

ANNEX 20

INFLUENCE BY THE DELAY OF

DISTRIBUTION SYSTEM IMPROVEMENT:

ANALYSIS AND MEASURES

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1 General

In addition to the comparative study of alternatives which are described in Chapter 4.2 of the Main Report Volume II, influence which will be caused by the delay of distribution system improvement has been analyzed focusing on the 1st Stage Projects.

Before the commencement of the Study, the study demarcation was agreed among the Lao PDR side, AFD, and JICA. According to the agreement, JICA would solely establish a master plan. Then the feasibility studies would be conducted by the JICA on intake, water treatment plant, and transmission facilities, and on the other hand the AFD would conduct feasibility study on distribution system. Since there is no financial commitment made by any donor at the moment, there is a possibility of time lag of completion of implementation. In case, implementation of the distribution system improvement was delayed, incremental treated water could not be distributed effectively.

In order to minimize such bad influence which will be caused by the time lag of the implementations, the required distribution mains to distribute water from the proposed treatment plant and from transmission mains were identified as counter measures for each alternative. The required distribution mains will not be the same as the distribution mains which were planned at the alternative study contained in the Main Report, because the required distribution mains for this analysis are only for the 1st Stage and diameter of pipes were decided without consideration of the development under the 2nd Stage. The alternatives examined here were, therefore, only three alternatives, Alternative C: expansion of the existing Chinaimo WTP, Alternative K: expansion of the existing Kaolieo WTP, and Alternative T which will be newly constructed at Thangone area as listed below.

- Alternative C: 40,000 m³/day Expansion of Existing Chinaimo WTP
- Alternative K: 40,000 m³/day Expansion of Existing Kaolieo WTP
- Alternative T: 40,000 m³/day New Construction of Thangone WTP

Costs required for the required distribution mains are added to the construction costs of treatment plant and transmission mains and total costs are compared. The minimum cost alternative will be evaluated as the plan which will be least influenced by the delay of the distribution system

improvement.

2 Methodology and Conditions of the Analysis

The analysis was conducted by the steps mentioned below:

Step 1: Conduct hydraulic network analysis of the existing facilities with the proposed water treatment capacity. Apparently, the existing system can not distribute additional 40,000 m³/day, and the results show that residual pressure at many junctions lower than zero.

Step 2: Add distribution pipes gradually to obtain the residual pressures at the all junctions become more than 15 m.

Step 3: Calculate construction costs for the added distribution pipelines.

At the Step 1, in case of Alternatives C and K, it is possible to carry out the network analysis without system modification. However, Alternative T can not distribute any water to the customers because treated water from the new Thangone WTP is distributed through the new distribution center. This means that if no distribution facilities for Alternative T, no water is distributed from the proposed plant. Therefore, the following conditions were assumed for the analysis for Alternative T to achieve the same results as the other alternatives.

- Transmission pipeline originally planned from new Thangone WTP to new distribution center is connected to the existing distribution mains. In this case, the increase of pipe diameter and transmission pump capacity at new Thangone WTP are needed to meet peak hour demand. This modification will require additional costs as shown below.
- In addition, in order to connect with the nearest existing distribution trunk mains, additional pipelines are necessary since the diameter of distribution trunk mains connected with new pipeline from Thangone WTP is extremely small for flow rate of 40,000 m³/day.
- The costs for improvement of Chinaimo WTP which is the separation of transmission and distribution systems is not included in the costs for Alternative T. The improvement of Chinaimo WTP is indispensable to supply water to the northern part of the city such as Dongdok area, however, in the case of the Alternative T, water can be distributed to the Dogndok area without the improvement of the Chinaimo WTP.

Modification of construction costs for Alternative T for the analysis is summarized below.

Original Construction Costs without Distribution Facilities

(x 1,000 US\$)	Alternative C	Alternative K	<i>Alternative T</i>
Treatment Plant	8,782	9,624	9,552
Transmission Pipelines	1,234	1,234	6,456
Improvement of Chinaimo WTP	2,433	2,433	-
Total	12,449	13,291	16,008

Improvement of Pumps at Thangone WTP

		(x 1,000 US\$)
Original	Q9.3m ³ /min x H42.5 x 96Kw x 4 units	763
After Modification	Q12.1m ³ /min x H100 x 300Kw x 4 units	1,672
Balance		909

Note: In addition, it is necessary to increase about 540 thousands US\$ as the increases of reservoir and generator capacities.

Increase of Pipe Diameter for meeting Peak Hour Demand

		(x 1,000 US\$)
Original	600 mm x L 10,580m	6,048
After Modification	700 mm x L 10,580m	7,521
Balance		1,473

Installation of Pipe for Connection with Existing Distribution Trunk Mains

		(x 1,000 US\$)
Original		-
After Modification	600 mm x L 4,590m	2,624
Balance		2,624

Delete of Transmission Pipeline by Improvement of Chinaimo WTP

		(x 1,000 US\$)
Original	700 mm x L 575m	409
After Modification		-
Balance		-409

Total Costs for Transmission Pipelines

		(x 1,000 US\$)
Original		6,457
After Modification		10,145
Balance		3,688

Summary of Increase Cost

		(x 1,000 US\$)
Treatment Plant		909
Transmission Pipelines		3,688
Total		4,597

Construction Costs for Risk Examination

(x 1,000 US\$)	Alternative C	Alternative K	<i>Alternative T</i>
Treatment Plant	8,782	9,624	10,461
Transmission Pipelines	1,234	1,234	10,144
Improvement of Chinaimo WTP	2,433	2,433	-
Total	12,449	13,291	20,605

3 Network Analysis for Alternative C

Figure 1 Network Model without Distribution System Development, Alternative C

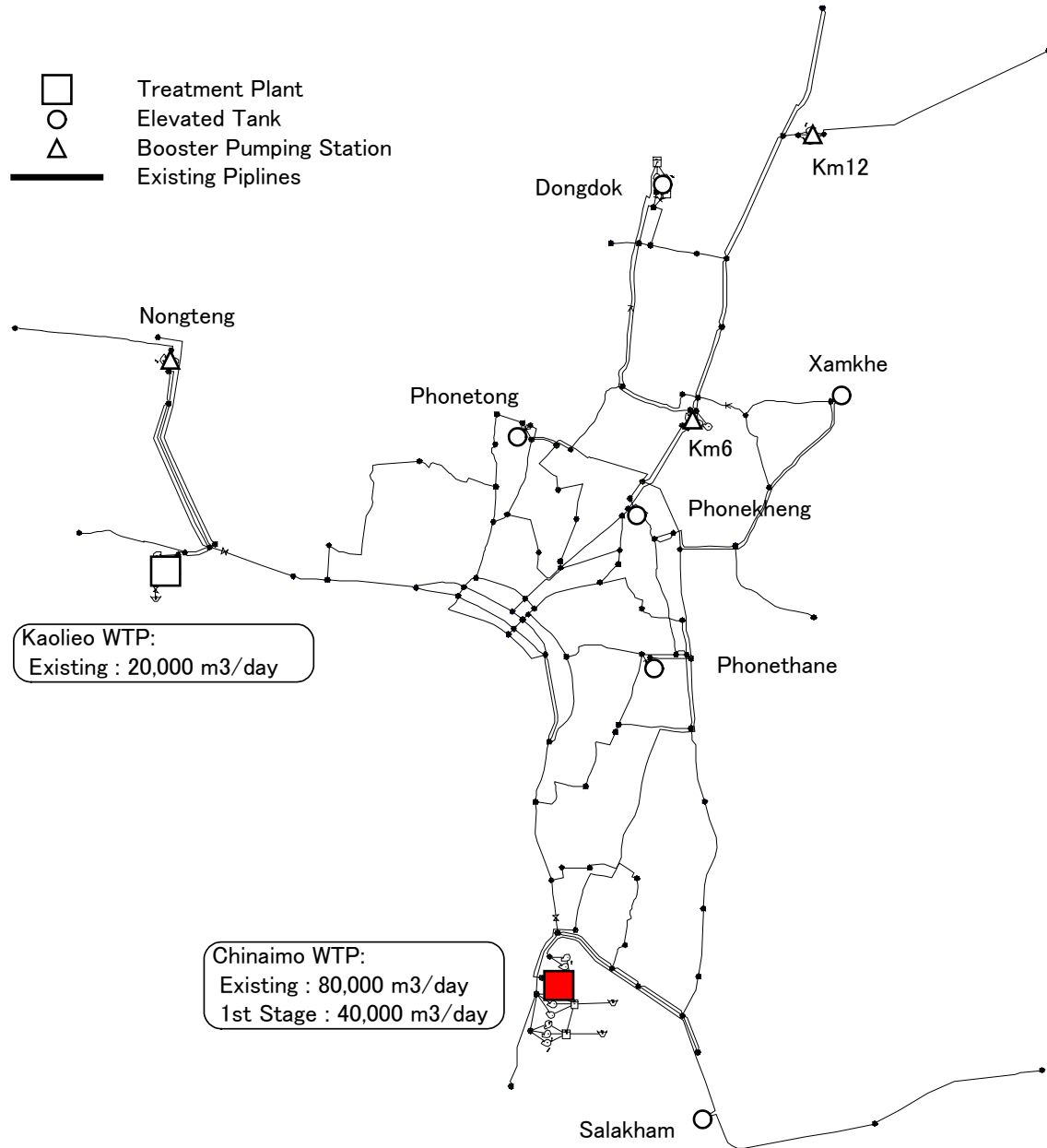


Table 1 Residual Pressure at Each Junction without Distribution System Development, Alternative C

Figure 2 Residual Water Pressure Contour at 13:00 without Distribution System Development, Alternative C

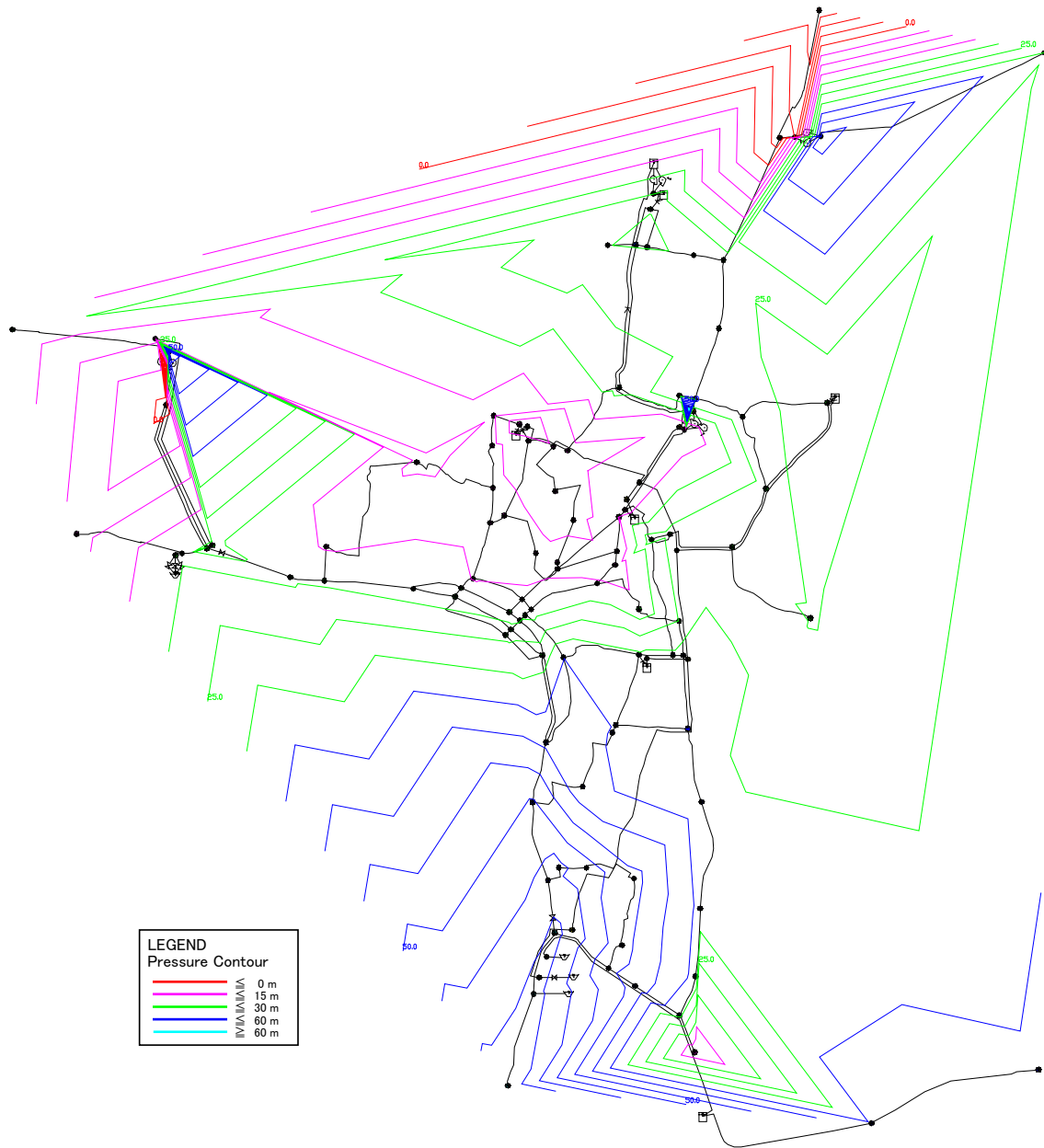


Figure 3 Clear Water Transmission and Required Distribution Trunk Mains, Alternative C

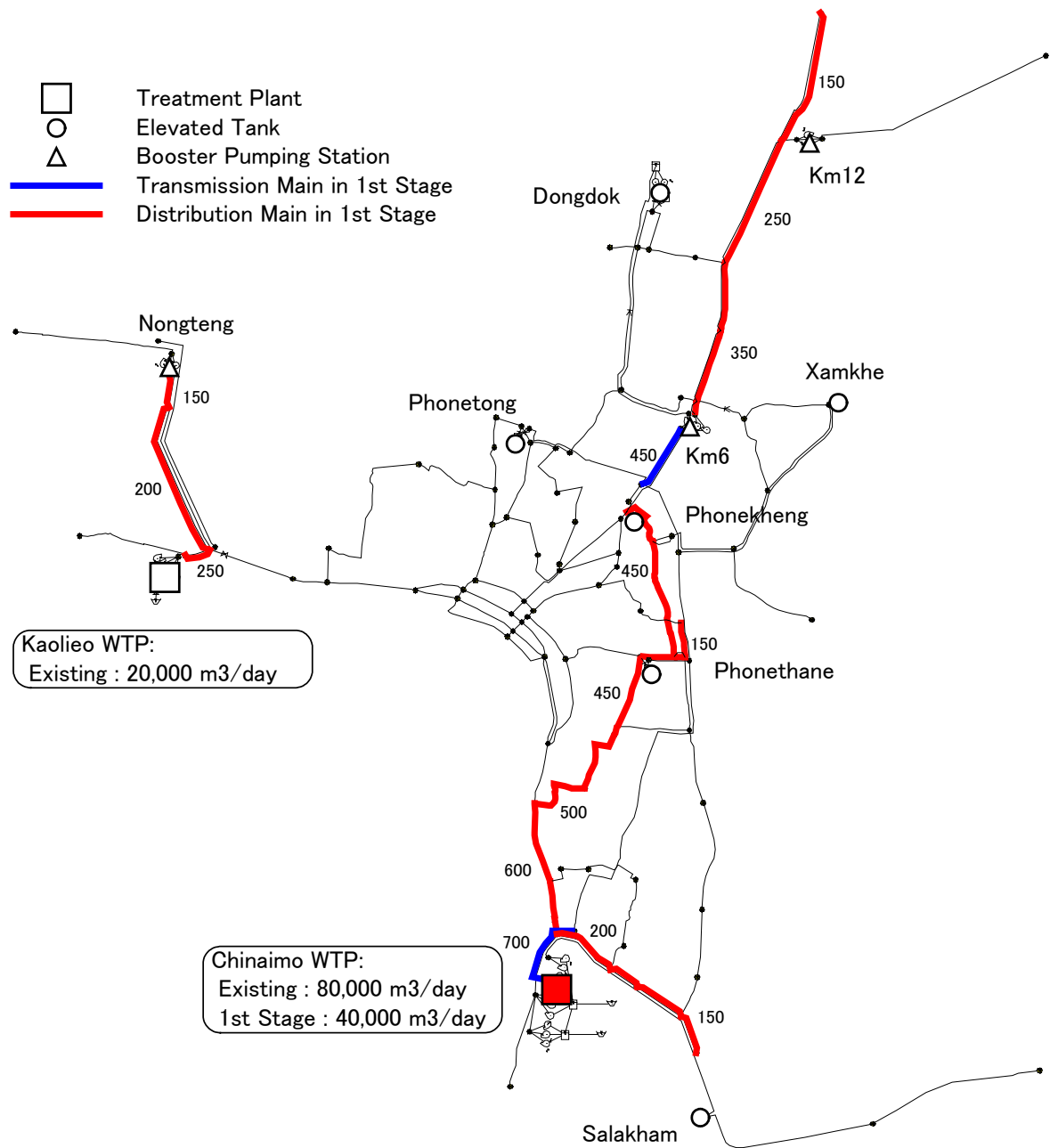


Table 2 **Residual Pressure at Each Junction with Required Distribution Trunk
Mains,
Alternative C**

The table contains a large amount of data organized in a grid format. The columns represent different junctions or pipe segments, and the rows represent various parameters related to residual pressure. The data is presented in a highly structured manner, typical of a technical report. There are several rows of data at the top and bottom of the table, which likely serve as headers and footers for the data presented. Some cells in the table are highlighted in pink and cyan, possibly indicating specific data points of interest or different categories of data.

Figure 4 Residual Water Pressure Contour at 13:00 with Required Distribution Trunk Mains, Alternative C

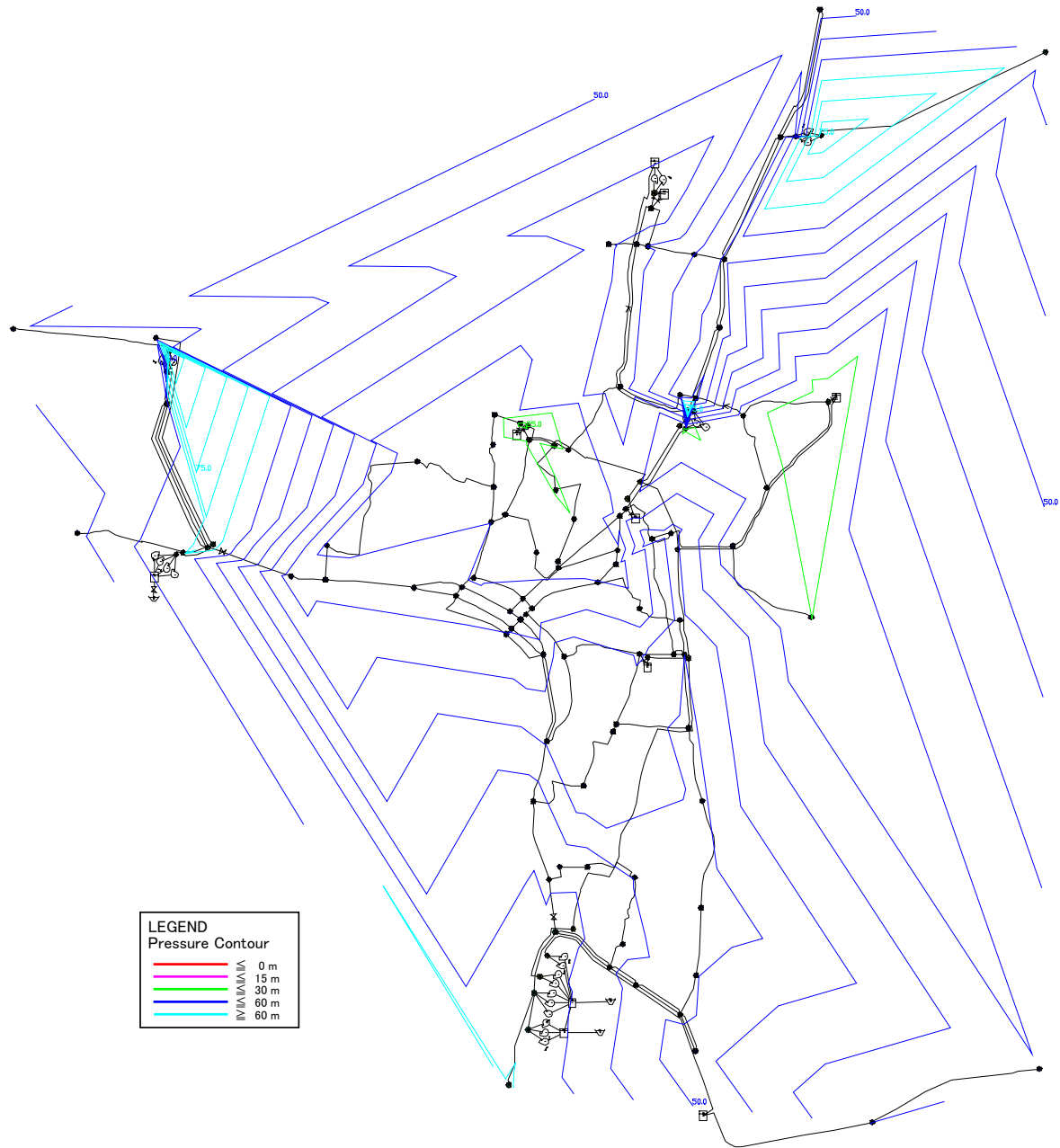


Table 3 Length and Cost for Required Distribution Trunk Mains, Alternative C

Diameter	Length	Costs	
		x 1,000 Yen	x 1,000 US\$
mm	m		
150	6,170	36,712	309
200	5,650	48,187	405
250	3,440	39,233	330
300		0	0
350	3,220	100,903	848
400		0	0
450	7,350	325,081	2,732
500	1,460	76,446	642
600	2,735	186,059	1,564
700		0	0
800		0	0
Total	30,025	812,620	6,829
Sub-total (150-250mm)		124,132	1,043
Sub-total (300-800mm)		688,488	5,786