Supporting Report – 5

Transmission/Distribution Network Analysis

Supporting Report 5.1 Transmission/Distribution Network Analysis

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1 Simulation Criteria

1.1 System Requirements

According to the Master Plan, the main requirements for the 2010 system are:

- a significant improvement of the water supply towards the southern part of the city, especially Ta Khmau, Mean Chhey and Dankao area;
- the dismissal of current low-pressure areas in Ta Khmau, Trapeang Krasang, Chaom Chau, Phnom Penh Thmei;
- the balancing of water pressures in the North and West areas, thanks to the loops created.

The minimum supply head to be adopted is 20 meters, at any supply outlet – the targeted value being 30 m as from 2015.

Table SR5.1.1: System Requirements for Simulation in 2010

Hydraulic grade	In the main network Everywhere as result	< 55.0 m > 30.0 m	
	Distribution system	> 20.0 m	
Velocity	Diameter	Max.	Min.
	> 1000 mm > 500 mm < 500 mm	1.6 m/s 2.2 m/s 1.8 m/s	0.2 m/s 0.3 m/s 0.3 m/s
Water Demand	Hourly coefficient	1.63	0.37
Loss rat	Stable for 2005-2020	1.15	
Energy cost	Kw/h reference	US$ 0.13	
Pipe material	Transmission	Ductile Iron	
	Distribution	HDPE if < 225	
C value (Hazen & Williams)	Ductile Iron	130	
	HDPE	150	
	Smooth steel pipe	110	

1.2 Reference Indicators

Our analysis evaluates action results and compares alternatives based on data observed at a few key points. It must be strongly underlined that the Master Plan refers to an “objective” reference state of the network which is supposed to be achieved in 2020.

At each implementation stage the positioning and sizing of facilities must be driven by the perspective of this final objective. As a result some transmission line segments that are planned in the first (2010) implementation stage might appear oversized if the vision is limited to the 2010 (or 2015) demand forecast and supply planning. These elements are highlighted and explained in the global Master Plan presentation.

The reference indicators that have been selected and used are presented in the following table.

Table SR5.1.2: Reference Indicators for Evaluation and Comparison of Alternatives

Indicator	Location	Parameter Unit	Comment
TFM (totalizing flow metered : m^3/d)	Outlets of all WTPs: - Chrouy Changvar (WTP1) - Phum Preak (WTP2) - Chancar Mon (WTP3) - Nirouth (from 2014 on) Representative Pressure Pipe: - A, B, C, D, E (Ref. Figure)	- Flow of Pressure Pipe (m^3/d),(l/s) - TFM (m^3/d) (totalizing flow metered) - Flow Velocity (m/s)	For a given water demand, the comparison of water quantities injected into the system at each WTP enables to evaluate the balancing level achieved between the different sectors. The flow repartition also highlights the head-related interactions which can restrain the efficiency of pumping and yield considerable energy losses.
Reference base pressure	Chrouy Changvar bridge - C1	- Pressure of junction: Hydraulic Grade (m)	This point is taken as a reference in various studies and especially the recent energy saving study by BCEOM.
Most remote pressure junction nodes	Svey Pack, Ta Khmau, Ken svei, Preak lieb, Cheung Aek, Baek Chan, Samraong Kraom	- Pressure of Junction: Hydraulic Grade (m) Head (m)	These nodes are the remote ends of each branch. The stake is to supply them with regularity and within the bounds of the Master Plan criteria (especially regarding pressure)
Pipe and/or Junction in Downstream (D/S) of each water tank	Representative Pressure Pipe: - P284: D/S of T2 - P259: D/S of T3 - P276: D/S of T4 - P3579: D/S of Ta Khmau	- Flow of Pressure Pipe (m^3/d),(l/s)	The operation conditions of water tanks currently under construction of course are a good indicator but their global analysis cannot be run in the restricted framework of this feasibility study. We choose the observation pressure junction at the downstream proximity of each tank.
	Representative junctions: - J445: D/S of T2 - J446: D/S of T3 - J449: D/S of T4 - J230: D/S of Ta Khmau	- Pressure of Junction: Hydraulic Grade (m)	
Central nodes on each loop	Representatives junctions: - J-476: PPCL - J-495: RKL - J-550: PPCL	- Pressure of Junction: Hydraulic Grade (m) - Flow of Pressure Pipe (m^3/d),(l/s)	So as to check the operation of each loop.
KPI	Global	- KPI = TFM – TFS / WD	The whole of water injected in the network should be as close as possible to the actual customer supply.

Note: PPCL =Prey Pring Cheung Loop, RKL =Russey Keav Loop
Water Tank: T2= Chom Chau, T3= Airport, T4= Chrang Chamreh

The location and names given to reference control points are shown on the figure 1 below.

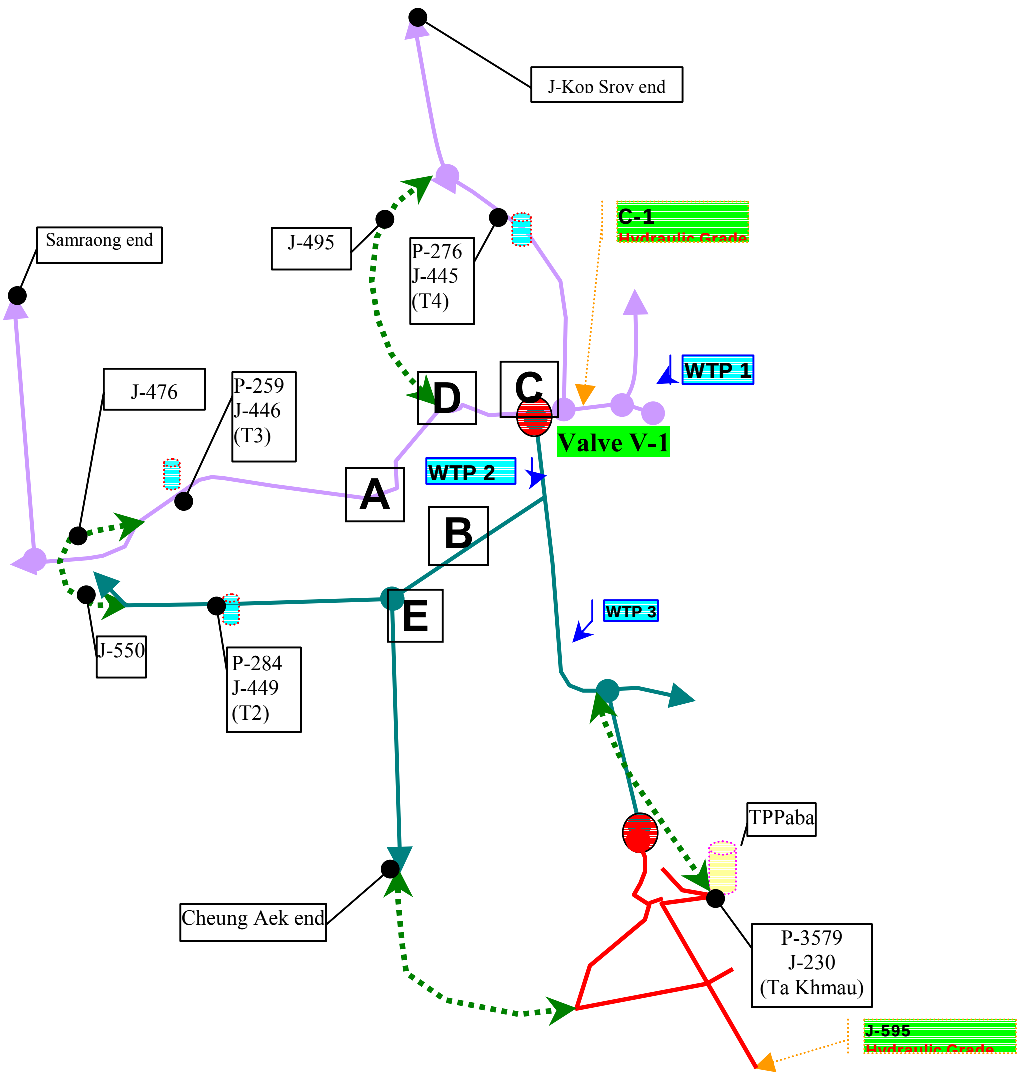

Figure SR5.1.1: Location and Names of Reference Control Points

2 Present State Simulations

The first simulations cover the present situation, to the exception that the three water tanks currently under construction have been integrated to the model. In a first stage Valve V1 is supposed to remain closed. These simulations of the “no further action taken” hypothesis hence serve as a comparison reference for all further scenarios.

Following 3 cases were simulated as the present state simulations. Case 2 and Case 3 were simulated to know the situation under conditions of only water demand increasing with the “no further action taken”.

Table SR5.1.3: Simulated Cases with Present Simulation Model

unit: (m^3/d)

Senario	Case 1	Case 2	Case 3
Simulation Model	2005	2005	2005
Water Demand	2005	2005 x 1.25 (Approx. to 2010 WD)	2005 x 1.4 (Approx. to 2010 WD + 15% of loss)
V1 Status	Close	Open	Open

Note : WD = Water Demand

2.1 Present Operation Conditions

2.1.1 Water Production Management

Through the analysis of the present state and use of the water treatment plants it appears as below.

- The Chrouy Changva WTP presently delivers a very high (65 m) hydraulic grade, with a very low efficiency since it generates important energy losses. Actual production volume of this WTP is much smaller than its nominal capacity (65,000 m^3/day). This WTP presently feeds the water to the northern and western main branches of the system.
- The Phum Prek WTP, on the contrary, produces 150,000 m^3/day with a 45 m hydraulic grade, with good energy handling, to supply the southern part of the network. This facility already works at its upper capacity limit.
- The Chamkar Mon WTP, despite its high outlet hydraulic grade (75 m), is unable to satisfy the most southern demand (Ta Khmau) due to inadequate transmission lines.

Present equipment in the Chrouy Changva WTP will be replaced by 2008 with a less powerful and energy-demanding equipment. This equipment will reduce the Hydraulic grade at inlet and the losses along the transmission network.

2.1.2 Water Transmission Balancing

The opportunity to open the valves “V1” in the North Monivong and bind the Chrouy Changva and Phum Prek WTPs at the root point of the Airport and Pochentong western branches is a major issue.

Under the present situation, this opening would lead to a considerable increase of energy losses, with little result on the water demand satisfaction. The reason is that the pressure set by the Chrouy Changva WTP cause reverse flow into the Phum Prek WTP and stop their pumping capacity.

If the Chrouy Changva WTP pumping power was decreased to reduce this excessive head, the two treatment plants could be coupled with benefit for the balance of distribution across the whole area they serve.

The completion northwards of a closed loop around the Russey Keav area, and the connection westwards of the Airport and Chaom Chao branches, will then naturally complete the transmission skeleton to improve pressure balance in normal use, and to increase PPWSA's capacity to offer a continuous service to most customers whenever any section of these lines must be temporarily disabled.

2.2 Water Demand 2005 with Present Simulation Model (Case 1)

It appears from simulations that in present demand conditions all three water tanks would remain full at all times. A high difference may be observed between Chrouy Changva WTP and Phum Preak WTP productions, as it has been already highlighted.

Flows

The Chrang Chamreh branch flow is count 9,895 m^3/day, measured at point "C" located at the inlet of the 500 mm pipe. This flow measured at the starting point of a branch, represents 28.5% of the total production of Chrouy Changva WTP.

The Airport and Choam Chau branch adds up 14,580 m^3/d which must be divided into direction of both water Tanks. Flow at point "A" in Airport branch represents 23.7% of the total production of Chrouy Changva WTP. The 47.8% of the total production of Chrouy Changva WTP are supplied in the dense area.

The flow of point "B" in Choam Chau branch, which is located in the Stung Mean Chey Bridge, is 6,349 m^3/d supplying along the Veng Sreng Road.

Pressures

Pressure at the reference point C1 (Chrouy Changva bridge) fluctuates between 61.8 m and 66.5 m in hydraulic grade, which is between 46.1 m and 51.4 m in head.

Except for the Ta Khmau branch, pressure heads at all end points of branches remains above 46.2 m.

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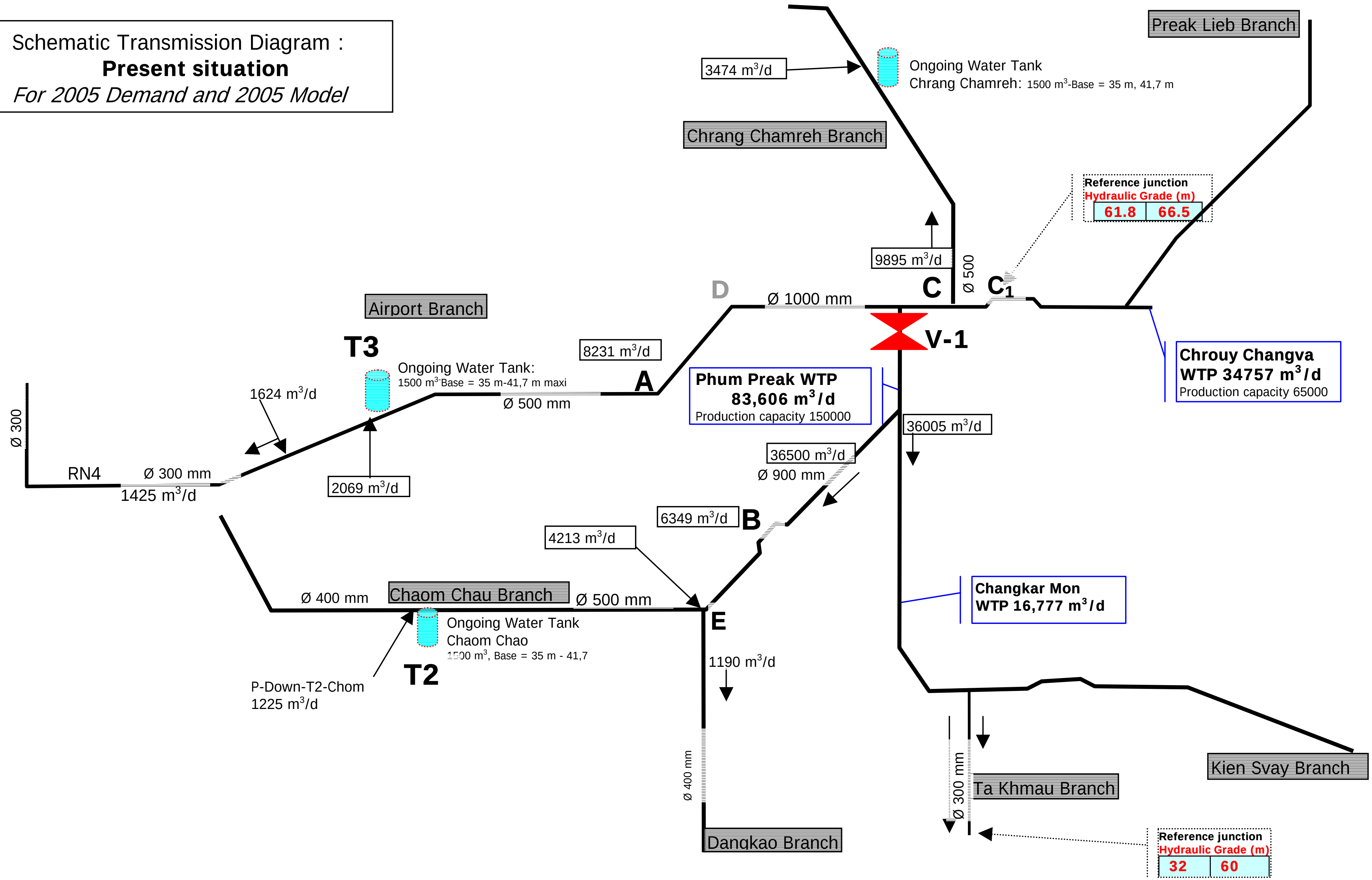
Figure SR5.1.2: Schematic Transmission Diagram for Present Situation (Simulation Model 2005 & Water Demand 2005)

Schematic Transmission Diagram :
Present situation
For 2005 Demand and 2005 Model



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2.3 Water Demand 2005 x 1.25 with Present Simulation Model (Case 2)

The water demand of 2005 x 1.25 is assumed to be approximate flow of water demand 2010. This case is simulated to know the situation under conditions of only water demand increasing with the "no further action taken".

Flows

Present system is able to run water with adequate flow to satisfy the increased demand.

The flow at point C increases to 11,964 m^3/day, which is 21% increase against Case 1.

Head losses in the 500 mm pipe remain under 2.13 m/km.

Pressures

The pressure head value at C1 point varies from 43.2 m to 51.1 m.

Water pressures exceed the criteria in the whole network, as illustrated in figure below.

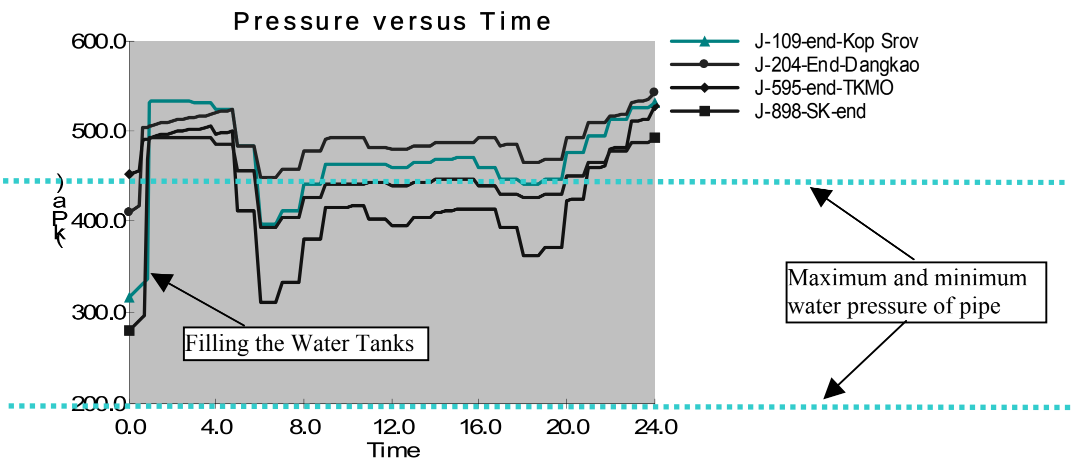

Figure SR5.1.3: Water Pressures at Network End Points with Water Demand 2005 x 1.25

If, given this situation, the V1 valve shall be opened, it can be observed that the hydraulic grade across the network will be slightly better balanced. All observed pressure heads remain above 33 m.

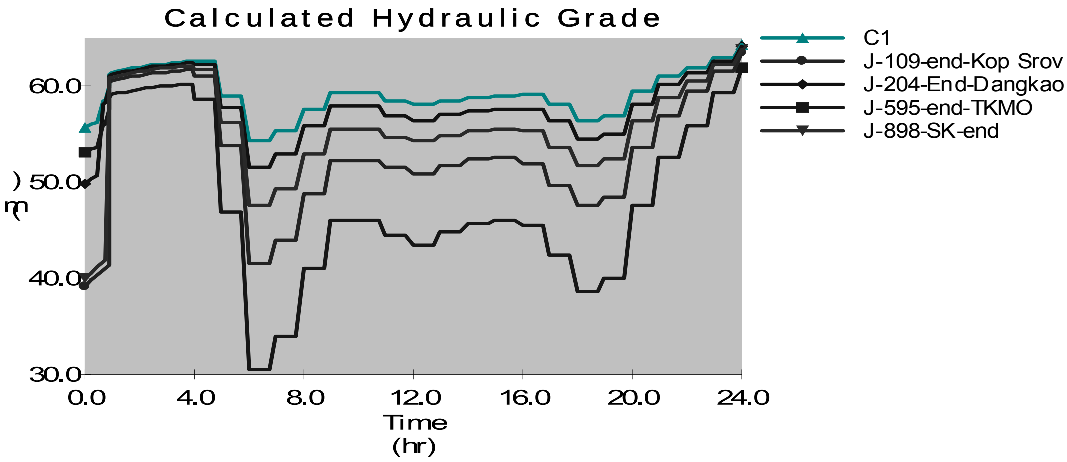

Figure SR5.1.4: Hydraulic Grade at Network End Points with Water Demand 2005 x 1.25 (V1 Open)

2.4 Water Demand 2005 x 1.4 with Present Simulation Model (Case 3)

The water demand of 2005 x 1.4 is assumed to be addition of approximate flow of water demand 2010 and 15% of loss. This case is simulated to know the situation under conditions of only water demand increasing with the "no further action taken".

In this situation, a discrepancy rises between the flows supplied by the WTPs and the water demand, but there is no negative impact since it is compensated by the clear water reservoirs capacity.

2.5 Energy Cost Analysis

Though it is not accurate cost analysis; WaterCAD offers a function to compute the energy balance of pumps. At the end of each simulation, we checked the impact of the tested scenario and observed that they are very little differences between them. They are presented in the following table:

Table SR5.1.4: Energy Cost for Varied Situation in 2005 Simulation Model

Simulation Case			Pumped Water Volume		Pump Energy Consumption	Energy Cost	Unit Energy Cost for Pumping
Case	V1	Water Tank	l/s	m³/day	KWh/day	$/day	$/m³
Case 1	Close	0	1,561	134,895	34,117	4,435	0.033
Case 2	Open	3	1,991	172,063	34,771	4,520	0.026
Case 3	Open	3	2,434	210,328	28,987	3,768	0.022

Note: Olympic water tank is not included in the number of water tanks. Electricity Unit Cost=US$0.13/kWh

Unit energy cost for pumping is decrease according to increasing of flow due to pump characteristic of efficiency.

2.6 Summary of Present State Simulations

The first apparently surprising result of these simulations is that the model of the 2005 network does not show any trouble under a much higher water demand than the present one, while the model of the 2010 network identifies quite several problems.

This result is explained by the concentration of water demand in the central zone, together with the presence of a very strong main transmission skeleton in the present network.

Table SR5.1.5 summarizes the simulation results in terms of flows at control points.

Table SR5.1.5: Flows at Control Points in Present Simulation Model

unit: (m^3/d)

Reference Points	Case 1 2005 WD	Case 2 2005WD x 1.25	Case 3 2005WD x 1.4
V1 Status	Close	Open	Open
A	8,231	9,922	11,293
B	6,349	7,613	8,637
C	9,895	11,964	13,641
E	1,190	1,460	1,679
P284 (Down Stream of T2)	1,225	1,503	1,728
P259 (Down Stream of T3)	2,069	2,539	2,920
P276 (Down Stream of T4)	3,474	4,263	4,902
Chrouy Changva-WTP	34,757	42,291	48,400
Phum Prek-WTP	83,606	104,963	120,868
Chamkar Mon-WTP	16,777	18,030	20,456
Total outflow of WTP	135,140	165,284	190,663

Note : WD = Water Demand
2010 WD (for simulation) = 2005 WD x1.227
Total outflow of WTP in Case 1 is 1% different from water demand due to cumulative error.

3 Simulation of 2010 Simulation Model with 2010 Water Demand

3.1 2010 Simulation Conditions

Based on Master plan concept and water demand projection, all the network extensions were assembled one by one on the WaterCAD modelling system taking account:

- the existing network structure and organisation;
- the existing and projected land use of the city;
- the further stages of Master plan, and
- the targeted technical parameters allowing to answer as well as possible to the defines/design criteria.

In 2010 the system will have been upgraded with:

- network extension from 282km to353 km of primary transmission pipes,
- upgraded capacity of Chrouy Changva WTP which should double from 65,000m to 130,000m^3/day,
- a new 900 mm pipe from this WTP to the Chrouy Changvar bridge,
- head of Chrouy Changva pumps reducing[1] to obtain a maximum of 55 meters (Hydraulic Grade) at the C_1 reference junction.

3.2 2010 Simulation Cases

Each of the planned actions was tested individually since they induce different impacts. The main issue was to reach the best match between production and consumption. This assumes that the system operates properly and that the unaccounted losses do not invalidate the results (KPI).

The mutual compatibility of different possible actions must be taken into account prior to the design of each scenario.

Scenarios were built to evaluate the impact of the following options:

- **Extensions without loop (V1 closed)**: main network is extended with tree formation (loop is not activated) and V1 is closed.
- **Extensions without loop (V1 open)**: main network is extended with tree formation (loop is not activated) and V1, which is the major junction between the Chrouy Changva and Phum Prek WTPs, is opened.
- **Loops completed (V1 closed)**: main network is extended with loop formation (loop is activated) and V1 is closed.
- **Loops completed (V1 open)**: main network is extended with loop formation (loop is activated) and V1 is opened.

Each scenario was tested against the projected water demand for 2010. So as to evaluate the sustainability of each scenario, several configurations also have been tested against the projected 2015 and 2020 conditions.

- [1] *Adjustment of the pumps with several scenarios tested: Head decreased by:*
    - *- Adjustment schedules (walk stop following of the programmed schedules)*
    - *- multi-pump system;*
    - *- Speed regulator.*

The three tests give satisfying results, our objective being to limit the pressure to 55m at the C1 point and to if possible reduce to the maximum the variations. However, it appears that the first solution requires a readjustment with each difficult to obtain

3.3 Ruessei Kaev Loop (North)

3.3.1 Formation of the Loop

3.3.1.1 Chrang Chamreh Branch

The Russey Keav loop intends at reinforcing distribution in the north zone up to Ponhea Leu village and to optimize the operation of the Chrang Chamreh water tank. It extends the existing Chrang Chamreh branch north of Daun Penh, starting at the Chrouy Changvar bridge and skirting the Tonle Sap river and NR5, to eventually end in Svay Pak with a 400mm pipe.

That is about 6000 m of 500 mm diameter pipe, towards the water tank under construction in the north and then 2000 m more of 400 mm pipe downstream of the water tank.

The Chrang Chamres branch supplies the sub-districts of Tuol Sangke, Russey Keav, KM-6, Chrang Chamres 2 and Chrang Chamres 1.

3.3.1.2 O'Veng Branch

The loop is created through the layout of a transmission line starting from the existing 1000 mm airport branch north of the Tuol Kork district, 2000 m away from the Chrouy Changva bridge. It runs up to the northern end of the Boeng Kak 1 sub-district (800mm) and then follows the new road along O'Veng canal, to eventually meet the already existing branch 6000m further.

3.3.1.3 Prolongations

From the above connection point between the two branches of the loop, the 800 mm pipe is divided into 2 branches:

1. 600 mm pipe westwards and
2. 500 mm pipe northwards.

(1) 600 mm pipe westwards

Towards the west and Phnom Penh Thmey area, the rationale is to prepare for the future loop to be implemented in the second stage of Master Plan. This branch will follow the new Municipality road to catch up the Teukthla – Dey Hoy – Phnom Penh Thmey axis along which a high level of development is concentrating.

(2) 500 mm pipe northwards

2The branch northwards crosses Tuol Sankae allotments with a 3630 m-long 500 mm pipe, and then Chrang Chamreh II and I with a DN 400 mm over 1950 m., to catch up the already laid 400mm at the southern limit of Svay Pak subdistrict.

At the point (km 6) where diameter changes, a new derivation is to be installed westwards. This 3000 m branch will outline the future larger North-South loop planned for 2015, that will circumvent the city towards the new Nirouth WTP to the system. This pipe has been sized based on 2020 figures; its vocation explains that its diameter increases with distance from the connection point.

Another prolongation, motivated by the ongoing urban developments, starts towards the west and then the north from the most north-west point of the loop south of Svay Pak subdistrict. It will serve the DIPO allotments next to Svay Pak and Khmuonh subdistricts and up to Kop Srov dike. Its diameter decreases from 400 to 300 mm, for a total length of 3600 m.

These projects have been constrained by existing facilities and ongoing projects.

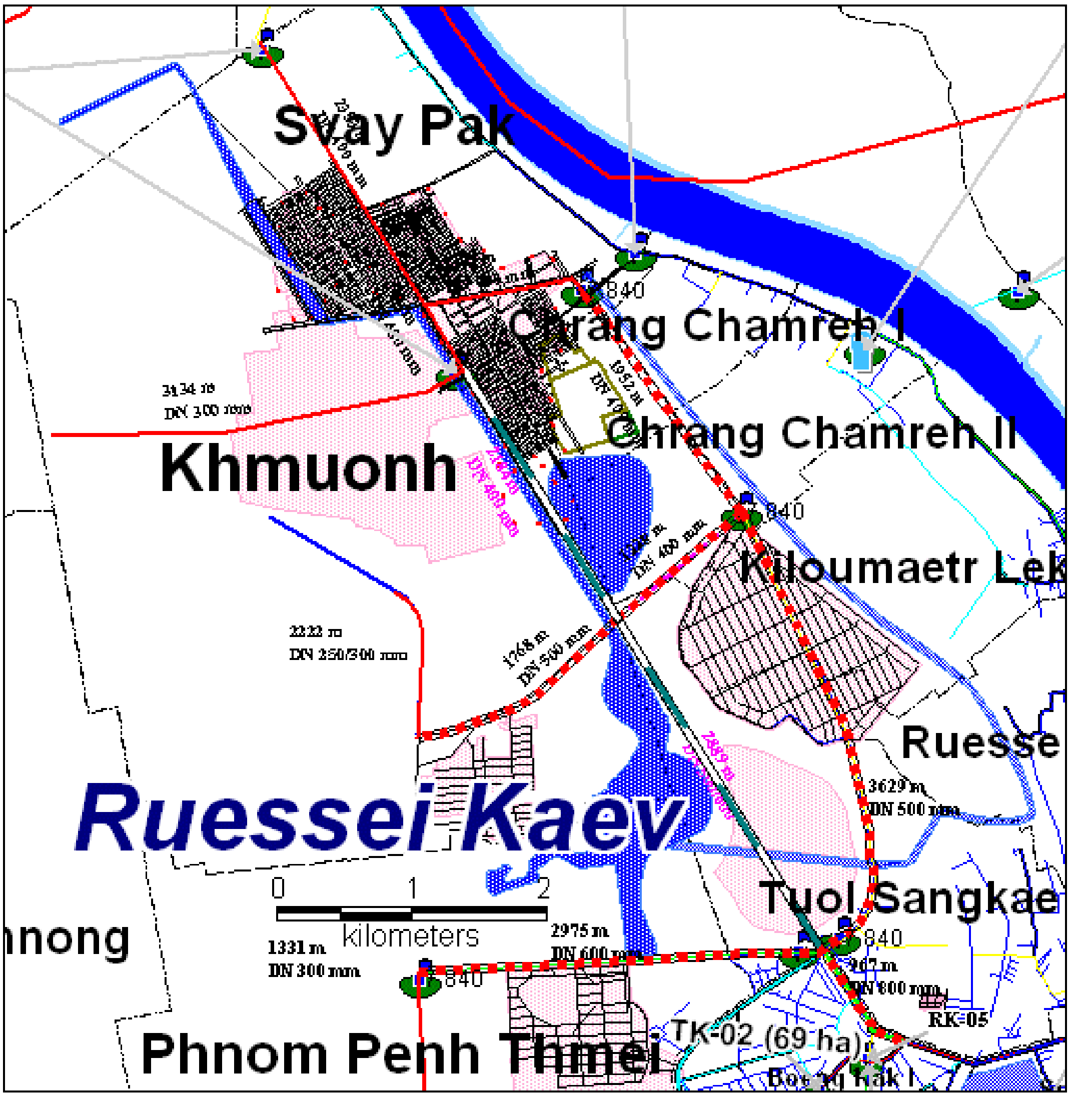

Figure SR5.1.5: Ruessei Kaev Loop and Extensions of the Network

3.3.2 Simulated Alternatives

3.3.2.1 Extensions without Loop (Loop not Activated, Valve V1 Closed)

Given the 2010 water demand, the simulation results for this situation are quite satisfactory:

Flows

The maximum flows observed in this situation are:

- 10,079 m^3/day on the Chrang Chamreh branch 1,636 m3/day on the (newly built) O'Veng branch.

- This new branch actually will serve to supply new developing sectors (Tuol Sangkae West) where water demand though very limited for now could increase considerably.
- The daily flow downstream from the water tank is estimated at 5,003 m^3/day: more than half of the demand is located upstream from this point.

Pressures

The pressure head value at C_1 point does not rise higher than 45.2 m. On the whole set of reference points the pressure heads range settles between 40.9 and 46.6 m, which matches the maximum recommended value of the Master Plan (55 m HG).

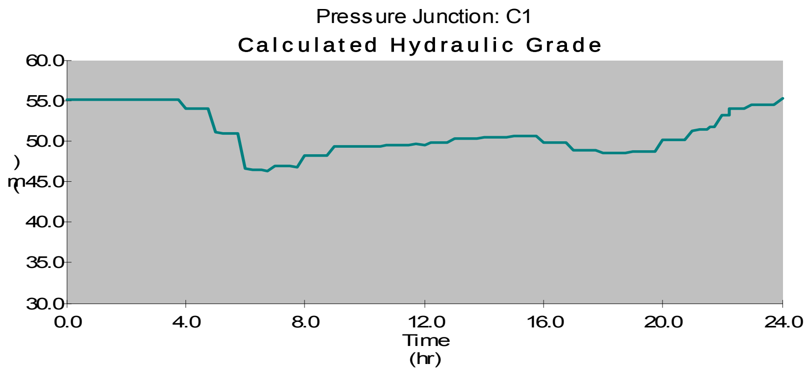

Figure SR5.1.6: Pressure Variations at C1 in 2010 (V1-Close, Loop not Active)

The required production of clean water appears to remain constant compared to other scenarios involving this 2010 water demand. In this case it is estimated at 108,250 m^3/day for Phum Prek WTP 47,450 m^3/day for Chrouy Changva WTP and 12,415 m^3/day for Chrouy Changva WTP.

3.3.2.2 Extension with Loop (Loop Activated, Valve V1 Closed)

Closing the loop – that is opening the remote connection between its two branches – changes the flow repartition between the branches, which becomes:

- 8,064 m^3/day on the Chrang Chamreh branch,
- 3,651 m^3/day on the O'Veng branch.

This shows that the connection enables the new branch to reinforce the role of the old one in supplying water to the most remote areas.

Flows

The minimum flow – around 5h00 in the morning – is around 95 l/s in the Chrang Chamreh branch, while one hour later it reaches 152 l/s. The flow in O'Veng branch never exceeds 69 l/s.

Pressures

Pressures up to the remote end of those branches remain remarkably steady across the day, as illustrated below in figure below.

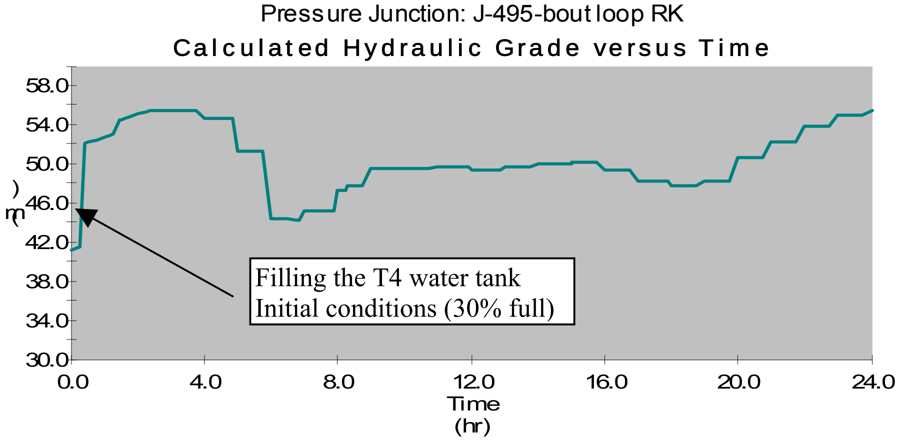

Figure SR5.1.7: Pressure Variations at the Remote Point of Ruessei Kaev Loop in 2010 Planned Situation

3.3.2.3 Opening Valve V1 Loop (Loop Activated, Valve V1 Opened)

Opening valve V1 appears to have a very limited impact on the current situation, and no real advantage since the total daily cost in energy slightly increases from $2925 to $2932.

3.3.3 Summary and Recommendations for Ruessei Kaev Loop

Table SR5.1.6: Summary of Simulation Results for the Ruessei Kaev Loop

2010 Model /2010 WD	V1 Status	Flow at point C (m^3/d)	Flow at point D (m^3/d)	Flows C+D (m^3/d)	Pressure range at C1 (m)	Pressures at balance point (m)	Energy Cost ($)
Ruessei Kaev Loop No active	V1 closed	10079	1636	11715	40.7 – 44.8	36.7 – 46.9	3392
	V1 open	10079	1636	11715	41.8 – 44.8	36.7 – 46.9	3425
Ruessei Kaev Loop Active	V1 closed	8064	3651	11715	40.7 – 44.8	42.8 – 47.9	3405
	V1 open	8044	3672	11716	41.8 – 44.8	43.8 – 48.9	3425

As a conclusion, we recommend to complete Ruessei Keav loop, which shows many advantages. The loop activation and opening V1 valve influence only slightly to the central system. The O'veng branch contributes for activation of the loop.

The loop will be a major branch of interconnections loop, which are intended to connect to Nirouth WTP at the Stage 2 of Master Plan.

On the other hand, the pressure balance is well improved with an average increase of 6 meters in the pressure balance point of the loop and fluctuation range is reduced about 5 meters.

Activate the loop allows to reduce approximately 20% of load of Chrang Chamreh branch.

Pumping system is not required for Chrang Chamreh Water Tank (T4). The role of the tank will be similar as a buffer only after 2015.

3.4 Prey Pring Choeung Loop (West)

3.4.1 Formation of the Loop

3.4.1.1 Airport Branch

The current airport branch starts from Chrouy Changva WTP with 800 mm pipe, heading towards the west across Chrouy Changvar Bridge. Between the bridge and intersection of Monivong Boulevard and Street No.70 (roundabout "Rouboumoul Stad Chass"), one line of 1600 mm pipe about 400m long is laid. A line of 1100mm pipe branches away southwards from "Rouboumoul Stad Chass" roundabout (currently this line is closed by valve V1). Another line with 1000 mm pipe is also laid westwards from "Rouboumoul Stad Chass" and continues along the north Boeung Kak dike to the Tuol Kork antenna roundabout where branch to Russey Keav loop is planed. It then runs down towards the Royal University of Phnom Penh with a 900 mm dia. pipe, and further continues as a 500 mm diameter pipe towards the airport along NR4. This section is already equipped with a telemeter, and has been chosen as reference point "A" for our simulations. In front of the airport, pipe diameter currently reduces to 400 mm pipe and derivation to and from the T3 water tank.

The new 400 mm pipe transmission prolongation planned in Stage 1 (by 2010) starts about 1.2km downstream from this point, at the place where the existing 400mm pipe ends into a 300mm distribution pipe.

The first 500 mm pipe section of this prolongation will be a part of South-North main interconnection loop from Nirouth WTP which will be implemented in the stage 3 of Master plan. This line comes from the south along NR3 and joins NR4 about 700 m away from the intersection of Prey Pring Cheung crossroads with the Veng Sreng BOT road. This 500 mm pipe then runs along NR4 for another 700 m long beyond the airport extremity to circumvent the possible airport extension to join the planned prolongation of Chaom Chao branch and close the loop.

A 400 mm pipe branch will also continue along the NR4 to supply Angk Smuol and better supply the 300 mm pipe departing to the north towards Trapeang Krasang zones which currently show a high development and industrialization rate.

3.4.1.2 Chaom Chao Branch

The Chaom Chau branch starts from the Phum Prek WTP where it is directly connected. At first, this branch runs under the Monivong Boulevard southwards over 6,800 m and supplying a large part of the inner city. A 1400 mm pipe branches away in the Charles de Gaulle crossroads. These 2 main branches are respectively :

- southwards under Monivong Boulevard, in a 900 mm dia. pipe towards Kbal Thnol, and
- to the south-west under Charles de Gaulle Boulevard and Monireth Boulevard, in a 1000 mm dia. pipe towards Steung Mean Chhey.

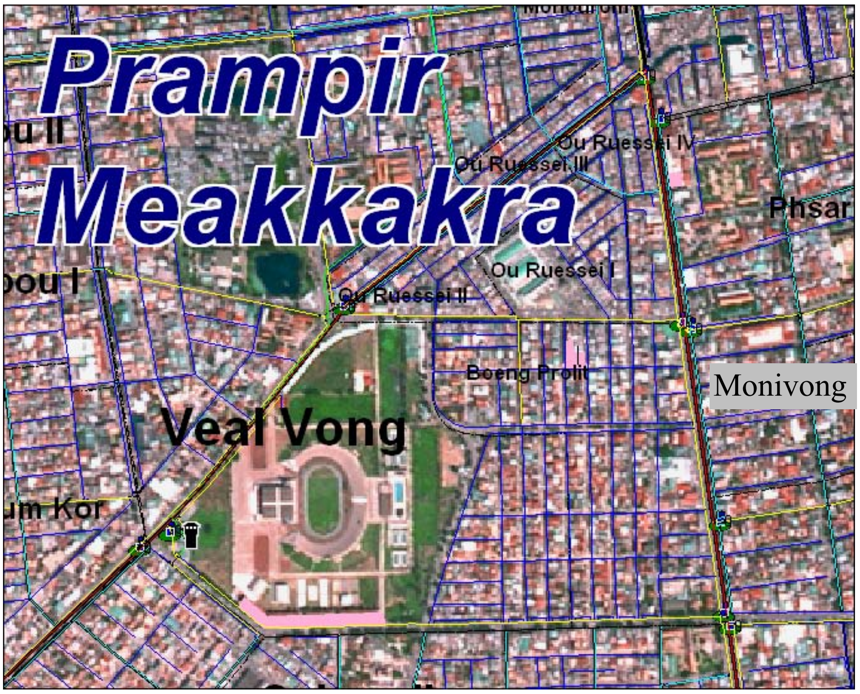

Figure SR5.1.8: Main Network of the Chaom Chau Branch in the City Center

This branch under Charles de Gaulle Boulevard and Monireth Boulevard reaches the Stung Mean Chey Bridge as a 900 mm pipe. Along this 3200 m extension, 8 existing telemeters control distribution blocks.

After important works recently took place, the line now crosses the Stung Mean Chey Bridge as a 800 mm iron pipe, and connects 200 meters downstream to the 600 mm pipe which was already in place. It then continues over 1400 m across the Steung Mean Chhey sub-district, and downsizes to a 500 mm diameter about 200 m before reaching the Veng Sreng road.

At this intersection, the pipe changes direction and heads westwards along the Veng Sreng ('BOT') road towards the south of the Pochentong airport. A new 400 mm derivation departs to supply the southern districts down to Cheung Aek. We identify this latter derivation as the « Dankao branch ».

3.4.2 Simulated Alternatives

Simulation has been carried out with 2010 water demand with 2010 simulation model. As the most part of two branches of this loop are existing pipes, this case is not so different from the 2005 network situation. There are however the following differences between model 2005 and 2010:

- the westwards prolongation with a 400 mm pipe along the NR4 is connected to the pipe that connects Chaom Chau branch and Airport branch,
- the pipe laid northwards from the downstream part of the Airport Branch is connected to the 400 mm pipe along the NR4.

3.4.2.1 Extensions without Loop (Valve V1 Closed and Opened)

This alternative simulation analyse the situation that main network is extended with tree formation (loop is not activated) and V1 is closed/opened.

Simulation of 2010 Simulation Model with 2010 Water Demand (Loop not Active, V1 Close)

Flows

The maximum flow observed in this situation is 13,192 m^3/day on the airport branch at the A point, and 8,981 m^3/day on the Choam Chau branch at the B point (Stung Mean Chey Bridge).

Table SR5.1.7: Key Reference Indicator of Prey Pring Choeung Loop in 2010

Scenario (2010 Model & 2010 WD)	Prey Pring Choeung Loop	
	Loop Not Active	
	V1-Close	V1-Open
Reference Pipes	Flow (m^3/d)	Flow (m^3/d)
A	13,192	13,192
B	8,981	8,981
P-284-Down-Chom - T2	2,820	4,885
P-259- Airport down-T3	5,585	3,546
Reference Junctions	Hydraulic Grade (m)	Hydraulic Grade (m)
C_1	48~55	49~55
J-550 Loop PPC	38~54	42~54

The daily flow downstream from the water tank is calculated at 5,585m^3/day for Airport and 2,820m^3/day for Choam Chau.

Pressures

The simulation results in terms of water pressures are quite satisfactory. Hydraulic Grade at the C1 reference point is within the range from 48 to 55 m, and at the pressure point of the loop is from 45 to 53 m.

The pressure head value at C1 point is not more than 45 m. The pressure heads range between 41m and 47m at all reference points, which satisfy the requirement (Hydraulic Grade<55m). At the most remote pressure junction nodes, hydraulic grade varies from 39 to 54 m, since the pressure is supported by the Tank from 06:00 a.m. to 08:00 a.m.

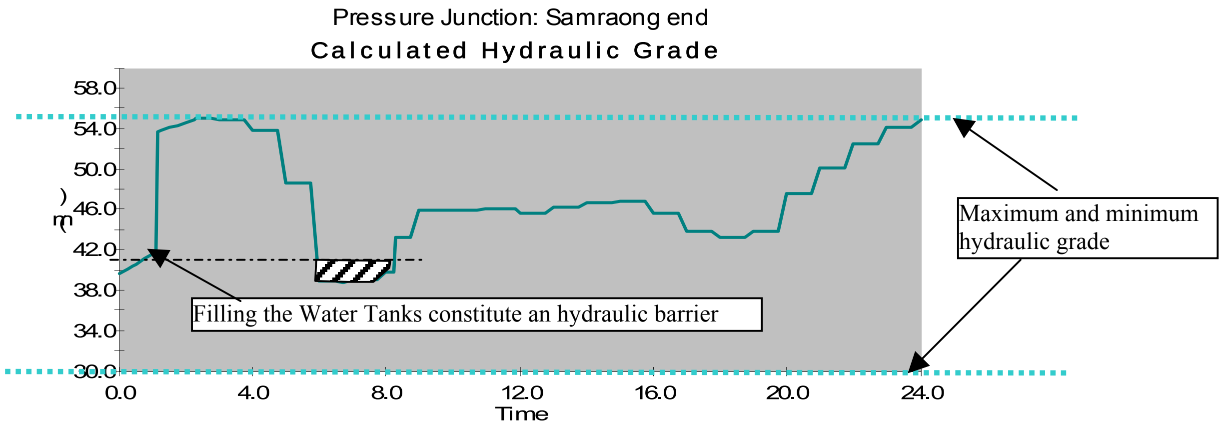

Figure SR5.1.9: Hydraulic Grade at the End of the Trapeang Branch (Samraong)

Simulation of 2010 Simulation Model with 2015 Water Demand
(Loop not Active, V1 Close/Open)

In order to test the sustainability of the loop, we simulated 2010 simulation model with water demand equivalent with 2015 water demand. The results are presented in the table below.

Table SR5.1.8: Key Reference Indicator of Prey Pring Choeung Loop in 2010 Model with 2015 WD

Scenario (2010 Model & 2015 WD)	Prey Pring Choeung Loop	
	Loop Not Active	
	V1-Close	V1-Open
Reference Pipes	Flow (m^3/d)	Flow (m^3/d)
A	17,149	17,149
B	12,139-464	11,675
- P284: D/S of T2	3,723-696	3,664
- P259: D/S of T3	7,260	4,681
Reference Junctions	Hydraulic Grade (m)	Hydraulic Grade (m)
C_1	37~53	-

Flows

The daily flow downstream from the water tank is calculated: at 7,260m^3/day for T3-Airport and 3,723m^3/day for T2-Choam Chau where appears a negative flow for 696m^3/day.

As we can observe in following figure, negative flow appears early morning, before the peak of day.

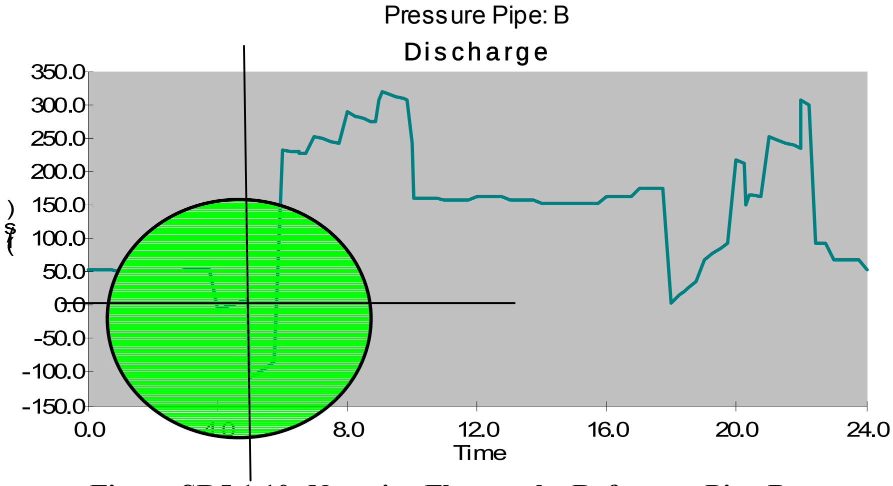

Figure SR5.1.10: Negative Flow at the Reference Pipe B

Pressure

The pressure values at the C1 point is satisfy the criteria. Water Tanks are necessary to keep pressure within range of simulation criteria.

Water Tank

Following figure confirms an activity of T2, T3 and T4.

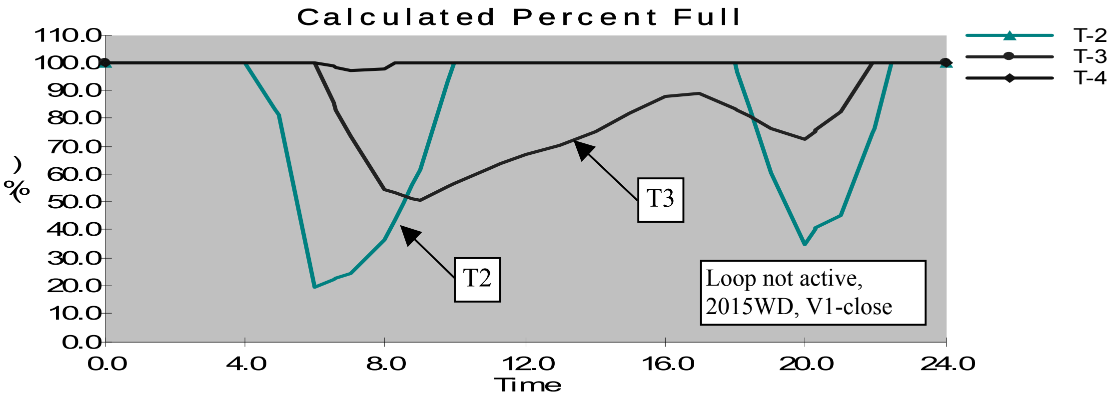

Figure SR5.1.11: Behaviors of the Water Tanks (V1 Close)

The activities of water tanks are summarised as follows:

- T2 starts to work two hours before T3; at 04:00 a.m.,
- the refill of T2 is started from 06:00 a.m. after activation of T3;
- a draining speed is very high between 5 and 6 a.m. for T2 (280l/s).

All this facts shows unbalanced pressure in the network. If V1 valve is opened, the situation changes drastically.

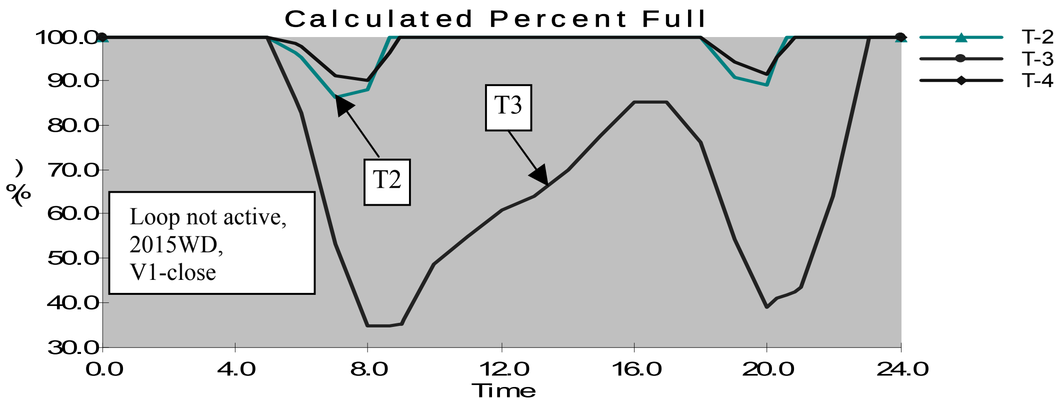

Figure SR5.1.12: Behaviors of the Water Tanks in Case of Open V1

The water tanks start to work at 05:00 a.m. T2 become stable. T3 keeps enough margins (more than 30% of full capacity) in peak time.

<u>Simulation of 2010 Simulation Model with 2020 Water Demand</u>
<u>(Loop not Active, V1 Close/Open)</u>

In order to test the sustainability of the loop and water tanks, we simulated 2010 simulation model with water demand equivalent with 2020 water demand. The results are presented in the table below.

Table SR5.1.9: Key Reference Indicator of Prey Pring Choeung Loop in 2010 Model with 2020 WD

Scenario (2010 Model & 2020 WD)	Prey Pring Choeung Loop Loop Not Active V1-Close
Reference Pipes	**Flow (m³/d)**
A	19,722
B	13,887-972
- P284: D/S of T2	6,736
- P259: D/S of T3	8,349
Reference Junctions	**Hydraulic Grade (m)**
C1	45.4~55.2
J-550 Loop PPC	**21.1**~44.5
Samraong	31.5~53.4

Flows

The daily flow at the point B is 13,887 m^3/day. Reverse flow with 972m^3/day is also observed at the point B. Maximum velocity raises 2.1m/s and is over Master plan criteria's.

The required production volume of clear water exceeds the production capacity in Phum Prek WTP and Chamkarmon WTP.

Pressure

The pressure of junction at Samraong is satisfy the criteria, but the pressure at the reference point J-550, which is 21m in hydraulic grade, is not satisfy the criteria. This situation is not applicable.

Water Tank

Following figures show activities of T2, T3 and T4 under conditions of open/close of V1-Valve without loop (loop is not activated).

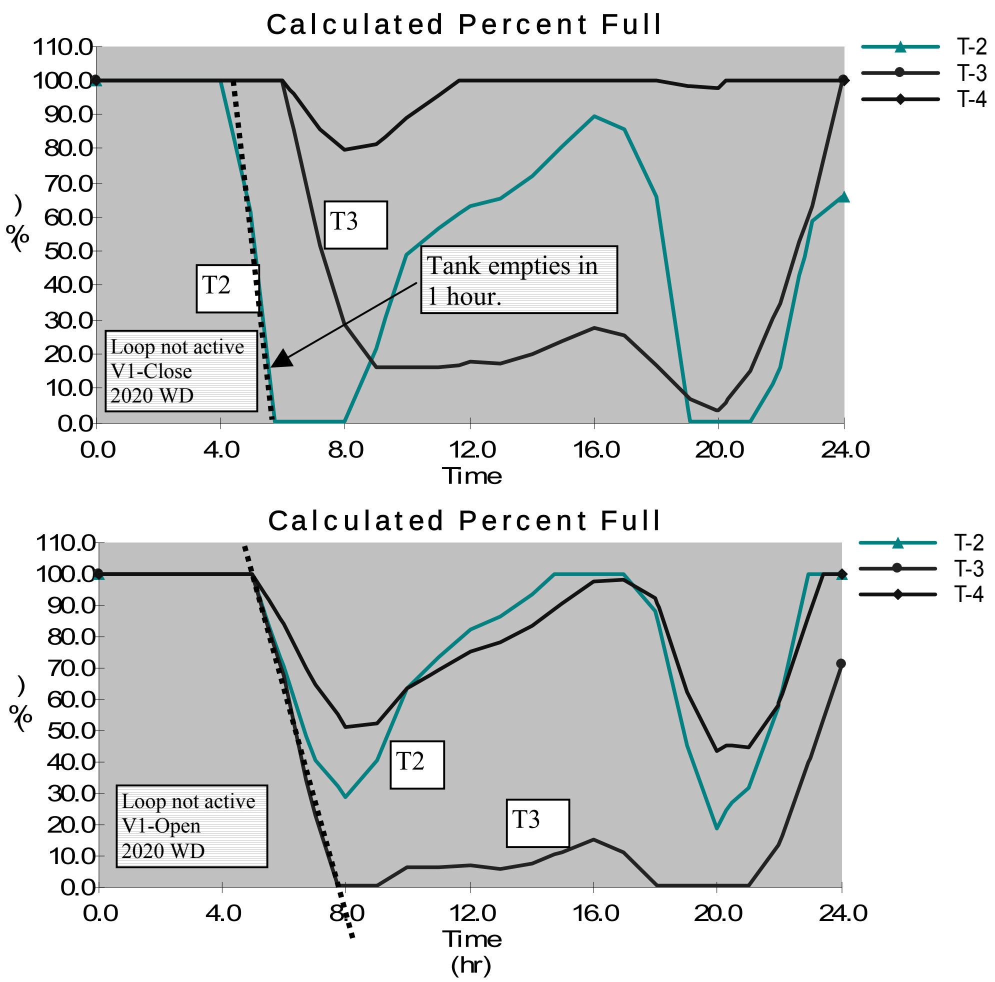

Figure SR5.1.13: Behaviors of Water Tanks, Open/Close V1-Valve without Loop

These figures show that behaviour of water tanks is similar to the case of 2015 water demand.

- Discharge speed is very high and the tank empties in 1 hour in T2 under condition of V1 Close. Because Phum Prek WTP cannot supply sufficient volume of water required in city core area, water tank T2 supply a part of its stored water to city core area, then filling rate of T2 decrease rapidly.
- T2 starts to work two hours before T3 at 04:00 a.m. under condition of V1 Close, because 2 tanks are isolated by V1 valve. Starting times of two water tanks are same under condition of V1 Open, because 2 tanks are in 1system.

Another issue in these cases is that the required water production volume in Phum Preak WTP exceeds capacity.

Following figure shows the pressure level of the nodes. Pressures at some areas are lower than the criteria and it can be identified the first sectors with problems.

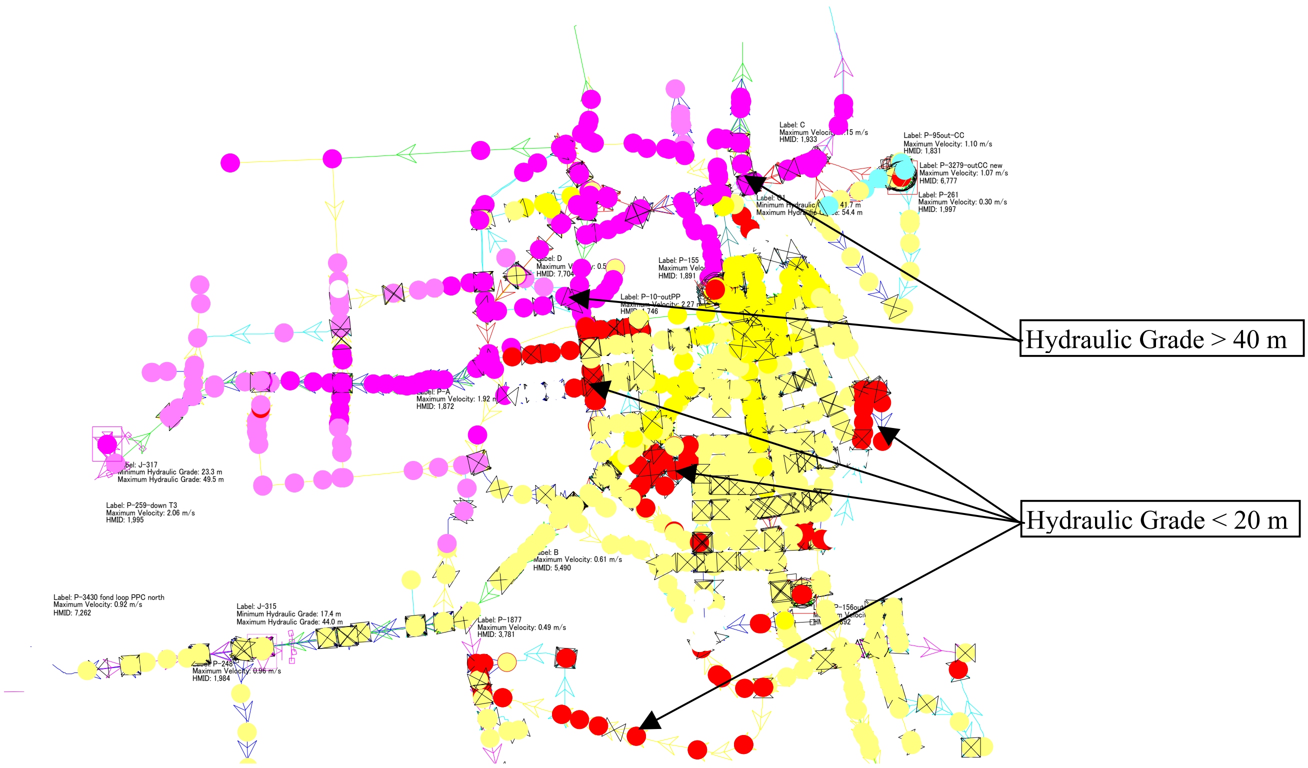

Figure SR5.1.14: Pressures Junction (nodes)

3.4.2.2 Extensions with Loop (Loop Activated)

This alternative simulation analyse the situation that main network is extended with loop (loop is activated) and V1 is closed/opened. Activation of loop means opening the remote connection between two branches.

Simulation of 2010 Simulation Model with 2010 Water Demand
(Loop Active, V1 Close)

Flows

13,007 m^3/day on the Airport branch, 10,730 m^3/day with reverse flow 43 m^3/day on the Chaom Chau branch

Table SR5.1.10: Key Reference Indicator of Prey Pring Choeung Loop in 2010

Scenario (2010 Model & 2010 WD)	**Prey Pring Choeung Loop**
	Loop Active
	V1-Close
Reference Pipes	Flow (m^3/d)
A	13,007
B	10,730-43
P-284-Down-Chom - T2	4,915-619
P-259- Airport down-T3	4,618
Reference Junctions	Hydraulic Grade (m)
C_1	48 ~ 55
J-550 Loop PPC	38 ~ 54

This result shows that system with activated loop enables to supply water to the most remote areas with existing pipes.

The daily flow downstream from the Airport water tank T3 is estimated at 4,618 m^3/day: For T2-Choam Chau this is 4,915 m^3/day with reverse flow 616 m^3/day.

Pressures

The pressure head value at C1 point is lower than 55 m. The Hydraulic Grade satisfies the criteria at the all reference points. This means a good repartition of pressures, which leads energy savings.

<u>Simulation of 2010 Simulation Model with 2010 Water Demand</u>
<u>(Loop Active, V1 open)</u>

For this simulation, the results are presented in Supporting Report 5.2 and5.3. They show the best repartition of flow and pressure and satisfy the criteria at the all reference points.

Principal indicators are shown in the following table.

Table SR5.1.11: Key Reference Indicator of Prey Pring Choeung Loop in 2010

Scenario (2010 Model & 2010 WD)	**Prey Pring Choeung Loop**
	Loop Active
	V1-Open
Reference Pipes	Flow (m^3/d)
A	11,907
B	11,830
P-284-Down-Chom - T2	4,885
P-259- Airport down-T3	3,546-47
Reference Junctions	Hydraulic Grade (m)
C1	47 ~ 56
J-550 Loop PPC	43 ~ 55

Flows

11,907 m^3/day on the Airport branch, and 11,830 m^3/day on the Chaom Chau branch

This shows that the activation of the loop and opening V1 valve enables balanced flow. The network will be able to supply water to the most remote areas.

The daily flow at downstream of the Airport water tank T3 is estimated at 3,546 m^3/day with reverse flow 47 m^3/day.

Pressures

C1 and some Transmission points show hydraulic grade 56 meters, which exceed the criteria 55m, but excessive pressure smaller than 1m in hydraulic grade do not affect the system.

Another points show good repartition of pressures, with an average reduction from 8 to 10 m. This fact leads to energy savings.

The following figure presents the performance of the C1 reference point for the water demand 2010 with 2010 simulation model.

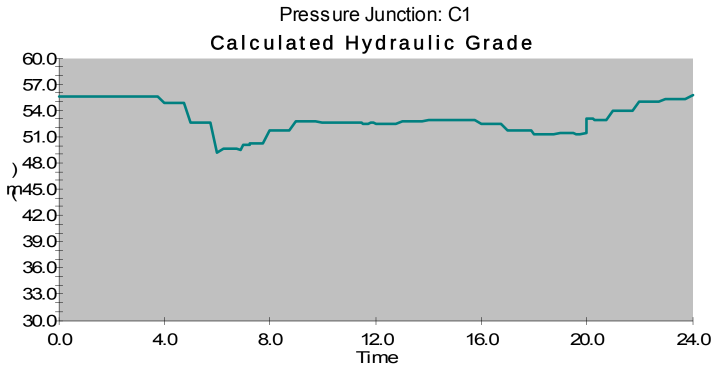

Figure SR5.1.15: The Profile of Pressure at C1 at the Chrouy Changva Bridge.

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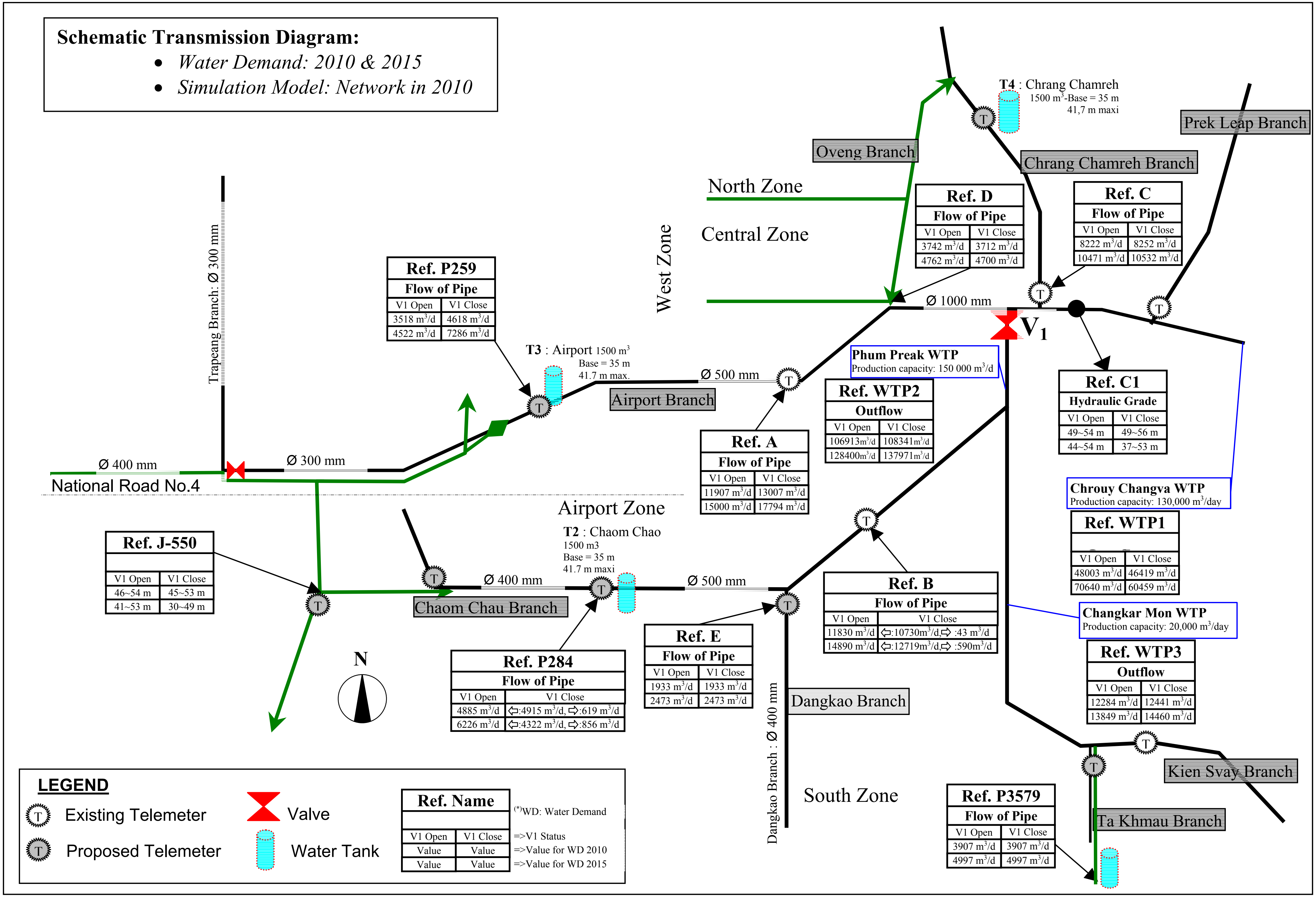
Figure SR5.1.16: Schematic Transmission Diagram (Simulation Model 2010 with Water Demand 2010 & 2015)



Schematic Transmission Diagram:

- *Water Demand: 2010 & 2015*
- *Simulation Model: Network in 2010*

<u>Simulation of 2010 Simulation Model with 2015 Water Demand</u>
<u>(Loop Active, V1 Close/Open)</u>

In order to test the sustainability of the loop, we simulated 2010 simulation model with water demand equivalent with 2015 water demand. The results are presented in the table below.

There is no significant difference of flow values between this case and case of "loop not activated". Only the pressures are in better range of fluctuation.

Table SR5.1.12: Key Reference Indicator of Prey Pring Choeung Loop in 2010 Model with 2015 WD

Scenario (2010 Model & 2015 WD)	Prey Pring Choeung Loop	
	Loop Active	
	V1-Close	V1-Open
Reference Pipes	Flow (m^3/d)	Flow (m^3/d)
A	17,794	15,000
B	12,719-590	14,890
- P284: D/S of T2	4,322-856	6,226
- P259: D/S of T3	7,286	4,522
Reference Junctions	Hydraulic Grade (m)	Hydraulic Grade (m)
C1	37 ~ 53	44 ~ 54
J-550 Loop PPC	30 ~ 49	41 ~ 53

Flows

The maximum flows observed in this situation are:

- 17,794 m^3/day on the airport branch,
- 12,719 m^3/day with reverse flow 590 m^3/day on the Choam Chau branch.

The daily flow at downstream of Airport water tank T3 is estimated at 7,286 m^3/day, and it is 4,322 m^3/day with reverse flow 856 m^3/day at the Choam Chau Water Tank T2.

Pressures

The pressure value at C1 reference point is between 44 and 54 m in hydraulic grade. This fact is one of the most remarkable performances for this given conditions. The minimum pressure values in the system stay between 29m and 39m. This means a good repartition of the required production of clean water.

In this case, the required water production volume in each WTP is smaller than their capacity.

<u>Simulation of 2010 Simulation Model with 2020 Water Demand</u>
<u>(Loop Active, V1 Close)</u>

In order to test the sustainability of the system, we simulated 2010 simulation model with water demand equivalent with 2020 water demand. The results are presented in the table below.

Table SR5.1.13: Key Reference Indicator of Prey Pring Choeung Loop in 2010 Model with 2020WD

Scenario (2010 Model & 2020 WD)	Prey Pring Choeung Loop Loop Active V1-Close
Reference Pipes	Flow (m^3/d)
A	20,250
B	12,377
- P284: D/S of T2	4,402-737
- P259: D/S of T3	8,899
Reference Junctions	Hydraulic Grade (m)
C1	49 ~ 55
J-550 Loop PPC	30 ~ 49
Samraong	30 ~ 49

Activation of loop improved water pressure situation in the system. The minimum hydraulic grade at reference junction J-550 rose from 21m (loop not active, V1 close) to 30m(loop active, V1 close).

Filling rate of water tanks are instable and behaviour of both of them are simmilar as shown in the figure below.

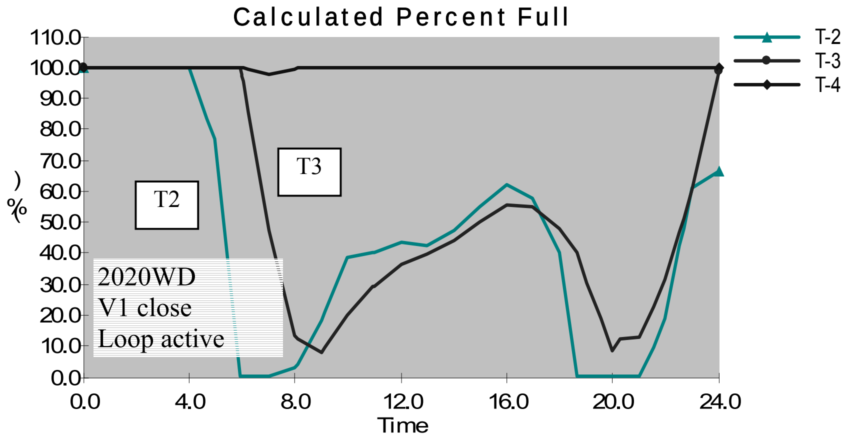


Figure SR5.1.17: Behaviors of Water Tanks (V1-Close, Loop Active)

Discharge speed is very high in T2 and T3. Because Phum Prek WTP cannot supply sufficient volume of water required in city core area, water tank T2 supply a part of its stored water to city core area, then filling rate of T2 decrease rapidly. When T2 become empty, T3 starts to supply water to downstream part of the West Zone and Airport Zone, and some part of water discharged from T3 flows toward T2 to supply water to the city core area. T2 become empty during the peak time in the morning and evening. These situation shall be considered undesirable in terms of efficiency.

Simulation of 2010 Simulation Model with 2020 Water Demand (Loop Active, V1 Open)

We simulated 2010 simulation model with water demand equivalent with 2020 water demand under condition of V1 valve is opened. The results are presented in the table below.

Table SR5.1.14: Key Reference Indicator of Prey Pring Choeung Loop in 2010 Model with 2020WD

Scenario (2010 Model & 2020 WD)	Prey Pring Choeung Loop Loop Active V1-Open
Reference Pipes	Flow (m^3/d)
A	16,757
B	16,316
- P284: D/S of T2	7,104
- P259: D/S of T3	5,508
Reference Junctions	Hydraulic Grade (m)
C1	41 ~ 53
J-550 Loop PPC	33 ~ 52
Samraong	32 ~ 52

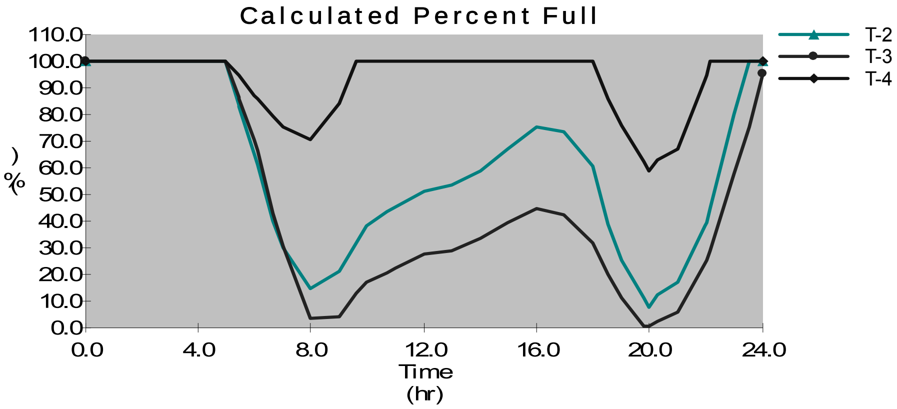


Figure SR5.1.18: Behaviors of Water Tanks (V1-Close, Loop Active) (2010 Model, 2020WD, Loop Active, V1 Open)

Activation of loop and opening the V1 valve bring balanced situation with satisfying the criteria in terms of flow, behaviour of water tanks, required volume of each WTP and values of pressure. Performance of the system is obviously improved.

3.4.3 Water Tank with Pumping System

The water tanks empty during the peak period. Central distribution network does not have enough water pressure to refill the water tanks.

T2 and T3, which are located on transmission line in the Prey Pring Choeung loop, are forced to cover wide area. T2 and T3 cannot supply water sufficiently to those areas due to high demand.

Following issues are considered:

(1) With consideration of long-term operation, each water tank shall have adequate distribution area corresponding to its capacity.

(2) It is not desirable to keep T2 and T3 in present situation as supporting bulk of a major transmission.

In order to ensure the flexibility of system, extreme condition of system was simulated (2010 simulation model, 2020 water demand, V1 open, Loop Active).

Under this condition, though all reference indicators remain within the range of criteria of Master Plan, two water tanks become empty at morning peak 8:00a.m. and evening peak at 20:00 (8:00p.m.). Then, water tanks require assistance to refill to ensure stable water distribution. We propose the pumping system to refill Water Tank (T2 and T3).

Simulation condition of pumping system is as follows.

- Diversion line equipped with pump shall be installed as shown in figure.
- Pipe between two connection points of diversion line shall be equipped with a chek valve in order to prevent circulation.
- Two valves shall be automatically closed when hydraulic grade become below 36.5m at T2/T3 to prevent reverse flow or circulation.
- Pumping system shall be turn on when hydraulic grade become below 36.5m at T2/T3.
- The initial condition of the water tank is 100% full.

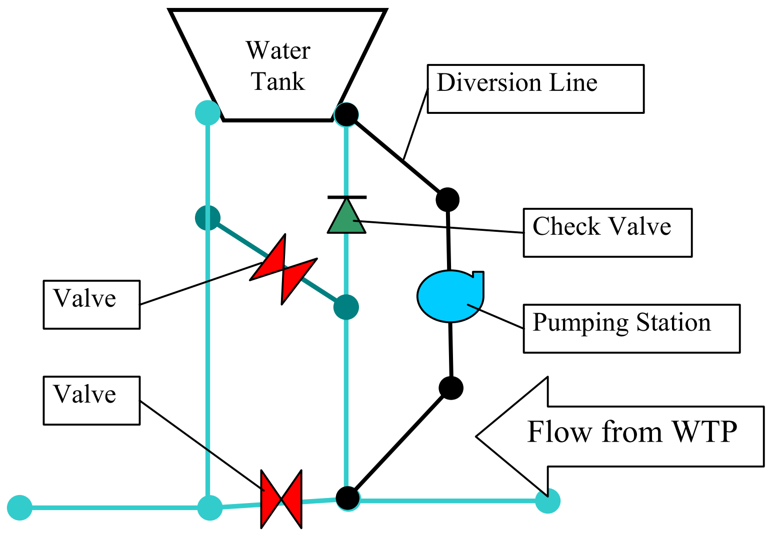


Figure SR5.1.19: Schematic Diagram of Pumping System for Water Tank

Table SR5.1.15: Pump Characteristics for Simulation

Pump Definition	KUBOTA DV-LF355F1K (small)
Initial Pump Status: Off	Initial Relative Speed Factor: 0.80
Operation Status of Pump	
Set relative speed factor at 0.80, and turn on when hydraulic grade at node T2/T3 become below 36.50m Turn off when hydraulic grade at node T2/T3 become above 40.50 m	

The following figure give result of simulation in case of T3 is equipped already and T2 has not equipped yet.

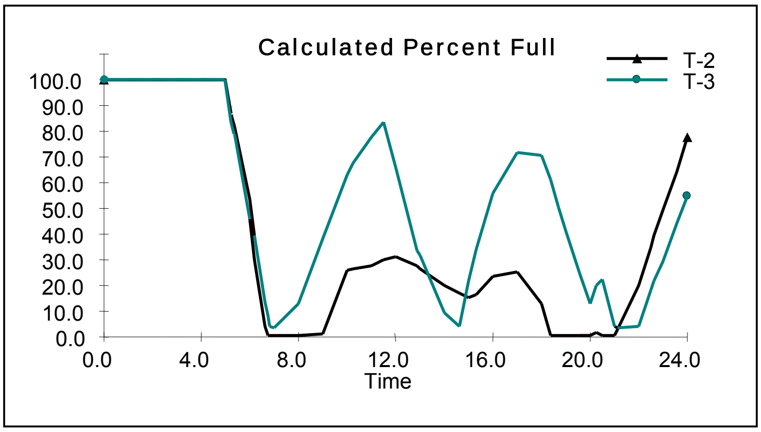


Figure SR5.1.20: Filling Rate at T-2 and T-3 Water Tanks (2010 Model, 2020WD, Loop Active, V1 Open) Only T-3 is equipped with a pumping system

According to simulation results, using local pumping system is the most efficient method to refill the water tank in terms of pressure and energy cost saving.

These results clearly show the necessity of pumping system to T2 and T3 water tanks. These equipments shall be in use at peak periods, and then enable to improve distribution performance. It is recommended that T-2 and T-3 Water Tanks needs to be equipped with pumping system.

3.4.4 Summary and Recommendations for Prey Pring Choeung Loop

Even under the most severe conditions, Prey Pring Choeung Loop including Airport and Choam Chau branches does not have a particular problem. This looping system brings obvious better distribution of flow on the network and better balancing of pressure. The simulations led under severe conditions show that the network can give very different behaviours according to the operating condition. This is particularly affected operation condition of V1-Valve and the Water Tanks.

Table SR5.1.16: Summary of Simulation Results for Prey Pring Choeung Loop

Scenario	Prey Pring Choeung Loop										
Loop Status	**No active**		**No active**		**No active**	**Active**		**Active**		**Active**	
Water Demand	**2010**		**2015**		**2020**	**2010**		**2015**		**2020**	
V1 Status	**Close**	**Open**	**Close**	**Open**	**Close**	**Close**	**Open**	**Close**	**Open**	**Close**	**Open**
Pressure pipes	Flow (m^3/d)	Flow (m^3/d)	Flow (m^3/d)	Flow (m^3/d)	Flow (m^3/d)	Flow (m^3/d)	Flow (m^3/d)	Flow (m^3/d)	Flow (m^3/d)	Flow (m^3/d)	Flow (m^3/d)
A	13,192	13,192	17,149	17,149	19,722	13,007	11,907	17,794	15,000	20,250	16,757
B	8,981	8,981	12,139 -464	11,675	13,887 -972	10,730 -43	11,830	12,719 -590	14,890	12,377	16,316
P-284 -Down-Chom - T2	2,820	4,885	3,723 -696	3,664	6,736	4,915 -619	4,885	4,322 -856	6,226	4,402 -737	7,104
P-259 - Airport down-T3	5,585	3,546	7,260	4,681	8,349	4,618	3,546 -47	7,286	4,522	8,899	5,508
Reference junctions	HG (m)	HG (m)	HG (m)	HG (m)	HG (m)	HG (m)	HG (m)	HG (m)	HG (m)	HG (m)	HG (m)
C1	48 ~ 55	49 ~ 55	37 ~ 53	-	45 ~ 55	48 ~ 55	47 ~ 56	37 ~ 53	44 ~ 54	49 ~ 55	41 ~ 53
J-550 Loop PPC	38 ~ 54	42 ~ 54	-	-	21 ~ 45	38 ~ 54	43 ~ 55	30 ~ 49	41 ~ 53	30 ~ 49	33 ~ 52

Note: HG=Hydraulic Grade

The simulation brings following results:

1) The required clear water production volume of Phum Prek WTP exceeds its capacity after 2010.
2) V1 valve shall be opened in 2010 after completion and activation of Prei Pring Choeung Loop system. Under the "V1-close" condition, reverse flow occurs at the point B (Bridge of Stung Mean Chey), and disturbs flow in transmission.
3) Existing pipes can supply water with adequate flow and pressure even in 2020.
4) T2 and T3 have important roles to regulate flow. These tanks shall be monitored and taken account into operation method.
5) The network is well balanced by the loop system and never meets critical situation.
6) The activation of the Prey Pring Choeung Loop contributes to improve the supply of the dense urban area with the condition of open the V1 valve.
7) Installation of pumping system is necessary to T2 and T3 for safety of water distribution. It will also contribute energy cost saving.
8) Chrang Chamreh water tank (T4) doesn't have important role for water distribution. It works like a "buffer" for Reussey Keav loop.
9) At the point "A", flow velocity is about 2m/s. It exceeds the range of criteria, but it will decrease with completion of inter-connection in 2015.

3.5 Ta Khmau Dangkao Loop (South)

3.5.1 Formation of the Loop

3.5.1.1 Dangkao Branch

The Dangkao branch goes down southwards from the east end of Veng Sreng road. This transmission line crosses the Prea Pung Lear (Vat Sambor) bridge with a 400 mm pipe. The branch now reaches to Cheung Aek where some development have emerged recently.

This branch with tree formation will be connected to the Ta Khmau branch in the Stage 3.

Dangkao branch will remain with tree formation as a transmission line until Stage 3.

3.5.1.2 Ta Khmau Branch

Water demand in the Ta Khmau branch will exceed that of Kien Svay area in 2010. Chak Angre Leu and Chak Angre Krom sub-districts are supplied by the currently existing pipes. Two pipes are laid along the National road No.2:

- Dia. 250 mm pipe (Tonlé Bassac river side).
- Dia. 300 mm pipe (west side);

Each of the possible alternative scenario was tested to fit the expected evolution. For the purpose of this comparison, some key points were selected on the network. The impact of system modification is observed and analysed on each of these key points.

Simulation model is built to find the most effective solutions regarding both hydraulic and energetic standpoints. The "energy cost" function of the WaterCAD software has been used to evaluate energetic situation.

The following criteria have been used in simulations.

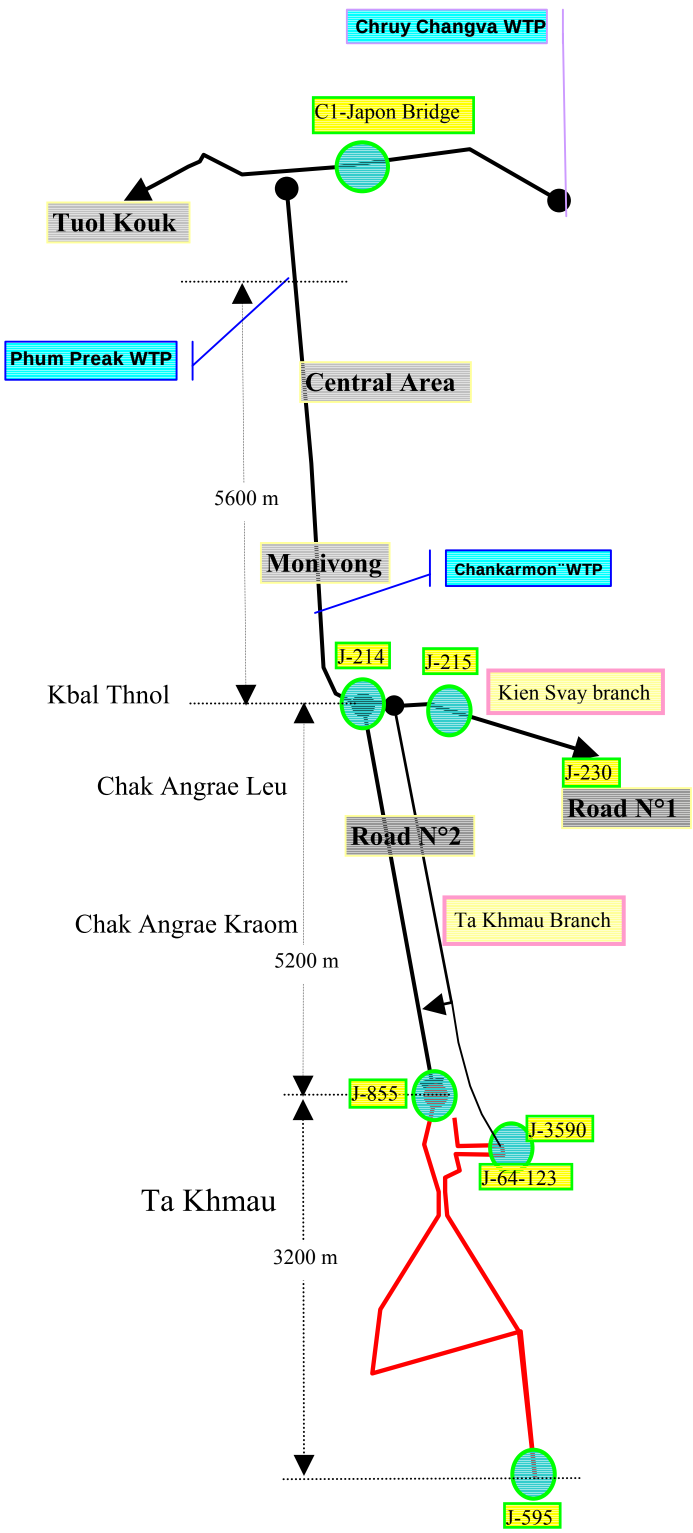


Figure SR5.1.21: Ta Khmau Branch

1) Ensure that the agreed level of service be met for all consumers and increase supply security.

2) Use existing infrastructure efficiently.

3) Locate new tank where the future water supply deficient areas is (to reduce energy and laying pipes costs).

4) Because the Water Tank and Transmission Line Pipe lifetime are over 50 years, the system should be planned reasonably flexible to adapt to city development variations and further longer-term development after the designed system is commissioned.

5) Proposed Tank should have no adverse effects to the existing (ongoing) reservoirs.

6) System operation and optimisation must be considered to ensure costs are acceptable to the community.

Existing land use and buildings were taken in account into simulation as constrains.

Some negative pressures are observed in simulation condition in 2010. This happens in the downstream area after crossing the Preak Thnot river.

A considerable head loss is already observed at the junction point of Dia.300mm pipe located at Kbal Thnol. The high flow velocity with 2.6 m/s causes this head loss.

The line supplying Chak Angrae Leu and Chak Angrae Kraom subdistricts before it reaches Ta Khmau. Its supply volume rises 180% from 2005 to 2010. The water demand in those areas will increase 400% in 2020.

3.5.2 Simulated Alternatives

Only Ta Khmau branch shall be improved its distribution ability, then simulated hereinafter.

Each of the alternative actions tested induce different impacts. The main issue was to reach the best match between production and consumption. This assumes that the system operates properly and that the unaccounted losses do not invalidate the results.

The mutual compatibility of different possible actions must be taken into account prior to the design of each scenario.

Successive scenarios were built to simulate the impact of the following options:

a. Booster pump at the top of Ta Khmau and Kien Svay branchs;
b. Water Tank in the premises of the existing Ta Khmau Waterworks;
c. Doubling Ta Khmau main line through the creation of a transmission line.

Tested alternatives, which are described in this report, are summarised in the table below.

Table SR5.1.17: Relevant Alternatives and Available Scenarios for Testing

Actions	Booster Pump	Water Tank	Transmission Pipe
Single action	**Case 1**	**Case 2**	**Case 3**
Booster Pump with		**Case 4**	
Water Tank with			**Case 5**

Each alternative was tested against the current water demand condition, and then against the projected water demand for 2010. So as to evaluate the sustainability of each alternative, several configurations also have been tested against the projected 2020 condition to meet the criteria.

3.5.2.1 Booster Pump (Case 1)

Figure SR5.1.22: Entry Point of Ta Khmau & Kien Svay line, "Kbal Thnol"

A booster pump is to be installed in this scenario at the entry of the Kien Svay and Ta Khmau branchs. A check valve, placed in the first part of section DN 600 prevents any return or loop flow. The characteristics of the simulated pump (FLOWSERVE 300-lnn-475) are given in appendix and we simply tested the following control condition: Controls: On if node J-616 above 65.0 m.

Thus, the pressure is deliberately increased up to a constant value of 65 m (hydraulic Grade) at the entry of the Ta Khmau branch. We can see the result on figure 5 which shows the answer is not very level-headed. Downstream, at the reference junction, this does not allow to match the criteria established for 2010: negative pressures are observed (Hydraulic Grade close to 0).

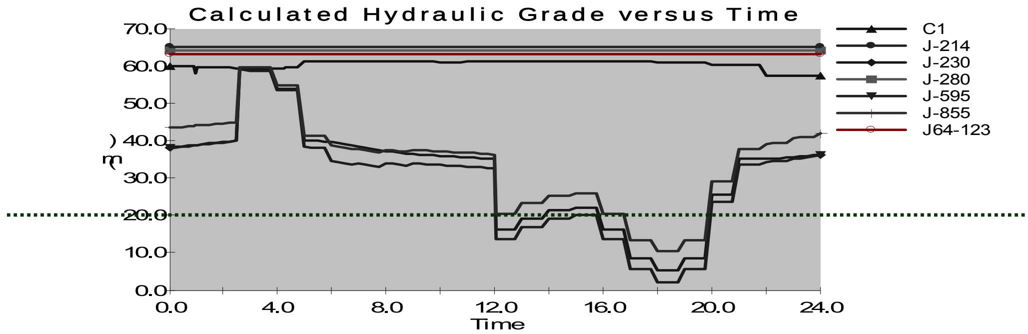


Figure SR5.1.23: Pressure Junction under Acceptable Levels for 2010

Towards the head of the branch, the high flow velocity has for effect *(i)* possible disorders in distribution; *(ii)* a high pressure loss, though probably less than that due to the consumption along that section. Amongst other reasons, a speed exceeding 2 m/s led us to discard this alternative. At peak periods, the energy loss also reaches too high levels.

Hence this alternative was not considered further.

3.5.2.2 Water Tank (Case 2)

With strictly identical conditions, building a Water Tank located at the old treatment plant of the Ta Khmau Waterworks would yield much more interesting results than the above alternative.

The specifications of the work have initially been arbitrarily set to be identical to those of the 3 Water Tanks currently under construction in Phnom Penh. The results show an excellent re-homogeneisation of pressures across the Ta Khmau network. Only towards the end of the day, an important pressure fall highlights a supply weakness.

Whatever the specifications given to this work – in a reasonable range – the pressure fall problem remains, due to a too high demand upstream.

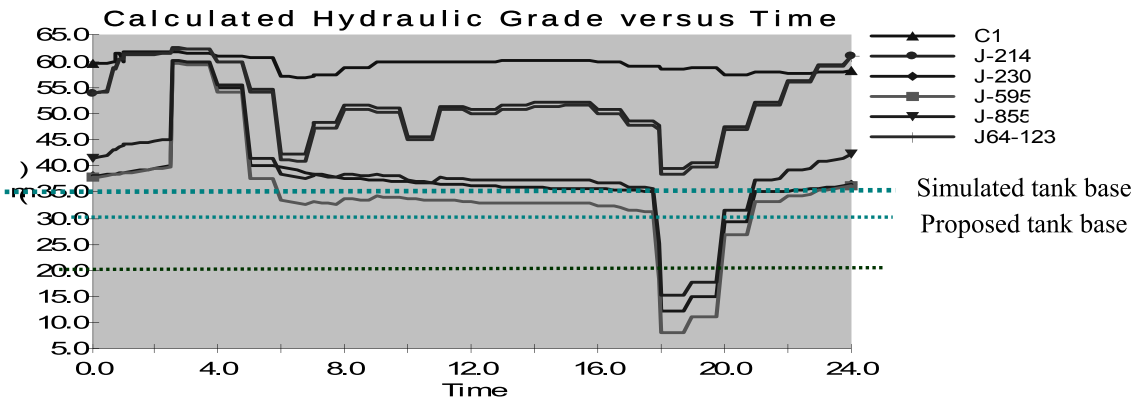


Figure SR5.1.24: Pressure Grade of main reference junction

The specifications of the simulated water tank are the following:

Table SR5.1.18: Water Tank Modeling Specifications

Geometric Summary			
X	494,277.54 m	Elevation	10.00 m
Y	1,269,816.84 m	Zone	TAKM-O
Operating Range Summary			
Maximum Elevation	41.70 m	Maximum Level	
Initial HGL	39.00 m	Initial Level	
Minimum Elevation	35.00 m	Minimum Level	
Base Elevation	35.00 m		
Storage			
Section Type	Variable Area	Inactive Volume	0.00 m³
Total Active Volume	1,500.00 m³		
Cross Section			
Depth Ratio		Volume Ratio	
0.00		0.00	
0.33		0.16	
0.66		0.46	
1.00		1.00	

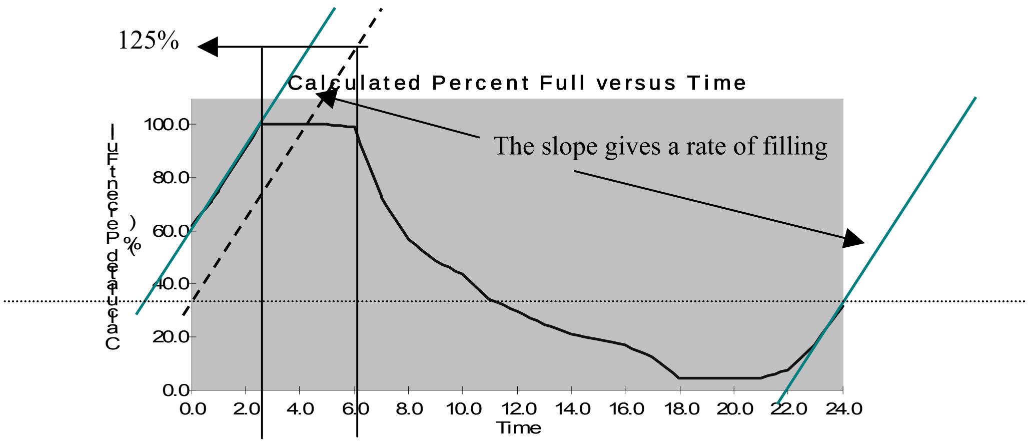


Figure SR5.1.25: Daily Filling Rate of Ta Khmau Water Tank in 2010.

The slope of the filling curve for the Tank indicates an average inflow of approximately 50 l/s. Initial conditions (predetermined) lead to a 60% of filling ratio after 24 hours. This seems optimistic, but carrying this result forward to the next day, we see that the Tank is full towards 4:30a.m. of the second day which spares about 2 hours for further filling if necessary. In spite of that, simulations show that the problem persists for these conditions because of a too low inflow from the network.

To conclude, the location of a Water Tank in Ta Khmau ensures a good pressure balance during daytime, above the required values set by the Master Plan recommendations. However, the weakness of the input system does not make it possible to consider this solution without associating a new transmission line for feeding it.

3.5.2.3 Transmission Pipe (Case 3)

The project of a new direct transmission pipeline on the road to Ta Khmau is considered a priority project by the Master Plan. Its programming belongs to the first stage (2006-2010). The analysis of the first alternatives give evidence that the existing pipes are waterlogged, and the answer of the modelling system shows the model's output is explicit to this regard. The overall increase of the hydraulic grade is about 30 meters. The transmission line shall be directly connected to the Ta Khmau network at the exsting WTP of the MIME.

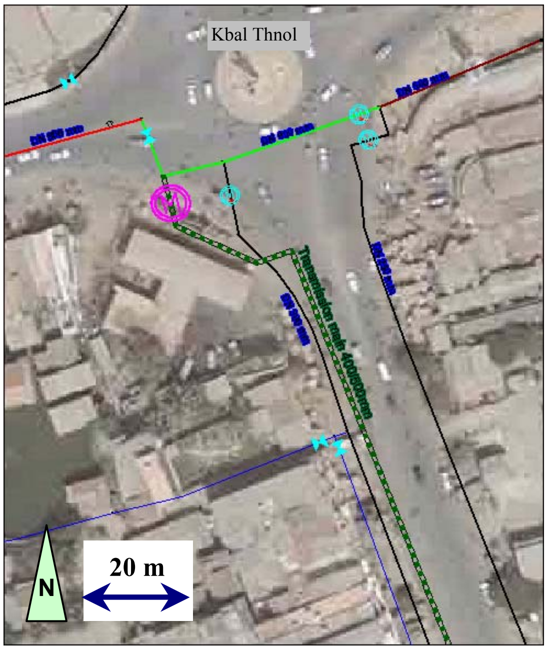


Figure SR5.1.26: Entry Connection of New Transmission Line to Ta Khmao

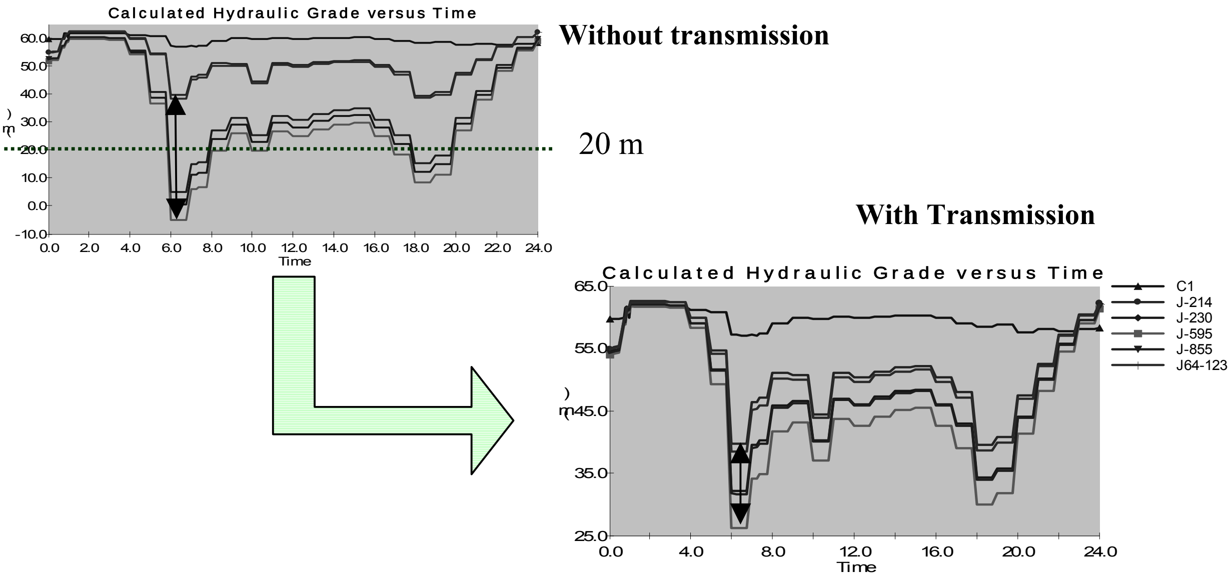


Figure SR5.1.27: Daily Hydraulic Grade on the Main Junction without/with Transmission Line

This new transmission line gives immediate and appreciable results. Pressure profiles keep the same shape as driven by the Water Demand (single supply source). We will in particular notice that the pressure loss in peak period is largely reduced by this alternative, which testifies the current network saturation.

In conclusion, the modelling tests concerning a new transmission line towards Ta Khmau show the high interest of this action. It appears that: [i] daily hydraulic grade is high enough (more than 30 meters), but [ii] on the other hand, the peak data for 2010 is near the lower limit values of the Master Plan. It will be thus necessary in the short term to plan additional equipment locally, and a Water Tank seems to be the best answer to this need.

3.5.2.4 Booster and Water Tank (Case 4)

As the existing transmission line appears to be unsatisfactory, this alternative could not be given much credit. We tested it however, to observe it brings strong disturbances in the system: too high speeds, pressures here again overdrawn and eventually the water tank getting empty by 14:00 pm.

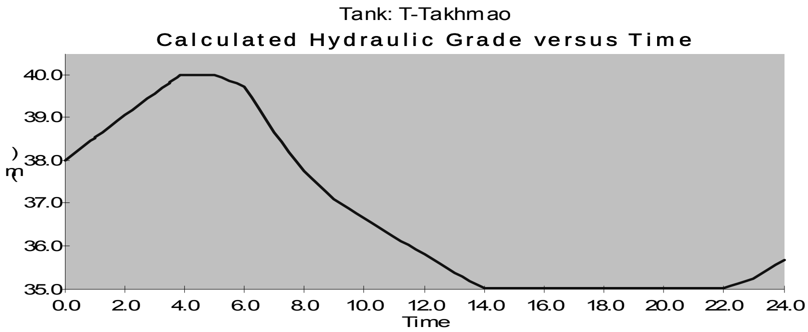


Figure SR5.1.28: Hydraulic Grade Variations at the Downstream of Ta Khmau Water Tank

These results could be expected; they are even worse than in the "water tank only" case. The speeding up caused at the pipe's head likely causes a considerable pressure loss. The energy cost is another considerable drawback of this alternative. Tests carried out with a clear water reservoir instead of the water tank, yield approximately the same effects.

In conclusion, we can find no way to optimize the use of the existing pipes regarding the various Master Plan indicators. This alternative is not relevant either on the energy point of view.

3.5.2.5 Water Tank and Transmission Pipe (Case 5)

Amongst all the cases tested, this one yields the most interesting results, including for the costs. In order to check this alternative against all Master Plan criteria and to evaluate the required works specifications, several tests were carried out under both the 2010 and 2020 scenarios projections.

The simulation of such a system must be run over more than 24 hours to eliminate the bias due to initial conditions such as the initial filling state of the water tank.

The stability of the system has been tested and results are attached in Appendix. The installation of a Water Tank in Ta Khmau was initially tested according to the characteristics of the ongoing projects, then we modified the profile by significantly lowering its base, down to 30 meters. The analysis led on 48h initially preserves the conditions set by the Master Plan, as shown by the variations of indicators on our reference points.

The two following figures show the water tank impact at the most distant junction node. It is noted that the result by far satisfies our criteria and that in particular, especially for the pressure which settles above hydraulic grade 30 m (HG between 30 and 55 m). The first part of the graph shows the effect of an initial regulation of the pumping system.

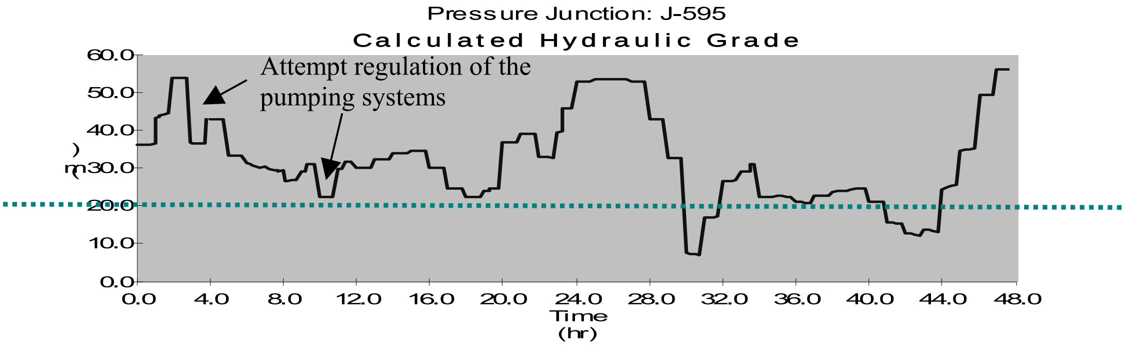


Figure SR5.1.29: Hydraulic Grade at the End of the Network without Project (2010)

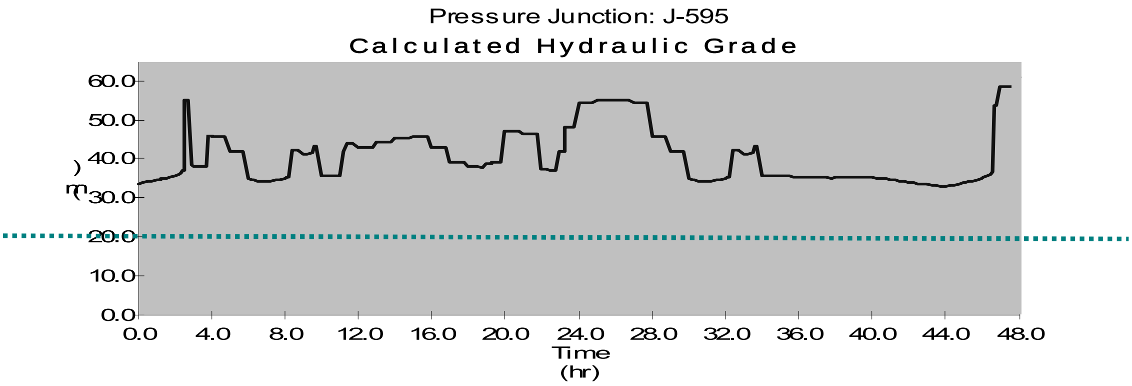


Figure SR5.1.30: Hydraulic Grade at the End of Network with Water Tank and New Transmission Pipe

It appears, that up to 2010 this scenario can keep the pressure above 30 m (hydraulic grade) at all points of the Ta Khmau network. Also, under such these conditions a better regulation of the existing pumping system (WTP) would lower the head by 10 meters without disturbing the tank behaviour. We can note that the level regulation role of the water tank gets much more important after the first 24 hours. This shows that under the current conditions (pumping from the WTP) the tank's retention capacity is actually used to balance the peaks periods. On the average the following rates are observed:

Table SR5.1.19: Water Tank Modeling Behavior

Tank Status	Percent time	Hours/day	Average Flow
Filling	18.98%	4.55	33 l/s(*)
Discharging	21.64%	5.19	38 l/s
Full	59.38%	14.25	-

(*)But can reach significant values (near to 200 l/s)

In order to ensure the system's flexibility, we have tested the hypothesis of a global Water Demand increase by 20% to 2592 l/s., that is: water demand TKMO= 57.89 l/s.

Ref: Water Demand in TKMO: 2015 average = 63.58 l/s
2020 average = 73.78 l/s

All others parameters being unchanged, the results show that the second day (with no pumping regulation) the reservoir is empty at 2.00 PM.

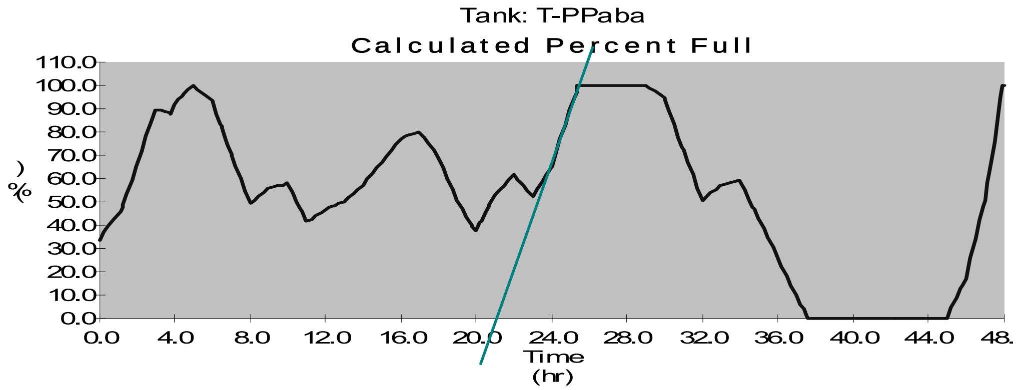


Figure SR5.1.31: Percentage of full in the Water Tank

Towards the end of the network, for this hard test, the pressure does not reach the Master Plan recommendations.

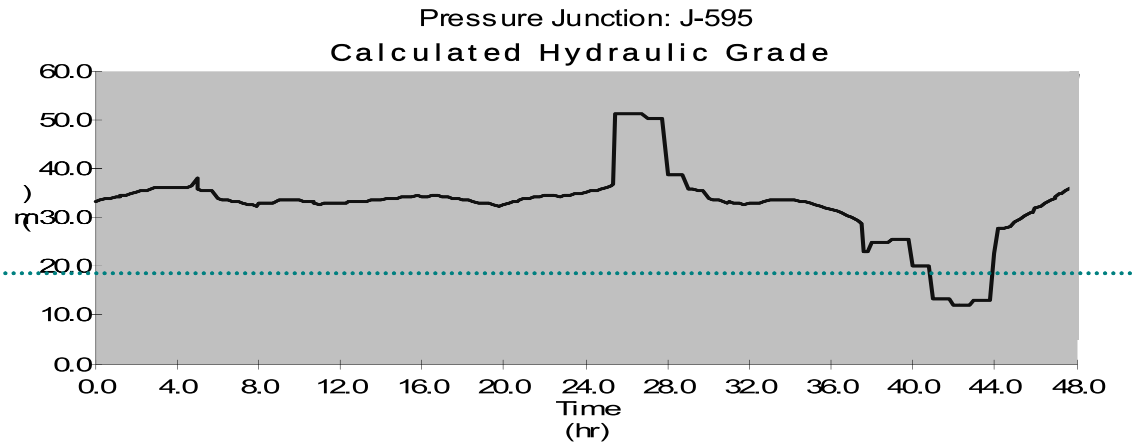


Figure SR5.1.32: The last pressure junction at the South of Ta Khmau

As this possibility must be prevented before 2015, we recommend (as a safety measure) to add a pumping system as shown below.

Table SR5.1.20: Pump Modeling Characteristics

Pump Definition Summary			
Pump Definition	**KUBOTA DV-LF355F1K (small)**		
Initial Status			
Initial Pump Status	Off	Initial Relative Speed Factor	0.40
Simple Controls			
Set relative speed factor to 0.50 if node T-Ta Khmau below 30.50 m			
Off if node T-Ta Khmau above 34.50 m			

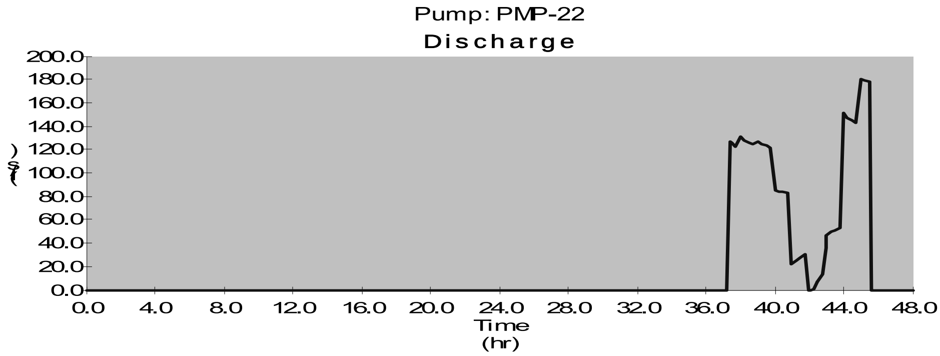


Figure SR5.1.33: Discharge of the Pumping Station to Compensate for the Water Tank Insufficiency

As result, the last point of the network is well pressurized and conforms to the Master Plan recommendations.

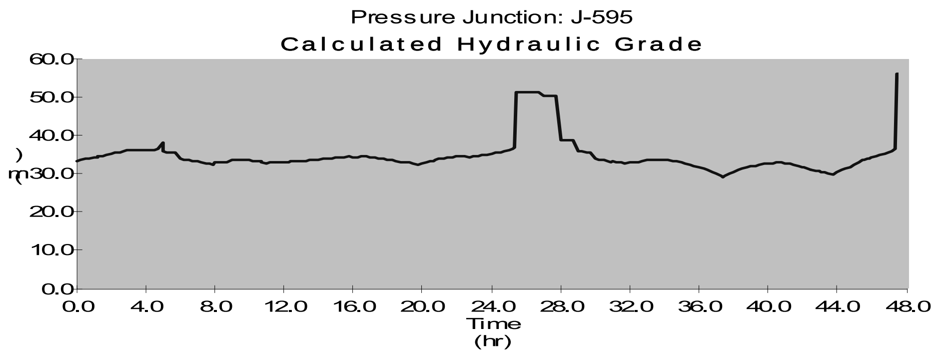


Figure SR5.1.34: Hydraulic Grade at the Last Pressure Junction towards the South of Ta Khmau

If we insert a check valve to limit all direct injection into the network, by the system pumping (« one way » water tank), the profile becomes more stable, as shown hereafter during 96 hours.

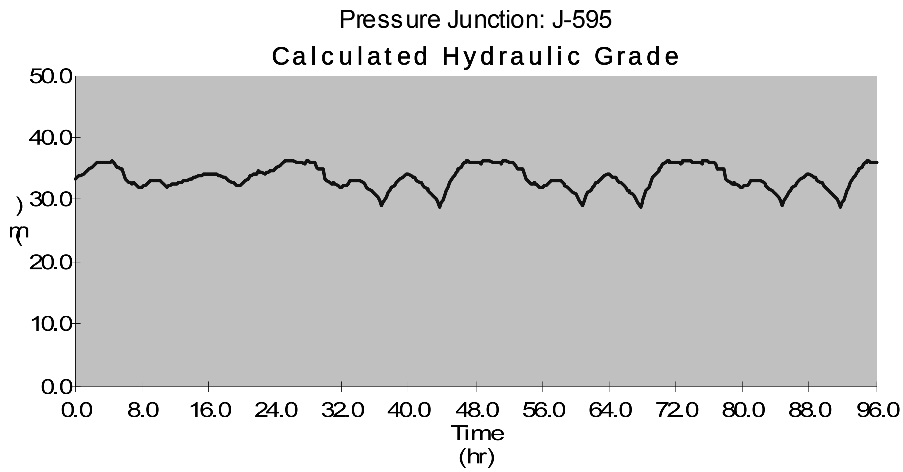


Figure SR5.1.35: the last pressure junction at the South of Ta Khmau (4 days)

So as to check the system in the long term, we used a sub-model extracted from the 2020 project model (average WD: 2973,77l/s) rather than applying the 2020 WD to the 2010 model. In all cases the system will work. This subject will be discussed in the Ta Khmau-Dankao loop feasibility study. The present equipment size will play a role in the strategy to be defined.

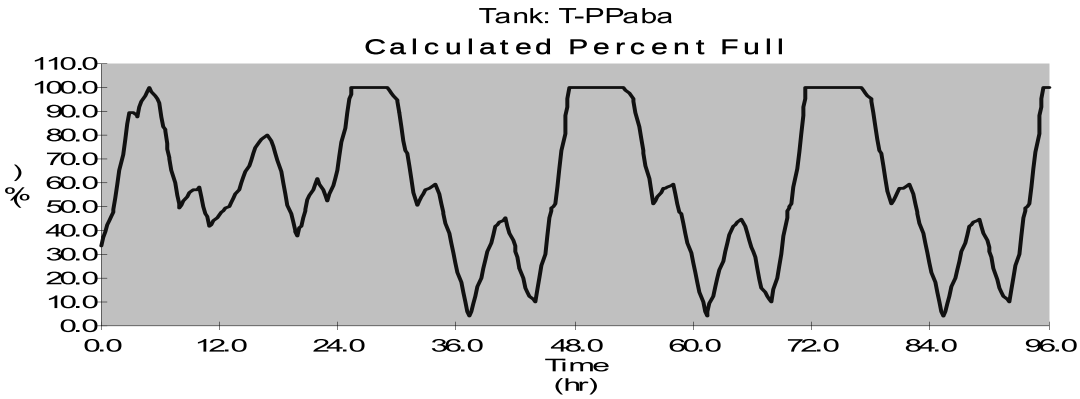


Figure SR5.1.36: Filling Percentage of the Water Tank
(over 4 days period, the system is stable.)

3.5.3 Energy Cost Comparison in Ta Khmau-Dangkao Loop System

Each alternative is the subject of a power consumption statement based on the "energy cost" feature of the waterCAD system. A relative analysis brings some interesting confirmations.

Table SR5.1.21: Classification of Situations according to the Performance Indicator

Simulation Alternatives		Energy Used by Pump	Volume Pumped	Volume Stored	Energy Daily Cost (calc. by WaterCAD system)	KPI
		kWh	m^3	m^3	US$	%
2005 model	Initial condition	49,670	247,793	-7,903	6,663	119%
Case 1	Booster Pump	54,413	263,419	-7,903	7,286	127%
Case 2	Water Tank	49,475	247,303	-8,396	6,650	119%
Case 3	Transmission Pipe	49,670	247,793	-7,903	6,663	119%
Case 5	Water Tank & Transmission Pipe	41,054	241,648	-7,275	5,498	116%

This table calls some comments about the energetic efficiency of the tested situations. This is why we make use of the KPI index [KPI index = (Pumped Water Volume – Stored Volume)/Water Demand]. The KPI calculations and resulting comparisons are presented in the above table.

One can observe for instance that in the «booster» alternative, the unit price (Cost/Volume pumped) is reasonable, but the pumped volume increases, however there is no storage. Considering the consumption, this means losses (likely due to water circulation in a loop). An efficient pressurization of the network would require a high energy contribution for about the same pumped volume as in other simulations, resulting in a significant increase of the unit cost.

Conversely, the alternatives in which water is stored downstream from the network under good conditions allow the generation of considerable energy profits.

3.5.4 Summary and Recommendations for Ta Khmau Dangkao Loop

3.5.4.1 Summary and Recommendations

It appears indisputably that the best scenario for the Ta Khmau water supply is first to reinforce the network capacity, then to build a water Tank. The following table shows the overall comparison of technical alternatives.

Table SR5.1.22: Comparison and Classification of the Scenarios

Technical Criteria's	Parameters	Case 2 Water Tank	Case 3 Transmission Dia.400 mm	Case 4 Water Tank & Booster	Case 5 Water Tank & Transmission Dia.400mm	(Reference) Transmission Dia.500mm
Efficiency and Sustainability	Hydraulic Grade	7 m	23 m	10 m	32 m	+
	Minimum Pressure	KPa < 0	130 KPa	KPa < 0	220 KPa	+
	Discharge Branch	4	2	3	1	=
	Velocity Branch	high	low	Very high	low	-
Energy Cost	Comparison with the Others	average	average	higher	lower	avarage
Effect	-	Stabilized and making safe	Acceptable but not durable	Disturbing	Conform and sustainable	Upgrade all
Classification:	A>B>C>D	C	B	D	A	give more potential

The first priority is to create a direct transmission line with diameter 400 or 500 mm. This priority results from the very close overflow of current pipes and of the disorders that would result from setting a too high charge on it. Being directly connected on the downstream end of the main transmission pipe (Monivong), this new connection will not perturb the existing system. It is advisable to turn this action into a priority considering the downstream water demand progression and the fact that no other solution is available, given the high demand on the existing structures. These structures will further be treated as a distribution system. The new pipe length depends on the site selected for settlement of the water tank; it will be approximately 5300 meters.

The only transmission line, in spite of its paramount character, does not answer the downstream distribution demand with satisfying quality conditions in peaks period. In addition the crucial shortage of global reserves - as well as the service quality standards (pressure balance) - make its appear essential to combine the water tank and transmission line projects together.

Moreover, the clear treated water source (distance is more than 14 km for Phum Preak) and the Monivong transmission line solicited by crossing from all the central dense area, imply for energy consumption a not desirable configuration.

We also recommend to directly setting up a system of mechanized raising with two pumps with total capacity of 150 m^3/h. this investment could prove to be profitable in particular like above exposed, to limit the contribution of the central systems at the WTP.

It should be added that simulations of this Water Tank showed very satisfactory and sustainable results until 2020.

The problems met on the head of treated water pumping system will be solved by lowering the head of the system. Already, BCEOM hypothesise fix this one at lower levels. In counterpart, a better regulation of the pumping station will offer more regularity and will undoubtedly reduce the high depression due to the peaks of consumption. Simulations give good results on this subject. It is thus a very favourable issue and in agreement with the Master Plan concept which delimits already the resumption gravitating zones which will in durably facilitate to extend the service and to make it more homogeneous and protected.

The bases for calculation for the Water Tank were inspired by those which ongoing in built. With relatively similar characteristics, the system gives good results.

3.5.4.2 Advantages and Benefit

Ta Khmau is a recent development area where PPWSA has been making investments to build its distribution network. This area was however identified by the Master Plan as currently in deficit of pressurization equipment. In its first stage, the Master Plan thus proposes a series of actions to remedy for this situation.

In the Kandal province, which is given for the richest of Cambodia, Ta Khmao is a remarkably wealthy close suburb of the capital city, progressively becoming a green residential area organised around the Prek Thnot and Tonle Bassac riverbanks. In its southern area, some less accessible spaces are currently equipped with a distribution system funded by AFD. The project will supply these zones with appreciable benefit for all stakeholders.

These benefits, which have been considered in the choice of design criteria, especially are:

- enabling a large number of new customer to have access to clean water distribution. For all these new PPWSA customers, the benefits are multiple:
  - a substantial reduction of their water bill: water is presently sold by private distributors at a higher cost than that sold by the PPWSA and it generally needs some additional treatment.
  - A reduction of their health expenses generated by the use of low quality water.
  - A reduction of fire hazard, with the widening of the area where fire hydrants are available.
  - A general improvement of their living conditions (convenience, reliability, and modernisation) and its impact on regional development.
- through the new income generated, allowing a reduction of the unit cost of a cubic meter, which will indirectly benefit all customers.

These benefits will be maximized and enhanced as the two following concerns were taken into account in the scenario comparison and selection:

- the reduction and better control of energy consumption,

- o balancing pressures in order to offer the best service and to give the best sustainability to the developed infrastructures.

3.5.5 Preliminary Design of Facilities

3.5.5.1 Location of the Tower Tank

Since the technical scenario is validated, there does not remain alternative other than that of the site where the Water Tank will be built. The major obstacles were:

- Suitable location according to the hydraulic computations;
- Cost of the land;
- Size of the land;
- Condition of the land.

Figure SR5.1.37: Alternative Locations of the Ta Khmau Tower Tank

Table SR5.1.23: Comparison and Classification of the Proposed Sites

Comparison Items	MIME WTP area	Near the Boeng Cheung Hek (pond)	Dense area with Industrial development	To the provincial governor area	"Central area"
Land use	public (MIME)	Private	Private	Public (Government)	Private
Cost of land	-	+	++	-	+++
Efficiency and sustainability					
Technical efficiency	Good	Fair	Good	Good	Medium
Distance to the network	Immediate	940 m	850 m	780 m	400 m
Access	Good	Difficult	Good	Good	difficult
Physical constraints	no	yes	yes	no	yes
Environment (Impacts and risks)					
Flooding	No land filling required	Land filling required	Land filling required	No land filling required	No land filling required
Impact	the least	less	low	the most	low
Protected area?	no	yes	no	no	no
Classification	**1**	**4**	**2**	**3**	**5**

The classification gives MIME Water Treatment Plant area as first option to erect the Water Tank. Then, it appears also possible to consider other localizations, in particular in edge of the boeung Cheung Hek in the sectors under development along the Maine road (north of Ta Khmau). Those sector must be investigate before considering

3.5.5.2 Pipe Sizing

The transmission pipe between the primary pipes and the water tank will be connected to the main primary pipe by one inlet pipe and one outlet pipe.

Table SR5.1.24: Transmission Pipe and Some Connections

Location	Dia. 500 mm	Dia. 400 mm
From Kbal Thnol	5,243 m	-
Ta Khmau	-	107 m
On site	70 m	46 m
Total	5,313 m	153 m

On this assumption, the evaluation of the "capital cost" for pipes is shown in the table below.

Table SR5.1.25: Capital Cost for the Pipes

Transmission	Quantity	Unit	Unit Cost ($)	Construction Cost ($)
Diameter 500 mm	5,313	m	364	1,949,871
Diameter 400 mm	153	m	273	41,769
			Total	1,991,640

3.5.5.3 Sizing of the Water Tank

For O&M reason, the Water Tank must have similar characteristics with another under construction water tanks (Total active volume of 1500m^3).

Build a water tank which will be used as relay for the network pressurization, in particular in high peak period constitutes the prospect for a reserve of safety for Ta Khmau. The water Tank will be built in concrete. Inlet, outlet and overflow pipes will be made of steel for easier installation. Furthermore, a space will be reserved for a pumping station (150m^3/h).

The hydraulic sizing of the water towers has been determined using WaterCAD. The following hydraulic characteristics have been determined:

Table SR5.1.26: Proposed Characteristics of the Water Tank

Geometric Summary			
X	494,277.54 m	Elevation	10.00 m
Y	1,269,816.84 m	Zone	TAKM-O
Operating Range Summary			
Maximum Elevation	36.70 m	Maximum Level	6.70 m
Initial HGL	33.50 m		
Minimum Elevation	30.00 m	Minimum Level	0.00 m
Base Elevation	30.00 m		
Storage			
Section Type	Variable Area	Inactive Volume	0.00 m³
Total Active Volume	1,500.00 m³		
Cross Section			
Depth Ratio		Volume Ratio	
0.00		0.00	
0.33		0.16	
0.66		0.46	
1.00		1.00	

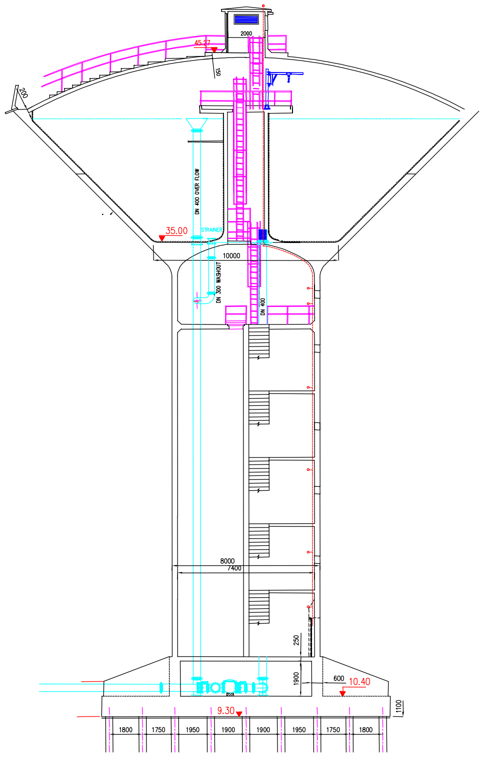


Figure SR5.1.38: Proposed Water Tank

Like existing projects, the inlet of the Tank will be equipped with an electric power valve. The valve will be closed when the Reservoir is full and will be open at an intermediate level. Level control can be made with two level sensors in relation with the pumping station. In case of power cut, the valve position will be closed.

It is proposed to install a chlorination injection point at each water tower location. Thus the water distributed downstream the Clear Water Reservoir will always be chlorinated.

4 Summary and Recommendation

4.1 Present State Simulations

The surprising result of these simulations is that the model of the 2005 network does not show any trouble under a much higher water demand. This result may be explained by the high concentration of present water demand in the central zone, together with the presence of a very strong main transmission skeleton across this same zone.

Though the current transmission network could seem oversized, it allows for an efficient transmission of pressures across the whole city with almost no head losses.

4.2 2010 Simulations

The network expands according to urban development plan/projection. Adequate transmission lines will be highly required to expand the network. It is also important for energy savings expected from the Master Plan actions.

According to simulation results, the airport branch would be threatened to loose its capacity in the mid-term, if the second stage of the Master Plan would not realized.

4.2.1 Ruessei Keav Loop (North)

The Ruessei Keav loop has as no really significant incidence on the existing central distribution system.

This loop is very effective to supply the entire northern zone. Activation of the loop gives improvement of the pressures balance, which evolve from 37~47m to 44~49m in hydraulic grade, thus it reduce the variations pressure from 10m to 5m in hydraulic grade. The balance of flows is also significant advantage of loop activation.

Another significant effect of this loop is that this loop will be the important branch in the Stage 2 and Stage 3 of the Master Plan.

Table SR5.1.27: Summary of Simulation Result of Ruessei Keav Loop

Scenario (2010model& 2010 water demand)	**Ruessei Keav Loop**			
	Loop not Active		**Loop Active**	
	V1-CLOSE	**V1-OPEN**	**V1-CLOSE**	**V1-OPEN**
Reference Pipe	Flow (m^3/d)	Flow (m^3/d)	Flow (m^3/d)	Flow (m^3/d)
C	10,079	10,079	8,064	8,044
D	1,636	1,636	3,651	3,671
Reference Junction	HG (m)	HG (m)	HG (m)	HG (m)
C1	40.7 – 44.8	41.8 – 44.8	40.7 – 44.8	41.8 – 44.8
Balance point	36.7 – 46.9	36.7 – 46.9	42.8 – 47.9	43.8 – 48.9

Note: HG=Hydraulic grade

As a conclusion, we recommend to complete Ruessei Keav loop, which shows many advantages. The loop activation and opening V1 valve influence only slightly to the central system. The O'veng branch contributes for activation of the loop.

The loop will be a major branch of interconnections loop, which are intended to connect to Nirouth WTP at the Stage 2 of Master Plan.

On the other hand, the pressure balance is well improved with an average increase of 6 meters in the pressure balance point of the loop and fluctuation range is reduced about 5 meters.

Activate the loop allows to reduce approximately 20% of load of Chrang Chamreh branch.

Pumping system is not required for Chrang Chamreh Water Tank (T4). The role of the tank will be similar as a buffer only after 2015.

4.2.2 Prey Pring Choeung loop (West)

Under the most severe conditions, Prey Pring Choeung loop, which consist of Airport and Choam Chau branche, does not cause any particular problem. This loop system brings a better distribution of the flows on the network and better balancing of pressure. The simulation results under severe conditions show that the network can give very different behaviours according to the operating method. This is reflected particularly by operation of the V1 valve and the Water Tanks.

Table SR5.1.28: Simulation Results for the Prey Pring Choeung Loop in 2010

Technical Criteria's	**Parameters**	**Scenario 1**	**Scenario 2**	**Scenario 3**	**Scenario 4**	**Alternative** Pumps T2,T3
Loop Status	Not Active/Active	Not Active	Not Active	Active	Active	Active
V1 Status	Close/Open	Close	Open	Close	Open	Open
Efficiency and Sustainability	Hydraulic Grade: C1 [m]	48-55	49-55	48-55	47-56	
	Hydraulic Grade: J-550 [m]	38-54	42-54	38-54	43-55	
	Flow of Pipe: A [m^3/s]	13,192	13,192	13,007	11,907	=
	Flow of Pipe: B [m^3/s]	8,981	8,981	10,730-43	11,830	
	Max. Velocity in Branch	1.47	1.47	1.19	1.02	-
Energy Cost	Energy Cost	3,392	3,392	3,405	3,425	↔
Effect	-	Disturbing	Acceptable but no durable	Stabilized and making safe	Conform and sustainable	All Upgraded
Classification:	A>B>C>D	D	B	C	A	More Advantage

1) The required clear water production volume of Phum Prek WTP exceeds its capacity after 2010.
2) V1 valve shall be opened in 2010 after completion and activation of Prei Pring Choeung Loop system.
3) Existing pipes can supply water with adequate flow and pressure even in 2020.
4) The activation of the Prey Pring Choeung Loop contributes to improve the supply of the dense urban area with the condition of open the V1 valve.
5) Installation of pumping system is necessary to T2 and T3 for safety of water distribution. It will also contribute energy cost saving.

4.2.3 Ta Khmau Dangkao Loop (Ta Khmau Water Supply System)

The best scenario for the Ta Khmau water supply system is first to reinforce the network capacity, then to build a Water Tank. The following table shows the overall comparison of technical alternatives.

Table SR5.1.29: Comparison and Classification of the Scenarios

Technical Criteria's	**Parameters**	**Case 2** Water Tank	**Case 3** Transmission Dia.400 mm	**Case 4** Water Tank & Booster	**Case 5** Water Tank & Transmission Dia.400mm	(Reference) Transmission Dia.500mm
Efficiency and Sustainability	Hydraulic Grade	7 m	23 m	10 m	32 m	+
	Minimum Pressure	KPa < 0	130 KPa	KPa < 0	220 KPa	+
	Discharge Branch	4	2	3	1	=
	Velocity Branch	high	low	Very high	low	-
Energy Cost	Comparison with the Others	average	average	higher	lower	average
Effect	-	Stabilized and making safe	Acceptable but not durable	Disturbing	Conform and sustainable	Upgrade all
Classification:	A>B>C>D	C	B	D	A	give more potential

The first priority is to create a direct transmission line with diameter 400 or 500 mm and water tank with capacity of 1500m3. The new pipe length will be approximately 5300 meters. Then, water tank and transmission line shall be combined together in the system.

We also recommend installing pumping system with total capacity of 150 m3/h to the water tank. This investment makes the system sustainable until 2020.

Supporting Report 5.2 Distribution Pipeline Analysis (Pipeline Route Indicators)

Pipe Line Route Indictors

Pipe Name	From (Node Name)	To (Node Name)	Length (m)	Diameter (mm)	Material	Hazen-Williams Coeff.	Maximum Velocity (m/s)	Minimum Velocity (m/s)	Maximum Headloss Gradient (m/km)	Maximum Discharge (l/s)
0A	T-PP	IN PP	1	2,000	Ductile Iron	130	0.2	0.1	0.0	715.2
0B	T-CW1+2	IN CW1+2	1	2,000	Ductile Iron	130	0.3	0.1	0.0	950.9
1A	IN PP	PMP-1a	5	600	Ductile Iron	130	-	-	-	-
1B	PMP-1a	OUT PP	2	700	Ductile Iron	130	-	-	-	-
2A	IN PP	PMP-2a	5	600	Ductile Iron	130	-	-	-	-
2B	PMP-2a	OUT PP	2	700	Ductile Iron	130	-	-	-	-
3A	IN PP	PMP-3	5	600	Ductile Iron	130	-	-	-	-
3B	PMP-3	OUT PP	2	700	Ductile Iron	130	-	-	-	-
4A	IN PP	PMP-4a	5	400	Ductile Iron	130	1.4	0.6	4.6	178.8
4B	PMP-4a	OUT PP	2	400	Ductile Iron	130	1.4	0.6	4.6	178.8
5A	IN PP	PMP-5a	5	400	Ductile Iron	130	1.4	0.6	4.6	178.8
5B	PMP-5a	OUT PP	2	400	Ductile Iron	130	1.4	0.6	4.6	178.8
6A	IN PP	PMP-6a	5	400	Ductile Iron	130	1.4	-	4.6	178.8
6B	PMP-6a	OUT PP	2	400	Ductile Iron	130	1.4	-	4.6	178.8
7A	IN PP	PMP-7	5	400	Ductile Iron	130	1.4	0.6	4.6	178.8
7B	PMP-7	OUT PP	2	400	Ductile Iron	130	1.4	0.6	4.6	178.8
8A	IN CW1+2	PMP-8	5	600	Ductile Iron	130	0.5	0.1	0.4	135.9
8B	PMP-8	OUT CW1+2	2	600	Ductile Iron	130	0.5	0.1	0.4	135.9
9A	IN CW1+2	PMP-9	5	600	Ductile Iron	130	0.5	0.1	0.4	135.9
9B	PMP-9	OUT CW1+2	2	600	Ductile Iron	130	0.5	0.1	0.4	135.9
10A	IN CW1+2	PMP-10	5	600	Ductile Iron	130	0.5	0.1	0.4	135.9
10B	PMP-10	OUT CW1+2	2	600	Ductile Iron	130	0.5	0.1	0.4	135.9
11A	IN CW1+2	PMP-11	5	600	Ductile Iron	130	0.5	0.1	0.4	135.9
11B	PMP-11	OUT CW1+2	2	600	Ductile Iron	130	0.5	0.1	0.4	135.9
12A	IN CW1+2	PMP-12	5	600	Ductile Iron	130	0.5	0.1	0.4	135.9
12B	PMP-12	OUT CW1+2	2	600	Ductile Iron	130	0.5	0.1	0.4	135.9
13A	IN CW1+2	PMP-13	5	600	Ductile Iron	130	0.5	0.1	0.4	135.9
13B	PMP-13	OUT CW1+2	2	600	Ductile Iron	130	0.5	0.1	0.4	135.9
B	J-6	J-7	117	800	Ductile Iron	130	0.4	0.1	0.2	207.5
C	J-279	J-299	265	500	Ductile Iron	130	0.8	0.2	1.2	151.6
D	J-372	J-502	1,769	500	Ductile Iron	130	0.4	0.1	0.3	69.4
P-1	FCV-156	J-DP-CCW-RK01-Phum3	474	250	Ductile Iron	130	0.2	0.1	0.2	10.0
P-2	J-2	J-1	2	1,600	Ductile Iron	130	0.3	0.0	0.0	542.6
P-6	J-18	J-19	159	1,400	Ductile Iron	130	1.1	0.1	0.6	1,648.2
P-7	J-17	J-18	400	1,400	Ductile Iron	130	1.1	0.1	0.7	1,676.0
P-8	J-412-IZa	J-658a	24	400	Ductile Iron	130	-	-	-	-
P-9	J-1	J-17	66	1,400	Ductile Iron	130	1.2	0.1	0.8	1,846.0
P-10-outPP	J-32	J-27	48	1,350	Ductile Iron	130	1.4	0.2	1.0	1,951.1
P-12	J-25	J-26	2	1,350	Ductile Iron	130	1.0	0.1	0.6	1,481.7
P-13	J-29	J-25	3	1,350	Ductile Iron	130	1.0	0.1	0.6	1,481.7
P-14	J-33	J-31	31	1,350	Ductile Iron	130	1.4	0.2	1.0	1,951.1
P-15	J-30	J-29	3	1,350	Ductile Iron	130	1.0	0.1	0.6	1,481.7
P-16	J-28	J-30	3	1,350	Ductile Iron	130	1.4	0.2	1.0	1,951.1
P-17	J-27	J-28	2	1,350	Ductile Iron	130	1.4	0.2	1.0	1,951.1
P-19	J-44	J-33	28	1,250	Ductile Iron	130	1.6	0.2	1.5	1,951.1
P-20	J-45	J-44	26	1,250	Ductile Iron	130	0.6	-	0.3	761.1
P-21	PMP-4	J-44	5	1,250	Ductile Iron	130	0.6	-	0.2	718.9
P-23	J-54	J-53	145	1,100	Ductile Iron	130	0.4	0.0	0.2	396.5
P-24	J-4	J-54	797	1,100	Ductile Iron	130	0.4	0.0	0.2	408.3
P-29	J-64	J-60	810	1,000	Ductile Iron	130	0.6	0.1	0.3	483.2
P-30	J-65	J-66	1,417	1,000	Ductile Iron	130	0.7	0.2	0.4	526.3
P-32	J-58	J-59	8	1,000	Ductile Iron	130	0.8	0.2	0.6	637.4
P-33	J-61	J-62	36	1,000	Ductile Iron	130	0.5	0.1	0.2	363.7
P-34	J-19	J-57	7	1,000	Ductile Iron	130	1.0	0.2	0.8	755.7
P-35	J-59	J-63	658	1,000	Ductile Iron	130	0.8	0.2	0.6	637.4
P-36	J-60	J-61	12	1,000	Ductile Iron	130	0.6	0.1	0.3	444.4
P-37	J-66	FCV-1	6	900	Ductile Iron	130	0.8	0.2	0.7	526.3
P-38	J-96	J-81	516	900	Ductile Iron	130	0.5	0.1	0.2	291.7
P-39	J-97	J-94	68	900	Ductile Iron	130	0.4	0.1	0.2	233.6
P-42	R-9	R-10	31	900	Ductile Iron	130	-	-	-	0.9
P-43	J-1433	J-101	453	900	Ductile Iron	130	1.3	0.0	1.5	828.5
P-44	J-98	J-87	486	900	Ductile Iron	130	1.5	0.0	2.0	945.9
P-46	J-100	J-77	141	900	Ductile Iron	130	0.5	0.1	0.2	303.2
P-47	J-77	J-78	2	900	Ductile Iron	130	-	-	-	-
P-49	J-77	J-102	338	900	Ductile Iron	130	0.5	0.1	0.2	303.2
P-50	J-81	J-82	6	900	Ductile Iron	130	0.4	0.1	0.2	262.3
P-53	J-94	J-95	32	900	Ductile Iron	130	0.0	0.0	-	23.6
P-56	J-103	J-97	550	900	Ductile Iron	130	0.4	0.1	0.2	233.6
P-58	J-101	J-91	214	900	Ductile Iron	130	1.2	0.1	1.3	762.6
P-59	R-9	J-83	7	900	Ductile Iron	130	-	-	-	0.6
P-60	J-83	J-86	31	900	Ductile Iron	130	-	-	-	0.6
P-61	J-102	J-104	884	900	Ductile Iron	130	0.4	0.1	0.2	276.8
P-63	R-10	J-86	7	900	Ductile Iron	130	-	-	-	0.6
P-66	J-2	J-147	13	800	Ductile Iron	130	-	-	-	-
P-69	J-133	J-134	3	800	Ductile Iron	130	1.2	0.0	1.6	622.3
P-70	J-140	J-141	10	800	Ductile Iron	130	1.2	-	1.5	596.1
P-71	J-140	J-134	404	800	Ductile Iron	130	1.2	0.0	1.5	606.6

Pipe Line Route Indictors

Pipe Name	From (Node Name)	To (Node Name)	Length (m)	Diameter (mm)	Material	Hazen-Williams Coeff.	Maximum Velocity (m/s)	Minimum Velocity (m/s)	Maximum Headloss Gradient (m/km)	Maximum Discharge (l/s)
P-72	J-163	J-144	428	800	Ductile Iron	130	1.0	0.0	1.1	514.0
P-73	J-92	J-164	531	800	Ductile Iron	130	1.4	0.1	2.1	722.3
P-75	J-164	J-133	319	800	Ductile Iron	130	1.4	0.0	1.9	679.9
P-83	J-137	J-152	540	800	Ductile Iron	130	0.9	0.1	0.9	457.0
P-84	R-5	J-150	17	800	Ductile Iron	130	2.6	2.6	6.1	1,283.6
P-86	J-144	J-142	11	800	Ductile Iron	130	1.0	0.0	1.1	495.1
P-88	J-135	J-136	3	800	Ductile Iron	130	0.2	0.0	0.0	73.6
P-89	J-165	J-146	399	800	Ductile Iron	130	0.8	0.1	0.7	383.4
P-95out-CC	J-151	J-159	123	800	Ductile Iron	130	0.9	0.2	0.8	426.0
P-96	J-160	J-165	1,165	800	Ductile Iron	130	0.9	0.2	0.8	426.0
P-97	J-142	J-143	10	800	Ductile Iron	130	1.1	0.2	1.3	545.7
P-98	J-159	J-160	107	800	Ductile Iron	130	0.9	0.2	0.8	426.0
P-99	J-146	J-135	11	800	Ductile Iron	130	0.8	0.1	0.7	383.4
P-100	J-201	J-200	12	700	Ductile Iron	130	1.2	1.2	1.9	473.9
P-102	J-200	R-5	93	700	Ductile Iron	130	1.0	1.0	1.2	380.7
P-103	R-6	J-199	196	700	Ductile Iron	130	5.6	5.6	30.1	2,138.2
P-110	J-201	R-5	50	700	Ductile Iron	130	1.2	1.2	1.9	473.9
P-111	J-199	J-150	8	700	Ductile Iron	130	3.3	3.3	11.7	1,283.6
P-114	J-218	J-219	67	600	Ductile Iron	130	-	-	-	-
P-117	R-4	J-46	84	600	Ductile Iron	130	-	-	-	-
P-119	J-223	J-225	362	600	Ductile Iron	130	0.7	0.2	0.9	207.5
P-121	J-214	J-215	40	600	Ductile Iron	130	0.6	0.1	0.6	172.5
P-123	J-221	J-227	553	600	Ductile Iron	130	0.7	0.2	0.7	184.1
P-124	R-4	J-46	57	600	Ductile Iron	130	-	-	-	-
P-125	R-4	J-46	77	600	Ductile Iron	130	-	-	-	-
P-126	J-216	J-217	53	600	Ductile Iron	130	0.7	0.2	0.9	207.5
P-128	R-4	J-46	60	600	Ductile Iron	130	-	-	-	-
P-129	J-220	J-221	96	600	Ductile Iron	130	0.7	0.2	0.7	184.1
P-130	J-222	J-223	126	600	Ductile Iron	130	0.7	0.2	0.9	207.5
P-131	J-217	J-222	128	600	Ductile Iron	130	0.7	0.2	0.9	207.5
P-132	J-281	J-266	33	500	Ductile Iron	130	0.4	0.1	0.3	78.6
P-133	J39-296	J-287	219	500	Ductile Iron	130	0.3	0.1	0.2	50.7
P-135	J-17	J-258	5	500	Ductile Iron	130	0.9	0.2	1.4	170.0
P-137	J-254	J-255	4	500	Ductile Iron	130	0.4	0.1	0.3	77.1
P-138	J-302	J-278	896	500	Ductile Iron	130	0.4	0.1	0.3	74.1
P-139	J-259	J-260	6	500	Ductile Iron	130	0.4	0.1	0.3	73.5
P-140	J-293	J-300	267	500	Ductile Iron	130	0.4	0.1	0.4	81.2
P-141	J-309	J-274	667	500	Ductile Iron	130	0.9	0.2	1.4	170.0
P-142	J38-305	J-297	438	500	Ductile Iron	130	0.4	0.1	0.4	80.8
P-143	J-249	J-248	3	500	Ductile Iron	130	1.2	-	2.7	237.3
P-144	J-247	J-248	3	500	Ductile Iron	130	1.8	-	5.6	355.4
P-146	J-304	J38-305	313	500	Ductile Iron	130	0.5	0.1	0.5	100.6
P-148	J-251	J-95	3	500	Ductile Iron	130	0.1	0.0	0.0	23.6
P-149	J-295	J-254	2,295	500	Ductile Iron	130	0.4	0.1	0.3	77.1
P-150	J-215	J-292	90	500	Ductile Iron	130	0.7	0.2	1.0	137.1
P-155	J-44	J-295	234	500	Ductile Iron	130	0.4	0.1	0.3	77.1
P-156out CM	J-270	J-224	13	500	Ductile Iron	130	1.8	-	5.6	355.4
P-157	J-250	J-249	3	500	Ductile Iron	130	0.6	-	0.7	115.0
P-158	J-271	T-1	16	500	Ductile Iron	130	-	-	-	-
P-159	J-274	J-275	17	500	Ductile Iron	130	0.9	0.2	1.4	170.0
P-161	J-301	J-302	273	500	Ductile Iron	130	0.4	0.1	0.3	72.8
P-162	J-287	J-288	49	500	Ductile Iron	130	0.1	0.0	0.0	16.2
P-164	J-260	J-286	47	500	Ductile Iron	130	0.4	0.1	0.3	73.5
P-167	J-246	J-298	375	500	Ductile Iron	130	0.6	0.1	0.7	119.3
P-168	J-297	J39-296	222	500	Ductile Iron	130	0.4	0.1	0.4	80.8
P-169	J-225	J-220	84	500	Ductile Iron	130	0.9	0.2	1.7	184.1
P-172	J-282	J-283	37	500	Ductile Iron	130	0.5	0.1	0.5	92.5
P-174	J-303	J-308	533	500	Ductile Iron	130	0.4	0.1	0.4	81.8
P-176	J-310	J-252	1,065	500	Ductile Iron	130	0.7	0.2	0.9	133.6
P-177	J-280	J-281	34	500	Ductile Iron	130	0.7	0.2	1.0	137.1
P-179	J-256	J74-257	4	500	Ductile Iron	130	0.4	0.1	0.3	71.3
P-180	J70-311	J-276	857	500	Ductile Iron	130	0.3	0.1	0.2	58.6
P-183	J-227	J-294	160	500	Ductile Iron	130	0.9	0.2	1.7	184.1
P-184	J-282	J-317	927	500	Ductile Iron	130	0.3	0.1	0.3	66.5
P-185	J-301	J-315	821	500	Ductile Iron	130	0.4	0.1	0.4	81.6
P-186	J-308	J-272	785	500	Ductile Iron	130	0.4	0.1	0.4	81.8
P-187	J-252	J-253	3	500	Ductile Iron	130	0.7	0.2	1.0	142.2
P-188	J-316	J-312	859	500	Ductile Iron	130	0.2	0.1	0.1	46.5
P-189	J-283	J-306	367	500	Ductile Iron	130	0.5	0.1	0.5	92.5
P-190	J-299	J-303	278	500	Ductile Iron	130	0.5	0.1	0.4	90.0
P-191	J-298	J-294	245	500	Ductile Iron	130	0.8	0.2	1.1	147.6
P-192	J-314	J-253	1,185	500	Ductile Iron	130	0.8	0.2	1.2	152.1
P-193	J-307	J-306	316	500	Ductile Iron	130	0.7	0.2	0.9	133.7
P-194	J-307	J-310	611	500	Ductile Iron	130	0.7	0.2	0.9	133.7
P-196	J-278	J-246	2	500	Ductile Iron	130	0.5	0.1	0.6	101.2
P-198	J-285	J-314	711	500	Ductile Iron	130	0.8	0.2	1.2	152.1
P-200	J-284	J-285	38	500	Ductile Iron	130	1.1	0.3	2.1	210.0
P-202	J-412	J-413	143	500	Ductile Iron	130	0.4	0.1	0.3	74.0
P-203	J-393	J-401	14	500	Ductile Iron	130	0.4	0.1	0.4	80.3

Pipe Line Route Indictors

Pipe Name	From (Node Name)	To (Node Name)	Length (m)	Diameter (mm)	Material	Hazen-Williams Coeff.	Maximum Velocity (m/s)	Minimum Velocity (m/s)	Maximum Headloss Gradient (m/km)	Maximum Discharge (l/s)
P-204	J-413	J-397	223	500	Ductile Iron	130	0.4	0.1	0.3	74.0
P-205	J-399	J-400	10	500	Ductile Iron	130	0.2	0.1	0.1	46.4
P-206	J-407	J-408	108	500	Ductile Iron	130	0.3	0.1	0.1	48.2
P-207	J-415	J-416	373	500	Ductile Iron	130	-	-	-	-
P-208	J-397	J-414	260	500	Ductile Iron	130	0.5	0.1	0.5	97.4
P-209	J-402	J35-403	14	500	Ductile Iron	130	-	-	-	-
P-211	J-410	J-411	142	500	Ductile Iron	130	-	-	-	-
P-212	J-98	J-393	7	500	Ductile Iron	130	0.4	0.1	0.4	80.3
P-213	J-416	J-391	498	500	Ductile Iron	130	-	-	-	-
P-214	J-219	J-415	314	500	Ductile Iron	130	-	-	-	-
P-215	J-744	J-402	15	500	Ductile Iron	130	-	-	-	-
P-216	J-406	J-407	96	500	Ductile Iron	130	0.3	0.1	0.1	48.2
P-217	J-64	J-396	12	500	Ductile Iron	130	0.8	0.2	1.2	154.2
P-219	J-401	J-406	156	500	Ductile Iron	130	0.4	0.1	0.3	73.7
P-220	J-392	J-410	163	500	Ductile Iron	130	-	-	-	-
P-221	J-397	J-398	12	500	Ductile Iron	130	0.1	0.0	0.0	23.3
P-222	J-411	J-412	144	500	Ductile Iron	130	0.3	0.1	0.2	59.1
P-223	J-391	J-392	5	500	Ductile Iron	130	-	-	-	-
P-224	J-414	J-399	270	500	Ductile Iron	130	0.5	0.1	0.5	97.4
P-225	J-394	J-395	11	500	Ductile Iron	130	0.8	0.2	1.2	154.2
P-226	J-392	J-744	673	500	Ductile Iron	130	-	-	-	-
P-227	J-61	J-447	8	400	Ductile Iron	130	0.6	0.2	1.1	80.8
P-228	J-456	J-457	20	400	Ductile Iron	130	0.6	0.2	1.1	80.8
P-229	J-411	J-451	9	400	Ductile Iron	130	0.5	0.1	0.6	59.1
P-231	J-412	J33-450	8	400	Ductile Iron	130	0.1	0.0	0.1	14.9
P-233	J-487	J-488	319	400	Ductile Iron	130	0.5	0.1	0.7	66.5
P-235	J-473	J-288	119	400	Ductile Iron	130	0.1	0.0	0.1	16.2
P-236	J-466	J-445	47	400	Ductile Iron	130	-	-	-	-
P-237	J35-403	J-473	164	400	Ductile Iron	130	0.1	0.0	0.1	16.2
P-238	J-490	J-446	283	400	Ductile Iron	130	-	-	-	-
P-239	J-91	J-458	19	400	Ductile Iron	130	0.3	0.1	0.2	30.9
P-240	J-58	J-454	20	400	Ductile Iron	130	0.5	0.1	0.6	61.4
P-241	J-455	J-461	35	400	Ductile Iron	130	0.3	0.1	0.3	39.7
P-244	J-454	J-455	13	400	Ductile Iron	130	0.5	0.1	0.6	61.4
P-246	J-100	J-453	10	400	Ductile Iron	130	1.0	0.2	2.2	119.1
P-248	J-452	J-475	120	400	Ductile Iron	130	0.7	0.2	1.3	91.3
P-250	FCV-257	FCV-521	193	250	Ductile Iron	130	0.3	0.1	0.5	14.7
P-251	J-444	J-304	6	400	Ductile Iron	130	1.0	0.2	2.2	119.1
P-252	J-470	J-496	939	400	Ductile Iron	130	0.3	0.1	0.2	34.1
P-253	J-486	J-494	1,027	400	Ductile Iron	130	0.2	0.0	0.1	22.9
P-256	J-482	J-483	205	400	Ductile Iron	130	0.5	0.1	0.7	62.3
P-258	J-474	J-487	257	400	Ductile Iron	130	0.5	0.1	0.7	66.5
P-259-down T3	J-446	J-474	349	400	Ductile Iron	130	0.5	0.1	0.7	66.5
P-260	J-483	J-492	710	400	Ductile Iron	130	0.5	0.1	0.7	62.3
P-261	J-459	J-460	25	400	Ductile Iron	130	0.2	0.0	0.1	22.1
P-263	J-492	J-464	542	400	Ductile Iron	130	0.5	0.1	0.7	63.6
P-268	J-485	J-469	214	400	Ductile Iron	130	0.3	0.1	0.2	34.1
P-270	J-317	J-446	5	400	Ductile Iron	130	0.5	0.1	0.7	66.5
P-273	J46-478	J-479	154	400	Ductile Iron	130	0.2	0.1	0.1	26.5
P-274	J-477	J-482	426	400	Ductile Iron	130	0.4	0.1	0.5	52.5
P-275	J-476-jonction sud	J-477	138	400	Ductile Iron	130	0.4	0.1	0.5	52.5
P-276-down T4 chamreh	J-449	J-486	218	400	Ductile Iron	130	0.4	0.1	0.4	46.5
P-279	J-465	J-475	126	400	Ductile Iron	130	0.7	0.2	1.3	91.3
P-280	J-479	J-493	579	400	Ductile Iron	130	0.2	0.1	0.1	26.5
P-281	J74-257	J-485	523	400	Ductile Iron	130	0.3	0.1	0.2	34.1
P-283	J-469	J-470	96	400	Ductile Iron	130	0.3	0.1	0.2	34.1
P-284-down T2-Chom	J-445	J-452	10	400	Ductile Iron	130	0.7	0.2	1.3	91.3
P-285	J-464	J-465	44	400	Ductile Iron	130	0.6	0.1	1.0	76.8
P-287	J-443	J-315	3	400	Ductile Iron	130	0.7	0.2	1.3	91.3
P-290	J-292	J-554	7	400	Ductile Iron	130	0.5	0.1	0.8	67.7
P-291	J-560	J-459	86	400	Ductile Iron	130	-	-	-	-
P-294	J22-561	J-562	290	250	Ductile Iron	130	0.6	0.1	1.4	26.8
P-296	J-557	J-459	12	400	Ductile Iron	130	0.2	0.0	0.1	22.1
P-297	J-555	J-557	16	400	Ductile Iron	130	0.1	0.0	0.0	8.0
P-299	J-402	J-559	13	400	Ductile Iron	130	-	-	-	-
P-300	J-553	J-280	6	400	Ductile Iron	130	0.5	0.1	0.8	67.7
P-301	J-610	J-611	6	300	Ductile Iron	130	-	-	-	-
P-304	J-758	J-681	29	300	Ductile Iron	130	0.7	0.2	1.6	47.5
P-305	J-104	J-576	11	300	Ductile Iron	130	0.3	0.1	0.4	21.6
P-306	J-733	J-734	20	300	Ductile Iron	130	1.1	0.3	4.3	80.8
P-307	J-625	J-626	9	300	Ductile Iron	130	0.7	0.0	1.5	46.3
P-313	J33-634	J-670	155	300	Ductile Iron	130	-	-	-	-
P-315	J-603	J20-604	5	300	Ductile Iron	130	0.2	0.1	0.2	14.1
P-316	J-630	J-610	7	300	Ductile Iron	130	-	-	-	-
P-327	J-82	J-624	8	300	Ductile Iron	130	0.8	0.2	2.1	54.8

Pipe Line Route Indictors

Pipe Name	From (Node Name)	To (Node Name)	Length (m)	Diameter (mm)	Material	Hazen-Williams Coeff.	Maximum Velocity (m/s)	Minimum Velocity (m/s)	Maximum Headloss Gradient (m/km)	Maximum Discharge (l/s)
P-328	J19-692	J-862	238	300	Ductile Iron	130	0.7	0.2	1.6	47.5
P-329	J-788	J-701	205	300	Ductile Iron	130	0.1	0.0	0.1	10.1
P-331	PMP-1	J-270	17	300	Ductile Iron	130	-	-	-	-
P-335	J-750	J-691	235	300	Ductile Iron	130	0.8	0.2	2.3	57.0
P-339	J-600	J-873	222	300	Ductile Iron	130	0.2	0.0	0.1	10.7
P-341	J-103	J-629	9	300	Ductile Iron	130	0.3	0.1	0.4	21.7
P-342	J-691	J19-692	10	300	Ductile Iron	130	0.8	0.2	2.3	57.0
P-343	J22-864	J22-869	212	300	Ductile Iron	130	0.2	0.1	0.2	13.7
P-347	J-609	J-451	6	300	Ductile Iron	130	0.2	0.1	0.2	14.9
P-353	J72-497	J-906	910	300	Ductile Iron	130	0.1	0.0	0.1	7.7
P-354	J-251	J-900	484	300	Ductile Iron	130	0.3	0.1	0.4	23.6
P-355	J-751	J-752	25	300	Ductile Iron	130	-	-	-	-
P-356	J-647	J-665	8	300	Ductile Iron	130	-	-	-	-
P-358	J-727	J-594	21	300	Ductile Iron	130	0.4	0.1	0.6	27.9
P-359	J-681	J-682	9	300	Ductile Iron	130	0.5	0.1	1.1	37.9
P-360	J-742	J-870	433	300	Ductile Iron	130	-	-	-	-
P-363	J-687	J-660	116	300	Ductile Iron	130	0.2	0.1	0.2	14.9
P-366	J-725	J19-856	240	300	Ductile Iron	130	1.2	0.3	4.5	82.7
P-368	J-846	J-847	128	300	Ductile Iron	130	1.0	0.2	3.4	70.7
P-370	J15-706	J-751	167	300	Ductile Iron	130	-	-	-	-
P-375	J-645	J-809	74	300	Ductile Iron	130	0.0	0.0	0.0	2.9
P-378	J-743	J-729	330	300	Ductile Iron	130	1.1	0.3	4.3	80.8
P-379	J-731	J-810	76	300	Ductile Iron	130	0.3	0.1	0.3	17.9
P-380	J-776	J-617	40	300	Ductile Iron	130	1.0	0.2	3.4	70.7
P-381	J-719	J-725	16	300	Ductile Iron	130	1.2	0.3	4.5	82.7
P-383	J-65	J-713	12	300	Ductile Iron	130	0.9	0.2	2.8	64.0
P-385	J-247	PMP-2	14	300	Ductile Iron	130	5.0	-	67.3	355.4
P-388	J-690	J-731	326	300	Ductile Iron	130	0.3	0.1	0.3	17.9
P-391	J-577	J-578	2	300	Ductile Iron	130	0.4	0.1	0.6	28.4
P-397	J-627	J-628	6	300	Ductile Iron	130	0.1	0.0	0.0	6.6
P-399	J-151	J-599	15	300	Ductile Iron	130	-	-	-	-
P-400	J-592	J-811	80	300	Ductile Iron	130	0.2	0.0	0.1	11.9
P-401	PMP-2	J-270	23	300	Ductile Iron	130	5.0	-	67.3	355.4
P-402	J-699	J-690	240	300	Ductile Iron	130	0.3	0.1	0.3	17.9
P-403	J-214	J-738	18	300	Ductile Iron	130	0.8	0.2	2.2	55.8
P-404	J-729	J-712	77	300	Ductile Iron	130	1.1	0.3	4.3	80.8
P-408	J-734	J-743	182	300	Ductile Iron	130	1.1	0.3	4.3	80.8
P-409	J-591	J-592	3	300	Ductile Iron	130	0.2	0.0	0.1	11.9
P-412	J-904	J-895	646	300	Ductile Iron	130	0.3	0.1	0.4	23.6
P-419	J-863	J22-864	181	300	Ductile Iron	130	0.4	0.1	0.6	27.3
P-425	J17-746	J-759	120	300	Ductile Iron	130	1.1	0.3	4.1	78.3
P-427	J-872	J-676	220	300	Ductile Iron	130	0.4	0.1	0.6	28.6
P-431	J58-768	J-830	209	300	Ductile Iron	130	0.4	0.1	0.6	28.6
P-432	J-593	J-594	3	300	Ductile Iron	130	-	-	-	-
P-435	J-611	J-687	13	300	Ductile Iron	130	0.2	0.1	0.2	14.9
P-439	J-705	J-457	290	300	Ductile Iron	130	1.1	0.3	4.3	80.8
P-445	J10-792	J-765	122	300	Ductile Iron	130	0.6	0.0	1.1	38.8
P-447	J-853	J-821	151	300	Ductile Iron	130	-	-	-	-
P-451	C1	R-1	1	1,600	Ductile Iron	130	-	-	-	-
P-453	J35-403	J-889	1,018	300	Ductile Iron	130	-	-	-	-
P-456	J-834	J-835	122	300	Ductile Iron	130	-	-	-	-
P-459	J-878	J-807	264	300	Ductile Iron	130	1.0	0.2	3.4	70.7
P-461	J-776	J-875	233	300	Ductile Iron	130	1.0	0.2	3.4	70.7
P-472	J-712	J-705	273	300	Ductile Iron	130	1.1	0.3	4.3	80.8
P-475	J-875	J-878	243	300	Ductile Iron	130	1.0	0.2	3.4	70.7
P-480	J-830	J-872	514	300	Ductile Iron	130	0.4	0.1	0.6	28.6
P-481	J-586	J58-879	244	300	Ductile Iron	130	0.2	0.1	0.2	14.1
P-483	J-806	J-774	63	300	Ductile Iron	130	0.2	0.0	0.1	11.8
P-484	J-814	J-762	85	300	Ductile Iron	130	0.3	0.1	0.4	23.5
P-485	J-476-jonction sud	J-786	217	300	Ductile Iron	130	0.2	0.1	0.3	17.2
P-486	J-675	J-676	12	300	Ductile Iron	130	0.8	0.2	2.1	54.8
P-490	J-581	J-582	2	300	Ductile Iron	130	0.4	0.1	0.6	28.2
P-491	J-889	J-890	314	300	Ductile Iron	130	-	-	-	-
P-493	J-57	J-716	14	300	Ductile Iron	130	0.8	0.2	2.3	56.8
P-494	J-404	J-744	16	300	Ductile Iron	130	-	-	-	-
P-495	J22-869	FCV-152	659	300	Ductile Iron	130	-	-	-	-
P-499	J-807	J-699	73	300	Ductile Iron	130	1.0	0.2	3.4	70.7
P-500	J-884	J-767	320	300	Ductile Iron	130	0.2	0.0	0.1	10.7
P-507	J-665	J-733	138	300	Ductile Iron	130	-	-	-	-
P-508	J-598	J-409	5	300	Ductile Iron	130	0.4	0.1	0.5	25.2
P-509	J-821	J-822	86	300	Ductile Iron	130	0.3	0.1	0.3	20.2
P-513	J-809	J-877	375	300	Ductile Iron	130	0.0	0.0	-	1.7
P-514	J-767	J58-768	193	300	Ductile Iron	130	0.2	0.0	0.1	10.7
P-515	J-897	J-898	404	300	Ductile Iron	130	0.0	0.0	-	2.0
P-516	J-765	J10-766	143	300	Ductile Iron	130	0.6	0.0	1.1	38.8
P-518	J-300	J-597	4	300	Ductile Iron	130	1.1	0.3	4.1	78.3
P-519	J35-637	J-788	63	300	Ductile Iron	130	0.1	0.0	0.1	10.1
P-522	J-778	J-897	635	300	Ductile Iron	130	0.0	0.0	-	2.0
P-524	J-451	J-619	6	300	Ductile Iron	130	0.6	0.2	1.4	44.2
P-526	J-591	J-612	6	300	Ductile Iron	130	0.2	0.0	0.1	11.9

Pipe Line Route Indictors

Pipe Name	From (Node Name)	To (Node Name)	Length (m)	Diameter (mm)	Material	Hazen-Williams Coeff.	Maximum Velocity (m/s)	Minimum Velocity (m/s)	Maximum Headloss Gradient (m/km)	Maximum Discharge (l/s)
P-530	J-584	J-585	795	300	Ductile Iron	130	0.1	0.0	0.1	9.4
P-531	J62-804	J-805	68	300	Ductile Iron	130	0.6	0.1	1.1	39.1
P-533	J-881	J-882	254	300	Ductile Iron	130	-	-	-	-
P-534	J-810	J58-796	399	300	Ductile Iron	130	0.3	0.1	0.3	17.9
P-536	J-708	J-622	274	300	Ductile Iron	130	0.3	0.1	0.4	20.7
P-538	J-748	J-760	32	300	Ductile Iron	130	0.3	0.1	0.3	18.5
P-540	J-868	J-892	330	300	Ductile Iron	130	0.6	0.1	1.1	39.1
P-541	J-813	J-817	169	300	Ductile Iron	130	0.8	0.2	2.2	55.8
P-542	J-583	J-584	2	300	Ductile Iron	130	0.1	0.0	0.1	9.4
P-543	J-738	J-785	55	300	Ductile Iron	130	0.8	0.2	2.2	55.8
P-544	J-854	J-855	158	300	Ductile Iron	130	-	-	-	-
P-545	J-894	J-735	458	300	Ductile Iron	130	-	-	-	-
P-547	J-861	J-838	177	300	Ductile Iron	130	-	-	-	-
P-550	J-825	J-888	297	300	Ductile Iron	130	0.0	0.0	-	2.0
P-552	J-828	J62-804	320	300	Ductile Iron	130	0.8	0.2	2.2	55.8
P-554	J-310	J-739	18	300	Ductile Iron	130	0.0	-	-	0.4
P-556	J-882	J-899	413	300	Ductile Iron	130	-	-	-	-
P-557	J-770	J-867	554	300	Ductile Iron	130	0.4	0.1	0.7	30.4
P-560	J-843	J-894	360	300	Ductile Iron	130	-	-	-	-
P-561	J-493	J-756	27	300	Ductile Iron	130	0.4	0.1	0.6	26.5
P-562	J-578	J-579	809	300	Ductile Iron	130	0.4	0.1	0.6	28.4
P-563	J-824	J-825	133	300	Ductile Iron	130	0.0	0.0	-	2.0
P-564	J-760	J-304	209	300	Ductile Iron	130	0.3	0.1	0.3	18.5
P-565	J-841	J-806	126	300	Ductile Iron	130	0.2	0.0	0.1	11.8
P-566	J-582	J-857	168	300	Ductile Iron	130	0.2	0.0	0.1	11.8
P-567	J-857	J-841	160	300	Ductile Iron	130	0.2	0.0	0.1	11.8
P-568	J-747	J-748	25	300	Ductile Iron	130	0.3	0.1	0.3	18.5
P-571	J66-851	J-783	151	300	Ductile Iron	130	-	-	-	-
P-572	J-575	J-576	2	300	Ductile Iron	130	0.3	0.1	0.4	21.6
P-573	J-876	J-842	234	300	Ductile Iron	130	-	-	-	-
P-574	J-605	J22-606	6	300	Ductile Iron	130	0.6	0.1	1.2	41.0
P-576	J-622	J-657	8	300	Ductile Iron	130	0.1	0.0	0.1	8.1
P-577	J-805	J-782	188	300	Ductile Iron	130	0.6	0.1	1.1	39.1
P-580	J-783	J-784	50	300	Ductile Iron	130	-	-	-	-
P-582	J-845	J-891	327	300	Ductile Iron	130	-	-	-	-
P-584	J-592	J-602	5	300	Ductile Iron	130	-	-	-	-
P-585	J-579	J-580	2	300	Ductile Iron	130	0.4	0.1	0.6	28.4
P-586	J-811	J66-851	241	300	Ductile Iron	130	0.2	0.0	0.1	11.9
P-587	J-253	J-581	19	300	Ductile Iron	130	0.1	0.0	0.1	9.9
P-589	J-817	J-828	291	300	Ductile Iron	130	0.8	0.2	2.2	55.8
P-590	J-612	J-831	109	300	Ductile Iron	130	0.3	0.1	0.3	18.5
P-592	J-812	J60-860	167	300	Ductile Iron	130	0.7	0.2	1.7	49.0
P-593	J-774	J-775	47	300	Ductile Iron	130	0.2	0.0	0.1	11.8
P-594	J-784	J-887	283	300	Ductile Iron	130	-	-	-	-
P-595	J-838	J-799	122	300	Ductile Iron	130	-	-	-	-
P-596	J-782	J-868	347	300	Ductile Iron	130	0.6	0.1	1.1	39.1
P-597	J-785	J-813	171	300	Ductile Iron	130	0.8	0.2	2.2	55.8
P-598	J-769	J46-684	37	300	Ductile Iron	130	0.4	0.1	0.6	26.5
P-600	J-852	J-769	151	300	Ductile Iron	130	0.4	0.1	0.6	26.5
P-601	J-893	J-861	330	300	Ductile Iron	130	-	-	-	-
P-603	J-888	J-778	341	300	Ductile Iron	130	0.0	0.0	-	2.0
P-605	J-901	J-770	790	300	Ductile Iron	130	0.5	0.1	0.9	34.8
P-606	J-775	J71-844	213	300	Ductile Iron	130	0.2	0.0	0.1	11.8
P-607	J-779	J-780	43	300	Ductile Iron	130	0.2	0.1	0.2	14.4
P-608	J-600	J-870	219	300	Ductile Iron	130	-	-	-	-
P-610	J-887	J-881	311	300	Ductile Iron	130	-	-	-	-
P-612	J-699	J-700	11	300	Ductile Iron	130	0.8	0.2	2.0	52.9
P-613	J-799	J-779	254	300	Ductile Iron	130	-	-	-	-
P-614	J-580	J62-587	621	300	Ductile Iron	130	0.4	0.1	0.6	28.4
P-615	J62-587	J58-588	3	300	Ductile Iron	130	0.4	0.1	0.8	31.4
P-616	J-605	J-708	259	300	Ductile Iron	130	0.6	0.1	1.2	41.0
P-619	J-703	J-605	12	300	Ductile Iron	130	-	-	-	-
P-620	J-842	J-843	120	300	Ductile Iron	130	-	-	-	-
P-622	J-756	J-852	233	300	Ductile Iron	130	0.4	0.1	0.6	26.5
P-623	J46-720	J-721	14	300	Ductile Iron	130	0.1	0.0	0.1	9.7
P-624	J58-879	J-886	265	300	Ductile Iron	130	0.4	0.1	0.6	28.4
P-627	J-585	J-586	3	300	Ductile Iron	130	0.1	0.0	0.1	9.4
P-628	J-740	J-583	254	300	Ductile Iron	130	0.1	0.0	0.1	9.4
P-629	J-629	J-850	145	300	Ductile Iron	130	0.3	0.1	0.4	21.7
P-632	FCV-152	J-703	4	300	Ductile Iron	130	-	-	-	-
P-635	J-1500	J71-1285	152	250	Ductile Iron	130	0.5	0.1	1.1	23.6
P-638	J-1492	J-1493	41	250	Ductile Iron	130	0.4	0.1	0.9	21.8
P-641	J-1244	J-1274	5	250	Ductile Iron	130	-	-	-	-
P-643	J-1252	J-1268	5	250	Ductile Iron	130	-	-	-	-
P-644	J-1260	J-1438	22	250	Ductile Iron	130	-	-	-	-
P-646	J25-1364	J-1428	17	250	Ductile Iron	130	-	-	-	-
P-648	J01-1600	J-263	147	250	Ductile Iron	130	0.5	0.1	1.1	24.1
P-655	J-1560	J-1642	228	200	Ductile Iron	130	0.3	0.1	0.6	9.3
P-659	J-1552	J-1418	89	250	Ductile Iron	130	0.5	0.1	1.2	25.5
P-662	J-1344	J-1363	164	250	Ductile Iron	130	0.2	0.1	0.3	11.8
P-670	J-1463	J-1552	82	250	Ductile Iron	130	0.5	0.1	1.2	25.5

Pipe Line Route Indictors

Pipe Name	From (Node Name)	To (Node Name)	Length (m)	Diameter (mm)	Material	Hazen-Williams Coeff.	Maximum Velocity (m/s)	Minimum Velocity (m/s)	Maximum Headloss Gradient (m/km)	Maximum Discharge (l/s)
P-671	J-1325	J-1326	8	250	Ductile Iron	130	0.3	0.1	0.4	14.2
P-672	J-1617	J09-1618	165	250	Ductile Iron	130	0.5	-	1.2	25.0
P-674	J-1522	J-1414	69	250	Ductile Iron	130	-	-	-	-
P-677	J24-1265	J-1266	4	250	Ductile Iron	130	1.3	0.3	6.8	64.0
P-678	J-1624	J-1527	179	250	Ductile Iron	130	0.2	0.0	0.2	10.4
P-679	J-1312	J-259	48	250	Ductile Iron	130	0.1	0.0	0.0	3.6
P-682	J-1580	J-1615	245	250	Ductile Iron	130	1.3	0.3	6.7	63.5
P-683	J-1393	J26-1394	13	250	Ductile Iron	130	0.2	0.1	0.2	10.1
P-687	J-1451	J-1452	25	250	Ductile Iron	130	0.9	0.2	3.3	42.9
P-689	J-1521	J-1522	63	250	Ductile Iron	130	-	-	-	-
P-691	J-1281	J-1282	5	250	Ductile Iron	130	-	-	-	-
P-694	J-1456	J21-1561	89	250	Ductile Iron	130	1.6	0.4	9.4	75.9
P-697	J-1538	J-1382	82	250	Ductile Iron	130	0.2	0.1	0.3	10.9
P-703	J-1351	J-1434	64	250	Ductile Iron	130	1.2	0.3	5.5	56.8
P-707	J-1415	J-1506	192	250	Ductile Iron	130	-	-	-	-
P-712	J-1596	J-1381	152	250	Ductile Iron	130	-	-	-	-
P-713	J-1550	J-1544	79	250	Ductile Iron	130	0.9	0.2	3.6	45.3
P-714	J-1555	J-1535	84	250	Ductile Iron	130	0.3	0.1	0.5	15.5
P-716	J30-1599	J30-1568	197	250	Ductile Iron	130	0.4	0.1	0.9	21.6
P-717	J-1251	J-1252	3	250	Ductile Iron	130	-	-	-	-
P-719	J-1458	J31-1511	80	250	Ductile Iron	130	0.4	0.1	0.8	20.1
P-720	J27-1626	J-1523	188	250	Ductile Iron	130	0.5	0.1	0.9	22.0
P-722	J-1467	J28-1407	46	200	Ductile Iron	130	0.9	0.2	4.4	27.9
P-726	J-1381	J-1566	92	250	Ductile Iron	130	-	-	-	-
P-727	J-1567	J-1443	360	250	Ductile Iron	130	-	-	-	-
P-728	J-1349	J34-1331	149	250	Ductile Iron	130	0.3	0.1	0.5	14.9
P-729	J-1356	J-1384	158	250	Ductile Iron	130	0.3	0.1	0.5	14.9
P-731	J09-1618	J-1442	245	250	Ductile Iron	130	0.4	-	0.8	20.7
P-734	J-1434	J28-1435	19	250	Ductile Iron	130	1.2	0.3	5.5	56.8
P-735	J06-1663	J-1455	368	250	Ductile Iron	130	-	-	-	-
P-736	J-1620	J-1636	219	250	Ductile Iron	130	0.1	0.0	0.1	4.3
P-737	J30-1568	J-1272	97	250	Ductile Iron	130	-	-	-	-
P-738	J-1527	J-1590	196	250	Ductile Iron	130	0.2	0.0	0.2	10.4
P-746	J-1372	J-1416	177	250	Ductile Iron	130	0.1	0.0	0.0	2.4
P-747	J-1459	J-1460	28	250	Ductile Iron	130	0.5	0.1	1.1	23.5
P-748	J-1503	J31-1335	84	250	Ductile Iron	130	-	-	-	-
P-749	J-1361	J41-1362	12	250	Ductile Iron	130	1.5	0.3	8.5	72.0
P-751	J-1518	J27-1626	202	250	Ductile Iron	130	-	-	-	-
P-752	J-1358	J29-1532	192	200	Ductile Iron	130	0.5	0.1	1.4	14.9
P-754	J-1615	J-1616	164	250	Ductile Iron	130	0.4	0.1	0.8	20.6
P-756	J-1254	J-1574	117	250	Ductile Iron	130	-	-	-	-
P-760	J-1495	J-1496	44	250	Ductile Iron	130	0.1	0.0	0.1	6.5
P-761	J-1428	J-1447	174	250	Ductile Iron	130	-	-	-	-
P-768	J-1427	J-1580	123	250	Ductile Iron	130	1.3	0.3	6.7	63.5
P-769	J-1643	J08-1627	298	250	Ductile Iron	130	0.8	0.0	2.7	38.9
P-775	J-1634	J-1492	255	250	Ductile Iron	130	0.4	0.1	0.9	21.8
P-777	J-1523	J27-1509	64	250	Ductile Iron	130	0.5	0.1	0.9	22.0
P-778	J12-1648	J-1661	379	250	Ductile Iron	130	-	-	-	-
P-779	J-395	J-1287	6	250	Ductile Iron	130	0.2	0.1	0.2	10.5
P-782	J-732	J-1621	249	250	Ductile Iron	130	0.3	0.1	0.3	12.3
P-786	J-1565	J-1542	167	250	Ductile Iron	130	0.4	0.1	0.7	18.6
P-788	J-1323	J-1324	11	250	Ductile Iron	130	0.6	0.1	1.6	29.4
P-789	J-1368	J-1538	74	250	Ductile Iron	130	0.2	0.1	0.3	10.9
P-794	J-1367	J-1368	11	250	Ductile Iron	130	0.0	0.0	0.0	1.8
P-795	J-1433	J-628	23	250	Ductile Iron	130	1.0	0.2	4.5	51.0
P-802	J-1590	J-1578	523	250	Ductile Iron	130	0.2	0.0	0.2	10.4
P-804	J-1424	J-1316	20	250	Ductile Iron	130	0.4	0.1	0.7	19.2
P-810	J-903	J-629	48	250	Ductile Iron	130	-	-	-	-
P-812	J-1534	J-1258	105	250	Ductile Iron	130	0.3	0.1	0.5	16.2
P-813	J-1510	J24-1502	102	250	Ductile Iron	130	0.8	0.2	2.8	39.3
P-815	J-1266	J-1436	108	250	Ductile Iron	130	1.3	0.3	6.8	64.0
P-816	J30-1594	J-1595	136	250	Ductile Iron	130	-	-	-	-
P-818	J-1329	J-1564	92	250	Ductile Iron	130	0.2	0.0	0.2	9.2
P-822	J-1506	J-1503	156	250	Ductile Iron	130	-	-	-	-
P-824	J-1575	J-1592	135	250	Ductile Iron	130	0.3	0.1	0.4	14.5
P-825	J-1603	J-1602	195	250	Ductile Iron	130	0.4	0.1	0.8	20.2
P-829	J-1363	J25-1364	11	250	Ductile Iron	130	0.2	0.1	0.3	11.8
P-830	J-1247	J-1500	50	250	Ductile Iron	130	0.5	0.1	1.1	23.6
P-833	J-1644	J06-1663	468	250	Ductile Iron	130	0.2	0.0	0.2	8.8
P-835	J27-1425	J-1426	17	250	Ductile Iron	130	0.2	0.1	0.2	10.1
P-836	J24-1502	J24-1265	49	250	Ductile Iron	130	1.1	0.3	4.6	51.6
P-837	J-95	J-1256	4	250	Ductile Iron	130	-	-	-	-
P-839	J-1316	J-1510	106	250	Ductile Iron	130	0.8	0.2	2.8	39.3
P-840	J-1276	J-1277	5	250	Ductile Iron	130	0.2	0.0	0.2	8.5
P-842	J-1372	J29-1373	7	250	Ductile Iron	130	0.1	0.0	0.0	3.8
P-844	J-1365	J-1596	149	250	Ductile Iron	130	-	-	-	-
P-851	J-1426	J-1393	132	250	Ductile Iron	130	0.2	0.1	0.2	10.1
P-854	J-81	J-1246	2	250	Ductile Iron	130	0.6	0.1	1.6	29.4
P-856	J-1544	J18-1545	76	250	Ductile Iron	130	0.9	0.2	3.6	45.3
P-859	J-1536	J-1537	73	250	Ductile Iron	130	0.3	0.1	0.5	15.5
P-861	J-285	J71-1421	22	250	Ductile Iron	130	0.8	0.2	2.8	39.6

Pipe Line Route Indictors

Pipe Name	From (Node Name)	To (Node Name)	Length (m)	Diameter (mm)	Material	Hazen-Williams Coeff.	Maximum Velocity (m/s)	Minimum Velocity (m/s)	Maximum Headloss Gradient (m/km)	Maximum Discharge (l/s)
P-865	J-1549	J-1358	104	200	Ductile Iron	130	0.5	0.1	1.4	14.9
P-868	J-1607	J-1624	357	250	Ductile Iron	130	0.2	0.0	0.2	10.4
P-870	J-1325	J-1330	11	250	Ductile Iron	130	0.3	0.1	0.4	14.2
P-872	J21-1561	J-1550	111	250	Ductile Iron	130	0.9	0.2	3.6	45.3
P-874	J-834	J-1267	4	250	Ductile Iron	130	-	-	-	-
P-877	J47-1556	J-1557	84	250	Ductile Iron	130	0.2	0.1	0.3	10.8
P-881	J-1438	J-1643	233	250	Ductile Iron	130	0.8	0.0	2.7	38.9
P-883	J-1477	J29-1453	463	250	Ductile Iron	130	0.1	0.0	0.0	3.7
P-884	J-1345	J-1254	10	250	Ductile Iron	130	-	-	-	-
P-890	J-847	J19-1654	300	250	Ductile Iron	130	0.2	0.0	0.1	7.2
P-891	J-1579	J-1395	142	250	Ductile Iron	130	0.2	0.1	0.2	10.5
P-894	J-1650	J-1651	255	250	Ductile Iron	130	-	-	-	-
P-898	J-1326	J36-1478	284	250	Ductile Iron	130	0.5	0.1	1.1	24.3
P-899	J08-1627	J-1617	189	250	Ductile Iron	130	0.5	-	1.2	25.0
P-900	J-1307	J30-1308	46	250	Ductile Iron	130	0.1	0.0	0.0	3.7
P-901	J-1628	J-1438	196	250	Ductile Iron	130	0.8	0.0	2.7	38.9
P-902	J-1299	J-1359	147	250	Ductile Iron	130	0.3	0.1	0.5	14.9
P-903	J-1602	J42-1491	191	250	Ductile Iron	130	0.4	0.1	0.8	20.2
P-908	J-1282	J-1575	117	250	Ductile Iron	130	-	-	-	-
P-910	J-1548	J-1549	79	200	Ductile Iron	130	0.5	0.1	1.4	14.9
P-916	J-732	J-1255	3	250	Ductile Iron	130	0.2	0.0	0.1	7.4
P-917	J-102	J-1243	10	250	Ductile Iron	130	0.5	0.1	1.3	26.4
P-930	J-1460	J-1339	95	250	Ductile Iron	130	0.5	0.1	1.1	23.5
P-931	J-1289	J-1288	6	250	Ductile Iron	130	0.6	0.1	1.5	28.3
P-932	J-1254	J-251	3	250	Ductile Iron	130	-	-	-	-
P-933	J-1309	J-814	8	250	Ductile Iron	130	1.3	0.3	6.8	64.0
P-936	J-1616	J12-1648	252	250	Ductile Iron	130	0.4	0.1	0.8	20.6
P-939	J-1417	J-1516	58	250	Ductile Iron	130	-	-	-	-
P-941	J30-1308	J-1634	207	250	Ductile Iron	130	0.4	0.1	0.9	21.8
P-942	J-1260	J-1644	236	250	Ductile Iron	130	0.2	0.0	0.2	8.8
P-943	J-1543	J-1489	79	250	Ductile Iron	130	0.3	0.1	0.4	13.3
P-946	J-1569	J62-1572	210	250	Ductile Iron	130	0.7	0.2	2.3	35.4
P-947	J-1621	J-1619	167	250	Ductile Iron	130	0.3	0.1	0.3	12.3
P-948	J-1420	J-1343	16	250	Ductile Iron	130	0.2	0.0	0.2	9.4
P-949	J-1422	J-1274	20	200	Ductile Iron	130	0.6	0.1	2.2	19.2
P-950	J-1443	J66-1444	24	250	Ductile Iron	130	-	-	-	-
P-952	J-1597	J-1483	144	250	Ductile Iron	130	0.4	0.1	0.7	19.2
P-960	J-1585	J-1553	244	250	Ductile Iron	130	0.4	0.1	0.7	18.6
P-961	J-1429	J66-1501	83	250	Ductile Iron	130	0.5	0.1	1.1	23.5
P-963	J-1573	J-1412	168	250	Ductile Iron	130	0.2	0.1	0.3	11.9
P-964	J-1625	J-DP-CCW-RK01-Phum1	425	250	Ductile Iron	130	0.1	0.0	0.0	3.6
P-967	J-1586	J30-1594	169	250	Ductile Iron	130	0.2	0.1	0.3	10.8
P-968	J-215	J-1432	26	250	Ductile Iron	130	0.7	0.2	2.3	35.4
P-970	J-1535	J-1536	72	250	Ductile Iron	130	0.3	0.1	0.5	15.5
P-971	J38-1278	J-612	5	250	Ductile Iron	130	0.1	0.0	0.1	6.6
P-976	J-1292	J-1293	213	250	Ductile Iron	130	0.2	0.1	0.2	10.0
P-977	J-1481	J-1482	79	250	Ductile Iron	130	0.1	0.0	0.1	6.5
P-978	J-1482	J-1528	67	250	Ductile Iron	130	0.1	0.0	0.1	6.5
P-980	J-1465	J-1324	220	250	Ductile Iron	130	0.6	0.1	1.6	29.4
P-981	J68-1249	J-1250	3	250	Ductile Iron	130	0.1	0.0	0.1	6.8
P-982	J-1656	J41-1657	323	250	Ductile Iron	130	-	-	-	-
P-983	J62-1572	J-1640	455	250	Ductile Iron	130	0.5	0.1	1.2	24.8
P-985	J75-1439	J-1252	151	250	Ductile Iron	130	-	-	-	-
P-986	J66-1444	J-1573	115	250	Ductile Iron	130	0.2	0.1	0.3	11.9
P-988	J-266	J61-1320	24	250	Ductile Iron	130	0.8	0.2	2.6	38.0
P-989	J-1622	J-1639	254	250	Ductile Iron	130	0.4	0.1	0.9	21.7
P-990	J-1640	J63-1583	2,613	250	Ductile Iron	130	0.5	0.1	1.2	24.8
P-992	J-1515	J-1669	521	250	Ductile Iron	130	-	-	-	-
P-993	J-1354	J-1283	10	250	Ductile Iron	130	-	-	-	-
P-995	J-1528	J-1495	81	250	Ductile Iron	130	0.1	0.0	0.1	6.5
P-996	J57-1539	J-1540	65	250	Ductile Iron	130	0.3	0.1	0.4	14.1
P-997	J66-1501	J-1497	184	250	Ductile Iron	130	-	-	-	-
P-1000	J-1293	J-DP-CCW-RK01-Phum3	277	250	Ductile Iron	130	0.2	0.1	0.2	10.0
P-1001	J-657	J-1318	8	250	Ductile Iron	130	-	-	-	-
P-1004	J-DP-CCW-RK01-Phum1	J-1488	401	250	Ductile Iron	130	0.1	0.0	0.0	3.6
P-1005	J-1440	J-1261	347	250	Ductile Iron	130	0.5	0.1	1.1	23.6
P-1006	J-303	J-657	9	250	Ductile Iron	130	0.2	0.0	0.2	8.1
P-1008	J41-1464	J-1465	31	250	Ductile Iron	130	0.6	0.1	1.6	29.4
P-1012	J-1512	J-1369	66	250	Ductile Iron	130	0.1	0.0	0.1	6.5
P-1013	J66-851	J-1514	149	250	Ductile Iron	130	-	-	-	-
P-1015	J-1298	J-1622	168	250	Ductile Iron	130	0.4	0.1	0.9	21.7
P-1028	J-1637	J69-1638	214	250	Ductile Iron	130	0.4	0.1	0.9	21.7
P-1036	J-1449	J-1454	23	250	Ductile Iron	130	-	-	-	-
P-1037	J-1396	J-1288	631	250	Ductile Iron	130	0.3	0.1	0.4	14.1
P-1040	J-1498	J-1649	250	250	Ductile Iron	130	-	-	-	-
P-1041	J-278	J-1305	7	250	Ductile Iron	130	0.6	0.1	1.4	27.1
P-1042	J-1525	J-1562	190	250	Ductile Iron	130	-	-	-	-

Pipe Line Route Indictors

Pipe Name	From (Node Name)	To (Node Name)	Length (m)	Diameter (mm)	Material	Hazen-Williams Coeff.	Maximum Velocity (m/s)	Minimum Velocity (m/s)	Maximum Headloss Gradient (m/km)	Maximum Discharge (l/s)
P-1045	J74-1630	J-DP-CCW-RK01-Phum2	204	250	Ductile Iron	130	0.1	0.0	0.0	3.6
P-1046	J-1496	J47-1587	126	250	Ductile Iron	130	0.1	0.0	0.1	6.5
P-1047	J-DP-CCW-RK01-Phum2	J-1625	127	250	Ductile Iron	130	0.1	0.0	0.0	3.6
P-1048	J-1562	J-1563	91	250	Ductile Iron	130	-	-	-	-
P-1050	J71-1659	J-891	902	250	Ductile Iron	130	-	-	-	-
P-1053	J-1639	J-1637	220	250	Ductile Iron	130	0.4	0.1	0.9	21.7
P-1054	J-1339	J-1567	12	250	Ductile Iron	130	-	-	-	-
P-1055	J-306	J-1273	5	250	Ductile Iron	130	0.8	0.2	3.0	41.2
P-1056	J-1339	J-1429	546	250	Ductile Iron	130	0.5	0.1	1.1	23.5
P-1057	J-1432	J-1569	500	250	Ductile Iron	130	0.7	0.2	2.3	35.4
P-1058	J-1519	J-1520	63	250	Ductile Iron	130	0.1	0.0	0.1	5.1
P-1059	J69-1660	J-1650	449	250	Ductile Iron	130	-	-	-	-
P-1060	J-1541	J69-1613	232	250	Ductile Iron	130	0.1	0.0	0.1	5.1
P-1061	J-1488	J74-1667	455	250	Ductile Iron	130	0.1	0.0	0.0	3.6
P-1063	J71-1285	J-1286	317	250	Ductile Iron	130	0.2	0.1	0.3	11.8
P-1064	J-1286	J71-1659	338	250	Ductile Iron	130	0.2	0.1	0.3	11.8
P-1065	J-1261	J76-1262	4	225	HDPE	130	0.6	0.1	1.8	23.6
P-1067	J-261	J-256	7	250	Ductile Iron	130	1.5	0.3	8.4	71.3
P-1069	J-1261	J-1408	13	250	Ductile Iron	130	-	-	-	-
P-1073	J-1614	J47-1556	162	250	Ductile Iron	130	0.6	0.2	1.8	31.5
P-1075	J-1563	J-1519	92	250	Ductile Iron	130	0.1	0.0	0.1	5.1
P-1078	J-1557	J69-1660	365	250	Ductile Iron	130	0.2	0.1	0.3	10.8
P-1079	J-1497	J-1498	44	250	Ductile Iron	130	-	-	-	-
P-1080	J-1540	J-1396	324	250	Ductile Iron	130	0.3	0.1	0.4	14.1
P-1081	J-1514	J-1515	58	250	Ductile Iron	130	-	-	-	-
P-1082	J-898	J43-1431	19	250	Ductile Iron	130	0.0	0.0	-	1.0
P-1087	J-1273	J-1614	161	250	Ductile Iron	130	0.6	0.2	1.8	31.5
P-1088	J-1322	J-1329	292	250	Ductile Iron	130	0.2	0.0	0.2	9.2
P-1093	J-87	J-1433	7	900	Ductile Iron	130	1.4	-	1.7	869.2
P-1096	J-1419	J-1582	45	250	Ductile Iron	130	1.4	0.3	7.4	66.6
P-1097	J-2188	J13-2364	109	225	HDPE	130	0.2	0.1	0.3	8.9
P-1098	J14-2347	J-2243	107	225	HDPE	130	0.0	0.0	0.0	1.6
P-1099	J-2133	J-2270	55	225	HDPE	130	0.2	0.1	0.2	8.0
P-1102	J-2290	J-2276	421	225	HDPE	130	-	-	-	-
P-1104	J13-2363	J-2195	108	225	HDPE	130	0.2	0.1	0.3	8.9
P-1105	J-2171	J-2165	243	225	HDPE	130	0.4	0.1	0.9	16.7
P-1106	J-2423	J-2253	214	225	HDPE	130	-	-	-	-
P-1108	J35-2402	J-2403	128	225	HDPE	130	-	-	-	-
P-1110	J-2164	J-2182	254	225	HDPE	130	1.1	0.3	5.3	42.2
P-1112	J-2148	J02-2151	6	225	HDPE	130	0.5	0.1	1.3	19.6
P-1114	J-2192	J-2219	34	225	HDPE	130	0.0	0.0	0.0	1.1
P-1115	J19-2375	J-2237	120	225	HDPE	130	-	-	-	-
P-1116	J-2451	J-2459	342	225	HDPE	130	-	-	-	-
P-1121	J-2228	J-2229	37	225	HDPE	130	0.0	0.0	0.0	1.3
P-1123	J-2341	J-2323	78	225	HDPE	130	-	-	-	-
P-1124	J19-2433	J01-2470	516	225	HDPE	130	0.7	0.2	2.5	28.4
P-1125	J-2229	J14-2379	95	225	HDPE	130	0.1	0.0	0.0	2.9
P-1127	J-2167	J-2162	235	225	HDPE	130	0.2	0.0	0.2	7.4
P-1128	J-2191	J-2192	16	225	HDPE	130	0.2	0.1	0.2	7.8
P-1130	J-2348	J-2349	81	225	HDPE	130	0.7	0.2	2.2	26.2
P-1131	J-2295	J-2191	82	225	HDPE	130	0.2	0.1	0.2	7.8
P-1132	J-2394	J09-2395	110	225	HDPE	130	0.3	0.1	0.4	10.7
P-1134	J-2323	J-2116	74	225	HDPE	130	-	-	-	-
P-1135	J-2422	J-2370	185	225	HDPE	130	0.2	0.1	0.3	9.4
P-1142	J-2404	J35-2402	128	225	HDPE	130	0.4	0.1	0.7	14.2
P-1143	J-2253	J-2223	120	225	HDPE	130	-	-	-	-
P-1144	J-2120	J-2121	4	225	HDPE	130	0.2	0.0	0.2	7.4
P-1146	J-2242	J-2418	250	225	HDPE	130	-	-	-	-
P-1153	J-676	J-2155	5	225	HDPE	130	0.7	0.2	2.2	26.2
P-1155	J02-2151	J-2159	7	225	HDPE	130	-	-	-	0.0
P-1156	J-2371	J57-2455	315	225	HDPE	130	0.2	0.1	0.3	9.4
P-1157	J23-2372	J-2351	87	225	HDPE	130	0.1	0.0	0.0	2.5
P-1162	J-2351	J-2260	133	225	HDPE	130	0.1	0.0	0.0	2.5
P-1164	J-2376	J-2422	146	225	HDPE	130	0.2	0.1	0.3	9.4
P-1165	J-2270	J-2329	145	225	HDPE	130	0.2	0.1	0.2	8.0
P-1166	J23-2335	J23-2315	74	225	HDPE	130	0.2	0.0	0.2	7.0
P-1167	J-2156	J-2432	334	225	HDPE	130	-	-	-	-
P-1168	J-2427	J-2397	179	225	HDPE	130	-	-	-	-
P-1172	J-2299	J-626	167	225	HDPE	130	-	-	-	-
P-1173	J-2160	J-2447	228	225	HDPE	130	-	-	-	-
P-1174	J-2360	J-2385	156	225	HDPE	130	-	-	-	-
P-1177	J-2187	J-2188	15	225	HDPE	130	0.2	0.1	0.3	8.9
P-1179	J-2125	J-2376	90	225	HDPE	130	0.2	0.1	0.3	9.4
P-1180	J-2192	J-2339	77	225	HDPE	130	-	-	-	-
P-1185	J-2244	J-2228	122	225	HDPE	130	0.0	0.0	0.0	1.3
P-1187	J-2160	J-2161	8	225	HDPE	130	-	-	-	-
P-1191	J-2161	J-2236	63	225	HDPE	130	-	-	-	-
P-1192	J-2415	J-2104	195	225	HDPE	130	0.3	0.1	0.4	10.5
P-1193	J-2317	J-2169	216	225	HDPE	130	-	-	-	-

Pipe Line Route Indictors

Pipe Name	From (Node Name)	To (Node Name)	Length (m)	Diameter (mm)	Material	Hazen-Williams Coeff.	Maximum Velocity (m/s)	Minimum Velocity (m/s)	Maximum Headloss Gradient (m/km)	Maximum Discharge (l/s)
P-1196	J-2311	J23-2312	68	225	HDPE	130	0.3	0.1	0.6	12.9
P-1197	J41-2456	J-2454	346	225	HDPE	130	1.2	0.3	6.3	46.3
P-1200	J-1330	J-2448	232	225	HDPE	130	0.4	0.1	0.7	14.2
P-1201	J-2298	J-2344	147	225	HDPE	130	-	-	-	-
P-1204	J-1452	J-2261	589	225	HDPE	130	1.1	0.3	5.4	42.9
P-1205	J-2260	J-2225	88	225	HDPE	130	0.1	0.0	0.0	2.5
P-1207	J23-2337	J-2304	164	225	HDPE	130	0.1	0.0	0.1	4.2
P-1209	J-2202	J41-1362	20	225	HDPE	130	1.2	0.3	6.3	46.3
P-1210	J-2340	J-2147	166	225	HDPE	130	0.5	0.1	1.3	19.6
P-1226	J-2116	J-2313	67	225	HDPE	130	-	-	-	-
P-1229	J-2401	J-2427	180	225	HDPE	130	-	-	-	-
P-1230	J08-2220	J-2221	35	225	HDPE	130	-	-	-	-
P-1233	J-2386	J-2396	110	225	HDPE	130	0.2	0.0	0.2	6.8
P-1236	J-2122	J-2130	5	225	HDPE	130	-	-	-	-
P-1237	J-2313	J-2120	72	225	HDPE	130	-	-	-	-
P-1239	J-2349	J08-2220	198	225	HDPE	130	0.7	0.2	2.2	26.2
P-1240	J-2365	J-2309	243	225	HDPE	130	-	-	-	-
P-1241	J-2169	J-2342	78	225	HDPE	130	-	-	-	-
P-1243	J-2413	J-2414	141	225	HDPE	130	-	-	-	-
P-1244	J-626	J-1338	19	225	HDPE	130	1.2	0.1	6.3	46.3
P-1246	J13-2380	J-2189	92	225	HDPE	130	0.2	0.1	0.2	8.0
P-1247	J02-2324	J-2325	142	225	HDPE	130	-	-	-	-
P-1248	J-2150	J47-2411	227	225	HDPE	130	0.2	0.1	0.4	9.7
P-1249	J-2126	J-2127	4	225	HDPE	130	-	-	-	-
P-1251	J-2195	J-2192	17	225	HDPE	130	0.2	0.1	0.3	8.9
P-1255	J-2255	J-562	54	225	HDPE	130	0.3	0.1	0.7	13.7
P-1256	J-2397	J22-2398	111	225	HDPE	130	-	-	-	-
P-1262	J-2184	J39-2185	14	225	HDPE	130	-	-	-	-
P-1268	J-2449	J-1345	297	225	HDPE	130	-	-	-	-
P-1273	J-2368	J-2164	160	225	HDPE	130	1.1	0.3	5.3	42.2
P-1274	J-2237	J-2238	41	225	HDPE	130	-	-	-	-
P-1276	J-2204	J-2109	118	225	HDPE	130	-	-	-	-
P-1281	J-2165	J36-2217	109	225	HDPE	130	0.4	0.1	0.9	16.7
P-1287	J-2439	J47-2466	436	225	HDPE	130	0.2	0.1	0.4	9.7
P-1290	J-2448	J-2404	256	225	HDPE	130	0.4	0.1	0.7	14.2
P-1295	J15-2248	J-2190	155	225	HDPE	130	0.4	0.1	0.9	15.8
P-1303	J-2243	J-2244	43	225	HDPE	130	0.0	0.0	0.0	1.6
P-1305	J-2238	J-2413	170	225	HDPE	130	-	-	-	-
P-1306	J-2297	J-2409	184	225	HDPE	130	0.6	0.1	1.8	23.5
P-1308	J-1283	J-2158	10	225	HDPE	130	-	-	-	-
P-1309	J-2277	J-2299	185	225	HDPE	130	-	-	-	-
P-1310	J-900	J-904	10	225	HDPE	130	0.6	0.1	1.8	23.6
P-1312	J23-2312	J23-2337	76	225	HDPE	130	0.2	0.0	0.2	7.7
P-1313	J-2215	J12-2216	31	225	HDPE	130	0.8	0.2	3.0	30.9
P-1317	J-2454	J-2202	302	225	HDPE	130	1.2	0.3	6.3	46.3
P-1320	J-2441	J-2246	202	225	HDPE	130	0.1	0.0	0.1	5.3
P-1322	J-2136	J-742	4	225	HDPE	130	-	-	-	-
P-1324	J57-1296	J-2168	11	225	HDPE	130	0.1	0.0	0.1	5.4
P-1326	J-2387	J-2382	112	225	HDPE	130	0.2	0.0	0.2	6.8
P-1329	J-2329	J02-2319	71	225	HDPE	130	0.2	0.1	0.2	8.0
P-1332	J-1273	J-2150	6	225	HDPE	130	0.2	0.1	0.4	9.7
P-1337	J-2254	J-2255	50	225	HDPE	130	0.3	0.1	0.7	13.7
P-1338	J-2355	J-2305	223	225	HDPE	130	-	-	-	-
P-1342	J-2424	J-2446	220	225	HDPE	130	-	-	-	-
P-1344	J-1405	J-2296	89	225	HDPE	130	0.6	0.1	1.8	23.5
P-1346	J-2331	J-2245	72	225	HDPE	130	-	-	-	-
P-1348	J70-2420	J-2421	146	225	HDPE	130	0.3	0.1	0.4	10.0
P-1349	J-2287	J57-1539	15	225	HDPE	130	-	-	-	-
P-1350	J-2434	J50-2471	536	225	HDPE	130	0.1	0.0	0.0	2.4
P-1352	J-2426	J-2196	411	225	HDPE	130	0.4	0.1	1.0	16.9
P-1353	J22-2398	J-2254	198	225	HDPE	130	0.3	0.1	0.7	13.7
P-1357	J-2383	J-2386	101	225	HDPE	130	0.2	0.0	0.2	6.8
P-1359	J-2247	J-2332	72	225	HDPE	130	0.1	0.0	0.1	5.3
P-1364	J-2180	J-2249	82	225	HDPE	130	0.2	0.1	0.2	7.7
P-1365	J-2382	J-2383	98	225	HDPE	130	0.2	0.0	0.2	6.8
P-1367	J-2410	J-2440	199	225	HDPE	130	0.6	0.1	1.8	23.5
P-1369	J-1341	J-2149	9	225	HDPE	130	0.2	0.1	0.3	8.8
P-1370	J-2405	J-739	128	225	HDPE	130	0.4	0.1	0.9	16.3
P-1371	J-2393	J-2373	110	225	HDPE	130	0.5	0.1	1.1	18.3
P-1373	J-2250	J-2460	344	225	HDPE	130	0.2	0.1	0.2	7.7
P-1374	J47-1556	J-2369	351	225	HDPE	130	-	-	-	-
P-1375	J-2128	J-2129	4	225	HDPE	130	-	-	-	-
P-1378	J-2417	J-2302	144	225	HDPE	130	0.5	0.1	1.1	18.3
P-1381	J-2358	J-2359	84	225	HDPE	130	-	-	-	-
P-1383	J-2245	J-2230	44	225	HDPE	130	-	-	-	-
P-1384	J-2396	J-2399	113	225	HDPE	130	0.2	0.0	0.2	6.8
P-1386	J-685	J-893	226	225	HDPE	130	-	-	-	-
P-1388	J-2326	J-2327	71	225	HDPE	130	0.3	0.1	0.4	10.0
P-1391	J-2157	J-2406	133	225	HDPE	130	-	-	-	-
P-1392	J-1398	J-2103	3	225	HDPE	130	0.3	0.1	0.6	13.3
P-1396	J47-2411	J-2412	137	225	HDPE	130	-	-	-	-

Pipe Line Route Indictors

Pipe Name	From (Node Name)	To (Node Name)	Length (m)	Diameter (mm)	Material	Hazen-Williams Coeff.	Maximum Velocity (m/s)	Minimum Velocity (m/s)	Maximum Headloss Gradient (m/km)	Maximum Discharge (l/s)
P-1397	J-2409	J-2410	134	225	HDPE	130	0.6	0.1	1.8	23.5
P-1398	J-2302	J-2303	65	225	HDPE	130	0.5	0.1	1.1	18.3
P-1399	J-2249	J-2250	49	225	HDPE	130	0.2	0.1	0.2	7.7
P-1400	J-2179	J-2180	11	225	HDPE	130	0.2	0.1	0.2	7.7
P-1402	J71-1421	J-2393	862	225	HDPE	130	0.5	0.1	1.1	18.3
P-1403	J-2384	J-2437	257	225	HDPE	130	0.5	0.1	1.1	18.3
P-1404	J-2296	J-2297	62	225	HDPE	130	0.6	0.1	1.8	23.5
P-1406	J-2469	J-2362	443	225	HDPE	130	0.4	0.1	1.0	16.9
P-1407	J70-2268	J-2269	56	225	HDPE	130	0.4	0.1	1.0	16.9
P-1408	J-2360	J-2361	84	225	HDPE	130	-	-	-	-
P-1410	J-1290	J-2172	12	225	HDPE	130	-	-	-	-
P-1411	J-2336	J-2179	262	225	HDPE	130	0.2	0.1	0.2	7.7
P-1412	J-2429	J70-2268	247	225	HDPE	130	0.1	0.0	0.1	5.3
P-1414	J-2146	J-2111	136	225	HDPE	130	0.3	0.1	0.5	11.6
P-1415	J-1269	J-2153	8	225	HDPE	130	0.0	0.0	0.0	1.3
P-1416	J-2197	J-2442	213	225	HDPE	130	0.4	0.1	1.0	16.9
P-1420	J-1302	J-2128	5	225	HDPE	130	-	-	-	-
P-1421	J-2440	J57-839	262	225	HDPE	130	0.6	0.1	1.8	23.5
P-1422	J-2194	J-2113	16	225	HDPE	130	0.3	0.1	0.6	13.3
P-1423	J-2437	J-2430	196	225	HDPE	130	0.5	0.1	1.1	18.3
P-1426	J-2113	J-1377	4	225	HDPE	130	0.3	0.1	0.6	13.3
P-1427	J-2444	J-2464	365	225	HDPE	130	-	-	-	-
P-1429	J-2103	J-2114	4	225	HDPE	130	-	-	-	-
P-1431	J-2232	J-2233	39	225	HDPE	130	0.5	0.1	1.1	18.3
P-1436	J-1336	J-2141	7	225	HDPE	130	-	-	-	-
P-1437	J-2385	J-2358	101	225	HDPE	130	-	-	-	-
P-1438	J-2303	J-2384	99	225	HDPE	130	0.5	0.1	1.1	18.3
P-1439	J71-2152	J-2424	147	225	HDPE	130	-	-	-	-
P-1443	J46-1413	J-2138	7	225	HDPE	130	0.3	0.1	0.4	9.8
P-1444	J-2230	J-1405	37	225	HDPE	130	-	-	-	-
P-1445	J-2265	J-2417	472	225	HDPE	130	0.5	0.1	1.1	18.3
P-1447	J-2117	J71-2152	6	225	HDPE	130	0.5	0.1	1.1	17.7
P-1449	J-2453	J-2463	360	225	HDPE	130	-	-	-	-
P-1453	J-2446	J-2453	300	225	HDPE	130	-	-	-	-
P-1455	J-2211	J-2434	182	225	HDPE	130	0.1	0.0	0.0	2.4
P-1456	J-2373	J-2374	88	225	HDPE	130	0.5	0.1	1.1	18.3
P-1457	J-2103	J-2186	14	225	HDPE	130	0.3	0.1	0.6	13.3
P-1458	J-2233	J-2265	54	225	HDPE	130	0.5	0.1	1.1	18.3
P-1460	J-2443	J-2444	218	225	HDPE	130	-	-	-	-
P-1461	J-2264	J-2204	186	225	HDPE	130	-	-	-	-
P-1463	J66-1501	J-2336	77	225	HDPE	130	0.2	0.1	0.2	7.7
P-1465	J-2269	J-2362	84	225	HDPE	130	0.4	0.1	1.0	16.9
P-1468	J-2400	J-2388	115	225	HDPE	130	-	-	-	-
P-1470	J-2246	J-2247	47	225	HDPE	130	0.1	0.0	0.1	5.3
P-1471	J61-1320	J-2123	117	225	HDPE	130	0.3	0.1	0.5	11.6
P-1472	J-2123	J-2146	200	225	HDPE	130	0.3	0.1	0.5	11.6
P-1473	J-1410	J-2122	5	225	HDPE	130	0.3	0.1	0.4	9.8
P-1476	J-2332	J-2429	166	225	HDPE	130	0.1	0.0	0.1	5.3
P-1477	J-2196	J-2197	18	225	HDPE	130	0.4	0.1	1.0	16.9
P-1478	J-2369	J-2126	192	225	HDPE	130	-	-	-	-
P-1479	J-1322	J-2117	9	225	HDPE	130	0.0	-	-	0.6
P-1481	J-582	J-2405	939	225	HDPE	130	0.4	0.1	0.9	16.3
P-1483	J-2388	J-2389	103	225	HDPE	130	-	-	-	-
P-1484	J-2430	J-2431	167	225	HDPE	130	0.5	0.1	1.1	18.3
P-1485	J-2389	J-2443	670	225	HDPE	130	-	-	-	-
P-1493	R-7	R-8	17	200	Ductile Iron	130	-	-	-	0.0
P-1498	J-2851	J16-2852	4	200	Ductile Iron	130	0.4	0.1	1.1	13.1
P-1499	J-3089	J-3113	171	200	Ductile Iron	130	-	-	-	-
P-1500	FCV-501	J-3000	174	200	Ductile Iron	130	-	-	-	-
P-1501	J-1264	J-2934	120	200	Ductile Iron	130	-	-	-	-
P-1502	J-2936	J-2925	108	200	Ductile Iron	130	-	-	-	-
P-1504	J-2951	J-2906	33	200	Ductile Iron	130	-	-	-	-
P-1510	J-473	J-2859	5	200	Ductile Iron	130	-	-	-	-
P-1515	J-2958	J-2959	35	200	Ductile Iron	130	-	-	-	-
P-1519	J-2922	J-3102	120	200	Ductile Iron	130	-	-	-	-
P-1524	J-3057	J-3048	72	200	Ductile Iron	130	0.2	0.0	0.2	4.7
P-1529	J-3027	J-1645	204	200	Ductile Iron	130	-	-	-	-
P-1533	J-3055	J-2927	75	200	Ductile Iron	130	-	-	-	-
P-1534	J-3041	J-2991	75	200	Ductile Iron	130	-	-	-	-
P-1535	J-2979	J-2980	53	200	Ductile Iron	130	-	-	-	-
P-1536	J-2873	J-2864	63	200	Ductile Iron	130	0.3	0.1	0.6	9.6
P-1538	J-2906	J27-1425	14	200	Ductile Iron	130	-	-	-	-
P-1541	J-2895	J-2900	155	200	Ductile Iron	130	1.2	0.3	7.1	36.4
P-1543	J-103	J-2902	12	200	Ductile Iron	130	-	-	-	-
P-1550	J-3115	J-2877	250	200	Ductile Iron	130	-	-	-	-
P-1551	J-2872	J-2873	8	200	Ductile Iron	130	-	-	-	-
P-1554	J-3105	J-2981	158	200	Ductile Iron	130	0.9	0.2	4.2	27.3
P-1555	J-3034	J-2983	127	200	Ductile Iron	130	0.3	0.1	0.5	8.8
P-1557	J-599	R-7	34	200	Ductile Iron	130	-	-	-	-
P-1558	J-3047	J03-2985	71	200	Ductile Iron	130	-	-	-	-
P-1561	J-3058	J-866	176	200	Ductile Iron	130	0.5	0.1	1.4	15.1

Pipe Line Route Indictors

Pipe Name	From (Node Name)	To (Node Name)	Length (m)	Diameter (mm)	Material	Hazen-Williams Coeff.	Maximum Velocity (m/s)	Minimum Velocity (m/s)	Maximum Headloss Gradient (m/km)	Maximum Discharge (l/s)
P-1562	J-2904	J-2898	227	200	Ductile Iron	130	1.3	0.3	9.3	41.9
P-1566	J-2977	J-2978	161	200	Ductile Iron	130	-	-	-	-
P-1567	J-2974	J-2939	165	200	Ductile Iron	130	-	-	-	-
P-1568	J-3061	J-1646	70	200	Ductile Iron	130	0.5	0.1	1.3	14.7
P-1569	J-2913	J25-2911	14	200	Ductile Iron	130	0.1	0.0	0.0	1.4
P-1571	J-2923	J-725	25	200	Ductile Iron	130	-	-	-	-
P-1573	J-3079	J-2979	83	200	Ductile Iron	130	-	-	-	-
P-1577	J-2925	J-2974	95	200	Ductile Iron	130	-	-	-	-
P-1580	J-2938	J-2960	36	200	Ductile Iron	130	-	-	-	-
P-1582	J03-2985	J-2986	57	200	Ductile Iron	130	0.2	0.0	0.2	4.7
P-1583	J-3044	J-3058	129	200	Ductile Iron	130	0.5	0.1	1.4	15.1
P-1584	J-3009	J-1609	197	200	Ductile Iron	130	-	-	-	-
P-1586	J-2855	J22-2856	5	200	Ductile Iron	130	0.4	0.1	1.2	13.7
P-1587	J-3090	J01-3099	94	200	Ductile Iron	130	-	-	-	-
P-1592	J-2882	J-2857	173	200	Ductile Iron	130	1.2	0.3	7.1	36.4
P-1596	J06-2987	J-3019	258	200	Ductile Iron	130	0.4	0.1	1.1	13.3
P-1598	J-2902	J-2459	144	200	Ductile Iron	130	-	-	-	-
P-1605	J-2435	J-3089	76	200	Ductile Iron	130	-	-	-	-
P-1608	J-3116	J-2880	195	200	Ductile Iron	130	0.1	0.0	0.0	1.4
P-1612	J-1365	J-2963	86	200	Ductile Iron	130	0.3	0.1	0.7	10.5
P-1616	J-3102	J-2936	134	200	Ductile Iron	130	-	-	-	-
P-1617	J-2917	J-3115	172	200	Ductile Iron	130	-	-	-	-
P-1618	J-3087	J-2971	78	200	Ductile Iron	130	-	-	-	-
P-1619	J-3017	J-3091	225	200	Ductile Iron	130	-	-	-	-
P-1622	J32-2870	J-2895	147	200	Ductile Iron	130	1.2	0.3	7.1	36.4
P-1623	J-725	J-2919	23	200	Ductile Iron	130	-	-	-	-
P-1625	J-3119	J41-1464	214	250	Ductile Iron	130	0.3	0.1	0.5	14.7
P-1630	J-2999	J-1610	197	200	Ductile Iron	130	-	-	-	-
P-1631	J09-2878	J-600	4	200	Ductile Iron	130	0.3	0.1	0.7	10.7
P-1639	J-2861	J-2862	193	200	Ductile Iron	130	1.3	0.3	8.9	41.0
P-1641	J-2860	J-2861	5	200	Ductile Iron	130	1.3	0.3	8.9	41.0
P-1646	J-2978	J16-2894	83	200	Ductile Iron	130	-	-	-	-
P-1648	J-2914	J-2915	14	200	Ductile Iron	130	0.9	0.2	4.2	27.3
P-1649	J-2903	J-2904	13	200	Ductile Iron	130	1.3	0.3	9.3	41.9
P-1653	J-3021	J-3085	202	200	Ductile Iron	130	-	-	-	-
P-1655	J39-2907	J-2908	14	200	Ductile Iron	130	-	-	-	-
P-1661	J-1603	J-2955	72	200	Ductile Iron	130	0.3	0.1	0.7	10.5
P-1662	J-2997	J-3110	180	200	Ductile Iron	130	-	-	-	-
P-1667	J-3040	J-3041	63	200	Ductile Iron	130	-	-	-	-
P-1668	J-2960	J-2961	35	200	Ductile Iron	130	-	-	-	-
P-1670	J-2862	J22-2863	6	200	Ductile Iron	130	1.3	0.3	8.9	41.0
P-1671	J-623	J-2469	6	200	Ductile Iron	130	0.5	0.1	1.7	16.9
P-1672	J-3013	J-3072	130	200	Ductile Iron	130	-	-	-	-
P-1673	J-2910	J-1420	195	200	Ductile Iron	130	0.3	0.1	0.6	9.4
P-1675	J-2905	J-2933	25	200	Ductile Iron	130	0.3	0.1	0.5	8.6
P-1676	J-3056	J-3057	65	200	Ductile Iron	130	0.2	0.0	0.2	4.7
P-1677	J25-2911	J-2912	14	200	Ductile Iron	130	0.6	0.1	2.2	19.2
P-1682	J-3062	J-1632	69	200	Ductile Iron	130	0.6	0.1	2.2	19.2
P-1684	J22-2863	J-2855	187	200	Ductile Iron	130	1.7	0.4	15.1	54.6
P-1686	J-2898	J-3029	127	200	Ductile Iron	130	1.4	0.3	10.1	43.9
P-1687	J-2981	J22-2982	55	200	Ductile Iron	130	0.9	0.2	4.2	27.3
P-1691	J-3069	J-3065	68	200	Ductile Iron	130	-	-	-	-
P-1694	J-3064	J-3011	66	200	Ductile Iron	130	1.0	0.2	5.5	31.6
P-1695	J-3054	J-3055	65	200	Ductile Iron	130	-	-	-	-
P-1696	J-2934	J05-2930	27	200	Ductile Iron	130	-	-	-	-
P-1697	J-3075	J-3076	71	200	Ductile Iron	130	-	-	-	-
P-1702	J-3076	J-3080	73	200	Ductile Iron	130	-	-	-	-
P-1704	J16-2852	J-3037	150	200	Ductile Iron	130	-	-	-	-
P-1705	J-2912	J-3084	98	200	Ductile Iron	130	0.6	0.1	2.2	19.2
P-1706	J-3095	J-3030	105	200	Ductile Iron	130	-	-	-	-
P-1707	J-1382	J14-2973	39	200	Ductile Iron	130	0.4	0.1	1.1	13.0
P-1708	J-3060	J-3061	66	200	Ductile Iron	130	0.5	0.1	1.3	14.7
P-1709	J16-3103	J-2977	10	200	Ductile Iron	130	-	-	-	-
P-1710	J-2927	J-2928	21	200	Ductile Iron	130	-	-	-	-
P-1714	J-2888	J-3101	103	200	Ductile Iron	130	-	-	-	-
P-1719	J-2918	J-2913	164	200	Ductile Iron	130	0.1	0.0	0.0	1.4
P-1721	J-2866	J-3096	93	200	Ductile Iron	130	0.3	0.1	0.6	9.6
P-1723	J11-2995	J-2996	59	200	Ductile Iron	130	0.4	0.1	0.9	12.0
P-1726	J-3070	J-3024	68	200	Ductile Iron	130	-	-	-	-
P-1732	J-713	J-1309	9	200	Ductile Iron	130	2.0	0.5	20.3	64.0
P-1733	J-3066	J-3068	67	200	Ductile Iron	130	-	-	-	-
P-1734	J-2908	J-2922	85	200	Ductile Iron	130	-	-	-	-
P-1736	J28-1435	J26-2867	7	200	Ductile Iron	130	0.9	0.2	4.0	26.6
P-1740	J-2881	J-2918	16	200	Ductile Iron	130	0.1	0.0	0.0	1.4
P-1742	J-3098	J23-2416	174	200	Ductile Iron	130	0.6	0.1	2.2	19.3
P-1744	J-2991	J-2992	58	200	Ductile Iron	130	-	-	-	-
P-1747	J-287	J-2905	13	200	Ductile Iron	130	0.6	0.1	1.8	17.2
P-1748	J-1516	J-2871	262	250	PVC	150	-	-	-	-
P-1749	J-2928	J-3070	80	200	Ductile Iron	130	-	-	-	-
P-1751	J-2865	J-2866	6	200	Ductile Iron	130	0.3	0.1	0.6	9.6
P-1752	J-3101	J-3113	186	200	Ductile Iron	130	-	-	-	-

Pipe Line Route Indictors

Pipe Name	From (Node Name)	To (Node Name)	Length (m)	Diameter (mm)	Material	Hazen-Williams Coeff.	Maximum Velocity (m/s)	Minimum Velocity (m/s)	Maximum Headloss Gradient (m/km)	Maximum Discharge (l/s)
P-1755	J-3052	J03-3053	65	200	Ductile Iron	130	-	-	-	-
P-1756	J05-2930	J-2958	62	200	Ductile Iron	130	-	-	-	-
P-1763	J-2864	J-2865	6	200	Ductile Iron	130	0.3	0.1	0.6	9.6
P-1764	J-2992	J05-3082	75	200	Ductile Iron	130	-	-	-	-
P-1765	J28-1407	J-1548	7	250	Ductile Iron	130	0.3	0.1	0.5	14.9
P-1767	J-3059	J-3056	65	200	Ductile Iron	130	0.2	0.0	0.2	4.7
P-1768	J-2873	J15-3118	197	200	Ductile Iron	130	0.3	0.1	0.6	9.6
P-1769	J-3051	J-2851	88	200	Ductile Iron	130	0.4	0.1	1.1	13.1
P-1770	J-3029	J-3049	126	200	Ductile Iron	130	1.4	0.3	10.1	43.9
P-1772	J-2915	J-3105	132	200	Ductile Iron	130	0.9	0.2	4.2	27.3
P-1774	J-3065	J-3066	67	200	Ductile Iron	130	-	-	-	-
P-1775	J03-3053	J-3062	66	200	Ductile Iron	130	0.6	0.1	2.2	19.2
P-1776	J-3031	J-3034	129	200	Ductile Iron	130	0.3	0.1	0.5	8.8
P-1779	J-3030	J-2872	62	200	Ductile Iron	130	-	-	-	-
P-1781	J-2857	J32-2896	156	200	Ductile Iron	130	1.2	0.3	7.1	36.4
P-1796	J-2920	J-2917	16	200	Ductile Iron	130	-	-	-	-
P-1799	J34-1551	J-398	4	200	Ductile Iron	130	0.7	0.2	3.1	23.3
P-1804	J-1305	J57-2461	7	200	Ductile Iron	130	0.9	0.2	4.1	27.1
P-1806	J-3	FCV-2	3	1,000	Ductile Iron	130	0.8	0.2	0.5	590.3
P-1807	FCV-2	J-65	118	1,000	Ductile Iron	130	0.8	0.2	0.5	590.3
P-1809	FCV-3	J-4	144	1,100	Ductile Iron	130	0.5	-	0.2	450.2
P-1810	J-53	FCV-4	43	1,100	Ductile Iron	130	0.4	0.0	0.2	396.5
P-1811	FCV-4	J-20	5	1,100	Ductile Iron	130	0.4	0.0	0.2	396.5
P-1813	FCV-5	J-20	5	700	Ductile Iron	130	1.2	0.2	1.8	469.4
P-1814	J-20	FCV-6	4	1,400	Ductile Iron	130	0.4	0.0	0.1	542.6
P-1816	J-19	FCV-7	6	900	Ductile Iron	130	1.6	-	2.2	1,009.9
P-1817	FCV-7	J-98	109	900	Ductile Iron	130	1.6	-	2.2	1,009.9
P-1818	J-57	FCV-8	12	1,000	Ductile Iron	130	0.9	0.2	0.7	698.8
P-1819	FCV-8	J-58	861	1,000	Ductile Iron	130	0.9	0.2	0.7	698.8
P-1820	J-87	FCV-9	10	250	Ductile Iron	130	2.0	0.5	14.5	96.1
P-1821	FCV-9	J-1436	18	250	Ductile Iron	130	2.0	0.5	14.5	96.1
P-1822	J-91	FCV-11	8	900	Ductile Iron	130	1.2	0.1	1.2	738.0
P-1823	FCV-11	J-92	18	900	Ductile Iron	130	1.2	0.1	1.2	738.0
P-1824	J-286	FCV-12	3	500	Ductile Iron	130	0.4	0.1	0.3	73.5
P-1825	FCV-12	J-405	21	500	Ductile Iron	130	0.4	0.1	0.3	73.5
P-1826	J-289	FCV-13	3	400	Ductile Iron	130	0.9	0.2	2.1	115.2
P-1827	FCV-13	FCV-14	10	400	Ductile Iron	130	0.9	0.2	2.1	115.2
P-1828	FCV-14	J-284	3	400	Ductile Iron	130	0.9	0.2	2.1	115.2
P-1829	J-104	FCV-15	610	900	Ductile Iron	130	0.4	0.1	0.2	255.3
P-1830	FCV-15	J-103	19	900	Ductile Iron	130	0.4	0.1	0.2	255.3
P-1831	J-575	FCV-16	8	250	Ductile Iron	130	-	-	-	-
P-1832	FCV-16	J-903	576	250	Ductile Iron	130	-	-	-	-
P-1833	J-1346	FCV-17	7	250	Ductile Iron	130	-	-	-	-
P-1834	FCV-17	J-575	3	250	Ductile Iron	130	-	-	-	-
P-1835	FCV-18	J-449	6	400	Ductile Iron	130	0.4	0.1	0.4	46.5
P-1836	J-313	FCV-18	4	400	Ductile Iron	130	0.4	0.1	0.4	46.5
P-1837	J-312	FCV-19	618	500	Ductile Iron	130	0.2	0.1	0.1	46.5
P-1838	FCV-19	J-313	92	500	Ductile Iron	130	0.2	0.1	0.1	46.5
P-1839	J-276	FCV-20	851	500	Ductile Iron	130	0.2	0.1	0.1	46.5
P-1840	FCV-20	J-316	5	500	Ductile Iron	130	0.2	0.1	0.1	46.5
P-1842	FCV-21	J72-497	40	400	Ductile Iron	130	0.2	0.1	0.2	27.8
P-1843	J-272	FCV-22	621	500	Ductile Iron	130	0.4	0.1	0.4	81.8
P-1844	FCV-22	J70-311	5	500	Ductile Iron	130	0.4	0.1	0.4	81.8
P-1845	J-496	FCV-23	73	400	Ductile Iron	130	0.2	0.1	0.2	27.8
P-1846	FCV-23	FCV-21	1,120	400	Ductile Iron	130	0.2	0.1	0.2	27.8
P-1847	J-211	FCV-24	17	600	Ductile Iron	130	-	-	-	-
P-1848	FCV-24	J-153	2	600	Ductile Iron	130	-	-	-	-
P-1849	J-157	FCV-25	4	500	Ductile Iron	130	0.8	0.2	1.2	151.6
P-1850	FCV-25	J-279	32	500	Ductile Iron	130	0.8	0.2	1.2	151.6
P-1851	J-5	FCV-26	3	1,600	Ductile Iron	130	0.4	0.0	0.1	813.7
P-1852	FCV-26	J-3	395	1,600	Ductile Iron	130	0.4	0.0	0.1	813.7
P-1856	J-63	FCV-29	52	1,000	Ductile Iron	130	0.8	0.2	0.6	637.4
P-1857	FCV-29	J-64	41	1,000	Ductile Iron	130	0.8	0.2	0.6	637.4
P-1858	J-396	FCV-31	2	400	Ductile Iron	130	0.7	0.2	1.2	87.0
P-1859	FCV-30	J-394	3	400	Ductile Iron	130	0.7	0.2	1.2	87.0
P-1860	FCV-31	FCV-30	8	400	Ductile Iron	130	0.7	0.2	1.2	87.0
P-1861	J-62	FCV-32	3	900	Ductile Iron	130	0.6	0.1	0.3	363.7
P-1862	FCV-32	J-96	46	900	Ductile Iron	130	0.6	0.1	0.3	363.7
P-1863	J-82	FCV-33	115	900	Ductile Iron	130	0.3	0.1	0.1	207.5
P-1864	FCV-33	J-99	8	900	Ductile Iron	130	0.3	0.1	0.1	207.5
P-1865	J-141	FCV-34	9	800	Ductile Iron	130	1.1	0.0	1.2	542.9
P-1866	FCV-34	J-163	248	800	Ductile Iron	130	1.1	0.0	1.2	542.9
P-1867	J-143	FCV-35	15	800	Ductile Iron	130	1.0	0.1	1.0	482.3
P-1868	FCV-35	J-161	1,184	800	Ductile Iron	130	1.0	0.1	1.0	482.3
P-1870	FCV-36	J-553	6	400	Ductile Iron	130	0.5	0.1	0.8	67.7
P-1872	FCV-37	J-280	6	400	Ductile Iron	130	0.6	0.1	0.8	69.4
P-1873	J-886	FCV-38	197	300	Ductile Iron	130	0.4	0.1	0.6	28.4
P-1874	FCV-38	J-577	310	300	Ductile Iron	130	0.4	0.1	0.6	28.4
P-1875	FCV-39	J-445	3	400	Ductile Iron	130	0.7	0.2	1.3	91.3
P-1876	FCV-39	J-443	2	400	Ductile Iron	130	0.7	0.2	1.3	91.3
P-1877	J-294	FCV-40	18	400	Ductile Iron	130	0.3	0.1	0.2	36.5

Pipe Line Route Indictors

Pipe Name	From (Node Name)	To (Node Name)	Length (m)	Diameter (mm)	Material	Hazen-Williams Coeff.	Maximum Velocity (m/s)	Minimum Velocity (m/s)	Maximum Headloss Gradient (m/km)	Maximum Discharge (l/s)
P-1878	FCV-40	J-463	826	400	Ductile Iron	130	0.3	0.1	0.2	36.5
P-1879	J-463	FCV-41	189	400	Ductile Iron	130	0.3	0.1	0.2	36.5
P-1880	FCV-41	J-484	2	400	Ductile Iron	130	0.3	0.1	0.2	36.5
P-1881	J-779	FCV-42	3	250	Ductile Iron	130	0.3	0.1	0.4	14.4
P-1882	FCV-42	J46-1413	12	250	Ductile Iron	130	0.3	0.1	0.4	14.4
P-1883	J-2472	FCV-43	603	225	HDPE	130	-	-	-	-
P-1884	FCV-43	J-2141	7	225	HDPE	130	-	-	-	-
P-1885	J-477	FCV-44	3	250	Ductile Iron	130	-	-	-	-
P-1886	FCV-44	J-1336	6	250	Ductile Iron	130	-	-	-	-
P-1887	J-482	FCV-45	4	250	Ductile Iron	130	0.2	0.0	0.2	9.8
P-1888	FCV-45	J-1410	10	250	Ductile Iron	130	0.2	0.0	0.2	9.8
P-1889	J-2138	FCV-46	1,050	225	HDPE	130	0.3	0.1	0.4	9.8
P-1890	FCV-46	J-2122	3	225	HDPE	130	0.3	0.1	0.4	9.8
P-1891	J-736	FCV-47	5	250	Ductile Iron	130	-	-	-	-
P-1893	J-735	FCV-49	3	300	Ductile Iron	130	-	-	-	-
P-1894	FCV-48	J-736	3	300	Ductile Iron	130	-	-	-	-
P-1895	FCV-49	FCV-48	11	300	Ductile Iron	130	-	-	-	-
P-1896	J-876	FCV-50	5	225	HDPE	130	0.4	0.1	1.0	16.9
P-1897	FCV-50	J-2426	157	225	HDPE	130	0.4	0.1	1.0	16.9
P-1898	J46-684	FCV-51	3	300	Ductile Iron	130	0.2	0.1	0.2	16.9
P-1899	FCV-51	J-876	863	300	Ductile Iron	130	0.2	0.1	0.2	16.9
P-1900	J46-684	FCV-52	5	300	Ductile Iron	130	-	-	-	-
P-1901	FCV-52	J-685	5	300	Ductile Iron	130	-	-	-	-
P-1902	J-838	FCV-53	3	250	Ductile Iron	130	-	-	-	-
P-1903	FCV-53	J-1290	18	250	Ductile Iron	130	-	-	-	-
P-1904	J-1290	FCV-54	3	250	Ductile Iron	130	-	-	-	-
P-1905	FCV-54	J-1291	3	250	Ductile Iron	130	-	-	-	-
P-1906	J-1377	FCV-55	2	250	Ductile Iron	130	0.3	0.1	0.4	14.5
P-1907	FCV-55	J46-1378	9	250	Ductile Iron	130	0.3	0.1	0.4	14.5
P-1908	J-2194	FCV-56	3	225	HDPE	130	-	-	-	-
P-1909	FCV-56	J-2468	432	225	HDPE	130	-	-	-	-
P-1910	J-492	FCV-57	2	250	Ductile Iron	130	0.0	-	-	1.3
P-1911	FCV-57	J-1377	18	250	Ductile Iron	130	0.0	-	0.0	1.3
P-1913	FCV-58	J-2186	5	225	HDPE	130	0.3	0.1	0.6	13.3
P-1914	J-1398	FCV-59	4	250	Ductile Iron	130	-	-	-	-
P-1915	FCV-59	J-1399	9	250	Ductile Iron	130	-	-	-	-
P-1916	J-464	FCV-60	3	250	Ductile Iron	130	0.3	0.1	0.4	13.3
P-1917	FCV-60	J-1398	16	250	Ductile Iron	130	0.3	0.1	0.4	13.3
P-1918	J-465	FCV-61	2	250	Ductile Iron	130	0.3	0.1	0.4	14.5
P-1919	FCV-61	J-1302	14	250	Ductile Iron	130	0.3	0.1	0.4	14.5
P-1920	J-2129	FCV-62	8	225	HDPE	130	-	-	-	-
P-1921	FCV-62	J-2473	755	225	HDPE	130	-	-	-	-
P-1922	J-1302	FCV-63	3	250	Ductile Iron	130	0.3	0.1	0.4	14.5
P-1923	FCV-63	J-1303	4	250	Ductile Iron	130	0.3	0.1	0.4	14.5
P-1924	J-315	FCV-64	2	225	HDPE	130	0.2	0.1	0.4	9.7
P-1925	FCV-64	J-2119	2	225	HDPE	130	0.2	0.1	0.3	9.7
P-1926	J-1341	FCV-65	3	250	Ductile Iron	130	-	-	-	-
P-1927	FCV-65	J-1342	7	250	Ductile Iron	130	-	-	-	-
P-1928	J-2149	FCV-66	4	225	HDPE	130	-	-	-	-
P-1930	J-301	FCV-67	2	250	Ductile Iron	130	0.2	0.0	0.2	8.8
P-1931	FCV-67	J-1341	13	250	Ductile Iron	130	0.2	0.0	0.2	8.8
P-1932	J-302	FCV-68	2	250	Ductile Iron	130	0.0	-	-	1.3
P-1933	FCV-68	J-1269	6	250	Ductile Iron	130	0.0	-	0.0	1.3
P-1934	J-2119	FCV-69	1,097	225	HDPE	130	0.2	0.1	0.4	9.7
P-1935	FCV-69	J-2153	3	225	HDPE	130	0.2	0.1	0.4	9.7
P-1936	J-1269	FCV-70	3	250	Ductile Iron	130	-	-	-	-
P-1937	FCV-70	J-1270	2	250	Ductile Iron	130	-	-	-	-
P-1938	J-1283	FCV-71	2	250	Ductile Iron	130	-	-	-	-
P-1939	FCV-71	J-1284	11	250	Ductile Iron	130	-	-	-	-
P-1941	FCV-72	J-2158	6	225	HDPE	130	0.2	0.1	0.3	8.8
P-1942	J57-1296	FCV-73	3	250	Ductile Iron	130	-	-	-	-
P-1943	FCV-73	J-1297	4	250	Ductile Iron	130	-	-	-	-
P-1944	J-2168	FCV-74	6	225	HDPE	130	0.2	0.1	0.3	8.8
P-1946	J-2137	FCV-75	5	225	HDPE	130	0.4	0.1	0.7	14.3
P-1947	FCV-75	J-1288	2	225	HDPE	130	0.4	0.1	0.7	14.3
P-1948	J-298	FCV-76	2	250	Ductile Iron	130	0.6	0.1	1.5	28.3
P-1949	FCV-76	J-1289	7	250	Ductile Iron	130	0.6	0.1	1.5	28.3
P-1950	J-5	FCV-77	9	500	Ductile Iron	130	-	-	-	-
P-1951	FCV-77	J-291	69	500	Ductile Iron	130	-	-	-	-
P-1952	J-289	FCV-78	11	400	Ductile Iron	130	0.8	0.2	1.4	94.7
P-1953	FCV-78	J-284	12	400	Ductile Iron	130	0.8	0.2	1.4	94.7
P-1954	J-396	FCV-79	15	400	Ductile Iron	130	0.5	0.1	0.8	67.2
P-1955	FCV-79	J-394	6	400	Ductile Iron	130	0.5	0.1	0.8	67.2
P-1956	J-258	FCV-80	3	400	Ductile Iron	130	0.7	0.2	1.1	83.5
P-1957	FCV-80	J-309	13	400	Ductile Iron	130	0.7	0.2	1.1	83.5
P-1958	J-707	FCV-81	5	250	Ductile Iron	130	0.3	0.1	0.4	12.9
P-1959	FCV-81	J-727	15	250	Ductile Iron	130	0.3	0.1	0.4	12.9
P-1960	J-726	FCV-82	13	250	Ductile Iron	130	-	-	-	0.0
P-1961	FCV-82	J-835	5	250	Ductile Iron	130	-	-	-	0.0
P-1962	J-1360	FCV-83	17	250	Ductile Iron	130	0.4	0.0	0.8	19.9
P-1963	FCV-83	J-625	10	250	Ductile Iron	130	0.4	0.0	0.8	19.9

Pipe Line Route Indictors

Pipe Name	From (Node Name)	To (Node Name)	Length (m)	Diameter (mm)	Material	Hazen-Williams Coeff.	Maximum Velocity (m/s)	Minimum Velocity (m/s)	Maximum Headloss Gradient (m/km)	Maximum Discharge (l/s)
P-1964	J-447	FCV-84	12	300	Ductile Iron	130	0.5	0.1	0.9	34.5
P-1965	FCV-84	J-456	7	300	Ductile Iron	130	0.5	0.1	0.9	34.5
P-1966	J-1304	FCV-85	15	200	Ductile Iron	130	0.9	0.2	4.8	29.4
P-1967	FCV-85	J-1361	7	200	Ductile Iron	130	0.9	0.2	4.8	29.4
P-1968	J-1246	FCV-86	12	200	Ductile Iron	130	0.4	0.1	0.9	11.8
P-1969	FCV-86	J-1323	7	200	Ductile Iron	130	0.4	0.1	0.9	11.8
P-1970	J-624	FCV-87	15	250	Ductile Iron	130	0.5	0.1	1.1	23.7
P-1971	FCV-87	J-675	8	250	Ductile Iron	130	0.5	0.1	1.1	23.7
P-1974	J-1312	FCV-89	4	250	Ductile Iron	130	-	-	-	-
P-1975	FCV-89	J-1313	3	250	Ductile Iron	130	-	-	-	-
P-1976	J-254	FCV-90	5	200	Ductile Iron	130	-	-	-	-
P-1977	FCV-90	J-2952	29	200	Ductile Iron	130	-	-	-	-
P-1978	J-255	FCV-91	4	500	Ductile Iron	130	0.4	0.1	0.3	77.1
P-1979	FCV-91	J-259	5	500	Ductile Iron	130	0.4	0.1	0.3	77.1
P-1980	J-1319	FCV-92	3	250	Ductile Iron	130	-	-	-	-
P-1981	FCV-92	J-286	5	250	Ductile Iron	130	-	-	-	-
P-1982	J-1595	FCV-93	240	250	Ductile Iron	130	-	-	-	-
P-1983	FCV-93	J-395	5	250	Ductile Iron	130	-	-	-	-
P-1984	J-1447	FCV-94	12	250	Ductile Iron	130	-	-	-	-
P-1985	FCV-94	J-454	9	250	Ductile Iron	130	-	-	-	-
P-1986	J-59	FCV-95	5	250	Ductile Iron	130	-	-	-	-
P-1987	FCV-95	J-1244	5	250	Ductile Iron	130	-	-	-	-
P-1988	J-1436	FCV-96	6	250	Ductile Iron	130	-	-	-	-
P-1989	FCV-96	J-1521	102	250	Ductile Iron	130	-	-	-	-
P-1990	J16-2894	FCV-97	4	200	Ductile Iron	130	0.2	0.1	0.3	6.6
P-1991	FCV-97	J-627	6	200	Ductile Iron	130	0.2	0.1	0.3	6.6
P-1992	J-3096	FCV-98	82	200	Ductile Iron	130	0.3	0.1	0.6	9.6
P-1993	FCV-98	J-874	6	200	Ductile Iron	130	0.3	0.1	0.6	9.6
P-1995	FCV-99	J15-871	7	300	Ductile Iron	130	-	-	-	-
P-1996	J15-753	FCV-100	4	200	Ductile Iron	130	-	-	-	-
P-1997	FCV-100	J20-754	22	200	Ductile Iron	130	-	-	-	-
P-1998	J-682	FCV-101	6	250	Ductile Iron	130	-	-	-	-
P-1999	FCV-101	J20-1608	597	250	Ductile Iron	130	-	-	-	-
P-2000	J-607	FCV-102	8	300	Ductile Iron	130	-	-	-	-
P-2001	FCV-102	J-853	655	300	Ductile Iron	130	-	-	-	-
P-2003	FCV-103	J-832	7	300	Ductile Iron	130	-	-	-	-
P-2004	J-3120	FCV-104	210	200	Ductile Iron	130	-	-	-	-
P-2005	FCV-104	J19-692	5	200	Ductile Iron	130	-	-	-	-
P-2006	J-594	FCV-105	7	250	Ductile Iron	130	-	-	-	-
P-2007	FCV-105	J28-1485	49	250	Ductile Iron	130	-	-	-	-
P-2008	J-593	FCV-106	4	250	Ductile Iron	130	-	-	-	-
P-2009	FCV-106	J-1484	152	250	Ductile Iron	130	-	-	-	-
P-2010	J-716	FCV-107	4	250	Ductile Iron	130	-	-	-	-
P-2011	FCV-107	J-1518	61	250	Ductile Iron	130	-	-	-	-
P-2012	J-716	FCV-108	11	200	Ductile Iron	130	-	-	-	-
P-2013	FCV-108	J-2951	41	200	Ductile Iron	130	-	-	-	-
P-2014	J-2889	FCV-109	7	200	Ductile Iron	130	-	-	-	-
P-2015	FCV-109	J-2314	3	200	Ductile Iron	130	-	-	-	-
P-2016	J-1387	FCV-110	4	250	Ductile Iron	130	-	-	-	-
P-2017	FCV-110	J29-1388	8	250	Ductile Iron	130	-	-	-	-
P-2018	J-2871	FCV-111	4	200	Ductile Iron	130	-	-	-	-
P-2019	FCV-111	J-1387	4	200	Ductile Iron	130	-	-	-	-
P-2020	J-27	FCV-112	3	800	Ductile Iron	130	-	-	-	-
P-2021	FCV-112	J-139	5	800	Ductile Iron	130	-	-	-	-
P-2022	J-28	FCV-113	3	800	Ductile Iron	130	-	-	-	-
P-2023	FCV-113	J-138	5	800	Ductile Iron	130	-	-	-	-
P-2024	J-31	FCV-114	3	400	Ductile Iron	130	-	-	-	-
P-2025	FCV-114	J-468	57	400	Ductile Iron	130	-	-	-	-
P-2026	J-200	FCV-115	9	700	Ductile Iron	130	2.2	2.2	5.5	854.6
P-2027	FCV-115	J-199	6	700	Ductile Iron	130	2.2	2.2	5.5	854.6
P-2028	J23-2416	FCV-116	239	200	Ductile Iron	130	-	-	-	-
P-2029	FCV-116	J-2915	8	200	Ductile Iron	130	-	-	-	-
P-2034	J-2877	FCV-119	32	200	Ductile Iron	130	-	-	-	-
P-2035	FCV-119	J-619	4	200	Ductile Iron	130	-	-	-	-
P-2036	J29-1453	FCV-120	20	250	Ductile Iron	130	-	-	-	-
P-2037	FCV-120	J-609	6	250	Ductile Iron	130	-	-	-	-
P-2038	J-398	FCV-121	9	200	Ductile Iron	130	-	-	-	-
P-2039	FCV-121	J-1547	13	200	Ductile Iron	130	-	-	-	-
P-2040	J-159	FCV-122	3	200	Ductile Iron	130	-	-	-	-
P-2041	FCV-122	J-2909	11	200	Ductile Iron	130	-	-	-	-
P-2042	J-458	FCV-123	9	250	Ductile Iron	130	-	-	-	-
P-2043	FCV-123	J-1281	10	250	Ductile Iron	130	-	-	-	-
P-2044	J-3037	FCV-124	66	200	Ductile Iron	130	-	-	-	-
P-2045	FCV-124	J19-856	7	200	Ductile Iron	130	-	-	-	-
P-2046	J-3024	FCV-125	56	200	Ductile Iron	130	-	-	-	-
P-2047	FCV-125	J-2923	5	200	Ductile Iron	130	-	-	-	-
P-2048	J-2194	FCV-126	2	225	HDPE	130	0.3	0.1	0.6	13.3
P-2049	FCV-126	FCV-58	543	225	HDPE	130	0.3	0.1	0.6	13.3
P-2050	FCV-66	FCV-127	1,107	225	HDPE	130	-	-	-	-
P-2051	FCV-127	J-2186	9	225	HDPE	130	-	-	-	-
P-2052	J-2149	FCV-128	4	225	HDPE	130	0.2	0.1	0.3	8.8

Pipe Line Route Indictors

Pipe Name	From (Node Name)	To (Node Name)	Length (m)	Diameter (mm)	Material	Hazen-Williams Coeff.	Maximum Velocity (m/s)	Minimum Velocity (m/s)	Maximum Headloss Gradient (m/km)	Maximum Discharge (l/s)
P-2053	FCV-128	FCV-72	442	225	HDPE	130	0.2	0.1	0.3	8.8
P-2054	J-2153	FCV-129	3	225	HDPE	130	0.2	0.0	0.3	8.4
P-2055	FCV-129	J57-2461	890	225	HDPE	130	0.2	0.0	0.3	8.4
P-2058	J-2137	FCV-131	363	225	HDPE	130	0.4	0.1	0.7	14.3
P-2059	FCV-131	J-2168	4	225	HDPE	130	0.4	0.1	0.7	14.3
P-2060	J57-2461	FCV-132	4	225	HDPE	130	-	-	-	-
P-2061	FCV-132	J-2462	353	225	HDPE	130	-	-	-	-
P-2062	J-246	FCV-133	2	250	Ductile Iron	130	0.4	0.1	0.7	18.1
P-2063	FCV-133	J57-1296	15	250	Ductile Iron	130	0.4	0.1	0.7	18.1
P-2064	J-2370	FCV-134	7	225	HDPE	130	0.2	0.1	0.3	9.4
P-2065	FCV-134	J-2371	79	225	HDPE	130	0.2	0.1	0.3	9.4
P-2066	J-463	FCV-135	3	250	Ductile Iron	130	-	-	-	-
P-2067	FCV-135	J-1347	4	250	Ductile Iron	130	-	-	-	-
P-2068	J-740	FCV-136	2	225	HDPE	130	0.2	0.1	0.3	9.4
P-2069	FCV-136	J-2125	2	225	HDPE	130	0.2	0.1	0.3	9.4
P-2070	J-700	FCV-137	5	300	Ductile Iron	130	0.8	0.2	2.0	52.9
P-2071	FCV-137	J58-588	851	300	Ductile Iron	130	0.8	0.2	2.0	52.9
P-2072	J-221	FCV-138	3	250	Ductile Iron	130	-	-	-	-
P-2073	FCV-138	J-1375	9	250	Ductile Iron	130	-	-	-	-
P-2074	J-225	FCV-139	5	250	Ductile Iron	130	0.5	0.1	1.1	23.5
P-2075	FCV-139	J-1405	8	250	Ductile Iron	130	0.5	0.1	1.1	23.5
P-2076	J-840	FCV-140	71	225	HDPE	130	-	-	-	-
P-2077	FCV-140	J-1454	7	225	HDPE	130	-	-	-	-
P-2078	J-1324	FCV-141	6	250	Ductile Iron	130	-	-	-	-
P-2079	FCV-141	J-1449	23	250	Ductile Iron	130	-	-	-	-
P-2080	J-1246	FCV-143	2	200	Ductile Iron	130	0.6	0.1	1.9	17.6
P-2081	FCV-142	J-1323	2	200	Ductile Iron	130	0.6	0.1	1.9	17.6
P-2082	FCV-143	FCV-142	5	200	Ductile Iron	130	0.6	0.1	1.9	17.6
P-2083	J-624	FCV-144	3	250	Ductile Iron	130	0.6	0.2	1.8	31.0
P-2084	FCV-144	FCV-145	8	250	Ductile Iron	130	0.6	0.2	1.8	31.0
P-2085	FCV-145	J-675	3	250	Ductile Iron	130	0.6	0.2	1.8	31.0
P-2086	J-1465	FCV-146	3	200	Ductile Iron	130	-	-	-	-
P-2087	FCV-146	J-2897	10	200	Ductile Iron	130	-	-	-	-
P-2088	J-892	FCV-147	3	300	Ductile Iron	130	0.6	0.1	1.1	39.1
P-2089	FCV-147	J-901	497	300	Ductile Iron	130	0.6	0.1	1.1	39.1
P-2090	J63-1583	FCV-148	2	250	Ductile Iron	130	0.6	0.1	1.7	30.4
P-2091	FCV-148	J-1584	124	250	Ductile Iron	130	0.6	0.1	1.7	30.4
P-2092	J-266	FCV-149	8	400	Ductile Iron	130	0.3	0.1	0.3	40.6
P-2093	FCV-149	J-267	3	500	Ductile Iron	130	0.2	0.1	0.1	40.6
P-2097	FCV-151	J61-2154	3	225	HDPE	130	0.3	0.1	0.5	11.6
P-2098	J-755	FCV-153	3	225	HDPE	130	-	-	-	-
P-2099	FCV-153	J-2157	4	225	HDPE	130	-	-	-	-
P-2100	J74-257	FCV-154	3	300	Ductile Iron	130	-	-	-	-
P-2101	FCV-154	J-755	33	300	Ductile Iron	130	-	-	-	-
P-2102	J-165	FCV-155	5	500	Ductile Iron	130	0.4	0.1	0.3	71.3
P-2103	FCV-155	J-261	3	500	Ductile Iron	130	0.4	0.1	0.3	71.3
P-2105	FCV-156	J-460	4	250	Ductile Iron	130	0.2	0.1	0.2	10.0
P-2106	J-460	FCV-157	3	250	Ductile Iron	130	0.3	0.1	0.3	12.1
P-2108	J74-1630	FCV-158	4	250	Ductile Iron	130	0.2	0.1	0.2	10.0
P-2109	FCV-158	J-1292	163	250	Ductile Iron	130	0.2	0.1	0.2	10.0
P-2110	J74-1279	FCV-159	4	250	Ductile Iron	130	-	-	-	-
P-2111	FCV-159	J-1306	4	250	Ductile Iron	130	-	-	-	-
P-2112	J-496	FCV-160	4	250	Ductile Iron	130	0.1	0.0	0.1	6.4
P-2113	FCV-160	J74-1279	6	250	Ductile Iron	130	0.1	0.0	0.1	6.4
P-2114	J-708	FCV-161	2	300	Ductile Iron	130	0.9	0.2	2.6	61.6
P-2115	FCV-161	J-299	9	300	Ductile Iron	130	0.9	0.2	2.6	61.6
P-2116	J-622	FCV-162	3	300	Ductile Iron	130	0.4	0.1	0.6	28.8
P-2117	FCV-162	J-623	3	300	Ductile Iron	130	0.4	0.1	0.6	28.8
P-2118	J-623	FCV-163	4	250	Ductile Iron	130	0.2	0.1	0.3	11.9
P-2119	FCV-163	J-1412	12	250	Ductile Iron	130	0.2	0.1	0.3	11.9
P-2120	J-2327	FCV-164	359	225	HDPE	130	0.3	0.1	0.4	10.0
P-2122	J-276	FCV-165	16	250	Ductile Iron	130	0.3	0.1	0.3	12.1
P-2123	FCV-165	J68-1249	2	250	Ductile Iron	130	0.3	0.1	0.3	12.1
P-2124	J-2359	FCV-166	118	225	HDPE	130	-	-	-	-
P-2125	FCV-166	J-1250	3	225	HDPE	130	-	-	-	-
P-2126	J68-1249	FCV-167	4	225	HDPE	130	-	-	-	-
P-2127	FCV-167	J-2264	50	225	HDPE	130	-	-	-	-
P-2128	J-1250	FCV-168	3	225	HDPE	130	0.2	0.0	0.2	6.8
P-2129	FCV-168	J-2387	98	225	HDPE	130	0.2	0.0	0.2	6.8
P-2132	J-486	FCV-170	3	250	Ductile Iron	130	0.5	0.1	1.1	23.6
P-2133	FCV-170	J-1440	20	250	Ductile Iron	130	0.5	0.1	1.1	23.6
P-2136	J-494	FCV-172	7	250	Ductile Iron	130	0.2	0.1	0.3	10.7
P-2137	FCV-172	J75-1439	15	250	Ductile Iron	130	0.2	0.1	0.3	10.7
P-2138	J-1251	FCV-173	6	250	Ductile Iron	130	-	-	-	-
P-2139	FCV-173	J-1310	2	250	Ductile Iron	130	-	-	-	-
P-2140	J-2421	FCV-175	338	225	HDPE	130	0.3	0.1	0.4	10.0
P-2141	FCV-174	J-2326	88	225	HDPE	130	0.3	0.1	0.4	10.0
P-2142	FCV-175	FCV-174	8	225	HDPE	130	0.3	0.1	0.4	10.0
P-2143	J70-2420	FCV-176	3	225	HDPE	130	-	-	-	-
P-2144	FCV-176	J-2452	274	225	HDPE	130	-	-	-	-
P-2145	J-258	FCV-178	6	400	Ductile Iron	130	0.7	0.2	1.2	86.5

Pipe Line Route Indictors

Pipe Name	From (Node Name)	To (Node Name)	Length (m)	Diameter (mm)	Material	Hazen-Williams Coeff.	Maximum Velocity (m/s)	Minimum Velocity (m/s)	Maximum Headloss Gradient (m/km)	Maximum Discharge (l/s)
P-2146	FCV-177	J-309	2	400	Ductile Iron	130	0.7	0.2	1.2	86.5
P-2147	FCV-178	FCV-177	7	400	Ductile Iron	130	0.7	0.2	1.2	86.5
P-2148	J-727	FCV-179	3	250	Ductile Iron	130	0.3	0.1	0.5	15.0
P-2149	FCV-179	FCV-180	9	250	Ductile Iron	130	0.3	0.1	0.5	15.0
P-2150	FCV-180	J-707	3	250	Ductile Iron	130	0.3	0.1	0.5	15.0
P-2151	J-18	FCV-181	9	300	Ductile Iron	130	0.4	0.1	0.6	27.9
P-2152	FCV-181	J-707	5	300	Ductile Iron	130	0.4	0.1	0.6	27.9
P-2154	FCV-182	J-847	7	300	Ductile Iron	130	-	-	-	-
P-2155	J-726	FCV-183	2	250	Ductile Iron	130	-	-	-	0.0
P-2156	FCV-183	FCV-184	8	250	Ductile Iron	130	-	-	-	0.0
P-2157	FCV-184	J-835	3	250	Ductile Iron	130	-	-	-	0.0
P-2158	J-63	FCV-185	5	300	Ductile Iron	130	-	-	-	-
P-2159	FCV-185	J-726	11	300	Ductile Iron	130	-	-	-	-
P-2160	J-96	FCV-186	7	250	Ductile Iron	130	1.5	0.3	8.5	72.0
P-2161	FCV-186	J-1304	3	250	Ductile Iron	130	1.5	0.3	8.5	72.0
P-2162	J-1304	FCV-187	3	200	Ductile Iron	130	1.4	0.3	9.6	42.7
P-2163	FCV-187	FCV-188	6	200	Ductile Iron	130	1.4	0.3	9.6	42.7
P-2164	FCV-188	J-1361	2	200	Ductile Iron	130	1.4	0.3	9.6	42.7
P-2165	J-447	FCV-190	2	300	Ductile Iron	130	0.7	0.2	1.5	46.3
P-2166	FCV-189	J-456	2	300	Ductile Iron	130	0.7	0.2	1.5	46.3
P-2167	FCV-190	FCV-189	7	300	Ductile Iron	130	0.7	0.2	1.5	46.3
P-2168	J-1360	FCV-192	3	250	Ductile Iron	130	0.5	0.0	1.3	26.4
P-2169	FCV-191	J-625	3	250	Ductile Iron	130	0.5	0.0	1.3	26.4
P-2170	FCV-192	FCV-191	10	250	Ductile Iron	130	0.5	0.0	1.3	26.4
P-2171	J-60	FCV-193	11	250	Ductile Iron	130	0.9	0.1	3.8	46.3
P-2172	FCV-193	J-1360	3	250	Ductile Iron	130	0.9	0.1	3.8	46.3
P-2173	J-562	FCV-194	562	250	HDPE	130	0.3	0.1	0.4	13.2
P-2174	FCV-194	J38-563	4	250	HDPE	130	0.3	0.1	0.4	13.2
P-2175	J38-563	FCV-195	6	200	Ductile Iron	130	-	-	-	-
P-2176	FCV-195	J-2257	125	200	Ductile Iron	130	-	-	-	-
P-2177	J-453	FCV-196	5	400	Ductile Iron	130	0.4	0.1	0.5	53.0
P-2178	FCV-196	J-444	13	400	Ductile Iron	130	0.4	0.1	0.5	53.0
P-2179	J38-305	FCV-197	3	200	Ductile Iron	130	-	-	-	-
P-2180	FCV-197	J-2888	7	200	Ductile Iron	130	-	-	-	-
P-2181	J-2257	FCV-198	4	225	HDPE	130	-	-	-	-
P-2182	FCV-198	J-2258	47	225	HDPE	130	-	-	-	-
P-2183	J-2257	FCV-199	4	225	HDPE	130	-	-	-	-
P-2184	FCV-199	J-2435	336	225	HDPE	130	-	-	-	-
P-2185	J-287	FCV-200	5	200	Ductile Iron	130	0.6	0.1	1.8	17.2
P-2187	J-2905	FCV-201	4	200	Ductile Iron	130	0.3	0.1	0.5	8.6
P-2188	FCV-201	J-2929	29	200	Ductile Iron	130	0.3	0.1	0.5	8.6
P-2189	J-2475	FCV-203	3	225	HDPE	130	-	-	-	-
P-2190	FCV-202	J-591	2	225	HDPE	130	-	-	-	-
P-2191	FCV-203	FCV-202	1,463	225	HDPE	130	-	-	-	-
P-2192	J-2184	FCV-204	7	225	HDPE	130	-	-	-	-
P-2193	FCV-204	J-2419	427	225	HDPE	130	-	-	-	-
P-2194	J-2418	FCV-205	128	225	HDPE	130	-	-	-	-
P-2195	FCV-205	J-2419	16	225	HDPE	130	-	-	-	-
P-2196	J38-2241	FCV-206	4	225	HDPE	130	-	-	-	-
P-2197	FCV-206	J-2242	39	225	HDPE	130	-	-	-	-
P-2198	J-883	FCV-207	3	225	HDPE	130	-	-	-	-
P-2199	FCV-207	J-2475	805	225	HDPE	130	-	-	-	-
P-2200	J-883	FCV-208	3	250	Ductile Iron	130	0.4	0.1	0.9	21.7
P-2201	FCV-208	J-1298	4	250	Ductile Iron	130	0.4	0.1	0.9	21.7
P-2202	J-883	FCV-209	3	300	Ductile Iron	130	0.3	0.1	0.4	21.7
P-2203	FCV-209	J-850	255	300	Ductile Iron	130	0.3	0.1	0.4	21.7
P-2204	J-1666	FCV-210	3	250	Ductile Iron	130	-	-	-	-
P-2205	FCV-210	J-1346	434	250	Ductile Iron	130	-	-	-	-
P-2206	J-1243	FCV-211	2	250	Ductile Iron	130	-	-	-	-
P-2207	FCV-211	J-1348	7	250	Ductile Iron	130	-	-	-	-
P-2208	J-1243	FCV-212	9	250	Ductile Iron	130	-	-	-	-
P-2209	FCV-212	J-1666	426	250	Ductile Iron	130	-	-	-	-
P-2210	J39-2450	FCV-213	3	225	HDPE	130	-	-	-	-
P-2211	FCV-213	J-2451	254	225	HDPE	130	-	-	-	-
P-2212	J-2929	FCV-214	413	225	HDPE	130	0.2	0.1	0.3	8.6
P-2213	FCV-214	J39-2450	4	225	HDPE	130	0.2	0.1	0.3	8.6
P-2215	J-2232	J-285	2	110	HDPE	130	1.9	0.5	36.7	18.3
P-2216	J41-1657	FCV-215	295	250	Ductile Iron	130	0.3	0.1	0.5	14.7
P-2217	FCV-215	J-3119	4	250	PVC	150	0.3	0.1	0.3	14.7
P-2219	FCV-216	J-1656	6	250	Ductile Iron	130	-	-	-	-
P-2220	J-895	FCV-217	358	300	Ductile Iron	130	0.3	0.1	0.4	23.6
P-2221	FCV-217	J-896	3	300	Ductile Iron	130	0.3	0.1	0.4	23.6
P-2222	J-896	FCV-218	4	250	Ductile Iron	130	-	-	-	-
P-2223	FCV-218	FCV-216	449	250	Ductile Iron	130	-	-	-	-
P-2224	J-896	FCV-219	2	250	Ductile Iron	130	0.5	0.1	1.1	23.6
P-2225	FCV-219	J-1247	4	250	Ductile Iron	130	0.5	0.1	1.1	23.6
P-2226	J69-1638	FCV-220	319	250	Ductile Iron	130	0.1	0.0	0.1	5.1
P-2227	FCV-220	J-1658	5	250	Ductile Iron	130	0.1	0.0	0.1	5.1
P-2228	J-1658	FCV-221	4	250	Ductile Iron	130	0.1	0.0	0.1	5.1
P-2229	FCV-221	FCV-222	700	250	Ductile Iron	130	0.1	0.0	0.1	5.1
P-2230	FCV-222	J-1563	6	250	Ductile Iron	130	0.1	0.0	0.1	5.1

Pipe Line Route Indictors

Pipe Name	From (Node Name)	To (Node Name)	Length (m)	Diameter (mm)	Material	Hazen-Williams Coeff.	Maximum Velocity (m/s)	Minimum Velocity (m/s)	Maximum Headloss Gradient (m/km)	Maximum Discharge (l/s)
P-2231	J-1564	FCV-224	182	250	Ductile Iron	130	0.2	0.0	0.2	9.2
P-2232	FCV-223	J-1524	149	250	Ductile Iron	130	0.2	0.0	0.2	9.2
P-2233	FCV-224	FCV-223	12	250	Ductile Iron	130	0.2	0.0	0.2	9.2
P-2234	J-252	FCV-225	4	250	Ductile Iron	130	0.2	0.0	0.2	8.7
P-2235	FCV-225	J-1322	4	250	Ductile Iron	130	0.2	0.0	0.2	8.7
P-2238	J-2374	FCV-227	838	225	HDPE	130	0.5	0.1	1.1	18.3
P-2239	FCV-227	J-581	6	225	HDPE	130	0.5	0.1	1.1	18.3
P-2240	J-282	FCV-228	3	300	Ductile Iron	130	0.4	0.1	0.5	26.0
P-2241	FCV-228	J47-764	32	300	Ductile Iron	130	0.4	0.1	0.5	26.0
P-2242	J46-2210	FCV-229	8	225	HDPE	130	0.1	0.0	0.0	2.4
P-2243	FCV-229	J-2211	20	225	HDPE	130	0.1	0.0	0.0	2.4
P-2244	J46-2210	FCV-230	5	225	HDPE	130	0.4	0.1	1.0	16.9
P-2245	FCV-230	J-2442	499	225	HDPE	130	0.4	0.1	1.0	16.9
P-2246	J36-2217	FCV-231	4	225	HDPE	130	-	-	-	-
P-2247	FCV-231	J-900	27	225	HDPE	130	-	-	-	-
P-2248	J-1301	FCV-232	4	225	HDPE	130	1.1	0.3	5.3	42.2
P-2249	FCV-232	J-2368	82	225	HDPE	130	1.1	0.3	5.3	42.2
P-2250	J-1301	FCV-233	7	225	HDPE	130	0.1	0.0	0.0	2.4
P-2251	FCV-233	J37-2436	188	225	HDPE	130	0.1	0.0	0.0	2.4
P-2252	J36-1478	FCV-234	5	250	Ductile Iron	130	0.8	0.2	3.0	40.9
P-2254	J-610	FCV-235	4	250	Ductile Iron	130	-	-	-	-
P-2255	FCV-235	J-702	8	250	Ductile Iron	130	-	-	-	-
P-2256	J-701	FCV-236	7	300	Ductile Iron	130	0.1	0.0	0.1	10.1
P-2257	FCV-236	J-702	3	300	Ductile Iron	130	0.1	0.0	0.1	10.1
P-2258	J-559	FCV-237	15	300	Ductile Iron	130	-	-	-	-
P-2259	FCV-237	J35-637	3	300	Ductile Iron	130	-	-	-	-
P-2260	J37-2436	FCV-238	7	225	HDPE	130	0.7	0.2	2.5	27.9
P-2261	FCV-238	J41-2456	325	225	HDPE	130	0.7	0.2	2.5	27.9
P-2262	J-2182	FCV-239	4	225	HDPE	130	1.1	0.3	5.3	42.2
P-2263	FCV-239	J-2174	232	225	HDPE	130	1.1	0.3	5.3	42.2
P-2264	J-2971	FCV-240	79	200	Ductile Iron	130	-	-	-	-
P-2265	FCV-240	J-647	7	200	Ductile Iron	130	-	-	-	-
P-2266	J34-1331	FCV-241	77	250	Ductile Iron	130	-	-	-	-
P-2267	FCV-241	J-733	11	250	Ductile Iron	130	-	-	-	-
P-2268	J-3097	FCV-242	7	200	Ductile Iron	130	-	-	-	-
P-2269	FCV-242	J-3075	83	200	Ductile Iron	130	-	-	-	-
P-2270	J-3080	FCV-243	92	200	Ductile Iron	130	-	-	-	-
P-2271	FCV-243	J-3100	7	200	Ductile Iron	130	-	-	-	-
P-2272	J-3100	FCV-244	7	200	Ductile Iron	130	-	-	-	-
P-2273	FCV-244	J-3087	165	200	Ductile Iron	130	-	-	-	-
P-2274	J-1277	FCV-245	5	250	Ductile Iron	130	0.2	0.0	0.2	8.5
P-2276	J34-1551	FCV-247	4	250	Ductile Iron	130	0.2	0.0	0.2	8.5
P-2277	FCV-246	J-1276	5	250	Ductile Iron	130	0.2	0.0	0.2	8.5
P-2278	FCV-247	FCV-246	71	250	Ductile Iron	130	0.2	0.0	0.2	8.5
P-2279	J-1272	FCV-248	62	250	Ductile Iron	130	-	-	-	-
P-2280	FCV-248	J-1547	23	250	Ductile Iron	130	-	-	-	-
P-2281	J-1338	FCV-249	14	250	Ductile Iron	130	0.9	0.1	3.8	46.3
P-2282	FCV-249	J07-1629	221	250	Ductile Iron	130	0.9	0.1	3.8	46.3
P-2283	J-2983	FCV-250	50	200	Ductile Iron	130	0.3	0.1	0.5	8.8
P-2284	FCV-250	J-1259	4	200	Ductile Iron	130	0.3	0.1	0.5	8.8
P-2285	J-1259	FCV-251	4	250	Ductile Iron	130	0.2	0.0	0.2	8.8
P-2286	FCV-251	J-1260	2	250	Ductile Iron	130	0.2	0.0	0.2	8.8
P-2287	J-3123	FCV-252	3	200	Ductile Iron	130	-	-	-	-
P-2288	FCV-252	J-3069	259	200	Ductile Iron	130	-	-	-	-
P-2289	J-2937	FCV-253	4	200	Ductile Iron	130	-	-	-	-
P-2290	FCV-253	J-2938	56	200	Ductile Iron	130	-	-	-	-
P-2291	J-2961	FCV-254	127	200	Ductile Iron	130	-	-	-	-
P-2292	FCV-254	J-3073	4	200	Ductile Iron	130	-	-	-	-
P-2293	J-3073	FCV-255	5	200	Ductile Iron	130	-	-	-	-
P-2294	FCV-255	J-3052	65	200	Ductile Iron	130	-	-	-	-
P-2295	J-1632	FCV-256	5	200	Ductile Iron	130	-	-	-	-
P-2296	FCV-256	J-3009	126	200	Ductile Iron	130	-	-	-	-
P-2298	FCV-257	J-1632	5	250	Ductile Iron	130	0.3	0.1	0.5	14.7
P-2300	FCV-258	J-1609	6	250	Ductile Iron	130	0.7	0.2	2.4	36.2
P-2301	FCV-259	J-1609	5	250	Ductile Iron	130	0.7	0.2	2.4	36.2
P-2302	FCV-259	FCV-260	143	250	Ductile Iron	130	0.7	0.2	2.4	36.2
P-2303	FCV-260	J-1610	6	250	Ductile Iron	130	0.7	0.2	2.4	36.2
P-2304	J-1610	FCV-261	4	200	Ductile Iron	130	-	-	-	-
P-2305	FCV-261	J-3021	130	200	Ductile Iron	130	-	-	-	-
P-2306	J-3072	FCV-262	135	200	Ductile Iron	130	-	-	-	-
P-2307	FCV-262	J-3094	22	200	Ductile Iron	130	-	-	-	-
P-2308	J-3085	FCV-263	69	200	Ductile Iron	130	-	-	-	-
P-2309	FCV-263	J-3093	15	200	Ductile Iron	130	-	-	-	-
P-2310	J-3046	FCV-264	7	200	Ductile Iron	130	-	-	-	-
P-2311	FCV-264	J-3047	57	200	Ductile Iron	130	-	-	-	-
P-2312	J-3074	FCV-265	4	200	Ductile Iron	130	0.2	0.0	0.2	4.7
P-2313	FCV-265	J-3059	66	200	Ductile Iron	130	0.2	0.0	0.2	4.7
P-2314	J-3048	FCV-266	4	200	Ductile Iron	130	-	-	-	-
P-2315	FCV-266	J-2999	123	200	Ductile Iron	130	-	-	-	-
P-2316	J-834	FCV-267	569	300	Ductile Iron	130	-	-	-	-
P-2317	FCV-267	J30-709	14	300	Ductile Iron	130	-	-	-	-

Pipe Line Route Indictors

Pipe Name	From (Node Name)	To (Node Name)	Length (m)	Diameter (mm)	Material	Hazen-Williams Coeff.	Maximum Velocity (m/s)	Minimum Velocity (m/s)	Maximum Headloss Gradient (m/km)	Maximum Discharge (l/s)
P-2318	J-1385	FCV-268	5	250	Ductile Iron	130	0.5	0.1	1.2	24.5
P-2320	J-161	FCV-269	3	300	Ductile Iron	130	1.0	0.2	3.4	70.7
P-2321	FCV-269	J-617	36	300	Ductile Iron	130	1.0	0.2	3.4	70.7
P-2322	J01-1577	FCV-270	128	250	Ductile Iron	130	0.2	0.0	0.2	10.4
P-2323	FCV-270	J-1578	5	250	Ductile Iron	130	0.2	0.0	0.2	10.4
P-2324	J-162	FCV-271	5	600	Ductile Iron	130	0.8	0.2	1.0	228.3
P-2326	J-1553	FCV-272	5	250	Ductile Iron	130	-	-	-	-
P-2327	FCV-272	J-1554	78	250	Ductile Iron	130	-	-	-	-
P-2328	J-1553	FCV-273	4	250	Ductile Iron	130	0.4	0.1	0.7	18.6
P-2329	FCV-273	J-1565	301	250	Ductile Iron	130	0.4	0.1	0.7	18.6
P-2330	J-163	FCV-274	8	250	Ductile Iron	130	1.3	0.0	6.5	62.2
P-2331	FCV-274	J-1253	25	250	Ductile Iron	130	1.3	0.0	6.5	62.2
P-2332	J-1385	FCV-275	368	250	Ductile Iron	130	-	-	-	-
P-2333	FCV-275	J-1598	13	250	Ductile Iron	130	-	-	-	-
P-2334	J-1294	FCV-276	4	250	Ductile Iron	130	1.2	0.3	5.5	56.8
P-2335	FCV-276	J01-1295	3	250	Ductile Iron	130	1.2	0.3	5.5	56.8
P-2336	J-859	FCV-277	7	225	HDPE	130	-	-	-	-
P-2337	FCV-277	J-2156	17	225	HDPE	130	-	-	-	-
P-2338	J-859	FCV-278	3	250	Ductile Iron	130	1.2	0.3	5.5	56.8
P-2339	FCV-278	J-1294	19	250	Ductile Iron	130	1.2	0.3	5.5	56.8
P-2340	J-1448	FCV-279	16	250	Ductile Iron	130	1.4	0.3	7.4	66.6
P-2341	FCV-279	J-859	7	250	Ductile Iron	130	1.4	0.3	7.4	66.6
P-2342	J-858	FCV-280	161	300	Ductile Iron	130	0.1	0.0	0.1	9.8
P-2343	FCV-280	J-859	4	300	Ductile Iron	130	0.1	0.0	0.1	9.8
P-2344	J-858	FCV-281	3	225	HDPE	130	0.3	0.1	0.4	9.8
P-2345	FCV-281	J02-2324	91	225	HDPE	130	0.3	0.1	0.4	9.8
P-2346	J-2367	FCV-282	11	225	HDPE	130	-	-	-	-
P-2347	FCV-282	J-2355	171	225	HDPE	130	-	-	-	-
P-2348	J-2432	FCV-283	171	225	HDPE	130	-	-	-	0.1
P-2349	FCV-283	J-2367	4	225	HDPE	130	-	-	-	0.1
P-2350	J-2353	FCV-284	6	225	HDPE	130	-	-	-	0.0
P-2352	J-2352	FCV-285	77	225	HDPE	130	-	-	-	-
P-2353	FCV-285	J-2353	5	225	HDPE	130	-	-	-	-
P-2354	J-2342	FCV-286	149	225	HDPE	130	-	-	-	-
P-2355	FCV-286	J-2357	13	225	HDPE	130	-	-	-	-
P-2356	FCV-284	FCV-287	154	225	HDPE	130	-	-	-	0.0
P-2357	FCV-287	J-2357	5	225	HDPE	130	-	-	-	0.0
P-2359	FCV-288	J-2357	5	225	HDPE	130	-	-	-	0.0
P-2360	J-2357	FCV-289	5	225	HDPE	130	-	-	-	0.0
P-2361	FCV-289	J-2140	79	225	HDPE	130	-	-	-	0.0
P-2362	J-2159	FCV-290	5	225	HDPE	130	-	-	-	0.0
P-2363	FCV-290	FCV-288	144	225	HDPE	130	-	-	-	0.0
P-2364	J02-2151	FCV-291	5	225	HDPE	130	-	-	-	0.0
P-2365	FCV-291	J-2365	168	225	HDPE	130	-	-	-	0.0
P-2366	J-2344	FCV-292	231	225	HDPE	130	-	-	-	-
P-2367	FCV-292	J-2148	10	225	HDPE	130	-	-	-	-
P-2368	J-2147	FCV-293	3	225	HDPE	130	0.5	0.1	1.3	19.6
P-2369	FCV-293	J-2148	3	225	HDPE	130	0.5	0.1	1.3	19.6
P-2370	J-2140	FCV-294	80	225	HDPE	130	-	-	-	0.0
P-2371	FCV-294	J-2356	9	225	HDPE	130	-	-	-	0.0
P-2372	J-1400	FCV-295	5	250	Ductile Iron	130	-	-	-	-
P-2374	J-1386	FCV-296	7	250	Ductile Iron	130	-	-	-	-
P-2376	J-1647	FCV-297	238	250	Ductile Iron	130	-	-	-	-
P-2377	FCV-297	J-1386	7	250	Ductile Iron	130	-	-	-	-
P-2378	J-1652	FCV-298	3	250	Ductile Iron	130	-	-	-	-
P-2379	FCV-298	J-1647	280	250	Ductile Iron	130	-	-	-	-
P-2380	J-2162	FCV-299	3	225	HDPE	130	0.2	0.0	0.2	7.4
P-2381	FCV-299	J-1652	5	225	HDPE	130	0.2	0.0	0.2	7.4
P-2382	J-1255	FCV-300	320	250	Ductile Iron	130	0.2	0.0	0.1	7.4
P-2383	FCV-300	J-1652	3	250	Ductile Iron	130	0.2	0.0	0.1	7.4
P-2384	J-2121	FCV-301	5	225	HDPE	130	-	-	-	-
P-2385	FCV-301	J-2298	131	225	HDPE	130	-	-	-	-
P-2386	J-2120	FCV-302	4	225	HDPE	130	0.2	0.0	0.2	7.4
P-2387	FCV-302	J-2167	4	225	HDPE	130	0.2	0.0	0.2	7.4
P-2388	J19-856	FCV-303	245	200	Ductile Iron	130	-	-	-	-
P-2389	FCV-303	J-3122	3	200	Ductile Iron	130	-	-	-	-
P-2390	J-1619	FCV-304	2	225	HDPE	130	0.2	0.1	0.2	8.0
P-2391	FCV-304	J-2133	4	225	HDPE	130	0.2	0.1	0.2	8.0
P-2392	J-1619	FCV-305	10	250	Ductile Iron	130	0.1	0.0	0.1	4.3
P-2393	FCV-305	J-1620	158	250	Ductile Iron	130	0.1	0.0	0.1	4.3
P-2394	J-620	FCV-306	3	300	Ductile Iron	130	-	-	-	-
P-2395	FCV-306	J-621	7	300	Ductile Iron	130	-	-	-	-
P-2398	J-620	FCV-308	3	200	Ductile Iron	130	-	-	-	-
P-2399	FCV-308	J-1620	3	200	Ductile Iron	130	-	-	-	-
P-2400	J-2330	FCV-309	3	225	HDPE	130	0.1	0.0	0.1	4.3
P-2401	FCV-309	J-2338	140	225	HDPE	130	0.1	0.0	0.1	4.3
P-2402	J-2330	FCV-310	9	200	Ductile Iron	130	-	-	-	-
P-2403	FCV-310	J-2932	16	200	Ductile Iron	130	-	-	-	-
P-2404	J-2305	FCV-311	134	225	HDPE	130	-	-	-	-
P-2405	FCV-311	J-2330	3	225	HDPE	130	-	-	-	-
P-2406	J-2932	FCV-312	12	200	Ductile Iron	130	-	-	-	-

Pipe Line Route Indictors

Pipe Name	From (Node Name)	To (Node Name)	Length (m)	Diameter (mm)	Material	Hazen-Williams Coeff.	Maximum Velocity (m/s)	Minimum Velocity (m/s)	Maximum Headloss Gradient (m/km)	Maximum Discharge (l/s)
P-2407	FCV-312	J-3090	68	200	Ductile Iron	130	-	-	-	-
P-2412	J-2121	FCV-315	5	110	HDPE	130	0.8	0.2	6.8	7.4
P-2413	FCV-315	J-2425	6	110	HDPE	130	0.8	0.2	6.8	7.4
P-2414	J-2425	FCV-316	149	225	HDPE	130	0.2	0.0	0.2	7.4
P-2415	FCV-316	J02-2319	5	225	HDPE	130	0.2	0.0	0.2	7.4
P-2417	FCV-317	J02-2319	5	225	HDPE	130	0.1	0.0	0.1	4.3
P-2418	J02-2319	FCV-318	5	225	HDPE	130	-	-	-	-
P-2419	FCV-318	J-2317	64	225	HDPE	130	-	-	-	-
P-2420	J-2428	FCV-319	3	225	HDPE	130	0.1	0.0	0.1	4.3
P-2421	FCV-319	FCV-317	156	225	HDPE	130	0.1	0.0	0.1	4.3
P-2422	J-607	FCV-320	3	225	HDPE	130	1.0	0.2	4.3	37.9
P-2423	FCV-320	J19-2433	198	225	HDPE	130	1.0	0.2	4.3	37.9
P-2424	J-607	FCV-321	3	300	Ductile Iron	130	-	-	-	-
P-2425	FCV-321	J-608	2	300	Ductile Iron	130	-	-	-	-
P-2426	J-682	FCV-322	157	300	Ductile Iron	130	0.5	0.1	1.1	37.9
P-2427	FCV-322	J-607	4	300	Ductile Iron	130	0.5	0.1	1.1	37.9
P-2428	J-681	FCV-323	5	225	HDPE	130	0.2	0.1	0.3	9.5
P-2429	FCV-323	J19-2375	84	225	HDPE	130	0.2	0.1	0.3	9.5
P-2430	J-862	FCV-324	175	300	Ductile Iron	130	0.7	0.2	1.6	47.5
P-2431	FCV-324	J-758	6	300	Ductile Iron	130	0.7	0.2	1.6	47.5
P-2432	J-758	FCV-325	7	300	Ductile Iron	130	-	-	-	-
P-2433	FCV-325	FCV-103	636	300	Ductile Iron	130	-	-	-	-
P-2434	J19-692	FCV-326	5	200	Ductile Iron	130	-	-	-	-
P-2435	FCV-326	J-2997	53	200	Ductile Iron	130	-	-	-	-
P-2436	J-749	FCV-327	20	300	Ductile Iron	130	0.8	0.2	2.3	57.0
P-2437	FCV-327	J-750	4	300	Ductile Iron	130	0.8	0.2	2.3	57.0
P-2438	J19-856	FCV-328	4	300	Ductile Iron	130	1.0	0.2	3.4	70.7
P-2439	FCV-328	J-846	156	300	Ductile Iron	130	1.0	0.2	3.4	70.7
P-2440	J27-1509	FCV-329	49	250	Ductile Iron	130	0.7	0.2	1.9	32.1
P-2441	FCV-329	J-1436	4	250	Ductile Iron	130	0.7	0.2	1.9	32.1
P-2442	J-627	FCV-330	3	200	Ductile Iron	130	-	-	-	-
P-2443	FCV-330	J-3054	65	200	Ductile Iron	130	-	-	-	-
P-2444	J-2875	FCV-331	5	200	Ductile Iron	130	0.2	0.1	0.3	6.6
P-2445	FCV-331	J16-3103	244	200	Ductile Iron	130	0.2	0.1	0.3	6.6
P-2446	J-401	FCV-332	3	200	Ductile Iron	130	0.2	0.1	0.3	6.6
P-2447	FCV-332	J-2875	6	200	Ductile Iron	130	0.2	0.1	0.3	6.6
P-2448	J14-2973	FCV-333	118	200	Ductile Iron	130	0.1	0.0	0.1	4.2
P-2449	FCV-333	J-2229	7	200	Ductile Iron	130	0.1	0.0	0.1	4.2
P-2450	J14-2956	FCV-334	122	200	Ductile Iron	130	0.0	-	-	0.3
P-2451	FCV-334	J-2244	8	200	Ductile Iron	130	0.0	-	-	0.3
P-2452	J-628	FCV-335	244	300	Ductile Iron	130	0.6	0.2	1.4	44.5
P-2453	FCV-335	J-874	6	300	Ductile Iron	130	0.6	0.2	1.4	44.5
P-2454	J-874	FCV-336	6	200	Ductile Iron	130	0.4	0.1	1.1	13.1
P-2455	FCV-336	J-3051	127	200	Ductile Iron	130	0.4	0.1	1.1	13.1
P-2456	J-874	FCV-337	6	300	Ductile Iron	130	0.3	0.1	0.4	21.7
P-2458	J-407	FCV-338	6	200	Ductile Iron	130	-	-	-	-
P-2459	FCV-338	J-3095	81	200	Ductile Iron	130	-	-	-	-
P-2460	J-1537	FCV-339	205	250	Ductile Iron	130	0.3	0.1	0.5	15.5
P-2461	FCV-339	J-598	4	250	Ductile Iron	130	0.3	0.1	0.5	15.5
P-2462	J-409	FCV-340	5	300	Ductile Iron	130	-	-	-	-
P-2463	FCV-340	FCV-99	493	300	Ductile Iron	130	-	-	-	-
P-2464	J15-871	FCV-341	6	300	Ductile Iron	130	-	-	-	-
P-2465	FCV-341	FCV-182	434	300	Ductile Iron	130	-	-	-	-
P-2466	J-3110	FCV-342	162	200	Ductile Iron	130	-	-	-	-
P-2467	FCV-342	J-3111	4	200	Ductile Iron	130	-	-	-	-
P-2469	FCV-343	J-866	8	200	Ductile Iron	130	0.5	0.1	1.4	15.1
P-2470	J-794	FCV-344	58	300	Ductile Iron	130	-	-	-	-
P-2471	FCV-344	J-603	4	300	Ductile Iron	130	-	-	-	-
P-2472	J20-604	FCV-345	4	200	Ductile Iron	130	0.5	0.1	1.4	15.1
P-2473	FCV-345	J-3044	154	200	Ductile Iron	130	0.5	0.1	1.4	15.1
P-2474	J20-604	FCV-346	5	250	Ductile Iron	130	0.3	0.1	0.5	16.2
P-2475	FCV-346	J-1534	152	250	Ductile Iron	130	0.3	0.1	0.5	16.2
P-2476	J20-1608	FCV-347	181	250	Ductile Iron	130	0.4	0.1	0.8	20.2
P-2477	FCV-347	J-821	4	250	Ductile Iron	130	0.4	0.1	0.8	20.2
P-2478	J20-754	FCV-348	6	200	Ductile Iron	130	0.5	0.1	1.4	15.1
P-2479	FCV-348	FCV-343	175	200	Ductile Iron	130	0.5	0.1	1.4	15.1
P-2481	FCV-349	J15-753	4	200	Ductile Iron	130	0.3	0.1	0.6	9.6
P-2482	J-408	FCV-350	5	225	HDPE	130	0.6	0.1	1.7	23.0
P-2483	FCV-350	J15-2248	44	225	HDPE	130	0.6	0.1	1.7	23.0
P-2484	J-1258	FCV-351	191	250	Ductile Iron	130	0.3	0.1	0.5	16.2
P-2485	FCV-351	J-822	4	250	Ductile Iron	130	0.3	0.1	0.5	16.2
P-2486	J-745	FCV-352	11	300	Ductile Iron	130	0.5	0.1	1.0	36.4
P-2487	FCV-352	J17-746	15	300	Ductile Iron	130	0.5	0.1	1.0	36.4
P-2488	J-275	FCV-353	5	500	Ductile Iron	130	0.9	0.2	1.4	170.0
P-2489	FCV-353	J-293	100	500	Ductile Iron	130	0.9	0.2	1.4	170.0
P-2490	J-1418	FCV-354	9	250	Ductile Iron	130	0.5	0.1	1.2	25.5
P-2491	FCV-354	J-406	7	250	Ductile Iron	130	0.5	0.1	1.3	25.5
P-2492	J-1382	FCV-355	9	250	Ductile Iron	130	0.5	0.1	1.1	23.9
P-2493	FCV-355	J-1383	3	250	Ductile Iron	130	0.5	0.1	1.1	23.9
P-2494	J-1383	FCV-356	3	225	HDPE	130	0.0	0.0	0.0	1.7
P-2495	FCV-356	J13-2380	98	225	HDPE	130	0.0	0.0	0.0	1.7

Pipe Line Route Indictors

Pipe Name	From (Node Name)	To (Node Name)	Length (m)	Diameter (mm)	Material	Hazen-Williams Coeff.	Maximum Velocity (m/s)	Minimum Velocity (m/s)	Maximum Headloss Gradient (m/km)	Maximum Discharge (l/s)
P-2496	J-1383	FCV-357	3	250	Ductile Iron	130	0.5	0.1	1.2	25.5
P-2497	FCV-357	J-1463	27	250	Ductile Iron	130	0.5	0.1	1.2	25.5
P-2498	J-1368	FCV-358	3	200	Ductile Iron	130	0.3	0.1	0.6	9.1
P-2499	FCV-358	J14-2956	31	200	Ductile Iron	130	0.3	0.1	0.6	9.1
P-2500	J-1367	FCV-359	4	225	HDPE	130	0.1	0.0	0.0	1.9
P-2501	FCV-359	J13-2363	81	225	HDPE	130	0.1	0.0	0.0	1.9
P-2502	J-1462	FCV-360	88	250	Ductile Iron	130	-	-	-	-
P-2503	FCV-360	J-1531	2	250	Ductile Iron	130	-	-	-	-
P-2504	J-1531	FCV-361	4	225	HDPE	130	0.2	0.0	0.2	7.1
P-2505	FCV-361	J14-2347	89	225	HDPE	130	0.2	0.0	0.2	7.1
P-2506	J13-2364	FCV-362	81	225	HDPE	130	0.1	0.0	0.1	3.4
P-2507	FCV-362	J-1531	4	225	HDPE	130	0.1	0.0	0.1	3.4
P-2508	J-1531	FCV-363	3	250	Ductile Iron	130	0.1	0.0	0.0	3.7
P-2509	FCV-363	J-1367	65	250	Ductile Iron	130	0.1	0.0	0.0	3.7
P-2510	J-2189	FCV-364	13	225	HDPE	130	0.2	0.1	0.2	8.0
P-2511	FCV-364	J-2190	3	225	HDPE	130	0.2	0.1	0.2	8.0
P-2512	J-2190	FCV-365	4	225	HDPE	130	0.2	0.1	0.2	7.8
P-2514	J-2193	FCV-366	3	225	HDPE	130	0.2	0.1	0.2	7.8
P-2515	FCV-366	J-2295	59	225	HDPE	130	0.2	0.1	0.2	7.8
P-2516	FCV-365	FCV-367	9	225	HDPE	130	0.2	0.1	0.2	7.8
P-2517	FCV-367	J-2193	3	225	HDPE	130	0.2	0.1	0.2	7.8
P-2518	J-809	FCV-368	8	225	HDPE	130	0.1	0.0	0.1	4.5
P-2519	FCV-368	J23-2372	127	225	HDPE	130	0.1	0.0	0.1	4.5
P-2520	J-2223	FCV-369	119	225	HDPE	130	-	-	-	-
P-2521	FCV-369	J-2401	4	225	HDPE	130	-	-	-	-
P-2522	J-1387	FCV-370	7	250	Ductile Iron	130	0.1	0.0	0.0	3.7
P-2523	FCV-370	J-1307	36	250	Ductile Iron	130	0.1	0.0	0.0	3.7
P-2524	J-1493	FCV-371	38	250	Ductile Iron	130	0.4	0.1	0.9	21.8
P-2525	FCV-371	J-455	12	250	Ductile Iron	130	0.4	0.1	0.9	21.8
P-2526	J-1274	FCV-372	4	250	Ductile Iron	130	0.4	0.1	0.7	19.2
P-2527	FCV-372	J-1597	195	250	Ductile Iron	130	0.4	0.1	0.7	19.2
P-2528	J-461	FCV-373	10	250	Ductile Iron	130	0.6	0.1	1.6	28.9
P-2529	FCV-373	J30-1599	136	250	Ductile Iron	130	0.6	0.1	1.6	28.9
P-2530	J-1316	FCV-374	13	250	Ductile Iron	130	0.4	0.1	0.8	20.1
P-2531	FCV-374	J-1458	23	250	Ductile Iron	130	0.4	0.1	0.8	20.1
P-2532	J-461	FCV-375	11	250	Ductile Iron	130	0.2	0.1	0.3	10.8
P-2533	FCV-375	J-1586	123	250	Ductile Iron	130	0.2	0.1	0.3	10.8
P-2534	J-1312	FCV-376	4	250	Ductile Iron	130	0.1	0.0	0.0	3.6
P-2535	FCV-376	J30-1662	367	250	Ductile Iron	130	0.1	0.0	0.0	3.6
P-2536	J07-3117	FCV-377	7	200	Ductile Iron	130	0.4	0.1	1.1	13.0
P-2537	FCV-377	FCV-378	180	200	Ductile Iron	130	0.4	0.1	1.1	13.0
P-2538	FCV-378	J-3049	8	200	Ductile Iron	130	0.4	0.1	1.1	13.0
P-2539	J-3049	FCV-379	9	200	Ductile Iron	130	0.3	0.1	0.5	8.8
P-2540	FCV-379	J-3031	56	200	Ductile Iron	130	0.3	0.1	0.5	8.8
P-2541	J-3049	FCV-380	10	200	Ductile Iron	130	0.7	0.2	2.8	22.1
P-2542	FCV-380	FCV-381	212	200	Ductile Iron	130	0.7	0.2	2.8	22.1
P-2543	FCV-381	J06-3121	13	200	Ductile Iron	130	0.7	0.2	2.8	22.1
P-2544	J-797	FCV-382	61	250	Ductile Iron	130	0.6	0.2	1.9	31.6
P-2545	FCV-382	J-405	4	300	Ductile Iron	130	0.5	0.1	0.8	31.6
P-2546	J-405	FCV-383	4	300	Ductile Iron	130	0.6	0.1	1.3	41.9
P-2547	FCV-383	J-885	260	300	Ductile Iron	130	0.6	0.1	1.3	41.9
P-2548	J07-3109	FCV-384	9	200	Ductile Iron	130	0.5	0.1	1.7	16.7
P-2549	FCV-384	J-2943	153	200	Ductile Iron	130	0.5	0.1	1.7	16.7
P-2550	J-2943	FCV-385	25	200	Ductile Iron	130	0.5	0.1	1.7	16.7
P-2551	FCV-385	J-2898	8	200	Ductile Iron	130	0.5	0.1	1.7	16.7
P-2552	J-2898	FCV-386	6	200	Ductile Iron	130	0.5	0.1	1.3	14.7
P-2553	FCV-386	J-2899	6	200	Ductile Iron	130	0.5	0.1	1.3	14.7
P-2554	J-2899	FCV-387	215	200	Ductile Iron	130	0.5	0.1	1.3	14.7
P-2555	FCV-387	J-3077	6	200	Ductile Iron	130	0.5	0.1	1.3	14.7
P-2556	J-2931	FCV-388	221	200	Ductile Iron	130	0.5	0.1	1.3	14.7
P-2557	FCV-388	J-3077	7	200	Ductile Iron	130	0.5	0.1	1.3	14.7
P-2558	J05-2930	FCV-389	11	200	Ductile Iron	130	0.5	0.1	1.3	14.7
P-2559	FCV-389	J-2931	15	200	Ductile Iron	130	0.5	0.1	1.3	14.7
P-2560	J-1263	FCV-390	2	250	Ductile Iron	130	-	-	-	-
P-2561	FCV-390	J-1264	2	250	Ductile Iron	130	-	-	-	-
P-2562	J-1555	FCV-391	6	225	HDPE	130	0.3	0.1	0.4	10.0
P-2563	FCV-391	J-2187	86	225	HDPE	130	0.3	0.1	0.4	10.0
P-2564	FCV-200	FCV-392	13	200	Ductile Iron	130	0.6	0.1	1.8	17.2
P-2565	FCV-392	J39-2907	2	200	Ductile Iron	130	0.6	0.1	1.8	17.2
P-2566	J39-902	FCV-394	3	300	Ductile Iron	130	-	-	-	-
P-2567	FCV-393	J-903	4	300	Ductile Iron	130	-	-	-	-
P-2568	FCV-394	FCV-393	588	300	Ductile Iron	130	-	-	-	-
P-2569	J-762	FCV-395	4	250	Ductile Iron	130	0.5	0.1	1.1	23.5
P-2570	FCV-395	J-1459	203	250	Ductile Iron	130	0.5	0.1	1.1	23.5
P-2571	J-762	FCV-396	4	300	Ductile Iron	130	-	-	-	-
P-2572	FCV-396	J-763	30	300	Ductile Iron	130	-	-	-	-
P-2573	J-4	FCV-397	16	200	Ductile Iron	130	2.2	0.5	22.9	68.3
P-2574	FCV-397	J-2924	7	200	Ductile Iron	130	2.2	0.5	22.9	68.3
P-2575	J22-561	FCV-398	6	300	Ductile Iron	130	0.6	0.1	1.2	40.5
P-2576	FCV-398	J-814	121	300	Ductile Iron	130	0.6	0.1	1.2	40.5
P-2577	J22-2982	FCV-399	10	200	Ductile Iron	130	1.3	0.3	8.9	41.0

Pipe Line Route Indictors

Pipe Name	From (Node Name)	To (Node Name)	Length (m)	Diameter (mm)	Material	Hazen-Williams Coeff.	Maximum Velocity (m/s)	Minimum Velocity (m/s)	Maximum Headloss Gradient (m/km)	Maximum Discharge (l/s)
P-2578	FCV-399	J-2860	132	200	Ductile Iron	130	1.3	0.3	8.9	41.0
P-2579	J-54	FCV-400	3	200	Ductile Iron	130	0.6	0.1	2.2	19.3
P-2580	FCV-400	J-3098	89	200	Ductile Iron	130	0.6	0.1	2.2	19.3
P-2581	J-2415	FCV-401	138	225	HDPE	130	0.3	0.1	0.4	10.5
P-2582	FCV-401	J23-2416	5	225	HDPE	130	0.3	0.1	0.4	10.5
P-2583	J-2914	FCV-402	4	200	Ductile Iron	130	0.9	0.2	4.2	27.3
P-2584	FCV-402	FCV-403	240	200	Ductile Iron	130	0.9	0.2	4.2	27.3
P-2585	FCV-403	J-863	3	200	Ductile Iron	130	0.9	0.2	4.2	27.3
P-2586	J-2403	FCV-404	5	225	HDPE	130	-	-	-	-
P-2587	FCV-404	J-2449	246	225	HDPE	130	-	-	-	-
P-2588	J37-2170	FCV-405	4	225	HDPE	130	0.4	0.1	0.9	16.7
P-2589	FCV-405	J-2171	7	225	HDPE	130	0.4	0.1	0.9	16.7
P-2590	J-2174	FCV-406	13	225	HDPE	130	1.1	0.3	5.3	42.2
P-2591	FCV-406	J37-2170	4	225	HDPE	130	1.1	0.3	5.3	42.2
P-2592	J32-2896	FCV-407	5	200	Ductile Iron	130	0.9	0.2	4.6	28.6
P-2593	FCV-407	J-630	6	200	Ductile Iron	130	0.9	0.2	4.6	28.6
P-2594	J-1384	FCV-408	5	250	Ductile Iron	130	0.3	0.1	0.5	14.9
P-2595	FCV-408	J-611	7	250	Ductile Iron	130	0.3	0.1	0.5	14.9
P-2596	J32-653	FCV-409	8	200	Ductile Iron	130	0.4	0.1	1.1	13.1
P-2597	FCV-409	J-3112	158	200	Ductile Iron	130	0.4	0.1	1.1	13.1
P-2598	J-3112	FCV-410	165	200	Ductile Iron	130	0.4	0.1	1.1	13.1
P-2599	FCV-410	J-3114	5	200	Ductile Iron	130	0.4	0.1	1.1	13.1
P-2600	J-3114	FCV-411	4	200	Ductile Iron	130	0.4	0.1	1.1	13.1
P-2601	FCV-411	FCV-412	161	200	Ductile Iron	130	0.4	0.1	1.1	13.1
P-2602	FCV-412	J-3107	4	200	Ductile Iron	130	0.4	0.1	1.1	13.1
P-2603	J-3107	FCV-413	5	200	Ductile Iron	130	0.4	0.1	1.1	13.1
P-2604	FCV-413	FCV-414	151	200	Ductile Iron	130	0.4	0.1	1.1	13.1
P-2605	FCV-414	J-3108	4	200	Ductile Iron	130	0.4	0.1	1.1	13.1
P-2606	J-410	FCV-415	4	250	Ductile Iron	130	-	-	-	-
P-2607	FCV-415	J-1311	4	250	Ductile Iron	130	-	-	-	-
P-2608	J-619	FCV-416	5	200	Ductile Iron	130	1.4	0.3	10.2	44.2
P-2609	FCV-416	J32-2870	5	200	Ductile Iron	130	1.4	0.3	10.2	44.2
P-2610	J-609	FCV-417	5	250	Ductile Iron	130	0.3	0.1	0.5	14.9
P-2611	FCV-417	J-1299	5	250	Ductile Iron	130	0.3	0.1	0.5	14.9
P-2612	J-2900	FCV-418	7	200	Ductile Iron	130	1.2	0.3	7.1	36.4
P-2613	FCV-418	J-2882	6	200	Ductile Iron	130	1.2	0.3	7.1	36.4
P-2614	J-1359	FCV-419	164	250	Ductile Iron	130	0.3	0.1	0.5	14.9
P-2615	FCV-419	J-1355	5	250	Ductile Iron	130	0.3	0.1	0.5	14.9
P-2616	J-1355	FCV-420	5	250	Ductile Iron	130	0.3	0.1	0.5	14.9
P-2617	FCV-420	J-1356	165	250	Ductile Iron	130	0.3	0.1	0.5	14.9
P-2618	J-2314	FCV-421	4	225	HDPE	130	-	-	-	-
P-2619	FCV-421	J23-2315	63	225	HDPE	130	-	-	-	-
P-2620	J13-1558	FCV-422	6	250	Ductile Iron	130	0.1	0.0	0.1	5.5
P-2621	FCV-422	J-1555	82	250	Ductile Iron	130	0.1	0.0	0.1	5.5
P-2622	J-1461	FCV-423	4	250	Ductile Iron	130	-	-	-	-
P-2623	FCV-423	J-1462	25	250	Ductile Iron	130	-	-	-	-
P-2624	J-2219	FCV-424	31	225	HDPE	130	0.0	0.0	0.0	1.1
P-2625	FCV-424	J-2187	4	225	HDPE	130	0.0	0.0	0.0	1.1
P-2626	J-697	FCV-425	6	250	Ductile Iron	130	0.6	0.1	1.5	27.9
P-2627	FCV-425	J-1467	30	200	Ductile Iron	130	0.9	0.2	4.4	27.9
P-2628	J-594	FCV-426	5	300	Ductile Iron	130	0.4	0.1	0.6	27.9
P-2629	FCV-426	J-697	6	300	Ductile Iron	130	0.4	0.1	0.6	27.9
P-2630	J-31	FCV-427	9	1,350	Ductile Iron	130	1.4	0.2	1.0	1,951.1
P-2631	FCV-427	J-32	21	1,350	Ductile Iron	130	1.4	0.2	1.0	1,951.1
P-2632	J-30	FCV-428	3	700	Ductile Iron	130	1.2	0.2	1.8	469.4
P-2633	FCV-428	FCV-5	317	700	Ductile Iron	130	1.2	0.2	1.8	469.4
P-2634	J-29	FCV-429	3	600	Ductile Iron	130	-	-	-	-
P-2635	FCV-429	J-218	202	600	Ductile Iron	130	-	-	-	-
P-2636	J-1642	FCV-430	7	200	Ductile Iron	130	0.3	0.1	0.6	9.3
P-2637	FCV-430	J29-1388	7	200	Ductile Iron	130	0.3	0.1	0.6	9.3
P-2638	J29-1388	FCV-431	22	200	Ductile Iron	130	-	-	-	-
P-2639	FCV-431	J-2920	22	200	Ductile Iron	130	-	-	-	-
P-2640	J-1387	FCV-432	21	250	Ductile Iron	130	0.1	0.0	0.0	3.7
P-2641	FCV-432	J-1477	9	250	Ductile Iron	130	0.1	0.0	0.0	3.7
P-2642	J-26	FCV-433	217	1,000	Ductile Iron	130	1.9	0.2	2.7	1,481.7
P-2643	FCV-433	J-1	4	1,000	Ductile Iron	130	1.9	0.2	2.7	1,481.7
P-2644	FCV-6	FCV-434	215	1,400	Ductile Iron	130	0.4	0.0	0.1	542.6
P-2645	FCV-434	J-2	10	1,400	Ductile Iron	130	0.4	0.0	0.1	542.6
P-2646	J-135	FCV-435	4	800	Ductile Iron	130	0.9	0.1	0.9	457.0
P-2647	FCV-435	J-137	3	800	Ductile Iron	130	0.9	0.1	0.9	457.0
P-2648	J-136	FCV-436	16	800	Ductile Iron	130	0.9	0.1	0.9	450.2
P-2649	FCV-436	J-148	4	800	Ductile Iron	130	0.9	0.1	0.9	450.2
P-2652	FCV-438	J-555	2	400	Ductile Iron	130	0.1	0.0	0.0	8.0
P-2653	R-7	FCV-438	5	400	Ductile Iron	130	0.1	0.0	0.0	8.0
P-2654	FCV-439	J-557	3	400	Ductile Iron	130	0.1	0.0	0.0	14.1
P-2655	R-8	FCV-439	5	400	Ductile Iron	130	0.1	0.0	0.0	14.1
P-2656	J-152	FCV-440	16	800	Ductile Iron	130	0.9	0.1	0.9	457.0
P-2657	FCV-440	J-153	3	800	Ductile Iron	130	0.9	0.1	0.9	457.0
P-2658	J-156	FCV-441	24	800	Ductile Iron	130	0.9	0.1	0.9	450.2
P-2659	FCV-441	J-157	3	800	Ductile Iron	130	0.9	0.1	0.9	450.2
P-2660	J-2225	FCV-442	144	225	HDPE	130	0.1	0.0	0.0	2.5

Pipe Line Route Indictors

Pipe Name	From (Node Name)	To (Node Name)	Length (m)	Diameter (mm)	Material	Hazen-Williams Coeff.	Maximum Velocity (m/s)	Minimum Velocity (m/s)	Maximum Headloss Gradient (m/km)	Maximum Discharge (l/s)
P-2661	FCV-442	J-877	5	225	HDPE	130	0.1	0.0	0.0	2.5
P-2662	J-2304	FCV-443	219	225	HDPE	130	0.1	0.0	0.1	4.2
P-2663	FCV-443	J-877	4	225	HDPE	130	0.1	0.0	0.1	4.2
P-2664	J-877	FCV-444	8	300	Ductile Iron	130	-	-	-	-
P-2665	FCV-444	J-863	238	300	Ductile Iron	130	-	-	-	-
P-2666	J-293	FCV-445	3	200	Ductile Iron	130	0.4	0.1	1.0	12.9
P-2667	FCV-445	J-2311	8	200	Ductile Iron	130	0.4	0.1	1.0	12.9
P-2668	J-293	FCV-446	5	250	Ductile Iron	130	1.6	0.4	9.4	75.9
P-2669	FCV-446	J-1456	22	250	Ductile Iron	130	1.6	0.4	9.4	75.9
P-2670	J-300	FCV-447	6	300	Ductile Iron	130	0.0	0.0	0.0	2.9
P-2671	FCV-447	J-645	2	300	Ductile Iron	130	0.0	0.0	0.0	2.9
P-2672	J-597	FCV-448	4	300	Ductile Iron	130	1.1	0.3	4.1	78.3
P-2673	FCV-448	J-826	93	300	Ductile Iron	130	1.1	0.3	4.1	78.3
P-2674	J-826	FCV-449	4	300	Ductile Iron	130	1.1	0.3	4.1	78.3
P-2675	FCV-449	J-759	157	300	Ductile Iron	130	1.1	0.3	4.1	78.3
P-2676	J-822	FCV-450	3	300	Ductile Iron	130	0.5	0.1	1.0	36.4
P-2677	FCV-450	J-745	269	300	Ductile Iron	130	0.5	0.1	1.0	36.4
P-2678	J31-1335	FCV-451	5	250	Ductile Iron	130	0.4	0.1	0.8	20.1
P-2679	FCV-451	J-458	6	250	Ductile Iron	130	0.4	0.1	0.8	20.1
P-2680	J-92	FCV-452	4	300	Ductile Iron	130	0.3	0.1	0.3	19.6
P-2681	FCV-452	J-732	14	300	Ductile Iron	130	0.3	0.1	0.3	19.6
P-2682	J-1592	FCV-453	277	250	Ductile Iron	130	0.3	0.1	0.4	14.5
P-2683	FCV-453	J-1379	5	250	Ductile Iron	130	0.3	0.1	0.4	14.5
P-2684	J-1379	FCV-454	5	250	Ductile Iron	130	0.8	0.2	2.7	38.6
P-2685	FCV-454	J-1546	72	250	Ductile Iron	130	0.8	0.2	2.7	38.6
P-2686	J-164	FCV-455	6	250	Ductile Iron	130	1.1	0.3	4.8	53.1
P-2687	FCV-455	J-1379	8	250	Ductile Iron	130	1.1	0.3	4.8	53.1
P-2688	J-133	FCV-456	7	250	Ductile Iron	130	1.5	0.3	8.6	72.3
P-2689	FCV-456	J-1400	10	250	Ductile Iron	130	1.5	0.3	8.6	72.3
P-2690	J-1386	FCV-457	7	225	HDPE	130	0.5	0.1	1.3	19.6
P-2691	FCV-457	J-2340	70	225	HDPE	130	0.5	0.1	1.3	19.6
P-2692	J-134	FCV-458	6	250	Ductile Iron	130	0.4	0.1	0.8	19.6
P-2693	FCV-458	J-1386	6	250	Ductile Iron	130	0.4	0.1	0.8	19.6
P-2694	J-140	FCV-459	5	300	Ductile Iron	130	0.2	0.0	0.2	13.3
P-2695	FCV-459	J-724	15	300	Ductile Iron	130	0.2	0.0	0.2	13.3
P-2696	J-141	FCV-460	3	250	Ductile Iron	130	1.4	0.3	7.4	66.6
P-2697	FCV-460	J-1419	13	250	Ductile Iron	130	1.4	0.3	7.4	66.6
P-2698	J-1582	FCV-461	4	250	Ductile Iron	130	1.4	0.3	7.4	66.6
P-2700	FCV-462	J-1448	4	250	Ductile Iron	130	1.4	0.3	7.4	66.6
P-2701	J-1253	FCV-463	9	300	Ductile Iron	130	0.7	0.0	1.9	52.2
P-2702	FCV-463	J10-792	67	300	Ductile Iron	130	0.7	0.0	1.9	52.2
P-2703	J-1606	FCV-464	149	250	Ductile Iron	130	0.2	0.1	0.2	10.0
P-2704	FCV-464	J10-1450	4	250	Ductile Iron	130	0.2	0.1	0.2	10.0
P-2705	J10-1450	FCV-465	5	250	Ductile Iron	130	-	-	-	-
P-2706	FCV-465	J-1427	19	250	Ductile Iron	130	-	-	-	-
P-2707	J-224	FCV-466	279	600	Ductile Iron	130	1.1	0.0	1.7	299.0
P-2708	FCV-466	J-142	18	600	Ductile Iron	130	1.1	0.0	1.7	299.0
P-2709	J-143	FCV-467	8	250	Ductile Iron	130	1.3	0.3	6.7	63.5
P-2710	FCV-467	J-1427	16	250	Ductile Iron	130	1.3	0.3	6.7	63.5
P-2711	J-144	FCV-468	3	250	Ductile Iron	130	0.5	0.1	1.2	24.5
P-2712	FCV-468	J-1385	9	250	Ductile Iron	130	0.5	0.1	1.2	24.5
P-2713	J-248	FCV-469	2	250	Ductile Iron	130	2.4	-	21.2	118.0
P-2714	J-673	FCV-469	8	250	Ductile Iron	130	2.4	-	21.2	118.0
P-2715	J-673	FCV-470	7	250	Ductile Iron	130	2.5	-	22.7	122.4
P-2716	FCV-470	J-249	2	250	Ductile Iron	130	2.5	-	22.7	122.4
P-2717	J-673	FCV-471	8	250	Ductile Iron	130	2.3	-	20.2	115.0
P-2718	FCV-471	J-250	2	250	Ductile Iron	130	2.3	-	20.2	115.0
P-2721	T-6	FCV-473	11	500	Ductile Iron	130	1.8	-	5.6	355.4
P-2722	FCV-473	J-673	10	500	Ductile Iron	130	1.8	-	5.6	355.4
P-2723	T-6	FCV-474	14	500	Ductile Iron	130	-	-	-	-
P-2724	FCV-474	PMP-1	56	500	Ductile Iron	130	-	-	-	-
P-2727	J-554	FCV-476	5	400	Ductile Iron	130	0.5	0.1	0.8	67.7
P-2728	FCV-476	FCV-36	279	400	Ductile Iron	130	0.5	0.1	0.8	67.7
P-2729	J-292	FCV-477	5	400	Ductile Iron	130	0.6	0.1	0.8	69.4
P-2730	FCV-477	FCV-37	278	400	Ductile Iron	130	0.6	0.1	0.8	69.4
P-2731	J-617	FCV-478	10	250	Ductile Iron	130	-	-	-	-
P-2732	FCV-478	J-1661	9	250	Ductile Iron	130	-	-	-	-
P-2733	J-617	FCV-479	2	300	Ductile Iron	130	-	-	-	-
P-2734	FCV-479	J-618	4	300	Ductile Iron	130	-	-	-	-
P-2735	J-1396	FCV-480	8	250	Ductile Iron	130	-	-	-	-
P-2736	FCV-480	J-1397	4	250	Ductile Iron	130	-	-	-	-
P-2737	J-2467	FCV-481	3	225	HDPE	130	-	-	-	-
P-2738	FCV-481	J-2287	547	225	HDPE	130	-	-	-	-
P-2739	J-453	FCV-482	2	400	Ductile Iron	130	0.5	0.1	0.7	66.0
P-2740	FCV-482	FCV-483	8	400	Ductile Iron	130	0.5	0.1	0.7	66.0
P-2741	FCV-483	J-444	2	400	Ductile Iron	130	0.5	0.1	0.7	66.0
P-2742	J-831	FCV-484	306	300	Ductile Iron	130	0.3	0.1	0.3	18.5
P-2743	FCV-484	J-880	5	300	Ductile Iron	130	0.3	0.1	0.3	18.5
P-2744	J38-2854	FCV-485	8	200	Ductile Iron	130	-	-	-	-
P-2745	FCV-485	J-880	2	200	Ductile Iron	130	-	-	-	-
P-2746	J-880	FCV-486	4	300	Ductile Iron	130	0.3	0.1	0.3	18.5

Pipe Line Route Indictors

Pipe Name	From (Node Name)	To (Node Name)	Length (m)	Diameter (mm)	Material	Hazen-Williams Coeff.	Maximum Velocity (m/s)	Minimum Velocity (m/s)	Maximum Headloss Gradient (m/km)	Maximum Discharge (l/s)
P-2747	FCV-486	J-747	256	300	Ductile Iron	130	0.3	0.1	0.3	18.5
P-2748	J-1445	FCV-487	5	250	Ductile Iron	130	0.3	0.1	0.4	13.1
P-2749	FCV-487	J29-1446	21	250	Ductile Iron	130	0.3	0.1	0.4	13.1
P-2750	J-873	FCV-488	258	300	Ductile Iron	130	0.2	0.0	0.1	10.7
P-2751	FCV-488	J-884	3	300	Ductile Iron	130	0.2	0.0	0.1	10.7
P-2752	J09-2395	FCV-489	156	225	HDPE	130	-	-	-	-
P-2753	FCV-489	J-2177	18	225	HDPE	130	-	-	-	-
P-2755	FCV-490	J-2394	9	225	HDPE	130	0.3	0.1	0.4	10.7
P-2756	J58-796	FCV-491	35	300	Ductile Iron	130	-	-	-	-
P-2757	FCV-491	J-742	45	300	Ductile Iron	130	-	-	-	-
P-2758	J-2236	FCV-492	37	225	HDPE	130	-	-	-	-
P-2759	FCV-492	J-2136	5	225	HDPE	130	-	-	-	-
P-2760	J-2276	FCV-493	71	225	HDPE	130	-	-	-	-
P-2761	FCV-493	J-2160	6	225	HDPE	130	-	-	-	-
P-2762	J-2161	FCV-494	25	225	HDPE	130	-	-	-	-
P-2763	FCV-494	J-2215	10	225	HDPE	130	-	-	-	-
P-2764	J-2261	FCV-495	128	225	HDPE	130	0.8	0.2	3.0	30.9
P-2765	FCV-495	J-2215	7	225	HDPE	130	0.8	0.2	3.0	30.9
P-2766	J-1615	FCV-496	4	225	HDPE	130	1.1	0.3	5.4	42.9
P-2767	FCV-496	J-1451	300	225	HDPE	130	1.1	0.3	5.4	42.9
P-2769	FCV-497	J-2261	14	200	Ductile Iron	130	0.4	0.1	0.9	12.0
P-2770	J-3000	FCV-498	44	200	Ductile Iron	130	-	-	-	-
P-2771	FCV-498	J11-2995	139	200	Ductile Iron	130	-	-	-	-
P-2774	J-2279	FCV-500	15	225	HDPE	130	-	-	-	-
P-2775	FCV-500	J-2290	103	225	HDPE	130	-	-	-	-
P-2776	J11-3035	FCV-501	306	200	Ductile Iron	130	-	-	-	-
P-2778	J-849	FCV-502	5	225	HDPE	130	0.3	0.1	0.4	10.7
P-2779	FCV-502	FCV-490	202	225	HDPE	130	0.3	0.1	0.4	10.7
P-2780	J-2285	FCV-503	180	225	HDPE	130	0.5	-	1.4	20.7
P-2781	FCV-503	J-849	4	225	HDPE	130	0.5	-	1.4	20.7
P-2782	J-849	FCV-504	5	225	HDPE	130	-	-	-	-
P-2784	J-848	FCV-505	10	300	Ductile Iron	130	0.2	-	0.2	13.0
P-2785	FCV-505	J-849	131	300	Ductile Iron	130	0.2	-	0.2	13.0
P-2786	J-803	FCV-506	156	300	Ductile Iron	130	0.4	-	0.6	28.8
P-2787	FCV-506	J-848	7	300	Ductile Iron	130	0.4	-	0.6	28.8
P-2788	J-848	FCV-507	6	200	Ductile Iron	130	0.6	0.1	1.9	18.0
P-2789	FCV-507	J11-3035	60	200	Ductile Iron	130	0.6	0.1	1.9	18.0
P-2790	J-3019	FCV-508	83	200	Ductile Iron	130	0.4	0.1	1.1	13.3
P-2791	FCV-508	J-1441	4	200	Ductile Iron	130	0.4	0.1	1.1	13.3
P-2792	J-1455	FCV-509	34	250	Ductile Iron	130	-	-	-	-
P-2793	FCV-509	J-1441	12	250	Ductile Iron	130	-	-	-	-
P-2794	J-1441	FCV-510	3	250	Ductile Iron	130	0.3	0.1	0.4	13.3
P-2796	J-1441	FCV-511	8	250	Ductile Iron	130	-	-	-	-
P-2797	FCV-511	J-1442	15	250	Ductile Iron	130	-	-	-	-
P-2798	J-1442	FCV-512	5	225	HDPE	130	0.5	-	1.4	20.7
P-2799	FCV-512	J-2285	53	225	HDPE	130	0.5	-	1.4	20.7
P-2800	J-1645	FCV-513	4	200	Ductile Iron	130	-	-	-	-
P-2801	FCV-513	J06-2987	68	200	Ductile Iron	130	-	-	-	-
P-2802	J-1645	FCV-514	6	250	Ductile Iron	130	-	-	-	-
P-2804	J-3104	FCV-515	190	200	Ductile Iron	130	-	-	-	-
P-2805	FCV-515	J04-1633	5	200	Ductile Iron	130	-	-	-	-
P-2806	FCV-514	FCV-516	231	250	Ductile Iron	130	-	-	-	-
P-2807	FCV-516	J04-1633	6	250	Ductile Iron	130	-	-	-	-
P-2808	J04-1633	FCV-517	5	250	Ductile Iron	130	0.7	0.2	2.4	36.2
P-2810	J04-1633	FCV-518	5	200	Ductile Iron	130	-	-	-	-
P-2811	FCV-518	J-3017	194	200	Ductile Iron	130	-	-	-	-
P-2812	J-1646	FCV-519	4	200	Ductile Iron	130	-	-	-	-
P-2813	FCV-519	J-3027	119	200	Ductile Iron	130	-	-	-	-
P-2814	J-1646	FCV-520	5	250	Ductile Iron	130	0.3	0.1	0.5	14.7
P-2816	J-1631	FCV-521	5	250	Ductile Iron	130	0.3	0.1	0.5	14.7
P-2818	J-3068	FCV-522	62	200	Ductile Iron	130	-	-	-	-
P-2819	FCV-522	J-1631	6	200	Ductile Iron	130	-	-	-	-
P-2820	FCV-520	FCV-523	232	250	Ductile Iron	130	0.3	0.1	0.5	14.7
P-2821	FCV-523	J-1631	6	250	Ductile Iron	130	0.3	0.1	0.5	14.7
P-2822	J-1631	FCV-524	5	200	Ductile Iron	130	-	-	-	-
P-2823	FCV-524	J-3104	121	200	Ductile Iron	130	-	-	-	-
P-2824	J31-1511	FCV-525	125	250	Ductile Iron	130	-	-	-	-
P-2825	FCV-525	J-1591	8	250	Ductile Iron	130	-	-	-	-
P-2826	J-1483	FCV-526	33	250	Ductile Iron	130	0.4	0.1	0.7	19.2
P-2827	FCV-526	J-1424	5	250	Ductile Iron	130	0.4	0.1	0.7	19.2
P-2828	J-1414	FCV-527	4	250	Ductile Iron	130	-	-	-	-
P-2829	FCV-527	J-1415	11	250	Ductile Iron	130	-	-	-	-
P-2830	J-2919	FCV-528	5	200	Ductile Iron	130	-	-	-	-
P-2831	FCV-528	J-3079	67	200	Ductile Iron	130	-	-	-	-
P-2832	J-1566	FCV-529	187	250	Ductile Iron	130	-	-	-	-
P-2833	FCV-529	J-457	12	250	Ductile Iron	130	-	-	-	-
P-2834	J-1395	FCV-530	6	250	Ductile Iron	130	0.2	0.1	0.2	10.5
P-2835	FCV-530	J-1365	6	250	Ductile Iron	130	0.2	0.1	0.2	10.5
P-2836	J-3012	FCV-531	7	200	Ductile Iron	130	-	-	-	-
P-2837	FCV-531	J-3006	122	200	Ductile Iron	130	-	-	-	-
P-2838	J-3012	FCV-532	15	200	Ductile Iron	130	1.0	0.2	5.5	31.6

Pipe Line Route Indictors

Pipe Name	From (Node Name)	To (Node Name)	Length (m)	Diameter (mm)	Material	Hazen-Williams Coeff.	Maximum Velocity (m/s)	Minimum Velocity (m/s)	Maximum Headloss Gradient (m/km)	Maximum Discharge (l/s)
P-2839	FCV-532	J07-3109	148	200	Ductile Iron	130	1.0	0.2	5.5	31.6
P-2840	J-3011	FCV-533	3	200	Ductile Iron	130	1.0	0.2	5.5	31.6
P-2841	FCV-533	J-3012	56	200	Ductile Iron	130	1.0	0.2	5.5	31.6
P-2842	J-399	FCV-534	100	500	Ductile Iron	130	0.7	0.2	1.1	143.8
P-2843	FCV-534	J-395	8	500	Ductile Iron	130	0.7	0.2	1.1	143.8
P-2844	J-1287	FCV-535	7	250	Ductile Iron	130	0.2	0.1	0.2	10.5
P-2845	FCV-535	J-1579	113	250	Ductile Iron	130	0.2	0.1	0.2	10.5
P-2846	J-797	FCV-536	5	200	Ductile Iron	130	1.0	0.2	5.5	31.6
P-2847	FCV-536	J-3064	108	200	Ductile Iron	130	1.0	0.2	5.5	31.6
P-2848	J-286	FCV-537	9	250	Ductile Iron	130	-	-	-	-
P-2849	FCV-537	J-1267	56	250	Ductile Iron	130	-	-	-	-
P-2850	FCV-538	T-1	5	600	Ductile Iron	130	-	-	-	-
P-2851	J-260	FCV-538	9	600	Ductile Iron	130	-	-	-	-
P-2852	J-255	FCV-539	9	500	Ductile Iron	130	-	-	-	-
P-2853	FCV-539	T-1	5	500	Ductile Iron	130	-	-	-	-
P-2854	J-400	FCV-540	4	250	Ductile Iron	130	1.0	0.2	3.8	46.4
P-2855	FCV-540	J42-1327	4	250	Ductile Iron	130	1.0	0.2	3.8	46.4
P-2856	J42-1327	FCV-541	98	250	Ductile Iron	130	0.3	0.1	0.5	16.1
P-2857	FCV-541	J-1571	7	250	Ductile Iron	130	0.3	0.1	0.5	16.1
P-2858	J-1571	FCV-542	7	250	Ductile Iron	130	0.3	0.1	0.5	16.1
P-2859	FCV-542	J-1603	144	250	Ductile Iron	130	0.3	0.1	0.5	16.1
P-2861	FCV-543	J-1603	10	200	Ductile Iron	130	0.2	0.1	0.3	6.4
P-2862	J-414	FCV-544	4	200	Ductile Iron	130	-	-	-	-
P-2863	FCV-544	J-2874	4	200	Ductile Iron	130	-	-	-	-
P-2864	J-702	FCV-545	3	200	Ductile Iron	130	0.3	0.1	0.7	10.1
P-2865	FCV-545	J-1326	4	200	Ductile Iron	130	0.3	0.1	0.7	10.1
P-2866	J-3084	FCV-546	71	200	Ductile Iron	130	0.6	0.1	2.2	19.2
P-2867	FCV-546	J-1422	4	200	Ductile Iron	130	0.6	0.1	2.2	19.2
P-2868	J-737	FCV-547	5	250	Ductile Iron	130	1.2	0.3	5.5	56.8
P-2869	FCV-547	J-1351	5	250	Ductile Iron	130	1.2	0.3	5.5	56.8
P-2870	J-1484	FCV-548	35	250	Ductile Iron	130	-	-	-	-
P-2871	FCV-548	J-737	4	250	Ductile Iron	130	-	-	-	-
P-2872	FCV-549	J-737	13	300	Ductile Iron	130	0.8	0.2	2.3	56.8
P-2873	J-716	FCV-549	4	300	Ductile Iron	130	0.8	0.2	2.3	56.8
P-2874	J-408	FCV-550	88	500	Ductile Iron	130	0.1	0.0	0.0	25.2
P-2875	FCV-550	J-409	8	500	Ductile Iron	130	0.1	0.0	0.0	25.2
P-2876	J-598	FCV-551	5	300	Ductile Iron	130	0.1	0.0	0.1	9.6
P-2877	FCV-551	J15-706	6	300	Ductile Iron	130	0.1	0.0	0.1	9.6
P-2878	J-752	FCV-552	5	300	Ductile Iron	130	-	-	-	-
P-2879	FCV-552	J-794	65	300	Ductile Iron	130	-	-	-	-
P-2880	J18-1315	FCV-553	61	250	Ductile Iron	130	0.3	0.1	0.4	14.1
P-2881	FCV-553	J-603	4	250	Ductile Iron	130	0.3	0.1	0.4	14.1
P-2882	J18-1545	FCV-554	5	250	Ductile Iron	130	0.5	0.1	1.3	26.5
P-2883	FCV-554	J18-1315	89	250	Ductile Iron	130	0.5	0.1	1.3	26.5
P-2884	J-802	FCV-556	4	300	Ductile Iron	130	0.4	-	0.6	28.8
P-2885	FCV-555	J-803	4	300	Ductile Iron	130	0.4	-	0.6	28.8
P-2886	FCV-556	FCV-555	58	300	Ductile Iron	130	0.4	-	0.6	28.8
P-2887	J10-766	FCV-557	7	300	Ductile Iron	130	0.4	-	0.6	28.8
P-2888	FCV-557	J-802	225	300	Ductile Iron	130	0.4	-	0.6	28.8
P-2889	J-1416	FCV-558	9	250	Ductile Iron	130	0.1	0.0	0.0	2.4
P-2890	FCV-558	J-1417	6	250	Ductile Iron	130	0.1	0.0	0.0	2.4
P-2891	J-2880	FCV-559	5	200	Ductile Iron	130	0.1	0.0	0.0	1.4
P-2892	FCV-559	J-2881	4	200	Ductile Iron	130	0.1	0.0	0.0	1.4
P-2893	J-1343	FCV-560	5	250	Ductile Iron	130	0.2	0.1	0.3	11.8
P-2894	FCV-560	J-1344	5	250	Ductile Iron	130	0.2	0.1	0.3	11.8
P-2895	J-644	FCV-561	3	300	Ductile Iron	130	-	-	-	-
P-2896	FCV-561	J-627	5	300	Ductile Iron	130	-	-	-	-
P-2897	J42-1491	FCV-562	24	250	Ductile Iron	130	-	-	-	-
P-2898	FCV-562	J-729	22	250	Ductile Iron	130	-	-	-	-
P-2899	J05-3082	FCV-563	115	200	Ductile Iron	130	0.5	0.1	1.3	14.7
P-2900	FCV-563	J-3060	21	200	Ductile Iron	130	0.5	0.1	1.3	14.7
P-2901	J-101	FCV-10	3	300	Ductile Iron	130	1.2	0.3	4.5	82.7
P-2902	FCV-10	J-719	10	300	Ductile Iron	130	1.2	0.3	4.5	82.7
P-2903	J-45	PMP-5	4	1,250	Ductile Iron	130	0.6	-	0.3	761.1
P-2904	PMP-5	J-46	3	1,250	Ductile Iron	130	0.6	-	0.3	761.1
P-2905	J-99	J-6	8	800	Ductile Iron	130	0.4	0.1	0.2	207.5
P-2907	J-7	J-8	8	800	Ductile Iron	130	0.4	0.1	0.2	207.5
P-2908	J-8	J-216	267	800	Ductile Iron	130	0.4	0.1	0.2	207.5
P-2910	J01-1600	J-9	43	250	Ductile Iron	130	1.0	0.1	3.9	47.0
P-2911	J-9	FCV-564	15	250	Ductile Iron	130	1.0	0.1	3.9	47.0
P-2915	J03-2985	FCV-566	6	160	PVC	150	0.7	0.2	3.0	14.5
P-2916	FCV-565	J-1575	5	160	PVC	150	0.7	0.2	3.0	14.5
P-2917	FCV-566	FCV-565	151	160	PVC	150	0.7	0.2	3.0	14.5
P-2918	J-2986	FCV-567	69	160	HDPE	130	0.2	0.1	0.5	4.7
P-2919	FCV-567	J-3074	3	160	HDPE	130	0.2	0.1	0.5	4.7
P-2920	J-1400	FCV-568	5	250	Ductile Iron	130	1.5	0.3	8.6	72.3
P-2921	J04-1611	FCV-569	7	160	PVC	150	-	-	-	-
P-2922	FCV-568	J04-1611	69	250	Ductile Iron	130	1.5	0.3	8.6	72.3
P-2923	FCV-569	FCV-570	317	160	PVC	150	-	-	-	-
P-2924	FCV-570	J-1546	4	160	PVC	150	-	-	-	-
P-2927	J-161	J-12	216	800	Ductile Iron	130	0.8	0.1	0.7	411.6

Pipe Line Route Indictors

Pipe Name	From (Node Name)	To (Node Name)	Length (m)	Diameter (mm)	Material	Hazen-Williams Coeff.	Maximum Velocity (m/s)	Minimum Velocity (m/s)	Maximum Headloss Gradient (m/km)	Maximum Discharge (l/s)
P-2929	J-1578	J-12	13	300	Ductile Iron	130	-	-	-	-
P-2931	FCV-571	J-13	7	225	HDPE	130	-	-	-	-
P-2933	J-14	FCV-571	5	225	HDPE	130	-	-	-	-
P-2935	J-15	J-586	6	150	HDPE	130	0.3	0.1	0.7	4.7
P-2936	J-1303	J-21	566	250	Ductile Iron	130	0.3	0.1	0.4	14.5
P-2937	J-21	J-22	513	250	Ductile Iron	130	0.3	0.1	0.4	14.5
P-2938	J-22	J46-23	476	250	Ductile Iron	130	0.3	0.1	0.4	14.5
P-2940	J-1297	J-34	597	225	HDPE	130	-	-	-	-
P-2943	J-36	J71-1285	299	160	PVC	150	-	-	-	-
P-2945	J-38	J-39	374	300	Ductile Iron	130	-	-	-	-
P-2946	J-39	J-1670	418	300	Ductile Iron	130	-	-	-	-
P-2947	J-494	J-40	653	400	Ductile Iron	130	0.1	0.0	0.0	12.2
P-2948 - loop RK bout	J-40	J-495-bout loop RK	464	400	Ductile Iron	130	0.1	0.0	0.0	7.7
P-2949	J-40	J-41	21	250	Ductile Iron	130	0.4	0.1	0.8	19.8
P-2950	J-42	J-43	21	250	Ductile Iron	130	-	-	-	-
P-2951	J-43	J-47	27	250	Ductile Iron	130	0.4	0.1	0.8	19.8
P-2952	J-47	J-41	8	250	Ductile Iron	130	0.4	0.1	0.8	19.8
P-2953	J-43	J-50	195	250	Ductile Iron	130	0.4	0.1	0.8	19.8
P-2956	J-50	J-51	134	250	Ductile Iron	130	0.4	0.1	0.8	19.8
P-2957	J-51	J67-52	203	250	Ductile Iron	130	0.4	0.1	0.8	19.8
P-2958	J67-52	J-55	184	250	Ductile Iron	130	0.3	0.1	0.5	14.9
P-2959	J-55	J-56	118	250	Ductile Iron	130	0.3	0.1	0.5	14.9
P-2960	J-56	J-67	154	250	Ductile Iron	130	0.3	0.1	0.5	14.9
P-2961	J-67	J67-68	206	250	Ductile Iron	130	0.3	0.1	0.5	14.9
P-2962	J67-68	J-69	62	250	Ductile Iron	130	0.1	0.0	0.1	5.9
P-2963	J67-68	J-70	24	250	Ductile Iron	130	-	-	-	-
P-2964	J-69	J-71	122	225	HDPE	130	0.2	0.0	0.1	5.9
P-2965	J-71	J-72	60	225	HDPE	130	0.2	0.0	0.1	5.9
P-2966	J-76	J-79	85	225	HDPE	130	0.2	0.0	0.1	5.9
P-2968	J-74	J-75	35	225	HDPE	130	0.2	0.0	0.1	5.9
P-2969	J-75	J-76	91	225	HDPE	130	0.2	0.0	0.1	5.9
P-2970	J-79	J67-80	194	225	HDPE	130	0.2	0.0	0.1	5.9
P-2971	J67-80	J-84	68	225	HDPE	130	-	-	-	-
P-2972	J-84	J-89	56	225	HDPE	130	-	-	-	-
P-2973	J-89	J-85	83	225	HDPE	130	-	-	-	-
P-2974	J-85	J-90	326	225	HDPE	130	-	-	-	-
P-2975	J-90	J-93	49	225	HDPE	130	-	-	-	-
P-2976	J-93	J-105	29	225	HDPE	130	-	-	-	-
P-2977	J-105	J-106	43	225	HDPE	130	-	-	-	-
P-2978	J-106	J-107	63	225	HDPE	130	-	-	-	-
P-2979	J-107	J-108	122	225	HDPE	130	-	-	-	-
P-2980	J-108	J-109	50	225	HDPE	130	-	-	-	-
P-2981	J-105	J-110	80	225	HDPE	130	-	-	-	-
P-2982	J-85	J-111	140	160	PVC	150	-	-	-	-
P-2983	J-84	J-112	117	225	HDPE	130	-	-	-	-
P-2984	J-74	J-72	183	225	HDPE	130	0.2	0.0	0.1	5.9
P-2985	J-153	J-5	2	2,500	Asphalted cast iron	130	0.1	0.0	-	457.0
P-2986	J-5	J-157	3	2,500	Asphalted cast iron	130	0.1	-	-	356.7
P-2987	J-2924	J-2855	126	200	Ductile Iron	130	2.2	0.5	22.9	68.3
P-2988	J-749	J16-113	8	300	Ductile Iron	130	0.8	0.2	2.3	57.0
P-2989	J16-113	J-847	211	300	Ductile Iron	130	0.9	0.2	2.8	63.6
P-2990	J-2475	J39-2185	8	160	PVC	150	-	-	-	-
P-2991	J38-2241	J-113	329	160	PVC	150	0.5	0.1	1.5	9.9
P-2992	FCV-157	FCV-573	166	250	Ductile Iron	130	0.3	0.1	0.3	12.1
P-2993	J-113	J38-2854	311	160	PVC	150	0.5	0.1	1.5	9.9
P-2994	FCV-573	J74-1623	5	250	Ductile Iron	130	0.3	0.1	0.3	12.1
P-2995 - out T2	T-2	J-466	30	400	Ductile Iron	130	-	-	-	-
P-2996 IN T2	J-467	T-2	30	400	Ductile Iron	130	-	-	-	-
P-2997-out T3	T-3	J-490	30	400	Ductile Iron	130	-	-	-	-
P-2998 - IN T3	J-489	T-3	30	400	Ductile Iron	130	-	-	-	-
P-2999 - OUT T4	T-4	J-481	30	400	Ductile Iron	130	-	-	-	-
P-3000-IN T4	J-480	T-4	30	400	Ductile Iron	130	-	-	-	-
P-3005	J74-1623	J-117	644	225	HDPE	130	0.2	0.0	0.1	5.8
P-3006	J-117	J-118	57	225	HDPE	130	0.2	0.0	0.1	5.8
P-3007	J-118	J-119	259	225	HDPE	130	0.2	0.0	0.1	5.8
P-3008	J-119	J-120	370	225	HDPE	130	0.2	0.0	0.1	5.8
P-3011	J-116	FCV-575	115	225	HDPE	130	-	-	-	-
P-3012	FCV-575	J74-1623	4	225	HDPE	130	-	-	-	-
P-3013	J-120	J74-1667	525	225	HDPE	130	0.2	0.0	0.1	5.8
P-3014	J74-1667	FCV-576	3	160	PVC	150	-	-	-	-
P-3015	J-121	J-122	122	225	HDPE	130	-	-	-	-

Pipe Line Route Indictors

Pipe Name	From (Node Name)	To (Node Name)	Length (m)	Diameter (mm)	Material	Hazen-Williams Coeff.	Maximum Velocity (m/s)	Minimum Velocity (m/s)	Maximum Headloss Gradient (m/km)	Maximum Discharge (l/s)
P-3016	FCV-576	J-121	107	160	PVC	150	-	-	-	-
P-3018	FCV-577	J64-123	3	400	Ductile Iron	130	0.3	0.1	0.2	34.6
P-3019	J-281	FCV-578	3	300	Ductile Iron	130	0.8	0.2	2.4	58.5
P-3020	FCV-578	J60-696	78	300	Ductile Iron	130	0.8	0.2	2.4	58.5
P-3021	J-267	J-124	280	400	Ductile Iron	130	0.3	0.1	0.3	40.6
P-3022	J-124	FCV-577	870	400	Ductile Iron	130	0.3	0.1	0.2	34.6
P-3025	J-125	J-127	100	225	HDPE	130	0.2	0.0	0.1	6.0
P-3027	J-127	J-129	161	225	HDPE	130	0.2	0.0	0.1	6.0
P-3029	J-129	FCV-579	151	225	HDPE	130	0.2	0.0	0.1	6.0
P-3030	J-131	FCV-580	5	160	PVC	150	-	-	-	-
P-3031	FCV-579	J-131	5	225	HDPE	130	0.2	0.0	0.1	6.0
P-3032	FCV-580	J-132	9	160	PVC	150	-	-	-	-
P-3033	J-124	FCV-581	3	225	HDPE	130	0.2	0.0	0.1	6.0
P-3034	FCV-581	J-125	54	225	HDPE	130	0.2	0.0	0.1	6.0
P-3035	J60-860	J-149	55	300	Ductile Iron	130	0.6	0.1	1.2	39.6
P-3036	J-149	J-154	113	300	Ductile Iron	130	0.6	0.1	1.2	39.6
P-3038	J-154	J-158	80	300	Ductile Iron	130	0.6	0.1	1.2	39.6
P-3039	J-158	J59-167	181	300	Ductile Iron	130	0.6	0.1	1.2	39.6
P-3041	J59-167	J-168	448	300	Ductile Iron	130	-	-	-	-
P-3042	J-168	FCV-582	15	300	Ductile Iron	130	-	-	-	-
P-3043	FCV-582	J-169	35	300	Ductile Iron	130	-	-	-	-
P-3045	J-158	FCV-583	8	160	PVC	150	-	-	-	-
P-3046	FCV-583	J-171	8	160	PVC	150	-	-	-	-
P-3047	J59-167	J-172	368	225	HDPE	130	0.4	0.1	0.8	14.8
P-3050	J-173	J-175	366	225	HDPE	130	0.4	0.1	0.8	14.8
P-3053	J-172	FCV-584	4	225	HDPE	130	0.4	0.1	0.8	14.8
P-3054	FCV-584	J-173	495	225	HDPE	130	0.4	0.1	0.8	14.8
P-3055	J-175	FCV-585	2	225	HDPE	130	-	-	-	-
P-3056	FCV-585	J-176	4	225	HDPE	130	-	-	-	-
P-3057	J-175	FCV-586	4	225	HDPE	130	0.4	0.1	0.8	14.8
P-3058	FCV-586	J-177	168	225	HDPE	130	0.4	0.1	0.8	14.8
P-3061	J-180	J-181	307	300	Ductile Iron	130	0.3	0.1	0.3	18.4
P-3064	J-183	J-184	159	225	HDPE	130	0.1	0.0	0.0	3.2
P-3066	J39-2185	J-186	590	160	PVC	150	1.1	0.3	6.1	21.6
P-3069	J-187	J-188	271	160	PVC	150	0.4	0.1	1.1	8.6
P-3070	J-188	J-189	302	160	PVC	150	0.4	0.1	1.1	8.6
P-3072	J39-902	FCV-587	6	160	PVC	150	0.4	0.1	1.1	8.6
P-3073	FCV-587	J-187	100	160	PVC	150	0.4	0.1	1.1	8.6
P-3074	J-189	FCV-588	115	160	PVC	150	0.4	0.1	1.1	8.6
P-3075	FCV-588	J-2933	27	160	PVC	150	0.4	0.1	1.1	8.6
P-3076	J-190	J-191	265	400	Ductile Iron	130	0.3	0.1	0.2	36.5
P-3077	J-191	J42-192	259	400	Ductile Iron	130	0.2	0.1	0.2	30.2
P-3078	J42-192	J-193	465	400	Ductile Iron	130	0.2	0.0	0.1	23.8
P-3080	J-193	FCV-589	3	200	Ductile Iron	130	0.1	0.0	0.0	2.1
P-3081	FCV-589	J42-195	18	200	Ductile Iron	130	0.1	0.0	0.0	2.1
P-3082	J-484	J-190	71	400	Ductile Iron	130	0.3	0.1	0.2	36.5
P-3083	J-191	J-196	19	200	Ductile Iron	130	0.2	0.1	0.3	6.3
P-3084	J42-197	J-196	7	200	Ductile Iron	130	0.2	0.1	0.3	6.3
P-3085	J-198	J-203	74	225	HDPE	130	-	-	-	-
P-3086	J-203	FCV-590	2	225	HDPE	130	-	-	-	-
P-3087	J-203	J-204	33	200	Ductile Iron	130	-	-	-	-
P-3088	FCV-590	J-202	4	225	HDPE	130	-	-	-	-
P-3095	J-206	FCV-592	3	250	Ductile Iron	130	0.3	0.1	0.5	15.9
P-3096	FCV-592	J-207	495	250	Ductile Iron	130	0.3	0.1	0.5	15.9
P-3099	J-212	J-210	531	225	PVC	150	-	-	-	-
P-3101	J-212	J-213	271	250	Ductile Iron	130	0.2	0.1	0.2	10.1
P-3104	J-229	J-205	235	200	Ductile Iron	130	0.2	0.0	0.2	4.8
P-3107	J-231	J-232	282	200	Ductile Iron	130	0.2	0.0	0.2	4.8
P-3109	J-233	J-234	134	200	Ductile Iron	130	-	-	-	-
P-3110	J-207	FCV-593	6	200	Ductile Iron	130	0.2	0.0	0.2	4.8
P-3111	FCV-593	J-231	85	200	Ductile Iron	130	0.2	0.0	0.2	4.8
P-3112	J-207	FCV-594	6	200	Ductile Iron	130	-	-	-	-
P-3113	FCV-594	J-233	48	200	Ductile Iron	130	-	-	-	-
P-3114	J-206	J-235	523	300	Ductile Iron	130	0.3	0.1	0.5	23.7
P-3117	J-236	J-237	119	250	Ductile Iron	130	0.1	0.0	0.1	4.8
P-3118	J-237	J-229	281	250	Ductile Iron	130	0.1	0.0	0.1	4.8
P-3119	J-235	FCV-595	8	250	Ductile Iron	130	0.2	0.1	0.2	9.6
P-3120	FCV-595	J-236	152	250	Ductile Iron	130	0.2	0.1	0.2	9.6
P-3121	J-237	J-238	244	200	Ductile Iron	130	-	-	-	-
P-3122	J-236	J-239	101	200	Ductile Iron	130	-	-	-	-
P-3123	J-239	J-240	51	200	Ductile Iron	130	-	-	-	-
P-3124	J-239	J-241	269	200	Ductile Iron	130	-	-	-	-
P-3128	J-207	FCV-596	317	250	Ductile Iron	130	0.2	0.1	0.3	11.2
P-3129	FCV-596	J-243	9	250	Ductile Iron	130	0.2	0.1	0.3	11.2
P-3130	J-243	FCV-597	6	200	Ductile Iron	130	0.2	0.1	0.3	6.4
P-3131	FCV-597	J-242	333	200	Ductile Iron	130	0.2	0.1	0.3	6.4
P-3132	J-243	FCV-598	6	200	Ductile Iron	130	-	-	-	-
P-3133	FCV-598	J-244	145	200	Ductile Iron	130	-	-	-	-
P-3134	J-243	FCV-599	9	200	Ductile Iron	130	0.2	0.0	0.2	4.8
P-3135	FCV-599	J-262	192	200	Ductile Iron	130	0.2	0.0	0.2	4.8
P-3136	J04-1611	FCV-600	166	250	Ductile Iron	130	0.7	0.2	2.4	36.2

Pipe Line Route Indictors

Pipe Name	From (Node Name)	To (Node Name)	Length (m)	Diameter (mm)	Material	Hazen-Williams Coeff.	Maximum Velocity (m/s)	Minimum Velocity (m/s)	Maximum Headloss Gradient (m/km)	Maximum Discharge (l/s)
P-3138	J-1546	J-3048	137	250	Ductile Iron	130	0.8	0.2	2.7	38.6
P-3139	J-3048	FCV-601	4	250	Ductile Iron	130	0.7	0.2	2.1	33.9
P-3140	FCV-601	FCV-602	147	250	Ductile Iron	130	0.7	0.2	2.1	33.9
P-3141	FCV-602	J-1632	4	250	Ductile Iron	130	0.7	0.2	2.1	33.9
P-3142	J-224	FCV-564	20	250	Ductile Iron	130	1.0	0.1	3.9	47.0
P-3143	J-224	J-1585	29	250	Ductile Iron	130	0.4	0.1	0.7	18.6
P-3145	FCV-268	J-264	3	250	Ductile Iron	130	0.5	0.1	1.2	24.5
P-3146	J-264	J-1607	145	250	Ductile Iron	130	0.2	0.0	0.2	10.4
P-3147	J-263	FCV-603	61	250	Ductile Iron	130	0.5	0.1	1.1	24.1
P-3148	FCV-603	J-264	4	250	Ductile Iron	130	0.5	0.1	1.1	24.1
P-3149	FCV-461	J-10	253	250	Ductile Iron	130	1.4	0.3	7.4	66.6
P-3150	J-10	FCV-462	329	250	Ductile Iron	130	1.4	0.3	7.4	66.6
P-3151	J-2309	FCV-604	63	160	PVC	150	-	-	-	-
P-3152	FCV-604	J-10	8	160	PVC	150	-	-	-	-
P-3153	J-2903	FCV-605	6	200	Ductile Iron	130	1.3	0.3	9.3	41.9
P-3154	FCV-605	J-885	3	200	Ductile Iron	130	1.3	0.3	9.3	41.9
P-3155	FCV-517	J-265	180	250	Ductile Iron	130	0.7	0.2	2.4	36.2
P-3156	J-265	J-268	4	250	Ductile Iron	130	0.7	0.2	2.4	36.2
P-3157	J-268	FCV-258	12	250	Ductile Iron	130	0.7	0.2	2.4	36.2
P-3158	J-1609	FCV-606	4	200	Ductile Iron	130	-	-	-	-
P-3159	FCV-606	J-3013	129	200	Ductile Iron	130	-	-	-	-
P-3160	FCV-600	J-1610	11	250	Ductile Iron	130	0.7	0.2	2.4	36.2
P-3161	J-2955	J-2963	144	200	Ductile Iron	130	0.3	0.1	0.7	10.5
P-3163	J-290	FCV-607	7	160	PVC	150	-	-	-	-
P-3165	FCV-607	J-296	409	160	PVC	150	-	-	-	-
P-3166	J15-871	FCV-608	6	200	Ductile Iron	130	0.3	0.1	0.6	9.6
P-3167	FCV-608	FCV-349	207	200	Ductile Iron	130	0.3	0.1	0.6	9.6
P-3168	FCV-337	FCV-609	219	300	Ductile Iron	130	0.3	0.1	0.4	21.7
P-3169	FCV-609	J15-871	6	300	Ductile Iron	130	0.3	0.1	0.4	21.7
P-3170	J-318	J-319	261	225	HDPE	130	-	-	-	-
P-3171	J-319	J-320	61	225	HDPE	130	-	-	-	-
P-3172	J-320	J-321	1,468	160	PVC	150	-	-	-	-
P-3173	J-321	J68-322	102	160	PVC	150	-	-	-	-
P-3174	J68-322	J76-1262	531	160	PVC	150	0.2	0.1	0.4	4.7
P-3176	J-323	J-324	40	225	HDPE	130	-	-	-	-
P-3177	FCV-74	J-2158	711	225	HDPE	130	0.2	0.1	0.3	8.8
P-3179	J-319	FCV-610	591	225	HDPE	130	-	-	-	-
P-3180	FCV-610	J-323	5	225	HDPE	130	-	-	-	-
P-3181	J-324	FCV-611	6	225	HDPE	130	-	-	-	-
P-3182	FCV-611	J-325	6	225	HDPE	130	-	-	-	-
P-3183	J-323	FCV-612	4	225	HDPE	130	-	-	-	-
P-3184	FCV-612	J-326	4	225	HDPE	130	-	-	-	-
P-3185	J-2428	FCV-614	4	160	PVC	150	0.2	0.1	0.3	4.3
P-3186	FCV-613	J-2330	4	160	PVC	150	0.2	0.1	0.3	4.3
P-3187	FCV-614	FCV-613	246	225	HDPE	130	0.1	0.0	0.1	4.3
P-3188	J69-1660	J-327	1,125	160	PVC	150	0.5	0.1	1.3	9.2
P-3189	J-327	FCV-615	751	160	PVC	150	0.5	0.1	1.3	9.2
P-3190	FCV-615	J-1524	4	160	PVC	150	0.5	0.1	1.3	9.2
P-3191	J61-2154	FCV-617	3	160	PVC	150	0.3	0.1	0.6	6.0
P-3192	FCV-616	J-131	4	160	PVC	150	0.3	0.1	0.6	6.0
P-3193	FCV-617	FCV-616	227	160	PVC	150	0.3	0.1	0.6	6.0
P-3194	J-2111	FCV-151	7	225	HDPE	130	0.3	0.1	0.5	11.6
P-3195	J-3108	FCV-618	69	150	HDPE	130	0.7	0.2	4.3	13.1
P-3196	FCV-618	J-1445	4	150	HDPE	130	0.7	0.2	4.3	13.1
P-3197	J01-3099	FCV-619	212	200	Ductile Iron	130	0.9	0.2	4.5	28.4
P-3198	FCV-619	J-2890	5	200	Ductile Iron	130	0.9	0.2	4.5	28.4
P-3199	J-2338	FCV-620	74	225	HDPE	130	0.1	0.0	0.1	4.3
P-3200	FCV-620	J-1636	3	225	HDPE	130	0.1	0.0	0.1	4.3
P-3201	J-2104	J23-2335	77	225	HDPE	130	0.3	0.1	0.4	10.5
P-3202	J-660	J33-634	7	300	Ductile Iron	130	0.2	0.1	0.2	14.9
P-3203	J-670	J-647	59	300	Ductile Iron	130	-	-	-	-
P-3204	J-630	J32-653	208	300	Ductile Iron	130	0.4	0.1	0.6	28.6
P-3205	FCV-234	J-328	25	250	Ductile Iron	130	0.8	0.2	3.0	40.9
P-3207	FCV-245	J-331	143	250	Ductile Iron	130	0.2	0.0	0.2	8.5
P-3208	J-331	J-1349	196	250	Ductile Iron	130	0.3	0.1	0.5	14.9
P-3209	J30-709	J-458	676	300	Ductile Iron	130	0.2	0.0	0.1	10.8
P-3210	J-331	FCV-543	520	200	Ductile Iron	130	0.2	0.1	0.3	6.4
P-3211	J-2996	FCV-497	149	200	Ductile Iron	130	0.4	0.1	0.9	12.0
P-3212	J-177	FCV-621	1,077	225	HDPE	130	0.4	0.1	0.8	14.8
P-3213	J-1542	J01-1577	365	250	Ductile Iron	130	0.4	0.1	0.7	18.6
P-3214	FCV-621	J64-178	8	225	HDPE	130	0.4	0.1	0.8	14.8
P-3215	J60-696	FCV-622	165	300	Ductile Iron	130	0.7	0.2	1.7	49.0
P-3216	FCV-622	J-789	7	300	Ductile Iron	130	0.7	0.2	1.7	49.0
P-3217	J-789	FCV-623	6	300	Ductile Iron	130	0.7	0.2	1.7	49.0
P-3218	FCV-623	J-812	75	300	Ductile Iron	130	0.7	0.2	1.7	49.0
P-3221	J-296	FCV-625	132	160	PVC	150	-	-	-	-
P-3222	FCV-625	J-305	6	160	PVC	150	-	-	-	-
P-3223	J-2157	FCV-626	2,131	225	PVC	150	-	-	-	-
P-3224	FCV-626	J-2476	9	225	HDPE	130	-	-	-	-
P-3225	J74-1279	FCV-627	9	250	Ductile Iron	130	-	-	-	-
P-3226	FCV-627	J-1280	5	250	Ductile Iron	130	-	-	-	-

Pipe Line Route Indictors

Pipe Name	From (Node Name)	To (Node Name)	Length (m)	Diameter (mm)	Material	Hazen-Williams Coeff.	Maximum Velocity (m/s)	Minimum Velocity (m/s)	Maximum Headloss Gradient (m/km)	Maximum Discharge (l/s)
P-3227	J-906	FCV-628	568	300	Ductile Iron	130	0.1	0.0	0.0	6.5
P-3228	FCV-628	J-114	10	300	Ductile Iron	130	0.1	0.0	0.0	6.5
P-3229	J57-2455	FCV-629	844	225	HDPE	130	0.1	0.0	0.1	4.7
P-3230	FCV-629	J-14	4	225	HDPE	130	0.1	0.0	0.1	4.7
P-3231	J-14	FCV-630	4	160	PVC	150	0.2	0.1	0.4	4.7
P-3232	FCV-630	J-15	751	160	PVC	150	0.2	0.1	0.4	4.7
P-3233	FCV-164	J-257	6	225	HDPE	130	0.3	0.1	0.4	10.0
P-3234	J-257	J-2445	33	250	Ductile Iron	130	0.0	0.0	0.0	1.6
P-3235	J-257	J70-311	45	225	HDPE	130	0.3	0.1	0.5	11.5
P-3236	J-2399	FCV-631	203	225	HDPE	130	0.2	0.0	0.2	6.8
P-3237	FCV-631	J-2445	8	225	HDPE	130	0.2	0.0	0.2	6.8
P-3238	J-2441	FCV-632	615	225	HDPE	130	0.1	0.0	0.1	5.3
P-3239	FCV-632	J-2445	10	225	HDPE	130	0.1	0.0	0.1	5.3
P-3240	FCV-504	FCV-633	356	225	HDPE	130	-	-	-	-
P-3241	FCV-633	J-2279	5	225	HDPE	130	-	-	-	-
P-3242	J-2467	FCV-634	3	160	PVC	150	-	-	-	-
P-3243	FCV-634	J-36	373	160	HDPE	150	-	-	-	-
P-3244	J-186	FCV-635	268	160	PVC	150	1.1	0.3	6.1	21.6
P-3245	FCV-635	J-575	8	160	PVC	150	1.1	0.3	6.1	21.6
P-3246	J-2155	FCV-636	2	225	HDPE	130	0.7	0.2	2.2	26.2
P-3247	FCV-636	J-2348	271	225	HDPE	130	0.7	0.2	2.2	26.2
P-3248	J-1369	J-1481	83	250	Ductile Iron	130	0.1	0.0	0.1	6.5
P-3249	J-739	FCV-641	4	250	Ductile Iron	130	0.1	0.0	0.1	6.5
P-3250	J-1520	J-1541	115	250	Ductile Iron	130	0.1	0.0	0.1	5.1
P-3251	J-1298	FCV-637	3	225	HDPE	130	-	-	-	-
P-3252	FCV-637	J-2400	803	225	HDPE	130	-	-	-	-
P-3253	J-1253	FCV-638	4	250	Ductile Iron	130	0.2	0.1	0.2	10.0
P-3254	FCV-638	J-1606	260	250	Ductile Iron	130	0.2	0.1	0.2	10.0
P-3255	FCV-295	FCV-639	380	250	Ductile Iron	130	-	-	-	-
P-3256	FCV-639	J-724	3	250	Ductile Iron	130	-	-	-	-
P-3257	J-1489	FCV-640	37	250	Ductile Iron	130	0.3	0.1	0.4	13.3
P-3258	FCV-640	J-724	3	250	Ductile Iron	130	0.3	0.1	0.4	13.3
P-3259	FCV-641	J-1512	290	250	Ductile Iron	130	0.1	0.0	0.1	6.5
P-3260	J-739	FCV-642	8	225	HDPE	130	0.2	0.1	0.4	9.7
P-3261	FCV-642	J-2439	191	225	HDPE	130	0.2	0.1	0.4	9.7
P-3262	PMP-6	J-151	13	800	Ductile Iron	130	-	-	-	-
P-3263	J-235	J-179	221	300	Ductile Iron	130	0.5	0.1	0.8	33.2
P-3266	J-193	J-68	926	400	Ductile Iron	130	0.2	0.0	0.1	21.7
P-3267	J-68	J42-194	2,123	300	Ductile Iron	130	0.1	0.0	0.0	6.3
P-3269	J-290	J42-197	7	160	Ductile Iron	130	-	-	-	-
P-3271	OUT CW1+2	J-151	25	1,300	Ductile Iron	130	0.7	0.1	0.3	950.9
P-3272	FCV-510	J-3091	234	250	Ductile Iron	130	0.3	0.1	0.4	13.3
P-3273	J29-1532	J-1560	86	200	Ductile Iron	130	0.3	0.1	0.6	9.3
P-3274	J-3091	J-3094	210	250	Ductile Iron	130	0.3	0.1	0.4	13.3
P-3275	J-3094	J-3093	152	250	Ductile Iron	130	0.3	0.1	0.4	13.3
P-3276	J-3093	J-1543	230	250	Ductile Iron	130	0.3	0.1	0.4	13.3
P-3279-outCC new	J-151	J-73	148	900	Ductile Iron	130	0.8	0.2	0.7	524.9
P-3282	J-88	J-115	54	900	Ductile Iron	130	0.8	0.2	0.7	524.9
P-3285	J-126	J-128	514	900	Ductile Iron	130	0.8	0.2	0.7	524.9
P-3286	J-128	J-130	550	900	Ductile Iron	130	0.8	0.2	0.7	524.9
P-3287	J-130	J-170	116	900	Ductile Iron	130	0.8	0.2	0.7	524.9
P-3288	J-170	J-165	8	900	Ductile Iron	130	0.8	0.2	0.7	524.9
P-3289	J-115	J-126	220	900	Ductile Iron	130	0.8	0.2	0.7	524.9
P-3291	J-73	J-88	72	900	Ductile Iron	130	0.8	0.2	0.7	524.9
P-3294	J-165	J-192	19	900	Ductile Iron	130	0.8	0.1	0.7	523.7
P-3295	J-192	J-194	69	900	Ductile Iron	130	0.8	0.1	0.7	523.7
P-3296	J-194	J-197	119	900	Ductile Iron	130	0.8	0.1	0.7	523.7
P-3297	J-136	J-208	12	800	Ductile Iron	130	1.0	0.2	1.2	523.7
P-3299	J-197	J-208	180	900	Ductile Iron	130	0.8	0.1	0.7	523.7
P-3300	OUT PP	J-44	53	1,350	Ductile Iron	130	0.5	0.2	0.2	715.2
P-3301	J-481	J-245	12	400	Ductile Iron	130	-	-	-	-
P-3302	J-245	J-449	150	400	Ductile Iron	130	-	-	-	-
P-3303	J-313	J-273	160	400	Ductile Iron	130	-	-	-	-
P-3304	J-273	J-480	2	400	Ductile Iron	130	-	-	-	-
P-3305	J-245	J-273	2	400	Ductile Iron	130	-	-	-	-
P-3306	J-317	J-277	271	400	Ductile Iron	130	-	-	-	-
P-3307	J-277	J-489	1	400	Ductile Iron	130	-	-	-	-
P-3308	J-490	J-277	2	400	Ductile Iron	130	-	-	-	-
P-3309	J-443	J-311	47	400	Ductile Iron	130	-	-	-	-
P-3310	J-311	J-467	1	400	Ductile Iron	130	-	-	-	-
P-3311	J-466	J-311	2	400	Ductile Iron	130	-	-	-	-
P-3312	J-488	J-721	548	300	Ductile Iron	130	0.1	0.0	0.1	9.7
P-3314	J47-1587	J-322	543	250	Ductile Iron	130	-	-	-	-
P-3315	J-322	J-1670	9	250	Ductile Iron	130	-	-	-	-
P-3316	J71-844	J-329	6	300	Ductile Iron	130	-	-	-	-
P-3317	J-329	J-845	130	300	Ductile Iron	130	-	-	-	-
P-3318	J-1524	J-330	4	250	Ductile Iron	130	-	-	-	-
P-3319	J-330	J-1525	59	250	Ductile Iron	130	-	-	-	-
P-3320	J-744	J-332	11	300	Ductile Iron	130	-	-	-	-

Pipe Line Route Indictors

Pipe Name	From (Node Name)	To (Node Name)	Length (m)	Diameter (mm)	Material	Hazen-Williams Coeff.	Maximum Velocity (m/s)	Minimum Velocity (m/s)	Maximum Headloss Gradient (m/km)	Maximum Discharge (l/s)
P-3321	J-332	J32-653	77	300	Ductile Iron	130	-	-	-	-
P-3322	J-484	J-333	7	300	Ductile Iron	130	-	-	-	-
P-3323	J-333	J-740	14	300	Ductile Iron	130	-	-	-	-
P-3324	J-328	J-334	178	250	Ductile Iron	130	0.8	0.2	3.0	40.9
P-3325	J-334	J-1301	11	250	Ductile Iron	130	0.8	0.2	2.8	39.8
P-3326	J-334	J-733	17	250	Ductile Iron	130	1.7	0.4	10.5	80.8
P-3327	J-1379	J-336	4	250	Ductile Iron	130	-	-	-	-
P-3328	J-336	J-1400	319	250	Ductile Iron	130	-	-	-	-
P-3329	J-179	JKT-855	21	300	Ductile Iron	130	0.0	-	-	0.9
P-3330	JKT-855	J-180	106	300	Ductile Iron	130	0.0	-	-	0.9
P-3331	J-1598	J-337	249	250	Ductile Iron	130	-	-	-	-
P-3332	J-337	J-1582	10	250	Ductile Iron	130	-	-	-	-
P-3333	J-891	J-338	46	300	Ductile Iron	130	-	-	-	-
P-3334	J-338	J-38	228	300	Ductile Iron	130	-	-	-	-
P-3335	J-1243	J-339	100	160	HDPE	130	1.3	0.3	11.6	26.4
P-3336	J-339	J-340	136	160	HDPE	130	1.3	0.3	11.6	26.4
P-3337	J-340	J38-2241	105	160	HDPE	130	1.3	0.3	11.6	26.4
P-3338	J-3006	J-341	132	200	Ductile Iron	130	-	-	-	-
P-3339	J-341	J-2277	8	200	Ductile Iron	130	-	-	-	-
P-3340	FCV-296	J-342	398	250	Ductile Iron	130	-	-	-	-
P-3341	J-342	J-1419	10	250	Ductile Iron	130	-	-	-	-
P-3342	J-1554	J-343	506	250	Ductile Iron	130	-	-	-	-
P-3343	J-343	J-1448	6	250	Ductile Iron	130	-	-	-	-
P-3344	J-866	J-344	10	200	Ductile Iron	130	-	-	-	-
P-3345	J-344	J-3120	218	200	Ductile Iron	130	-	-	-	-
P-3346	J-1628	J07-1629	22	250	Ductile Iron	130	0.8	0.0	2.7	38.9
P-3347	J07-1629	J-269	181	250	Ductile Iron	130	-	-	-	-
P-3348	J-269	J-1260	13	250	Ductile Iron	130	-	-	-	-
P-3349	FCV-47	J-824	10	250	Ductile Iron	130	-	-	-	-
P-3351	J01-1295	J-335	12	200	Ductile Iron	130	0.9	0.2	4.5	28.4
P-3352	J-335	J-345	4	160	HDPE	130	1.4	0.3	13.4	28.4
P-3353	J-345	J-346	55	160	HDPE	130	1.4	0.3	13.4	28.4
P-3354	J-346	J-347	90	160	HDPE	130	1.4	0.3	13.4	28.4
P-3355	J-347	J-348	86	160	HDPE	130	1.4	0.3	13.4	28.4
P-3356	J-348	J-349	671	160	HDPE	130	1.4	0.3	13.4	28.4
P-3357	J-349	J-2890	364	160	HDPE	130	1.4	0.3	13.4	28.4
P-3365	J-355	J-356	889	400	Ductile Iron	130	-	-	-	-
P-3366	J-356	J-357	564	500	Ductile Iron	130	-	-	-	-
P-3371	J-354	J-362	22	300	Ductile Iron	130	-	-	-	-
P-3372	J-362	J-363	174	300	Ductile Iron	130	-	-	-	-
P-3373	J-363	J-364	400	300	Ductile Iron	130	-	-	-	-
P-3374	J-364	J-365	165	300	Ductile Iron	130	-	-	-	-
P-3375	J-365	J-366	149	300	Ductile Iron	130	-	-	-	-
P-3376	J-366	J-367	270	300	Ductile Iron	130	-	-	-	-
P-3377	J-367	J-368	213	250	Ductile Iron	130	-	-	-	-
P-3378	J-368	J-109	360	250	Ductile Iron	130	-	-	-	-
P-3379	J-367	J-369	311	250	Ductile Iron	130	-	-	-	-
P-3380	J-369	J-370	419	250	Ductile Iron	130	-	-	-	-
P-3381	J-370	Kop Srov end	226	250	Ductile Iron	130	-	-	-	-
P-3382	J-354	J-exWTPsp	634	400	Ductile Iron	130	-	-	-	-
P-3383	J-exWTPsp	J-355	778	400	Ductile Iron	130	-	-	-	-
P-3385	J-372	J-373	38	800	Ductile Iron	130	0.2	0.1	0.1	104.1
P-3386	J-373	J-374	348	800	Ductile Iron	130	0.2	0.1	0.1	104.1
P-3387	J-374	J-375	315	800	Ductile Iron	130	0.2	0.1	0.1	104.1
P-3388	J-375	J-376	202	800	Ductile Iron	130	0.2	0.1	0.1	104.1
P-3389-In loop	J-376	J-377	24	800	Ductile Iron	130	0.2	0.1	0.1	104.1
P-3403	J-390	J-417	492	500	Ductile Iron	130	0.2	0.0	0.1	38.2
P-3404	J-358	J-418	801	400	Ductile Iron	130	-	-	-	-
P-3426	J-437	J-438	1,936	600	Ductile Iron	130	0.1	0.0	0.0	34.8
P-3427	J-438	J-439	1,041	600	Ductile Iron	130	0.1	0.0	0.0	34.8
P-3429	J-417	J-441	144	500	Ductile Iron	130	0.2	0.0	0.1	38.2
P-3430 fond loop PPC north	J-441	J-442	325	500	Ductile Iron	130	0.1	0.0	0.0	20.7
P-3431	J-442	J-448	244	500	Ductile Iron	130	0.1	0.0	0.0	20.7
P-3432	J-448	J-450	388	500	Ductile Iron	130	0.1	0.0	0.0	20.7
P-3433	J-450	J-462	605	500	Ductile Iron	130	0.1	0.0	0.0	20.7
P-3434	J-471-jonction-nord	J-462	680	500	Ductile Iron	130	0.1	0.0	0.0	20.7
P-3437	J-2117	J-478	5	225	HDPE	130	0.5	0.1	1.1	18.3
P-3438	J-2431	J-478	396	225	HDPE	130	0.5	0.1	1.1	18.3
P-3441	J-497	J-498	450	400	Ductile Iron	130	0.3	0.1	0.2	30.9
P-3442	J-498	J-499	205	400	Ductile Iron	130	0.3	0.1	0.2	30.9
P-3444	J-500	J-501	1,368	400	Ductile Iron	130	0.3	0.1	0.3	38.5
P-3445	J-501	J-502	1,841	500	Ductile Iron	130	0.2	0.0	0.1	38.5
P-3446	J-502	J-899	14	300	Ductile Iron	130	-	-	-	-
P-3451	J-357	J-508	309	250	HDPE	130	-	-	-	-
P-3452	J-508	J-509	1,523	250	HDPE	130	-	-	-	-
P-3453	J-509	J-510	1,303	250	HDPE	130	-	-	-	-
P-3454	J-358	J-511	1,196	400	Ductile Iron	130	-	-	-	-

Pipe Line Route Indictors

Pipe Name	From (Node Name)	To (Node Name)	Length (m)	Diameter (mm)	Material	Hazen-Williams Coeff.	Maximum Velocity (m/s)	Minimum Velocity (m/s)	Maximum Headloss Gradient (m/km)	Maximum Discharge (l/s)
P-3455	J-511	J-512	25	400	Ductile Iron	130	-	-	-	-
P-3457	J-513	J-514	36	400	Ductile Iron	130	-	-	-	-
P-3465	J-522	J-523	26	300	Ductile Iron	130	-	-	-	-
P-3466	J-523	J-524	748	300	Ductile Iron	130	-	-	-	-
P-3467	J-524	J-525	1,474	300	Ductile Iron	130	-	-	-	-
P-3473	J-441	J-532	1,160	400	Ductile Iron	130	0.5	0.1	0.6	58.2
P-3474	J-532	J-533	1,003	400	Ductile Iron	130	0.4	0.1	0.4	47.0
P-3489-fond loop PPC sud	J-550-bout loop PPC	J-551	1,068	400	Ductile Iron	130	0.3	0.1	0.3	38.2
P-3490	J-551	J-552	607	400	Ductile Iron	130	0.3	0.1	0.3	38.2
P-3491	J-552	J-556	18	400	Ductile Iron	130	0.0	-	-	2.8
P-3492	J-148	J-156	535	800	Ductile Iron	130	0.9	0.1	0.9	450.2
P-3493	J-156	C1	3	800	Ductile Iron	130	-	-	-	-
P-3494	J-86	J-558	27	900	Ductile Iron	130	-	-	-	-
P-3495	J-558	PMP-6	12	900	Ductile Iron	130	-	-	-	-
P-3496	J-558	PMP-20	12	800	Ductile Iron	130	-	-	-	-
P-3497	PMP-20	J-151	16	800	Ductile Iron	130	-	-	-	-
P-3498	J26-2867	J26-2887	152	150	HDPE	130	1.1	0.3	9.1	19.5
P-3500	J-1417	J-561	368	150	HDPE	130	0.1	0.0	0.2	2.4
P-3501	J-561	J-1343	82	150	HDPE	130	0.1	0.0	0.2	2.4
P-3502	J29-1373	J-563	248	150	HDPE	130	0.1	0.0	0.1	1.8
P-3503	J26-2887	J-564	11	200	Ductile Iron	130	0.4	0.1	0.8	11.2
P-3504	J-564	J-2910	14	200	Ductile Iron	130	0.3	0.1	0.6	9.4
P-3505	J-563	J-564	82	150	HDPE	130	0.1	0.0	0.1	1.8
P-3506	J28-1485	J-565	25	250	Ductile Iron	130	0.2	0.0	0.2	9.3
P-3507	J-565	J-1372	189	250	Ductile Iron	130	0.1	0.0	0.1	6.2
P-3508	J-565	J28-1435	244	150	HDPE	130	0.9	0.2	5.9	15.4
P-3509	J-2367	J-2353	126	250	Ductile Iron	130	-	-	-	0.1
P-3510	J-2353	J-566	171	250	Ductile Iron	130	-	-	-	0.1
P-3511	J-566	J-2432	85	250	Ductile Iron	130	-	-	-	0.1
P-3512	J-566	J-2356	165	250	Ductile Iron	130	-	-	-	0.0
P-3513	J-2356	J-2365	161	250	Ductile Iron	130	-	-	-	0.0
P-3514	J26-1394	J-567	78	150	HDPE	130	1.0	0.2	7.0	16.9
P-3514a	FCV-591	J-206	143	300	Ductile Iron	130	0.1	0.0	0.1	7.7
P-3515	J-567	J-568	122	150	HDPE	130	1.0	0.2	7.0	16.9
P-3515a	J-855	FCV-591	10	300	Ductile Iron	130	0.1	0.0	0.1	7.7
P-3516	J-568	J27-1626	84	150	HDPE	130	1.0	0.2	7.0	16.9
P-3517	J-179	J-569	348	300	Ductile Iron	130	0.5	0.1	0.8	32.3
P-3519	J-180	J-570	270	300	Ductile Iron	130	0.3	0.1	0.3	19.3
P-3521	J-569	J-570	146	225	HDPE	130	0.5	0.1	1.3	20.0
P-3522	J-569	J-571	15	300	Ductile Iron	130	0.7	0.2	1.9	52.3
P-3523	J-571	J-230	139	300	Ductile Iron	130	1.0	0.2	3.7	73.7
P-3524	FCV-271	J-601	3	600	Ductile Iron	130	0.8	0.2	1.0	228.3
P-3525	J-572	J-185	63	400	Ductile Iron	130	-	-	-	-
P-3526	J-571	J-572	148	225	HDPE	130	0.5	0.1	1.5	21.4
P-3527	J-570	J-573	7	300	Ductile Iron	130	0.0	-	-	0.7
P-3528	J-573	J-572	6	400	Ductile Iron	130	0.2	0.0	0.1	21.4
P-3529	J-182	J-574	89	300	Ductile Iron	130	0.3	0.1	0.3	18.9
P-3530	J-574	J-183	17	250	Ductile Iron	130	0.1	0.0	0.0	3.2
P-3531	J-573	J-574	359	300	Ductile Iron	130	0.3	0.1	0.4	22.0
P-3532	J-182	J-587	29	300	Ductile Iron	130	0.2	0.1	0.2	14.1
P-3533	J-587	J-212	2,133	225	HDPE	130	0.2	0.0	0.2	6.6
P-3534	J-587	J-588	10	300	Ductile Iron	130	0.1	0.0	0.1	7.5
P-3535	J-181	J-589	19	300	Ductile Iron	130	0.2	0.0	0.2	13.2
P-3536	J-589	J-209	2,888	300	Ductile Iron	130	0.2	0.0	0.1	11.9
P-3537	J-589	J-590	9	300	Ductile Iron	130	0.0	-	-	1.2
P-3538	J-590	J-588	34	300	Ductile Iron	130	0.0	-	-	1.2
P-3539	J-213	J-595-TKMO end	738	250	Ductile Iron	130	0.2	0.1	0.2	10.1
P-3540	J-209	J-596	2,460	225	PVC	150	-	-	-	0.2
P-3541	J-596	J-212	16	250	Ductile Iron	130	0.1	0.0	0.0	3.5
P-3542	J-588	J-596	2,134	250	Ductile Iron	130	0.2	0.0	0.2	8.7
P-3543	J-12	J-401aa	8	800	Ductile Iron	130	0.5	0.1	0.3	228.3
P-3544	J-401aa	J-162	8	800	Ductile Iron	130	0.5	0.1	0.3	228.3
P-3545	J-601	J-604	17	600	Ductile Iron	130	0.8	0.2	1.0	228.3
P-3546	J-604	J-214	5	600	Ductile Iron	130	0.8	0.2	1.0	228.3
P-3550	J-671	J-854	291	300	Ductile Iron	130	-	-	-	-
P-3551	J-661a	J-658a	2	250	Ductile Iron	130	-	-	-	-
P-3555	J-867	J-606	121	300	Ductile Iron	130	0.4	0.1	0.7	30.4
P-3556	J-606	J-671	87	300	Ductile Iron	130	-	-	-	-
P-3558	FCV-1	J-377	8	900	Ductile Iron	130	0.8	0.2	0.7	526.3
P-3559	J-356	J-497	459	400	Ductile Iron	130	0.3	0.1	0.2	30.9
P-3560	J-377	J-100	324	900	Ductile Iron	130	0.7	0.2	0.4	422.2
P-3561	J-389	J-550-bout loop PPC	354	500	Ductile Iron	130	-	-	-	-
P-3562	J-550-bout loop PPC	J-390	202	500	Ductile Iron	130	0.2	0.0	0.1	38.2
P-3563	J46-478	J-471-jonction-nord	193	400	Ductile Iron	130	0.3	0.1	0.2	36.2
P-3564	J-471-jonction-nord	J-488	73	400	Ductile Iron	130	0.5	0.1	0.6	56.9

Pipe Line Route Indictors

Pipe Name	From (Node Name)	To (Node Name)	Length (m)	Diameter (mm)	Material	Hazen-Williams Coeff.	Maximum Velocity (m/s)	Minimum Velocity (m/s)	Maximum Headloss Gradient (m/km)	Maximum Discharge (l/s)
P-3565	J-495-bout loop RK	J-499	190	400	Ductile Iron	130	0.3	0.1	0.2	30.9
P-3567	J-495-bout loop RK	J-500	595	400	Ductile Iron	130	0.3	0.1	0.3	38.5
P-3568	J-780	J-556	170	300	Ductile Iron	130	0.2	0.1	0.2	14.4
P-3569	J-556	J-786	53	300	Ductile Iron	130	0.2	0.1	0.3	17.2
P-3570	J-824	J-613	5	250	PVC	150	0.0	0.0	0.0	2.0
P-3571	J-613	JKA-1665	398	250	PVC	150	0.2	0.0	0.2	9.2
P-3572	J-532	J-613	5	400	Ductile Iron	130	0.1	0.0	0.0	11.2
P-3574	J-614	J-672	1,115	250	HDPE	130	-	-	-	-
P-3577	J-672	J-615	203	250	HDPE	130	-	-	-	-
P-3578	J-615	J-616	72	250	HDPE	130	-	-	-	-
P-3579-out tank TKMO	J-659a	J-616	17	400	Ductile Iron	130	0.6	0.1	0.9	73.7
P-3580	J-616	J-230	7	400	Ductile Iron	130	0.6	0.1	0.9	73.7
P-3581	J-68	J-204	62	300	Ductile Iron	130	0.2	0.1	0.2	15.4
P-3582	J-204	J-427	1,524	300	Ductile Iron	130	0.2	0.1	0.2	15.4
P-3583	J-198	J-631	824	225	HDPE	130	-	-	-	-
P-3584	J-427	J-632	4	300	Ductile Iron	130	-	-	-	-
P-3585	J-632	J-633	1,323	300	Ductile Iron	130	-	-	-	-
P-3586	J-633	J-634	844	300	Ductile Iron	130	-	-	-	-
P-3587	J-634	J-635	77	300	Ductile Iron	130	-	-	-	-
P-3588	J-635	Cheung Aek end	854	300	Ductile Iron	130	-	-	-	-
P-3589	J-533	J-637	1,270	300	Ductile Iron	130	-	-	-	-
P-3590	J43-1431	J-638	412	250	Ductile Iron	130	0.0	0.0	-	1.0
P-3591	J-638	J-639	209	250	Ductile Iron	130	0.0	0.0	-	1.0
P-3592	J-639	J-640	94	225	HDPE	130	0.0	0.0	0.0	1.0
P-3593	J-640	J-641	109	225	HDPE	130	0.0	0.0	0.0	1.0
P-3594	J-641	J-642	561	225	HDPE	130	0.0	0.0	0.0	1.0
P-3595	J-642	J-643	1,410	225	HDPE	130	0.0	0.0	0.0	1.0
P-3596	J-898	J-646	2,051	300	Ductile Iron	130	0.0	0.0	-	1.0
P-3597	J-646	Samraong end	2,693	300	Ductile Iron	130	0.0	0.0	-	1.0
P-3598	J-646	J-649	1,624	225	HDPE	130	-	-	-	-
P-3599	J-389	J-650	2,313	500	Ductile Iron	130	-	-	-	-
P-3600	J-418	J-522	963	400	Ductile Iron	130	-	-	-	-
P-3601	J-522	J-419	5	400	Ductile Iron	130	-	-	-	-
P-3602	J-439	J-372	45	800	Ductile Iron	130	0.1	0.0	0.0	34.8
P-3603	J-906	J-651	51	225	HDPE	130	0.0	0.0	0.0	1.2
P-3604	J-651	J-652	1,834	225	HDPE	130	0.0	0.0	0.0	1.2
P-3607	J-114	J-655	41	300	Ductile Iron	130	0.0	-	-	1.2
P-3608	J-655	J-656	502	250	HDPE	130	0.0	0.0	-	1.2
P-3609	J-652	J-658	261	225	HDPE	130	0.0	0.0	0.0	1.2
P-3610	J-658	J-653	1,401	225	HDPE	130	-	-	-	-
P-3610a	J-412-IZa	J-659a	67	400	Ductile Iron	130	-	-	-	-
P-3611	J-656	J-658	734	225	HDPE	130	0.0	0.0	0.0	1.2
P-3612	J-658	J-659	1,176	225	HDPE	130	-	-	-	-
P-3613	J-659	J-661	199	225	HDPE	130	-	-	-	-
P-3613a	J-661a	J-659a	25	400	Ductile Iron	130	0.6	0.1	0.9	73.7
P-3614	J-512	J-501	32	400	Ductile Iron	130	-	-	-	-
P-3614a	T-PPaba	J-661a	30	400	Ductile Iron	130	0.6	0.1	0.9	73.7
P-3615	J-501	J-513	32	400	Ductile Iron	130	-	-	-	-
P-3615a	J-662a	T-PPaba	30	400	Ductile Iron	130	2.0	-	8.8	252.6
P-3616	J-3116	J26-1394	16	90	HDPE	130	0.2	0.1	0.9	1.4
P-3616a	J-658a	J-662a	1	400	Ductile Iron	130	-	-	-	-
P-3617-in TKMO	J-12	J-662	5,181	500	Ductile Iron	130	1.3	-	3.0	252.6
P-3618	PMP-22	J-663	19	500	Ductile Iron	130	-	-	-	-
P-3619	J-662	PMP-22	18	500	Ductile Iron	130	-	-	-	-
P-3621	J-662	J-663	35	500	Ductile Iron	130	1.3	-	3.0	252.6
P-3622	J69-1613	J-437	1,374	300	Ductile Iron	130	0.5	0.1	0.9	34.8
P-3623	J-437	J-664	1,331	300	Ductile Iron	130	-	-	-	-
P-3624	J-552	J-476-jonction sud	288	400	Ductile Iron	130	0.3	0.1	0.2	35.3
P-3626	J-150	J-666	28	800	Ductile Iron	130	-	-	-	-
P-3627	J-666	PMP-4	15	800	Ductile Iron	130	1.4	-	2.1	718.9
P-3628	J-666	T-PP	100	1,200	Ductile Iron	130	0.6	-	0.3	718.9
P-3629	J-46	T-PP	94	1,200	Ductile Iron	130	0.7	-	0.3	761.1
P-3630	OUT CW1+2	PMP-23	35	800	Ductile Iron	130	0.3	0.1	0.1	135.8
P-3631	PMP-23	IN CW1+2	31	800	Ductile Iron	130	0.3	0.1	0.1	135.8
P-3632	J-614	J-1584	8	250	Ductile Iron	130	-	-	-	-
P-3633	J-1584	J-606	23	250	Ductile Iron	130	0.6	0.1	1.7	30.4
P-3634	J-663	T-PPaba	53	400	Ductile Iron	130	-	-	-	-
P-3635	J-663	J-661a	51	400	Ductile Iron	130	-	-	-	-
P-3638	T-7	PMP-25	18	400	Ductile Iron	130	-	-	-	-
P-3639	PMP-25	T-3	22	400	Ductile Iron	130	-	-	-	-
P-3640	PMP-24	T-2	34	400	Ductile Iron	130	-	-	-	-
P-3645	PMP-24	T-8	20	800	Ductile Iron	130	-	-	-	-
P-3646	J-663	J-662a	23	400	Ductile Iron	130	2.0	-	8.8	252.6
P-A	J-94	J-289	51	500	Ductile Iron	130	1.1	0.3	2.1	210.0
V1	J-3	FCV-3	15	1,100	Ductile Iron	130	0.5	-	0.2	450.2

Supporting Report 5.3 Distribution Pipeline Analysis (Network Junction Indicators)

Network Junction Indicators

Junction Name	Coordinate X (m)	Coordinate Y (m)	Ground Elevation (m)	Flow (l/s)	Minimum Hydraulic Grade (m)	Maximum Hydraulic Grade (m)	Minimum Pressure (kPa)	Maximum Pressure (kPa)
C1	491,228	1,280,814	10.4	-	47	56	359.2	445.7
Cheung Aek end	487,418	1,268,780	8.9	-	45	56	355.3	456.5
IN CW1+2	493,212	1,280,925	9.4	-	11	11	10.8	10.8
IN PP	490,874	1,279,457	11.5	-	13	13	14.0	16.6
J-1	491,059	1,279,339	9.2	-	47	56	368.4	457.9
J-2	491,061	1,279,339	9.2	-	47	56	368.4	457.9
J-3	490,868	1,280,703	10.4	-	47	56	358.6	445.7
J-4	490,881	1,280,544	9.8	-	47	56	364.2	451.6
J-5	491,219	1,280,843	9.8	-	47	56	364.8	451.5
J-6	488,845	1,276,524	11.1	-	46	56	342.7	436.4
J-7	488,762	1,276,443	11.1	-	46	56	342.6	436.4
J-8	488,761	1,276,434	11.1	-	46	56	342.6	436.4
J-9	491,898	1,275,504	6.1	-	46	56	385.8	490.4
J-10	491,805	1,276,147	6.5	-	44	56	367.7	481.6
J-12	492,423	1,274,626	7.0	-	45	56	366.9	478.8
J-13	488,845	1,274,610	7.0	-	39	56	308.6	474.4
J-14	488,834	1,274,612	7.0	-	39	56	308.6	474.4
J-15	488,783	1,273,870	7.0	-	39	56	311.3	474.6
J-17	491,068	1,279,274	9.2	-	47	56	368.2	457.8
J-18	491,126	1,278,878	9.2	-	47	56	367.3	457.5
J-19	491,152	1,278,721	9.3	-	47	56	366.0	456.4
J-20	491,027	1,279,565	9.5	-	47	56	365.6	454.9
J-21	484,604	1,274,142	7.0	-	45	55	366.9	474.2
J-22	484,683	1,273,638	7.0	-	44	55	364.7	474.0
J-25	490,886	1,279,388	8.9	-	47	56	372.2	461.9
J-26	490,888	1,279,388	8.9	-	47	56	372.2	461.9
J-27	490,875	1,279,386	8.9	-	47	56	372.2	461.9
J-28	490,877	1,279,387	8.9	-	47	56	372.2	461.9
J-29	490,883	1,279,388	8.9	-	47	56	372.2	461.9
J-30	490,880	1,279,387	8.9	-	47	56	372.2	461.9
J-31	490,806	1,279,405	9.4	-	47	56	367.4	457.1
J-32	490,836	1,279,406	9.4	-	47	56	367.3	457.1
J-33	490,802	1,279,435	9.4	-	47	56	367.4	457.2
J-34	486,820	1,275,640	7.0	-	45	56	374.9	475.1
J-36	487,553	1,276,844	7.0	-	46	56	383.2	476.1
J-38	485,678	1,276,950	7.2	-	45	56	368.9	472.3
J-39	485,306	1,276,911	7.2	-	45	56	368.9	472.3
J-40	487,400	1,286,490	6.8	-	46	56	386.6	478.2
J-41	487,383	1,286,502	7.2	-	46	56	382.6	474.3
J-42	487,363	1,286,538	7.2	-	46	56	382.5	474.3
J-43	487,357	1,286,519	7.2	-	46	56	382.5	474.3
J-44	490,798	1,279,463	9.4	-	47	56	367.5	457.3
J-45	490,794	1,279,488	9.2	-	47	56	369.4	459.3
J-46	490,801	1,279,489	9.2	-	13	13	36.3	39.2
J-47	487,382	1,286,509	7.2	-	46	56	382.6	474.3
J-50	487,183	1,286,603	7.2	-	46	56	381.9	474.2
J-51	487,082	1,286,692	7.2	-	46	56	381.5	474.1
J-53	491,020	1,279,612	9.5	-	47	56	365.7	454.9
J-54	490,999	1,279,756	9.3	-	47	56	367.9	456.8
J-55	486,778	1,286,933	7.2	-	46	56	380.5	474.0
J-56	486,685	1,287,005	7.2	-	46	56	380.3	473.9
J-57	491,146	1,278,717	9.3	-	47	56	365.9	456.4
J-58	490,461	1,278,176	8.6	-	47	56	370.5	462.2
J-59	490,455	1,278,171	8.6	-	47	56	370.5	462.2
J-60	489,386	1,277,039	7.0	-	46	56	383.5	476.7
J-61	489,378	1,277,030	7.0	-	46	56	383.4	476.7
J-62	489,352	1,277,005	7.0	-	46	56	383.4	476.7
J-63	490,037	1,277,665	7.0	-	46	56	384.7	477.1
J-64	489,971	1,277,600	7.2	-	46	56	382.6	475.1
J-65	490,748	1,280,695	9.6	-	47	56	366.2	453.4

Network Junction Indicators

Junction Name	Coordinate X (m)	Coordinate Y (m)	Ground Elevation (m)	Flow (l/s)	Minimum Hydraulic Grade (m)	Maximum Hydraulic Grade (m)	Minimum Pressure (kPa)	Maximum Pressure (kPa)
J-66	489,386	1,280,669	9.3	-	47	56	366.9	455.2
J-67	486,562	1,287,099	7.2	-	46	56	380.0	473.9
J-68	488,113	1,272,190	7.0	-	45	56	375.0	475.1
J-69	486,365	1,287,280	7.2	-	46	56	379.6	473.8
J-70	486,427	1,287,255	7.2	-	46	56	379.6	473.8
J-71	486,269	1,287,355	7.2	-	46	56	379.6	473.8
J-72	486,225	1,287,395	7.2	-	46	56	379.5	473.8
J-73	493,039	1,280,911	7.0	-	49	56	409.7	479.6
J-74	486,097	1,287,525	7.2	-	46	56	379.4	473.8
J-75	486,076	1,287,553	7.2	-	46	56	379.4	473.8
J-76	486,020	1,287,624	7.2	-	46	56	379.4	473.8
J-77	488,992	1,280,560	7.5	-	47	56	383.8	472.5
J-78	488,990	1,280,561	7.5	-	47	56	383.8	472.5
J-79	485,967	1,287,691	7.2	-	46	56	379.3	473.7
J-81	488,945	1,276,613	9.0	-	46	56	363.3	457.0
J-82	488,941	1,276,609	9.0	-	46	56	363.3	457.0
J-83	493,126	1,280,906	9.3	-	9	9	-	-
J-84	485,817	1,287,906	7.2	-	46	56	379.2	473.7
J-85	485,731	1,288,015	7.2	-	46	56	379.2	473.7
J-86	493,153	1,280,921	9.3	-	9	9	-	-
J-87	491,241	1,278,126	9.1	-	46	56	365.1	458.0
J-88	492,967	1,280,907	7.0	-	49	56	409.2	479.6
J-89	485,781	1,287,948	7.2	-	46	56	379.2	473.7
J-90	485,538	1,288,277	7.2	-	46	56	379.2	473.7
J-91	491,340	1,277,459	8.8	-	46	56	366.2	460.8
J-92	491,344	1,277,433	8.8	-	46	56	366.1	460.8
J-93	485,510	1,288,318	7.2	-	46	56	379.2	473.7
J-94	487,839	1,278,535	9.6	-	47	56	361.4	451.3
J-95	487,848	1,278,504	9.6	-	47	56	361.4	451.3
J-96	489,317	1,276,971	7.0	-	46	56	383.4	476.7
J-97	487,833	1,278,603	9.7	-	47	56	360.4	450.3
J-98	491,169	1,278,607	8.9	-	47	56	369.2	460.2
J-99	488,854	1,276,524	11.1	-	46	56	342.7	436.4
J-100	489,121	1,280,507	7.3	-	47	56	385.9	474.5
J-101	491,308	1,277,671	9.2	-	46	56	362.7	456.9
J-102	488,773	1,280,303	7.0	-	47	56	388.3	477.2
J-103	487,791	1,279,151	9.0	-	47	56	367.6	457.2
J-104	488,199	1,279,630	7.2	-	47	56	385.7	474.9
J-105	485,493	1,288,341	7.2	-	46	56	379.2	473.7
J-106	485,468	1,288,376	7.2	-	46	56	379.2	473.7
J-107	485,431	1,288,427	7.0	-	46	56	381.2	475.7
J-108	485,359	1,288,525	7.2	-	46	56	379.2	473.7
J-109	485,324	1,288,562	7.2	-	46	56	381.8	474.2
J-110	485,424	1,288,301	7.0	-	46	56	381.2	475.7
J-111	485,612	1,287,941	7.0	-	46	56	381.2	475.7
J-112	485,713	1,287,854	7.0	-	46	56	381.2	475.7
J-113	488,911	1,280,684	7.0	-	44	55	365.0	473.9
J-114	491,703	1,285,470	9.0	4.7	48	56	377.5	458.2
J-115	492,913	1,280,903	8.3	-	49	56	396.2	466.8
J-116	493,200	1,281,124	8.3	-	25	25	162.9	163.4
J-117	493,311	1,280,376	7.0	-	25	25	174.8	176.1
J-118	493,313	1,280,319	7.0	-	25	25	174.7	176.1
J-119	493,322	1,280,061	7.0	-	25	25	174.3	176.0
J-120	493,318	1,279,691	7.0	-	25	25	173.9	176.0
J-121	493,147	1,279,127	7.0	-	25	25	173.2	176.0
J-122	493,239	1,279,208	7.0	-	25	25	173.2	176.0
J-124	493,176	1,274,797	7.0	-	44	56	363.6	478.5
J-125	493,172	1,274,853	7.0	-	44	56	363.5	478.4
J-126	492,731	1,280,780	7.0	-	49	56	407.5	479.5
J-127	493,137	1,274,946	7.0	-	44	56	363.5	478.4
J-128	492,267	1,280,559	7.0	-	48	56	404.2	479.4
J-129	493,107	1,275,105	7.0	-	44	56	363.3	478.4
J-130	492,042	1,281,049	7.0	-	48	56	400.6	479.2

Network Junction Indicators

Junction Name	Coordinate X (m)	Coordinate Y (m)	Ground Elevation (m)	Flow (l/s)	Minimum Hydraulic Grade (m)	Maximum Hydraulic Grade (m)	Minimum Pressure (kPa)	Maximum Pressure (kPa)
J-131	493,092	1,275,259	7.0	-	44	56	363.2	478.4
J-132	493,092	1,275,273	7.0	-	44	56	363.2	478.4
J-133	491,470	1,276,593	6.1	-	46	56	390.1	487.2
J-134	491,471	1,276,589	6.1	-	46	56	390.1	487.2
J-135	491,733	1,281,020	18.0	-	48	56	289.6	371.4
J-136	491,737	1,281,021	18.0	-	48	56	289.6	371.4
J-137	491,726	1,281,018	18.0	-	48	56	289.5	371.4
J-138	490,877	1,279,395	8.9	-	47	56	372.2	461.9
J-139	490,874	1,279,394	8.9	-	47	56	372.2	461.9
J-140	491,526	1,276,189	6.1	-	46	56	389.5	487.2
J-141	491,527	1,276,179	6.1	-	46	56	389.5	487.2
J-142	491,634	1,275,492	6.5	-	46	56	382.1	484.1
J-143	491,636	1,275,482	6.5	-	46	56	382.0	484.1
J-144	491,633	1,275,502	6.5	-	46	56	382.2	484.1
J-146	491,730	1,281,031	18.0	-	48	56	289.6	371.4
J-147	491,074	1,279,341	9.2	-	47	56	368.4	457.9
J-148	491,730	1,281,008	18.0	-	48	56	289.4	371.4
J-149	493,050	1,274,291	7.0	-	43	56	356.4	477.8
J-150	490,783	1,279,450	7.2	-	11	11	41.1	41.1
J-151	493,165	1,280,953	9.0	-	49	56	391.1	460.0
J-152	491,223	1,280,824	18.5	-	47	56	279.8	366.4
J-153	491,217	1,280,842	9.8	-	47	56	364.8	451.5
J-154	493,085	1,274,184	7.0	-	43	56	355.1	477.8
J-156	491,230	1,280,816	18.5	-	47	56	279.9	366.4
J-157	491,222	1,280,842	9.5	-	47	56	367.8	454.5
J-158	493,115	1,274,110	7.0	-	43	56	354.2	477.7
J-159	493,245	1,281,020	8.8	-	49	56	392.1	462.0
J-160	493,205	1,281,119	8.3	-	49	56	396.1	466.8
J-161	492,212	1,274,587	8.8	-	45	56	350.5	461.2
J-162	492,439	1,274,631	8.7	-	45	56	350.2	462.2
J-163	491,570	1,275,926	6.3	-	46	56	387.3	485.5
J-164	491,423	1,276,908	6.2	-	46	56	389.9	486.2
J-165	492,099	1,281,149	9.6	-	48	56	374.8	454.1
J-168	493,327	1,273,518	7.0	-	43	56	352.2	477.5
J-169	493,349	1,273,474	7.0	-	43	56	352.2	477.5
J-170	492,102	1,281,143	7.0	-	48	56	399.9	479.2
J-171	493,130	1,274,114	7.0	-	43	56	354.2	477.7
J-172	493,535	1,274,004	7.0	-	43	56	349.4	477.4
J-173	493,961	1,273,766	7.0	-	42	56	345.7	477.1
J-175	494,106	1,273,435	7.0	-	42	56	343.0	476.9
J-176	494,107	1,273,429	7.0	-	42	56	343.0	476.9
J-177	494,278	1,273,436	7.0	-	42	56	341.7	476.8
J-179	493,778	1,269,592	8.0	-	35	37	265.4	280.3
J-180	493,843	1,269,483	8.0	-	35	37	265.4	280.3
J-181	493,975	1,269,206	8.0	3.2	35	37	264.6	280.2
J-182	494,014	1,269,200	8.9	2.9	35	37	256.0	271.6
J-183	494,120	1,269,203	8.0	-	35	37	264.8	280.2
J-184	494,279	1,269,205	8.0	1.9	35	37	264.8	280.2
J-185	494,167	1,269,561	7.5	-	35	37	271.1	285.2
J-186	488,054	1,279,871	7.2	-	46	56	378.9	473.7
J-187	488,303	1,279,591	7.2	-	46	56	381.6	474.2
J-188	488,552	1,279,483	7.2	-	46	56	382.8	474.4
J-189	488,829	1,279,363	7.2	-	47	56	384.2	474.6
J-190	487,754	1,274,067	8.5	-	45	56	361.3	460.6
J-191	487,806	1,273,807	8.5	-	45	56	361.0	460.6
J-192	492,081	1,281,154	7.0	-	48	56	399.7	479.2
J-193	487,946	1,273,101	9.0	-	45	56	355.8	455.6
J-194	492,018	1,281,126	7.0	-	48	56	399.3	479.2
J-196	487,824	1,273,811	8.5	-	45	56	361.0	460.6
J-197	491,905	1,281,089	7.0	-	48	56	398.5	479.1
J-198	488,144	1,272,212	8.0	-	45	56	365.2	465.3
J-199	490,782	1,279,458	7.2	-	11	11	40.2	40.2
J-200	490,785	1,279,468	9.2	-	11	11	21.4	21.4

Network Junction Indicators

Junction Name	Coordinate X (m)	Coordinate Y (m)	Ground Elevation (m)	Flow (l/s)	Minimum Hydraulic Grade (m)	Maximum Hydraulic Grade (m)	Minimum Pressure (kPa)	Maximum Pressure (kPa)
J-201	490,784	1,279,480	9.2	-	11	11	21.6	21.6
J-202	488,159	1,272,134	9.0	-	45	56	355.4	455.5
J-203	488,158	1,272,139	9.0	-	45	56	355.4	455.5
J-204	488,126	1,272,130	9.0	-	45	56	355.4	455.5
J-205	494,168	1,269,754	7.0	2.9	35	37	272.3	289.9
J-206	493,791	1,270,266	8.0	-	35	37	261.3	280.0
J-207	493,492	1,270,067	9.0	-	34	37	249.0	270.0
J-208	491,734	1,281,032	12.0	-	48	56	348.4	430.2
J-209	492,630	1,266,677	11.0	7.2	35	37	231.6	250.6
J-210	495,439	1,267,603	10.0	-	35	37	241.4	260.4
J-211	491,202	1,280,842	9.8	-	47	56	364.8	451.5
J-212	495,010	1,267,293	10.0	-	35	37	241.4	260.4
J-213	495,144	1,267,057	10.0	-	35	37	240.8	260.3
J-214	492,458	1,274,620	8.7	-	45	56	350.0	462.1
J-215	492,496	1,274,632	8.7	-	44	56	349.8	462.1
J-216	488,574	1,276,244	8.3	-	46	56	369.8	463.8
J-217	488,538	1,276,204	8.6	-	46	56	366.7	460.8
J-218	490,960	1,279,253	9.4	-	47	56	367.3	457.0
J-219	490,970	1,279,187	9.4	-	47	56	367.3	457.0
J-220	488,055	1,275,696	9.1	-	46	56	359.2	455.4
J-221	487,988	1,275,627	9.0	-	46	56	360.0	456.4
J-222	488,451	1,276,110	8.9	-	46	56	363.3	457.8
J-223	488,364	1,276,019	9.1	-	46	56	361.0	455.8
J-224	491,923	1,275,481	7.3	-	46	56	374.2	479.2
J-225	488,113	1,275,757	8.8	-	46	56	362.7	458.5
J-227	487,606	1,275,227	7.0	-	46	56	378.1	475.7
J-229	494,137	1,269,982	8.0	-	35	37	262.9	280.1
J-230	494,248	1,269,703	7.0	-	36	37	283.1	290.6
J-231	493,401	1,270,072	8.0	-	34	37	258.6	279.8
J-232	493,123	1,270,022	9.0	2.9	34	37	248.4	270.0
J-233	493,543	1,270,053	9.0	-	34	37	249.0	270.0
J-234	493,668	1,270,003	9.0	-	34	37	249.0	270.0
J-235	493,676	1,269,787	9.0	-	35	37	253.8	270.4
J-236	493,794	1,269,883	9.0	2.9	35	37	253.3	270.3
J-237	493,880	1,269,920	9.0	-	35	37	253.2	270.3
J-238	493,910	1,269,682	8.0	-	35	37	263.0	280.1
J-239	493,701	1,269,922	9.0	-	35	37	253.3	270.3
J-240	493,656	1,269,946	9.0	-	35	37	253.3	270.3
J-241	493,812	1,270,167	9.0	-	35	37	253.3	270.3
J-242	493,206	1,269,619	10.0	3.9	34	37	237.4	260.1
J-243	493,520	1,269,743	9.0	-	34	37	248.1	270.0
J-244	493,665	1,269,786	9.0	-	34	37	248.1	270.0
J-245	489,094	1,285,795	7.0	-	46	56	385.5	476.4
J-246	486,881	1,275,023	5.4	-	45	56	390.6	490.7
J-247	491,906	1,275,448	7.3	-	10	12	29.0	46.0
J-248	491,908	1,275,448	7.3	-	10	12	29.1	46.0
J-249	491,912	1,275,448	7.3	-	10	12	29.1	46.0
J-250	491,915	1,275,448	7.3	-	10	12	29.1	46.0
J-251	487,851	1,278,505	9.6	-	47	56	361.4	451.3
J-252	485,924	1,278,224	9.8	-	46	56	349.6	447.6
J-253	485,927	1,278,224	9.8	-	46	56	349.6	447.6
J-254	490,073	1,277,650	7.2	-	47	56	385.7	477.2
J-255	490,074	1,277,647	7.2	-	47	56	385.7	477.2
J-256	492,108	1,281,160	9.6	-	48	56	374.5	454.0
J-257	491,003	1,283,312	9.5	-	47	56	362.9	452.3
J-258	491,073	1,279,275	9.2	-	47	56	368.2	457.8
J-259	490,080	1,277,639	7.2	-	47	56	385.7	477.2
J-260	490,083	1,277,634	7.2	-	47	56	385.7	477.2
J-261	492,103	1,281,155	9.6	-	48	56	374.8	454.1
J-262	493,533	1,269,542	10.0	2.9	34	37	238.0	260.1
J-263	491,709	1,275,500	6.4	-	46	56	382.9	485.8
J-264	491,646	1,275,495	6.5	-	46	56	382.0	484.3
J-265	491,033	1,276,567	5.8	-	45	56	384.4	488.6

Network Junction Indicators

Junction Name	Coordinate X (m)	Coordinate Y (m)	Ground Elevation (m)	Flow (l/s)	Minimum Hydraulic Grade (m)	Maximum Hydraulic Grade (m)	Minimum Pressure (kPa)	Maximum Pressure (kPa)
J-266	492,888	1,274,776	10.0	-	44	56	334.8	449.2
J-267	492,899	1,274,776	10.0	-	44	56	334.8	449.1
J-268	491,036	1,276,564	5.8	-	45	56	384.5	488.7
J-269	489,687	1,276,733	8.9	-	46	56	362.6	458.2
J-270	491,923	1,275,468	7.3	-	46	56	374.2	479.6
J-271	490,105	1,277,647	6.0	-	26	26	195.7	195.7
J-272	491,136	1,282,703	9.9	-	47	56	360.0	448.7
J-273	489,106	1,285,785	7.0	-	46	56	385.5	476.4
J-274	491,666	1,279,280	9.4	-	46	56	362.4	453.9
J-275	491,683	1,279,282	9.4	-	46	56	362.3	453.9
J-276	490,725	1,284,114	9.1	-	47	56	366.2	456.1
J-277	482,860	1,277,414	10.0	-	44	55	329.9	444.1
J-278	486,879	1,275,023	8.8	-	45	56	357.3	457.5
J-279	491,198	1,280,851	9.8	-	47	56	364.7	451.5
J-280	492,830	1,274,785	12.1	-	44	56	314.5	428.6
J-281	492,855	1,274,775	10.2	-	44	56	332.9	447.2
J-282	483,673	1,277,781	10.1	-	44	55	331.2	443.2
J-283	483,700	1,277,806	10.3	-	44	55	329.4	441.3
J-284	487,787	1,278,494	9.9	-	47	56	357.9	448.2
J-285	487,755	1,278,473	7.4	-	46	56	382.0	472.6
J-286	490,067	1,277,593	7.2	-	47	56	385.6	477.1
J-287	488,994	1,279,300	7.8	-	47	56	379.1	468.9
J-288	489,010	1,279,256	7.8	-	47	56	379.1	468.9
J-289	487,800	1,278,503	9.9	-	47	56	358.0	448.2
J-290	487,829	1,273,810	8.5	-	45	56	361.0	460.6
J-291	491,290	1,280,866	6.0	-	47	56	402.0	488.7
J-292	492,563	1,274,676	8.7	-	44	56	349.3	462.1
J-293	491,786	1,279,296	9.3	-	46	56	362.7	454.6
J-294	487,492	1,275,115	8.7	-	46	56	360.4	458.9
J-295	490,945	1,279,347	9.4	-	47	56	367.2	457.1
J-296	488,083	1,273,654	8.0	-	45	56	365.9	465.5
J-297	489,047	1,279,738	6.8	-	47	56	389.3	478.7
J-298	487,253	1,275,072	8.6	-	45	56	360.4	459.6
J-299	491,135	1,281,109	9.7	-	47	56	364.4	451.8
J-300	492,050	1,279,337	9.3	-	46	56	362.3	454.4
J-301	485,720	1,274,862	6.4	-	45	56	379.5	480.7
J-302	485,991	1,274,900	8.8	-	45	56	356.3	457.3
J-303	491,104	1,281,385	9.6	-	47	56	364.9	452.6
J-304	489,122	1,280,485	7.3	-	47	56	385.7	474.4
J-305	488,218	1,273,656	8.0	-	45	56	365.9	465.5
J-306	483,979	1,278,045	9.6	-	44	55	337.9	448.3
J-307	484,256	1,278,196	10.0	-	44	55	336.8	444.6
J-308	491,124	1,281,918	9.7	-	47	56	363.1	451.2
J-309	491,076	1,279,286	9.2	-	47	56	368.1	457.7
J-310	484,859	1,278,257	8.2	-	45	56	359.9	462.6
J-311	484,888	1,274,706	10.5	-	45	56	338.2	440.3
J-312	489,653	1,285,427	9.0	-	46	56	366.3	456.9
J-313	489,192	1,285,916	9.5	-	46	56	361.0	452.0
J-314	487,105	1,278,260	9.7	-	46	56	356.1	449.5
J-315	484,907	1,274,748	8.8	-	45	56	354.8	457.0
J-316	490,255	1,284,816	9.4	-	47	56	362.8	453.1
J-317	482,973	1,277,174	10.6	-	44	55	324.0	438.2
J-318	490,298	1,284,046	7.0	-	46	56	382.8	476.0
J-319	490,100	1,284,177	7.0	-	46	56	382.8	476.0
J-320	490,132	1,284,229	7.0	-	46	56	382.8	476.0
J-321	489,174	1,285,334	8.0	-	46	56	373.0	466.2
J-322	484,889	1,276,876	7.0	-	45	56	370.8	474.3
J-323	489,757	1,283,689	8.0	-	46	56	373.0	466.2
J-324	489,728	1,283,661	8.0	-	46	56	373.0	466.2
J-325	489,720	1,283,670	8.0	-	46	56	373.0	466.2
J-326	489,763	1,283,683	8.0	-	46	56	373.0	466.2
J-327	485,162	1,278,883	7.5	-	45	56	365.5	469.3
J-328	489,170	1,278,369	6.5	-	42	55	348.4	477.5

Network Junction Indicators

Junction Name	Coordinate X (m)	Coordinate Y (m)	Ground Elevation (m)	Flow (l/s)	Minimum Hydraulic Grade (m)	Maximum Hydraulic Grade (m)	Minimum Pressure (kPa)	Maximum Pressure (kPa)
J-329	485,920	1,277,428	7.0	-	46	56	382.5	475.9
J-330	485,905	1,278,962	7.0	-	46	56	383.7	476.2
J-331	489,637	1,278,233	6.6	-	46	56	386.5	480.4
J-332	489,120	1,278,977	7.0	-	43	55	349.8	473.1
J-333	487,751	1,274,133	8.5	-	39	56	295.9	459.8
J-334	489,189	1,278,192	7.0	-	43	55	348.7	473.0
J-335	492,172	1,276,162	8.0	-	41	56	325.3	465.0
J-336	491,412	1,276,902	7.0	-	46	56	380.7	478.1
J-337	491,551	1,276,127	7.0	-	46	56	377.2	479.3
J-338	485,904	1,276,974	7.0	-	45	56	370.8	474.3
J-339	488,715	1,280,390	7.0	-	46	56	383.7	476.1
J-340	488,644	1,280,506	9.0	-	46	56	357.9	455.5
J-341	489,637	1,277,264	7.2	-	46	56	380.0	474.4
J-342	491,541	1,276,190	6.5	-	46	56	386.1	483.2
J-343	492,130	1,276,136	6.0	-	45	56	386.0	491.3
J-344	492,142	1,278,349	8.0	-	44	56	356.5	465.4
J-345	492,175	1,276,165	8.0	-	41	56	324.8	464.9
J-346	492,230	1,276,160	8.0	-	41	56	317.6	464.4
J-347	492,312	1,276,189	8.0	-	39	55	305.8	463.6
J-348	492,377	1,276,244	8.0	-	38	55	294.6	462.8
J-349	492,546	1,276,890	8.0	-	29	55	206.9	456.6
J-354	484,616	1,288,078	5.0	-	46	56	403.3	495.7
J-355	485,360	1,286,877	8.0	-	46	56	373.9	466.3
J-356	485,836	1,286,127	8.9	18.9	46	56	365.3	457.7
J-357	486,126	1,285,643	8.9	-	46	56	365.3	457.7
J-358	487,271	1,283,794	8.9	-	47	56	368.3	458.3
J-362	484,597	1,288,066	8.9	-	46	56	365.3	457.7
J-363	484,645	1,288,223	8.9	-	46	56	365.3	457.7
J-364	484,761	1,288,605	8.9	-	46	56	365.3	457.7
J-365	484,837	1,288,752	8.9	-	46	56	365.3	457.7
J-366	484,792	1,288,894	8.9	-	46	56	365.3	457.7
J-367	485,004	1,289,034	8.0	-	46	56	373.9	466.3
J-368	485,099	1,288,843	8.0	-	46	56	373.9	466.3
J-369	484,862	1,289,310	8.9	-	46	56	365.3	457.7
J-370	484,634	1,289,661	8.9	-	46	56	365.3	457.7
J-372	488,793	1,281,329	9.0	-	47	56	369.6	458.0
J-373	488,818	1,281,301	9.0	-	47	56	369.6	458.0
J-374	489,004	1,281,007	9.0	-	47	56	369.7	458.1
J-375	489,177	1,280,744	9.0	-	47	56	369.7	458.1
J-376	489,368	1,280,677	9.0	-	47	56	369.8	458.1
J-377	489,381	1,280,657	9.0	-	47	56	369.8	458.1
J-389	480,567	1,273,836	11.1	-	43	55	311.9	432.7
J-390	480,824	1,274,325	11.1	-	43	55	311.8	432.7
J-391	489,792	1,279,063	9.4	-	47	56	367.3	457.0
J-392	489,787	1,279,062	9.4	-	46	56	358.8	453.0
J-393	491,176	1,278,607	8.9	-	47	56	369.2	460.2
J-394	489,983	1,277,617	7.2	-	46	56	382.4	475.0
J-395	489,982	1,277,625	7.2	-	46	56	382.4	475.0
J-396	489,973	1,277,608	7.2	-	46	56	382.5	475.1
J-397	489,880	1,278,252	6.7	-	46	56	385.8	479.5
J-398	489,872	1,278,257	6.7	-	46	56	385.8	479.5
J-399	489,971	1,277,730	6.7	-	46	56	386.8	479.7
J-400	489,960	1,277,729	6.7	-	46	56	386.8	479.7
J-401	491,189	1,278,610	8.9	-	47	56	369.2	460.2
J-401aa	492,431	1,274,628	8.9	-	45	56	348.4	460.4
J-402	489,104	1,278,987	9.5	-	47	56	362.4	452.2
J-404	489,117	1,279,005	9.5	-	46	56	357.8	452.0
J-405	490,050	1,277,576	7.2	-	47	56	385.6	477.1
J-406	491,341	1,278,645	8.8	-	47	56	370.0	461.1
J-407	491,435	1,278,665	8.6	-	47	56	371.9	463.0
J-408	491,540	1,278,689	8.8	-	47	56	369.9	461.1
J-409	491,634	1,278,710	8.9	-	47	56	368.9	460.1
J-410	489,808	1,278,900	7.4	-	46	56	378.4	472.5

Network Junction Indicators

Junction Name	Coordinate X (m)	Coordinate Y (m)	Ground Elevation (m)	Flow (l/s)	Minimum Hydraulic Grade (m)	Maximum Hydraulic Grade (m)	Minimum Pressure (kPa)	Maximum Pressure (kPa)
J-411	489,822	1,278,759	7.1	-	46	56	381.3	475.5
J-412	489,839	1,278,616	6.9	-	46	56	383.4	477.5
J-412-IZa	494,197	1,269,717	8.0	-	36	37	273.6	280.9
J-413	489,854	1,278,474	6.9	-	46	56	383.5	477.5
J-414	489,924	1,277,996	6.8	-	46	56	385.3	478.6
J-415	490,658	1,279,145	10.0	-	47	56	361.4	451.1
J-416	490,288	1,279,109	9.9	-	47	56	362.4	452.1
J-417	480,787	1,274,813	11.1	-	43	55	311.3	432.6
J-418	486,686	1,283,247	8.9	-	47	56	368.3	458.3
J-419	485,786	1,282,912	8.9	-	47	56	368.3	458.3
J-427	488,409	1,270,633	8.0	9.5	45	56	363.9	465.1
J-437	485,797	1,281,175	8.9	-	47	56	370.4	459.0
J-438	487,731	1,281,280	8.9	-	47	56	370.6	459.2
J-439	488,771	1,281,320	8.9	-	47	56	370.8	459.2
J-441	480,798	1,274,956	8.0	-	43	55	341.7	463.0
J-442	481,119	1,275,010	8.0	-	43	55	341.8	463.1
J-443	484,904	1,274,748	8.8	-	45	56	354.8	457.0
J-444	489,118	1,280,487	7.3	-	47	56	385.7	474.4
J-445	484,898	1,274,747	8.8	-	45	56	354.8	457.0
J-446	482,969	1,277,170	10.6	-	44	55	324.0	438.2
J-447	489,372	1,277,029	7.0	-	46	56	383.4	476.7
J-448	481,291	1,275,183	8.0	-	43	55	341.8	463.1
J-449	489,185	1,285,913	9.5	-	46	56	361.0	452.0
J-450	481,576	1,275,446	8.0	-	43	55	341.9	463.1
J-451	489,813	1,278,758	7.1	-	46	56	381.3	475.5
J-452	484,898	1,274,757	8.8	-	45	56	354.8	457.0
J-453	489,119	1,280,498	7.3	-	47	56	385.8	474.5
J-454	490,446	1,278,171	8.6	-	47	56	370.5	462.2
J-455	490,433	1,278,169	8.6	-	46	56	370.4	462.1
J-456	489,365	1,277,022	7.0	-	46	56	383.3	476.7
J-457	489,350	1,277,026	7.0	-	46	56	383.3	476.6
J-458	491,325	1,277,453	8.8	-	46	56	366.2	460.8
J-459	493,096	1,280,915	4.8	-	25	25	197.7	197.7
J-460	493,085	1,280,938	4.8	-	25	25	197.7	197.7
J-461	490,404	1,278,149	8.8	-	46	56	368.4	460.2
J-462	481,997	1,275,880	8.0	-	43	55	342.1	463.1
J-463	487,707	1,274,320	6.7	-	45	56	379.2	478.3
J-464	484,610	1,274,717	9.2	-	45	56	347.5	452.8
J-465	484,654	1,274,723	9.5	-	45	56	344.9	449.9
J-466	484,881	1,274,706	8.5	-	45	56	357.7	459.9
J-467	484,888	1,274,698	8.5	-	45	56	357.8	459.9
J-468	490,750	1,279,392	7.2	-	47	56	388.9	478.7
J-469	492,454	1,281,805	5.1	-	48	56	417.6	497.3
J-470	492,457	1,281,901	8.9	-	48	56	380.3	460.1
J-471-jonction-nord	482,279	1,276,467	8.0	-	43	55	342.3	463.1
J-473	489,047	1,279,144	6.9	-	47	56	387.8	477.7
J-474	482,702	1,276,945	9.2	-	43	55	335.1	451.7
J-475	484,779	1,274,741	8.9	-	45	56	352.4	455.9
J-476-jonction sud	482,608	1,274,443	8.0	-	44	55	347.2	463.5
J-477	482,745	1,274,463	8.9	-	44	55	339.1	454.8
J-478	485,931	1,278,225	9.8	-	46	56	349.6	447.6
J-479	482,150	1,276,144	10.1	-	43	55	321.1	442.5
J-480	489,086	1,285,758	7.1	-	46	56	384.5	475.5
J-481	489,085	1,285,802	7.1	-	46	56	384.5	475.5
J-482	483,167	1,274,519	7.4	-	44	55	355.7	469.6
J-483	483,370	1,274,549	7.4	-	44	55	357.0	469.7
J-484	487,744	1,274,132	8.5	-	45	56	361.4	460.6
J-485	492,385	1,281,606	4.7	-	48	56	422.0	501.6
J-486	488,987	1,286,002	9.5	-	46	56	360.7	451.9
J-487	482,508	1,276,777	10.6	-	43	55	319.6	437.9
J-488	482,305	1,276,535	10.6	-	43	55	317.2	437.7

Network Junction Indicators

Junction Name	Coordinate X (m)	Coordinate Y (m)	Ground Elevation (m)	Flow (l/s)	Minimum Hydraulic Grade (m)	Maximum Hydraulic Grade (m)	Minimum Pressure (kPa)	Maximum Pressure (kPa)
J-489	482,866	1,277,416	10.0	-	44	55	329.9	444.1
J-490	482,857	1,277,421	10.0	-	44	55	329.9	444.1
J-492	484,073	1,274,645	8.2	-	44	55	353.7	462.3
J-493	481,903	1,275,624	9.7	-	43	55	324.2	446.4
J-494	488,027	1,286,366	9.4	-	46	56	361.2	452.8
J-495-bout loop RK	487,051	1,286,184	6.8	-	46	56	386.6	478.2
J-496	492,360	1,282,829	9.6	-	48	56	372.6	452.9
J-497	486,287	1,286,213	8.0	-	46	56	374.2	466.4
J-498	486,732	1,286,282	8.0	-	46	56	374.6	466.5
J-499	486,931	1,286,331	8.0	-	46	56	374.7	466.5
J-500	487,415	1,285,714	8.0	-	46	56	375.5	466.6
J-501	488,193	1,284,589	8.0	-	47	56	376.9	466.9
J-502	488,972	1,282,921	8.0	18.9	47	56	377.5	467.0
J-508	485,859	1,285,486	8.9	-	46	56	365.3	457.7
J-509	484,368	1,285,175	8.9	-	46	56	365.3	457.7
J-510	483,066	1,285,159	8.9	-	46	56	365.3	457.7
J-511	488,177	1,284,575	8.9	-	47	56	368.3	458.3
J-512	488,162	1,284,594	8.9	-	47	56	368.3	458.3
J-513	488,225	1,284,583	8.9	-	47	56	368.3	458.3
J-514	488,203	1,284,612	8.9	-	47	56	368.3	458.3
J-522	485,791	1,282,913	8.9	-	47	56	368.3	458.3
J-523	485,789	1,282,938	8.9	-	47	56	368.3	458.3
J-524	485,834	1,283,685	8.9	-	47	56	368.3	458.3
J-525	484,687	1,284,549	8.9	-	47	56	368.3	458.3
J-532	479,653	1,274,768	11.1	-	42	55	304.6	432.0
J-533	478,664	1,274,603	11.1	28.8	42	55	300.8	431.8
J-550-bout loop PPC	480,711	1,274,159	11.1	-	43	55	311.9	432.7
J-551	481,779	1,274,165	8.0	-	43	55	345.1	463.4
J-552	482,341	1,274,396	8.0	-	43	55	346.6	463.5
J-553	492,828	1,274,791	12.2	-	44	56	313.6	427.7
J-554	492,560	1,274,682	8.6	-	44	56	350.2	463.0
J-555	493,123	1,280,927	9.0	-	25	25	156.6	156.6
J-556	482,341	1,274,413	8.0	-	43	55	346.6	463.5
J-557	493,108	1,280,921	4.8	-	25	25	197.7	197.7
J-558	493,177	1,280,934	9.4	-	9	9	(1.0)	(1.0)
J-559	489,106	1,278,975	9.5	-	42	55	314.7	447.9
J-560	493,155	1,280,898	9.3	-	25	25	153.6	153.7
J-561	490,708	1,278,483	8.9	-	46	56	361.7	457.6
J-562	490,361	1,280,612	9.1	-	47	56	367.8	456.7
J-563	490,884	1,278,622	8.9	-	46	56	362.1	457.7
J-564	490,933	1,278,556	8.9	-	46	56	362.1	457.7
J-565	491,031	1,278,902	8.9	-	46	56	362.0	457.7
J-566	492,083	1,276,508	6.0	-	46	56	389.7	487.6
J-567	490,990	1,278,487	8.9	-	46	56	358.6	457.6
J-568	491,100	1,278,434	8.9	-	46	56	361.9	458.2
J-569	494,094	1,269,708	8.9	-	35	37	259.5	271.9
J-570	494,091	1,269,562	8.9	-	35	37	257.6	271.7
J-571	494,108	1,269,708	8.9	-	35	37	259.8	271.9
J-572	494,104	1,269,560	8.9	-	35	37	257.6	271.7
J-573	494,098	1,269,562	8.9	-	35	37	257.6	271.7
J-574	494,103	1,269,203	8.9	-	35	37	256.2	271.6
J-575	488,203	1,279,639	7.2	-	47	56	385.6	474.9
J-576	488,204	1,279,639	7.2	-	47	56	385.7	474.9
J-577	489,756	1,273,579	8.7	-	39	56	299.8	458.3
J-578	489,758	1,273,579	8.7	-	39	56	299.9	458.3
J-579	490,547	1,273,401	9.2	-	40	56	299.9	453.8
J-580	490,549	1,273,401	9.2	-	40	56	299.9	453.8
J-581	485,926	1,278,204	9.8	-	46	56	349.6	447.6
J-582	485,925	1,278,205	9.8	-	46	56	349.6	447.6
J-583	488,012	1,274,089	8.6	-	39	56	295.1	458.9
J-584	488,014	1,274,088	8.6	-	39	56	295.1	458.9

Network Junction Indicators

Junction Name	Coordinate X (m)	Coordinate Y (m)	Ground Elevation (m)	Flow (l/s)	Minimum Hydraulic Grade (m)	Maximum Hydraulic Grade (m)	Minimum Pressure (kPa)	Maximum Pressure (kPa)
J-585	488,777	1,273,866	9.0	-	39	56	291.8	455.0
J-586	488,780	1,273,865	9.0	-	39	56	291.8	455.0
J-587	494,007	1,269,175	8.9	-	35	37	255.9	271.6
J-588	493,999	1,269,170	8.9	-	35	37	255.9	271.6
J-589	493,967	1,269,189	8.9	-	35	37	255.9	271.6
J-590	493,974	1,269,183	8.9	-	35	37	255.9	271.6
J-591	488,783	1,281,318	8.6	-	47	56	371.9	461.2
J-592	488,780	1,281,319	8.6	-	47	56	371.9	461.2
J-593	491,112	1,278,913	9.0	-	47	56	368.6	459.2
J-594	491,112	1,278,916	9.0	-	47	56	369.1	459.4
J-595-TKMO end	495,512	1,266,417	8.9	6.2	34	37	250.2	271.2
J-596	494,997	1,267,284	8.9	3.3	35	37	252.4	271.4
J-597	492,055	1,279,338	9.3	-	46	56	362.2	454.4
J-598	491,633	1,278,715	8.9	-	47	56	368.9	460.1
J-599	493,151	1,280,946	9.0	-	25	25	156.6	156.6
J-600	490,273	1,275,386	9.0	-	46	56	360.3	456.5
J-601	492,441	1,274,623	8.0	-	45	56	357.0	469.0
J-602	488,775	1,281,319	8.6	-	47	56	371.9	461.2
J-603	491,959	1,278,783	8.4	-	46	56	362.8	461.5
J-604	492,454	1,274,619	8.0	-	45	56	356.9	469.0
J-605	491,184	1,280,855	9.8	-	47	56	362.1	450.2
J-606	493,706	1,270,930	8.0	-	40	56	310.4	465.5
J-607	492,892	1,278,132	9.0	-	44	56	337.8	455.0
J-608	492,895	1,278,127	9.0	-	44	56	337.8	455.0
J-609	489,814	1,278,752	7.1	-	46	56	381.3	475.5
J-610	489,151	1,278,688	6.1	-	46	56	389.8	485.1
J-611	489,152	1,278,682	6.1	-	46	56	389.8	485.1
J-612	488,788	1,281,315	8.6	-	47	56	371.9	461.2
J-613	479,652	1,274,773	10.0	-	42	55	315.5	442.9
J-614	493,730	1,270,931	8.9	-	36	37	264.8	272.2
J-615	494,176	1,269,711	8.9	-	36	37	264.8	272.2
J-616	494,248	1,269,710	8.9	-	36	37	264.8	272.2
J-617	492,187	1,274,569	8.5	-	45	56	352.6	464.1
J-618	492,190	1,274,564	8.5	-	45	56	352.6	464.1
J-619	489,812	1,278,764	7.1	-	46	56	381.2	475.5
J-620	491,943	1,277,457	8.5	-	46	56	368.5	463.4
J-621	491,953	1,277,457	8.5	-	46	56	368.5	463.4
J-622	491,093	1,281,378	9.6	-	47	56	364.9	452.6
J-623	491,093	1,281,385	9.6	-	47	56	364.9	452.6
J-624	488,944	1,276,604	9.0	-	46	56	363.3	457.0
J-625	489,377	1,277,017	7.0	-	46	56	383.3	476.7
J-626	489,381	1,277,011	7.0	-	46	56	383.3	476.7
J-627	491,255	1,278,116	9.1	-	46	56	364.6	457.8
J-628	491,261	1,278,117	9.1	-	46	56	364.6	457.8
J-629	487,794	1,279,157	9.0	-	47	56	367.6	457.2
J-630	489,151	1,278,694	6.1	-	43	55	359.9	482.0
J-631	488,955	1,272,150	8.9	-	45	56	356.5	456.7
J-632	488,405	1,270,633	8.9	-	45	56	355.3	456.5
J-633	488,615	1,269,327	8.9	-	45	56	355.3	456.5
J-634	488,204	1,268,596	8.9	-	45	56	355.3	456.5
J-635	488,163	1,268,531	8.9	-	45	56	355.3	456.5
J-637	477,552	1,273,989	11.1	-	42	55	300.8	431.8
J-638	478,910	1,276,437	11.0	-	42	55	305.6	433.0
J-639	478,701	1,276,426	11.0	-	42	55	305.6	433.0
J-640	478,610	1,276,448	11.0	-	42	55	305.6	433.0
J-641	478,542	1,276,534	11.0	-	42	55	305.6	433.0
J-642	478,103	1,276,884	11.0	-	42	55	305.6	433.0
J-643	476,745	1,276,729	11.0	1.0	42	55	305.5	432.9
J-644	491,247	1,278,115	9.1	-	46	56	364.6	457.8
J-645	492,049	1,279,345	9.3	-	46	56	362.3	454.4
J-646	478,956	1,278,572	11.0	-	42	55	305.6	433.0
J-647	489,190	1,278,333	6.2	-	46	56	388.8	484.1

Network Junction Indicators

Junction Name	Coordinate X (m)	Coordinate Y (m)	Ground Elevation (m)	Flow (l/s)	Minimum Hydraulic Grade (m)	Maximum Hydraulic Grade (m)	Minimum Pressure (kPa)	Maximum Pressure (kPa)
J-649	480,570	1,278,742	11.0	-	42	55	305.6	433.0
J-650	480,247	1,271,545	11.1	-	43	55	311.9	432.7
J-651	491,899	1,284,922	8.9	-	48	56	378.8	459.5
J-652	491,430	1,286,693	8.9	-	48	56	378.7	459.4
J-653	489,891	1,286,072	8.9	-	48	56	378.7	459.4
J-655	491,682	1,285,505	8.9	-	48	56	378.7	459.4
J-656	491,444	1,285,947	8.9	-	48	56	378.7	459.4
J-657	491,101	1,281,379	9.6	-	47	56	364.9	452.6
J-658	491,177	1,286,630	8.9	-	48	56	378.7	459.4
J-658a	494,231	1,269,793	8.0	-	36	56	275.4	469.0
J-659	490,702	1,287,706	8.9	-	48	56	378.7	459.4
J-659a	494,264	1,269,716	8.0	-	36	37	273.6	280.9
J-660	489,165	1,278,552	6.2	-	46	56	388.8	484.1
J-661	490,664	1,287,901	8.9	-	48	56	378.7	459.4
J-661a	494,245	1,269,793	8.0	-	36	37	273.8	280.9
J-662	494,188	1,269,825	8.9	-	36	56	268.4	460.4
J-662a	494,211	1,269,817	8.0	-	36	56	275.4	469.0
J-663	494,220	1,269,838	8.9	-	36	56	267.9	460.4
J-664	484,468	1,281,110	8.9	-	47	56	370.4	459.0
J-665	489,191	1,278,325	6.2	-	43	55	358.3	481.0
J-666	490,811	1,279,455	-	-	13	13	126.4	129.2
J-670	489,183	1,278,392	6.1	-	46	56	389.7	485.0
J-671	493,736	1,270,848	8.0	-	40	56	310.4	465.5
J-672	494,175	1,269,914	8.9	-	36	37	264.8	272.2
J-673	491,912	1,275,439	7.2	-	10	12	31.3	47.0
J-675	488,935	1,276,594	9.0	-	46	56	363.2	457.0
J-676	488,936	1,276,583	9.0	-	46	56	363.1	457.0
J-681	492,722	1,278,128	7.3	-	44	56	356.2	471.8
J-682	492,731	1,278,129	7.3	-	44	56	356.1	471.8
J-685	481,622	1,275,274	11.3	-	43	55	313.9	431.2
J-687	489,153	1,278,668	6.1	-	46	56	389.8	485.1
J-690	491,167	1,274,216	9.0	-	42	56	321.8	457.1
J-691	492,301	1,277,947	8.5	-	44	56	351.8	460.5
J-697	491,109	1,278,927	9.0	-	47	56	369.1	459.4
J-699	491,406	1,274,230	9.2	-	42	56	320.5	455.2
J-700	491,407	1,274,220	9.2	-	42	56	320.3	455.2
J-701	489,138	1,278,697	6.1	-	42	55	348.2	481.2
J-702	489,139	1,278,687	6.1	-	42	55	348.2	481.2
J-703	491,192	1,280,847	9.8	-	38	55	272.6	441.9
J-705	489,307	1,277,312	5.7	-	46	56	391.0	488.5
J-707	491,121	1,278,888	9.0	-	47	56	369.2	459.5
J-708	491,123	1,281,106	9.7	-	47	56	364.3	451.8
J-712	489,276	1,277,583	5.2	-	45	56	391.2	492.6
J-713	490,747	1,280,707	9.6	-	47	56	366.1	453.3
J-716	491,147	1,278,704	9.3	-	47	56	365.8	456.4
J-719	491,321	1,277,672	9.2	-	46	56	362.5	456.8
J-721	481,893	1,276,897	10.3	-	43	55	319.7	440.6
J-724	491,517	1,276,202	6.1	-	46	56	389.5	487.2
J-725	491,337	1,277,675	9.2	-	46	56	362.2	456.6
J-726	490,050	1,277,656	7.0	-	46	56	384.7	477.1
J-727	491,119	1,278,902	9.0	-	47	56	369.2	459.4
J-729	489,268	1,277,660	5.2	-	45	56	389.9	492.3
J-731	490,872	1,274,343	9.1	-	42	56	320.0	456.1
J-732	491,360	1,277,435	8.8	-	46	56	366.1	460.8
J-733	489,206	1,278,188	6.4	-	43	55	356.3	479.0
J-734	489,208	1,278,168	6.4	-	43	55	357.2	479.1
J-735	479,670	1,274,794	12.9	-	42	55	288.5	414.7
J-736	479,672	1,274,777	10.8	-	42	55	309.0	435.3
J-737	491,139	1,278,720	9.3	-	47	56	365.7	456.3
J-738	492,462	1,274,602	8.7	-	44	56	349.7	462.1
J-739	484,860	1,278,238	8.9	-	45	56	353.1	455.7
J-740	487,761	1,274,124	8.5	-	39	56	295.9	459.8
J-742	490,574	1,274,807	9.3	-	46	56	357.4	453.5

Network Junction Indicators

Junction Name	Coordinate X (m)	Coordinate Y (m)	Ground Elevation (m)	Flow (l/s)	Minimum Hydraulic Grade (m)	Maximum Hydraulic Grade (m)	Minimum Pressure (kPa)	Maximum Pressure (kPa)
J-743	489,229	1,277,988	5.6	-	44	55	372.7	487.4
J-744	489,118	1,278,988	9.5	-	46	56	357.8	452.0
J-745	492,331	1,279,151	9.5	-	46	56	354.0	451.1
J-747	489,135	1,280,744	7.4	-	47	56	384.4	473.3
J-748	489,148	1,280,723	8.8	-	47	56	370.7	459.6
J-749	492,062	1,277,846	8.5	-	45	56	357.7	461.1
J-750	492,085	1,277,854	8.5	-	45	56	357.1	461.0
J-751	491,805	1,278,750	8.8	-	47	56	369.9	461.0
J-752	491,830	1,278,754	8.8	-	46	56	358.9	457.6
J-755	492,083	1,281,162	9.6	-	48	56	374.5	454.0
J-756	481,885	1,275,603	11.6	-	43	55	305.5	427.8
J-758	492,694	1,278,119	7.3	-	44	56	356.7	471.8
J-759	492,272	1,279,284	9.5	-	46	56	356.1	451.5
J-760	489,149	1,280,691	6.7	-	47	56	391.3	480.2
J-762	490,834	1,280,727	9.6	-	47	56	365.0	452.8
J-763	490,861	1,280,706	10.4	-	47	56	357.1	444.9
J-765	491,366	1,275,890	3.6	-	46	56	412.0	511.2
J-767	489,814	1,276,026	6.4	-	46	56	386.1	482.0
J-769	481,638	1,275,310	11.0	-	43	55	309.3	433.5
J-770	493,449	1,271,553	8.8	2.7	40	56	307.3	458.0
J-774	485,882	1,277,689	7.8	-	46	56	368.9	467.1
J-775	485,883	1,277,642	8.1	-	46	56	365.9	464.2
J-776	492,152	1,274,550	8.5	-	44	56	351.7	464.0
J-778	479,516	1,275,533	12.8	-	42	55	288.1	415.5
J-779	482,166	1,274,531	9.8	-	43	55	328.6	445.8
J-780	482,199	1,274,504	8.4	-	43	55	342.4	459.6
J-782	492,799	1,273,398	8.5	-	42	56	330.2	462.4
J-783	489,124	1,281,628	6.4	-	47	56	393.3	482.7
J-784	489,144	1,281,673	6.7	-	47	56	390.3	479.7
J-785	492,487	1,274,555	8.2	-	44	56	353.9	466.9
J-786	482,393	1,274,413	9.6	-	43	55	331.1	447.8
J-788	489,112	1,278,899	8.2	-	42	55	327.5	460.6
J-789	492,959	1,274,581	8.6	-	44	56	345.4	462.5
J-794	491,899	1,278,769	8.4	-	46	56	362.8	461.5
J-797	489,996	1,277,611	7.2	-	47	56	385.2	476.9
J-799	481,971	1,274,694	9.5	-	43	55	331.5	448.8
J-802	490,992	1,275,880	4.8	-	46	56	399.2	499.0
J-803	490,926	1,275,879	5.1	-	46	56	396.1	496.0
J-805	492,733	1,273,573	8.3	-	43	56	334.3	464.5
J-806	485,887	1,277,751	8.0	-	46	56	366.9	465.2
J-807	491,474	1,274,255	9.2	-	42	56	322.9	455.4
J-809	492,017	1,279,411	10.1	-	46	56	354.5	446.6
J-810	490,815	1,274,393	9.2	-	42	56	318.8	455.1
J-811	488,844	1,281,362	7.2	-	47	56	385.6	474.9
J-812	492,983	1,274,503	8.6	-	44	56	344.2	462.4
J-813	492,547	1,274,394	8.6	-	44	56	347.5	462.8
J-814	490,757	1,280,700	9.6	-	47	56	365.1	452.8
J-817	492,576	1,274,228	8.5	-	44	56	346.1	463.5
J-821	492,444	1,278,812	9.3	-	46	56	354.8	452.9
J-822	492,407	1,278,890	9.3	-	46	56	354.9	452.9
J-824	479,658	1,274,775	11.4	-	42	55	301.8	429.2
J-825	479,634	1,274,906	12.7	-	42	55	289.1	416.5
J-826	492,151	1,279,351	9.3	-	46	56	360.6	453.9
J-828	492,608	1,273,939	8.6	-	43	56	338.9	462.1
J-830	489,424	1,276,104	9.4	-	46	56	357.3	452.7
J-831	488,852	1,281,228	8.7	-	47	56	371.1	460.3
J-832	492,691	1,277,472	9.2	-	44	56	338.1	453.2
J-834	490,114	1,277,548	7.0	-	46	56	384.7	477.1
J-835	490,052	1,277,643	7.0	-	46	56	384.7	477.1
J-838	481,878	1,274,771	10.6	-	43	55	320.8	438.0
J-840	488,850	1,276,529	11.1	-	46	56	342.6	436.4
J-841	485,897	1,277,877	8.0	-	46	56	367.0	465.2
J-842	480,594	1,274,951	11.0	-	42	55	307.1	433.3

Network Junction Indicators

Junction Name	Coordinate X (m)	Coordinate Y (m)	Ground Elevation (m)	Flow (l/s)	Minimum Hydraulic Grade (m)	Maximum Hydraulic Grade (m)	Minimum Pressure (kPa)	Maximum Pressure (kPa)
J-843	480,476	1,274,931	12.4	-	42	55	293.4	419.6
J-845	485,916	1,277,302	7.0	-	46	56	382.5	475.9
J-846	491,729	1,277,750	8.3	-	46	56	365.0	464.0
J-847	491,852	1,277,785	8.1	-	45	56	365.2	465.7
J-848	490,764	1,275,874	6.6	-	46	56	381.1	481.1
J-849	490,622	1,275,869	5.7	-	46	56	389.8	489.8
J-850	487,782	1,279,301	9.3	-	47	56	364.4	454.2
J-852	481,736	1,275,425	11.5	-	43	55	305.2	428.6
J-853	492,528	1,278,686	9.5	-	46	56	352.9	450.9
J-854	493,806	1,270,566	8.0	-	40	56	310.4	465.5
J-855	493,832	1,270,411	8.0	4.7	35	37	261.2	280.0
J-857	485,910	1,278,037	8.0	-	46	56	367.1	465.2
J-858	491,967	1,276,161	7.4	-	41	56	333.1	471.0
J-859	492,132	1,276,164	9.0	-	42	56	317.6	455.3
J-861	481,743	1,274,886	11.2	-	43	55	314.9	432.1
J-862	492,528	1,278,046	8.2	-	44	56	350.8	463.2
J-863	491,727	1,279,948	9.3	-	38	55	278.9	446.9
J-866	492,137	1,278,358	8.3	-	45	56	361.2	462.1
J-867	493,661	1,271,042	9.0	-	40	56	301.4	455.8
J-868	492,919	1,273,073	8.4	-	42	56	327.4	463.1
J-870	490,374	1,275,191	9.1	-	46	56	359.3	455.5
J-872	489,004	1,276,376	9.0	-	46	56	362.5	456.9
J-873	490,168	1,275,581	9.3	-	46	56	357.4	453.6
J-874	491,509	1,278,153	9.1	-	46	56	363.2	457.1
J-875	491,940	1,274,453	8.9	-	44	56	342.6	459.5
J-876	480,825	1,274,991	12.3	-	42	55	294.4	420.6
J-877	491,850	1,279,746	9.5	-	46	56	360.3	452.4
J-878	491,717	1,274,357	8.8	-	43	56	335.5	459.9
J-880	489,018	1,280,965	8.7	-	47	56	371.4	460.4
J-881	489,127	1,282,258	6.8	-	47	56	389.4	478.8
J-882	489,073	1,282,507	6.8	-	47	56	389.4	478.8
J-883	487,768	1,279,559	7.0	-	47	56	386.6	476.7
J-884	490,047	1,275,813	9.0	-	46	56	360.5	456.5
J-885	490,255	1,277,409	7.1	-	47	56	385.2	477.4
J-886	489,269	1,273,720	8.8	-	39	56	295.8	457.1
J-887	489,171	1,281,951	6.4	-	47	56	393.3	482.7
J-888	479,579	1,275,198	11.7	-	42	55	298.8	426.3
J-889	488,119	1,278,696	7.9	-	47	56	378.0	467.9
J-890	487,848	1,278,543	9.6	-	47	56	361.4	451.2
J-891	485,950	1,276,978	7.1	-	46	56	381.5	475.0
J-892	492,970	1,272,747	8.9	-	42	56	318.8	457.9
J-893	481,489	1,275,097	11.8	-	43	55	309.0	426.3
J-894	480,121	1,274,871	12.4	-	42	55	293.4	419.6
J-895	487,682	1,277,536	6.7	-	46	56	387.7	479.3
J-896	487,702	1,277,181	8.4	-	46	56	370.4	462.5
J-897	479,401	1,276,158	12.4	-	42	55	291.9	419.4
J-898	479,325	1,276,555	11.6	-	42	55	299.8	427.2
J-899	488,978	1,282,908	6.5	-	47	56	392.3	481.7
J-900	488,050	1,278,066	8.0	-	46	56	376.2	466.8
J-901	493,180	1,272,294	8.0	2.7	41	56	322.1	466.3
J-903	487,825	1,279,194	6.6	-	47	56	391.5	480.8
J-904	488,043	1,278,059	8.0	-	46	56	376.1	466.7
J-906	491,850	1,284,911	7.9	-	48	56	388.3	469.1
J-1243	488,775	1,280,311	7.0	-	47	56	388.3	477.2
J-1244	490,461	1,278,163	8.6	-	46	56	361.0	460.3
J-1246	488,944	1,276,615	9.0	-	46	56	363.3	457.0
J-1247	487,696	1,277,179	8.4	-	46	56	370.4	462.5
J-1250	490,716	1,284,107	9.1	-	47	56	366.2	456.1
J-1251	487,947	1,286,210	7.1	-	46	56	383.7	475.3
J-1252	487,948	1,286,213	7.1	-	46	56	383.7	475.3
J-1253	491,560	1,275,903	6.3	-	46	56	386.5	485.2
J-1254	487,854	1,278,507	9.6	-	47	56	361.4	451.3
J-1255	491,360	1,277,432	8.8	-	46	56	366.1	460.8

Network Junction Indicators

Junction Name	Coordinate X (m)	Coordinate Y (m)	Ground Elevation (m)	Flow (l/s)	Minimum Hydraulic Grade (m)	Maximum Hydraulic Grade (m)	Minimum Pressure (kPa)	Maximum Pressure (kPa)
J-1256	487,845	1,278,502	9.6	-	47	56	361.4	451.3
J-1258	492,219	1,278,843	7.9	-	46	56	368.2	466.5
J-1259	489,701	1,276,729	7.3	-	44	55	360.5	470.5
J-1260	489,697	1,276,724	7.3	-	44	55	360.5	470.5
J-1261	488,811	1,285,679	6.5	-	46	56	388.5	481.0
J-1263	490,440	1,277,409	6.8	-	45	56	376.5	476.8
J-1264	490,440	1,277,405	6.8	-	45	56	376.5	476.8
J-1266	491,119	1,278,141	8.1	-	46	56	370.3	466.0
J-1267	490,117	1,277,551	7.0	-	46	56	384.7	477.1
J-1268	487,953	1,286,210	7.1	-	46	56	383.7	475.3
J-1269	485,992	1,274,892	8.8	-	45	56	356.3	457.3
J-1270	485,992	1,274,888	8.8	-	45	56	356.3	457.3
J-1272	489,974	1,278,237	6.6	-	46	56	388.3	480.9
J-1273	483,978	1,278,050	9.6	-	44	55	337.8	448.3
J-1274	490,464	1,278,160	8.6	-	46	56	361.0	460.3
J-1276	489,788	1,278,249	6.7	-	46	56	385.7	479.5
J-1277	489,783	1,278,249	6.7	-	46	56	385.7	479.5
J-1280	492,385	1,282,834	9.6	-	48	56	372.6	452.9
J-1281	491,326	1,277,434	8.8	-	46	56	363.5	460.3
J-1282	491,332	1,277,433	8.8	-	46	56	363.5	460.3
J-1283	486,167	1,274,942	6.4	-	45	56	380.0	480.8
J-1284	486,166	1,274,955	6.4	-	45	56	380.0	480.8
J-1286	487,182	1,277,110	6.8	-	46	56	384.8	478.0
J-1287	489,978	1,277,621	7.2	-	46	56	382.4	475.0
J-1288	487,251	1,275,087	8.6	-	45	56	360.3	459.6
J-1289	487,251	1,275,081	8.6	-	45	56	360.3	459.6
J-1290	481,864	1,274,755	8.9	-	43	55	337.4	454.7
J-1291	481,860	1,274,751	8.9	-	43	55	337.4	454.7
J-1292	492,219	1,280,538	5.9	-	25	25	184.8	186.8
J-1293	492,410	1,280,631	5.9	-	25	25	185.3	186.8
J-1294	492,154	1,276,164	8.0	-	41	56	326.2	465.0
J-1297	486,879	1,275,046	7.4	-	45	56	371.0	471.2
J-1298	487,762	1,279,559	9.0	-	47	56	367.0	457.1
J-1299	489,804	1,278,751	7.1	-	46	56	381.2	475.5
J-1301	489,191	1,278,181	6.4	-	43	55	354.3	478.9
J-1302	484,654	1,274,708	9.5	-	45	56	344.9	449.9
J-1303	484,653	1,274,701	9.5	-	45	56	344.8	449.9
J-1304	489,317	1,276,978	7.0	-	46	56	383.0	476.6
J-1305	486,879	1,275,016	5.4	-	45	56	390.6	490.7
J-1306	492,369	1,282,839	9.6	-	48	56	372.6	452.9
J-1307	490,336	1,278,758	8.8	-	46	56	366.4	459.2
J-1309	490,756	1,280,708	9.6	-	47	56	365.3	453.0
J-1310	487,943	1,286,203	7.1	-	46	56	383.7	475.3
J-1311	489,800	1,278,899	7.4	-	46	56	378.4	472.5
J-1312	490,065	1,277,682	7.0	-	47	56	387.7	479.1
J-1313	490,060	1,277,676	7.0	-	47	56	387.7	479.1
J-1316	490,857	1,278,143	7.9	-	46	56	369.0	467.3
J-1318	491,109	1,281,380	9.6	-	47	56	364.9	452.6
J-1319	490,061	1,277,598	7.2	-	47	56	385.6	477.1
J-1322	485,924	1,278,232	9.8	-	46	56	349.5	447.6
J-1323	488,937	1,276,621	9.0	-	46	56	363.3	457.0
J-1324	488,929	1,276,622	9.0	-	46	56	363.2	457.0
J-1325	489,132	1,278,679	6.1	-	42	55	348.2	481.2
J-1326	489,140	1,278,680	6.1	-	42	55	348.3	481.2
J-1329	485,927	1,278,523	8.1	-	46	56	366.0	464.2
J-1330	489,125	1,278,674	6.1	-	42	55	348.2	481.2
J-1336	482,744	1,274,472	8.1	-	44	55	346.9	462.6
J-1338	489,368	1,276,998	7.0	-	46	56	383.0	476.7
J-1339	490,810	1,281,052	9.5	-	47	56	364.6	453.1
J-1341	485,719	1,274,877	6.2	-	45	56	381.4	482.7
J-1342	485,718	1,274,886	6.2	-	45	56	381.4	482.7
J-1343	490,757	1,278,417	7.9	-	46	56	371.2	467.2
J-1344	490,750	1,278,411	7.9	-	46	56	371.2	467.2

Network Junction Indicators

Junction Name	Coordinate X (m)	Coordinate Y (m)	Ground Elevation (m)	Flow (l/s)	Minimum Hydraulic Grade (m)	Maximum Hydraulic Grade (m)	Minimum Pressure (kPa)	Maximum Pressure (kPa)
J-1345	487,854	1,278,516	9.6	-	41	55	309.7	446.6
J-1346	488,209	1,279,646	7.2	-	47	56	385.6	474.9
J-1347	487,714	1,274,321	6.7	-	45	56	379.2	478.3
J-1348	488,782	1,280,318	7.0	-	47	56	388.3	477.2
J-1349	489,442	1,278,213	6.5	-	46	56	387.2	481.4
J-1351	491,132	1,278,714	9.3	-	47	56	365.4	456.2
J-1354	486,168	1,274,932	7.0	-	45	56	374.1	474.9
J-1355	489,489	1,278,717	6.7	-	46	56	384.6	479.3
J-1356	489,320	1,278,700	6.7	-	46	56	384.3	479.2
J-1358	490,842	1,278,888	8.9	-	47	56	367.7	459.2
J-1359	489,657	1,278,735	6.7	-	46	56	384.9	479.3
J-1360	489,388	1,277,028	7.0	-	46	56	383.3	476.7
J-1361	489,326	1,276,986	7.0	-	46	56	382.6	476.5
J-1363	490,621	1,278,309	7.6	-	46	56	374.0	470.1
J-1365	489,780	1,277,430	6.9	-	46	56	385.1	477.8
J-1367	491,283	1,279,035	8.8	-	47	56	368.7	460.5
J-1368	491,285	1,279,024	8.8	-	47	56	368.7	460.5
J-1369	484,867	1,277,877	8.2	-	45	56	359.6	462.5
J-1372	490,844	1,278,874	8.9	-	46	56	361.8	457.5
J-1375	487,980	1,275,634	9.0	-	46	56	360.0	456.4
J-1377	484,072	1,274,664	7.5	-	44	55	360.5	469.1
J-1379	491,412	1,276,905	6.2	-	46	56	389.6	486.1
J-1381	489,565	1,277,220	7.1	-	46	56	383.1	475.8
J-1382	491,307	1,278,871	9.0	-	47	56	366.9	458.6
J-1383	491,309	1,278,859	9.0	-	47	56	367.0	458.6
J-1384	489,163	1,278,684	6.1	-	46	56	389.9	485.1
J-1385	491,645	1,275,504	6.5	-	46	56	382.1	484.2
J-1386	491,483	1,276,591	6.1	-	46	56	390.1	487.2
J-1387	490,330	1,278,800	8.8	-	46	56	366.4	459.2
J-1393	490,952	1,278,556	7.9	-	45	56	366.0	466.8
J-1395	489,789	1,277,439	6.9	-	46	56	385.1	477.8
J-1396	487,269	1,275,717	6.4	-	45	56	380.8	481.0
J-1397	487,280	1,275,710	7.2	-	45	56	372.9	473.1
J-1398	484,614	1,274,736	8.2	-	45	56	357.2	462.5
J-1399	484,618	1,274,749	9.0	-	45	56	349.3	454.7
J-1400	491,459	1,276,586	6.1	-	46	56	389.5	486.9
J-1405	488,103	1,275,766	8.8	-	46	56	362.6	458.5
J-1408	488,805	1,285,667	6.5	-	46	56	388.5	481.0
J-1410	483,168	1,274,506	9.0	-	44	55	340.0	454.0
J-1412	491,080	1,281,390	9.6	-	47	56	364.9	452.6
J-1414	491,262	1,277,904	9.1	-	46	56	363.2	457.8
J-1415	491,265	1,277,889	9.1	-	46	56	363.2	457.8
J-1416	490,669	1,278,850	8.9	-	46	56	361.8	457.5
J-1417	490,654	1,278,847	8.9	-	46	56	361.8	457.5
J-1418	491,339	1,278,661	8.8	-	47	56	369.9	461.1
J-1419	491,543	1,276,180	6.1	-	46	56	389.0	487.1
J-1420	490,770	1,278,426	7.9	-	46	56	371.2	467.2
J-1422	490,470	1,278,175	8.6	-	46	56	360.8	460.3
J-1424	490,842	1,278,150	7.9	-	46	56	369.0	467.3
J-1426	491,054	1,278,639	8.1	-	45	56	363.9	464.8
J-1427	491,625	1,275,468	6.5	-	45	56	380.9	484.0
J-1428	490,599	1,278,292	7.6	-	46	56	373.9	470.1
J-1429	490,384	1,281,206	6.4	-	47	56	392.6	482.5
J-1432	492,492	1,274,614	8.7	-	44	56	349.5	462.1
J-1433	491,242	1,278,119	9.1	-	46	56	365.1	458.0
J-1434	491,081	1,278,674	8.1	-	47	56	375.8	467.2
J-1436	491,227	1,278,141	9.1	-	46	56	363.5	457.2
J-1438	489,684	1,276,707	7.3	-	46	56	377.0	473.7
J-1440	488,977	1,285,982	9.5	-	46	56	360.6	451.9
J-1441	490,619	1,276,134	5.7	-	46	56	392.0	490.8
J-1442	490,618	1,276,111	5.7	-	46	56	389.9	489.6
J-1443	490,803	1,281,424	7.6	-	47	56	384.1	472.0
J-1445	489,800	1,278,902	7.4	-	42	55	335.9	468.5

Network Junction Indicators

Junction Name	Coordinate X (m)	Coordinate Y (m)	Ground Elevation (m)	Flow (l/s)	Minimum Hydraulic Grade (m)	Maximum Hydraulic Grade (m)	Minimum Pressure (kPa)	Maximum Pressure (kPa)
J-1447	490,463	1,278,184	8.6	-	46	56	364.2	460.3
J-1448	492,131	1,276,141	9.2	-	42	56	317.3	453.5
J-1449	488,922	1,276,599	9.0	-	46	56	363.2	457.0
J-1451	491,381	1,275,063	3.6	-	42	56	374.5	509.5
J-1452	491,356	1,275,061	3.6	-	42	56	373.7	509.4
J-1454	488,908	1,276,581	9.0	-	46	56	363.2	457.0
J-1455	490,573	1,276,134	5.7	-	44	55	375.0	486.0
J-1456	491,794	1,279,271	9.3	-	46	56	361.7	454.1
J-1458	490,857	1,278,106	7.5	-	46	56	372.8	471.2
J-1459	490,825	1,280,929	9.7	-	47	56	363.1	451.4
J-1460	490,821	1,280,957	9.7	-	47	56	363.0	451.3
J-1461	491,261	1,279,221	9.0	-	47	56	366.7	458.5
J-1462	491,264	1,279,192	9.0	-	47	56	366.7	458.5
J-1463	491,314	1,278,829	9.0	-	47	56	367.1	458.7
J-1465	488,749	1,276,602	3.8	-	46	56	412.7	507.6
J-1467	491,074	1,278,921	8.6	-	47	56	372.5	463.1
J-1477	490,300	1,278,797	7.1	-	46	56	383.1	475.8
J-1481	484,851	1,277,798	8.1	-	45	56	360.5	463.5
J-1482	484,809	1,277,731	8.1	-	45	56	360.4	463.5
J-1483	490,805	1,278,151	7.8	-	46	56	369.8	468.3
J-1484	491,136	1,278,759	9.3	-	47	56	365.7	456.3
J-1488	492,782	1,279,551	8.9	-	25	25	154.7	157.4
J-1489	491,523	1,276,162	6.1	-	46	56	389.4	487.2
J-1492	490,414	1,278,256	8.5	-	46	56	371.1	463.0
J-1493	490,419	1,278,215	8.5	-	46	56	371.2	463.0
J-1495	484,813	1,277,584	8.1	-	45	56	360.2	463.5
J-1496	484,818	1,277,540	8.3	-	45	56	358.2	461.5
J-1497	490,181	1,281,300	6.0	-	47	56	396.1	486.4
J-1498	490,137	1,281,302	5.9	-	47	56	397.1	487.4
J-1500	487,647	1,277,168	7.0	-	46	56	383.9	476.2
J-1503	491,315	1,277,545	9.2	-	46	56	362.2	456.9
J-1506	491,292	1,277,699	9.2	-	46	56	362.2	456.9
J-1510	490,963	1,278,142	7.9	-	46	56	370.2	467.6
J-1512	484,865	1,277,943	8.4	-	45	56	357.7	460.6
J-1514	489,153	1,281,409	6.1	-	47	56	396.2	485.6
J-1515	489,201	1,281,378	6.2	-	47	56	395.2	484.6
J-1516	490,597	1,278,840	8.9	-	46	56	361.8	457.5
J-1518	491,153	1,278,642	8.9	-	46	56	364.1	458.5
J-1519	485,882	1,279,393	6.9	-	46	56	384.7	477.1
J-1520	485,880	1,279,456	6.1	-	46	56	392.6	485.0
J-1521	491,241	1,278,034	9.0	-	46	56	364.2	458.8
J-1522	491,250	1,277,971	9.1	-	46	56	363.2	457.8
J-1523	491,210	1,278,256	9.4	-	46	56	359.9	453.9
J-1524	485,906	1,278,958	7.7	-	46	56	369.5	468.0
J-1525	485,903	1,279,021	7.5	-	46	56	378.8	471.3
J-1527	491,784	1,274,832	4.9	-	45	56	396.1	500.1
J-1528	484,803	1,277,665	8.2	-	45	56	359.3	462.5
J-1531	491,273	1,279,103	8.8	-	47	56	368.7	460.5
J-1534	492,117	1,278,818	8.3	-	46	56	364.1	462.6
J-1535	491,582	1,279,064	8.8	-	47	56	369.2	460.7
J-1536	491,594	1,278,993	8.9	-	47	56	368.3	459.8
J-1537	491,605	1,278,921	8.9	-	47	56	368.5	459.9
J-1538	491,295	1,278,952	8.8	-	47	56	368.8	460.5
J-1540	487,289	1,276,040	7.3	-	45	56	371.4	472.1
J-1541	485,875	1,279,570	6.9	-	46	56	384.8	477.1
J-1542	492,283	1,275,097	8.7	-	45	56	358.1	463.9
J-1543	491,448	1,276,154	6.0	-	46	56	390.3	488.1
J-1544	491,884	1,279,006	8.7	-	46	56	361.5	458.9
J-1546	491,335	1,276,898	5.9	-	46	56	391.8	488.6
J-1547	489,895	1,278,258	6.7	-	46	56	387.4	479.9
J-1548	491,022	1,278,913	8.6	-	47	56	371.7	462.7
J-1549	490,944	1,278,902	8.5	-	47	56	372.2	463.4
J-1550	491,858	1,279,081	8.8	-	46	56	361.7	458.1

Network Junction Indicators

Junction Name	Coordinate X (m)	Coordinate Y (m)	Ground Elevation (m)	Flow (l/s)	Minimum Hydraulic Grade (m)	Maximum Hydraulic Grade (m)	Minimum Pressure (kPa)	Maximum Pressure (kPa)
J-1552	491,326	1,278,749	9.0	-	47	56	367.5	458.9
J-1553	492,166	1,275,553	9.1	-	45	56	355.7	461.0
J-1554	492,150	1,275,634	9.0	-	45	56	356.7	461.9
J-1555	491,571	1,279,147	8.9	-	47	56	368.0	459.7
J-1557	483,994	1,278,458	9.3	-	44	55	334.7	450.8
J-1560	490,567	1,278,847	9.1	-	46	56	364.5	456.7
J-1562	485,892	1,279,210	7.6	-	46	56	377.8	470.3
J-1563	485,888	1,279,301	7.4	-	46	56	379.8	472.2
J-1564	485,923	1,278,615	8.1	-	46	56	365.9	464.2
J-1565	492,224	1,275,254	8.7	-	45	56	358.7	464.2
J-1566	489,497	1,277,158	7.1	-	46	56	383.1	475.8
J-1567	490,810	1,281,064	8.7	-	47	56	373.3	461.2
J-1569	492,610	1,274,132	8.4	-	44	56	344.0	464.2
J-1571	489,848	1,277,722	6.5	-	46	56	388.4	481.6
J-1573	490,915	1,281,426	9.1	-	47	56	369.6	457.4
J-1574	487,904	1,278,401	8.5	-	47	56	372.1	462.0
J-1575	491,349	1,277,317	6.2	-	46	56	388.8	485.6
J-1578	492,417	1,274,638	9.0	-	45	56	354.4	460.1
J-1579	489,891	1,277,538	7.0	-	46	56	384.2	476.9
J-1580	491,647	1,275,348	6.2	-	45	56	378.5	486.3
J-1582	491,550	1,276,136	6.1	-	46	56	387.7	486.8
J-1584	493,727	1,270,938	9.8	-	40	56	292.4	447.9
J-1585	491,926	1,275,509	6.2	-	46	56	384.9	489.9
J-1586	490,341	1,278,041	8.6	-	46	56	370.3	462.1
J-1590	491,919	1,274,691	6.0	-	45	56	384.9	489.4
J-1591	490,865	1,277,895	6.9	-	46	56	378.4	477.1
J-1592	491,370	1,277,184	6.1	-	46	56	390.2	486.9
J-1595	490,151	1,277,802	7.0	-	46	56	385.7	477.6
J-1596	489,674	1,277,326	7.0	-	46	56	384.1	476.8
J-1597	490,661	1,278,150	7.4	-	46	56	373.3	472.1
J-1598	491,589	1,275,881	6.3	-	46	56	384.0	486.1
J-1602	489,504	1,277,684	5.4	-	46	56	398.3	492.2
J-1603	489,697	1,277,707	6.4	-	46	56	389.1	482.5
J-1606	491,598	1,275,644	6.5	-	46	56	384.4	483.2
J-1607	491,665	1,275,352	6.2	-	46	56	384.6	487.2
J-1609	491,054	1,276,564	5.8	-	45	56	384.9	488.7
J-1610	491,208	1,276,568	5.5	-	46	56	391.2	491.9
J-1614	483,981	1,278,212	9.8	-	44	55	332.9	446.1
J-1615	491,682	1,275,105	6.1	-	44	56	366.2	486.2
J-1616	491,712	1,274,944	5.9	-	43	56	366.9	488.0
J-1617	490,242	1,276,252	5.8	-	46	56	389.0	488.4
J-1619	491,776	1,277,447	8.4	-	46	56	370.0	464.9
J-1620	491,943	1,277,451	8.5	-	46	56	368.5	463.4
J-1621	491,609	1,277,442	8.4	-	46	56	369.5	464.3
J-1622	487,595	1,279,535	7.1	-	46	56	385.0	475.6
J-1624	491,721	1,274,999	6.0	-	45	56	385.8	489.3
J-1625	492,293	1,280,216	8.6	-	25	25	157.9	160.3
J-1628	489,532	1,276,830	7.0	-	46	56	380.9	476.6
J-1631	490,841	1,276,885	5.1	-	46	56	396.5	495.7
J-1632	491,044	1,276,891	5.1	-	46	56	396.8	495.8
J-1634	490,376	1,278,508	8.9	-	46	56	366.2	458.6
J-1636	492,157	1,277,439	8.4	-	46	56	369.2	464.2
J-1637	487,125	1,279,470	6.0	-	46	56	394.0	486.0
J-1639	487,343	1,279,501	3.7	-	46	56	417.3	508.7
J-1640	492,786	1,273,496	8.7	-	43	56	331.1	460.6
J-1642	490,341	1,278,814	8.8	-	46	56	367.0	459.4
J-1643	489,864	1,276,559	6.4	-	46	56	384.7	482.5
J-1644	489,880	1,276,575	6.4	-	44	55	368.9	479.2
J-1645	490,607	1,276,551	5.4	-	45	56	384.0	492.3
J-1646	490,598	1,276,877	7.3	-	46	56	374.5	474.1
J-1647	491,446	1,276,833	6.2	-	46	56	391.4	486.1
J-1649	489,887	1,281,302	5.8	-	47	56	398.1	488.4
J-1650	484,077	1,279,264	8.3	-	43	55	343.6	460.5

Network Junction Indicators

Junction Name	Coordinate X (m)	Coordinate Y (m)	Ground Elevation (m)	Flow (l/s)	Minimum Hydraulic Grade (m)	Maximum Hydraulic Grade (m)	Minimum Pressure (kPa)	Maximum Pressure (kPa)
J-1651	484,063	1,279,516	8.9	-	43	55	337.7	454.6
J-1652	491,405	1,277,113	6.0	-	46	56	393.2	487.9
J-1656	487,975	1,276,824	8.6	-	46	56	364.6	460.5
J-1658	486,592	1,279,397	6.4	-	46	56	389.4	482.0
J-1661	492,174	1,274,581	8.5	-	43	56	339.4	462.4
J-1666	488,493	1,279,979	7.1	-	47	56	387.3	476.2
J-1669	489,719	1,281,380	5.8	-	47	56	399.2	488.5
J-1670	484,890	1,276,867	7.3	-	45	56	367.9	471.3
J-2103	484,617	1,274,736	9.0	-	45	56	349.3	454.7
J-2104	491,313	1,279,460	8.6	-	47	56	371.9	462.2
J-2109	490,358	1,284,057	9.4	-	47	56	363.3	453.2
J-2111	492,858	1,275,231	8.4	-	44	56	348.6	464.6
J-2113	484,069	1,274,664	7.5	-	44	55	360.5	469.1
J-2114	484,619	1,274,740	9.0	-	45	56	349.3	454.7
J-2116	491,630	1,277,287	6.0	-	46	56	393.2	488.0
J-2117	485,927	1,278,225	9.8	-	46	56	349.5	447.6
J-2119	484,907	1,274,745	8.5	-	45	56	357.8	459.9
J-2120	491,652	1,277,150	5.7	-	46	56	396.0	490.8
J-2121	491,653	1,277,146	5.7	-	46	56	396.0	490.8
J-2122	483,164	1,274,508	9.0	-	44	55	340.0	454.0
J-2123	492,867	1,274,896	8.5	-	44	56	348.7	463.7
J-2125	487,761	1,274,128	8.5	-	39	56	295.8	459.8
J-2126	483,449	1,278,362	7.9	-	44	55	348.6	464.5
J-2127	483,445	1,278,362	7.9	-	44	55	348.6	464.5
J-2128	484,659	1,274,708	9.5	-	45	56	344.9	449.9
J-2129	484,659	1,274,713	9.5	-	45	56	344.9	449.9
J-2130	483,169	1,274,509	9.0	-	44	55	340.0	454.0
J-2133	491,777	1,277,441	8.4	-	46	56	370.0	464.9
J-2136	490,578	1,274,809	9.3	-	38	55	282.7	451.2
J-2137	487,247	1,275,083	8.6	-	45	56	360.2	459.6
J-2138	482,157	1,274,525	9.8	-	43	55	328.6	445.8
J-2140	491,906	1,276,569	5.9	-	46	56	390.7	488.6
J-2141	482,742	1,274,467	7.9	-	44	55	348.8	464.6
J-2146	492,854	1,275,095	8.6	-	44	56	347.1	462.7
J-2147	491,723	1,276,627	5.6	-	46	56	393.7	491.5
J-2148	491,729	1,276,628	5.6	-	46	56	393.7	491.5
J-2149	485,725	1,274,874	8.6	-	45	56	358.0	459.2
J-2150	483,974	1,278,046	9.6	-	44	55	337.7	448.3
J-2153	485,996	1,274,897	8.8	-	45	56	356.3	457.3
J-2155	488,941	1,276,584	9.0	-	46	56	363.0	457.0
J-2156	492,133	1,276,188	9.0	-	46	56	360.4	458.2
J-2157	492,089	1,281,166	9.6	-	48	56	374.5	454.0
J-2158	486,172	1,274,937	7.0	-	45	56	374.1	474.9
J-2159	491,742	1,276,630	5.6	-	46	56	393.7	491.5
J-2160	490,647	1,274,886	5.3	-	38	55	321.8	490.3
J-2161	490,647	1,274,879	5.3	-	38	55	321.8	490.3
J-2162	491,412	1,277,114	6.0	-	46	56	393.2	487.9
J-2164	488,947	1,278,155	6.3	-	41	55	342.5	478.9
J-2165	488,189	1,278,074	6.5	-	38	55	312.0	475.0
J-2167	491,644	1,277,149	5.7	-	46	56	396.0	490.8
J-2168	486,883	1,275,032	8.8	-	45	56	357.3	457.5
J-2169	491,860	1,276,890	5.7	-	46	56	395.7	490.7
J-2171	488,431	1,278,100	6.5	-	39	55	314.3	475.1
J-2172	481,873	1,274,759	10.6	-	43	55	320.8	438.0
J-2174	488,459	1,278,103	6.5	-	39	55	315.2	475.2
J-2177	490,124	1,275,855	6.0	-	46	56	386.4	486.8
J-2179	490,338	1,281,614	5.9	-	46	56	396.8	487.3
J-2180	490,336	1,281,625	5.9	-	46	56	396.8	487.3
J-2182	488,694	1,278,128	6.5	-	40	55	327.4	476.1
J-2184	487,751	1,280,373	7.4	-	43	55	350.8	469.2
J-2186	484,614	1,274,722	8.2	-	45	56	357.1	462.5
J-2187	491,480	1,279,133	8.7	-	47	56	369.8	461.5
J-2188	491,465	1,279,131	8.7	-	47	56	369.8	461.5

Network Junction Indicators

Junction Name	Coordinate X (m)	Coordinate Y (m)	Ground Elevation (m)	Flow (l/s)	Minimum Hydraulic Grade (m)	Maximum Hydraulic Grade (m)	Minimum Pressure (kPa)	Maximum Pressure (kPa)
J-2189	491,500	1,278,888	8.8	-	47	56	369.0	460.6
J-2190	491,515	1,278,890	8.8	-	47	56	369.0	460.6
J-2191	491,494	1,279,049	8.8	-	47	56	368.9	460.6
J-2192	491,491	1,279,065	8.8	-	47	56	368.9	460.6
J-2193	491,513	1,278,906	8.8	-	47	56	369.0	460.6
J-2194	484,069	1,274,647	8.2	-	44	55	353.8	462.3
J-2195	491,474	1,279,062	8.8	-	47	56	368.8	460.6
J-2196	480,784	1,275,550	11.1	-	42	55	300.7	432.0
J-2197	480,801	1,275,553	11.1	-	42	55	300.5	431.9
J-2202	489,324	1,277,013	7.0	-	46	56	381.7	476.4
J-2204	490,476	1,284,073	7.0	-	47	56	386.8	476.6
J-2211	480,276	1,275,725	11.6	-	41	55	288.8	426.6
J-2215	490,677	1,274,860	5.3	-	38	55	321.8	490.3
J-2219	491,485	1,279,098	8.7	-	47	56	369.8	461.5
J-2221	489,377	1,276,578	7.5	-	46	56	372.9	470.8
J-2223	490,746	1,279,911	6.9	-	47	56	388.6	477.8
J-2225	491,960	1,279,674	9.6	-	46	56	359.3	451.5
J-2228	491,140	1,278,881	9.2	-	47	56	364.7	456.5
J-2229	491,146	1,278,845	9.2	-	47	56	364.7	456.5
J-2230	488,078	1,275,738	8.8	-	46	56	362.6	458.5
J-2232	487,754	1,278,474	7.4	-	46	56	381.7	472.6
J-2233	487,722	1,278,452	9.9	-	46	56	357.1	448.1
J-2236	490,615	1,274,830	5.6	-	38	55	318.9	487.4
J-2237	492,720	1,277,918	7.7	-	44	56	352.0	467.8
J-2238	492,720	1,277,877	7.9	-	44	56	350.1	465.9
J-2242	488,552	1,280,587	7.0	-	45	56	369.7	474.2
J-2243	491,115	1,279,044	9.1	-	47	56	365.7	457.5
J-2244	491,123	1,279,002	9.3	-	47	56	363.7	455.6
J-2245	488,048	1,275,706	9.1	-	46	56	359.7	455.5
J-2246	491,121	1,282,504	9.8	-	47	56	360.4	449.4
J-2247	491,122	1,282,457	9.8	-	47	56	360.4	449.4
J-2249	490,334	1,281,707	5.8	-	46	56	397.7	488.3
J-2250	490,330	1,281,756	5.9	-	46	56	396.7	487.3
J-2253	490,765	1,279,792	6.8	-	47	56	389.6	478.8
J-2254	490,400	1,280,515	6.4	-	47	56	394.0	483.0
J-2255	490,380	1,280,562	6.4	-	47	56	394.1	483.0
J-2257	489,772	1,280,428	5.1	-	47	56	406.6	495.6
J-2258	489,724	1,280,445	4.6	-	47	56	411.4	500.5
J-2260	492,017	1,279,607	9.7	-	46	56	358.3	450.5
J-2261	490,794	1,274,926	4.4	-	39	55	334.6	499.4
J-2264	490,660	1,284,097	8.6	-	47	56	371.1	461.0
J-2265	487,679	1,278,419	9.6	-	46	56	359.8	451.0
J-2269	491,109	1,281,917	9.7	-	47	56	361.8	450.6
J-2270	491,785	1,277,386	6.6	-	46	56	387.1	482.0
J-2276	490,646	1,274,963	5.4	-	38	55	320.9	489.3
J-2277	489,631	1,277,258	7.1	-	46	56	382.3	475.7
J-2279	490,633	1,275,502	5.7	-	46	56	389.8	489.8
J-2285	490,619	1,276,053	6.1	-	46	56	385.9	485.7
J-2287	487,291	1,276,120	7.2	-	46	56	381.3	474.1
J-2290	490,636	1,275,384	5.6	-	38	55	318.9	487.4
J-2295	491,504	1,278,967	9.0	-	47	56	367.0	458.6
J-2296	488,164	1,275,830	9.0	-	46	56	360.1	456.4
J-2297	488,207	1,275,874	8.8	-	46	56	361.6	458.3
J-2298	491,670	1,277,012	5.2	-	46	56	401.0	495.8
J-2299	489,499	1,277,129	7.1	-	46	56	382.3	475.7
J-2302	487,104	1,278,265	7.9	-	46	56	373.6	467.1
J-2303	487,039	1,278,262	7.7	-	46	56	375.2	469.0
J-2304	491,743	1,279,612	8.9	-	46	56	366.3	458.3
J-2305	492,220	1,277,098	8.9	-	46	56	364.5	459.5
J-2309	491,797	1,276,218	6.1	-	46	56	388.8	486.6
J-2311	491,784	1,279,307	9.3	-	46	56	362.6	454.6
J-2313	491,640	1,277,221	6.0	-	46	56	393.2	488.0
J-2314	491,346	1,279,243	9.2	-	47	56	365.8	456.3

Network Junction Indicators

Junction Name	Coordinate X (m)	Coordinate Y (m)	Ground Elevation (m)	Flow (l/s)	Minimum Hydraulic Grade (m)	Maximum Hydraulic Grade (m)	Minimum Pressure (kPa)	Maximum Pressure (kPa)
J-2317	491,827	1,277,104	5.7	-	46	56	395.7	490.7
J-2323	491,620	1,277,360	6.6	-	46	56	387.8	482.6
J-2325	491,931	1,276,395	6.4	-	41	56	342.6	480.8
J-2326	490,572	1,283,251	8.6	-	47	56	371.1	461.0
J-2327	490,642	1,283,259	9.1	-	47	56	366.3	456.1
J-2329	491,805	1,277,243	6.0	-	46	56	392.4	487.4
J-2330	492,231	1,277,234	9.0	-	46	56	363.5	458.5
J-2331	487,999	1,275,654	9.0	-	46	56	360.7	456.5
J-2332	491,124	1,282,386	9.3	-	47	56	365.3	454.3
J-2336	490,368	1,281,362	6.4	-	47	56	392.2	482.5
J-2338	492,194	1,277,372	8.9	-	46	56	364.5	459.5
J-2339	491,567	1,279,075	8.8	-	47	56	368.9	460.6
J-2340	491,558	1,276,603	6.1	-	46	56	389.7	487.0
J-2341	491,610	1,277,437	8.4	-	46	56	369.5	464.3
J-2342	491,871	1,276,813	5.7	-	46	56	395.7	490.7
J-2344	491,694	1,276,866	5.6	-	46	56	397.1	491.9
J-2348	489,134	1,276,776	7.6	-	46	56	374.4	470.2
J-2349	489,194	1,276,723	7.2	-	46	56	377.6	474.0
J-2351	492,100	1,279,503	10.4	-	46	56	351.5	443.6
J-2352	492,045	1,276,758	6.6	-	46	56	383.9	481.7
J-2353	492,057	1,276,677	6.7	-	46	56	382.9	480.7
J-2355	492,198	1,276,876	8.8	-	46	56	365.5	460.5
J-2356	491,920	1,276,481	6.3	-	46	56	386.8	484.6
J-2357	491,894	1,276,652	6.0	-	46	56	389.7	487.6
J-2358	490,621	1,284,288	9.2	-	47	56	365.2	455.1
J-2359	490,658	1,284,213	9.2	-	47	56	365.2	455.1
J-2360	490,504	1,284,516	9.0	-	47	56	367.2	457.1
J-2361	490,458	1,284,586	9.3	-	47	56	364.3	454.1
J-2362	491,107	1,281,833	9.1	-	47	56	368.0	456.6
J-2365	491,760	1,276,458	5.8	-	46	56	391.7	489.5
J-2367	492,181	1,276,695	8.4	-	46	56	366.3	464.1
J-2368	489,106	1,278,173	6.6	-	42	55	347.8	476.6
J-2369	483,640	1,278,373	7.8	-	44	55	349.6	465.5
J-2370	487,677	1,274,540	8.6	-	39	56	293.5	458.8
J-2371	487,763	1,274,540	8.4	-	39	56	295.2	460.7
J-2373	486,856	1,278,197	9.7	-	46	56	354.8	449.3
J-2374	486,768	1,278,187	9.7	-	46	56	354.4	449.2
J-2376	487,743	1,274,217	8.0	-	39	56	300.5	464.7
J-2382	490,793	1,283,908	9.4	-	47	56	363.4	453.2
J-2383	490,829	1,283,818	9.4	-	47	56	363.5	453.2
J-2384	486,943	1,278,237	9.7	-	46	56	355.2	449.4
J-2385	490,575	1,284,377	9.4	-	47	56	363.3	453.2
J-2386	490,866	1,283,723	9.3	-	47	56	364.6	454.2
J-2387	490,751	1,284,012	9.4	-	47	56	363.4	453.2
J-2388	487,729	1,280,478	9.1	-	47	56	366.0	456.1
J-2389	487,780	1,280,567	9.2	-	47	56	365.0	455.1
J-2393	486,963	1,278,221	9.7	-	46	56	355.3	449.4
J-2394	490,408	1,275,864	5.6	-	46	56	390.5	490.7
J-2396	490,910	1,283,622	9.3	-	47	56	364.6	454.2
J-2397	490,522	1,280,232	6.1	-	47	56	396.4	485.7
J-2399	490,951	1,283,517	9.2	-	47	56	365.7	455.2
J-2400	487,720	1,280,364	5.4	-	47	56	402.2	492.3
J-2401	490,733	1,280,033	6.9	-	47	56	388.6	477.8
J-2403	488,386	1,278,595	6.3	-	41	55	342.0	478.9
J-2404	488,640	1,278,622	6.2	-	41	55	343.9	479.9
J-2405	484,988	1,278,231	9.9	-	45	56	344.4	446.0
J-2406	491,970	1,281,119	9.5	-	48	56	375.0	454.5
J-2409	488,335	1,276,007	9.3	-	46	56	355.4	453.2
J-2410	488,427	1,276,104	8.9	-	46	56	358.4	456.9
J-2412	483,698	1,277,809	10.3	-	44	55	330.1	441.4
J-2413	492,719	1,277,707	8.8	-	44	56	341.3	457.1
J-2414	492,720	1,277,566	9.7	-	44	56	332.5	448.3
J-2415	491,284	1,279,653	8.7	-	47	56	371.2	461.4

Network Junction Indicators

Junction Name	Coordinate X (m)	Coordinate Y (m)	Ground Elevation (m)	Flow (l/s)	Minimum Hydraulic Grade (m)	Maximum Hydraulic Grade (m)	Minimum Pressure (kPa)	Maximum Pressure (kPa)
J-2417	487,248	1,278,272	9.9	-	46	56	354.7	447.7
J-2418	488,310	1,280,523	7.1	-	45	56	368.7	473.2
J-2419	488,171	1,280,485	7.2	-	43	55	352.8	471.2
J-2421	490,411	1,282,960	6.4	-	47	56	392.0	482.4
J-2422	487,714	1,274,359	6.7	-	39	56	312.7	477.4
J-2423	490,707	1,279,610	7.1	-	47	56	386.6	475.9
J-2424	485,773	1,278,231	10.0	-	46	56	347.6	445.6
J-2425	491,663	1,277,149	5.7	-	46	56	395.7	490.7
J-2426	480,800	1,275,151	11.3	-	42	55	302.6	430.3
J-2427	490,681	1,280,187	6.3	-	47	56	394.5	483.7
J-2428	491,979	1,277,197	6.2	-	46	56	391.3	486.4
J-2429	491,121	1,282,220	9.6	-	47	56	362.5	451.4
J-2430	486,494	1,278,211	9.8	-	46	56	352.1	448.0
J-2431	486,327	1,278,215	9.8	-	46	56	351.4	447.9
J-2432	492,167	1,276,521	8.8	-	46	56	362.3	460.2
J-2434	480,193	1,275,888	11.8	-	41	55	286.8	424.6
J-2435	489,601	1,280,347	4.8	-	47	56	409.5	498.6
J-2437	486,690	1,278,204	9.7	-	46	56	354.0	449.2
J-2439	484,662	1,278,241	9.4	-	45	56	347.5	450.8
J-2440	488,564	1,276,249	8.3	-	45	56	362.8	462.5
J-2441	491,122	1,282,706	9.9	-	47	56	359.3	448.4
J-2442	480,772	1,275,764	11.1	-	42	55	298.5	431.8
J-2443	488,290	1,280,995	8.9	-	47	56	368.0	458.1
J-2444	488,472	1,281,115	9.0	-	47	56	367.0	457.1
J-2445	491,030	1,283,321	9.5	-	47	56	362.9	452.3
J-2446	485,553	1,278,238	10.0	-	46	56	347.6	445.6
J-2447	490,536	1,275,078	5.5	-	38	55	319.9	488.3
J-2448	488,895	1,278,649	6.6	-	42	55	341.7	476.2
J-2449	488,137	1,278,570	6.3	-	41	55	342.0	478.9
J-2451	488,286	1,279,209	6.2	-	47	56	394.1	484.4
J-2452	490,136	1,283,147	5.6	-	46	56	399.6	490.2
J-2453	485,253	1,278,248	7.7	-	46	56	370.1	468.1
J-2454	489,289	1,277,314	5.7	-	45	56	386.9	487.8
J-2459	487,947	1,279,167	6.6	-	47	56	390.2	480.5
J-2460	490,261	1,282,092	5.9	4.7	46	56	396.4	487.2
J-2462	487,234	1,275,068	6.3	-	45	56	381.6	481.9
J-2463	484,893	1,278,258	9.9	-	46	56	348.5	446.6
J-2464	488,779	1,281,313	8.6	-	47	56	370.9	461.0
J-2467	487,502	1,276,546	6.5	-	46	56	388.1	481.0
J-2468	483,638	1,274,588	7.5	-	44	55	360.6	469.1
J-2469	491,093	1,281,391	9.6	-	47	56	364.8	452.6
J-2472	483,346	1,274,549	7.2	-	44	55	355.7	471.4
J-2473	483,902	1,274,610	8.4	-	45	56	355.6	460.6
J-2475	487,730	1,280,367	5.4	-	43	55	370.4	488.8
J-2476	492,263	1,283,183	9.7	-	48	56	373.2	452.6
J-2851	491,540	1,277,934	9.0	-	46	56	363.3	457.6
J-2855	491,026	1,280,572	9.5	-	46	56	353.6	450.8
J-2857	489,317	1,278,712	6.5	-	44	55	367.4	478.9
J-2859	489,042	1,279,143	6.9	-	47	56	387.8	477.7
J-2860	491,240	1,280,244	9.0	-	42	55	319.0	452.4
J-2861	491,237	1,280,248	9.0	-	42	55	319.4	452.5
J-2862	491,131	1,280,410	9.5	-	43	55	331.3	448.8
J-2864	491,481	1,278,344	9.0	-	46	56	363.7	457.8
J-2865	491,482	1,278,338	9.0	-	46	56	363.8	457.8
J-2866	491,482	1,278,332	9.0	-	46	56	363.8	457.9
J-2871	490,337	1,278,801	8.8	-	46	56	362.7	458.5
J-2872	491,471	1,278,414	8.9	-	47	56	369.0	460.1
J-2873	491,472	1,278,407	8.9	-	46	56	364.6	458.7
J-2874	489,916	1,277,996	6.8	-	46	56	385.3	478.6
J-2875	491,187	1,278,618	8.9	-	47	56	369.2	460.2
J-2877	489,848	1,278,767	7.1	-	46	56	383.6	476.0
J-2880	490,775	1,278,418	7.9	-	45	56	366.1	466.8
J-2881	490,768	1,278,412	7.9	-	45	56	366.1	466.8

Network Junction Indicators

Junction Name	Coordinate X (m)	Coordinate Y (m)	Ground Elevation (m)	Flow (l/s)	Minimum Hydraulic Grade (m)	Maximum Hydraulic Grade (m)	Minimum Pressure (kPa)	Maximum Pressure (kPa)
J-2882	489,489	1,278,729	6.7	-	45	56	375.9	477.8
J-2888	489,101	1,280,174	6.8	-	47	56	389.9	479.0
J-2889	491,346	1,279,233	9.2	-	47	56	365.8	456.3
J-2890	492,644	1,277,241	8.7	-	24	54	152.5	446.4
J-2895	489,656	1,278,749	6.7	-	46	56	380.6	478.6
J-2897	488,758	1,276,610	3.8	-	46	56	412.7	507.6
J-2898	490,097	1,277,217	6.9	-	46	56	378.1	476.3
J-2899	490,106	1,277,209	6.9	-	46	56	378.0	476.3
J-2900	489,502	1,278,731	6.7	-	45	56	376.2	477.8
J-2902	487,804	1,279,149	9.0	-	47	56	366.7	457.0
J-2903	490,250	1,277,401	7.1	-	46	56	384.9	477.3
J-2904	490,242	1,277,391	7.0	-	46	56	385.4	478.0
J-2905	488,982	1,279,305	7.8	-	47	56	379.0	468.9
J-2906	491,079	1,278,657	8.1	-	45	56	363.9	464.8
J-2908	489,028	1,279,299	7.8	-	47	56	378.9	468.9
J-2909	493,259	1,281,024	4.0	-	49	56	439.1	508.9
J-2910	490,923	1,278,548	7.9	-	46	56	371.7	467.3
J-2912	490,605	1,278,283	7.6	-	45	56	369.1	469.8
J-2913	490,628	1,278,300	7.6	-	45	56	369.0	469.8
J-2914	491,514	1,279,824	9.1	-	39	55	290.9	449.5
J-2915	491,506	1,279,835	9.1	-	39	55	291.5	449.6
J-2917	490,268	1,278,807	8.3	-	46	56	371.8	464.2
J-2918	490,756	1,278,401	7.9	-	45	56	366.1	466.8
J-2919	491,322	1,277,665	9.2	-	46	56	362.2	456.6
J-2920	490,283	1,278,809	8.8	-	46	56	366.9	459.3
J-2922	489,112	1,279,314	6.5	-	47	56	391.6	481.6
J-2923	491,320	1,277,682	9.2	-	46	56	362.2	456.6
J-2924	490,903	1,280,548	10.0	-	47	56	360.1	448.6
J-2925	489,410	1,279,495	6.8	-	47	56	388.7	478.6
J-2927	491,285	1,277,910	9.1	-	46	56	364.6	457.8
J-2928	491,289	1,277,889	9.1	-	46	56	363.2	457.6
J-2929	488,955	1,279,292	7.0	-	47	56	386.7	476.7
J-2931	490,426	1,277,243	6.7	-	45	56	377.6	477.8
J-2932	492,256	1,277,237	9.0	-	23	54	140.0	442.8
J-2933	488,958	1,279,314	7.0	-	47	56	386.7	476.7
J-2934	490,441	1,277,286	6.9	-	45	56	375.5	475.8
J-2936	489,338	1,279,416	6.7	-	47	56	389.7	479.6
J-2937	491,032	1,277,424	7.3	-	46	56	374.1	474.0
J-2938	491,034	1,277,363	5.6	-	46	56	390.8	490.7
J-2939	489,485	1,279,735	6.7	-	47	56	389.7	479.6
J-2943	490,076	1,277,240	7.2	-	46	56	375.4	473.4
J-2951	491,105	1,278,677	8.1	-	45	56	363.9	464.8
J-2952	490,105	1,277,656	6.0	-	47	56	397.5	488.9
J-2955	489,706	1,277,636	6.1	-	46	56	392.2	485.5
J-2958	490,447	1,277,197	6.9	-	45	56	375.5	475.8
J-2959	490,445	1,277,162	6.9	-	45	56	375.5	475.8
J-2960	491,035	1,277,327	5.6	-	46	56	390.8	490.7
J-2961	491,035	1,277,292	5.4	-	46	56	392.7	492.6
J-2963	489,721	1,277,493	6.6	-	46	56	387.7	480.6
J-2971	489,276	1,278,340	6.2	-	46	56	388.8	484.1
J-2974	489,455	1,279,578	7.0	-	47	56	386.7	476.7
J-2977	491,219	1,278,368	9.4	-	46	56	361.7	454.8
J-2978	491,242	1,278,209	9.5	-	46	56	360.7	453.9
J-2979	491,346	1,277,513	9.0	-	46	56	364.2	458.6
J-2980	491,353	1,277,460	8.8	-	46	56	366.1	460.6
J-2981	491,348	1,280,079	9.0	-	40	55	304.4	451.4
J-2983	489,735	1,276,771	7.2	-	44	55	361.8	471.5
J-2986	491,190	1,277,237	5.2	-	46	56	396.9	495.0
J-2991	490,610	1,277,279	7.0	-	45	56	376.0	476.8
J-2992	490,597	1,277,223	7.2	-	45	56	374.1	474.8
J-2996	490,783	1,275,087	5.5	-	38	55	322.3	488.5
J-2997	492,334	1,277,897	8.2	-	44	56	354.5	463.5
J-2999	491,202	1,276,766	5.5	-	46	56	391.2	491.9

Network Junction Indicators

Junction Name	Coordinate X (m)	Coordinate Y (m)	Ground Elevation (m)	Flow (l/s)	Minimum Hydraulic Grade (m)	Maximum Hydraulic Grade (m)	Minimum Pressure (kPa)	Maximum Pressure (kPa)
J-3000	490,777	1,275,328	4.4	-	46	56	402.1	502.5
J-3006	489,732	1,277,356	6.9	-	46	56	382.9	477.3
J-3009	491,050	1,276,761	5.3	-	45	56	389.8	493.6
J-3011	489,866	1,277,487	7.0	-	46	56	383.2	477.0
J-3012	489,824	1,277,445	6.9	-	46	56	382.9	477.3
J-3013	491,057	1,276,431	5.8	-	46	56	391.7	490.0
J-3017	490,853	1,276,365	4.8	-	46	56	401.2	499.7
J-3019	490,617	1,276,221	5.2	-	46	56	396.5	495.6
J-3021	491,213	1,276,434	5.5	-	46	56	394.9	492.9
J-3024	491,311	1,277,742	9.2	-	46	56	362.2	456.6
J-3027	490,602	1,276,754	5.8	-	45	56	380.1	488.3
J-3029	490,016	1,277,118	6.5	-	45	56	376.9	479.3
J-3030	491,462	1,278,476	8.7	-	47	56	370.9	462.1
J-3031	489,896	1,276,969	6.8	-	44	55	367.0	475.5
J-3034	489,814	1,276,870	7.0	-	44	55	364.4	473.5
J-3037	491,563	1,277,782	8.9	-	46	56	364.1	458.5
J-3040	490,641	1,277,414	6.7	-	45	56	378.9	479.7
J-3041	490,627	1,277,352	6.8	-	45	56	378.0	478.7
J-3044	492,019	1,278,639	8.6	-	45	56	359.9	459.4
J-3046	491,187	1,277,429	7.4	-	46	56	375.3	473.4
J-3047	491,187	1,277,365	6.1	-	46	56	388.0	486.1
J-3048	491,199	1,276,893	5.1	-	46	56	398.1	496.0
J-3049	489,937	1,277,021	6.6	-	44	55	369.3	477.5
J-3051	491,527	1,278,021	9.1	-	46	56	362.7	456.8
J-3052	491,041	1,277,091	5.2	-	46	56	394.7	494.6
J-3054	491,265	1,278,048	9.0	-	46	56	365.6	458.8
J-3055	491,275	1,277,984	9.1	-	46	56	364.6	457.8
J-3056	491,195	1,277,030	5.1	-	46	56	398.1	496.0
J-3057	491,197	1,276,965	5.1	-	46	56	398.1	496.0
J-3058	492,069	1,278,521	8.4	-	45	56	361.2	461.3
J-3059	491,193	1,277,095	5.1	-	46	56	398.0	496.0
J-3060	490,595	1,277,013	7.5	-	46	56	371.8	472.0
J-3061	490,597	1,276,947	7.5	-	46	56	372.2	472.1
J-3062	491,043	1,276,961	4.9	-	46	56	398.2	497.6
J-3064	489,915	1,277,532	7.0	-	46	56	384.7	477.7
J-3065	490,836	1,277,088	5.1	-	46	56	396.5	495.7
J-3066	490,837	1,277,021	5.0	-	46	56	397.5	496.7
J-3068	490,839	1,276,953	4.8	-	46	56	399.4	498.6
J-3069	490,834	1,277,156	5.6	-	46	56	391.6	490.8
J-3070	491,301	1,277,809	9.1	-	46	56	363.2	457.6
J-3072	491,061	1,276,301	4.9	-	46	56	400.5	498.8
J-3073	491,040	1,277,161	5.1	-	46	56	395.7	495.6
J-3074	491,192	1,277,165	5.2	-	46	56	397.0	495.0
J-3075	489,765	1,278,392	6.7	-	46	56	383.9	479.2
J-3076	489,695	1,278,386	6.5	-	46	56	385.8	481.1
J-3077	490,278	1,277,070	6.5	-	45	56	380.8	480.0
J-3079	491,333	1,277,594	9.2	-	46	56	362.2	456.6
J-3080	489,622	1,278,377	6.3	-	46	56	387.8	483.1
J-3084	490,529	1,278,221	7.6	-	45	56	370.0	469.9
J-3085	491,216	1,276,232	5.2	-	46	56	397.8	495.9
J-3087	489,354	1,278,348	6.2	-	46	56	388.8	484.1
J-3089	489,538	1,280,306	4.9	-	47	56	408.5	497.6
J-3090	492,335	1,277,251	9.2	-	23	54	138.1	440.8
J-3091	490,856	1,276,140	7.3	-	46	56	376.7	475.2
J-3093	491,218	1,276,148	6.3	-	46	56	387.0	485.1
J-3094	491,066	1,276,145	6.4	-	46	56	385.8	484.1
J-3095	491,447	1,278,580	8.7	-	47	56	370.9	462.1
J-3096	491,495	1,278,240	9.0	-	46	56	364.0	458.0
J-3097	489,854	1,278,400	6.7	-	46	56	383.9	479.2
J-3098	491,090	1,279,770	9.1	-	47	56	369.0	458.4
J-3100	489,524	1,278,367	6.2	-	46	56	388.8	484.1
J-3101	489,202	1,280,196	6.5	-	47	56	392.9	481.9
J-3102	489,229	1,279,339	6.9	-	47	56	387.7	477.7

Network Junction Indicators

Junction Name	Coordinate X (m)	Coordinate Y (m)	Ground Elevation (m)	Flow (l/s)	Minimum Hydraulic Grade (m)	Maximum Hydraulic Grade (m)	Minimum Pressure (kPa)	Maximum Pressure (kPa)
J-3104	490,841	1,276,758	5.4	-	45	56	384.0	492.3
J-3105	491,435	1,279,947	9.0	-	39	55	297.9	450.9
J-3107	489,633	1,278,955	7.0	-	42	55	344.6	472.7
J-3108	489,791	1,278,975	8.7	-	42	55	326.2	455.9
J-3110	492,402	1,277,731	8.4	-	44	56	352.6	461.5
J-3111	492,465	1,277,578	9.0	-	44	56	346.7	455.6
J-3112	489,295	1,278,921	6.4	-	43	55	354.0	478.8
J-3113	489,383	1,280,241	5.7	-	47	56	400.7	489.8
J-3114	489,464	1,278,938	6.7	-	42	55	349.3	475.8
J-3115	490,096	1,278,790	8.0	-	46	56	374.8	467.2
J-3116	490,929	1,278,538	7.9	-	45	56	366.0	466.8
J-3119	488,577	1,276,762	8.5	-	46	56	366.1	461.5
J-3120	492,227	1,278,149	8.4	-	44	56	352.6	461.5
J-3122	491,609	1,277,465	8.4	-	46	56	365.6	462.8
J-3123	490,827	1,277,417	6.9	-	46	56	378.9	478.1
J-DP-CCW-RK01-Phum1	492,550	1,279,878	8.6	-	25	25	157.8	160.3
J-DP-CCW-RK01-Phum2	492,206	1,280,309	9.0	-	25	25	154.1	156.4
J-DP-CCW-RK01-Phum3	492,661	1,280,748	5.7	-	25	25	187.8	188.8
J-exWTPsp	484,949	1,287,538	9.4	-	46	56	360.2	452.6
J01-1295	492,160	1,276,164	8.0	17.4	41	56	325.8	465.0
J01-1577	492,411	1,274,756	7.6	17.4	45	56	367.7	473.9
J01-1600	491,855	1,275,499	6.1	17.4	46	56	385.6	489.8
J01-2470	492,966	1,277,452	8.5	17.4	41	55	321.4	458.4
J01-3099	492,428	1,277,265	9.2	17.4	23	54	138.1	440.8
J02-2151	491,735	1,276,629	5.6	12.0	46	56	393.7	491.5
J02-2319	491,816	1,277,172	6.0	12.0	46	56	392.8	487.9
J02-2324	491,953	1,276,255	6.8	6.0	41	56	338.7	476.8
J03-2985	491,189	1,277,294	5.4	11.8	46	56	394.9	493.0
J03-3053	491,042	1,277,027	4.9	11.8	46	56	397.6	497.5
J04-1611	491,385	1,276,575	5.6	22.2	46	56	391.9	491.2
J04-1633	490,848	1,276,564	6.1	22.2	45	56	377.1	485.4
J05-2930	490,445	1,277,259	6.9	9.0	45	56	375.5	475.8
J05-3082	490,593	1,277,149	6.7	9.0	45	56	378.9	479.7
J06-1663	490,242	1,276,278	5.8	5.4	44	55	374.0	485.1
J06-2987	490,607	1,276,479	5.7	8.1	46	56	390.5	490.6
J06-3121	490,119	1,276,873	5.7	13.6	44	55	371.6	485.8
J07-1629	489,546	1,276,846	7.0	5.7	46	56	381.0	476.6
J07-3109	489,950	1,277,341	7.3	9.1	46	56	375.5	472.6
J07-3117	489,785	1,277,145	7.2	8.0	44	55	361.4	471.4
J08-1627	490,095	1,276,371	6.1	10.7	46	56	386.2	485.4
J08-2220	489,349	1,276,600	7.5	16.0	46	56	372.9	470.8
J09-1618	490,380	1,276,161	5.6	3.3	46	56	390.9	490.4
J09-2395	490,297	1,275,861	6.2	6.6	46	56	384.4	484.8
J09-2878	490,277	1,275,387	9.0	6.6	46	56	360.3	456.5
J10-1450	491,621	1,275,492	6.5	6.2	46	56	384.2	483.2
J10-766	491,224	1,275,886	4.8	6.2	46	56	399.7	499.3
J10-792	491,488	1,275,897	4.8	8.2	46	56	400.7	499.7
J11-2995	490,782	1,275,146	5.3	7.4	38	55	323.8	490.4
J11-3035	490,765	1,275,808	7.7	11.1	46	56	369.8	470.2
J12-1648	491,836	1,274,727	5.7	12.6	43	56	366.8	489.8
J12-2216	490,667	1,274,832	5.3	18.9	38	55	321.0	490.2
J13-1558	491,559	1,279,234	9.1	3.4	47	56	366.0	457.7
J13-2363	491,367	1,279,047	8.8	4.2	47	56	368.7	460.5
J13-2364	491,357	1,279,115	8.9	3.4	47	56	367.7	459.5
J13-2380	491,409	1,278,875	8.8	5.9	47	56	368.9	460.6
J14-2347	491,181	1,279,090	8.8	5.4	47	56	368.6	460.4
J14-2379	491,155	1,278,753	9.3	1.8	47	56	363.7	455.6
J14-2956	491,251	1,279,020	8.8	5.4	47	56	368.6	460.5
J14-2973	491,269	1,278,864	9.0	5.4	47	56	366.8	458.5
J15-2248	491,537	1,278,737	8.8	4.4	47	56	369.6	460.9

Network Junction Indicators

Junction Name	Coordinate X (m)	Coordinate Y (m)	Ground Elevation (m)	Flow (l/s)	Minimum Hydraulic Grade (m)	Maximum Hydraulic Grade (m)	Minimum Pressure (kPa)	Maximum Pressure (kPa)
J15-3118	491,662	1,278,457	9.0	5.9	46	56	363.1	457.5
J15-706	491,644	1,278,716	8.9	5.9	47	56	368.9	460.1
J15-753	491,939	1,278,276	8.6	5.9	46	56	367.3	461.6
J15-871	491,731	1,278,216	8.9	7.4	46	56	364.8	458.9
J16-113	492,054	1,277,844	7.0	4.0	45	56	372.4	475.6
J16-2852	491,540	1,277,930	9.0	8.1	46	56	363.2	457.6
J16-2894	491,254	1,278,126	9.1	4.0	46	56	364.6	457.8
J16-3103	491,217	1,278,378	9.0	4.0	47	56	367.9	459.1
J17-746	492,322	1,279,175	9.5	25.7	46	56	354.1	451.2
J18-1315	491,938	1,278,844	8.6	7.7	46	56	360.9	459.6
J18-1545	491,907	1,278,934	8.7	11.5	46	56	360.4	458.7
J19-1654	491,933	1,277,496	8.5	4.4	45	56	361.3	461.8
J19-2375	492,722	1,278,039	7.6	5.9	44	56	353.0	468.8
J19-2433	492,951	1,277,961	8.8	5.9	43	55	331.3	456.4
J19-692	492,310	1,277,951	8.5	5.9	44	56	351.6	460.5
J19-856	491,574	1,277,709	8.6	7.3	46	56	364.3	461.6
J20-1608	492,457	1,278,659	8.3	12.4	46	56	364.0	462.6
J20-604	491,964	1,278,784	8.4	9.3	46	56	362.8	461.5
J20-754	491,964	1,278,284	8.6	9.3	45	56	357.2	459.0
J21-1561	491,824	1,279,186	9.1	18.8	46	56	360.3	455.5
J22-2398	490,478	1,280,333	6.0	8.4	47	56	397.4	486.6
J22-2856	491,024	1,280,576	9.5	8.4	46	56	353.6	450.7
J22-2863	491,128	1,280,415	9.5	8.4	43	55	331.8	448.8
J22-2982	491,317	1,280,125	9.0	8.4	40	55	306.6	451.6
J22-561	490,643	1,280,677	9.6	8.4	47	56	364.5	452.6
J22-606	491,181	1,280,850	9.8	25.1	47	56	362.0	450.2
J22-864	491,610	1,280,087	9.2	8.4	38	55	278.8	447.8
J22-869	491,487	1,280,259	9.1	8.4	38	55	279.5	448.7
J23-2312	491,775	1,279,374	9.8	3.2	46	56	357.6	449.6
J23-2315	491,335	1,279,310	9.2	4.3	47	56	365.8	456.3
J23-2335	491,324	1,279,384	9.1	2.2	47	56	366.9	457.3
J23-2337	491,765	1,279,450	9.6	2.2	46	56	359.5	451.5
J23-2372	492,150	1,279,432	10.4	4.3	46	56	351.5	443.6
J23-2416	491,263	1,279,795	8.8	5.4	47	56	370.5	460.6
J24-1265	491,115	1,278,141	8.1	7.6	46	56	370.2	465.9
J24-1502	491,066	1,278,142	8.2	7.6	46	56	368.4	464.8
J25-1364	490,613	1,278,303	7.6	7.3	46	56	373.9	470.1
J25-2911	490,617	1,278,291	7.6	10.9	45	56	369.0	469.8
J26-1394	490,942	1,278,548	7.9	5.1	45	56	366.0	466.8
J26-2867	491,061	1,278,657	8.1	4.3	46	56	375.3	467.0
J26-2887	490,942	1,278,563	7.9	5.1	46	56	371.8	467.3
J27-1425	491,068	1,278,649	8.1	6.2	45	56	363.9	464.8
J27-1509	491,219	1,278,193	9.5	6.2	46	56	359.2	453.1
J27-1626	491,183	1,278,442	8.8	3.1	46	56	365.1	459.5
J28-1407	491,029	1,278,914	8.6	8.0	47	56	371.7	462.7
J28-1435	491,066	1,278,661	8.1	9.1	47	56	375.4	467.0
J28-1485	491,056	1,278,906	8.6	5.7	46	56	364.8	460.4
J29-1373	490,845	1,278,868	8.9	3.4	46	56	361.8	457.5
J29-1388	490,328	1,278,812	8.8	5.7	46	56	366.9	459.3
J29-1446	489,825	1,278,906	7.4	8.0	42	55	335.8	468.4
J29-1453	489,839	1,278,754	7.1	2.3	46	56	383.0	475.8
J29-1532	490,651	1,278,859	8.9	3.4	46	56	366.7	458.7
J30-1308	490,344	1,278,712	8.8	11.1	46	56	366.4	459.2
J30-1568	490,069	1,278,218	6.9	13.3	46	56	385.4	478.0
J30-1594	490,236	1,277,909	7.5	6.6	46	56	380.9	472.7
J30-1599	490,262	1,278,180	7.9	4.4	46	56	376.3	468.5
J30-1662	490,304	1,277,964	7.7	2.2	47	56	380.8	472.2
J30-709	490,649	1,277,435	6.7	6.6	46	56	386.5	481.2
J31-1335	491,327	1,277,461	8.8	12.3	46	56	366.1	460.8
J31-1511	490,859	1,278,026	7.1	12.3	46	56	376.5	475.1
J32-2870	489,802	1,278,763	7.1	4.8	46	56	380.8	475.4
J32-2896	489,162	1,278,696	6.1	4.8	43	55	360.4	482.0
J32-653	489,130	1,278,901	8.2	9.6	43	55	338.1	461.3

Network Junction Indicators

Junction Name	Coordinate X (m)	Coordinate Y (m)	Ground Elevation (m)	Flow (l/s)	Minimum Hydraulic Grade (m)	Maximum Hydraulic Grade (m)	Minimum Pressure (kPa)	Maximum Pressure (kPa)
J33-450	489,831	1,278,616	6.9	9.2	46	56	383.4	477.5
J33-634	489,166	1,278,546	6.1	9.2	46	56	389.7	485.0
J34-1331	489,294	1,278,198	6.3	9.1	46	56	388.9	483.3
J34-1551	489,868	1,278,257	6.7	9.1	46	56	385.7	479.5
J35-2402	488,513	1,278,609	6.1	8.7	41	55	344.0	480.9
J35-403	489,089	1,278,986	9.5	9.9	47	56	362.4	452.2
J35-637	489,104	1,278,961	9.5	6.2	42	55	314.7	447.9
J36-1478	489,167	1,278,399	6.1	10.2	42	55	351.4	481.4
J36-2217	488,081	1,278,063	8.0	10.2	38	55	296.3	460.2
J37-2170	488,442	1,278,101	6.5	15.7	39	55	314.4	475.1
J37-2436	489,212	1,277,987	5.6	15.7	43	55	362.1	486.7
J38-1278	488,786	1,281,311	8.6	4.0	47	56	371.9	461.2
J38-2241	488,593	1,280,598	7.2	10.1	45	56	367.7	472.3
J38-2854	489,009	1,280,959	8.7	6.1	44	55	344.0	456.9
J38-305	489,091	1,280,173	6.8	12.1	47	56	389.9	479.0
J38-563	489,816	1,280,514	9.2	8.1	47	56	366.0	455.3
J39-2185	487,738	1,280,369	7.4	13.2	43	55	350.8	469.2
J39-2450	488,542	1,279,241	6.0	5.3	47	56	396.1	486.4
J39-2907	489,015	1,279,298	7.8	10.6	47	56	378.9	468.9
J39-296	489,022	1,279,517	7.3	18.5	47	56	384.1	473.8
J39-902	488,208	1,279,637	7.2	5.3	46	56	381.1	474.1
J41-1362	489,319	1,276,995	7.0	15.8	46	56	382.2	476.5
J41-1464	488,731	1,276,627	8.6	9.0	46	56	365.5	460.6
J41-1657	488,279	1,276,753	8.6	9.0	46	56	364.6	460.5
J41-2456	489,251	1,277,657	5.2	11.3	43	55	374.0	491.2
J42-1327	489,952	1,277,728	6.7	18.6	46	56	386.7	479.7
J42-1491	489,314	1,277,664	5.0	12.4	46	56	401.6	496.0
J42-192	487,856	1,273,557	9.0	3.9	45	56	356.0	455.7
J42-194	486,216	1,271,239	8.0	3.9	45	56	364.9	465.3
J42-195	487,967	1,273,106	9.0	1.3	45	56	355.8	455.6
J42-197	487,826	1,273,804	8.5	3.9	45	56	361.0	460.6
J43-1431	479,306	1,276,550	11.1	-	42	55	304.6	432.1
J46-1378	484,072	1,274,675	7.5	8.9	44	55	360.5	469.1
J46-1413	482,156	1,274,520	9.8	14.8	43	55	328.5	445.8
J46-2210	480,289	1,275,700	11.0	8.9	41	55	294.7	432.4
J46-23	484,696	1,273,162	7.0	8.9	44	55	362.6	473.9
J46-478	482,207	1,276,287	10.5	5.9	43	55	317.4	438.6
J46-684	481,615	1,275,280	11.3	5.9	43	55	306.2	430.5
J46-720	481,882	1,276,907	10.3	5.9	43	55	319.7	440.6
J47-1556	483,992	1,278,374	9.7	12.7	44	55	331.0	446.9
J47-1587	484,830	1,277,415	7.9	4.0	45	56	362.0	465.4
J47-2411	483,801	1,277,899	10.3	6.0	44	55	330.1	441.4
J47-2466	484,258	1,278,150	9.6	6.0	45	55	344.0	448.7
J47-764	483,698	1,277,756	10.1	15.9	44	55	331.0	443.2
J50-2471	480,011	1,276,367	11.1	1.5	41	55	293.5	431.5
J57-1296	486,879	1,275,040	7.4	14.4	45	56	371.0	471.2
J57-1539	487,290	1,276,105	7.5	8.6	45	56	369.4	470.1
J57-2455	488,068	1,274,559	8.0	8.6	39	56	298.1	464.6
J57-2461	486,881	1,275,021	5.4	11.5	45	56	390.4	490.7
J57-839	488,748	1,276,436	11.4	14.4	45	56	330.6	431.9
J58-588	491,152	1,273,466	8.9	13.2	40	56	306.7	457.0
J58-768	489,631	1,276,083	9.4	11.0	46	56	356.8	452.6
J58-796	490,611	1,274,736	9.3	11.0	42	56	316.8	454.1
J58-879	489,014	1,273,795	9.0	8.8	39	56	292.2	455.0
J59-167	493,175	1,273,939	7.0	15.2	43	56	352.2	477.5
J60-696	492,907	1,274,745	10.0	5.8	44	56	333.6	449.0
J60-860	493,034	1,274,344	8.8	5.8	44	56	339.4	460.3
J61-1320	492,894	1,274,782	10.0	16.2	44	56	334.4	449.1
J61-2154	492,859	1,275,241	8.4	10.8	44	56	348.6	464.6
J62-1572	492,632	1,273,923	8.5	6.5	43	56	338.3	462.9
J62-587	491,149	1,273,465	8.9	1.9	40	56	306.6	457.0
J62-804	492,707	1,273,636	8.4	10.3	43	56	334.0	463.5
J63-1583	493,678	1,271,054	9.0	33.9	40	56	298.1	455.5

Network Junction Indicators

Junction Name	Coordinate X (m)	Coordinate Y (m)	Ground Elevation (m)	Flow (l/s)	Minimum Hydraulic Grade (m)	Maximum Hydraulic Grade (m)	Minimum Pressure (kPa)	Maximum Pressure (kPa)
J64-123	494,040	1,274,673	7.0	21.2	44	56	362.3	478.3
J64-178	493,942	1,274,451	7.0	9.1	41	56	333.6	476.2
J66-1444	490,804	1,281,447	7.9	7.3	47	56	381.2	469.0
J66-1501	490,365	1,281,287	6.4	9.7	47	56	392.2	482.5
J66-851	489,038	1,281,504	6.1	7.3	47	56	396.2	485.6
J67-52	486,924	1,286,820	7.2	3.0	46	56	380.8	474.0
J67-68	486,410	1,287,237	7.2	5.5	46	56	379.6	473.8
J67-80	485,856	1,287,850	7.2	3.6	46	56	379.2	473.7
J68-1249	490,713	1,284,107	9.1	11.6	47	56	366.2	456.1
J68-322	489,253	1,285,399	8.0	2.9	46	56	373.0	466.2
J69-1613	485,863	1,279,803	7.1	18.2	46	56	382.9	475.2
J69-1638	486,913	1,279,441	6.3	16.4	46	56	390.3	483.0
J69-1660	484,044	1,278,818	9.2	12.3	43	55	334.8	451.7
J70-2268	491,112	1,281,973	9.7	7.2	47	56	361.6	450.5
J70-2420	490,277	1,282,907	6.6	6.1	46	56	389.8	480.4
J70-311	491,047	1,283,321	9.5	7.2	47	56	363.0	452.3
J71-1285	487,498	1,277,137	6.8	7.2	46	56	385.2	478.0
J71-1421	487,760	1,278,457	7.4	13.1	46	56	381.8	472.6
J71-1659	486,847	1,277,072	6.5	7.2	46	56	387.4	480.8
J71-2152	485,920	1,278,225	9.8	10.9	46	56	349.5	447.6
J71-844	485,923	1,277,433	7.6	7.2	46	56	370.7	469.1
J72-497	492,067	1,284,027	10.0	12.3	48	56	368.0	448.6
J74-1279	492,370	1,282,831	9.6	3.9	48	56	372.6	452.9
J74-1623	493,243	1,281,014	8.8	3.9	25	25	158.0	158.5
J74-1630	492,071	1,280,461	6.0	3.9	25	25	183.5	185.8
J74-1667	493,100	1,279,226	8.2	5.8	25	25	161.4	164.2
J74-257	492,110	1,281,163	5.7	22.8	48	56	412.3	491.8
J75-1439	488,018	1,286,346	7.7	6.6	46	56	377.8	469.4
J76-1262	488,815	1,285,677	6.5	11.6	46	56	388.4	481.0
JKA-1665	479,260	1,274,707	12.1	5.7	42	55	294.4	422.3
JKT-855	493,788	1,269,573	7.0	-	35	37	275.2	290.1
Kop Srov end	484,499	1,289,843	8.9	-	46	56	365.3	457.7
OUT CW1+2	493,190	1,280,958	9.4	-	49	56	387.2	456.1
OUT PP	490,834	1,279,457	11.5	-	47	56	347.0	436.7
Samraong end	478,177	1,281,150	11.0	1.0	42	55	305.6	433.0

Supporting Report 5.4 Pressure Pipes and Junctions in the Water CAD system

1 Models and Presentation Issues

The 2010 modeling system was prepared on two different bases which were developed through the Master Plan Study. Initially, it was the 2005 model, which was enriched by the following new facilities and transmission pipes to make the 2010 model:

- CDS 2006-2010;
- New WTP of Chrouy Changva;
- Replacement and/or regulation of the Chrouy Changva (and Chankarmon) WTP pumping system;
- Start-up of the water tanks T1, T2, T3, T4.

The 2010 water demand is distributed first to zones, then to 217 representative junctions as shown in SR 5.6 "Water Demand Input".

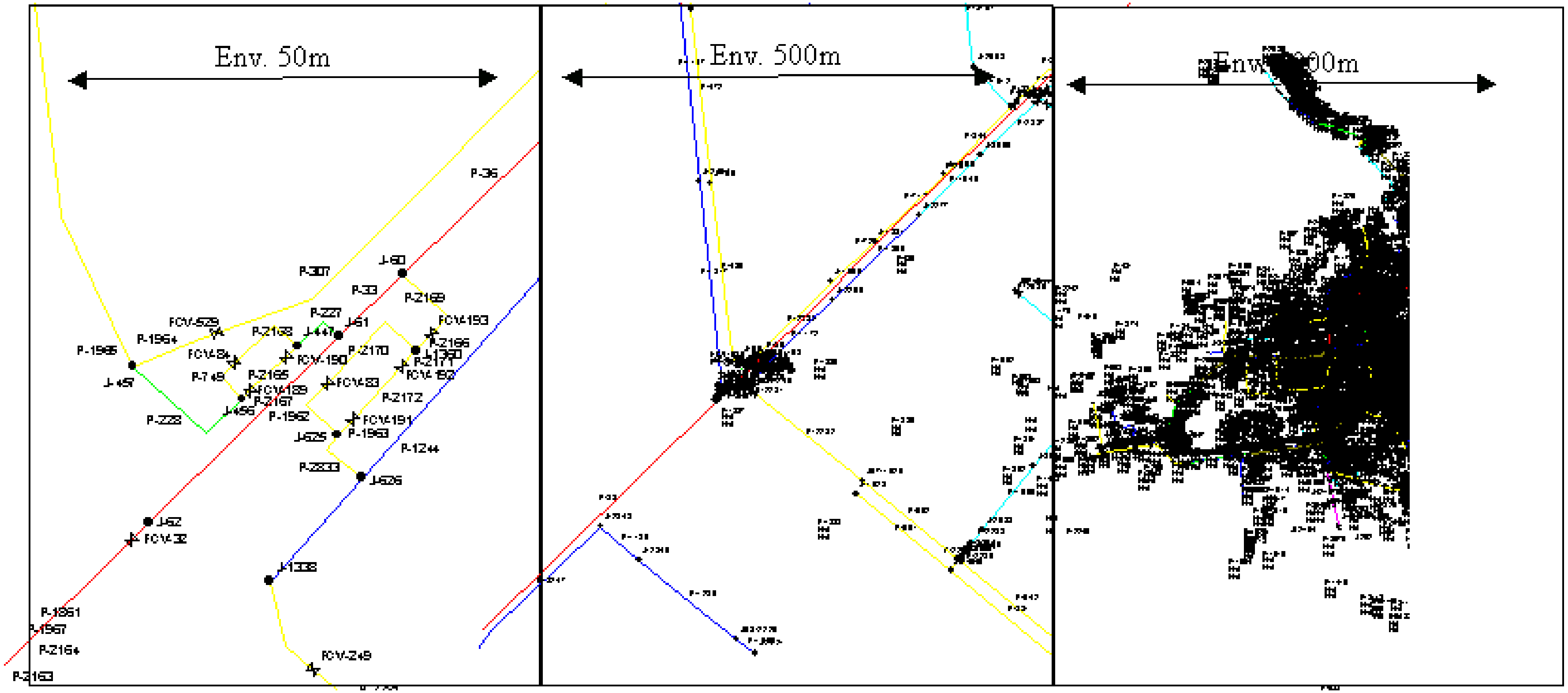
Then, a second model was built for the 2020 water demand. This model was used as a basis to build the network topology and to size pipes. The 2010 model contains over 1,500 junctions and 2,500 pipes.

Table 1 : Network Inventory for the 2010 model.

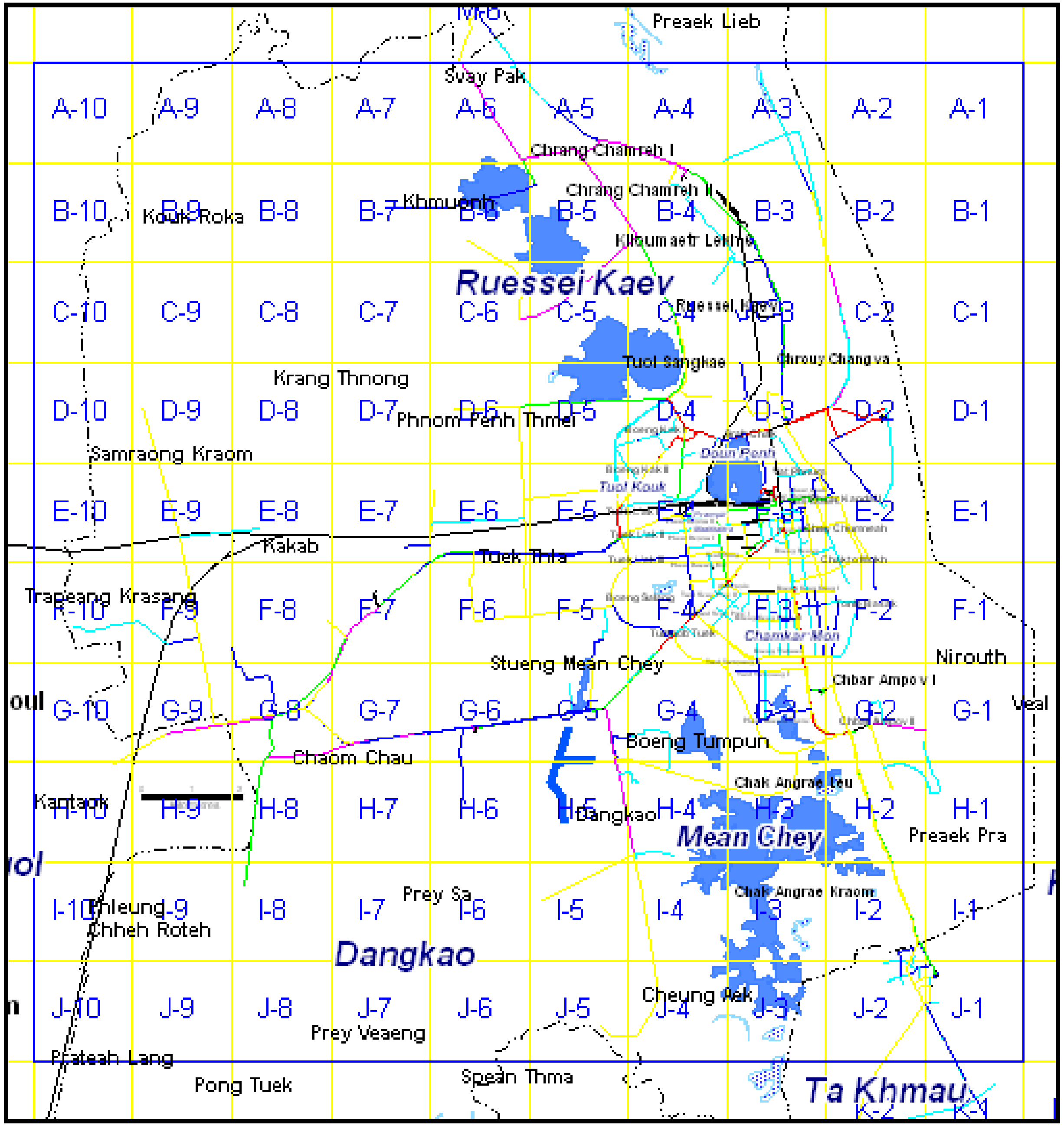
Network Inventory for 2010 model			
Pressure Pipes	2459	Number of Tanks	8
Number of Reservoirs	8	- Constant Area:	4
Number of Pressure Junctions	1599	- Variable Area:	4
Number of Pumps	21	Number of Valves	622
- Constant Power:	0	- FCV's:	622
- Multiple Point:	21	Number of Spot Elevations	1

The best way to examine data is accessing files electronically by using the WaterCAD system.

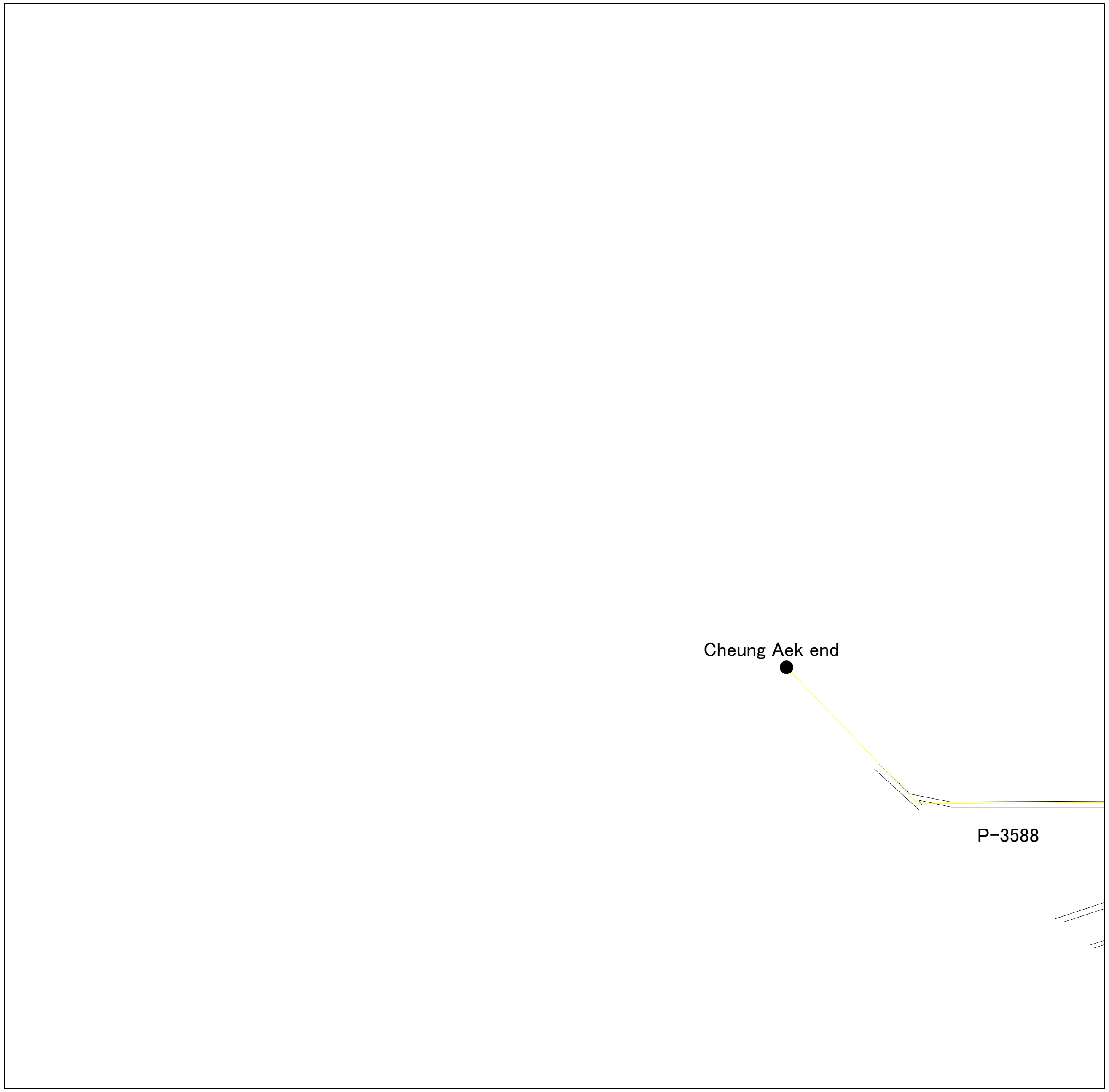
The following figure shows how big the scale should be to make pipes and node labels readable.



Coordinates are given to all the junctions. We only have removed the short pipes (length less than 10 m) from the following maps. For the further details, please refer to the electronic model on WaterCAD system.



Location map



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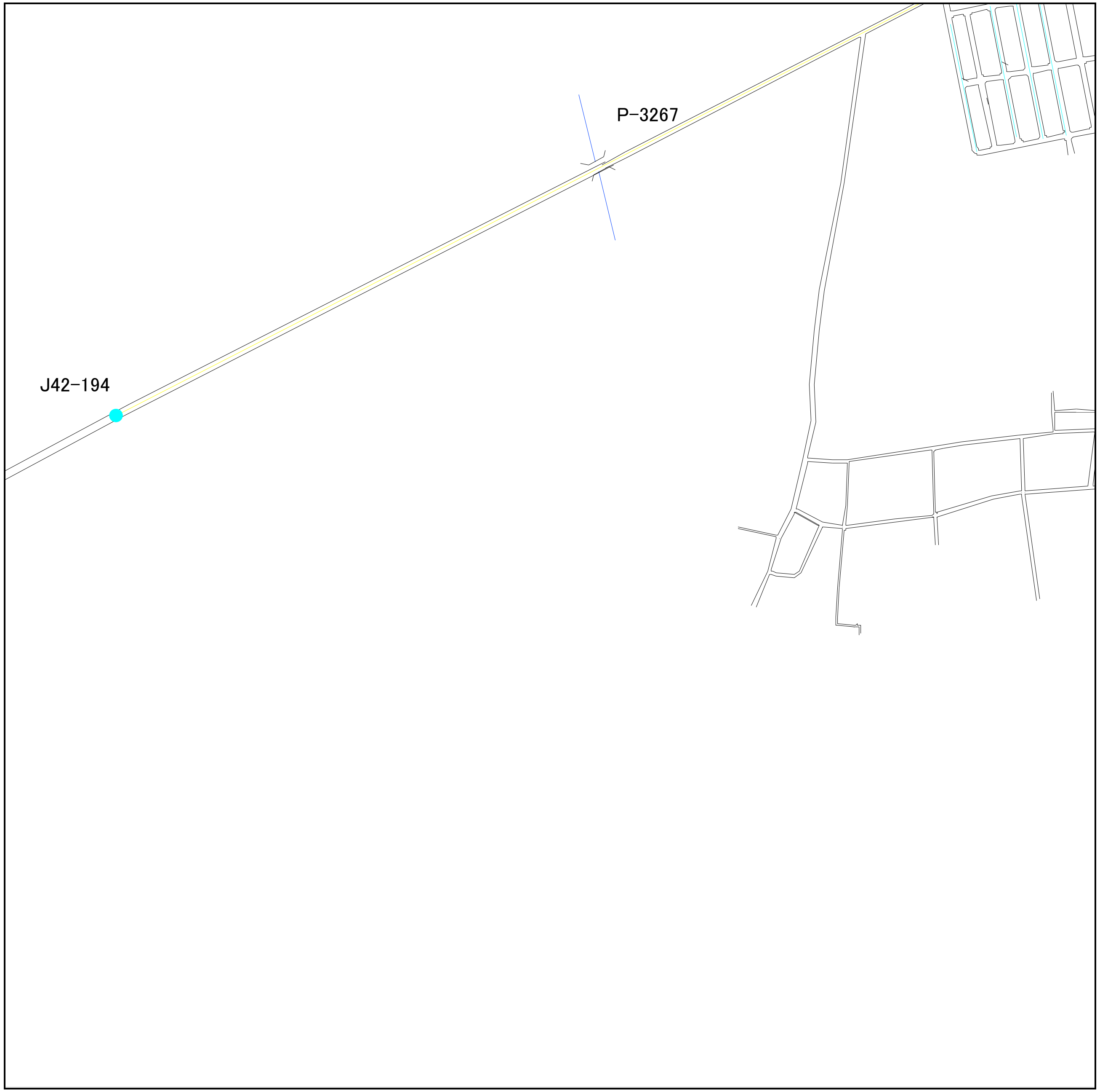

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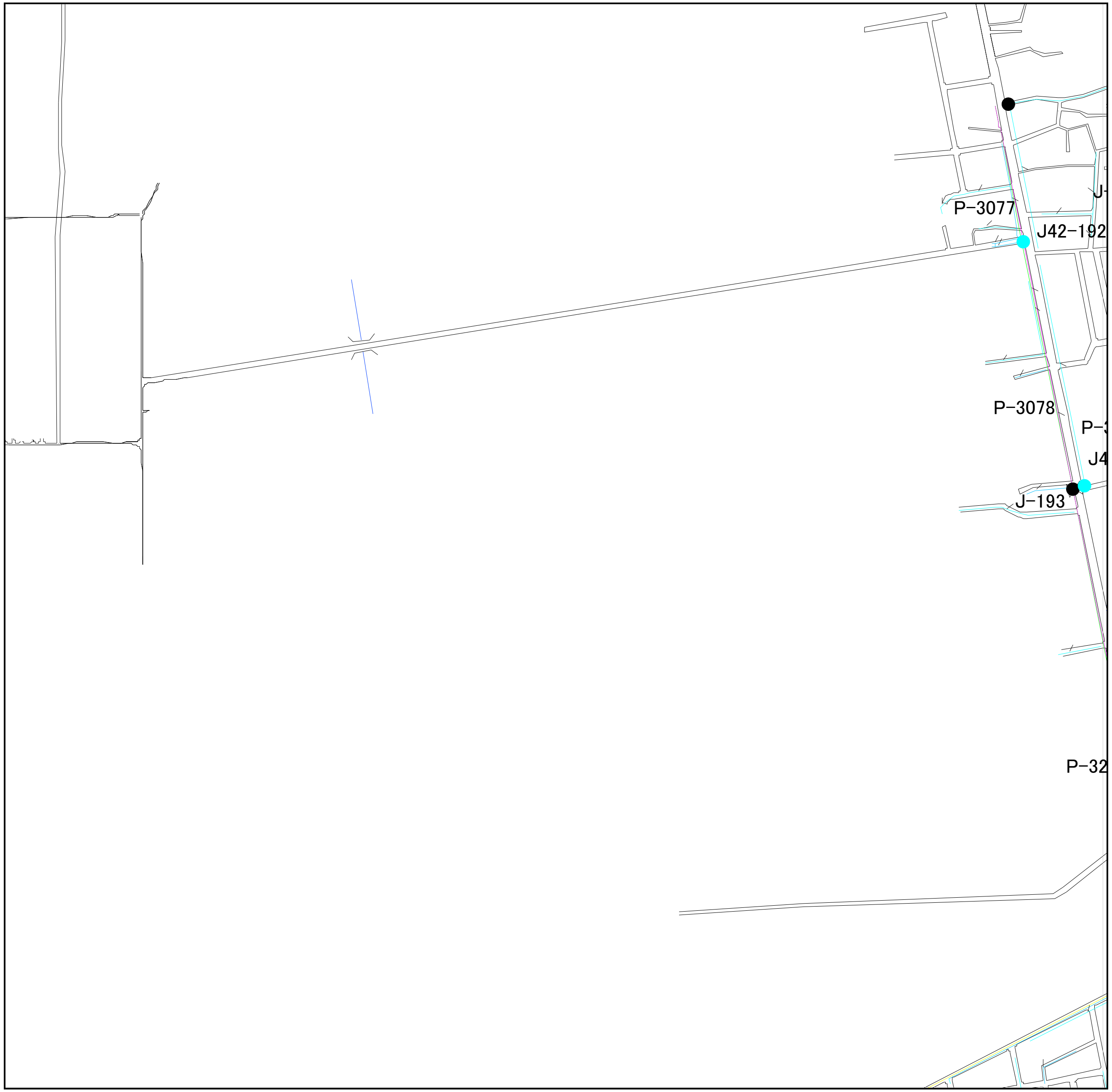

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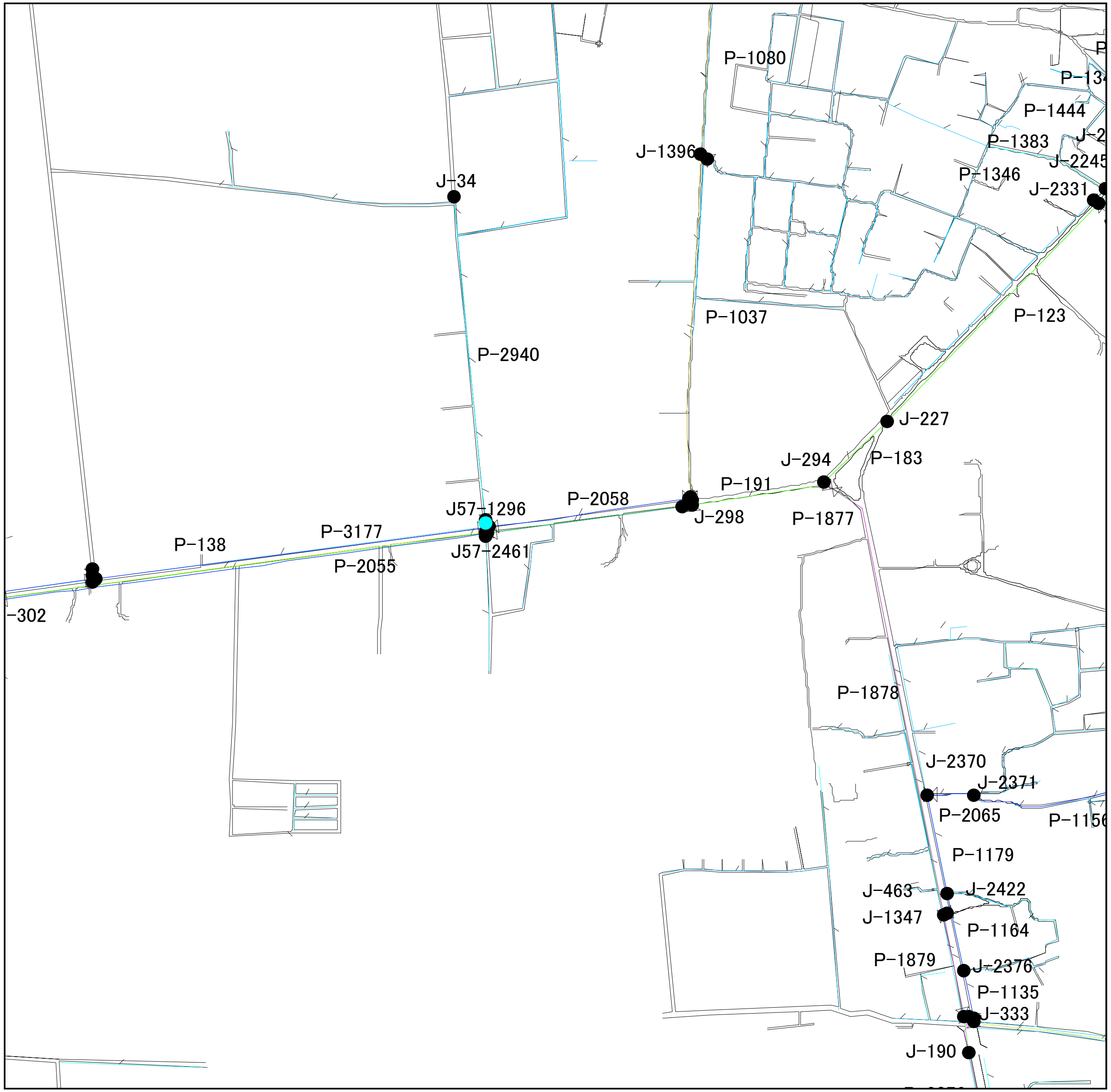

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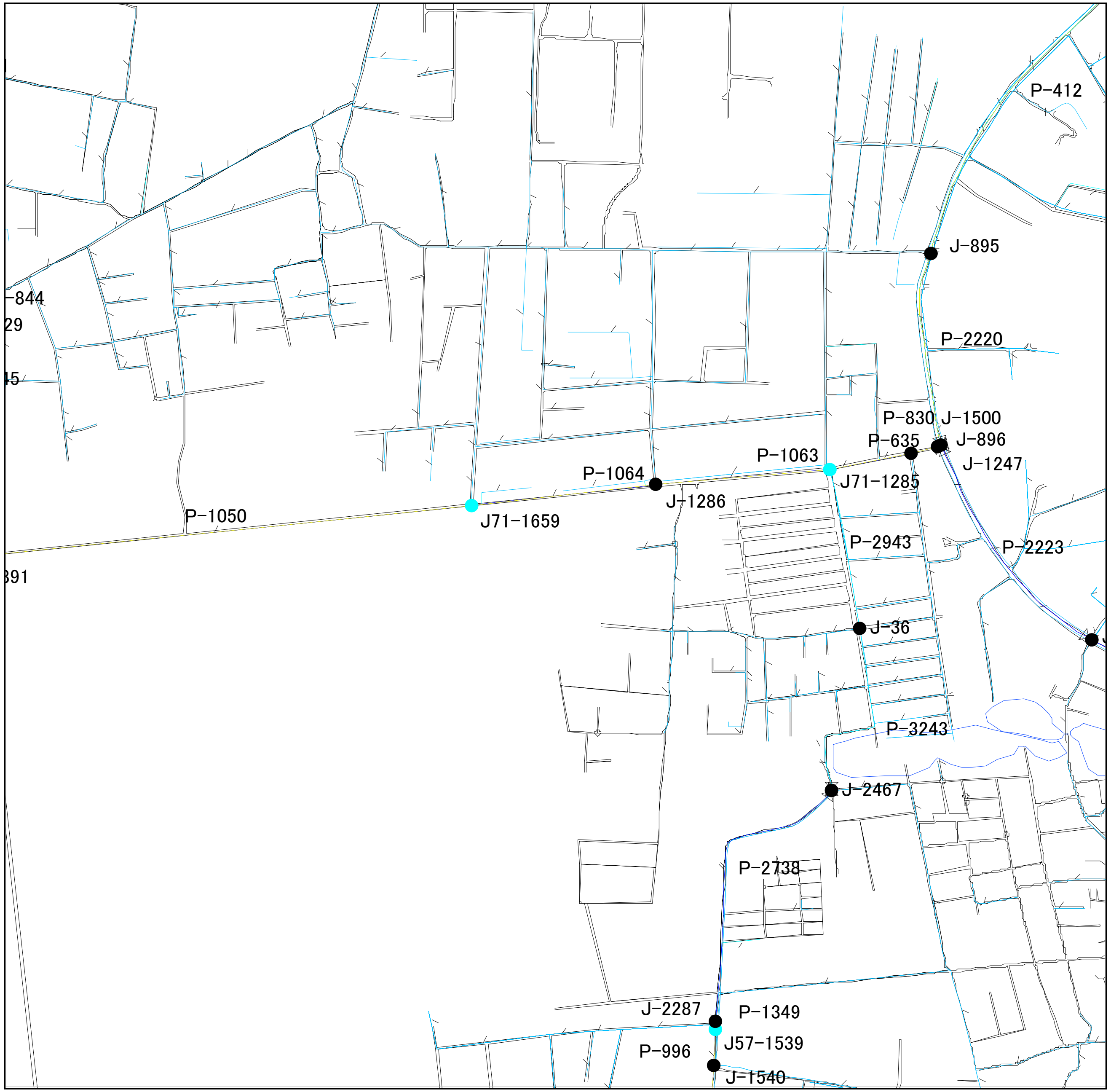
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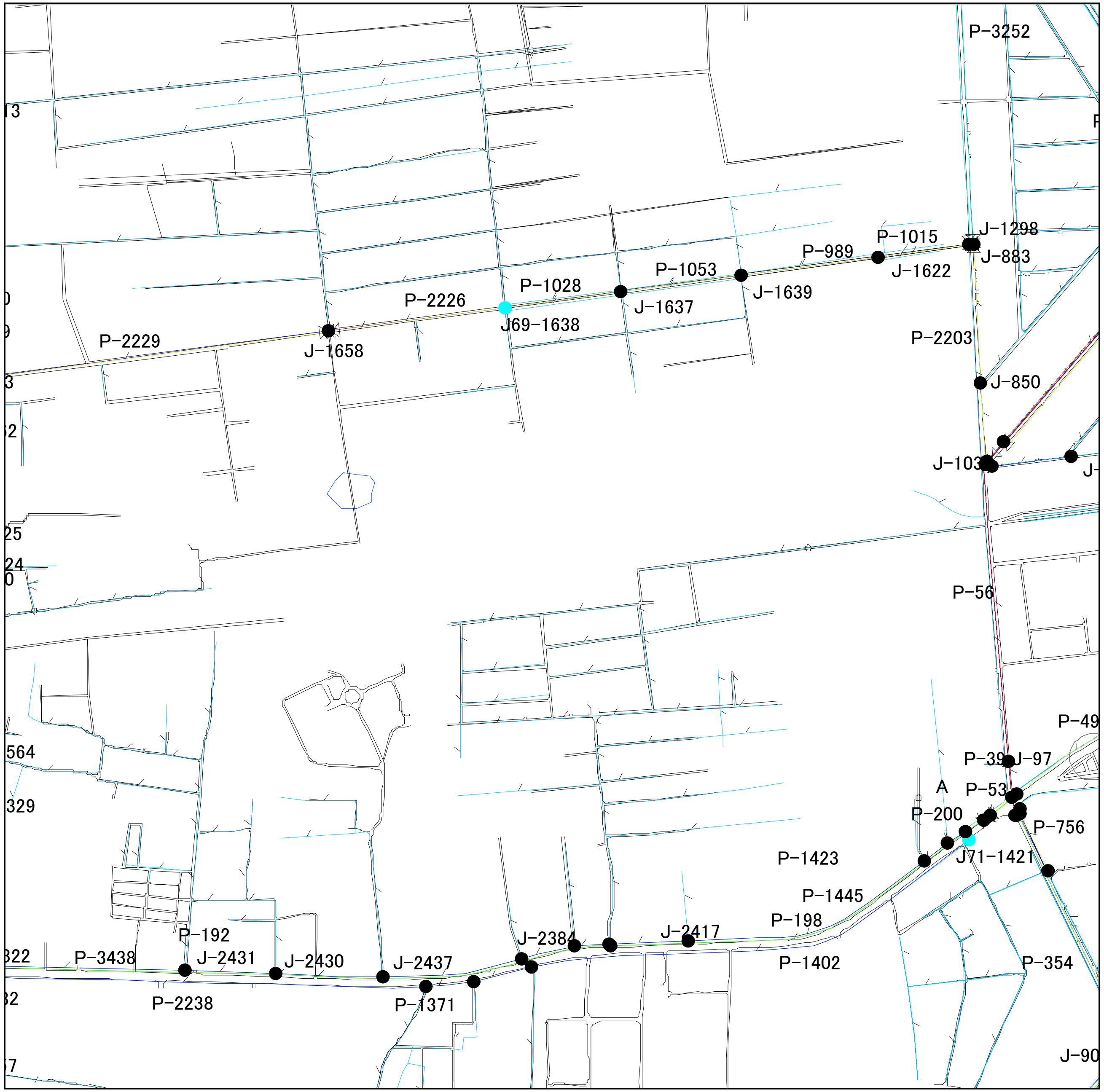
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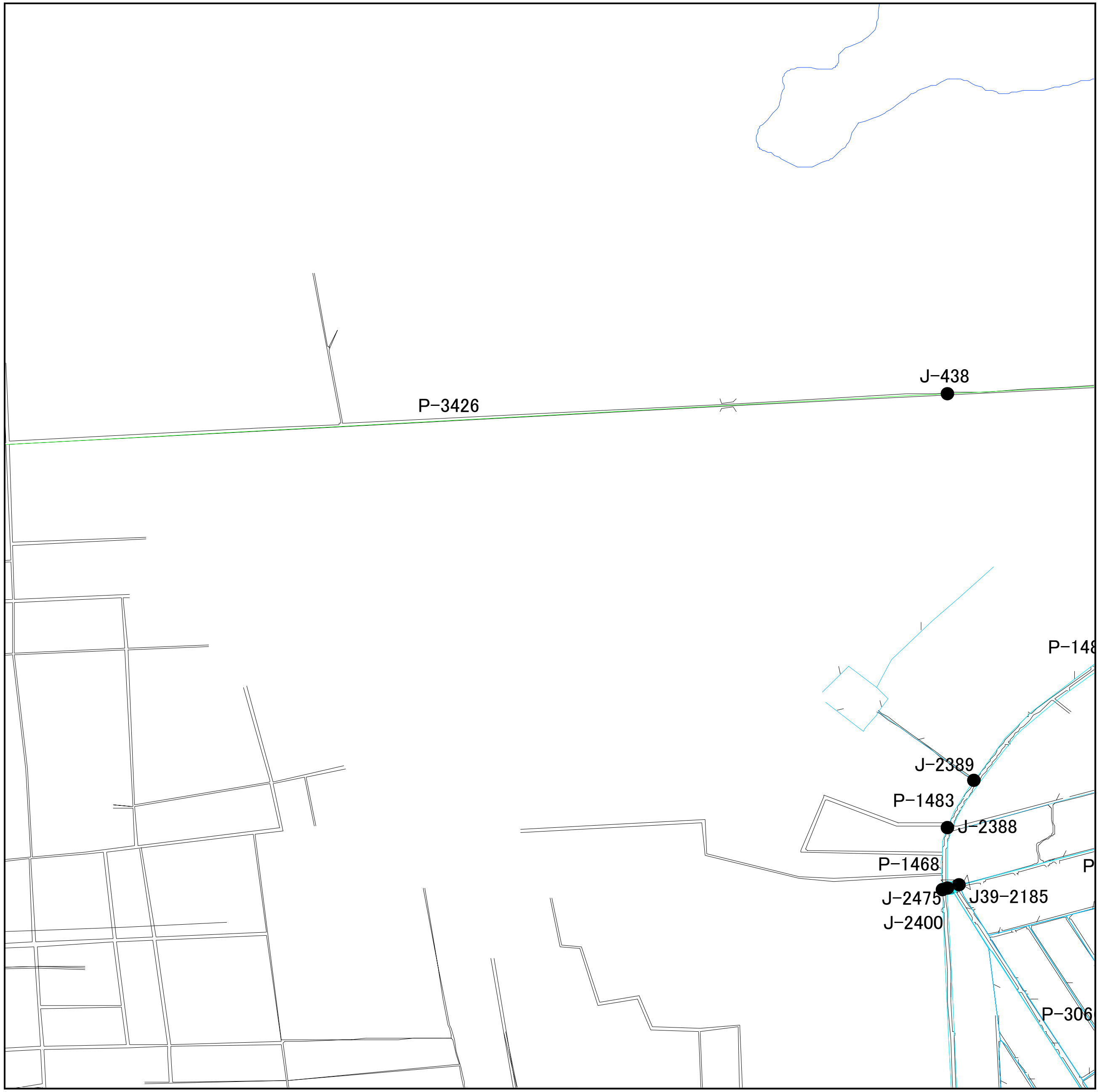
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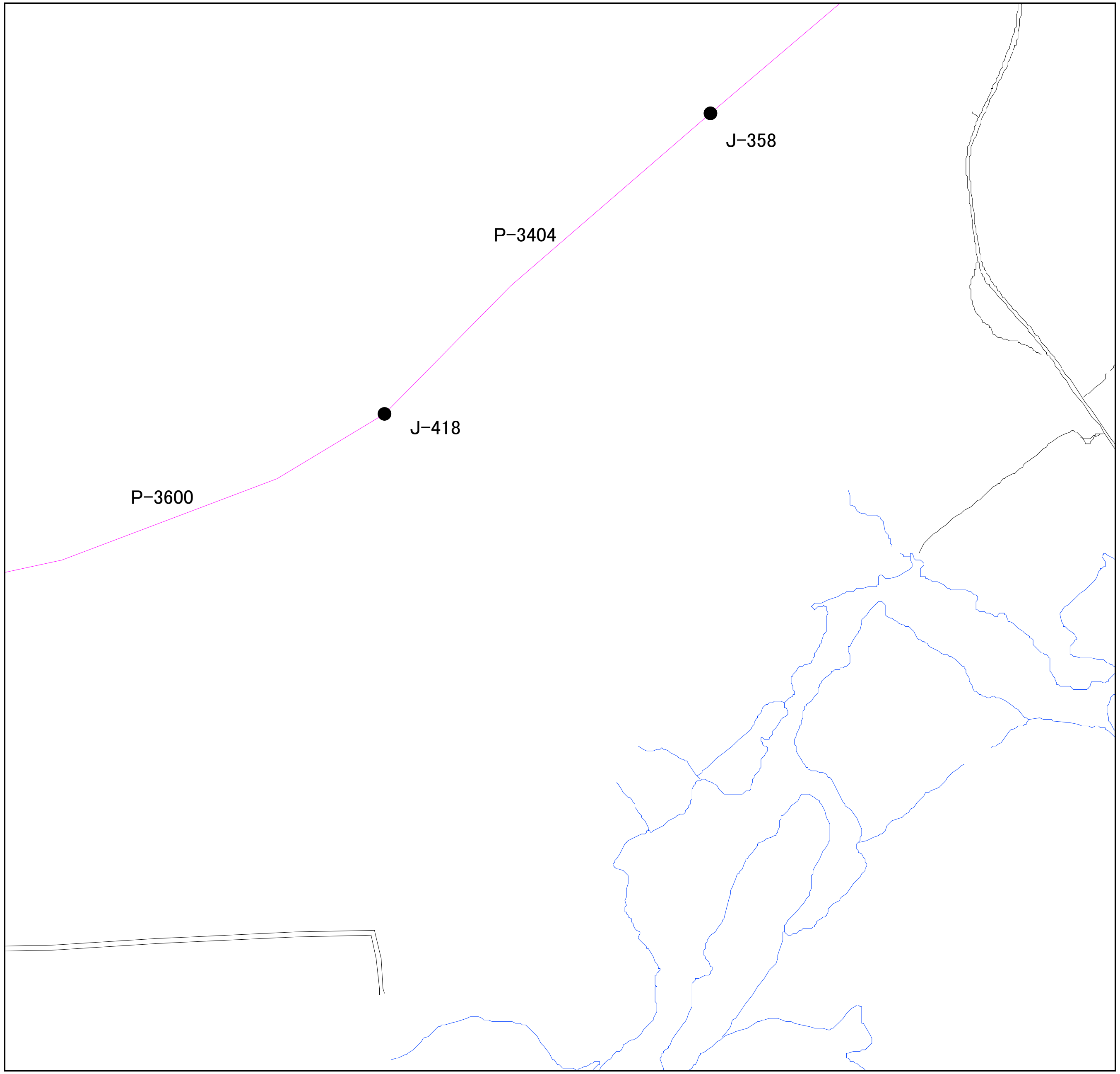

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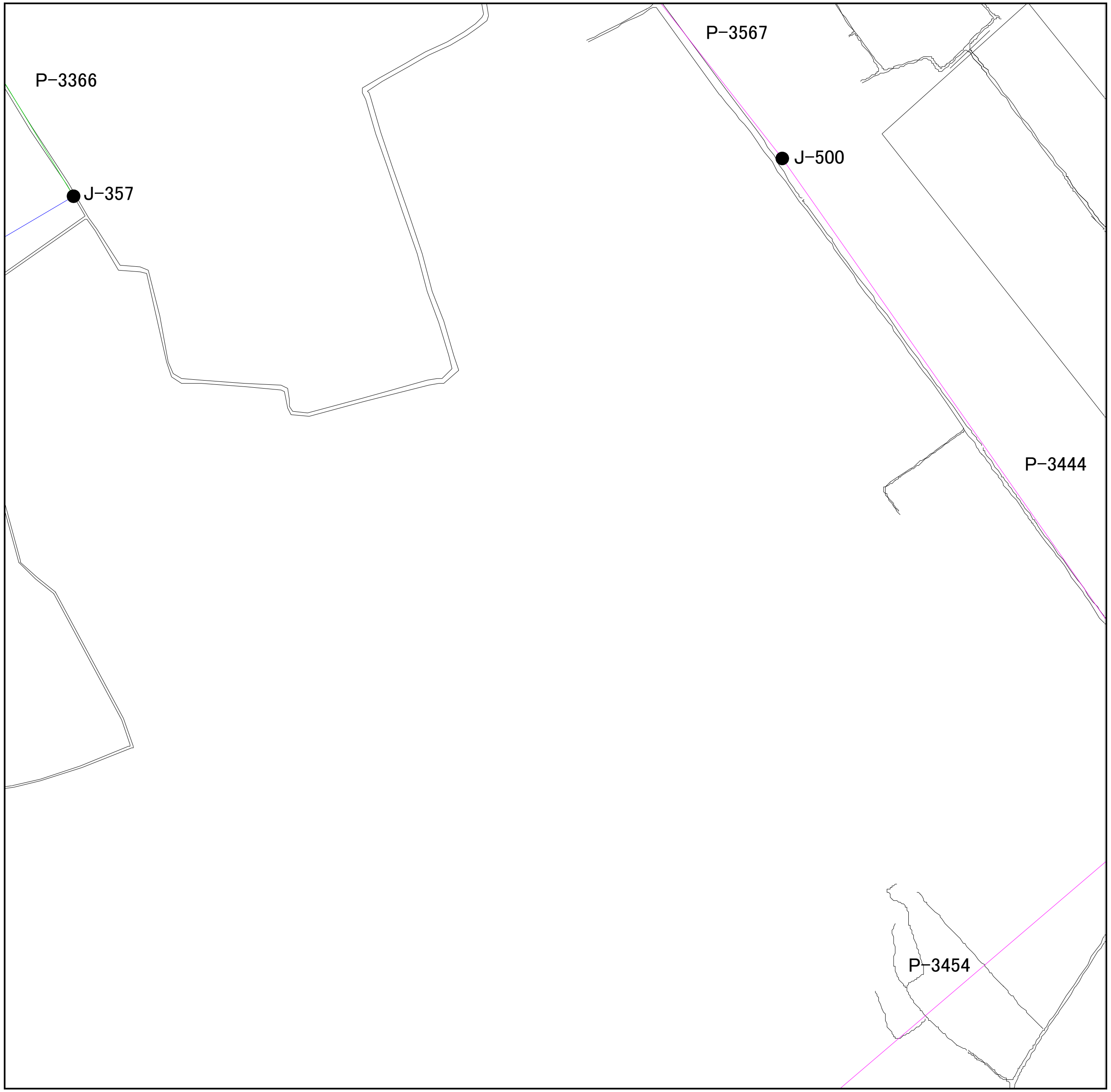

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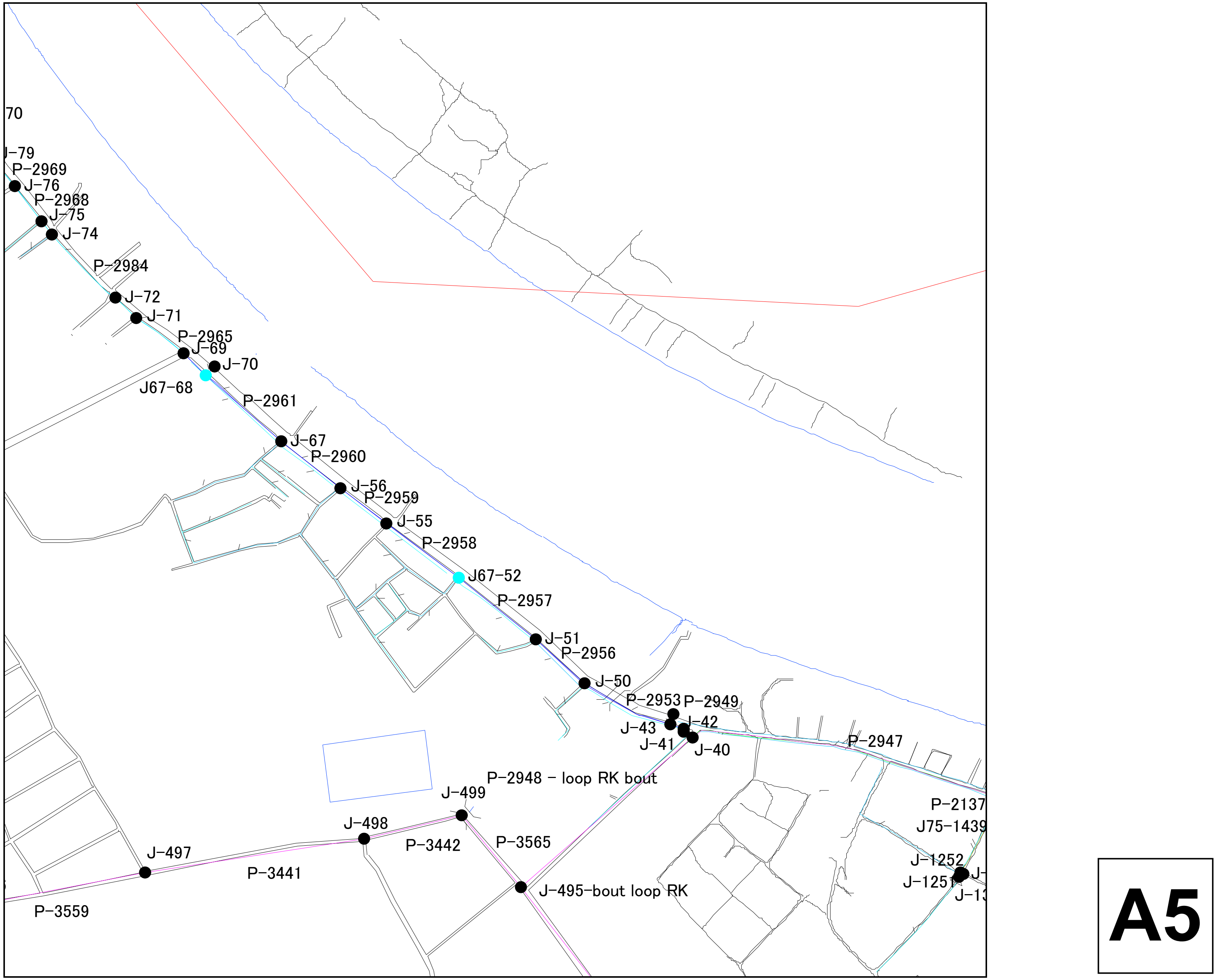
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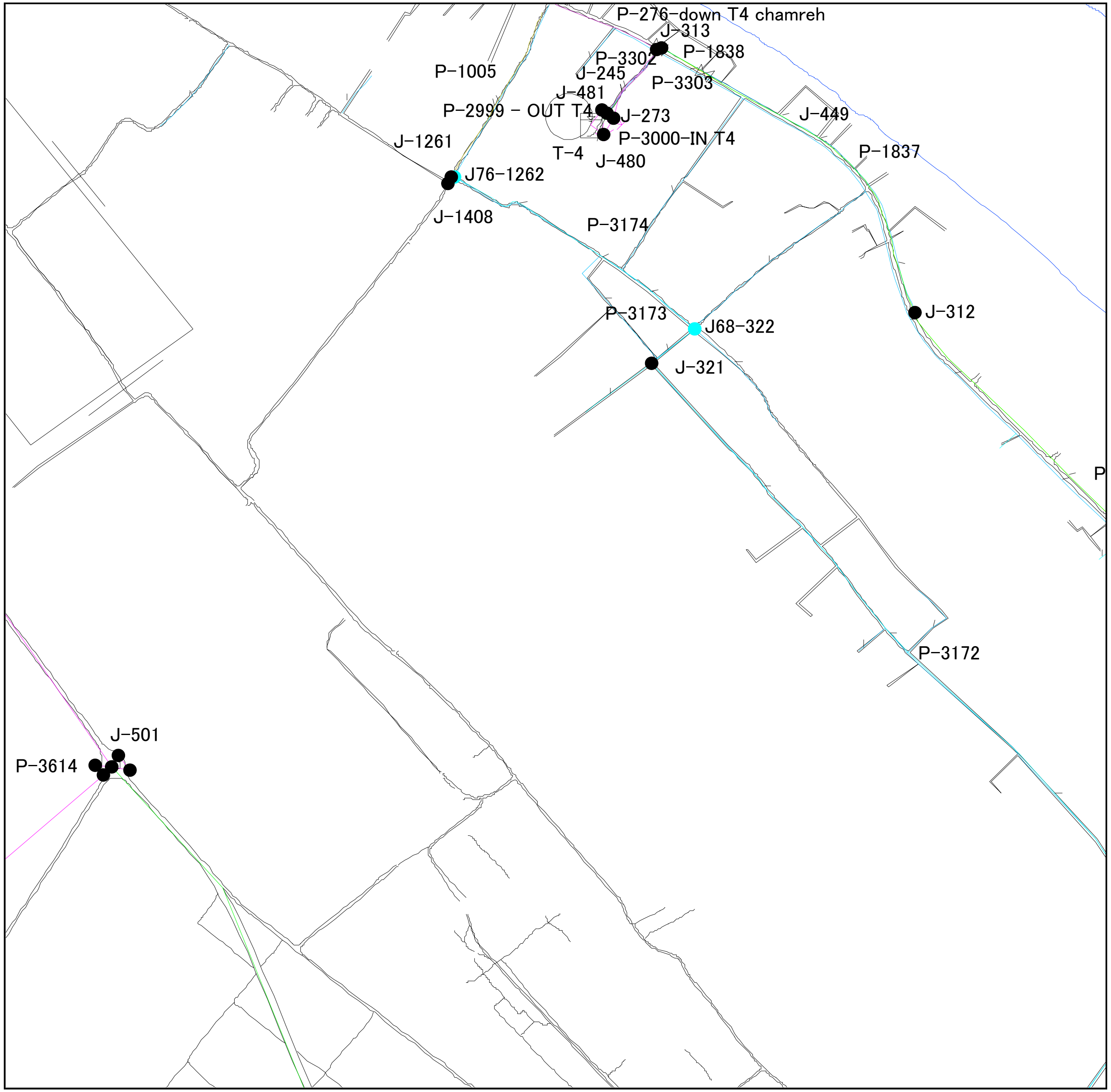
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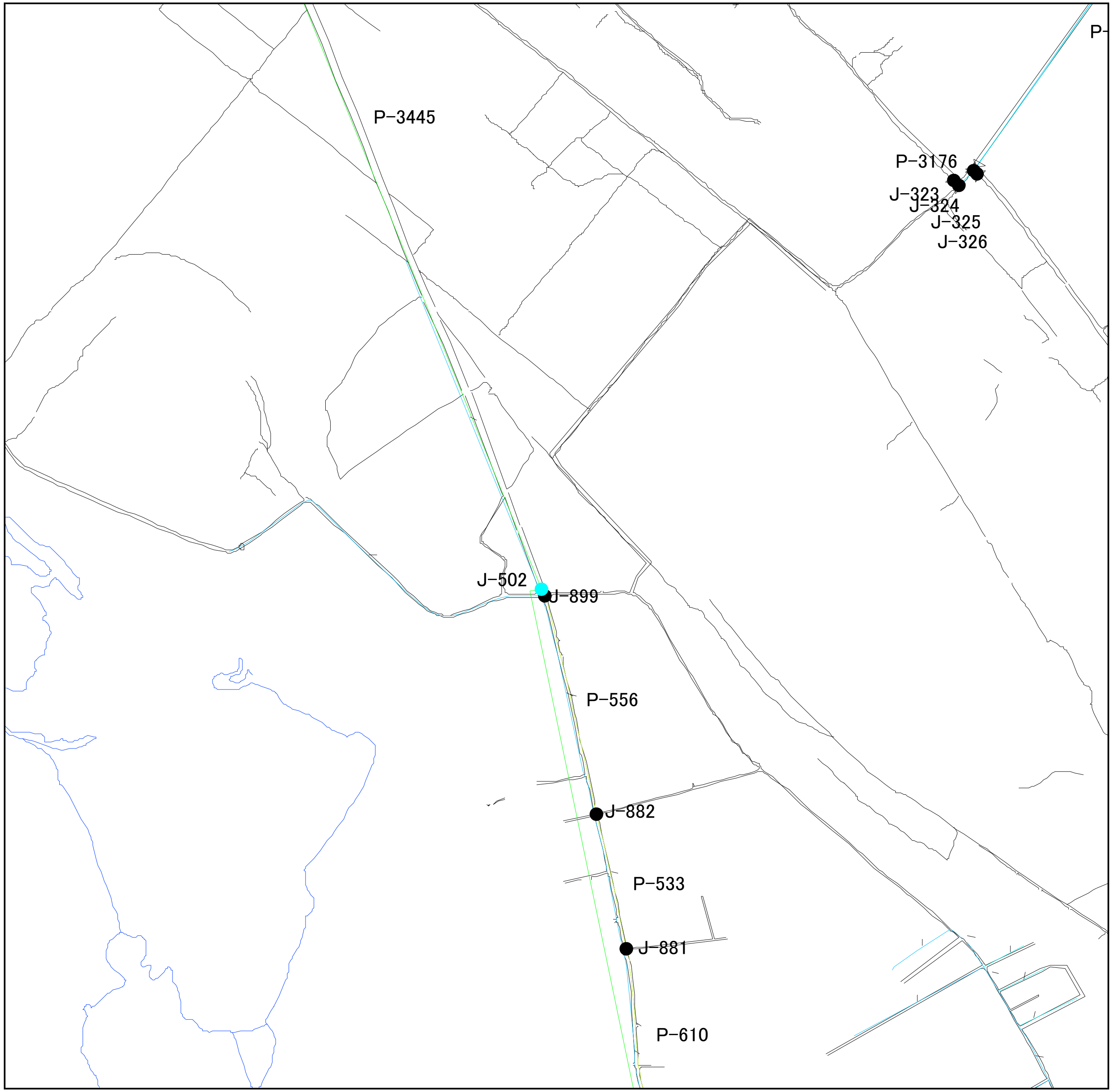
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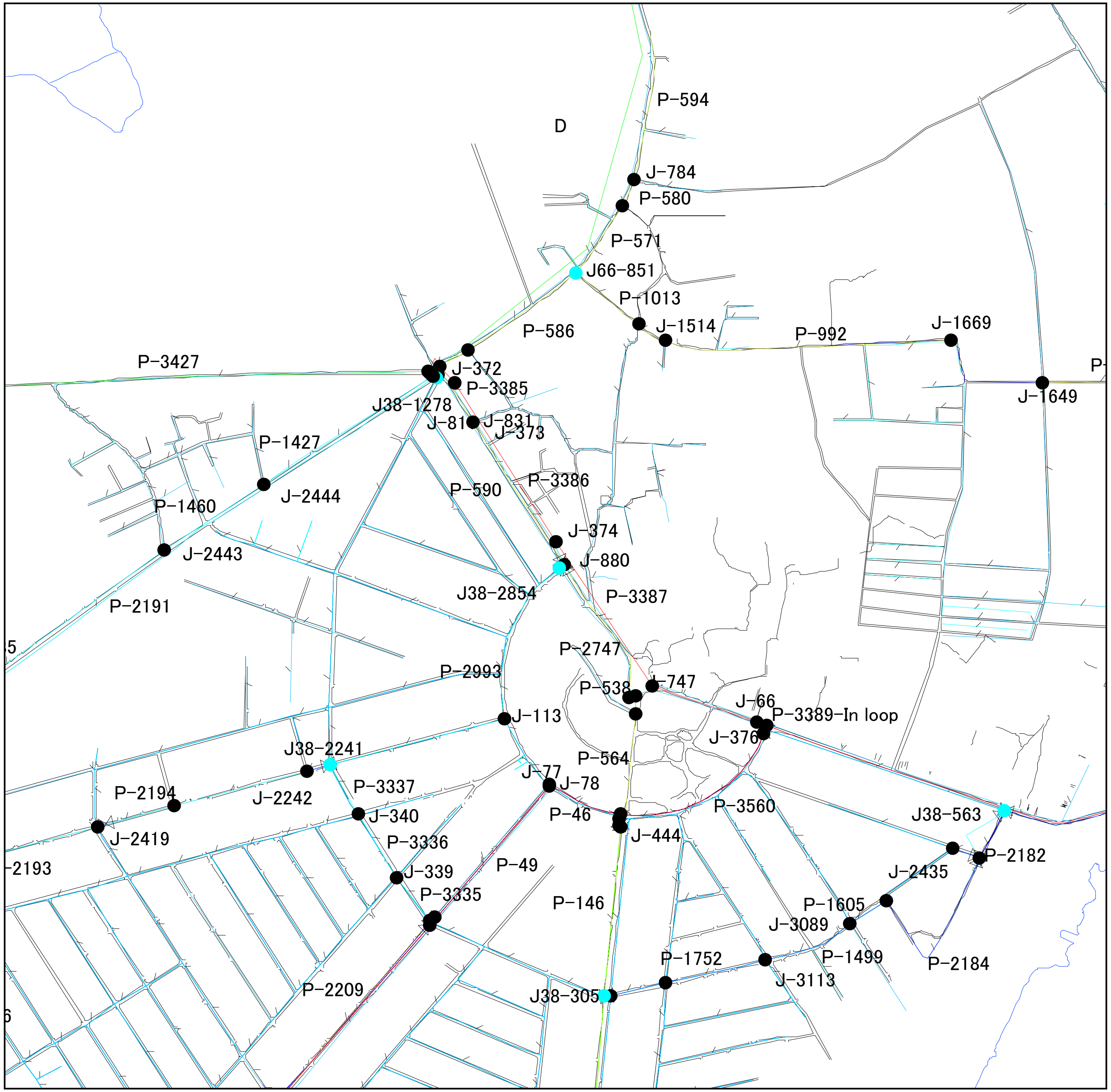
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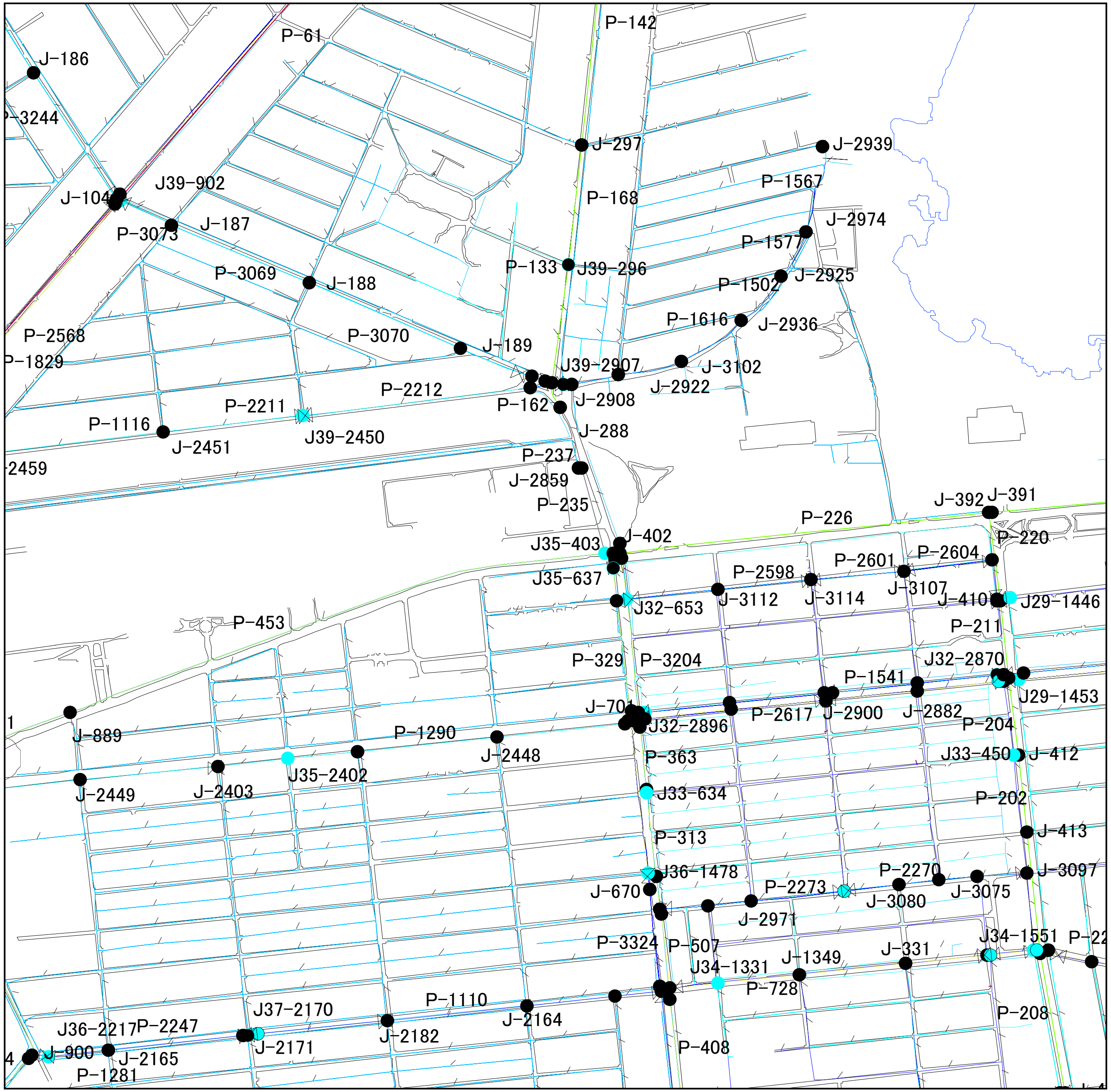
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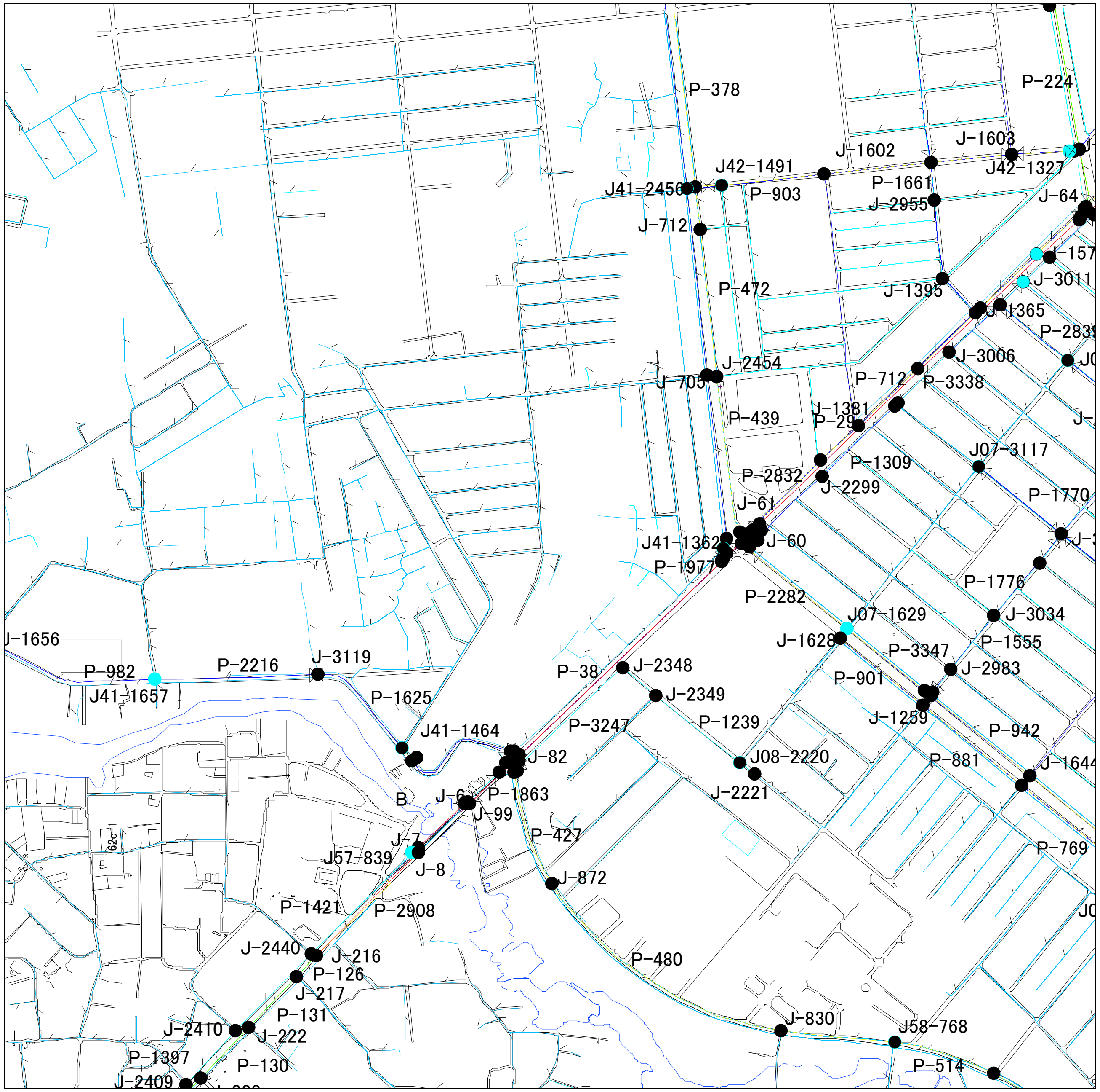

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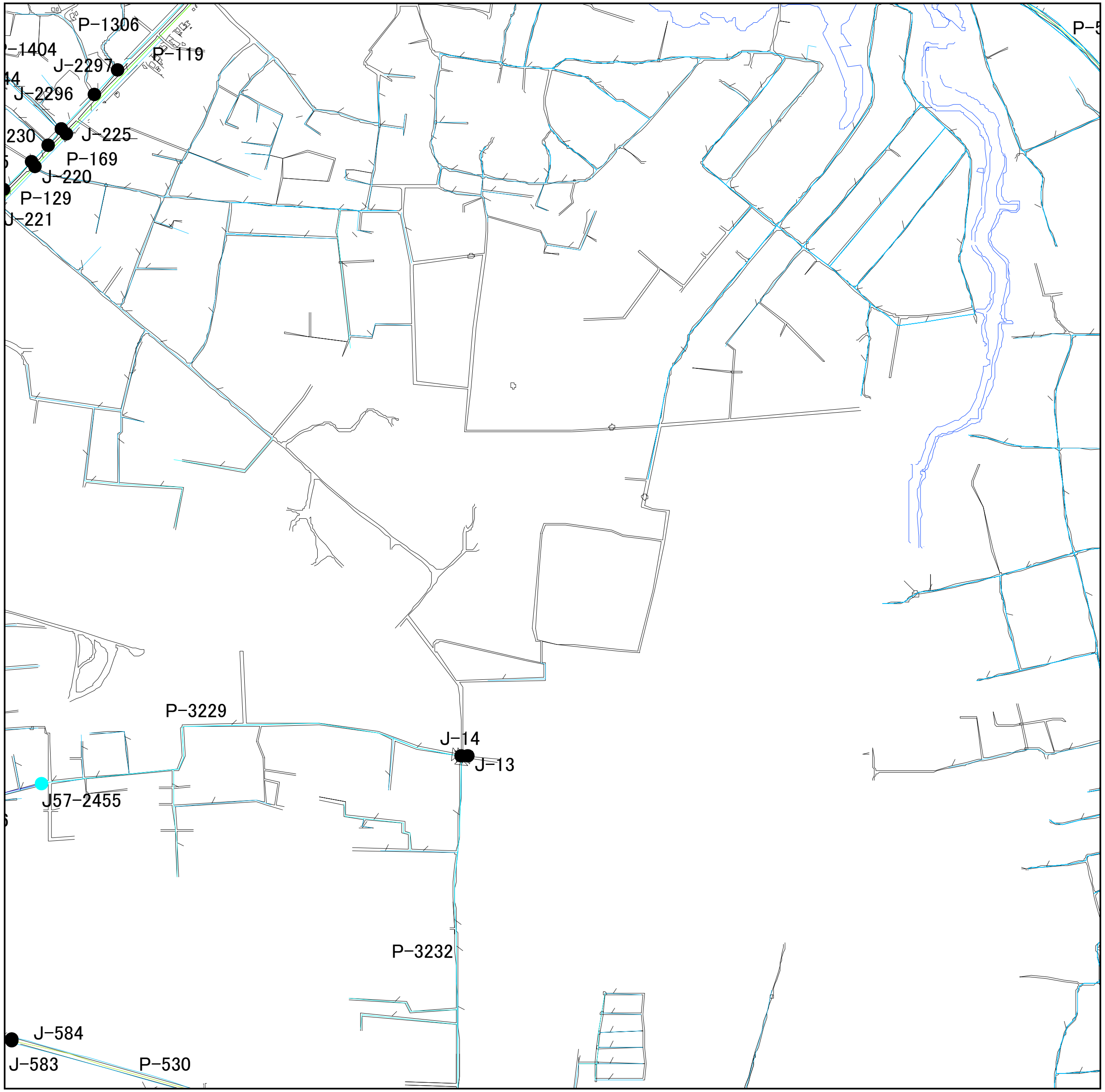
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