51	32	100	19	0.27	6.78	Open
Junc 718	1135.0	1168.2	1.4	33.2	Pipe 727	47.69	25	100	17.1	0.4	18.57	Open
Junc 719	1135.0	1168.3	1.4	33.3	Pipe 728	6.78	20	100	1.9	0.07	0.94	Open
Junc 720	1140.0	1176.5	0.7	36.5	Pipe 729	26.37	25	100	5.7	0.13	2.43	Open
Junc 721	1140.0	1176.5	0.7	36.5	Pipe 730	31.72	25	100	9.5	0.22	6.25	Open
Junc 722	1140.0	1176.5	0.7	36.5	Pipe 731	11.04	25	100	13.3	0.31	11.65	Open
Junc 723	1140.0	1173.4	1.9	33.4	Pipe 732	13.93	20	100	−1.9	0.07	0.94	Open
Junc 724	1140.0	1173.4	1.9	33.4	Pipe 733	13.06	20	100	−1.9	0.07	0.95	Open
Junc 725	1135.0	1172.4	0.7	37.4	Pipe 734	15.3	20	100	−1.9	0.07	0.94	Open
Junc 726	1135.0	1172.4	1.4	37.4	Pipe 735	16.34	20	100	−1.9	0.07	0.94	Open
Junc 727	1135.0	1172.4	0.7	37.4	Pipe 736	66.04	32	100	10.1	0.15	2.1	Open
Junc 728	1135.0	1171.7	0.7	36.7	Pipe 737	17.01	25	100	9.4	0.22	6.13	Open
Junc 729	1135.0	1171.6	0.7	36.6	Pipe 738	27.97	25	100	3.8	0.09	1.14	Open
Junc 730	1135.0	1171.6	0.7	36.6	Pipe 739	11.41	20	100	1.9	0.07	0.95	Open
Junc 731	1135.0	1171.6	0.7	36.6	Pipe 740	9.22	25	100	4.9	0.12	1.83	Open
Junc 732	1135.0	1171.6	0.7	36.6	Pipe 741	6.46	25	100	3.5	0.08	0.98	Open
Junc 733	1140.0	1171.8	1.9	31.8	Pipe 742	7.17	25	100	2.1	0.05	0.38	Open
Junc 734	1140.0	1171.6	1.9	31.6	Pipe 743	10.31	25	100	0.7	0.02	0.05	Open
Junc 735	1140.0	1171.7	1.9	31.7	Pipe 745	5.47	20	100	0.7	0.03	0.15	Open
Junc 736	1140.0	1171.7	1.9	31.7	Pipe 746	6.3	20	100	0.7	0.03	0.15	Open
Junc 737	1140.0	1171.7	1.9	31.7	Pipe 747	4.81	20	100	0.7	0.03	0.15	Open
Junc 738	1135.0	1171.7	1.9	36.7	Pipe 748	58.84	63	100	37.1	0.14	0.86	Open
Junc 739	1135.0	1171.7	1.9	36.7	Pipe 749	136.6	50	100	35.2	0.21	2.42	Open
Junc 740	1135.0	1171.7	1.9	36.7	Pipe 750	26.73	50	100	21.9	0.13	1	Open
Junc 741	1140.0	1169.5	1.9	29.5	Pipe 751	26.25	50	100	18.1	0.11	0.71	Open
Junc 742	1140.0	1169.5	1.9	29.5	Pipe 752	9.44	50	100	14.3	0.08	0.46	Open
Junc 743	1135.0	1171.6	0.7	36.6	Pipe 753	12.08	20	100	1.9	0.07	0.94	Open
Junc 744	1135.0	1171.6	0.7	36.6	Pipe 754	8.95	20	100	1.9	0.07	0.94	Open
Junc 745	1135.0	1171.6	0.7	36.6	Pipe 755	8.02	20	100	1.9	0.07	0.95	Open
Junc 746	1135.0	1171.6	0.7	36.6	Pipe 756	4.69	20	100	11.4	0.42	25.99	Open
Junc 747	1140.0	1168.6	2.8	28.6	Pipe 757	2.89	20	100	1.9	0.07	0.93	Open
Junc 748	1140.0	1168.6	2.8	28.6	Pipe 758	4.37	20	100	−1.9	0.07	0.94	Open
Junc 749	1140.0	1168.6	2.8	28.6	Pipe 759	3.81	20	100	−1.9	0.07	0.96	Open
Junc 750	1140.0	1168.5	1.9	28.5	Pipe 760	3.4	20	100	−3.8	0.14	3.41	Open
Junc 751	1140.0	1168.5	1.9	28.5	Pipe 761	4.18	20	100	−7.6	0.28	12.25	Open
Junc 752	1140.0	1168.4	1.9	28.4	Pipe 762	175.93	50	100	10.5	0.06	0.26	Open
Junc 753	1140.0	1168.3	1.9	28.3	Pipe 763	52.88	50	100	7	0.04	0.12	Open
Junc 754	1140.0	1168.3	1.9	28.3	Pipe 764	27.08	50	100	5.6	0.03	0.08	Open
Junc 755	1140.0	1168.3	1.9	28.3	Pipe 765	8.35	20	100	0.7	0.03	0.15	Open
Junc 756	1135.0	1168.3	1.9	33.3	Pipe 766	8.64	20	100	0.7	0.03	0.15	Open
Junc 757	1135.0	1168.2	1.9	33.2	Pipe 767	9.3	20	100	−0.7	0.03	0.14	Open
Junc 758	1135.0	1168.2	1.9	33.2	Pipe 768	12.42	20	100	−0.7	0.03	0.14	Open
Junc 759	1135.0	1168.2	1.9	33.2	Pipe 769	13.94	25	100	−1.4	0.03	0.18	Open
Junc 760	1135.0	1168.2	1.9	33.2	Pipe 770	70.56	25	100	2.8	0.07	0.65	Open
Junc 761	1135.0	1168.2	1.9	33.2	Pipe 771	36.16	50	100	4.2	0.02	0.05	Open
Junc 762	1135.0	1168.2	1.9	33.2	Pipe 772	94.42	50	100	2.8	0.02	0.02	Open
Junc 763	1135.0	1167.9	1.4	32.9	Pipe 773	31.26	50	100	1.4	0.01	0.01	Open
Junc 764	1135.0	1167.9	1.4	32.9	Pipe 774	19.69	20	100	0.7	0.03	0.15	Open
Junc 765	1135.0	1167.9	1.4	32.9	Pipe 775	13.94	20	100	−0.7	0.03	0.15	Open

NODE	Ma'an city				LINK	Ma'an city						
ID	Elevation m	Head m	Demand m3/d	Pressure m	ID	Length m	Diameter mm	Roughness	Flow m3/d	Velocity m/s	Unit head loss m/km	Status
Junc 766	1140.0	1166.7	2.8	26.7	Pipe 776	25.37	20	100	−0.7	0.03	0.15	Open
Junc 767	1140.0	1166.6	2.8	26.6	Pipe 777	65.03	63	100	67.8	0.25	2.64	Open
Junc 768	1140.0	1166.6	2.8	26.6	Pipe 778	21.49	50	100	67.1	0.4	7.98	Open
Junc 769	1140.0	1166.6	2.8	26.6	Pipe 779	197.97	50	100	66.4	0.39	7.83	Open
Junc 770	1140.0	1166.5	2.8	26.5	Pipe 780	19.2	50	100	63.6	0.37	7.22	Open
Junc 771	1140.0	1166.4	2.8	26.4	Pipe 781	10.53	50	100	60.8	0.36	6.65	Open
Junc 772	1140.0	1166.4	2.8	26.4	Pipe 782	16.34	50	100	58	0.34	6.09	Open
Junc 773	1135.0	1161.9	2.1	26.9	Pipe 783	37.42	50	100	52.4	0.31	5.05	Open
Junc 774	1135.0	1161.8	2.1	26.8	Pipe 784	45.17	50	100	49.6	0.29	4.56	Open
Junc 775	1135.0	1165.5	1.4	30.5	Pipe 785	20.19	50	100	44	0.26	3.65	Open
Junc 776	1135.0	1164.9	1.4	29.9	Pipe 786	4.46	50	100	1.4	0.01	0.02	Open
Junc 777	1135.0	1164.9	2.2	29.9	Pipe 787	16.81	20	100	−1.4	0.05	0.54	Open
Junc 778	1135.0	1164.9	1.4	29.9	Pipe 788	12.39	20	100	−1.4	0.05	0.53	Open
Junc 779	1135.0	1164.9	1.4	29.9	Pipe 789	17.67	20	100	−1.4	0.05	0.53	Open
Junc 780	1135.0	1164.8	2.2	29.8	Pipe 790	16.52	20	100	−1.4	0.05	0.54	Open
Junc 781	1135.0	1164.8	2.2	29.8	Pipe 791	6.6	20	100	−1.4	0.05	0.53	Open
Junc 782	1135.0	1164.8	2.2	29.8	Pipe 792	10.59	20	100	−4.2	0.15	4.09	Open
Junc 783	1135.0	1164.8	2.2	29.8	Pipe 793	19.12	20	100	1.4	0.05	0.53	Open
Junc 784	1135.0	1164.8	2.2	29.8	Pipe 794	3.93	20	100	4.2	0.15	4.09	Open
Junc 785	1135.0	1164.7	2.5	29.7	Pipe 795	3.54	20	100	1.4	0.05	0.53	Open
Junc 786	1135.0	1164.7	2.5	29.7	Pipe 796	30.05	20	100	1.4	0.05	0.53	Open
Junc 787	1135.0	1164.0	1.4	29.0	Pipe 797	48.64	25	100	−4.2	0.1	1.38	Open
Junc 788	1135.0	1164.0	1.4	29.0	Pipe 798	52.79	25	100	37	0.87	77.54	Open
Junc 789	1135.0	1163.5	1.4	28.5	Pipe 799	16.99	20	100	2.8	0.1	1.93	Open
Junc 790	1135.0	1163.4	1.4	28.4	Pipe 800	6.26	20	100	1.4	0.05	0.53	Open
Junc 791	1135.0	1163.4	1.4	28.4	Pipe 801	9.05	20	100	0.7	0.03	0.15	Open
Junc 792	1135.0	1163.1	2.2	28.1	Pipe 802	8.21	25	100	8.4	0.2	4.99	Open
Junc 793	1135.0	1163.1	2.2	28.1	Pipe 803	32.53	25	100	27.2	0.64	43.86	Open
Junc 794	1135.0	1163.0	2.2	28.0	Pipe 804	11.3	20	100	−1.4	0.05	0.53	Open
Junc 795	1135.0	1163.0	2.2	28.0	Pipe 805	13.69	20	100	−5.6	0.21	6.96	Open
Junc 796	1135.0	1162.9	2.2	27.9	Pipe 806	12.52	20	100	−1.4	0.05	0.53	Open
Junc 797	1135.0	1162.9	2.2	27.9	Pipe 807	38.94	20	100	−2.8	0.1	1.93	Open
Junc 798	1135.0	1162.8	2.2	27.8	Pipe 808	25.04	20	100	−1.4	0.05	0.53	Open
Junc 799	1135.0	1162.8	2.2	27.8	Pipe 809	29.06	20	100	1.4	0.05	0.53	Open
Junc 800	1135.0	1162.8	2.2	27.8	Pipe 810	156.22	25	100	24.4	0.58	35.87	Open
Junc 801	1135.0	1162.8	2.2	27.8	Pipe 811	29.41	20	100	−3.2	0.12	2.47	Open
Junc 802	1135.0	1162.8	2.2	27.8	Pipe 812	102.34	25	100	18	0.42	20.42	Open
Junc 803	1135.0	1162.8	2.2	27.8	Pipe 813	34.25	20	100	−3.2	0.12	2.47	Open
Junc 804	1135.0	1162.7	2.5	27.7	Pipe 814	209.32	25	100	11.6	0.27	9.05	Open
Junc 805	1135.0	1162.7	2.2	27.7	Pipe 815	301.08	25	100	5.8	0.14	2.51	Open
Junc 806	1135.0	1162.7	2.5	27.7	Pipe 816	68.59	25	100	4.5	0.11	1.57	Open
Junc 807	1135.0	1162.7	2.5	27.7	Pipe 817	28.82	25	100	1.5	0.04	0.2	Open
Junc 808	1135.0	1162.7	2.5	27.7	Pipe 818	6.89	20	100	−1.5	0.06	0.6	Open
Junc 809	1140.0	1165.8	2.8	25.8	Pipe 819	129.63	25	100	2.5	0.06	0.53	Open
Junc 810	1140.0	1165.8	2.8	25.8	Pipe 16	209.56	50	100	−67.8	0.4	8.13	Open
Junc 811	1140.0	1165.1	2.8	25.1	Pipe 141	330.07	50	100	0	0	0	Open
Junc 812	1140.0	1165.0	2.2	25.0	Pipe 158	368.77	50	100	−80.4	0.47	11.15	Open
Junc 813	1140.0	1165.6	2.8	25.6	Pipe 267	816.67	50	100	0	0	0	Open
Junc 814	1140.0	1165.5	2.8	25.5	Pipe 744	278.64	50	100	−86.2	0.51	12.69	Open
Junc 815	1140.0	1165.1	2.8	25.1	Pipe 820	172.61	50	100	−86.2	0.51	12.69	Open
Junc 816	1140.0	1165.4	2.8	25.4	Pipe 821	260.14	50	100	−35.99	0.21	2.52	Open
Junc 817	1140.0	1165.5	2.8	25.5	Pipe 822	62.89	50	100	70.6	0.42	8.77	Open
Junc 818	1140.0	1165.2	2.2	25.2	Pipe 823	186.23	50	100	−50.21	0.3	4.66	Open
Junc 819	1140.0	1164.6	2.2	24.6	Pipe 824	574.6	50	100	0	0	0	Open
Junc 820	1140.0	1164.5	2.8	24.5	Pipe 825	406.52	50	100	−5.8	0.03	0.09	Open
Junc 821	1140.0	1164.5	2.2	24.5	Pipe 826	657.3	50	100	0	0	0	Open
Junc 822	1140.0	1164.5	2.2	24.5	Pipe 827	700.64	100	100	0	0	0	Open
Junc 823	1140.0	1164.4	2.2	24.4	Pipe 828	119.8	100	100	−125.89	0.19	0.87	Open
Junc 824	1140.0	1164.5	2.2	24.5	Pipe 829	65.2	100	100	−217.69	0.32	2.41	Open
Junc 825	1140.0	1164.5	2.2	24.5	Pipe 830	248.95	100	100	56.01	0.08	0.2	Open
Junc 826	1135.0	1164.0	2.2	29.0	Pipe 831	384.34	100	100	−72.5	0.11	0.31	Open
Junc 827	1135.0	1164.0	2.2	29.0	Pipe 832	208.84	100	100	−54.1	0.08	0.18	Open
Junc 828	1135.0	1164.0	2.2	29.0	Pipe 833	98.86	100	100	−48.3	0.07	0.15	Open
Junc 829	1135.0	1164.0	2.2	29.0	Pipe 834	60.98	100	100	−29	0.04	0.06	Open
Junc 830	1135.0	1163.8	2.2	28.8	Pipe 835	326.09	100	100	27.1	0.04	0.05	Open
Junc 831	1135.0	1163.8	2.2	28.8	Pipe 836	581.31	50	100	18.4	0.11	0.73	Open
Junc 832	1135.0	1163.7	2.2	28.7	Pipe 837	753.8	50	100	5.8	0.03	0.09	Open
Junc 833	1135.0	1163.7	2.2	28.7	Pipe 838	286.79	50	100	−17.4	0.1	0.66	Open
Junc 834	1135.0	1163.3	2.2	28.3	Pipe 839	145.36	100	100	0	0	0	Open
Junc 835	1135.0	1163.2	2.6	28.2	Pipe 840	644.49	100	100	0	0	0	Open
Junc 836	1135.0	1163.1	2.2	28.1	Pipe 841	167.39	100	100	8.7	0.01	0.01	Open
Junc 837	1135.0	1163.1	2.2	28.1	Pipe 842	966.52	50	100	18.4	0.11	0.73	Open
Junc 838	1135.0	1163.0	2.2	28.0	Pipe 843	13.69	100	100	−330.7	0.49	5.23	Open
Junc 839	1135.0	1163.0	2.2	28.0	Pipe 844	93.61	100	100	−333.6	0.49	5.32	Open
Junc 840	1135.0	1162.9	2.2	27.9	Pipe 845	13.11	100	100	213.79	0.32	2.33	Open
Junc 841	1135.0	1162.9	2.2	27.9	Pipe 846	87.61	100	100	−213.79	0.32	2.33	Open
Junc 842	1135.0	1162.9	2.2	27.9	Pipe 847	196.6	20	100	−2.9	0.11	2.06	Open
Junc 843	1135.0	1162.8	2.2	27.8	Pipe 848	59.06	20	100	−9.4	0.35	18.18	Open
Junc 844	1135.0	1162.8	1.4	27.8	Pipe 849	53.08	20	100	−9.4	0.35	18.18	Open
Junc 845	1130.0	1162.8	1.4	32.8	Pipe 850	76.87	20	100	−11.5	0.42	26.41	Open
Junc 846	1130.0	1162.8	1.4	32.8	Pipe 851	586.23	50	100	53.2	0.31	5.19	Open
Junc 847	1130.0	1162.8	1.4	32.8	Pipe 852	115.58	150	100	27.1	0.02	0.01	Open
Junc 848	1130.0	1162.8	1.4	32.8	Pipe 853	32.67	150	100	8.3	0.01	0	Open
Junc 849	1130.0	1162.8	1.4	32.8	Pipe 854	110.17	150	100	−54.3	0.04	0.03	Open
Junc 850	1135.0	1162.8	2.5	27.8	Pipe 855	141.51	150	100	−73.1	0.05	0.04	Open

NODE	Ma'an city				LINK	Ma'an city						
ID	Elevation m	Head m	Demand m3/d	Pressure m	ID	Length m	Diameter mm	Roughness	Flow m3/d	Velocity m/s	Unit head loss m/km	Status
Junc 851	1135.0	1162.8	2.5	27.8	Pipe 856	111.97	150	100	-96.1	0.06	0.07	Open
Junc 852	1135.0	1162.6	2.2	27.6	Pipe 857	84.06	150	100	-123.4	0.08	0.12	Open
Junc 853	1135.0	1162.5	2.2	27.5	Pipe 858	163.67	150	100	-299.9	0.2	0.61	Open
Junc 854	1135.0	1161.8	2.2	26.8	Pipe 859	259.67	150	100	-420.4	0.28	1.13	Open
Junc 855	1135.0	1161.8	2.2	26.8	Pipe 860	76.13	50	100	117.9	0.69	22.67	Open
Junc 856	1135.0	1161.2	2.2	26.2	Pipe 861	167.26	50	100	77.8	0.46	10.5	Open
Junc 857	1135.0	1161.2	2.2	26.2	Pipe 862	126.8	50	100	41.6	0.25	3.29	Open
Junc 858	1135.0	1161.1	2.2	26.1	Pipe 863	158.97	50	100	10.2	0.06	0.24	Open
Junc 859	1135.0	1161.0	2.2	26.0	Pipe 864	113.78	20	100	0	0	0	Open
Junc 860	1135.0	1160.8	2.2	25.8	Pipe 865	275.04	25	100	-11.2	0.26	8.48	Open
Junc 861	1135.0	1160.7	2.6	25.7	Pipe 866	56.92	25	100	-13.1	0.31	11.33	Open
Junc 862	1135.0	1160.8	2.2	25.8	Pipe 867	87.35	50	100	-11.5	0.07	0.3	Open
Junc 863	1135.0	1160.6	2.6	25.6	Pipe 868	227.29	50	100	-15.8	0.09	0.55	Open
Junc 864	1135.0	1160.6	2.6	25.6	Pipe 872	348.93	50	100	-61.9	0.36	6.87	Open
Junc 865	1135.0	1160.4	2.6	25.4	Pipe 873	175.21	50	100	49.2	0.29	4.49	Open
Junc 866	1135.0	1160.4	2.6	25.4	Pipe 874	199.08	20	100	5.8	0.21	7.43	Open
Junc 867	1135.0	1160.3	2.6	25.3	Pipe 875	624.6	150	100	-166.71	0.11	0.2	Open
Junc 868	1135.0	1160.2	2.6	25.2	Pipe 876	1121.02	100	100	119.81	0.18	0.8	Open
Junc 869	1135.0	1160.2	2.6	25.2	Pipe 877	697.1	100	100	-293	0.43	4.18	Open
Junc 870	1135.0	1160.2	2.6	25.2	Pipe 878	445.87	100	100	-294.9	0.43	4.23	Open
Junc 871	1135.0	1160.1	2.6	25.1	Pipe 879	530.52	100	100	-35.8	0.05	0.09	Open
Junc 872	1135.0	1160.0	2.6	25.0	Pipe 880	554.05	100	100	0	0	0	Open
Junc 873	1135.0	1160.1	2.6	25.1	Pipe 881	1595.98	100	100	187.11	0.28	1.82	Open
Junc 874	1135.0	1160.1	2.6	25.1	Pipe 882	1755.57	100	100	-216.69	0.32	2.39	Open
Junc 875	1135.0	1160.1	2.2	25.1	Pipe 883	56.16	150	100	-586.7	0.38	2.1	Open
Junc 876	1135.0	1160.0	2.2	25.0	Pipe 884	55.92	150	100	-712.7	0.47	3.01	Open
Junc 877	1135.0	1160.1	1.4	25.1	Pipe 885	136.94	150	100	-789.5	0.52	3.64	Open
Junc 878	1135.0	1160.0	1.4	25.0	Pipe 886	49.22	20	100	-18.4	0.68	63.06	Open
Junc 879	1135.0	1160.1	1.4	25.1	Pipe 887	145.85	50	100	20.5	0.12	0.89	Open
Junc 880	1135.0	1161.9	2.5	26.9	Pipe 888	961.42	50	100	-10	0.06	0.23	Open
Junc 881	1135.0	1161.9	2.5	26.9	Pipe 889	117.53	150	100	848.4	0.56	4.16	Open
Junc 882	1135.0	1161.3	2.5	26.3	Pipe 890	55.99	200	100	898.9	0.33	1.14	Open
Junc 883	1135.0	1161.3	2.5	26.3	Pipe 891	589.04	50	100	25.5	0.15	1.33	Open
Junc 884	1135.0	1159.9	2.1	24.9	Pipe 892	77.82	50	100	15.8	0.09	0.55	Open
Junc 885	1135.0	1159.9	2.5	24.9	Pipe 893	121.52	50	100	-27.9	0.16	1.57	Open
Junc 886	1135.0	1159.1	2.1	24.1	Pipe 894	131.43	50	100	25.5	0.15	1.33	Open
Junc 887	1135.0	1159.1	2.6	24.1	Pipe 895	85	25	100	-7.9	0.19	4.44	Open
Junc 888	1135.0	1158.5	2.6	23.5	Pipe 896	13.07	50	100	42.3	0.25	3.39	Open
Junc 889	1135.0	1158.5	2.6	23.5	Pipe 897	364.27	50	100	-22	0.13	1.01	Open
Junc 890	1135.0	1157.7	2.6	22.7	Pipe 898	197.61	50	100	-7.9	0.05	0.15	Open
Junc 891	1130.0	1156.8	2.6	26.8	Pipe 899	232.56	25	100	5.5	0.13	2.27	Open
Junc 892	1130.0	1156.7	2.6	26.7	Pipe 900	522.42	50	100	120.8	0.71	23.71	Open
Junc 893	1130.0	1156.4	2.6	26.4	Pipe 901	267.88	25	100	-20	0.47	24.82	Open
Junc 894	1130.0	1156.4	2.0	26.4	Pipe 902	15.1	25	100	-44.72	1.05	110.15	Open
Junc 895	1130.0	1156.3	2.0	26.3	Pipe 903	368.5	200	100	1054.6	0.39	1.53	Open
Junc 896	1130.0	1156.3	2.0	26.3	Pipe 904	188.06	200	100	999.33	0.37	1.39	Open
Junc 897	1130.0	1156.2	2.0	26.2	Pipe 906	590.8	100	100	30.43	0.04	0.06	Open
Junc 898	1135.0	1156.3	2.0	21.3	Pipe 907	105.16	20	100	-18	0.66	60.54	Open
Junc 899	1130.0	1156.2	2.0	26.2	Pipe 908	36.66	20	100	-28.1	1.04	138.13	Open
Junc 900	1130.0	1156.2	2.0	26.2	Pipe 909	68.79	20	100	-5.62	0.21	7.01	Open
Junc 901	1130.0	1155.1	2.0	25.1	Pipe 910	67.27	80	100	28.1	0.06	0.16	Open
Junc 902	1130.0	1155.0	2.0	25.0	Pipe 911	61.03	80	100	-130.4	0.3	2.77	Open
Junc 903	1130.0	1155.1	2.0	25.1	Pipe 912	113.12	80	100	-18.85	0.04	0.08	Open
Junc 904	1130.0	1155.0	2.0	25.0	Pipe 913	81.68	80	100	-88.35	0.2	1.35	Open
Junc 905	1130.0	1155.0	1.4	25.0	Pipe 914	45.35	80	100	-159.15	0.37	4	Open
Junc 906	1130.0	1153.8	1.4	23.8	Pipe 915	94.73	20	100	-13.8	0.51	37.01	Open
Junc 907	1130.0	1153.8	1.4	23.8	Pipe 916	56.21	20	100	13.8	0.51	37.01	Open
Junc 908	1130.0	1153.6	3.2	23.6	Pipe 917	19.48	20	100	41.4	1.53	283.12	Open
Junc 909	1130.0	1153.5	3.2	23.5	Pipe 918	60.96	80	100	222.45	0.51	7.44	Open
Junc 910	1135.0	1162.5	2.1	27.5	Pipe 919	42.73	80	100	167.25	0.39	4.39	Open
Junc 911	1135.0	1162.5	2.1	27.5	Pipe 920	59.17	80	100	139.65	0.32	3.14	Open
Junc 912	1135.0	1162.2	2.1	27.2	Pipe 921	160.11	25	100	-13.8	0.33	12.48	Open
Junc 913	1135.0	1162.2	2.1	27.2	Pipe 922	20.81	80	100	-59.4	0.14	0.65	Open
Junc 914	1135.0	1162.1	2.1	27.1	Pipe 923	9.93	80	100	-11.4	0.03	0.03	Open
Junc 915	1135.0	1162.0	2.1	27.0	Pipe 924	4.11	20	100	-36.6	1.35	225.34	Open
Junc 916	1130.0	1156.0	2.0	26.0	Pipe 925	37.06	20	100	-11.4	0.42	25.98	Open
Junc 917	1130.0	1156.0	2.0	26.0	Pipe 926	119.27	20	100	13.8	0.51	37.01	Open
Junc 918	1130.0	1156.0	2.0	26.0	Pipe 927	19.42	80	100	-13.8	0.03	0.04	Open
Junc 919	1135.0	1157.6	2.6	22.6	Pipe 928	46.85	80	100	-41.4	0.1	0.33	Open
Junc 920	1135.0	1157.6	2.6	22.6	Pipe 929	77.41	20	100	13.8	0.51	37.01	Open
Junc 921	1130.0	1156.0	2.0	26.0	Pipe 930	54.33	20	100	-13.8	0.51	37.01	Open
Junc 922	1130.0	1156.0	2.0	26.0	Pipe 931	3.36	20	100	55.7	2.05	490.47	Open
Junc 923	1130.0	1156.0	2.0	26.0	Pipe 933	213.76	200	100	-1540.73	0.57	3.09	Open
Junc 924	1130.0	1156.0	2.0	26.0	Pipe 934	4.73	250	100	-1554.03	0.37	1.05	Open
Junc 925	1130.0	1156.0	2.0	26.0	Pipe 935	32.09	20	100	13.3	0.49	34.57	Open
Junc 926	1130.0	1156.0	2.0	26.0	Pipe 937	247.89	100	100	250.98	0.37	3.14	Open
Junc 927	1130.0	1155.7	2.0	25.7	Pipe 938	175.75	100	100	311.38	0.46	4.68	Open
Junc 928	1130.0	1155.7	2.0	25.7	Pipe 939	3.95	75	100	45.3	0.12	0.53	Open
Junc 929	1130.0	1155.7	2.0	25.7	Pipe 940	33.33	75	100	15.1	0.04	0.07	Open
Junc 930	1135.0	1163.2	2.1	28.2	Pipe 941	65.2	75	100	-15.1	0.04	0.07	Open
Junc 931	1135.0	1163.2	2.1	28.2	Pipe 942	89.47	100	100	227.9	0.34	2.63	Open
Junc 932	1135.0	1161.9	2.1	26.9	Pipe 943	4.61	100	100	-94.47	0.14	0.52	Open
Junc 933	1135.0	1161.9	2.1	26.9	Pipe 944	5.5	100	100	111.27	0.16	0.7	Open
Junc 934	1135.0	1161.9	2.1	26.9	Pipe 945	89.37	75	100	105.47	0.28	2.56	Open
Junc 935	1135.0	1161.8	2.1	26.8	Pipe 946	35.14	75	100	2.9	0.01	0	Open

NODE	Ma'an city				LINK	Ma'an city						
ID	Elevation m	Head m	Demand m3/d	Pressure m	ID	Length m	Diameter mm	Roughness	Flow m3/d	Velocity m/s	Unit head loss m/km	Status
Junc 936	1135.0	1161.8	2.1	26.8	Pipe 947	91.32	100	100	−342.08	0.5	5.57	Open
Junc 937	1135.0	1161.7	2.1	26.7	Pipe 948	79.82	350	100	2949.83	0.35	0.67	Open
Junc 938	1135.0	1161.7	2.1	26.7	Pipe 949	3.18	100	100	−310.95	0.46	4.68	Open
Junc 939	1130.0	1161.7	2.1	31.7	Pipe 950	68.99	20	100	2.9	0.11	2.06	Open
Junc 940	1130.0	1161.7	2.1	31.7	Pipe 951	57.1	20	100	2.9	0.11	2.06	Open
Junc 941	1130.0	1161.7	1.5	31.7	Pipe 952	31.19	20	100	8.7	0.32	15.75	Open
Junc 942	1130.0	1161.7	2.1	31.7	Pipe 953	34.41	100	100	−299.35	0.44	4.35	Open
Junc 943	1125.0	1154.6	2.0	29.6	Pipe 954	6.26	20	100	8.7	0.32	15.75	Open
Junc 944	1125.0	1154.6	2.0	29.6	Pipe 955	21.07	20	100	2.9	0.11	2.06	Open
Junc 945	1125.0	1154.6	2.0	29.6	Pipe 956	26.97	20	100	2.9	0.11	2.06	Open
Junc 946	1125.0	1154.6	2.0	29.6	Pipe 957	91.47	350	100	2635.98	0.32	0.55	Open
Junc 947	1130.0	1153.1	4.4	23.1	Pipe 958	24.9	20	100	−2.9	0.11	2.06	Open
Junc 948	1130.0	1153.1	4.4	23.1	Pipe 959	15.16	20	100	−18.5	0.68	63.69	Open
Junc 949	1130.0	1153.1	4.4	23.1	Pipe 960	2.33	80	100	231.89	0.53	8.05	Open
Junc 950	1130.0	1153.1	4.4	23.1	Pipe 961	16.94	80	100	206.99	0.48	6.51	Open
Junc 951	1135.0	1163.0	1.0	28.0	Pipe 962	63.03	80	100	184.99	0.43	5.29	Open
Junc 952	1135.0	1162.9	1.0	27.9	Pipe 963	6.76	20	100	−11	0.41	24.32	Open
Junc 953	1135.0	1157.2	2.6	22.2	Pipe 964	4.59	20	100	33	1.22	186.04	Open
Junc 954	1135.0	1162.8	2.2	27.8	Pipe 965	19.55	20	100	6.4	0.24	8.92	Open
Junc 955	1135.0	1162.8	2.2	27.8	Pipe 966	21.89	20	100	−11	0.41	24.32	Open
Junc 956	1140.0	1169.4	1.9	29.4	Pipe 967	64.96	20	100	−11	0.41	24.32	Open
Junc 957	1140.0	1169.4	1.9	29.4	Pipe 968	24.45	20	100	−11	0.41	24.32	Open
Junc 958	1140.0	1169.2	1.9	29.2	Pipe 969	4.73	20	100	−33	1.22	186.02	Open
Junc 959	1140.0	1169.2	1.9	29.2	Pipe 970	19.81	20	100	11	0.41	24.32	Open
Junc 960	1140.0	1169.2	1.9	29.2	Pipe 971	62.5	80	100	140.99	0.32	3.2	Open
Junc 961	1140.0	1169.1	1.9	29.1	Pipe 972	30.77	80	100	96.99	0.22	1.6	Open
Junc 962	1135.0	1168.0	1.4	33.0	Pipe 973	60.48	80	100	−32.13	0.07	0.21	Open
Junc 963	1135.0	1168.0	1.9	33.0	Pipe 974	3.4	80	100	−56.43	0.13	0.59	Open
Junc 964	1135.0	1157.1	2.6	22.1	Pipe 975	68.56	80	100	−73.83	0.17	0.96	Open
Junc 965	1135.0	1157.0	2.6	22.0	Pipe 976	114.17	25	100	−6.4	0.15	3.01	Open
Junc 966	1135.0	1157.5	2.6	22.5	Pipe 977	3.78	20	100	33	1.22	186.04	Open
Junc 967	1135.0	1161.7	2.1	26.7	Pipe 978	4.13	20	100	11	0.41	24.31	Open
Junc 968	1135.0	1171.6	0.7	36.6	Pipe 979	54.99	20	100	11	0.41	24.32	Open
Junc 969	1135.0	1171.6	0.7	36.6	Pipe 980	34.35	80	100	118.12	0.27	2.3	Open
Junc 970	1135.0	1171.6	0.7	36.6	Pipe 981	26.5	80	100	74.12	0.17	0.97	Open
Junc 971	1135.0	1163.2	2.5	28.2	Pipe 982	83.64	20	100	11	0.41	24.32	Open
Junc 972	1135.0	1163.1	2.5	28.1	Pipe 983	42.83	20	100	11	0.41	24.32	Open
Junc 973	1135.0	1161.7	2.1	26.7	Pipe 984	59.45	80	100	52.12	0.12	0.51	Open
Junc 974	1135.0	1161.6	2.1	26.6	Pipe 985	4.76	20	100	−36.1	1.33	219.68	Open
Junc 975	1135.0	1161.6	2.1	26.6	Pipe 986	15.59	20	100	−11.4	0.42	25.98	Open
Junc 976	1135.0	1161.6	2.1	26.6	Pipe 987	85.09	20	100	13.3	0.49	34.57	Open
Junc 977	1135.0	1162.5	2.5	27.5	Pipe 988	215.62	80	100	30.12	0.07	0.18	Open
Junc 978	1135.0	1162.5	2.5	27.5	Pipe 989	67.96	80	100	−11.4	0.03	0.03	Open
Junc 979	1135.0	1160.1	2.5	25.1	Pipe 990	65.35	80	100	−17.38	0.04	0.07	Open
Junc 980	1135.0	1160.0	2.1	25.0	Pipe 991	42.98	80	100	40.18	0.09	0.31	Open
Junc 981	1135.0	1157.1	2.6	22.1	Pipe 992	52.77	80	100	−91.48	0.21	1.44	Open
Junc 982	1135.0	1157.1	2.6	22.1	Pipe 993	37.52	20	100	−13.3	0.49	34.57	Open
Junc 983	1135.0	1162.5	2.2	27.5	Pipe 994	36.32	20	100	11.4	0.42	25.98	Open
Junc 984	1135.0	1160.6	2.2	25.6	Pipe 995	4.24	20	100	38	1.4	241.56	Open
Junc 985	1135.0	1160.6	2.2	25.6	Pipe 996	4.24	20	100	−39.9	1.47	264.42	Open
Junc 986	1135.0	1162.8	2.2	27.8	Pipe 997	37.52	20	100	−13.3	0.49	34.57	Open
Junc 987	1140.0	1165.0	2.2	25.0	Pipe 998	36.32	20	100	13.3	0.49	34.57	Open
Junc 988	1140.0	1166.3	2.8	26.3	Pipe 999	73.09	100	100	104.78	0.15	0.62	Open
Junc 989	1140.0	1166.3	2.8	26.3	Pipe 1000	87.3	100	100	−157.98	0.23	1.33	Open
Junc 990	1135.0	1165.0	1.4	30.0	Pipe 1001	130.78	25	100	−13.3	0.31	11.66	Open
Junc 991	1135.0	1165.0	1.4	30.0	Pipe 1002	76.09	100	100	−242.81	0.36	2.95	Open
Junc 992	1135.0	1162.0	2.1	27.0	Pipe 1003	16.17	80	100	6.4	0.01	0.01	Open
Junc 993	1135.0	1161.9	2.1	26.9	Pipe 1004	86.89	100	100	−255.61	0.38	3.25	Open
Junc 994	1135.0	1157.8	2.6	22.8	Pipe 1005	15.92	100	100	−274.81	0.4	3.72	Open
Junc 995	1135.0	1157.9	2.6	22.9	Pipe 1006	57.86	75	100	−6.4	0.02	0.01	Open
Junc 996	1135.0	1158.0	2.6	23.0	Pipe 1007	71.6	50	100	6.4	0.04	0.1	Open
Junc 997	1135.0	1158.0	2.6	23.0	Pipe 1008	154.76	350	110	2397.69	0.29	0.38	Open
Junc 998	1135.0	1157.2	2.6	22.2	Pipe 1009	12.11	350	100	2391.29	0.29	0.45	Open
Junc 999	1130.0	1157.1	2.6	27.1	Pipe 1010	115.26	350	100	2110.08	0.25	0.36	Open
Junc 1000	1130.0	1156.2	2.0	26.2	Pipe 1011	338.42	250	100	1580.63	0.37	1.09	Open
Junc 1001	1130.0	1154.6	2.0	24.6	Pipe 1015	45.76	300	110	6180.89	1.01	4.71	Open
Junc 1002	1135.0	1162.9	1.0	27.9	Pipe 1017	113.17	300	110	6092.39	1	4.58	Open
Junc 1003	1135.0	1162.9	1.0	27.9	Pipe 1018	158.36	50	110	37	0.22	2.22	Open
Junc 1004	1135.0	1162.2	2.1	27.2	Pipe 1019	113.75	50	110	18.5	0.11	0.61	Open
Junc 1005	1135.0	1161.9	2.1	26.9	Pipe 1021	32.57	20	100	−6.4	0.24	8.92	Open
Junc 1006	1130.0	1161.4	1.5	31.4	Pipe 1022	66.26	250	100	−523.05	0.12	0.14	Open
Junc 1007	1130.0	1161.2	1.5	31.2	Pipe 1023	107.16	250	100	494.05	0.12	0.13	Open
Junc 1008	1130.0	1161.2	1.5	31.2	Pipe 1024	30.01	250	100	454.85	0.11	0.11	Open
Junc 1009	1130.0	1161.7	2.1	31.7	Pipe 1025	8	250	100	445.05	0.1	0.11	Open
Junc 1010	1140.0	1163.2	2.5	23.2	Pipe 1027	10.03	20	100	−22.6	0.83	92.28	Open
Junc 1011	1130.0	1156.2	2.0	26.2	Pipe 1028	47.92	20	100	9.8	0.36	19.63	Open
Junc 1012	1130.0	1155.0	2.0	25.0	Pipe 1029	42.61	20	100	−9.8	0.36	19.64	Open
Junc 1013	1130.0	1154.3	1.4	24.3	Pipe 1030	9.54	20	100	−29.4	1.08	150.19	Open
Junc 1014	1130.0	1154.2	1.4	24.2	Pipe 1031	32.87	20	100	9.8	0.36	19.63	Open
Junc 1015	1130.0	1154.2	1.4	24.2	Pipe 1033	2.74	100	100	344.8	0.51	5.65	Open
Junc 1016	1130.0	1154.1	1.4	24.1	Pipe 1034	81.84	100	100	−335.45	0.49	5.37	Open
Junc 1017	1130.0	1154.1	1.4	24.1	Pipe 1035	100	100	100	295	0.43	4.23	Open
Junc 1018	1130.0	1155.1	2.0	25.1	Pipe 1036	125.53	250	100	−90	0.02	0.01	Open
Junc 1019	1130.0	1153.2	3.2	23.2	Pipe 1037	82.02	20	100	9.8	0.36	19.64	Open
Junc 1020	1130.0	1153.2	3.2	23.2	Pipe 1038	188.09	50	110	−9.8	0.06	0.19	Open

NODE	Ma'an city				LINK	Ma'an city						
ID	Elevation m	Head m	Demand m3/d	Pressure m	ID	Length m	Diameter mm	Roughness	Flow m3/d	Velocity m/s	Unit head loss m/km	Status
Junc 1021	1130.0	1153.2	3.2	23.2	Pipe 1039	66.89	250	100	−70.4	0.02	0	Open
Junc 1022	1125.0	1152.4	0.9	27.4	Pipe 1040	9.26	20	100	29	1.07	146.44	Open
Junc 1023	1125.0	1152.4	0.9	27.4	Pipe 1041	49.89	20	100	9.8	0.36	19.63	Open
Junc 1024	1130.0	1152.4	0.9	22.4	Pipe 1042	38.86	20	100	7.4	0.27	11.67	Open
Junc 1025	1130.0	1152.4	0.9	22.4	Pipe 1043	36.49	250	100	−29.6	0.01	0	Open
Junc 1026	1130.0	1152.4	0.9	22.4	Pipe 1044	31.38	200	100	22.2	0.01	0	Open
Junc 1027	1130.0	1152.4	0.9	22.4	Pipe 1045	21.73	50	100	−7.4	0.04	0.13	Open
Junc 1028	1130.0	1152.8	3.2	22.8	Pipe 1046	129.37	200	100	7.4	0	0	Open
Junc 1029	1130.0	1152.8	3.2	22.8	Pipe 1047	19.81	200	100	0	0	0	Closed
Junc 1030	1125.0	1151.7	0.9	26.7	Pipe 1048	62.04	100	100	40	0.06	0.11	Open
Junc 1031	1130.0	1151.8	0.9	21.8	Pipe 1049	40.2	100	100	35.4	0.05	0.08	Open
Junc 1032	1125.0	1151.7	0.9	26.7	Pipe 1050	84.12	25	100	−23.6	0.56	33.72	Open
Junc 1033	1130.0	1151.8	3.2	21.8	Pipe 1051	29.41	20	100	−11.8	0.43	27.7	Open
Junc 1034	1130.0	1151.7	3.2	21.7	Pipe 1052	4.11	20	100	35.4	1.3	211.85	Open
Junc 1035	1130.0	1152.7	3.2	22.7	Pipe 1053	27.66	20	100	−11.8	0.43	27.7	Open
Junc 1036	1130.0	1152.6	3.2	22.6	Pipe 1054	27.66	20	100	11.8	0.43	27.7	Open
Junc 1037	1130.0	1153.2	3.2	23.2	Pipe 1055	66.01	20	100	−11.8	0.43	27.7	Open
Junc 1038	1130.0	1153.1	3.2	23.1	Pipe 1056	49.46	25	100	−35.4	0.83	71.45	Open
Junc 1039	1135.0	1160.3	2.6	25.3	Pipe 1057	124.16	25	100	11.8	0.28	9.34	Open
Junc 1040	1135.0	1160.3	2.6	25.3	Pipe 1058	42.95	20	100	−11.8	0.43	27.7	Open
Junc 1041	1135.0	1160.0	2.6	25.0	Pipe 1059	4.69	20	100	−35.4	1.3	211.85	Open
Junc 1042	1135.0	1160.0	2.6	25.0	Pipe 1060	45.48	20	100	−11.8	0.43	27.7	Open
Junc 1043	1130.0	1162.2	1.9	32.2	Pipe 1061	128.36	25	100	−11.8	0.28	9.34	Open
Junc 1044	1130.0	1162.6	1.4	32.6	Pipe 1062	7.88	20	100	35.4	1.3	211.85	Open
Junc 1045	1130.0	1162.6	1.4	32.6	Pipe 1063	41.62	20	100	11.8	0.43	27.7	Open
Junc 1046	1135.0	1163.4	1.4	28.4	Pipe 1064	27.94	20	100	11.8	0.43	27.7	Open
Junc 1047	1135.0	1163.4	2.2	28.4	Pipe 1065	40.88	20	100	−11.8	0.43	27.7	Open
Junc 1048	1135.0	1162.7	2.5	27.7	Pipe 1066	7.4	20	100	−35.4	1.3	211.86	Open
Junc 1049	1135.0	1162.7	2.5	27.7	Pipe 1067	46.59	20	100	−11.8	0.43	27.7	Open
Junc 1050	1135.0	1165.5	1.4	30.5	Pipe 1068	63.77	100	100	247.8	0.37	3.07	Open
Junc 1051	1135.0	1165.4	1.4	30.4	Pipe 1069	51.58	100	100	224.2	0.33	2.55	Open
Junc 1052	1135.0	1164.7	2.5	29.7	Pipe 1070	94.04	100	100	177	0.26	1.64	Open
Junc 1053	1135.0	1164.7	2.2	29.7	Pipe 1071	126.03	100	100	129.8	0.19	0.93	Open
Junc 1054	1130.0	1163.7	2.5	33.7	Pipe 1072	145.81	100	100	82.6	0.12	0.4	Open
Junc 1055	1130.0	1163.6	1.4	33.6	Pipe 1073	11	20	100	28.2	1.04	139.04	Open
Junc 1056	1130.0	1163.6	1.4	33.6	Pipe 1074	34.24	20	100	9.2	0.34	17.47	Open
Junc 1057	1130.0	1163.5	1.4	33.5	Pipe 1075	39.19	20	100	9.8	0.36	19.64	Open
Junc 1058	1130.0	1163.5	1.4	33.5	Pipe 1076	13.56	20	100	−6.4	0.24	8.92	Open
Junc 1059	1130.0	1163.3	1.4	33.3	Pipe 1077	40.58	20	100	6.4	0.24	8.92	Open
Junc 1060	1130.0	1163.2	3.8	33.2	Pipe 1078	7.66	20	100	−19.2	0.71	68.23	Open
Junc 1061	1130.0	1163.4	1.4	33.4	Pipe 1079	29.43	20	100	−9.8	0.36	19.64	Open
Junc 1062	1130.0	1163.4	3.8	33.4	Pipe 1080	4.22	20	100	−22.6	0.83	92.28	Open
Junc 1063	1130.0	1163.6	1.4	33.6	Pipe 1081	79.54	20	100	6.4	0.24	8.92	Open
Junc 1064	1130.0	1163.4	1.9	33.4	Pipe 1082	4.61	20	100	27.6	1.02	133.62	Open
Junc 1065	1130.0	1163.4	1.9	33.4	Pipe 1083	31.43	20	100	9.2	0.34	17.47	Open
Junc 1066	1130.0	1163.5	0.0	33.5	Pipe 1084	9.02	20	100	9.2	0.34	17.47	Open
Junc 1067	1130.0	1155.1	3.8	25.1	Pipe 1085	72.62	100	100	−19.15	0.03	0.03	Open
Junc 1068	1130.0	1153.5	2.5	23.5	Pipe 1086	32.24	100	100	−48.15	0.07	0.15	Open
Junc 1069	1125.0	1153.4	2.5	28.4	Pipe 1087	79.68	100	100	−73.75	0.11	0.33	Open
Junc 1070	1130.0	1153.3	2.5	23.3	Pipe 1088	5.09	75	100	19.2	0.05	0.1	Open
Junc 1071	1130.0	1153.2	2.5	23.2	Pipe 1089	20.69	75	100	−6.4	0.02	0.01	Open
Junc 1072	1130.0	1155.1	3.8	25.1	Pipe 1090	37.23	75	100	6.4	0.02	0.01	Open
Junc 1073	1130.0	1158.9	3.8	28.9	Pipe 1091	43.64	75	100	−9.2	0.02	0.03	Open
Junc 1074	1130.0	1158.8	3.8	28.8	Pipe 1092	55.24	75	100	6.4	0.02	0.01	Open
Junc 1075	1135.0	1168.1	1.9	33.1	Pipe 1093	3.78	75	100	−22	0.06	0.14	Open
Junc 1076	1135.0	1168.2	1.9	33.2	Pipe 1094	10.6	50	100	−9.2	0.05	0.2	Open
Junc 1077	1140.0	1168.3	1.9	28.3	Pipe 1095	45.72	80	100	76.11	0.18	1.02	Open
Junc 1078	1140.0	1168.2	1.9	28.2	Pipe 1096	83.19	80	100	47.71	0.11	0.43	Open
Junc 1079	1140.0	1169.2	1.9	29.2	Pipe 1097	97.71	80	100	−94.51	0.22	1.52	Open
Junc 1080	1135.0	1171.7	0.7	36.7	Pipe 1098	14.72	100	100	41.31	0.06	0.11	Open
Junc 1081	1140.0	1171.6	1.9	31.6	Pipe 1099	66.66	100	100	15.71	0.02	0.02	Open
Junc 1082	1140.0	1171.6	1.9	31.6	Pipe 1100	54.68	100	100	−64.44	0.09	0.25	Open
Junc 1083	1140.0	1171.6	1.9	31.6	Pipe 1101	75.31	100	100	−101.24	0.15	0.58	Open
Junc 1084	1140.0	1171.6	1.9	31.6	Pipe 1102	77.15	100	100	−119.64	0.18	0.8	Open
Junc 1085	1140.0	1171.6	1.9	31.6	Pipe 1103	84.18	100	100	−147.24	0.22	1.17	Open
Junc 1086	1140.0	1173.4	0.7	33.4	Pipe 1104	9.44	100	100	−184.04	0.27	1.77	Open
Junc 1087	1140.0	1173.4	0.7	33.4	Pipe 1105	7.97	20	100	27.6	1.02	133.61	Open
Junc 1088	1135.0	1172.4	1.4	37.4	Pipe 1106	16.38	20	100	9.2	0.34	17.47	Open
Junc 1089	1135.0	1172.5	1.4	37.5	Pipe 1107	37.84	20	100	9.2	0.34	17.47	Open
Junc 1090	1135.0	1172.9	1.4	37.9	Pipe 1108	47.82	100	100	−287.75	0.42	4.04	Open
Junc 1091	1135.0	1172.9	1.4	37.9	Pipe 1109	47.22	25	100	−9.2	0.22	5.89	Open
Junc 1092	1135.0	1172.5	1.4	37.5	Pipe 1110	30.8	25	100	−18.4	0.43	21.27	Open
Junc 1093	1135.0	1172.5	1.4	37.5	Pipe 1111	128.52	25	100	−9.2	0.22	5.89	Open
Junc 1094	1140.0	1176.4	0.7	36.4	Pipe 1112	60.77	100	100	0	0	0	Closed
Junc 1095	1140.0	1176.4	0.7	36.4	Pipe 1113	55.38	100	100	20.8	0.03	0.03	Open
Junc 1096	1140.0	1176.4	0.7	36.4	Pipe 1114	31.04	100	100	9.2	0.01	0	Open
Junc 1097	1135.0	1168.3	1.4	33.3	Pipe 1115	4.91	20	100	8.7	0.32	15.75	Open
Junc 1098	1135.0	1168.4	1.4	33.4	Pipe 1116	21.84	20	100	−2.9	0.11	2.06	Open
Junc 1099	1135.0	1159.3	3.2	24.3	Pipe 1117	21.35	20	100	2.9	0.11	2.06	Open
Junc 1100	1135.0	1172.5	1.4	37.5	Pipe 1118	599.18	100	100	23.7	0.03	0.04	Open
Junc 1101	1135.0	1167.0	1.4	32.0	Pipe 1119	8.09	100	100	−57.5	0.08	0.2	Open
Junc 1102	1135.0	1166.9	1.4	31.9	Pipe 1120	100.79	100	100	−190.3	0.28	1.88	Open
Junc 1103	1135.0	1161.4	3.2	26.4	Pipe 1121	60.09	100	100	−222.9	0.33	2.52	Open
Junc 1104	1135.0	1161.3	3.2	26.3	Pipe 1122	89.16	100	100	−258.4	0.38	3.31	Open
Junc 1105	1135.0	1159.2	3.2	24.2	Pipe 1123	69.68	50	100	99	0.58	16.4	Open

NODE	Ma'an city				LINK	Ma'an city						
ID	Elevation m	Head m	Demand m3/d	Pressure m	ID	Length m	Diameter mm	Roughness	Flow m3/d	Velocity m/s	Unit head loss m/km	Status
Junc 1106	1130.0	1157.4	5.8	27.4	Pipe 1124	108.5	50	100	−32.6	0.19	2.1	Open
Junc 1107	1130.0	1156.6	5.8	26.6	Pipe 1125	57.38	50	100	−33.8	0.2	2.24	Open
Junc 1108	1130.0	1152.4	0.9	22.4	Pipe 1126	124.23	50	100	33.8	0.2	2.24	Open
Junc 1109	1140.0	1173.4	0.7	33.4	Pipe 1127	77.85	50	100	−101.4	0.6	17.14	Open
Junc 1110	1140.0	1173.4	0.7	33.4	Pipe 1128	71.3	50	100	−39.61	0.23	3	Open
Junc 1111	1140.0	1173.4	0.7	33.4	Pipe 1129	65.07	50	100	−72.32	0.43	9.17	Open
Junc 1112	1140.0	1173.4	0.7	33.4	Pipe 1130	60.16	20	100	−3.8	0.14	3.4	Open
Junc 1113	1140.0	1173.4	0.7	33.4	Pipe 1131	75.7	25	110	57.8	1.36	148.48	Open
Junc 1114	1140.0	1173.4	0.7	33.4	Pipe 1132	173.73	25	100	13.59	0.32	12.13	Open
Junc 1115	1130.0	1153.3	2.5	23.3	Pipe 1133	387.98	50	100	67.8	0.4	8.13	Open
Junc 1116	1135.0	1163.5	2.2	28.5	Pipe 1134	74.01	50	100	−21.8	0.13	1	Open
Junc 1117	1135.0	1163.4	2.2	28.4	Pipe 1135	67.03	50	100	−57.2	0.34	5.94	Open
Junc 1118	1135.0	1160.5	2.6	25.5	Pipe 1136	210.17	50	100	−32.6	0.19	2.1	Open
Junc 1119	1135.0	1160.5	2.6	25.5	Pipe 1137	384.73	50	100	−53.48	0.32	5.24	Open
Junc 1120	1135.0	1171.6	0.7	36.6	Pipe 1138	306.68	50	100	56.88	0.34	5.88	Open
Junc 1121	1135.0	1171.6	0.7	36.6	Pipe 1139	58.16	50	100	−130.76	0.77	27.46	Open
Junc 1124	1145.0	1169.6	2.5	24.6	Pipe 1140	222.67	50	100	79	0.47	10.8	Open
Junc 1125	1145.0	1167.7	4.8	22.7	Pipe 1141	62.86	50	100	−112.63	0.66	20.83	Open
Junc 1126	1145.0	1167.5	4.8	22.5	Pipe 1142	8.98	50	100	−422.47	2.49	240.93	Open
Junc 1127	1140.0	1167.6	2.5	27.6	Pipe 1143	211.11	100	100	−64.33	0.09	0.25	Open
Junc 1128	1140.0	1167.5	2.5	27.5	Pipe 1144	61.78	50	100	−86.13	0.51	12.67	Open
Junc 1129	1140.0	1180.7	0.7	40.7	Pipe 1145	207.28	50	100	67.8	0.4	8.14	Open
Junc 1130	1140.0	1180.4	1.7	40.4	Pipe 1146	19.48	50	100	−175.73	1.04	47.46	Open
Junc 1131	1140.0	1179.2	1.5	39.2	Pipe 1147	120.62	50	100	−197.53	1.16	58.94	Open
Junc 1132	1140.0	1180.4	1.7	40.4	Pipe 1148	199.86	50	100	60.4	0.36	6.57	Open
Junc 1133	1140.0	1180.4	1.7	40.4	Pipe 1149	58.79	50	100	12.6	0.07	0.36	Open
Junc 1134	1140.0	1173.0	0.7	33.0	Pipe 1150	25.74	20	100	−12.6	0.46	31.27	Open
Junc 1135	1140.0	1171.9	0.7	31.9	Pipe 1151	38.5	100	100	−283.13	0.42	3.92	Open
Junc 1136	1140.0	1169.4	2.5	29.4	Pipe 1152	30.57	100	100	−308.33	0.45	4.59	Open
Junc 1137	1140.0	1169.4	2.5	29.4	Pipe 1153	36.96	100	100	40.3	0.06	0.1	Open
Junc 1138	1140.0	1169.4	2.5	29.4	Pipe 1154	574.19	100	100	−361.23	0.53	6.16	Open
Junc 1139	1140.0	1169.4	2.5	29.4	Pipe 1155	159.72	50	100	48	0.28	4.29	Open
Junc 1140	1145.0	1173.6	3.4	28.6	Pipe 1156	143.07	25	100	−16.7	0.39	17.77	Open
Junc 1141	1145.0	1173.5	3.4	28.5	Pipe 1157	161.38	25	100	48	1.13	125.57	Open
Junc 1142	1145.0	1167.4	3.4	22.4	Pipe 1158	90.07	100	100	490.87	0.72	10.87	Open
Junc 1143	1145.0	1167.2	3.4	22.2	Pipe 1159	151.22	100	100	−572.27	0.84	14.44	Open
Junc 1144	1140.0	1165.0	2.5	25.0	Pipe 1160	66.17	50	100	21.9	0.13	1	Open
Junc 1145	1140.0	1165.0	2.5	25.0	Pipe 1161	4.87	50	100	14.6	0.09	0.47	Open
Junc 1146	1140.0	1180.7	0.7	40.7	Pipe 1162	88.5	50	100	−7.3	0.04	0.13	Open
Junc 1147	1140.0	1180.7	0.7	40.7	Pipe 1163	447.88	50	100	7.3	0.04	0.13	Open
Junc 1148	1140.0	1180.7	0.7	40.7	Pipe 1164	122.97	50	100	20.4	0.12	0.88	Open
Junc 1149	1140.0	1167.5	2.5	27.5	Pipe 1165	314.35	50	100	−5.8	0.03	0.09	Open
Junc 1150	1140.0	1167.5	2.5	27.5	Pipe 1166	157.8	100	100	618.17	0.91	16.66	Open
Junc 1151	1140.0	1166.6	1.9	26.6	Pipe 1167	203.46	100	100	650.77	0.96	18.33	Open
Junc 1152	1140.0	1166.6	1.9	26.6	Pipe 1168	313.94	100	100	−37.4	0.06	0.09	Open
Junc 1153	1140.0	1165.7	1.9	25.7	Pipe 1169	116.41	100	100	−52	0.08	0.17	Open
Junc 1154	1140.0	1165.7	1.9	25.7	Pipe 1170	476.19	100	100	−63.6	0.09	0.25	Open
Junc 1155	1140.0	1164.8	1.8	24.8	Pipe 1171	242.18	50	100	−7.3	0.04	0.13	Open
Junc 1156	1140.0	1164.3	1.8	24.3	Pipe 1172	299.66	50	100	−11.6	0.07	0.31	Open
Junc 1157	1140.0	1164.8	1.8	24.8	Pipe 1173	36.24	100	100	−81.6	0.12	0.39	Open
Junc 1158	1140.0	1165.1	2.5	25.1	Pipe 1174	167.82	100	100	−83.8	0.12	0.41	Open
Junc 1159	1140.0	1165.1	2.5	25.1	Pipe 1175	177.74	20	100	−5.8	0.21	7.43	Open
Junc 1160	1135.0	1164.7	1.0	29.7	Pipe 1176	73.4	25	100	39.8	0.94	88.76	Open
Junc 1161	1135.0	1164.7	1.0	29.7	Pipe 1177	318.59	25	100	15	0.35	14.57	Open
Junc 1162	1135.0	1164.7	1.0	29.7	Pipe 1178	640.4	25	100	7.6	0.18	4.14	Open
Junc 1163	1135.0	1164.7	1.8	29.7	Pipe 1179	58.98	20	100	−2.9	0.11	2.06	Open
Junc 1164	1145.0	1164.6	2.5	19.6	Pipe 1180	629.92	100	100	155.8	0.23	1.3	Open
Junc 1165	1145.0	1164.6	4.2	19.6	Pipe 1181	64.05	200	100	368.63	0.14	0.22	Open
Junc 1166	1140.0	1164.4	2.5	24.4	Pipe 1182	9.33	20	100	−7.4	0.27	11.67	Open
Junc 1167	1140.0	1164.3	2.5	24.3	Pipe 1183	3.59	200	100	383.43	0.14	0.23	Open
Junc 1168	1135.0	1164.1	2.5	29.1	Pipe 1184	75.1	150	100	−390.83	0.26	0.99	Open
Junc 1169	1135.0	1164.1	2.5	29.1	Pipe 1185	131.61	25	100	16.4	0.39	17.18	Open
Junc 1170	1140.0	1179.5	9.2	39.5	Pipe 1186	121.69	20	100	16.4	0.6	50.95	Open
Junc 1171	1140.0	1179.5	5.3	39.5	Pipe 1187	21.7	20	100	−16.4	0.6	50.95	Open
Junc 1172	1140.0	1179.6	9.2	39.6	Pipe 1188	101.49	25	100	−32.8	0.77	62.04	Open
Junc 1173	1140.0	1178.0	9.2	38.0	Pipe 1189	74.1	80	100	82	0.19	1.17	Open
Junc 1174	1140.0	1177.9	9.2	37.9	Pipe 1190	42.25	80	100	16.4	0.04	0.06	Open
Junc 1175	1140.0	1177.9	9.2	37.9	Pipe 1191	25.62	20	100	−16.4	0.6	50.95	Open
Junc 1176	1140.0	1179.7	1.7	39.7	Pipe 1192	9.66	20	100	16.4	0.6	50.96	Open
Junc 1177	1140.0	1179.7	1.7	39.7	Pipe 1193	54.31	25	100	−49.2	1.16	131.45	Open
Junc 1178	1140.0	1179.9	1.7	39.9	Pipe 1194	50.63	150	100	−444.13	0.29	1.25	Open
Junc 1179	1140.0	1179.9	1.7	39.9	Pipe 1195	28.91	150	100	−497.43	0.33	1.55	Open
Junc 1180	1140.0	1180.4	1.7	40.4	Pipe 1196	64.05	150	100	−567.13	0.37	1.97	Open
Junc 1181	1140.0	1180.3	1.7	40.3	Pipe 1197	64.34	20	100	21.6	0.8	84.86	Open
Junc 1182	1145.0	1180.4	1.7	35.4	Pipe 1198	48.11	20	100	−7.7	0.28	12.56	Open
Junc 1183	1145.0	1180.4	5.3	35.4	Pipe 1199	6.11	50	100	93.27	0.55	14.68	Open
Junc 1184	1145.0	1180.4	1.7	35.4	Pipe 1200	12.41	150	100	794.7	0.52	3.68	Open
Junc 1185	1140.0	1180.4	1.7	40.4	Pipe 1201	25.93	150	100	787	0.52	3.62	Open
Junc 1186	1140.0	1180.4	1.7	40.4	Pipe 1202	449.84	50	100	56.27	0.33	5.76	Open
Junc 1187	1140.0	1180.4	1.7	40.4	Pipe 1203	57.93	50	100	−61.2	0.36	6.73	Open
Junc 1188	1140.0	1180.4	1.7	40.4	Pipe 1204	100.86	50	100	−20.4	0.12	0.88	Open
Junc 1189	1140.0	1173.1	1.7	33.1	Pipe 1205	128.56	50	100	20.4	0.12	0.88	Open
Junc 1190	1140.0	1173.1	1.7	33.1	Pipe 1207	132.99	50	100	−25.33	0.15	1.31	Open
Junc 1191	1140.0	1173.0	1.7	33.0	Pipe 1208	3.6	50	100	−9.92	0.06	0.23	Open
Junc 1192	1140.0	1173.0	1.7	33.0	Pipe 1209	13.12	50	100	−54.72	0.32	5.47	Open

NODE	Ma'an city				LINK	Ma'an city						
ID	Elevation m	Head m	Demand m3/d	Pressure m	ID	Length m	Diameter mm	Roughness	Flow m3/d	Velocity m/s	Unit head loss m/km	Status
Junc 1193	1140.0	1173.0	1.7	33.0	Pipe 1210	24.31	50	100	−79.12	0.47	10.83	Open
Junc 1194	1140.0	1173.0	1.7	33.0	Pipe 1211	121.76	50	100	−112.42	0.66	20.75	Open
Junc 1195	1145.0	1171.3	3.4	26.3	Pipe 1212	76.44	50	100	36.4	0.21	2.57	Open
Junc 1196	1145.0	1171.3	3.4	26.3	Pipe 1213	316.07	20	100	8.9	0.33	16.43	Open
Junc 1197	1145.0	1171.3	3.4	26.3	Pipe 1214	294.21	20	100	−8.9	0.33	16.43	Open
Junc 1198	1145.0	1171.3	3.4	26.3	Pipe 1215	244.25	20	100	−16.7	0.62	52.69	Open
Junc 1199	1145.0	1171.3	3.4	26.3	Pipe 1216	74.67	100	100	38.9	0.06	0.1	Open
Junc 1200	1145.0	1171.3	3.4	26.3	Pipe 1217	22.89	150	100	−926.53	0.61	4.89	Open
Junc 1201	1145.0	1171.3	3.4	26.3	Pipe 1218	20.23	150	100	−996.54	0.65	5.6	Open
Junc 1202	1145.0	1171.4	3.4	26.4	Pipe 1219	126.3	150	100	872.43	0.57	4.38	Open
Junc 1203	1145.0	1171.3	3.4	26.3	Pipe 1220	225.37	150	100	531.23	0.35	1.75	Open
Junc 1204	1145.0	1171.9	2.5	26.9	Pipe 1221	90.31	150	100	−1299.66	0.85	9.16	Open
Junc 1205	1145.0	1171.9	2.5	26.9	Pipe 1222	80.91	150	100	−1333.46	0.87	9.6	Open
Junc 1206	1145.0	1172.0	2.5	27.0	Pipe 1223	54.5	20	100	−10.5	0.39	22.31	Open
Junc 1207	1145.0	1171.9	2.5	26.9	Pipe 1224	4.51	20	100	−28.7	1.06	143.65	Open
Junc 1208	1145.0	1171.9	2.5	26.9	Pipe 1225	27.61	150	100	169.33	0.11	0.21	Open
Junc 1209	1145.0	1171.9	2.5	26.9	Pipe 1226	23.53	150	100	130.13	0.09	0.13	Open
Junc 1210	1140.0	1171.9	2.5	31.9	Pipe 1227	42.04	150	100	119.63	0.08	0.11	Open
Junc 1211	1140.0	1171.8	2.5	31.8	Pipe 1229	110.78	20	100	7.7	0.28	12.56	Open
Junc 1212	1140.0	1171.9	2.5	31.9	Pipe 1230	170.43	150	100	824	0.54	3.94	Open
Junc 1213	1140.0	1171.8	2.5	31.8	Pipe 1231	37.06	150	110	2819	1.85	32.19	Open
Junc 1214	1140.0	1171.9	2.5	31.9	Pipe 1232	11.77	150	110	714.87	0.47	2.54	Open
Junc 1215	1140.0	1171.8	2.5	31.8	Pipe 1233	37.63	50	100	−351.4	2.07	171.29	Open
Junc 1216	1145.0	1168.0	3.4	23.0	Pipe 1234	65.38	50	100	95.83	0.56	15.44	Open
Junc 1217	1145.0	1167.9	3.4	22.9	Pipe 1235	169.12	50	100	74.83	0.44	9.77	Open
Junc 1218	1145.0	1168.5	5.3	23.5	Pipe 1236	52.65	25	100	−13.2	0.31	11.49	Open
Junc 1219	1145.0	1168.4	5.3	23.4	Pipe 1237	59.36	25	100	−26.4	0.62	41.5	Open
Junc 1220	1140.0	1173.4	0.7	33.4	Pipe 1238	61.71	50	100	−10.5	0.06	0.26	Open
Junc 1221	1140.0	1171.9	0.7	31.9	Pipe 1239	90.06	50	100	54.73	0.32	5.47	Open
Junc 1222	1140.0	1171.9	0.7	31.9	Pipe 1240	182.48	25	100	−10.5	0.25	7.52	Open
Junc 1223	1140.0	1169.3	2.5	29.3	Pipe 1241	188.25	25	100	−23.6	0.56	33.72	Open
Junc 1224	1140.0	1169.3	2.5	29.3	Pipe 1242	36.67	20	100	−9.6	0.35	18.9	Open
Junc 1225	1140.0	1169.2	2.5	29.2	Pipe 1243	49.64	20	100	−9.6	0.35	18.9	Open
Junc 1226	1140.0	1169.4	2.5	29.4	Pipe 1244	37.51	50	100	33.73	0.2	2.23	Open
Junc 1227	1140.0	1169.4	2.5	29.4	Pipe 1245	35.09	50	100	0.53	0	0	Open
Junc 1228	1140.0	1179.1	1.5	39.1	Pipe 1246	19.04	50	100	172	1.01	45.61	Open
Junc 1229	1140.0	1179.1	1.5	39.1	Pipe 1247	62.26	50	100	−138.8	0.82	30.66	Open
Junc 1230	1140.0	1179.1	1.5	39.1	Pipe 1248	22.3	50	100	−58.4	0.34	6.17	Open
Junc 1231	1140.0	1167.5	2.5	27.5	Pipe 1249	30.48	20	100	56.8	2.09	508.56	Open
Junc 1232	1140.0	1167.5	2.5	27.5	Pipe 1250	21.56	20	100	9.6	0.35	18.9	Open
Junc 1233	1140.0	1178.9	9.2	38.9	Pipe 1251	188.92	25	100	−23.6	0.56	33.72	Open
Junc 1234	1140.0	1178.7	5.3	38.7	Pipe 1252	30	20	100	23.6	0.87	99.98	Open
Junc 1235	1140.0	1168.6	2.5	28.6	Pipe 1254	83.78	150	100	0	0	0	Closed
Junc 1236	1140.0	1178.8	5.3	38.8	Pipe 1255	279.2	25	100	9.6	0.23	6.37	Open
Junc 1237	1135.0	1161.7	1.9	26.7	Pipe 1256	151.37	150	100	2808.5	1.84	38.15	Open
Junc 1238	1130.0	1161.7	1.9	31.7	Pipe 1257	699.12	150	100	0	0	0	Closed
Junc 1239	1140.0	1168.6	2.5	28.6	Pipe 1258	143.1	150	100	−686.03	0.45	2.8	Open
Junc 1240	1140.0	1168.6	2.5	28.6	Pipe 1259	25.87	150	100	−21.6	0.01	0	Open
Junc 1241	1140.0	1168.6	2.5	28.6	Pipe 1261	127.44	150	110	749.37	0.49	2.77	Open
Junc 1242	1140.0	1169.6	2.5	29.6	Pipe 1262	62.71	75	110	−15.92	0.04	0.06	Open
Junc 1243	1145.0	1169.5	2.5	24.5	Pipe 1263	113.32	50	110	−42.57	0.25	2.88	Open
Junc 1244	1140.0	1169.5	2.5	29.5	Pipe 1265	36.59	200	110	2842.59	1.05	8.05	Open
Junc 1245	1140.0	1169.5	2.5	29.5	Pipe 1267	116.08	50	110	−21.6	0.13	0.82	Open
Junc 1246	1145.0	1168.4	1.9	23.4	Pipe 1273	145.65	150	110	−725.33	0.48	2.61	Open
Junc 1247	1145.0	1168.4	3.8	23.4	Pipe 1274	55.07	150	110	−572.87	0.38	1.68	Open
Junc 1248	1145.0	1168.4	1.9	23.4	Pipe 1275	101.41	150	110	−503.64	0.33	1.33	Open
Junc 1249	1145.0	1168.4	1.9	23.4	Pipe 1277	182.85	75	110	−93.7	0.25	1.72	Open
Junc 1250	1145.0	1168.4	1.9	23.4	Pipe 1279	151.58	75	110	−288.31	0.76	13.81	Open
Junc 1251	1140.0	1168.0	2.5	28.0	Pipe 1281	83.17	50	110	72.58	0.43	7.74	Open
Junc 1252	1140.0	1168.0	2.5	28.0	Pipe 1282	74.67	50	110	54.59	0.32	4.56	Open
Junc 1253	1140.0	1167.8	2.5	27.8	Pipe 1283	167.81	50	110	−17.41	0.1	0.55	Open
Junc 1254	1140.0	1167.8	2.5	27.8	Pipe 1284	123.68	50	110	−93.61	0.55	12.39	Open
Junc 1255	1140.0	1167.6	2.5	27.6	Pipe 1285	90.44	75	110	70.03	0.18	1	Open
Junc 1256	1140.0	1167.5	2.5	27.5	Pipe 1286	50.85	75	110	−102.89	0.27	2.05	Open
Junc 1257	1140.0	1167.6	2.5	27.6	Pipe 1287	40.85	75	110	−137.29	0.36	3.49	Open
Junc 1258	1140.0	1167.5	2.5	27.5	Pipe 1290	202.81	75	110	93.92	0.25	1.73	Open
Junc 1259	1140.0	1167.5	2.5	27.5	Pipe 1291	53.9	75	110	18.55	0.05	0.08	Open
Junc 1260	1140.0	1167.5	2.5	27.5	Pipe 1292	55	75	110	−61.65	0.16	0.79	Open
Junc 1261	1140.0	1167.4	2.5	27.4	Pipe 1293	21.57	150	110	−1286.14	0.84	7.53	Open
Junc 1262	1140.0	1167.4	2.8	27.4	Pipe 1296	22.63	75	110	−100.63	0.26	1.97	Open
Junc 1263	1140.0	1167.4	2.8	27.4	Pipe 1298	80.14	150	110	−802.39	0.53	3.14	Open
Junc 1264	1140.0	1166.0	1.9	26.0	Pipe 1299	75.95	150	110	−1052.97	0.69	5.2	Open
Junc 1265	1140.0	1165.5	1.9	25.5	Pipe 1300	88.65	150	110	−1253.2	0.82	7.17	Open
Junc 1266	1140.0	1165.5	2.8	25.5	Pipe 1302	68.05	100	110	139.75	0.21	0.89	Open
Junc 1267	1140.0	1164.8	2.8	24.8	Pipe 1303	83.22	100	110	−21.58	0.03	0.03	Open
Junc 1268	1140.0	1165.9	2.8	25.9	Pipe 1304	70.28	100	110	−132.07	0.19	0.8	Open
Junc 1269	1140.0	1164.8	2.8	24.8	Pipe 1308	65.58	75	110	120.71	0.32	2.75	Open
Junc 1270	1140.0	1164.2	2.8	24.2	Pipe 1309	81.66	75	110	27.94	0.07	0.18	Open
Junc 1271	1140.0	1164.2	2.8	24.2	Pipe 1310	57.56	75	110	−53.06	0.14	0.6	Open
Junc 1272	1140.0	1164.2	2.8	24.2	Pipe 1311	105.04	75	110	−88.75	0.23	1.56	Open
Junc 1273	1145.0	1166.6	3.8	21.6	Pipe 1314	100.09	150	110	−800.97	0.52	3.13	Open
Junc 1274	1145.0	1166.6	3.8	21.6	Pipe 1315	110.6	150	110	−870.57	0.57	3.65	Open
Junc 1275	1145.0	1166.5	3.8	21.5	Pipe 1317	16.83	250	110	1854.64	0.44	1.23	Open
Junc 1276	1145.0	1166.6	1.9	21.6	Pipe 1319	121.19	50	110	51.23	0.3	4.06	Open
Junc 1277	1145.0	1166.6	1.9	21.6	Pipe 1320	412.63	50	110	43.83	0.26	3.04	Open

NODE	Ma'an city				LINK	Ma'an city						
ID	Elevation m	Head m	Demand m3/d	Pressure m	ID	Length m	Diameter mm	Roughness	Flow m3/d	Velocity m/s	Unit head loss m/km	Status
Junc 1278	1145.0	1166.6	1.9	21.6	Pipe 1322	104.45	50	110	−77.58	0.46	8.75	Open
Junc 1279	1145.0	1166.6	1.9	21.6	Pipe 1324	196.21	250	110	−2139.87	0.5	1.61	Open
Junc 1280	1145.0	1166.6	1.9	21.6	Pipe 1325	106.01	250	110	−2424.87	0.57	2.02	Open
Junc 1281	1145.0	1166.6	1.9	21.6	Pipe 1326	14.98	300	110	−4262.59	0.7	2.36	Open
Junc 1282	1145.0	1166.6	1.9	21.6	Pipe 1327	63.78	300	110	−4298.59	0.7	2.4	Open
Junc 1283	1140.0	1166.7	1.9	26.7	Pipe 1329	90.74	300	110	−5745.45	0.94	4.11	Open
Junc 1284	1140.0	1166.6	1.9	26.6	Pipe 1330	108.9	300	110	−5982.69	0.98	4.43	Open
Junc 1285	1140.0	1166.7	1.9	26.7	Pipe 1331	154.17	100	110	−124.48	0.18	0.72	Open
Junc 1286	1140.0	1166.7	1.9	26.7	Pipe 1332	83.08	100	110	−222.38	0.33	2.1	Open
Junc 1287	1140.0	1166.7	1.9	26.7	Pipe 1333	96.46	100	110	−339.41	0.5	4.6	Open
Junc 1288	1140.0	1166.7	1.9	26.7	Pipe 1334	73.6	100	110	−147.48	0.22	0.98	Open
Junc 1289	1145.0	1165.2	3.8	20.2	Pipe 1335	42.18	100	110	−292.54	0.43	3.49	Open
Junc 1290	1145.0	1165.2	10.2	20.2	Pipe 1337	46.42	100	110	66.33	0.1	0.22	Open
Junc 1291	1145.0	1165.1	3.8	20.1	Pipe 1339	55.89	100	110	−255.56	0.38	2.72	Open
Junc 1292	1145.0	1165.2	3.8	20.2	Pipe 1340	232.98	100	110	−351.59	0.52	4.91	Open
Junc 1293	1145.0	1165.2	2.5	20.2	Pipe 1341	146.37	100	110	342.72	0.51	4.68	Open
Junc 1294	1145.0	1165.3	2.5	20.3	Pipe 1343	107.74	50	110	−164.54	0.97	35.22	Open
Junc 1295	1145.0	1165.2	2.5	20.2	Pipe 1344	83.74	100	110	471.36	0.69	8.45	Open
Junc 1296	1145.0	1165.3	2.5	20.3	Pipe 1345	236.48	50	110	55.94	0.33	4.78	Open
Junc 1297	1145.0	1165.3	2.5	20.3	Pipe 1350	93.12	100	110	−873.25	1.29	26.48	Open
Junc 1298	1140.0	1165.4	2.5	25.4	Pipe 1351	107.63	100	110	−484.07	0.71	8.88	Open
Junc 1299	1140.0	1165.4	2.5	25.4	Pipe 1352	200.63	100	110	−467.67	0.69	8.33	Open
Junc 1300	1140.0	1165.4	2.5	25.4	Pipe 1353	29.28	100	110	−559.81	0.82	11.62	Open
Junc 1301	1140.0	1165.4	2.5	25.4	Pipe 1354	139.02	50	110	−73.82	0.44	7.98	Open
Junc 1302	1140.0	1165.5	2.5	25.5	Pipe 1355	203.37	150	110	−811.07	0.53	3.2	Open
Junc 1303	1140.0	1165.4	2.5	25.4	Pipe 1356	49.28	150	110	−994.45	0.65	4.67	Open
Junc 1304	1140.0	1165.6	1.9	25.6	Pipe 1357	57.12	150	110	−1100.88	0.72	5.64	Open
Junc 1305	1140.0	1165.6	1.9	25.6	Pipe 1358	81.08	150	110	−1770.56	1.16	13.61	Open
Junc 1306	1140.0	1165.6	1.9	25.6	Pipe 1359	124.51	75	110	73.86	0.19	1.11	Open
Junc 1307	1140.0	1165.6	1.9	25.6	Pipe 1360	60.64	75	110	133.67	0.35	3.33	Open
Junc 1308	1140.0	1165.5	1.9	25.5	Pipe 1361	103.71	75	110	−41.23	0.11	0.38	Open
Junc 1309	1140.0	1165.4	1.9	25.4	Pipe 1362	89.24	100	110	373.21	0.55	5.49	Open
Junc 1310	1140.0	1165.4	1.9	25.4	Pipe 1365	133.44	50	110	62.54	0.37	5.87	Open
Junc 1311	1140.0	1165.4	1.9	25.4	Pipe 1367	111.77	50	110	79.64	0.47	9.19	Open
Junc 1312	1140.0	1165.4	1.9	25.4	Pipe 1368	202.59	50	110	24.77	0.15	1.06	Open
Junc 1313	1140.0	1165.7	1.9	25.7	Pipe 1370	80.64	50	110	99.46	0.59	13.87	Open
Junc 1314	1140.0	1165.7	1.9	25.7	Pipe 1372	46.89	100	110	263.02	0.39	2.87	Open
Junc 1315	1140.0	1160.3	1.9	20.3	Pipe 1373	38.75	100	110	−319.98	0.47	4.12	Open
Junc 1316	1140.0	1160.3	2.5	20.3	Pipe 1374	136.86	100	110	−178.5	0.26	1.4	Open
Junc 1317	1140.0	1160.2	1.9	20.2	Pipe 1375	85.13	50	110	84.16	0.5	10.18	Open
Junc 1318	1140.0	1160.1	2.5	20.1	Pipe 1376	81.63	50	110	31.38	0.18	1.64	Open
Junc 1319	1140.0	1160.0	2.5	20.0	Pipe 1377	90.32	150	110	−935.05	0.61	4.17	Open
Junc 1320	1140.0	1160.0	2.5	20.0	Pipe 1378	88.79	150	110	−1096.98	0.72	5.61	Open
Junc 1321	1140.0	1160.0	1.9	20.0	Pipe 1380	54.88	50	110	25.66	0.15	1.13	Open
Junc 1322	1140.0	1165.0	2.5	25.0	Pipe 1381	75.03	50	110	−7.34	0.04	0.11	Open
Junc 1323	1140.0	1165.0	2.5	25.0	Pipe 1383	52.61	50	110	2.2	0.01	0.01	Open
Junc 1324	1140.0	1165.0	2.5	25.0	Pipe 1385	59.14	50	110	48.4	0.29	3.65	Open
Junc 1325	1140.0	1165.0	2.5	25.0	Pipe 1387	106.95	50	110	0.23	0	0	Open
Junc 1326	1140.0	1165.1	2.9	25.1	Pipe 1391	119.09	100	110	−84.04	0.12	0.35	Open
Junc 1327	1140.0	1164.9	2.9	24.9	Pipe 1392	18.96	100	110	−175.39	0.26	1.35	Open
Junc 1328	1140.0	1165.1	1.9	25.1	Pipe 1393	102.27	100	110	−200.69	0.3	1.74	Open
Junc 1329	1140.0	1165.0	2.9	25.0	Pipe 1394	145.55	50	110	37.03	0.22	2.23	Open
Junc 1330	1140.0	1165.1	1.9	25.1	Pipe 1395	43.4	100	110	159.41	0.23	1.14	Open
Junc 1331	1140.0	1165.1	1.9	25.1	Pipe 1397	72.12	100	110	−198.11	0.29	1.7	Open
Junc 1332	1140.0	1165.0	1.9	25.0	Pipe 1398	125.12	100	110	513.75	0.76	9.91	Open
Junc 1333	1140.0	1164.6	2.9	24.6	Pipe 1399	301.71	50	110	4.4	0.03	0.04	Open
Junc 1334	1140.0	1164.6	2.9	24.6	Pipe 1400	416.26	50	110	−44.02	0.26	3.06	Open
Junc 1335	1140.0	1164.6	2.9	24.6	Pipe 1401	550.76	50	110	30.4	0.18	1.54	Open
Junc 1336	1145.0	1164.6	2.5	19.6	Pipe 1402	125.91	100	110	−131.14	0.19	0.79	Open
Junc 1337	1145.0	1164.6	4.2	19.6	Pipe 1403	232.21	100	110	−251.54	0.37	2.64	Open
Junc 1338	1145.0	1164.6	2.5	19.6	Pipe 1404	54.07	100	110	−399.04	0.59	6.21	Open
Junc 1339	1145.0	1164.6	2.5	19.6	Pipe 1405	55.56	100	110	95.26	0.14	0.44	Open
Junc 1340	1145.0	1164.7	2.5	19.7	Pipe 1406	117.66	75	110	−252.9	0.66	10.83	Open
Junc 1341	1145.0	1164.6	2.5	19.6	Pipe 1407	76.78	50	110	99.88	0.59	13.97	Open
Junc 1342	1145.0	1164.7	2.5	19.7	Pipe 1409	59.31	50	110	−81.99	0.48	9.7	Open
Junc 1343	1145.0	1164.7	2.5	19.7	Pipe 1410	32.32	100	110	483.48	0.71	8.86	Open
Junc 1344	1140.0	1164.4	2.5	24.4	Pipe 1411	50.68	100	110	403.28	0.59	6.33	Open
Junc 1345	1140.0	1164.4	2.5	24.4	Pipe 1412	79.42	75	110	84.84	0.22	1.43	Open
Junc 1346	1140.0	1164.2	1.8	24.2	Pipe 1414	7.08	150	100	97.2	0.06	0.07	Open
Junc 1347	1140.0	1164.2	1.8	24.2	Pipe 1415	2.95	150	100	43.8	0.03	0.03	Open
Junc 1348	1140.0	1164.0	2.9	24.0	Pipe 1416	48.77	100	100	−9.6	0.01	0.01	Open
Junc 1349	1140.0	1163.1	2.9	23.1	Pipe 1417	134.77	100	100	34.2	0.05	0.08	Open
Junc 1350	1140.0	1164.0	2.9	24.0	Pipe 1418	142.41	50	100	34.2	0.2	2.29	Open
Junc 1351	1140.0	1164.8	1.8	24.8	Pipe 1419	249.57	150	100	1347.42	0.88	9.79	Open
Junc 1352	1140.0	1164.8	1.8	24.8	Pipe 1420	170.84	150	100	1279.02	0.84	8.89	Open
Junc 1353	1140.0	1164.8	1.8	24.8	Pipe 1422	556.54	150	100	1192.48	0.78	7.81	Open
Junc 1354	1140.0	1164.8	1.8	24.8	Pipe 1423	65.53	50	100	−34.2	0.2	2.29	Open
Junc 1355	1140.0	1162.8	2.9	22.8	Pipe 1424	52.13	50	100	−14.4	0.08	0.46	Open
Junc 1356	1140.0	1162.8	2.9	22.8	Pipe 1425	61.95	50	100	166	0.98	42.71	Open
Junc 1357	1140.0	1162.7	2.9	22.7	Pipe 1426	309.23	150	100	1098.62	0.72	6.71	Open
Junc 1358	1140.0	1163.0	2.9	23.0	Pipe 1427	14.08	50	100	−29.2	0.17	1.71	Open
Junc 1359	1140.0	1163.0	2.9	23.0	Pipe 1428	46.63	50	100	−29.2	0.17	1.71	Open
Junc 1360	1140.0	1163.1	2.9	23.1	Pipe 1429	138.47	150	100	1040.22	0.68	6.06	Open
Junc 1361	1140.0	1163.1	2.9	23.1	Pipe 1430	318.79	150	100	981.82	0.64	5.45	Open
Junc 1362	1140.0	1163.1	2.9	23.1	Pipe 1431	52.3	50	100	−36.4	0.21	2.57	Open

NODE	Ma'an city				LINK	Ma'an city						
ID	Elevation m	Head m	Demand m3/d	Pressure m	ID	Length m	Diameter mm	Roughness	Flow m3/d	Velocity m/s	Unit head loss m/km	Status
Junc 1363	1140.0	1163.0	2.9	23.0	Pipe 1432	72.3	25	100	-27.2	0.64	43.86	Open
Junc 1364	1145.0	1162.2	4.2	17.2	Pipe 1433	92.4	25	100	-28.8	0.68	48.76	Open
Junc 1365	1145.0	1162.2	10.2	17.2	Pipe 1434	224.51	50	100	-28.8	0.17	1.67	Open
Junc 1366	1145.0	1162.2	4.2	17.2	Pipe 1435	149.87	150	100	909.72	0.6	4.73	Open
Junc 1367	1145.0	1162.1	4.2	17.1	Pipe 1436	108.57	150	100	746.82	0.49	3.28	Open
Junc 1368	1145.0	1162.2	4.2	17.2	Pipe 1437	46.65	150	100	718.02	0.47	3.05	Open
Junc 1369	1145.0	1162.2	4.2	17.2	Pipe 1438	165.65	150	100	689.22	0.45	2.83	Open
Junc 1370	1145.0	1162.3	4.2	17.3	Pipe 1439	103.12	150	100	633.72	0.42	2.42	Open
Junc 1371	1145.0	1162.3	4.2	17.3	Pipe 1440	147.27	150	100	580.32	0.38	2.06	Open
Junc 1372	1140.0	1160.6	4.2	20.6	Pipe 1441	73.83	150	100	547.92	0.36	1.85	Open
Junc 1373	1140.0	1160.5	4.2	20.5	Pipe 1442	21.24	50	100	26.7	0.16	1.45	Open
Junc 1374	1140.0	1160.6	4.2	20.6	Pipe 1443	91.9	50	100	0	0	0	Open
Junc 1375	1140.0	1163.8	2.1	23.8	Pipe 1444	83.11	50	100	26.7	0.16	1.45	Open
Junc 1376	1140.0	1163.8	2.1	23.8	Pipe 1445	144.05	50	100	26.7	0.16	1.45	Open
Junc 1377	1140.0	1163.8	2.1	23.8	Pipe 1446	275.52	50	100	5.7	0.03	0.08	Open
Junc 1378	1140.0	1163.8	2.1	23.8	Pipe 1447	19.86	150	100	-20.1	0.01	0	Open
Junc 1379	1140.0	1163.9	2.1	23.9	Pipe 1448	38.86	150	100	-52.5	0.03	0.02	Open
Junc 1380	1140.0	1163.9	2.1	23.9	Pipe 1449	23.92	150	100	-104.1	0.07	0.08	Open
Junc 1381	1140.0	1163.9	2.1	23.9	Pipe 1450	42.51	150	100	-136.5	0.09	0.14	Open
Junc 1382	1140.0	1164.2	1.8	24.2	Pipe 1451	11.18	150	100	-168.9	0.11	0.21	Open
Junc 1383	1140.0	1164.3	1.8	24.3	Pipe 1452	39.78	150	100	-229	0.15	0.37	Open
Junc 1384	1140.0	1164.3	1.8	24.3	Pipe 1453	59.73	150	100	234.2	0.15	0.38	Open
Junc 1385	1140.0	1164.3	1.8	24.3	Pipe 1454	49.59	150	100	5.7	0	0	Open
Junc 1386	1140.0	1164.3	1.8	24.3	Pipe 1455	13.41	150	100	-5.7	0	0.01	Open
Junc 1387	1140.0	1164.4	1.8	24.4	Pipe 1456	14.86	150	100	849.08	0.56	4.17	Open
Junc 1388	1140.0	1164.4	1.8	24.4	Pipe 1457	62.64	150	100	922.4	0.6	4.85	Open
Junc 1389	1140.0	1164.7	1.8	24.7	Pipe 1458	60.36	50	100	-20.1	0.12	0.86	Open
Junc 1390	1140.0	1164.7	1.8	24.7	Pipe 1459	90.11	25	100	20.1	0.47	25.05	Open
Junc 1391	1135.0	1164.7	1.8	29.7	Pipe 1460	75.51	50	100	-45.9	0.27	3.95	Open
Junc 1392	1135.0	1164.7	1.8	29.7	Pipe 1461	153.17	50	100	26.7	0.16	1.45	Open
Junc 1393	1135.0	1164.7	1.8	29.7	Pipe 1462	139.72	20	100	-26.7	0.98	125.66	Open
Junc 1394	1140.0	1164.8	1.8	24.8	Pipe 1463	139.65	50	100	-26.7	0.16	1.45	Open
Junc 1395	1140.0	1164.8	1.8	24.8	Pipe 1464	22.02	20	100	-5.7	0.21	7.19	Open
Junc 1396	1140.0	1164.8	1.8	24.8	Pipe 1465	23.13	20	100	17.1	0.63	55.06	Open
Junc 1397	1135.0	1163.7	1.0	28.7	Pipe 1466	35.61	20	100	5.7	0.21	7.2	Open
Junc 1398	1135.0	1163.7	1.0	28.7	Pipe 1467	6.91	20	100	17.1	0.63	55.05	Open
Junc 1399	1135.0	1160.9	1.9	25.9	Pipe 1468	17.3	20	100	-5.7	0.21	7.2	Open
Junc 1400	1135.0	1161.8	1.9	26.8	Pipe 1469	41.83	20	100	5.7	0.21	7.2	Open
Junc 1401	1135.0	1161.1	1.9	26.1	Pipe 1470	80.61	20	100	-8.8	0.32	16.09	Open
Junc 1402	1135.0	1161.0	1.9	26.0	Pipe 1471	62.71	50	100	-31.6	0.19	1.98	Open
Junc 1403	1135.0	1161.1	1.9	26.1	Pipe 1472	109.39	50	100	-54.4	0.32	5.41	Open
Junc 1404	1135.0	1161.0	1.9	26.0	Pipe 1473	46.57	20	100	5.7	0.21	7.2	Open
Junc 1405	1135.0	1161.8	1.9	26.8	Pipe 1474	1510.15	150	100	-860.48	0.56	4.27	Open
Junc 1406	1135.0	1161.7	1.9	26.7	Pipe 1475	164.35	150	100	-79.02	0.05	0.05	Open
Junc 1407	1140.0	1162.3	2.9	22.3	Pipe 1476	894.4	100	100	222.8	0.33	2.52	Open
Junc 1408	1140.0	1162.2	2.9	22.2	Pipe 1477	666.05	150	100	911	0.6	4.74	Open
Junc 1409	1140.0	1167.5	2.5	27.5	Pipe 1478	811.54	150	100	630	0.41	2.39	Open
Junc 1410	1140.0	1167.4	2.8	27.4	Pipe 1479	1396.43	100	100	559.4	0.82	13.85	Open
Junc 1411	1140.0	1167.4	2.8	27.4	Pipe 1480	4668.44	100	100	5.8	0.01	0	Open
Junc 1412	1140.0	1167.4	2.8	27.4	Pipe 1481	1599.13	100	100	222.2	0.33	2.5	Open
Junc 1413	1140.0	1167.4	2.8	27.4	Pipe 1482	1636.47	50	100	-82	0.48	11.57	Open
Junc 1414	1135.0	1161.7	1.9	26.7	Pipe 1483	270.29	50	110	-20.4	0.12	0.74	Open
Junc 1415	1140.0	1162.3	2.9	22.3	Pipe 1484	85.15	75	110	-64	0.17	0.85	Open
Junc 1416	1145.0	1167.7	4.8	22.7	Pipe 1485	39.14	75	110	-107.6	0.28	2.23	Open
Junc 1417	1145.0	1171.3	3.4	26.3	Pipe 1486	67.95	75	110	43.6	0.11	0.42	Open
Junc 1418	1140.0	1165.0	2.8	25.0	Pipe 1489	403.04	50	110	64.6	0.38	6.23	Open
Junc 1419	1140.0	1165.0	1.9	25.0	Pipe 1491	57.7	50	100	78.18	0.46	10.59	Open
Junc 1420	1140.0	1162.4	1.9	22.4	Pipe 1492	47.87	50	100	51.78	0.31	4.94	Open
Junc 1421	1140.0	1162.4	1.9	22.4	Pipe 1493	28.91	50	100	36.38	0.21	2.57	Open
Junc 1422	1145.0	1166.6	1.9	21.6	Pipe 1494	39.76	50	100	20.98	0.12	0.93	Open
Junc 1423	1140.0	1164.2	2.8	24.2	Pipe 1495	140.84	50	100	56.71	0.33	5.84	Open
Junc 1424	1140.0	1164.2	2.8	24.2	Pipe 1496	59.82	50	100	-7.7	0.05	0.15	Open
Junc 1425	1145.0	1166.6	1.9	21.6	Pipe 1497	60.79	20	100	-7.7	0.28	12.56	Open
Junc 1426	1145.0	1166.6	1.9	21.6	Pipe 1498	68.35	20	100	-7.7	0.28	12.56	Open
Junc 1427	1140.0	1165.6	1.9	25.6	Pipe 1499	74.63	20	100	-13.2	0.49	34.09	Open
Junc 1428	1140.0	1165.6	1.9	25.6	Pipe 1500	66.09	20	100	-13.2	0.49	34.09	Open
Junc 1429	1140.0	1165.6	1.9	25.6	Pipe 1501	61.24	50	100	145.8	0.86	33.59	Open
Junc 1430	1140.0	1165.6	1.9	25.6	Pipe 1502	64.1	50	100	89.8	0.53	13.69	Open
Junc 1431	1145.0	1165.1	3.8	20.1	Pipe 1503	77.38	50	100	53.2	0.31	5.19	Open
Junc 1432	1140.0	1164.8	1.8	24.8	Pipe 1504	135.73	50	100	26.6	0.16	1.44	Open
Junc 1433	1140.0	1164.7	1.8	24.7	Pipe 1505	16.5	50	100	8.3	0.05	0.17	Open
Junc 1434	1140.0	1164.7	1.8	24.7	Pipe 1506	59.78	50	100	1.03	0.01	0	Open
Junc 1435	1140.0	1164.6	1.8	24.6	Pipe 1507	100.62	50	100	-35.24	0.21	2.42	Open
Junc 1436	1140.0	1164.6	1.8	24.6	Pipe 1508	123.66	50	100	-28.93	0.17	1.68	Open
Junc 1437	1135.0	1160.9	1.9	25.9	Pipe 1509	47.94	50	100	-119.49	0.7	23.24	Open
Junc 1438	1135.0	1160.9	1.9	25.9	Pipe 1511	310.54	50	100	19.17	0.11	0.78	Open
Junc 1439	1135.0	1160.9	1.9	25.9	Pipe 1512	47.63	50	100	45.6	0.27	3.9	Open
Junc 1440	1145.0	1164.7	2.5	19.7	Pipe 1513	78.87	25	100	15.2	0.36	14.93	Open
Junc 1441	1145.0	1164.2	2.5	19.2	Pipe 1514	80.74	25	100	15.2	0.36	14.93	Open
Junc 1442	1145.0	1164.2	2.5	19.2	Pipe 1515	28.43	20	100	-17.1	0.63	55.06	Open
Junc 1443	1145.0	1164.2	2.5	19.2	Pipe 1516	26.13	20	100	17.1	0.63	55.06	Open
Junc 1444	1145.0	1164.2	2.5	19.2	Pipe 1517	58.74	50	100	-51.3	0.3	4.85	Open
Junc 1445	1140.0	1168.4	1.9	28.4	Pipe 1518	92.98	150	100	-1401.86	0.92	10.53	Open
Junc 1446	1145.0	1169.6	2.5	24.6	Pipe 1519	182.02	50	100	23.47	0.14	1.14	Open
Junc 1447	1145.0	1174.7	2.5	29.7	Pipe 1520	58.02	50	100	89.61	0.53	13.63	Open

NODE	Ma'an city				LINK	Ma'an city						
ID	Elevation m	Head m	Demand m3/d	Pressure m	ID	Length m	Diameter mm	Roughness	Flow m3/d	Velocity m/s	Unit head loss m/km	Status
Junc 1448	1145.0	1173.4	2.5	28.4	Pipe 1521	223.76	100	100	−154.81	0.23	1.28	Open
Junc 1449	1145.0	1172.0	2.5	27.0	Pipe 1522	210.69	100	100	−341.4	0.5	5.55	Open
Junc 1450	1130.0	1156.0	2.0	26.0	Pipe 1523	81.63	100	100	−54.1	0.08	0.18	Open
Junc 1451	1200.0	1277.7	0.0	77.7	Pipe 1524	135.36	100	100	412.6	0.61	7.88	Open
Junc 1452	1115.0	1132.2	117.9	17.2	Pipe 1525	526	25	100	−5	0.12	1.9	Open
Junc 1453	1115.0	1132.1	57.9	17.1	Pipe 1526	479.56	25	100	−5	0.12	1.9	Open
Junc 1454	1105.0	1159.3	52.3	54.3	Pipe 1527	749.2	25	100	5	0.12	1.9	Open
Junc 1455	1105.0	1159.3	52.3	54.3	Pipe 1528	296.11	25	100	−14.4	0.34	13.51	Open
Junc 1456	1110.0	1136.7	53.0	26.7	Pipe 1529	68.96	25	100	−41.6	0.98	96.34	Open
Junc 1457	1110.0	1136.8	53.0	26.8	Pipe 1530	30.25	50	100	−11.2	0.07	0.29	Open
Junc 1458	1110.0	1137.2	39.3	27.2	Pipe 1531	33.13	50	100	−11.2	0.07	0.29	Open
Junc 1459	1110.0	1137.5	73.3	27.5	Pipe 1532	28.89	50	100	−53.7	0.32	5.28	Open
Junc 1460	1105.0	1136.3	44.6	31.3	Pipe 1533	600.05	50	100	−11.2	0.07	0.29	Open
Junc 1461	1105.0	1136.2	52.3	31.2	Pipe 1534	53.24	100	100	−22.4	0.03	0.03	Open
Junc 1462	1100.0	1135.5	55.8	35.5	Pipe 1535	69.86	100	100	−44.8	0.07	0.13	Open
Junc 1463	1105.0	1135.4	25.3	30.4	Pipe 1536	349.81	100	100	−152.2	0.22	1.24	Open
Junc 1464	1105.0	1135.7	53.0	30.7	Pipe 1537	80.84	100	100	402.8	0.59	7.54	Open
Junc 1465	1100.0	1133.0	64.6	33.0	Pipe 1538	127.42	100	100	331.8	0.49	5.26	Open
Junc 1466	1105.0	1135.3	25.3	30.3	Pipe 1539	77.7	100	100	248.2	0.37	3.07	Open
Junc 1467	1105.0	1135.1	25.3	30.1	Pipe 1540	66.31	100	100	164.6	0.24	1.44	Open
Junc 1468	1100.0	1135.1	2.9	35.1	Pipe 1541	49.46	100	100	111.9	0.16	0.7	Open
Junc 1469	1105.0	1135.0	25.3	30.0	Pipe 1542	46.59	20	100	−26.5	0.98	123.92	Open
Junc 1470	1110.0	1134.8	25.3	24.8	Pipe 1543	80.73	50	100	26.5	0.16	1.43	Open
Junc 1471	1110.0	1134.8	25.3	24.8	Pipe 1544	232.34	150	100	−1975.96	1.29	19.89	Open
Junc 1472	1105.0	1135.1	25.3	30.1	Pipe 1545	213.51	150	100	−2002.46	1.31	20.39	Open
Junc 1473	1110.0	1134.8	33.0	24.8	Pipe 1546	264	150	100	−2055.46	1.35	21.4	Open
Junc 1474	1105.0	1135.0	25.3	30.0	Pipe 1547	71.74	100	100	−500.8	0.74	11.28	Open
Junc 1475	1105.0	1135.6	53.0	30.6	Pipe 1548	179.42	100	100	−526.7	0.78	12.39	Open
Junc 1476	1105.0	1135.8	53.0	30.8	Pipe 1549	150.43	100	100	−570.1	0.84	14.34	Open
Junc 1477	1105.0	1135.8	53.0	30.8	Pipe 1550	138.5	100	100	451.8	0.67	9.32	Open
Junc 1478	1110.0	1136.7	53.0	26.7	Pipe 1551	605.02	50	100	40.1	0.24	3.08	Open
Junc 1479	1110.0	1135.2	33.0	25.2	Pipe 1552	578.56	50	100	40.1	0.24	3.08	Open
Junc 1480	1105.0	1135.1	33.0	30.1	Pipe 1553	442.13	50	100	71	0.42	8.86	Open
Junc 1481	1095.0	1135.1	4.4	40.1	Pipe 1554	378.05	50	100	71	0.42	8.86	Open
Junc 1482	1110.0	1136.5	44.6	26.5	Pipe 1555	445.89	50	100	71	0.42	8.86	Open
Junc 1483	1110.0	1136.2	44.6	26.2	Pipe 1556	245.35	50	100	−2.9	0.02	0.02	Open
Junc 1484	1110.0	1135.3	44.6	25.3	Pipe 1557	205.36	50	100	−2.9	0.02	0.02	Open
Junc 1485	1115.0	1135.3	25.4	20.3	Pipe 1558	335.46	50	100	−2.9	0.02	0.02	Open
Junc 1486	1110.0	1137.7	36.0	27.7	Pipe 1559	376.62	50	100	20.4	0.12	0.88	Open
Junc 1487	1110.0	1137.7	36.0	27.7	Pipe 1560	362.06	50	100	20.4	0.12	0.88	Open
Junc 1488	1115.0	1136.2	36.0	21.2	Pipe 1561	742.5	50	100	102.6	0.6	17.52	Open
Junc 1489	1110.0	1136.6	36.0	26.6	Pipe 1562	686.85	50	100	26.2	0.15	1.4	Open
Junc 1490	1115.0	1136.0	84.7	21.0	Pipe 1563	152.31	100	100	−26.2	0.04	0.05	Open
Junc 1491	1115.0	1135.4	25.4	20.4	Pipe 1564	359.86	100	100	764.5	1.13	24.7	Open
Junc 1492	1105.0	1134.3	25.4	29.3	Pipe 1565	54.22	50	100	−16.7	0.1	0.61	Open
Junc 1493	1115.0	1134.1	25.4	19.1	Pipe 1566	64.01	50	100	−46.1	0.27	3.98	Open
Junc 1494	1110.0	1134.6	77.2	24.6	Pipe 1567	31.03	50	100	−71.5	0.42	8.98	Open
Junc 1495	1110.0	1135.9	72.7	25.9	Pipe 1568	44.44	50	100	12.7	0.07	0.37	Open
Junc 1496	1110.0	1138.3	72.7	28.3	Pipe 1569	35.56	50	100	96.9	0.57	15.76	Open
Junc 1497	1110.0	1138.7	72.7	28.7	Pipe 1570	61.81	50	100	16.7	0.1	0.61	Open
Junc 1498	1110.0	1134.9	72.7	24.9	Pipe 1571	118.54	50	100	12.7	0.07	0.37	Open
Junc 1499	1110.0	1133.7	47.2	23.7	Pipe 1572	22.19	50	100	12.7	0.07	0.37	Open
Junc 1500	1110.0	1133.6	57.2	23.6	Pipe 1573	51.86	50	100	−12.7	0.07	0.37	Open
Junc 1501	1110.0	1133.0	23.4	23.0	Pipe 1574	87.55	50	100	−26.5	0.16	1.43	Open
Junc 1502	1115.0	1132.8	23.4	17.8	Pipe 1575	238.7	100	100	−26.5	0.04	0.05	Open
Junc 1503	1105.0	1134.2	72.7	29.2	Pipe 1576	21.41	100	100	−39.2	0.06	0.1	Open
Junc 1504	1110.0	1133.5	47.2	23.5	Pipe 1577	77.51	100	100	−51.9	0.08	0.17	Open
Junc 1505	1110.0	1133.1	97.9	23.1	Pipe 1578	198.98	100	100	−161.5	0.24	1.39	Open
Junc 1506	1115.0	1132.8	39.3	17.8	Pipe 1579	28.93	50	100	2.9	0.02	0.02	Open
Junc 1507	1105.0	1132.0	30.4	27.0	Pipe 1580	303.68	100	100	−161.6	0.24	1.39	Open
Junc 1508	1115.0	1132.9	97.9	17.9	Pipe 1581	1307.77	100	100	−665.17	0.98	19.08	Open
Junc 1509	1115.0	1132.8	39.3	17.8	Pipe 1582	145.49	150	100	−2061.26	1.35	21.51	Open
Junc 1510	1110.0	1139.7	29.5	29.7	Pipe 1583	70.73	150	100	−2736.64	1.79	36.36	Open
Junc 1511	1110.0	1139.9	29.5	29.9	Pipe 1585	140.23	25	100	5.8	0.14	2.51	Open
Junc 1512	1110.0	1140.6	22.3	30.6	Pipe 1586	48.37	50	100	−18.6	0.11	0.74	Open
Junc 1513	1110.0	1141.1	22.3	31.1	Pipe 1587	75.94	100	100	0	0	0	Open
Junc 1514	1110.0	1140.3	9.8	30.3	Pipe 1588	251.69	100	100	−90	0.13	0.47	Open
Junc 1515	1110.0	1138.8	18.5	28.8	Pipe 1589	318.44	50	100	0	0	0	Open
Junc 1516	1110.0	1138.8	18.5	28.8	Pipe 1590	187.77	50	100	−18.6	0.11	0.74	Open
Junc 1517	1105.0	1139.2	72.7	34.2	Pipe 1591	121.72	50	100	−18.6	0.11	0.74	Open
Junc 1518	1115.0	1140.3	9.8	25.3	Pipe 1592	124.64	50	100	−2.9	0.02	0.02	Open
Junc 1519	1110.0	1137.9	36.0	27.9	Pipe 1593	281.3	50	100	−2.9	0.02	0.02	Open
Junc 1520	1110.0	1137.7	36.0	27.7	Pipe 1594	281.83	50	100	−17.4	0.1	0.66	Open
Junc 1521	1110.0	1137.7	47.4	27.7	Pipe 1595	54.56	100	100	−92	0.14	0.49	Open
Junc 1522	1110.0	1137.7	47.4	27.7	Pipe 1596	115.51	100	100	−97.8	0.14	0.55	Open
Junc 1523	1115.0	1138.6	36.3	23.6	Pipe 1597	131.9	100	100	−103.6	0.15	0.61	Open
Junc 1524	1120.0	1139.0	46.3	19.0	Pipe 1598	36.21	100	100	−145.3	0.21	1.14	Open
Junc 1525	1115.0	1139.4	36.3	24.4	Pipe 1599	112.46	100	100	1090.13	1.61	47.64	Open
Junc 1526	1115.0	1139.3	36.3	24.3	Pipe 1600	50.01	100	100	1048.43	1.55	44.32	Open
Junc 1527	1115.0	1138.8	7.4	23.8	Pipe 1601	58.76	100	100	1027.73	1.51	42.72	Open
Junc 1528	1120.0	1139.1	43.3	19.1	Pipe 1602	371.2	100	100	917.03	1.35	34.59	Open
Junc 1529	1115.0	1137.5	61.7	22.5	Pipe 1603	222.59	100	100	−906.83	1.34	33.88	Open
Junc 1530	1115.0	1137.4	73.3	22.4	Pipe 1604	838.22	150	100	−2828.71	1.85	38.65	Open
Junc 1531	1115.0	1137.4	73.3	22.4	Pipe 1605	31.14	100	100	1258.53	1.85	62.16	Open
Junc 1532	1110.0	1136.5	73.3	26.5	Pipe 1606	236.46	100	100	0	0	0	Closed

NODE	Ma'an city				LINK	Ma'an city						
ID	Elevation m	Head m	Demand m3/d	Pressure m	ID	Length m	Diameter mm	Roughness	Flow m3/d	Velocity m/s	Unit head loss m/km	Status
Junc 1533	1110.0	1136.5	73.3	26.5	Pipe 1607	3428.47	300	100	−6506.57	1.07	6.18	Open
Junc 1534	1115.0	1136.8	39.3	21.8	Pipe 1608	288.53	100	100	71.7	0.11	0.31	Open
Junc 1535	1120.0	1136.9	37.1	16.9	Pipe 1609	21.37	100	100	23.9	0.04	0.04	Open
Junc 1536	1120.0	1136.9	33.3	16.9	Pipe 1610	64.64	25	100	−23.9	0.56	34.52	Open
Junc 1537	1120.0	1138.5	33.3	18.5	Pipe 1611	1942.21	300	110	−6502.17	1.06	5.17	Open
Junc 1538	1120.0	1138.1	37.1	18.1	Pipe 1612	252.5	200	100	1189.7	0.44	1.91	Open
Junc 1539	1120.0	1137.9	37.1	17.9	Pipe 1613	92.38	20	100	2.75	0.1	1.87	Open
Junc 1540	1120.0	1137.9	21.6	17.9	Pipe 1614	67.3	20	100	10	0.37	20.38	Open
Junc 1541	1120.0	1137.5	21.6	17.5	Pipe 1615	11.34	20	100	−2	0.07	1.03	Open
Junc 1542	1120.0	1167.7	21.6	47.7	Pipe 1616	10.81	20	100	−2	0.07	1.03	Open
Junc 1543	1120.0	1166.2	21.6	46.2	Pipe 1617	8.47	20	100	−2	0.07	1.03	Open
Junc 1544	1120.0	1165.9	21.6	45.9	Pipe 1618	30.4	20	100	6	0.22	7.92	Open
Junc 1545	1120.0	1137.4	21.6	17.4	Pipe 1619	22.22	20	100	2	0.07	1.03	Open
Junc 1546	1120.0	1137.5	37.1	17.5	Pipe 1620	8.09	20	100	−2	0.07	1.04	Open
Junc 1547	1115.0	1137.2	34.9	22.2	Pipe 1621	38.33	50	100	−12	0.07	0.33	Open
Junc 1548	1115.0	1137.1	39.3	22.1	Pipe 1622	14.49	20	100	−2	0.07	1.03	Open
Junc 1549	1115.0	1162.3	34.9	47.3	Pipe 1623	10.74	50	100	−16	0.09	0.56	Open
Junc 1550	1110.0	1159.7	39.3	49.7	Pipe 1624	44.02	50	100	8	0.05	0.16	Open
Junc 1551	1115.0	1164.4	36.0	49.4	Pipe 1625	10.26	50	100	4	0.02	0.04	Open
Junc 1552	1120.0	1164.9	36.0	44.9	Pipe 1626	9.37	20	100	−2	0.07	1.03	Open
Junc 1553	1120.0	1164.6	76.2	44.6	Pipe 1627	9.27	20	100	−2	0.07	1.04	Open
Junc 1554	1120.0	1164.5	46.0	44.5	Pipe 1628	87.55	50	100	8	0.05	0.16	Open
Junc 1555	1115.0	1162.7	34.4	47.7	Pipe 1629	38.84	50	100	4	0.02	0.04	Open
Junc 1556	1115.0	1162.6	34.4	47.6	Pipe 1631	53.6	200	100	−1536.1	0.57	3.07	Open
Junc 1557	1115.0	1162.4	34.4	47.4	Pipe 1632	685.77	200	100	−1535.4	0.57	3.07	Open
Junc 1558	1115.0	1162.3	34.4	47.3	Pipe 870	10.56	100	110	−186.82	0.28	1.52	Open
Junc 1559	1110.0	1159.6	80.2	49.6	Pipe 936	1445.85	50	100	39.81	0.23	3.03	Open
Junc 1560	1110.0	1159.6	80.2	49.6	Pipe 1026	675.42	50	100	20.4	0.12	0.88	Open
Junc 1561	1110.0	1159.8	80.2	49.8	Pipe 1206	71.97	25	100	55.8	1.32	165.96	Open
Junc 1562	1110.0	1160.1	80.2	50.1	Pipe 1228	67.41	25	100	10.4	0.25	7.39	Open
Junc 1563	1110.0	1160.4	34.4	50.4	Pipe 1253	31.09	50	100	343.06	2.02	163.84	Open
Junc 1564	1110.0	1159.8	44.4	49.8	Pipe 1369	73.95	20	100	4.9	0.18	5.44	Open
Junc 1565	1115.0	1160.4	34.4	45.4	Pipe 1389	76.45	20	100	2.1	0.08	1.13	Open
Junc 1566	1115.0	1161.5	36.0	46.5	Pipe 1421	7.72	20	100	0.7	0.03	0.14	Open
Junc 1567	1115.0	1158.3	9.6	43.3	Pipe 1510	18.33	20	100	0.7	0.03	0.15	Open
Junc 1568	1105.0	1154.9	43.6	49.9	Pipe 1584	44.06	20	100	2.1	0.08	1.13	Open
Junc 1569	1105.0	1155.0	43.6	50.0	Pipe 1633	23.84	20	100	0.7	0.03	0.15	Open
Junc 1570	1110.0	1154.9	43.6	44.9	Pipe 1634	7.24	20	100	0.7	0.03	0.14	Open
Junc 1571	1110.0	1154.8	43.6	44.8	Pipe 1635	153.46	100	100	488.3	0.72	10.77	Open
Junc 1572	1120.0	1152.9	86.4	32.9	Pipe 1636	132.71	100	100	407.1	0.6	7.69	Open
Junc 1573	1115.0	1154.6	20.4	39.6	Pipe 1637	146.8	100	100	300.5	0.44	4.38	Open
Junc 1574	1115.0	1136.3	84.7	21.3	Pipe 1638	27.62	63	100	−41.8	0.16	1.08	Open
Junc 1575	1110.0	1134.8	33.0	24.8	Pipe 1639	156.83	63	100	37.5	0.14	0.88	Open
Junc 1576	1115.0	1137.3	37.1	22.3	Pipe 1640	24.8	63	100	−77.6	0.29	3.39	Open
Junc 1577	1115.0	1137.9	47.4	22.9	Pipe 1641	20.49	63	100	27.1	0.1	0.48	Open
Junc 1578	1140.0	1180.7	1.7	40.7	Pipe 1642	3783.11	400	100	13051.29	1.2	5.52	Open
Junc 1579	1115.0	1143.5	9.8	28.5	Pipe 1643	85.5	100	100	733.1	1.08	22.85	Open
Junc 1580	1105.0	1135.1	33.0	30.1	Pipe 1644	2363.22	200	100	3335.2	1.23	12.92	Open
Junc 1581	1100.0	1128.0	55.8	28.0	Pipe 196	145.82	20	100	28.1	1.04	138.13	Open
Junc 1582	1105.0	1140.0	13.8	35.0	Pipe 206	149.61	200	100	1436.05	0.53	2.71	Open
Junc 1583	1140.0	1164.8	1.8	24.8	Pipe 932	69.09	200	100	1340.85	0.49	2.39	Open
Junc 1584	1120.0	1175.1	16.0	55.1	Pipe 1645	229.31	50	100	−87.6	0.52	13.07	Open
Junc 1585	1105.0	1139.1	29.5	34.1	Pipe 1646	71.6	50	100	16.7	0.1	0.61	Open
Junc 1586	1130.0	1148.2	0.0	18.2	Pipe 1647	96.57	50	100	18.9	0.11	0.76	Open
Junc 1587	1135.0	1176.0	1.0	41.0	Pipe 1648	93.37	50	100	1.7	0.01	0.01	Open
Junc 1588	1115.0	1146.9	0.0	31.9	Pipe 1649	38.42	20	100	−10	0.37	20.38	Open
Junc 1589	1120.0	1168.6	2.9	48.6	Pipe 1650	6.56	50	100	20.8	0.12	0.91	Open
Junc 1590	1120.0	1137.6	21.6	17.6	Pipe 1651	123.64	100	100	105.4	0.16	0.63	Open
Junc 1591	1110.0	1141.5	6.4	31.5	Pipe 1652	54.21	100	100	98.2	0.14	0.55	Open
Junc 1592	1115.0	1139.8	7.4	24.8	Pipe 1653	175.39	100	100	30.6	0.05	0.06	Open
Junc 1593	1125.0	1170.5	35.2	45.5	Pipe 1654	598.65	50	100	−21.28	0.13	0.95	Open
Junc 1594	1115.0	1163.8	37.1	48.8	Pipe 1655	177.89	50	100	90.88	0.54	14	Open
Junc 1595	1115.0	1162.2	34.9	47.2	Pipe 1656	13.07	50	100	8	0.05	0.15	Open
Junc 1596	1115.0	1160.0	39.3	45.0	Pipe 1657	19.35	50	100	90.7	0.53	13.94	Open
Junc 1597	1110.0	1159.4	69.3	49.4	Pipe 1666	67.26	400	100	12546.3	1.16	5.13	Open
Junc 1598	1105.0	1136.6	52.3	31.6	Pipe 1667	10.86	50	100	0	0	0	Closed
Junc 1599	1105.0	1136.5	52.3	31.5	Pipe 1668	26.36	100	100	342.2	0.5	5.57	Open
Junc 1600	1105.0	1138.9	19.5	33.9	Pipe 1670	260.19	400	100	12546.3	1.16	5.13	Open
Junc 1601	1105.0	1138.2	10.0	33.2	Pipe 1677	56.26	50	110	−19.99	0.12	0.71	Open
Junc 1602	1110.0	1139.6	18.5	29.6	Pipe 905	2727.64	200	100	4110.33	1.51	19.02	Open
Junc 1603	1170.0	1212.2	0.0	42.2	Pipe 142	1309.99	75	110	0	0	0	Closed
Junc 1604	1110.0	1139.4	18.5	29.4	Pipe 1664	205.73	75	110	0	0	0	Closed
Junc 1605	1110.0	1139.5	18.5	29.5	Pipe 1665	161.38	75	110	0	0	0	Closed
Junc 1606	1110.0	1140.0	22.3	30.0	Pipe 1678	152.98	75	110	0	0	0	Closed
Junc 1607	1110.0	1137.5	29.5	27.5	Pipe 1679	90.65	75	110	0	0	0	Closed
Junc 1608	1110.0	1140.8	22.3	30.8	Pipe 1682	12	75	110	0	0	0	Closed
Junc 1609	1110.0	1140.2	22.3	30.2	Pipe 1693	12.98	250	100	435.25	0.1	0.1	Open
Junc 1610	1110.0	1139.8	9.8	29.8	Pipe 1695	469.49	350	110	9248.6	1.11	4.69	Open
Junc 1611	1110.0	1138.5	18.5	28.5	Pipe 1696	78.13	300	110	6473.29	1.06	5.13	Open
Junc 1612	1110.0	1140.5	18.5	30.5	Pipe 1697	154.5	250	110	2761.51	0.65	2.57	Open
Junc 1613	1110.0	1138.1	16.0	28.1	Pipe 1698	680.25	250	110	2768.91	0.65	2.59	Open
Junc 1614	1110.0	1137.8	76.0	27.8	Pipe 1700	69.27	50	110	68.58	0.4	6.96	Open
Junc 1615	1110.0	1137.2	16.0	27.2	Pipe 1706	138.42	150	100	1072.34	0.7	6.41	Open
Junc 1616	1110.0	1137.8	36.0	27.8	Pipe 1710	197.72	50	110	33.09	0.2	1.81	Open
Junc 1617	1110.0	1136.3	16.0	26.3	Pipe 1714	37.14	100	110	359.06	0.53	5.11	Open

NODE	Ma'an city				LINK	Ma'an city						
ID	Elevation m	Head m	Demand m3/d	Pressure m	ID	Length m	Diameter mm	Roughness	Flow m3/d	Velocity m/s	Unit head loss m/km	Status
Junc 1618	1110.0	1136.8	67.4	26.8	Pipe 1660	908.04	50	110	47.03	0.28	3.46	Open
Junc 1619	1110.0	1137.8	47.4	27.8	Pipe 1663	125.75	50	110	59	0.35	5.27	Open
Junc 1620	1110.0	1135.9	18.5	25.9	Pipe 1669	106	50	110	29.5	0.17	1.46	Open
Junc 1621	1115.0	1137.8	47.4	22.8	Pipe 1671	117.76	25	110	10	0.24	5.76	Open
Junc 1622	1115.0	1137.5	47.4	22.5	Pipe 1675	60.62	300	110	6384.59	1.05	5	Open
Junc 1623	1110.0	1137.6	76.0	27.6	Pipe 1676	51.78	300	110	6343.79	1.04	4.94	Open
Junc 1624	1110.0	1136.9	16.0	26.9	Pipe 1680	67.27	25	110	18.5	0.44	18	Open
Junc 1625	1110.0	1136.9	16.0	26.9	Pipe 1681	65.34	25	110	18.5	0.44	18	Open
Junc 1626	1110.0	1137.6	47.4	27.6	Pipe 1703	64.69	300	110	6302.99	1.03	4.88	Open
Junc 1627	1110.0	1137.2	47.4	27.2	Pipe 1704	63.66	300	110	6210.39	1.02	4.75	Open
Junc 1628	1115.0	1138.2	36.3	23.2	Pipe 1708	37.82	50	110	70.3	0.41	7.29	Open
Junc 1629	1115.0	1137.8	36.3	22.8	Pipe 1709	25.15	25	110	18.5	0.44	18	Open
Junc 1630	1115.0	1137.7	47.4	22.7	Pipe 1715	58.68	25	110	29.5	0.7	42.73	Open
Junc 1631	1115.0	1137.7	36.0	22.7	Pipe 1716	99.82	50	110	66.4	0.39	6.56	Open
Junc 1632	1110.0	1137.7	36.0	27.7	Pipe 1717	77.31	50	110	29.4	0.17	1.45	Open
Junc 1633	1115.0	1137.9	47.4	22.9	Pipe 1722	110	25	110	18.5	0.44	18	Open
Junc 1634	1115.0	1138.2	47.4	23.2	Pipe 1723	103.64	25	110	9.8	0.23	5.55	Open
Junc 1635	1115.0	1136.2	61.7	21.2	Pipe 1724	36.71	50	110	48.43	0.29	3.66	Open
Junc 1636	1115.0	1137.5	81.7	22.5	Pipe 1725	50.52	50	110	−59.57	0.35	5.36	Open
Junc 1637	1120.0	1136.3	23.3	16.3	Pipe 1726	28.11	100	110	176.63	0.26	1.37	Open
Junc 1638	1120.0	1139.3	33.3	19.3	Pipe 1727	52.98	100	110	140.63	0.21	0.9	Open
Junc 1639	1120.0	1138.1	46.9	18.1	Pipe 1728	155.74	100	110	−62.11	0.09	0.2	Open
Junc 1640	1120.0	1138.0	36.9	18.0	Pipe 1731	92.46	100	110	−156.91	0.23	1.1	Open
Junc 1641	1120.0	1138.0	36.9	18.0	Pipe 1732	61.42	100	110	−328.2	0.48	4.32	Open
Junc 1642	1120.0	1137.9	21.6	17.9	Pipe 1733	49.01	25	110	16	0.38	13.76	Open
Junc 1643	1120.0	1137.9	21.6	17.9	Pipe 1734	50.99	25	110	16	0.38	13.76	Open
Junc 1644	1120.0	1137.5	21.6	17.5	Pipe 1735	45.83	25	110	16	0.38	13.76	Open
Junc 1645	1120.0	1136.4	23.3	16.4	Pipe 1736	48.29	50	110	41.36	0.24	2.73	Open
Junc 1646	1120.0	1135.8	23.3	15.8	Pipe 1737	44.95	50	110	−53.44	0.32	4.39	Open
Junc 1647	1120.0	1136.8	74.9	16.8	Pipe 1738	65.07	50	110	101.9	0.6	14.5	Open
Junc 1648	1115.0	1136.8	34.9	21.8	Pipe 1739	49.59	25	110	18.5	0.44	18.01	Open
Junc 1649	1115.0	1137.1	34.9	22.1	Pipe 1740	39.34	25	110	16	0.38	13.76	Open
Junc 1650	1115.0	1137.1	34.9	22.1	Pipe 1741	91.87	50	110	47.4	0.28	3.51	Open
Junc 1651	1120.0	1137.0	34.9	17.0	Pipe 1742	72.4	50	110	47.4	0.28	3.51	Open
Junc 1652	1115.0	1137.2	37.1	22.2	Pipe 1743	92.5	100	110	−293.07	0.43	3.51	Open
Junc 1653	1120.0	1136.9	37.1	16.9	Pipe 1744	72.28	100	110	−390.02	0.57	5.95	Open
Junc 1654	1115.0	1137.2	37.1	22.2	Pipe 1745	206.01	50	110	36.3	0.21	2.14	Open
Junc 1655	1120.0	1137.0	37.1	17.0	Pipe 1746	84.35	50	110	8.33	0.05	0.14	Open
Junc 1656	1115.0	1137.2	37.1	22.2	Pipe 1747	102.2	50	110	40.39	0.24	2.61	Open
Junc 1657	1120.0	1137.1	33.3	17.1	Pipe 1748	76.15	50	110	−7.75	0.05	0.12	Open
Junc 1658	1120.0	1137.3	43.3	17.3	Pipe 1749	116.64	50	110	38.25	0.23	2.36	Open
Junc 1659	1115.0	1137.3	37.1	22.3	Pipe 1750	70.03	50	110	−11.71	0.07	0.26	Open
Junc 1660	1115.0	1137.2	37.1	22.2	Pipe 1751	122.51	50	110	36.01	0.21	2.11	Open
Junc 1661	1120.0	1137.0	37.1	17.0	Pipe 1753	66.95	100	110	31.16	0.05	0.06	Open
Junc 1662	1120.0	1136.9	37.1	16.9	Pipe 1754	81.55	100	110	−36.9	0.05	0.08	Open
Junc 1663	1110.0	1137.1	39.3	27.1	Pipe 1755	66.4	100	110	−118.9	0.18	0.66	Open
Junc 1664	1120.0	1137.0	37.1	17.0	Pipe 1756	60.74	100	110	−237.07	0.35	2.37	Open
Junc 1665	1120.0	1135.7	21.6	15.7	Pipe 1757	75.25	100	110	−310.04	0.46	3.89	Open
Junc 1666	1120.0	1165.7	76.2	45.7	Pipe 1758	83.82	100	110	−374.65	0.55	5.52	Open
Junc 1667	1115.0	1161.2	34.9	46.2	Pipe 1759	50.88	25	110	25.57	0.6	32.79	Open
Junc 1668	1115.0	1160.8	34.9	45.8	Pipe 1760	70.98	25	110	18.92	0.45	18.77	Open
Junc 1669	1115.0	1160.9	34.9	45.9	Pipe 1761	124.49	25	110	17.21	0.41	15.75	Open
Junc 1670	1110.0	1159.9	39.3	49.9	Pipe 1762	54.67	100	110	−165.43	0.24	1.22	Open
Junc 1671	1110.0	1159.8	39.3	49.8	Pipe 1763	297.12	100	110	−368.78	0.54	5.37	Open
Junc 1672	1110.0	1159.6	39.3	49.6	Pipe 1764	95.44	25	110	−23.3	0.55	27.6	Open
Junc 1673	1110.0	1159.5	39.3	49.5	Pipe 1765	45.81	250	110	1767.11	0.42	1.13	Open
Junc 1674	1110.0	1159.4	39.3	49.4	Pipe 1766	141.78	250	110	1665.28	0.39	1.01	Open
Junc 1675	1115.0	1159.9	54.4	44.9	Pipe 1767	73.24	75	110	166.93	0.44	5.02	Open
Junc 1676	1115.0	1159.9	34.4	44.9	Pipe 1768	63.1	75	110	96.73	0.25	1.83	Open
Junc 1677	1115.0	1161.3	36.0	46.3	Pipe 1769	139.68	75	110	69.86	0.18	1	Open
Junc 1678	1120.0	1161.8	26.0	41.8	Pipe 1770	55.4	75	110	48.25	0.13	0.5	Open
Junc 1679	1120.0	1161.9	26.0	41.9	Pipe 1771	61.41	25	110	23.3	0.55	27.6	Open
Junc 1680	1120.0	1161.4	26.0	41.4	Pipe 1772	43.98	50	110	−10.03	0.06	0.2	Open
Junc 1681	1120.0	1161.4	26.0	41.4	Pipe 1773	81.46	50	110	0.01	0	0	Open
Junc 1682	1115.0	1163.7	46.0	48.7	Pipe 1774	181.11	50	110	−21.59	0.13	0.82	Open
Junc 1683	1115.0	1163.4	46.0	48.4	Pipe 1775	180.2	50	110	−68.52	0.4	6.95	Open
Junc 1684	1115.0	1164.5	46.0	49.5	Pipe 1776	58.92	150	110	278.25	0.18	0.44	Open
Junc 1685	1110.0	1157.5	24.4	47.5	Pipe 1777	109.53	150	110	16.16	0.01	0	Open
Junc 1686	1110.0	1157.6	24.4	47.6	Pipe 1778	108.43	75	110	129.5	0.34	3.14	Open
Junc 1687	1115.0	1159.8	44.4	44.8	Pipe 1779	47.87	50	110	93.29	0.55	12.31	Open
Junc 1688	1105.0	1152.8	23.6	47.8	Pipe 1780	81.53	150	110	−23.14	0.02	0	Open
Junc 1689	1110.0	1160.1	44.4	50.1	Pipe 1781	140.82	150	110	−115.42	0.08	0.09	Open
Junc 1690	1110.0	1160.5	44.4	50.5	Pipe 1782	47.54	150	110	−185.22	0.12	0.21	Open
Junc 1691	1110.0	1161.0	44.4	51.0	Pipe 1783	53.63	150	110	−262.22	0.17	0.4	Open
Junc 1692	1115.0	1162.4	44.4	47.4	Pipe 1784	27.5	150	110	−336.42	0.22	0.63	Open
Junc 1693	1110.0	1157.7	24.9	47.7	Pipe 1785	29.75	150	110	−410.62	0.27	0.91	Open
Junc 1694	1110.0	1159.2	24.4	49.2	Pipe 1786	51.56	150	110	−468.07	0.31	1.16	Open
Junc 1695	1110.0	1159.5	24.4	49.5	Pipe 1787	28.72	150	110	−542.27	0.36	1.52	Open
Junc 1696	1115.0	1161.2	24.4	46.2	Pipe 1788	74.49	150	110	−690.67	0.45	2.38	Open
Junc 1697	1110.0	1132.9	0.0	22.9	Pipe 1789	68.69	50	110	57.38	0.34	5	Open
Junc 1698	1115.0	1133.1	0.0	18.1	Pipe 1791	86.13	75	110	12.6	0.03	0.04	Open
Junc 1699	1115.0	1132.8	39.3	17.8	Pipe 1792	193.28	75	110	−30.74	0.08	0.22	Open
Junc 1700	1115.0	1132.1	67.2	17.1	Pipe 1793	45.45	75	110	−63.53	0.17	0.84	Open
Junc 1701	1115.0	1132.2	47.2	17.2	Pipe 1794	54.02	75	110	−133.93	0.35	3.34	Open
Junc 1702	1110.0	1132.5	57.2	22.5	Pipe 1795	49.21	75	110	−146.88	0.38	3.96	Open

NODE	Ma'an city				LINK	Ma'an city						
ID	Elevation m	Head m	Demand m3/d	Pressure m	ID	Length m	Diameter mm	Roughness	Flow m3/d	Velocity m/s	Unit head loss m/km	Status
Junc 1703	1110.0	1132.3	97.9	22.3	Pipe 1796	103.14	75	110	−213.48	0.56	7.92	Open
Junc 1704	1110.0	1132.4	57.2	22.4	Pipe 1797	92.3	50	110	34.9	0.21	1.99	Open
Junc 1705	1115.0	1132.3	47.2	17.3	Pipe 1798	114.69	50	110	−42.11	0.25	2.82	Open
Junc 1706	1115.0	1132.6	23.4	17.6	Pipe 1799	110.31	50	110	37.1	0.22	2.23	Open
Junc 1707	1110.0	1134.0	67.2	24.0	Pipe 1800	104.68	50	110	37.1	0.22	2.23	Open
Junc 1708	1110.0	1132.4	17.2	22.4	Pipe 1801	171.95	50	110	20.35	0.12	0.73	Open
Junc 1709	1115.0	1132.4	27.2	17.4	Pipe 1802	52.43	25	110	23.3	0.55	27.6	Open
Junc 1710	1115.0	1132.7	23.4	17.7	Pipe 1803	134.47	50	110	37.1	0.22	2.23	Open
Junc 1711	1115.0	1132.6	23.4	17.6	Pipe 1804	59.26	75	110	111.3	0.29	2.37	Open
Junc 1712	1115.0	1132.3	47.2	17.3	Pipe 1805	77.7	50	110	37.1	0.22	2.23	Open
Junc 1713	1115.0	1132.4	47.2	17.4	Pipe 1806	108.54	50	110	37.1	0.22	2.23	Open
Junc 1714	1115.0	1132.4	84.7	17.4	Pipe 1807	70.69	50	110	22.23	0.13	0.87	Open
Junc 1715	1115.0	1132.3	84.7	17.3	Pipe 1808	32.7	50	110	0.63	0	0	Open
Junc 1716	1115.0	1132.9	25.4	17.9	Pipe 1809	77.51	25	110	21.6	0.51	23.99	Open
Junc 1717	1115.0	1130.6	54.7	15.6	Pipe 1810	17.63	200	110	2820.99	1.04	7.94	Open
Junc 1718	1110.0	1133.9	47.2	23.9	Pipe 1811	159.11	200	110	2276.92	0.84	5.34	Open
Junc 1719	1110.0	1132.1	47.2	22.1	Pipe 1812	233.92	100	110	467.87	0.69	8.34	Open
Junc 1720	1115.0	1136.0	36.0	21.0	Pipe 1813	161.39	100	110	503.35	0.74	9.55	Open
Junc 1721	1115.0	1130.3	39.3	15.3	Pipe 1814	94.88	100	110	538.49	0.79	10.82	Open
Junc 1722	1100.0	1133.9	4.4	33.9	Pipe 1815	102.84	75	110	286.26	0.75	13.63	Open
Junc 1723	1110.0	1133.9	44.6	23.9	Pipe 1817	175.22	100	110	419.18	0.62	6.8	Open
Junc 1724	1110.0	1135.5	44.6	25.5	Pipe 1818	35.63	50	110	84.41	0.5	10.23	Open
Junc 1725	1105.0	1133.7	44.6	28.7	Pipe 1819	57.37	50	110	−28.86	0.17	1.4	Open
Junc 1726	1110.0	1132.8	44.6	22.8	Pipe 1820	159.6	100	110	254.07	0.37	2.69	Open
Junc 1727	1115.0	1135.2	44.6	20.2	Pipe 1821	46.42	100	110	214.77	0.32	1.97	Open
Junc 1728	1110.0	1134.9	33.0	24.9	Pipe 1822	67.92	100	110	156.52	0.23	1.1	Open
Junc 1729	1105.0	1135.9	44.6	30.9	Pipe 1823	62.23	100	110	131.74	0.19	0.8	Open
Junc 1730	1105.0	1135.0	53.0	30.0	Pipe 1824	52.75	75	11	−16.5	0.04	2.99	Open
Junc 1731	1110.0	1135.0	33.0	25.0	Pipe 1825	37.92	75	110	−66.16	0.17	0.89	Open
Junc 1732	1105.0	1134.5	44.6	29.5	Pipe 1826	46.73	75	110	−125.8	0.33	2.96	Open
Junc 1733	1110.0	1135.1	33.0	25.1	Pipe 1832	149.78	100	110	599.87	0.88	13.21	Open
Junc 1734	1105.0	1135.1	25.3	30.1	Pipe 1833	204.62	100	110	238.24	0.35	2.39	Open
Junc 1735	1110.0	1134.8	25.3	24.8	Pipe 1834	45.65	50	110	86.99	0.51	10.82	Open
Junc 1736	1105.0	1135.4	53.0	30.4	Pipe 1836	69.73	50	110	−3.02	0.02	0.02	Open
Junc 1737	1105.0	1132.3	52.3	27.3	Pipe 1837	63.61	75	110	117.02	0.31	2.6	Open
Junc 1738	1110.0	1134.9	25.3	24.9	Pipe 1838	147.6	50	110	81.02	0.48	9.48	Open
Junc 1739	1110.0	1133.2	25.3	23.2	Pipe 1840	79.57	25	110	26	0.61	33.82	Open
Junc 1740	1105.0	1134.9	25.3	29.9	Pipe 1841	52.67	150	110	1717.44	1.12	12.86	Open
Junc 1741	1105.0	1135.1	2.9	30.1	Pipe 1842	25.44	150	110	1645.44	1.08	11.88	Open
Junc 1742	1110.0	1134.8	25.3	24.8	Pipe 1843	64.43	150	110	1573.44	1.03	10.93	Open
Junc 1743	1105.0	1135.0	25.3	30.0	Pipe 1844	60.72	25	110	26	0.61	33.82	Open
Junc 1744	1110.0	1134.9	33.0	24.9	Pipe 1845	68.9	25	110	26	0.61	33.82	Open
Junc 1745	1110.0	1135.1	33.0	25.1	Pipe 1846	73.53	200	110	2186.33	0.81	4.95	Open
Junc 1746	1115.0	1136.2	73.3	21.2	Pipe 1847	20.03	200	110	2114.33	0.78	4.66	Open
Junc 1747	1115.0	1135.3	43.3	20.3	Pipe 1848	75.93	25	110	26	0.61	33.82	Open
Junc 1748	1115.0	1135.3	41.7	20.3	Pipe 1849	82.38	25	110	−21.5	0.51	23.79	Open
Junc 1749	1115.0	1136.5	61.7	21.5	Pipe 1850	23.71	50	110	55.61	0.33	4.72	Open
Junc 1750	1115.0	1135.3	41.7	20.3	Pipe 1851	36.25	50	110	−13.19	0.08	0.33	Open
Junc 1751	1115.0	1136.5	61.7	21.5	Pipe 1852	74.54	25	110	24.4	0.58	30.06	Open
Junc 1752	1105.0	1156.9	30.2	51.9	Pipe 1853	71.53	25	110	24.4	0.58	30.06	Open
Junc 1753	1105.0	1159.3	72.3	54.3	Pipe 1854	252.73	25	110	23.6	0.56	28.26	Open
Junc 1754	1115.0	1136.2	73.3	21.2	Pipe 1855	54.32	75	110	389.87	1.02	24.15	Open
Junc 1755	1115.0	1134.9	47.4	19.9	Pipe 1856	30.41	75	110	321.07	0.84	16.86	Open
Junc 1756	1110.0	1158.0	39.3	48.0	Pipe 1857	39.28	75	110	252.27	0.66	10.78	Open
Junc 1757	1110.0	1159.5	39.3	49.5	Pipe 1859	75.4	25	110	24.9	0.59	31.21	Open
Junc 1758	1110.0	1135.1	44.6	25.1	Pipe 1860	44.04	25	110	24.4	0.58	30.06	Open
Junc 1759	1105.0	1135.2	33.0	30.2	Pipe 1861	51.95	25	110	24.4	0.58	30.06	Open
Junc 1760	1105.0	1135.2	33.0	30.2	Pipe 1862	24.01	150	110	1114.45	0.73	5.77	Open
Junc 1761	1110.0	1135.0	47.2	25.0	Pipe 1863	16.95	150	110	1045.65	0.68	5.13	Open
Junc 1762	1110.0	1160.1	34.9	50.1	Pipe 1864	41.49	25	110	24.4	0.58	30.06	Open
Junc 1763	1105.0	1135.7	52.3	30.7	Pipe 1865	191.65	25	110	0	0	0	Open
Junc 1764	1105.0	1135.6	53.0	30.6	Pipe 1866	167.23	25	110	0	0	0	Open
Junc 1765	1110.0	1159.9	39.3	49.9	Pipe 1867	67.78	100	110	−52.83	0.08	0.15	Open
Junc 1766	1110.0	1159.8	80.2	49.8	Pipe 1868	80.86	100	110	−112.58	0.17	0.6	Open
Junc 1767	1105.0	1155.6	0.0	50.6	Pipe 1871	54.28	50	110	89.18	0.53	11.33	Open
Junc 1768	1200.0	1199.7	0.0	−0.4	Pipe 1872	96.03	50	110	87.86	0.52	11.02	Open
Junc 1769	1120.0	1162.2	0.0	42.2	Pipe 1873	100.04	50	110	−54.58	0.32	4.56	Open
Junc 1770	1115.0	1161.4	0.0	46.4	Pipe 1874	89.48	50	110	40.4	0.24	2.61	Open
Junc 1771	1115.0	1161.5	0.0	46.5	Pipe 1875	65.93	100	110	499.49	0.74	9.41	Open
Resvr 1122	1170.4	1170.4	−16386.5	0.0	Pipe 1876	57.26	100	110	298.68	0.44	3.63	Open
Resvr 1123	1200.0	1200.0	−10616.9	0.0	Pipe 1877	64.26	50	110	133.61	0.79	23.95	Open
					Pipe 1878	54.82	50	110	27.12	0.16	1.25	Open
					Pipe 1879	95.04	50	110	−38.5	0.23	2.39	Open
					Pipe 1880	52.57	50	110	17.2	0.1	0.54	Open
					Pipe 1881	59.87	50	110	−17.64	0.1	0.56	Open
					Pipe 1882	54.51	50	110	−38.67	0.23	2.41	Open
					Pipe 1883	74.64	50	110	149.49	0.88	29.49	Open
					Pipe 1884	55.75	50	110	31.12	0.18	1.61	Open
					Pipe 1885	98.33	50	110	−64.73	0.38	6.26	Open
					Pipe 1886	49.68	50	110	−136.76	0.81	25.01	Open
					Pipe 1887	36.79	50	110	15.1	0.09	0.42	Open
					Pipe 1888	39.41	50	110	11.15	0.07	0.24	Open
					Pipe 1889	85.05	50	110	46.63	0.27	3.41	Open
					Pipe 1890	99.67	25	110	18.57	0.44	18.13	Open
					Pipe 1891	68.83	50	110	104.55	0.62	15.21	Open

NODE Ma'an city

ID	Elevation m	Head m	Demand m3/d	Pressure m

LINK Ma'an city

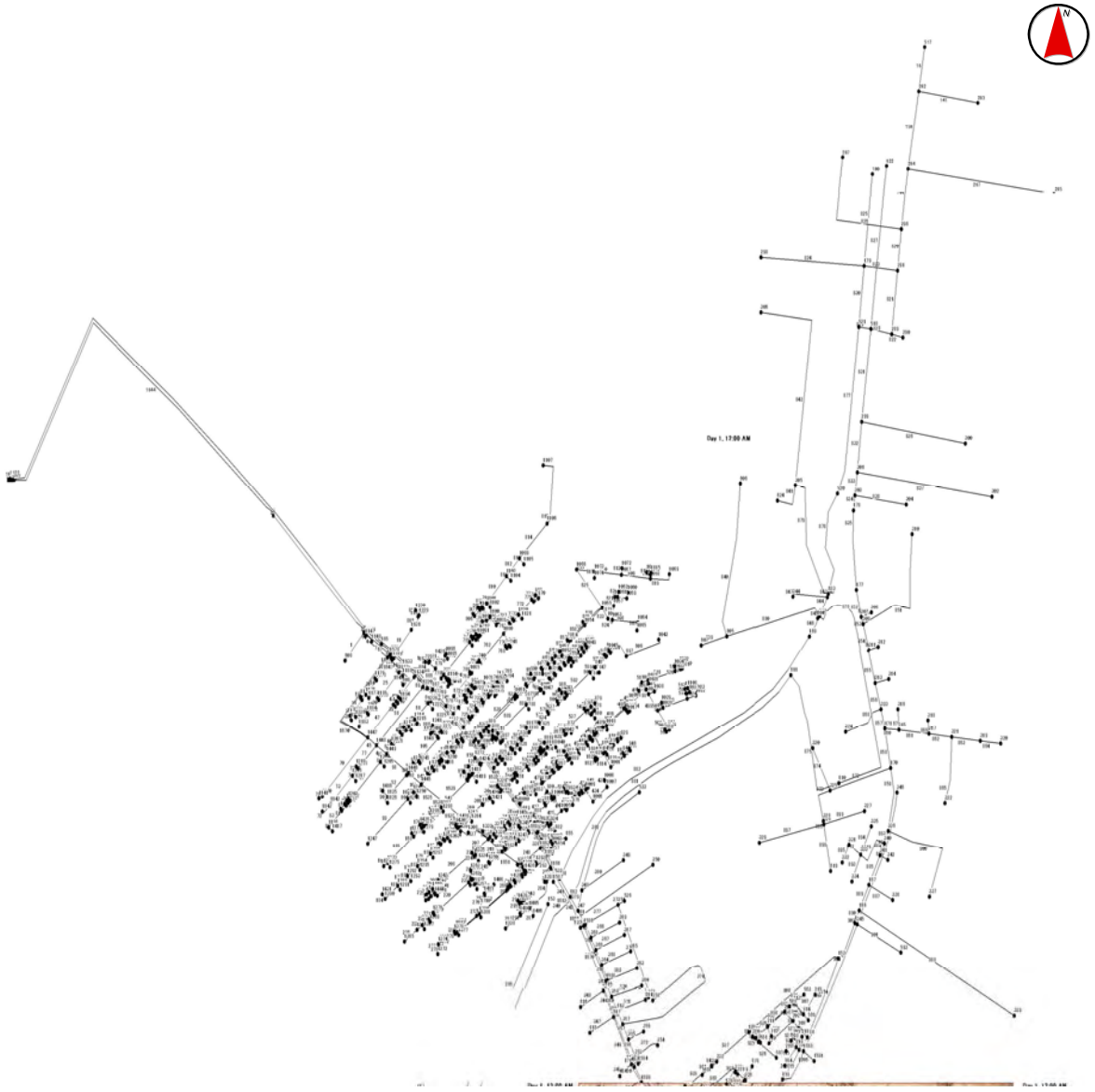
ID	Length m	Diameter mm	Roughness	Flow m3/d	Velocity m/s	Unit head loss m/km	Status
Pipe 1892	47.16	50	110	41.06	0.24	2.69	Open
Pipe 1893	122.79	25	110	16.29	0.38	14.23	Open
Pipe 1894	171.15	50	110	-20.14	0.12	0.72	Open
Pipe 1895	300.05	25	110	4.4	0.1	1.26	Open
Pipe 1896	99.58	25	110	21.74	0.51	24.27	Open
Pipe 1898	30.76	50	110	130.3	0.77	22.86	Open
Pipe 1899	103.58	50	110	42.18	0.25	2.83	Open
Pipe 1900	85.57	25	110	20.66	0.49	22.09	Open
Pipe 1901	56.99	25	110	16.69	0.39	14.87	Open
Pipe 1902	71.19	50	110	24.58	0.14	1.04	Open
Pipe 1903	68.57	50	110	-26.76	0.16	1.22	Open
Pipe 1904	101.6	25	110	6.74	0.16	2.77	Open
Pipe 1905	40.38	100	110	476.01	0.7	8.61	Open
Pipe 1906	134.65	100	110	367.19	0.54	5.32	Open
Pipe 1908	44.83	50	110	55.19	0.33	4.66	Open
Pipe 1909	87.48	50	110	12.53	0.07	0.3	Open
Pipe 1910	93.08	25	110	9.66	0.23	5.4	Open
Pipe 1911	69.45	25	110	-7.73	0.18	3.57	Open
Pipe 1914	114.72	25	110	-5.69	0.13	2.01	Open
Pipe 1915	72.15	50	110	52.14	0.31	4.19	Open
Pipe 1916	105.89	50	110	-21.33	0.13	0.8	Open
Pipe 1917	141.4	25	110	20.47	0.48	21.71	Open
Pipe 1918	125.87	25	110	-2.16	0.05	0.31	Open
Pipe 1013	106.65	50	110	75.08	0.44	8.24	Open
Pipe 1014	63.1	50	110	-79.85	0.47	9.23	Open
Pipe 1020	57.51	50	110	37.03	0.22	2.22	Open
Pipe 1264	49.78	25	110	25.3	0.6	32.15	Open
Pipe 1266	27.83	50	110	66.04	0.39	6.49	Open
Pipe 1268	33.82	50	110	44.97	0.27	3.19	Open
Pipe 1269	116.89	25	110	-4.23	0.1	1.13	Open
Pipe 1270	41.59	50	110	-6.33	0.04	0.08	Open
Pipe 1271	39.58	50	110	-25.36	0.15	1.1	Open
Pipe 1272	111.85	25	110	-6.27	0.15	2.43	Open
Pipe 1276	34.59	50	110	75.89	0.45	8.4	Open
Pipe 1278	28.66	50	110	48.77	0.29	3.71	Open
Pipe 1280	75.88	25	110	-5.88	0.14	2.15	Open
Pipe 1288	55.4	150	110	451.34	0.3	1.08	Open
Pipe 1289	70.94	50	110	102.73	0.61	14.72	Open
Pipe 1294	46.85	50	110	18.66	0.11	0.62	Open
Pipe 1295	49.66	50	110	-65.82	0.39	6.45	Open
Pipe 1297	48.83	25	110	22.37	0.53	25.6	Open
Pipe 1301	45.81	25	110	22.78	0.54	26.47	Open
Pipe 1306	73.77	50	110	-77.6	0.46	8.76	Open
Pipe 1307	44.98	25	110	19.03	0.45	18.97	Open
Pipe 1312	62.96	100	110	156.14	0.23	1.09	Open
Pipe 1313	44.04	100	110	53.64	0.08	0.15	Open
Pipe 1318	52.92	25	110	30.2	0.71	44.62	Open
Pipe 1321	63.62	25	110	-22.86	0.54	26.65	Open
Pipe 1323	47.45	25	110	-18.92	0.45	18.77	Open
Pipe 1336	54.99	50	110	126.28	0.74	21.57	Open
Pipe 1338	44	50	110	33.65	0.2	1.86	Open
Pipe 1342	50.22	25	110	-19.33	0.46	19.53	Open
Pipe 1346	40.66	25	110	-24.27	0.57	29.76	Open
Pipe 1347	109.46	25	110	24.35	0.57	29.95	Open
Pipe 1348	103.86	25	110	-23.05	0.54	27.05	Open
Pipe 1363	87.3	25	110	20.35	0.48	21.47	Open
Pipe 1364	79.25	25	110	-18.95	0.45	18.83	Open
Pipe 1371	87.9	50	110	53.82	0.32	4.44	Open
Pipe 1379	84.78	50	110	14.52	0.09	0.39	Open
Pipe 1382	29.57	25	110	-40.62	0.96	77.28	Open
Pipe 1384	58.33	25	110	-27.91	0.66	38.57	Open
Pipe 1408	94.5	50	110	35.54	0.21	2.06	Open
Pipe 1413	54.95	50	110	-43.7	0.26	3.02	Open
Pipe 1630	102.93	100	110	145.95	0.22	0.96	Open
Pipe 1694	50.12	100	110	104.27	0.15	0.52	Open
Pipe 1752	60.04	25	110	-8.68	0.2	4.43	Open
Pipe 1790	41.41	25	110	-10.86	0.26	6.71	Open
Pipe 1827	58.28	25	110	6.73	0.16	2.76	Open
Pipe 1828	131.55	25	110	18.85	0.44	18.64	Open
Pipe 1829	113.13	25	110	-20.45	0.48	21.67	Open
Pipe 1831	41.53	50	110	-20.87	0.12	0.77	Open
Pipe 1835	43.4	50	110	-41.98	0.25	2.81	Open
Pipe 1869	81.59	50	110	103.59	0.61	14.95	Open
Pipe 1870	59.49	50	110	46.09	0.27	3.34	Open
Pipe 1897	50.62	50	110	-44.84	0.26	3.17	Open
Pipe 1912	50.42	50	110	-62.07	0.37	5.79	Open
Pipe 1913	37.78	50	110	23.23	0.14	0.94	Open
Pipe 1919	34.12	50	110	-36.05	0.21	2.12	Open
Pipe 1920	33.33	50	110	-32.1	0.19	1.71	Open
Pipe 1921	49.48	75	110	336.62	0.88	18.4	Open
Pipe 1922	34.63	75	110	258.52	0.68	11.28	Open
Pipe 1923	60.97	25	110	-30.91	0.73	46.57	Open
Pipe 1924	50.57	25	110	23.59	0.56	28.24	Open
Pipe 1925	54.09	50	110	88.48	0.52	11.17	Open
Pipe 1926	45.74	50	110	24.13	0.14	1.01	Open

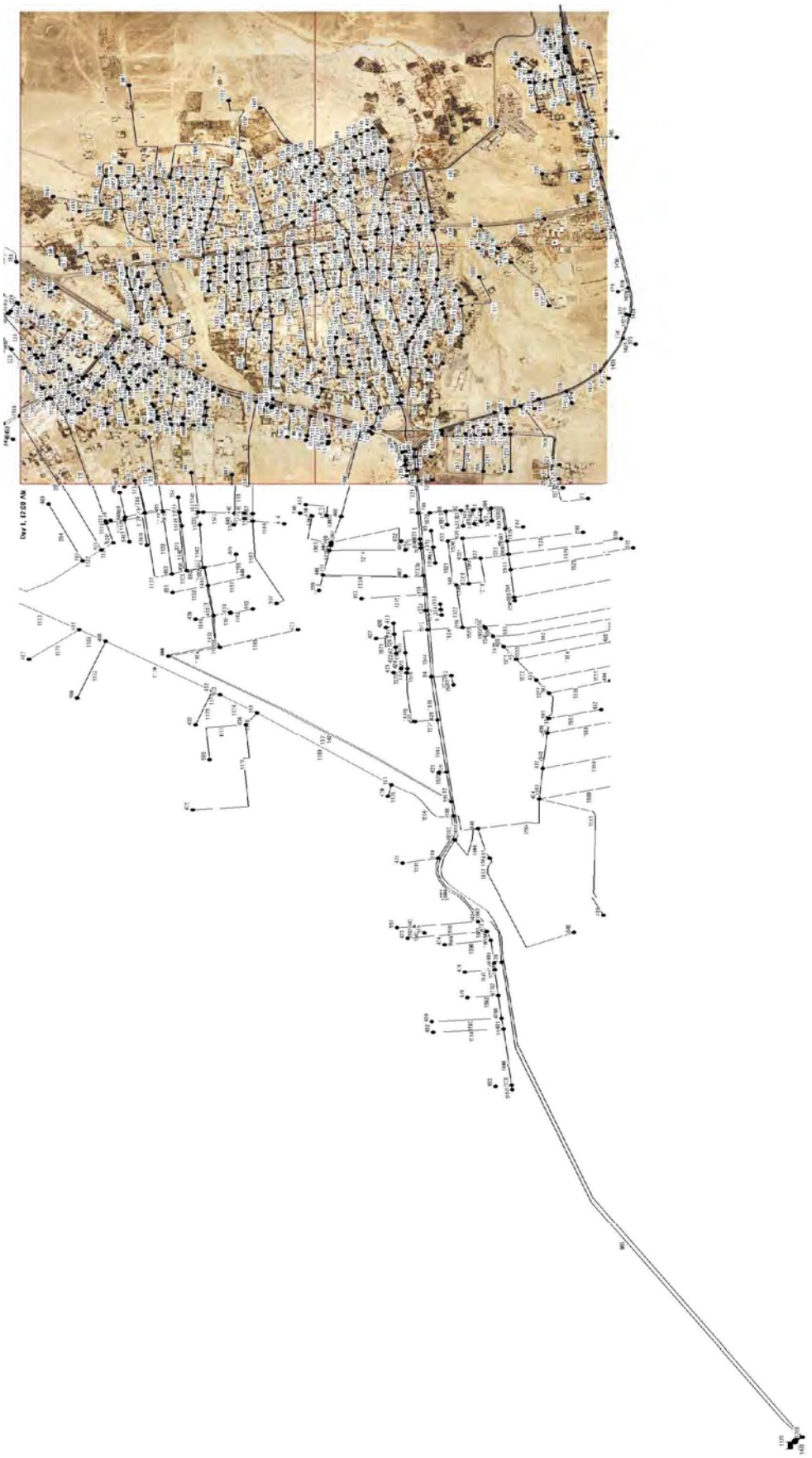
NODE Ma'an city

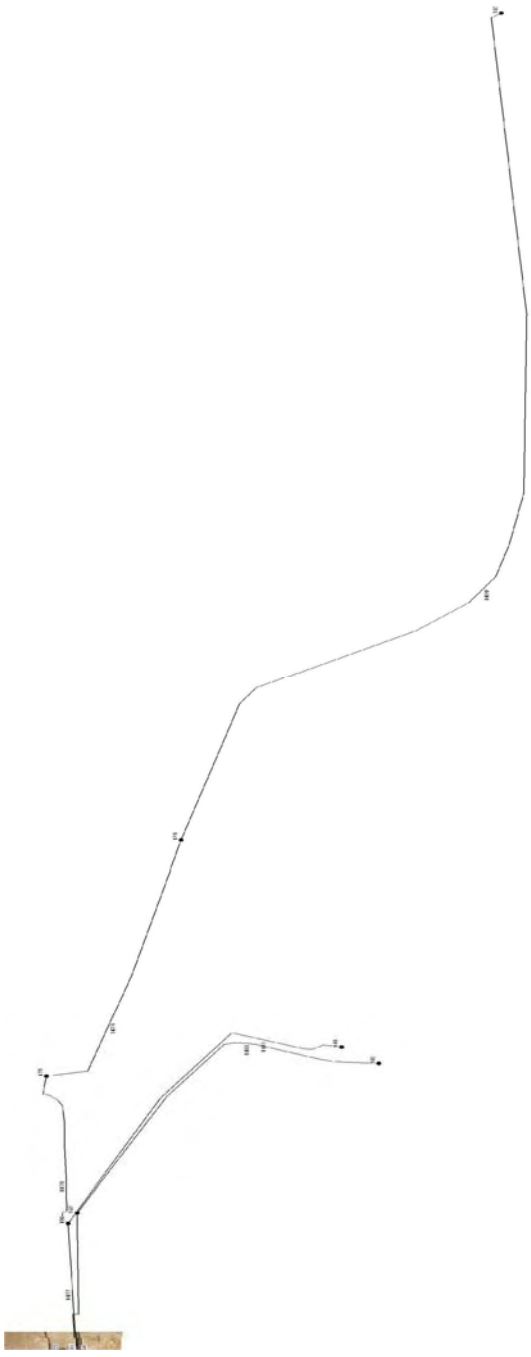
ID	Elevation m	Head m	Demand m3/d	Pressure m

LINK Ma'an city

ID	Length m	Diameter mm	Roughness	Flow m3/d	Velocity m/s	Unit head loss m/km	Status
Pipe 1927	71.74	25	110	−11.35	0.27	7.28	Open
Pipe 1928	24.08	100	110	149.42	0.22	1.01	Open
Pipe 1929	37.02	100	110	110.55	0.16	0.58	Open
Pipe 1930	110.11	100	110	69.82	0.1	0.25	Open
Pipe 1931	38.1	50	110	55.97	0.33	4.78	Open
Pipe 1932	67.49	50	110	28.51	0.17	1.37	Open
Pipe 1933	56.18	100	110	−11.45	0.02	0.01	Open
Pipe 1934	24.39	100	110	−43.02	0.06	0.1	Open
Pipe 1935	33.71	100	110	−74.01	0.11	0.27	Open
Pipe 1936	23.41	100	110	−81.14	0.12	0.32	Open
Pipe 1937	83.79	50	110	78.37	0.46	8.91	Open
Pipe 1938	84.49	50	110	43.47	0.26	2.99	Open
Pipe 1939	87.89	25	110	−36.13	0.85	62.2	Open
Pipe 1940	33.67	50	110	25.71	0.15	1.13	Open
Pipe 1941	125.89	50	110	−11.07	0.07	0.24	Open
Pipe 1942	39.38	50	110	−95.2	0.56	12.79	Open
Pipe 1943	75.3	25	110	16.23	0.38	14.12	Open
Pipe 1944	68.41	25	110	31.83	0.75	49.19	Open
Pipe 1945	56.22	75	110	182.97	0.48	5.95	Open
Pipe 1946	52.47	75	110	107.83	0.28	2.23	Open
Pipe 1947	115.8	75	110	222.5	0.58	8.55	Open
Pipe 1948	43.82	75	110	178.15	0.47	5.66	Open
Pipe 1949	104.27	25	110	5.06	0.12	1.63	Open
Pipe 1950	51.37	50	110	56.14	0.33	4.81	Open
Pipe 1305	60.32	100	110	115.55	0.17	0.63	Open
Pipe 23	32.21	200	110	459.25	0.17	0.27	Open
Pipe 1349	276.79	75	110	281.2	0.74	13.19	Open
Pipe 1366	251.15	50	110	86.4	0.51	10.68	Open
Pipe 1386	96.92	75	110	194.8	0.51	6.68	Open
Pipe 1396	176.27	50	110	91.81	0.54	11.96	Open
Pipe 1674	574.48	75	110	251	0.66	10.68	Open
Pipe 1683	141.69	50	110	19.15	0.11	0.66	Open
Pipe 1684	94.58	50	110	33.25	0.2	1.82	Open
Pipe 281	66.95	300	110	6506.57	1.07	5.18	Open
Pipe 869	64.9	75	110	353.77	0.93	20.17	Open
Pipe 871	293.48	75	110	236.24	0.62	9.55	Open
Pipe 1012	144.16	75	110	177.52	0.47	5.62	Open
Pipe 1390	387.97	75	110	192.12	0.5	6.51	Open
Pipe 1659	262.14	200	110	2957.8	1.09	8.67	Open
Pipe 1662	391.23	75	110	218.67	0.57	8.28	Open
Pipe 1672	44.15	50	100	328	1.93	150.77	Open
Pipe 1673	63.16	50	100	104.58	0.62	18.15	Open
Pipe 1685	244.42	75	110	223.42	0.59	8.61	Open
Pipe 1686	154.62	75	110	172.29	0.45	5.32	Open
Pipe 1687	272.97	150	100	1454.22	0.95	11.27	Open
Pipe 1688	330.07	150	100	1354.28	0.89	9.88	Open
Pipe 1689	5.12	150	110	1454.22	0.95	9.46	Open
Pipe 1016	153.42	100	100	−827.1	1.22	28.57	Open
Pipe 1032	11.62	100	100	99.3	0.15	0.56	Open
Pipe 1260	82.04	300	110	4799.5	0.79	2.95	Open
Pipe 1316	86.34	300	110	4455.3	0.73	2.57	Open
Pump 1658	#N/A	#N/A	#N/A	3335.2	0	−41.89	Open
Pump 1388	#N/A	#N/A	#N/A	2055.17	0	−77.65	Open
Pump 1488	#N/A	#N/A	#N/A	2055.17	0	−77.65	Open







Data 13 Review of Water Supply Plan for Hussiniyyeh, Ashari, and Abu Dnneh in Ma'an Governorate

The review of water supply plan for Hussiniyyeh, Ashari, and Abu Dnneh in Ma'an Governorate is made based on the WAJ existing plan, "Upgrading and Expansion of Water Facilities at Tafieleh and Ma'an (2005)".

(1) Existing water supply system

According to the WAJ existing plan, the water supply system together with corresponding well sources in the target areas is classified as shown in table below. The details of the water supply systems are shown in Figure-1 and a schematic drawing of the water supply system is shown in Figure-2.

Table -1 Classification of Water Supply System together with Corresponding Well Sources

Large system	Small system	Target area	Well source
Hussiniyyeh	Hussiniyyeh	Hussiniyyeh	Al Fujaij、Onaizah
Ashari	Ashari	Ashari	Al Mansheyah、Udhruh
Waji Mousa	Ail&Qa'	Abu Dnneh	Al Qa'、Al Jutha
	Taybah		
	Wadi Mousa		

The elevation difference of the service area in the target areas and their relevant areas is shown in Table-2. The differences in elevation are so small that pressure reducing facilities are not required for the target areas.

Table-2 Elevation Difference of the Service Area in the Target Areas and Relevant Areas

Area	Min elevation	Max elevation	Difference
Hussiniyyeh	1045	1080	35
Hashammiyyeh	1050	1069	19
Ashari（Manshiyyeh Jarba Kbiereh, Jarba Sghiereh, Edrah)	1270	1335	65
Abu Dneeh	1470	1540	70
Ail	1410	1470	60
Basta	1410	1510	100
Qa'	1394	1425	31

The average age of distribution pipe of Husseniyah and Husseniyah are shown in Table below. The average age is around 10 years and relative young pipes.

Table-3 Average Age of Distribution Pipe and Pipe Length

Area	Length (km)	Average age (year)
Husseniyah	23.4	7.2
Husseniyah	17.2	9

Source: WAJ Ma'an office

The pipe data of Ashari and Abu Dnneh are not available. Therefore, the pipe data of Waji Mousa, which includes the target areas, is shown in table below. Most pipes are composed of 10 years or more than 30 years' old pipes.

Table-4 Pipe age data of WAJ Waji Mousa Office

No.	Age	Length (km)	Ratio (%)
1	30 years old or more	138	48
2	Around 25 years old	3	1
3	Around 10 years old	122	42
4	5 years or less	8	3
5	No data	16	6
Total		287	100

Source: WAJ Waji Mousa office

The relevant distribution and transmission reservoirs are shown in Table-5. In the target areas, there are distribution reservoirs only in Husseniyah and Husseniyah, the volume of which is only 255m^3.

Table-5 relevant Transmission and Distribution Reservoir

Area		Structure	Capacity (m^3)	Altitude (m)	Water supply method
Hussiniyyeh	Hussiniyyeh	Steel	55	1110	Gravity flow
	Hashemiyyeh	Concrete	100 100	1076 1086	Gravity flow
Wadi Mousa	Jaththa	Concrete	2,000	1522	Pumping to Taybah tank and Qa' Tank Q, H=180m3/m, 215 m, 3 sets
	Qa'	Concrete	4,500	1410	Pump for Ail Tank 2 Q/H=220m3/m, 170m, 2 sets for Wadi Mousa 3 Q/H=180m3/m, 150m, 3 sets
	Ail	Concrete	4,500	1522	Gravity flow

Source: Consolidated Consultants、Upgrading and Expansion of Water Facilities at Tafieleh and Ma'an（2005）and WAJ office

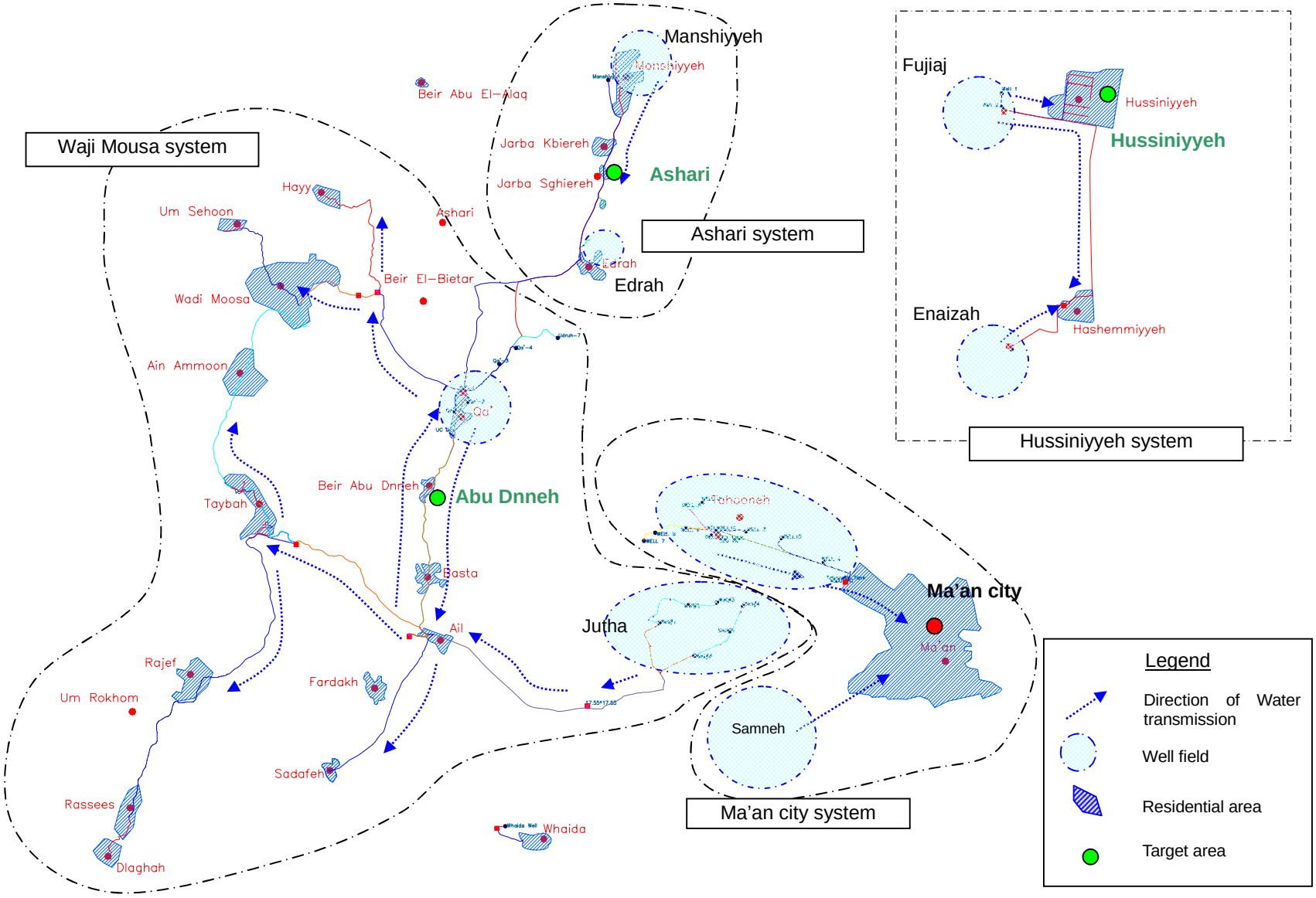


Figure-1 Water Supply System including Target Areas

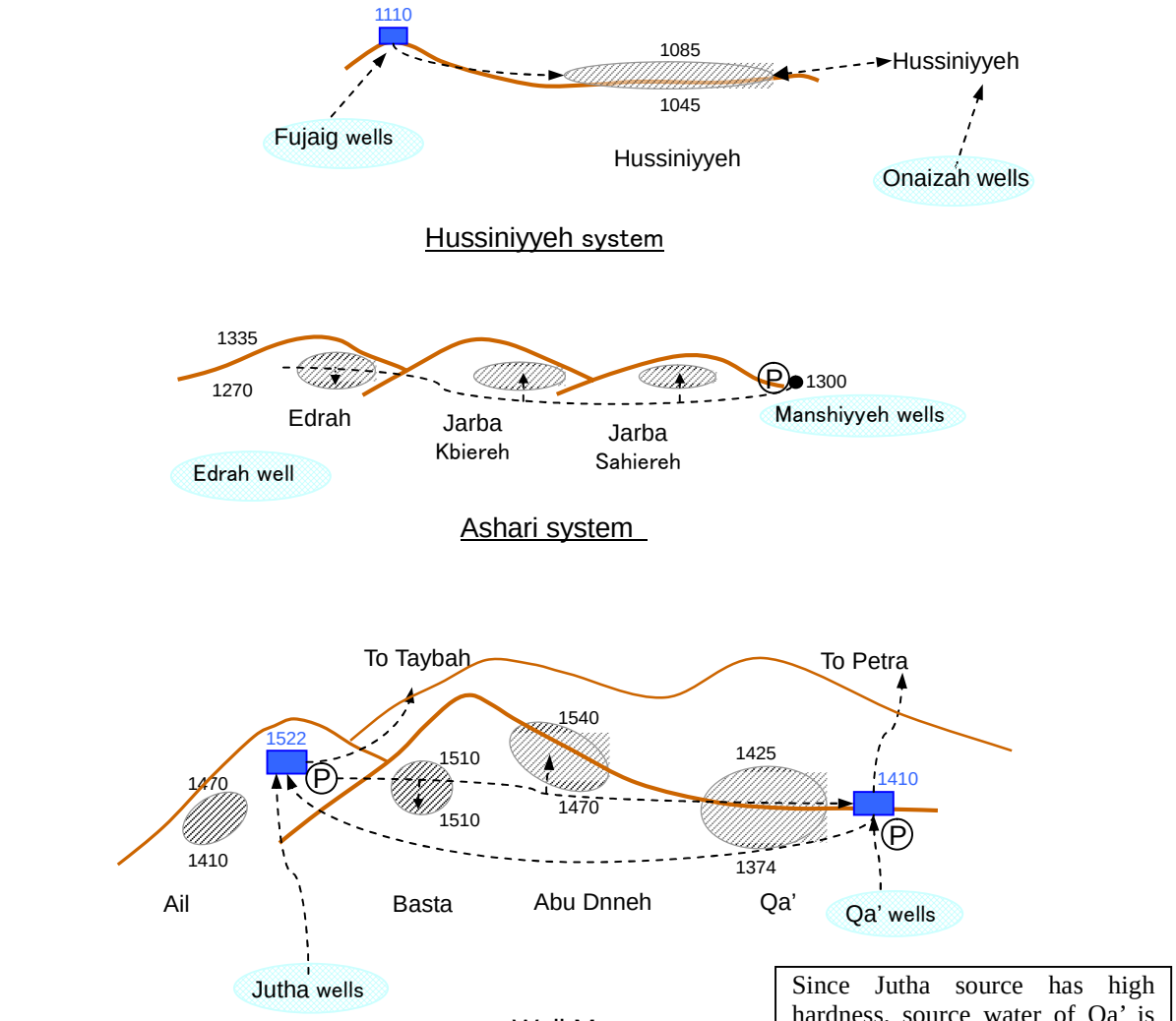


Figure-2 Schematic Layout of Water supply System in Target Area

(2) Problems of water supply system

The water supply situation of the target areas together with the problems of water supply facilities is shown in table below.

Table-6 Water Supply Situation of the Target Areas and Problems of Water Supply Facilities

Area	Water supply situation	Problems of Water Supply Facilities
Hussiniyyeh	• Daytime every day	• The storage volume of distribution reservoir is only 55 m3 and its capacity is far enough. I n addition, the capacity of distribution mains is also not enough. • The half of network was renewed but aged pipe is still remained.
Ashari	• 2 days /week	• Water cannot supply by gravity to the service area since there is no reservoir and distribution mains.
Abu Dnneh	• 8 hours per day	• Water cannot supply by gravity to the service area since there is no reservoir and distribution mains. • Currently, water is directly supplied from the transmission pipe from Qa' pumping station to Ail reservoir. Therefore, water supply pressure is very high, which makes operation and maintenance of the network difficult.

To solve or improve these problems, the following countermeasures area required for the target area.

Table-7 Required Countermeasures to Water Supply Problems

Area	Required Countermeasure
Hussiniyyeh/ Hashemmiyyeh	1. Constriction of adequate volume of a distribution reservoir and installation of distribution main to the service area 2. Renewing of remaining aged pipe lines
Ashari	1. Constriction of adequate volume of a distribution reservoir and installation of distribution main to the service area
Abu Dnneh	1. Constriction of adequate volume of a distribution reservoir and installation of distribution main to the service area

(3) Preliminary water supply plan

1) Planning review conditions

- Hussiniyyeh and Hashemmiyyeh is connected each other by one transmission mains. Therefore, planning review shall be made for these areas as one water supply system.
- The target area, Ashari, is equivalent to Ashari water supply system. Therefore, this area's plan shall be reviewed as Ashari water supply system as a whole.
- Abu Dnneh is one of the very small areas of a large regional water supply system. It is unrealistic to review a water supply plan for a large regional water supply system only for

such small target area. Therefore, only water supply plan for Abu Dnneh shall be reviewed.

- Planning review for water supply facilities shall be only for trunk water supply system since distribution network data is not available.

2) Planned water supply service population

The future population of the target areas is estimated up to the year of 2025 based on the same conditions of the main text of this report, and the future water supply service population is estimated as 100%. The result is shown in table below.

Table-8 Future Planed Service Population

Water supply system	Target area	2009	2010	2015	2020	2025
Hussiniyyeh	Hussiniyyeh	7,057	7,200	7,950	8,650	9,320
	Hashemmiyyeh	2,832	2,890	3,190	3,470	3,740
	Sub-total	9,889	10,090	11,140	12,120	13,060
Ashari	Ashari	4,450	4,550	5,030	5,470	5,900
Ail	Abu Dnneh	867	880	970	1,060	1,140

3) Planned water demand

a. Demand estimation conditions

The water demand of the target areas is estimated based on the following parameter values, which are prepared considering the water demand estimation conditions of Tafieleh city and south area in the main text, and Ma'an city in the Data in appendix. The parameter values are summarized in the table below.

Table-9 Water Demand Estimation Conditions

Item	Unit	2008 Actual	2010	2015	2020	2025 年
Leakage ratio	%	—	30	25	20	15
Non-revenue water ratio	%	57	57	45	35	25
Administration loss	%	—	27	20	15	10
Average water consumption per capita per day(excl. leakage)	L/c/d	161	160	150	140	130
Average water supply amount per capita per day	L/c/d	230	229	200	175	153
Planned maximum day coefficient	-		1.5	1.5	1.5	1.5
Time coefficient	-		2	2	2	2
Reservoir volume				12 hours of daily max demand		

b. Planned water demand

The planned average and maximum daily water supply amounts are estimated in the table below from the planned population and the demand estimation conditions as shown in table below

Table-10 Water Demand Estimation

(m^3/day)

Target area	Average daily water supply amount				Average maximum water supply amount			
	2010	2015	2020	2025	2010	2015	2020	2025
Hussiniyyeh	1,646	1,591	1,514	1,426	2,469	2,387	2,271	2,139
Hashemmiyyeh	660	639	608	572	990	959	912	858
小計	2,306	2,230	2,122	1,998	3,459	3,346	3,183	2,997
Ashari	1,040	1,007	958	902	1,560	1,511	1,437	1,353
Abu Dneeh	201	195	185	174	302	293	278	261

4) Demand and supply balance

The actual average daily water production by water supply source is summarized in Table-11. The water source potential is estimated in Table-12 assuming 20 hours pumping at source of the actual yield (m^3/hour) in the production test.

Table-11 Actual Average Daily Water Production (Water Intake Amount)

(m^3/day)

Water source	Water supply area	Target area	2007	2008	2009
Onaizah+Fujaij	Hussiniyyeh and Hashemmiyyeh	Hussiniyyeh and Hashemmiyyeh	1,965	2,130	1,862
Manshiyyeh と Edrah	Ashari	Ashari	1,436	1,578	1,513
Jutha	Petra, Thayba etc. for regional supply area	Abu Dnneh	4,121	4,612	4,679
Qa`	Petra, Thayba etc. for regional supply area		2,413	2,188	1,528

Table-12 Estimation of Water Source Potential

Source well	Actual yield in the production test (m^3/h)	Estimated water source potential (m^3/day)
Jutha	606	12,120
Manshiyyeh と Edrah	209	4,180
Qa'	390	7,800
Fujaij+Onaizah	201	4,020

The water balance in 2015 between the water demand and source potential is shown in table below. The water balance of Abu Dnneh was not taken since it is located in the large regional water supply system. The water demand of Hussiniyyeh and Ashri systems is below the water source potential. As for Ashari, the planned water demand in 2015 is below the actual production in 2009. Therefore, the water demand of two areas is estimated to be met with the exiting water resources.

Table-13 Water Demand and Supply Balance

Water supply system	Target area	Average daily water supply amount in 2015	Maximum daily water supply amount in 2015	Average daily water production in 2009	Water source potential
Hussiniyyeh	Hussiniyyeh	1,591	2,387	—	—
	Hashemmiyyeh	639	959	—	—
	Sub-total	2,230	3,346	1,862	4,020
Ashari	Ashari	1,007	1,511	1,513	4,180
Ail	Abu Dneeh	195	293	—	—

5) Trunk water supply facility plan

a) Distribution reservoir

The planned volume of distribution service reservoir is calculated in the table below as 12 hours storage volume of the maximum daily water supply amount in 2015.

Table-14 Calculation of Required Volume of Service Reservoir in 2015

Water supply system	Target area	Maximum daily water supply amount in 2015 (m^3/day)	Required Reservoir Volume (m^3)
Hussiniyyeh	Hussiniyyeh	2,387	1200
	Hashemmiyyeh	959	500
	Sub-total	3,346	1700
Ashari	Ashari	1,511	800
Ail	Abu Dnneh	293	200

b) Transmission and distribution mains

The planned length of transmission and distribution mains is estimated in the table below based on the WAJ existing plan.

Table-15 Planned Length of Transmission and Distribution Mains

(km)

Diameter	Hussiniyyeh	Ashari	Abu Dnneh
63 mm	20.7	0	0
100 mm	10.2	0	2.5
150 mm	0	1.8	0
200 mm	2.5	0	0.2
Total	33.4	1.8	2.7

The planned trunk facilities are shown in the figure below.

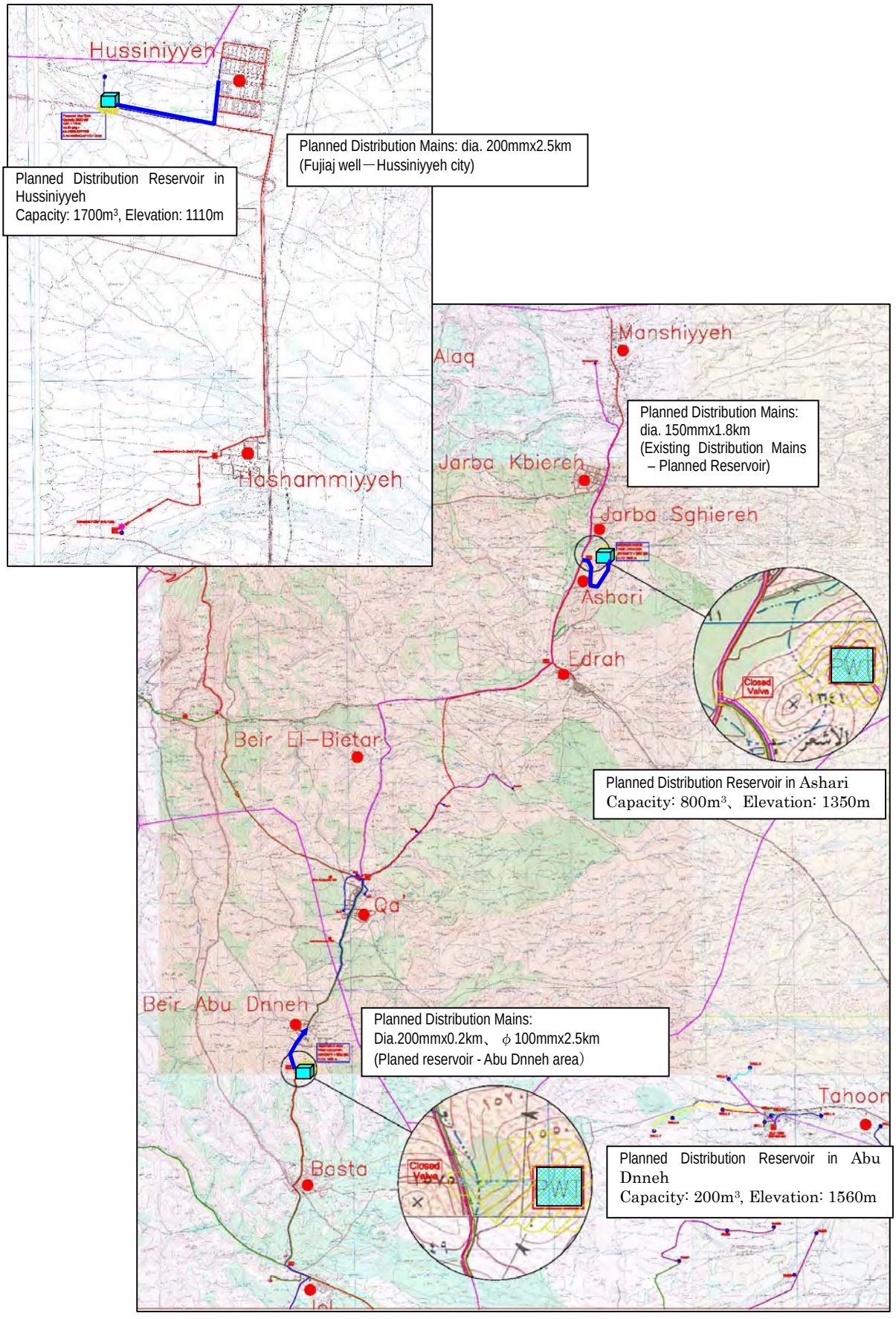


Figure-3 Planned Distribution Reservoir and Transmission and Distribution Mains

Data 14. Study of the Project as Grant Aid for Environment and Climate Change Measures

80% of the land in Jordan is desert or wasteland. Average annual precipitation is 200 mm and Jordan belongs to the desert region. Per capita water resources in this country is 155m^3 (2006) and extremely small compared with global average of 7,700 m^3. As for groundwater which is main water resource in Jordan, groundwater drawdown and salination occur by over pumping due to increasing of water demand and rapid population growth including refugees and returnees. Therefore, NWMP aims to limit pumping discharge to renewable amount by 2020 and reuse treated sewage for agriculture and industry as alternative water resource.

Figure 1 shows annual precipitation and temperature in past nine years in the target area of Tafieleh governorate (Source: Geographic department, 2010). As for topographic condition, Tafieleh area is located at hilly plateau area with elevation of 1200 to 1400m. The average annual precipitation in Tafieleh is 209mm and is equivalent to the national average.

Temperature in past nine years has not changed significantly, however, precipitation trends to decrease year by year. Drinking water in the target area of the Project is taken as nearly 100% from groundwater, and securement of water resources in the future is concerned by reduction of water recharge amount to groundwater. As mentioned above, if decreasing trend of precipitation due to climate change is intensified, access to safe water will be difficult for the people.

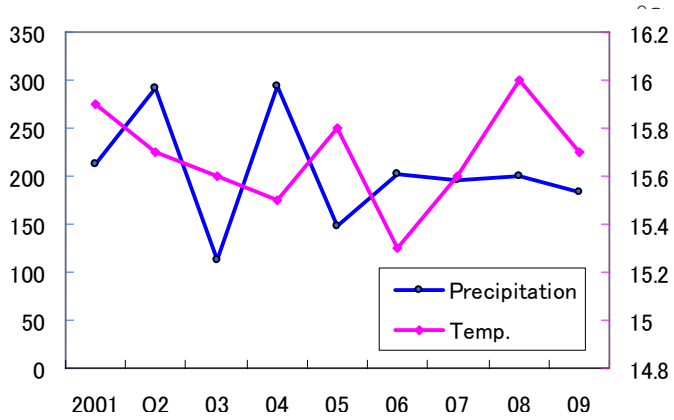


Figure 1 Precipitation and temperature in Tafieleh

Power consumption for intake and transmission pump is reduced by the improved water leakage amount, since water distribution can be increased by improvement of non-revenue water in the Project. Effective and fair water supply of the limited water resources is also garanteed to local people in the target area by improvement of effeciency of the existing water supply system. The reduction of power consumption and CO_2 emission contributes countermeasures for global warming caused by climate change.

(1) Reduction of water leakage

The difference between with or without improvement for pipeline and adjustment for appropriate pressure in the target year of 2015 is shown in Table 1 as an improvement impact.

Table 1 Improvement of Leakage (2015)

Items	Daily average water demand (m^3/day)	Daily average water supply(including water leakage) (m^3/day)	(1) water leakage amount (without improvement) (m^3/day)	(2) water leakage amount (with improvement) (m^3/day)	(3) Improvement impact (1)-(2) (m^3/day)	Improvement impact (m^3/year)	Improved ratio (%) (3)/(1)
Pipe replacement area	5,948	7,000	1,983	1,052	930	339,511	47%
Existing pipe area	2,815	3,646	938	831	0	0	0%
Total	8,763	10,646	2,921	1,883	1,038	351,860	

The improved water amount in 2015 is approximately 938 m^3/day and is equivalent to amount which can be supplied to 7,500 people in case that water demand per capita is 125 liters.

On the other hand, all water resource of water supply system is groundwater and pump equipment is required for intake water. Power consumption per one cubic meter is calculated by the relation between annual total transmission water and power consumption of pumping station and the result is shown in Table 2.

Table 2 Power consumption per 1 m^3

Annual power consumption (kWh/year)	Intake and transmission water amount (m^3/year)	Power consumption per 1m^3 (kWh/ m^3)
14,597,565	4,141,955	3.52

(Source：WAJ Operation and Management record in 2009)

The improved power consumption and CO_2 emission is calculated from the power consumption per 1 m^3 in Table 2 and the improved water amount in Table 1. The improved (Saving) electrical energy and the CO_2 reduction are shown in Table 3.

Table 3 Reduced electrical energy and CO_2

Reduced water amount (m^3/year)	Unit electric power (kWh/m^3)	Reduced electrical energy (MWh/year)	CO_2 reduction (*) (ton/year)	Electric power cost (JD)
339,511	3.52	1,195	741	51,388

Note)

(*): Emission coefficient related to CO_2 reduction (Emission Coefficient: tone CO_2 e/Mwh), UN, CDM Executive Boad According to Clean Development Mechanism Simplified Project Design Document for Small-Scale Project Activities (SSC-CDM-PDD, Dec 2006), emission coefficient (ton-CO_2 e/Mwh) is 0.557.
In the Report on JICA project study and progress (Dec 2008), emission coefficient is 0.62 kg-CO_2/kWh. In the Project,

0.62 in the materials of JICA (2006) is adopted as the latest information.

According to table, the reduced electrical energy is 1,195 MWh/year and CO_2 reduction is ton-CO_2 e./year.

(2) Improvement of efficiency for Erawath pumping station.

As for topographical condition in the study area, the elevation of intake locations for groundwater is lower than the one of distribution area and difference of elevation is large because of hilly area, therefore, pump equipment is required for water transmission.

Equipment in Erawath pumping station has an abnormal sound from erosion of pump bearing and leakage from roller bearing due to aging. In case of breakdown of pump/motor, the secondhand pump with similar specifications of previous equipment is provided from warehouse of WAJ and the pump which doesn't correspond to designed specifications is installed. Moreover, the pump efficiency is extremely low due to aging pump. The meter reading of pump efficient, discharge volume and pressure is not possible in the field since electric measurement instrument has been broken. The efficiency of existing pump is estimated by following verification.

Water supply service in the service area is not satisfied, however, minimum volume of water supply is carried out. The estimation of pump discharge, which considers pump operation time for current required water demand (Gharandal: 24 hours/week, Qhadesiyeh: 60 hours/week), is shown in below.

Gharandal:	0.14m^3/min
Qhadesiyeh:	0.57m^3/min
Head:	380m (for Qhadesiyeh)

According to above condition, the pump efficiency is estimated by following formula.

(0.163 x flow x head)/pump efficiency x motor safety ratio (1.1) = motor output power (151kWh)*

* The total output power of two pumps is calculated as 151 kWh from WAJ data in 2009.

The pump efficiency is estimated to be 30% on average. The designed efficiency of existing pump is generally up to 60% and it means that it deteriorates at half of maximum value.

<u>In case that pump replacement is implemented in the Project</u>

Motor outlet power is calculated to be 67.35 kWh by same condition (flow and operation time). Multiplying unit electric power by operation time gives the annual power consumption of 213,770

kWh. The electrical energy is improved to be 446,490 kWh (68%) compared with the current annual power consumption of 660,260 kWh (WAJ data).
Furthermore, water transmission flow and discharge pressure increases and operation time becomes longer, the annual average electric energy which meets designed condition is calculated in Table 4.

Table 4 Annual power consumption and cost

Item	Gharandal	Qhadesiyeh	Total
Motor load (kWh)	32	88	120
Operation time/year	8,760	8,760	17,520
Annual power consumption (kWh)	282,973	772,443	1,055,416

In case that pump replacement is not implemented in the Project and existing pump is used continuously

Power consumption for existing pump by same condition of Table 4 is obtained by following formula.
Power consumption before improvement (kWh/year) = Power consumption after improvement (kWh/year) / (1-Improved rate (%))
1,055,417/0.32＝3,298,177（kWh/year）

Therefore,

- The improved annual electric energy is calculated in below.
  3,298,177kWh-1,055,417kWh=2,242,760kWh/year
- The annual reduced CO_2 is approximately 1,391 ton.
  CO_2 reduction=2,242,760 (kWh)x 0.62(kg- CO_2e/kWh) = 1,390,511.2 (kg-CO_2/year)

The following electric energy and CO_2 is reduced for the year by pipe replacement for leakage control and replacement of pump equipments in Erawath pumping station.

Item	Annual electric energy (MWh)	Reduced CO_2 (ton)	Electric power cost (JD)
Leakage control	1,195	741	51,388
Pump replacement	2,243	1,391	96,439
Total	3,438	2,132	147,827

The reduce CO_2 is equivalent to approximately 108 persons in case that annual discharge volume per capita is 9.97 ton.*
(* Announcement of Tokyo metropolitan in 2006)

Attachment

(1) Estimation of CO_2 reduction impact and electric energy by reduction of water leakage amount

Table 1 Reduced water leakage amount in 2015

	2015						
			(1)	(2)	(3)	(4)	(5)
	Daily average water demand	Daily average water supplyt (including leakage)	Improved	Unimproved	Impact of improvement (1)-(2) (m3/day)	Impact of improvement (m3/day)	Improved ratio (%) (3)/(1)
Tafieleh							
Tafieleh	2,959	3,482	986	523	463	169,105	
Bsaira	1,298	1,528	433	230	203	74,071	
Gharandal	646	761	215	114	101	36,877	
Qhadesiyeh	1,045	1,230	348	185	163	59,458	
Improved area	5,948	7,000	1,983	1,052	930	339,511	47%
Unimproved area	2,815	3,646	938	831			
Total	8,763	10,646	2,921	1,883	1,038		36%
Ma'an							
Improved area (old town)	3,451	4,064	1,479	613	866	316,090	59%
Unimproved area	3,789	5,053					
Total	7,240	9,117	3,462	1,665	1,796	655,601	52%

As for topographical condition in the study area, the elevation of groundwater intake locations is lower than the one of service area and difference of elevation is large due to hilly area, therefore, pump equipments is required for water transmission and distribution. Power consumption per one cubic meter is calculated by the relation between annual total transmission water and power consumption of pumping station and the result is shown in Table 2.

Table 2 Power consumption per 1 m^3

Area	Annual power consumption (kWh/year)	Intake and transmission water amount (m3/year)	Power consumption per 1m3 (kWh/ m3)
Tafieleh	14,597,565	4,141,955	3.52
Ma'an	4,141,955	3,420,899	1.21

(Source: WAJ data in 2009)

Table 3 Reduction Impact (1)

Area	Impact of improvement in 2015 (m^3/year)	Reduced electric energy (kWh/year)	Reduced annual reduced poweer cost (JD) (0.043JD/kWh)	Electric energy without improvement		Improved ratio (%)
				(kWh/year)	(kWh/day)	
Tafieleh	339,511	1,195,078	51,388	2,547,202	109,530	47%
Ma'an	316,090	382,469	16,446	653,200	28,088	59%
Total		1,577,547	67,835	3,200,402	137,617	49%

Area	Impact of improvement in 2015 (m^3/year)	Reduced electric energy (kWh/year)	CO2 reduction	
			kgCo2/kWh	kg
Tafieleh	339,511	1,195,078	0.62	740,948
Ma'an	316,090	382,469	0.62	237,131
Total	655,601	1,577,547		978,079

741 ton-co2/yer

Estimation of CO_2 reduction impact and electric energy by improved efficiency of pump equipment in Erawath pumping station

I. Power saving by Pump replacement (2010)

1	Power consumption		**660,260**	kWh/day/year	WAJ data from actual record of 2009…(1)	
			1,809	kWh/day		
	Current operation hours		12	hourrs/day		
	Total load of pump		150.74	kW	Daily power consumption/operation hours	
2	Exsisting pump flow and head					
	Required water supply in 2010	(Gharandar)	719	m3/d	1.00	m^3/min
		(Qadesiya)	1,145	m3/d	1.59	m^3/min
	Total		1,864	m3/d		
	Current water supply					
	Basic water supply amount is 12hours in 24hours of above water supply.					
	Pump flow	(Gharandar: G)	359.5	m3/d	0.50	m^3/min
	Pump flow	(Qadesiya: Q)	572.5	m3/d	0.80	m^3/min
	Total		932	m3/d	1.29	m^3/min
	Alternate operation of each	G:2 days/ week, Q: 5days/week		(Gharandar)	**0.14**	**m^3/min**
				(Qadesiya)	**0.57**	**m^3/min**
				Subtotal	**0.71**	**m^3/min**
	Head	Pressure gauge in the outlet			**350**	**m**
3	Efficiency of existing motor=	$(0.163 * Q*H * 1.1) \div 151$kwh				
	=	44.59 /151				
	=	0.30	**30%**			
4	Pump shaft power of replaced pump in case of same flow with existing pump					
	Pump shaft power of replaced pump is assumed as 60%.				Note)	
	Pump shaft powe	(Gharandar)	8.72	kW	Head 225m, Flow 0.14m3/min	
	Pump shaft powe	(Qadesiya)	58.63	kW	Head 380m, Flow 0.92 m3/min	
5	Power consumption	(Gharandar)	230.21	kWh/week	2 days/week x 12 hours	24 hours
		(Qadesiya)	3869.71	kWh/week	5 days/week x 12 hours	60 hours
		Total	4,099.92	kWh/week	(Safety factor x 1.1)	
	Annual power consumption	Calculated by 52 w	**213,770**	kWh/year	…(2)	
	Annual power saving amoun	=(1)-(2)	**446,490**	kWh/year	**68%**	
	Annual power saving cost		**19,199**	JD	Power saving ratio is more than current condition.	

II. Operation and maintenance cost of the replaced pump in the Project (Electric power cost)

Operation condition

	Gharandar	Qadesiya
Flow(m3/min.)	0.53	0.85
Head (m)	225	380
Efficiency (%)	60%	60%
Operation hours (/day)	24	24

Daily average water flow (m3/d)

Gharandar	Qadesiya
761	1,230

	Gharandar	Qadesiya	Total	
Motor load (kWh)	32	88	120	
Operation hours/year	8,760	8,760	17,520	
Annual power consumption	282,973	772,443	**1,055,417**	…(3)
Annual power cost (JD)	12,168	33,215	45,383	

III Impact of power saving (2015)

1 Without replacement of pump

(1)÷(1-Saving ratio) =Power consumption before pump is replaced.

= 1,055,417÷(1-68%)

= **3,298,177** (kWh/yeart) …(4)

2 Impact of saving

Power saving amount (4) − (3) = **2,242,760** kWh/year 2,243 MWh/year

Power saving cost= **96,439** JD

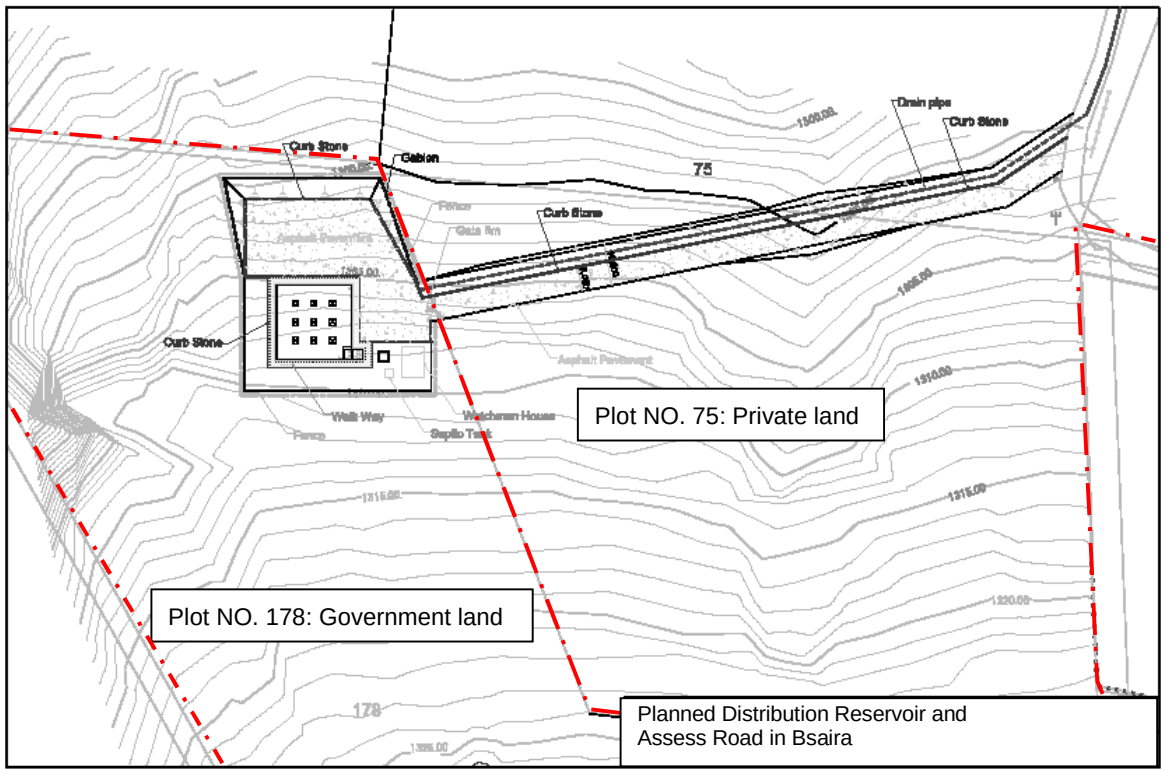
Reduction amount of CO_2 (0.62kg−CO_2/kWh)

= 1,390,511 kg-co2/year

1,391 ton/year

Data 15. Planned Assess Road for Planned Distribution Reservoir in Bsaira and Gharandal

1. Planned Bsaira Distribution Reservoir



2. Planned Gharandal Distribution reservoir