ANNEX 10

RESULTS OF 24 HOUR FLOW SURVEY

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1. General

In order to feed back to the network model for calibration and to examine the network analysis, flow measurement has been conducted at five (5) locations as listed below and shown in **Figure A10-2** by ultrasonic flow meter which was brought into Lao PDR by the Study Team. Pressure has been measured simultaneously with these flow measurements. The study team borrowed a flow meter and pressure gauge from NPVC. Staff of Leak Detection & Control Section of NPVC assisted the study team with the measurement. During the measurement, the technology transfer of the manipulation of the equipment to the counterpart has been done partly.

Photo A10-1 Flow Measurement at No.3, 02/04/03

Photo A10-2 Flow Measurement at No.4, 31/03/03

- Location No.1: Transmission trunk main installed by ADB loan project which expands from Chinaimo WTP to the theast (dia. 700 mm), see **Figures A10-3 & 4**
- Location No.2: Distribution trunk main which expands from Chinaimo WTP to the north (dia 700 mm), see **Figure A10-5 & 6**
- Location No.3: Distribution trunk main which expands to noertheast from Phonekeng Reservoir along Root 13 (dia. 350) and Transmission trunk main to Phonetong Reservoir (dia. 500 mm), see **Figure A10-7 & 8**
- Location No.4: Distribution trunk main which expands from Kaolieo WTP to the north (dia. 250 mm) and distribution trunk main which expands from Kaolieo WTP to the southeast downtown area (dia. 450 mm), see **Figure A10-9 & 10**
- Location No.5: Transmission trunk main to Salakham Reservoir from Chinaimo WTP (dia. 300 mm) measured at flow meter chamber inside of Chinaimo WTP

2. Equipment used for Measurement

Table A10-1 Equipment used for Measurement

Equipment	Type
Flow Meter	Potable Type Ultrasonic Flowmeter (Portaflow X), Fuji Electric Co., Ltd.
Measurement of Wall Thickness of Pipe	Measurement of Wall Thickness of Pipe: Ultrasonic Thickness Gauge TI-50K, Kawatetsu Advantech Co., Ltd.

3. Schedule of Flow Measurement

Table A10-2 Schedule of Flow Measurement

Location of Measurement	Start Time	Finish Time
No.1	27/03/03 12:00	28/03/03 12:00
No.2	07/04/03 11:20	08/04/03 11:40
No.3	02/04/03 11:50	03/04/03 12:10
No.4	31/03/03 11:00	01/04/03 11:00
No.5	10/04/03 10:20	11/04/03 10:20

Photo A10-3 Location No.1

Photo A10-4 Location No.2

4. Results of the Measurement

Results of the measurement are summarized in **Table A10-3** and illustrated **Figure A10-1**. Figures and table attached to the following pages are the results of measurement.

Table A10-3 Summary of Flow Measurement

Location	Pipe Dia. (mm)	Ave. Flow (m3/h)	Total Flow (m3/day)	Remarks
No.1	700	1,488	35,700	Flow rates of distribution main of 700 mm and transmission main of 700 mm are almost same. This result is correspondent to the information from NPVC's engineer.
No.2	700	1,530	36,717	
No.3	500	1,360 (1,039)	32,648 (24,925)	It is necessary to resurvey, because the flow rate is very high. Sensor space should be checked carefully.
	350	-	-	The data obtained by the survey were not stable and the flow rate could not be calculated.
No.4	450	-	-	The data obtained by the survey were not stable and the flow rate could not be calculated.
	250	216	5,179	This results were used for estimation of demand pattern of network analysis.
No.5	300	204	4,887	Pump working hour for Salakham Reservoir on the day of measurement is 15 hours.
	500	3,472	83,320	-

note: Figures of () are measured by NPVC's flow meter.

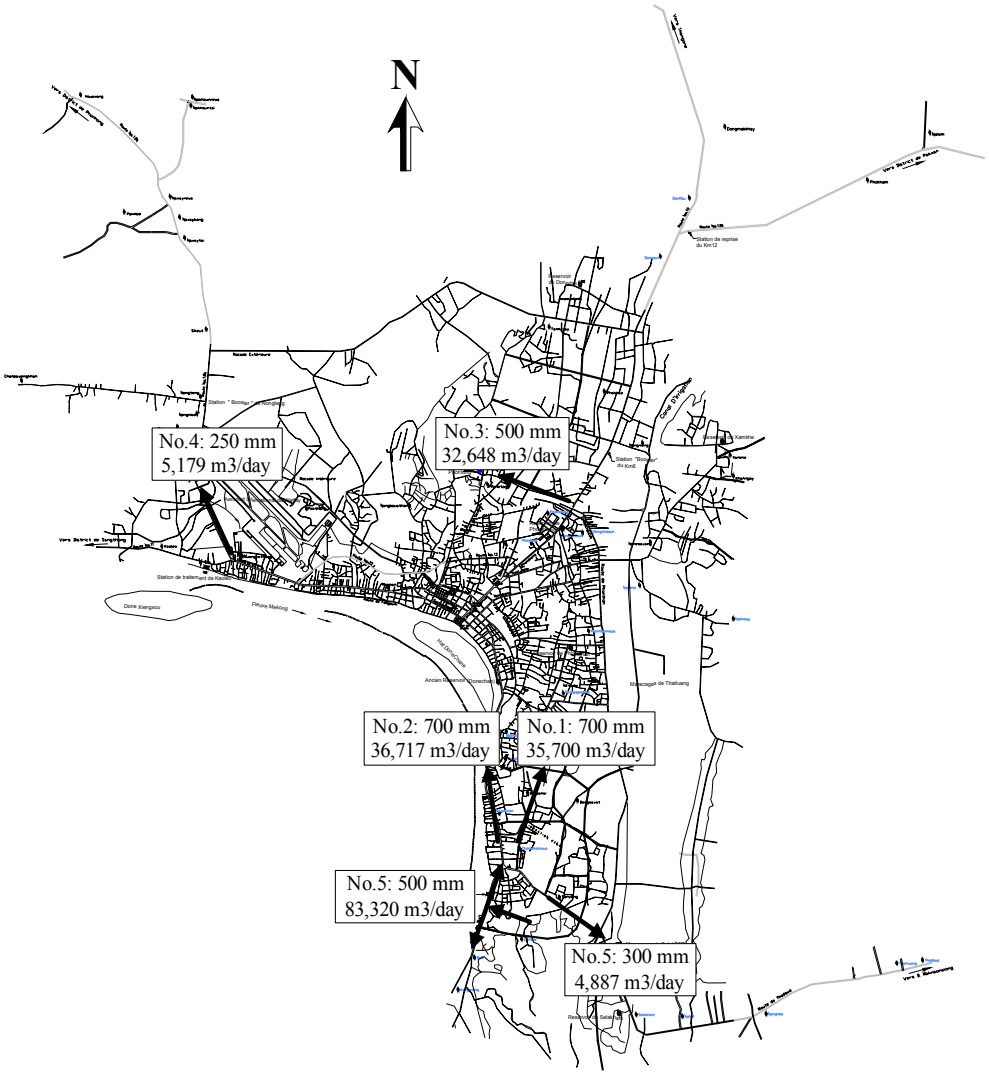

Figure A10-1 Summary of Flow Measurement

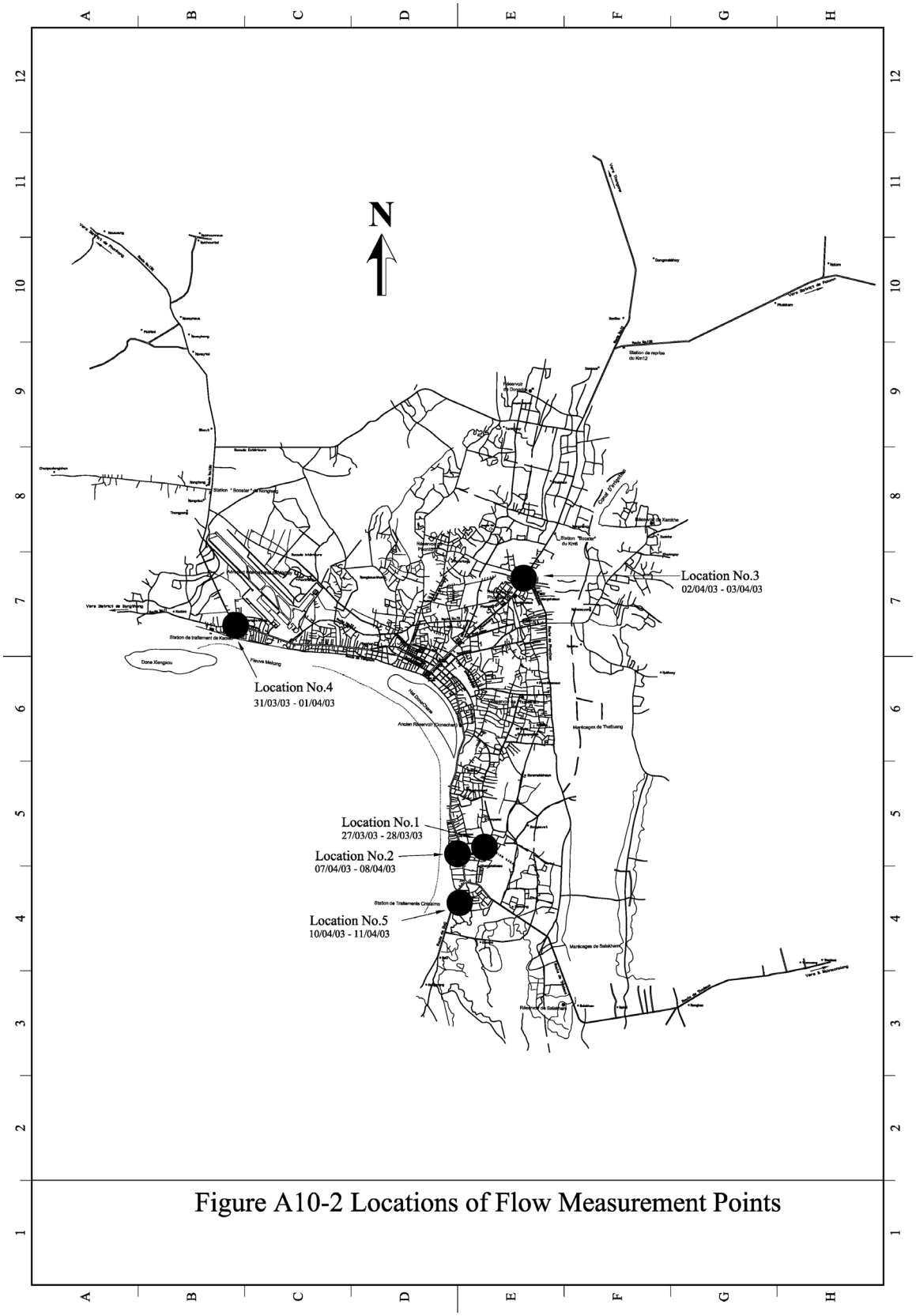

Figure A10-2 Locations of Flow Measurement Points