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REPUBLIC OF INDONESIA
MINISTRY OF PUBLIC WORKS
DIRECTORATE GENERAL OF HOUSING BUILDING
PLANNING AND URBAN DEVELOPMENT (CIPTA KARYA)

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MEDAN URBAN DEVELOPMENT, HOUSING, WATER SUPPLY AND SANITATION PROJECT

TECHNICAL MEMORANDUM NO. 34

SIBOLANGIT SPRINGS

This is a draft of Appendix A of the Master Plan Report for Water Supply and Sanitation

NOVEMBER 1979

ENGINEERING - SCIENCE, INC. • SINOTECH ENGINEERING CONSULTANTS, INC
A JOINT VENTURE
in association with
PADCO and P.T. DACREA

MEDAN URBAN DEVELOPMENT, HOUSING, WATER SUPPLY AND SANITATION PROJECT
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Our ref.: 79/1203/MUDS/313

9 November 1979

Director General Cipta Karya
Ministry of Public Works
Jalan Pattimura 20
Kebayoran Baru
Jakarta Selatan

Subject: Technical Memorandum No. 34, Sibolangit Springs

Dear Sir:

Attached are 20 copies of the subject Technical Memorandum for your information and review. The material contained in this memorandum constitutes submission of Appendix A of the draft Master Plan for Water Supply and Sanitation Report.

ENGINEERING SCIENCE, INC. MEDAN URBAN PROJECT INDONESIA

Yours faithfully,

John M. McGill
Project Representative

C.C.: Ir. Ruslan Diwiryo, Director of City & Regional Planning
Ir. Susanto Mertodiningrat, Director of Sanitary Engineering
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* Not yet submitted.

LIST OF TECHNICAL MEMORANDA PREVIOUSLY SUBMITTED

Report No.	Title	Date Submitted
1.	Preliminary Site Selection Criteria for Perumnas Medan III, SSCH/LCH Project	March, 1979
2.	Work Plan for Water Supply and Sanitation Master Plans and Feasibility Studies	April, 1979
3.	Policy Issues for Project Guidance	March, 1979
4.	Drainage - Principal Rivers and Rainfall Analysis	May, 1979
5.	Preliminary Evaluation of Sunggal Water Treatment Plant	May, 1979
6.	Public Health Considerations	July, 1979
7.	The Present Drainage System	August, 1979
8.	Recommended Drilling Program	August, 1979
9.	Medan Household Income/Expenditures	August, 1979
10.	Existing Land Use in Medan	August, 1979
11.	The Regional Functions of Medan	August, 1979
12.	Existing Solid Wastes Systems and Projected Solid Wastes Characteristics	August, 1979
13.	Evaluation of Medan Master Plan	August, 1979
14.	Physical Constraints to Urbanization	August, 1979
15.	Development in Health Care in Medan	September, 1979
16.	Existing Water Supply Systems	September, 1979
17.	Developments in Education	October, 1979
18.	Existing Water Supply and Sanitation Systems	October, 1979
19.	Public Health and Environmental Aspects	October, 1979
20.	Alternative Solid Wastes Management Systems	October, 1979

LIST OF TECHNICAL MEMORANDA PREVIOUSLY SUBMITTED (CONTINUED)

Report No.	Title	Date Submitted
21	The Distributed Investment Strategy Plan (DISP)	October, 1979
22	Recommended Solid Wastes Management System	October, 1979
23	Recommended Drainage Management System	October, 1979
24	Alternative Water Supply Management Systems	November, 1979
25	Water, Wastewater, Stormwater and Solid Wastes Systems	November, 1979
26	Alternative Wastewater Management Systems	November, 1979
27	Design Criteria and Bases for Cost Estimates	November, 1979
28	Recommended Water Supply Management System	November, 1979
29	Recommended Wastewater Management System	November, 1979
30	Environmental Assessment	November, 1979
31	Finance	November, 1979
32	Groundwater Resources	November, 1979
33	The Existing Urban Situation	November, 1979

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APPENDIX A

SIBOLANGIT SPRINGS

A.1 SPRINGS LOCATIONS AND FLOWS

The springs near Sibolangit and Sembahe have supplied Medan with water for more than 70 years. These springs are located about 40 km south of the city center of Medan and about 26 km from the near connection with the distribution system. Analyses of the spring transmission system has been presented in Section 2 and Appendix ____. As indicated in report Figure 2.2, the springs lie along the the tributaries of the Petani and Betimus branches of the Deli River. Several springs also lie to the west in the Tenbengan and Bentar branches of the Belawan River.

Flows from the Sibolangit springs have been reported by the Geological Survey of Indonesia (Bandung, 1973) and by old Dutch maps of the water company. These reports indicate eight major groups of springs:

EASTERN		
No. 31	Puang Aja*	150 l/s; 13,000 m^3/d
	Sembahe	
No. 32	Lau Kaban*	200 l/s; 18,000 m^3/d
No. 33	Lau Bengklewang*	160 l/s; 14,000 m^3/d
No. 34	Rumah Sumbul*	150 l/s; 13,000 m^3/d
WESTERN		
No. 27	Lau Seram	
No. 28	Lau Gurisa	220 l/s; 19,000 m^3/d
No. 29	Lau Tambunan	
No. 30	Lau Timah	
Total		880 l/s; 77,000 m^3/d

(* springs collected by Tirtanadi).

PAM Tirtanadi collects about 46,500 m^3/d from the eastern group of the Sibolangit springs or about 75 percent of their estimated flow old map records of Tirtanadi indicated flows which are quite similar to those reported by the GSI (above) for the eastern group. The old maps also indicated several other nearby springs with a combined flow of about 4,000 m^3/d. The western group of spring were recorded on the old maps with a combined flow of 18,100 m^3/d which is again similar to that

reported by the GSI for the same group. The exact locations of these springs are not known.

Reports have been made that the springs have very stable flows without significant daily or seasonal changes. A review of the available production measurements taken during the last year indicates some seasonal changes and flow variations of more than 10 percent. Furthermore, total production has been about 43,000 m^3/d, about 10 percent less than the reported production of 47,000. Production from the Lau Bengklewang and Rumah Sumbul springs have varied by about 20 percent. Rumah Sumbul production showed increases from July to December, 1978, from the dry to wet seasons. Variations at Lau Bengklewang showed no clear trend. Combined production from the Puang Aja and Lau Kaban springs varied by 25 percent and showed increased production from the dry season to the wet season and then a slight decline in the dryer months of January and February, 1979.

Less than 60 percent of the total available spring flow is collected by Tirtanadi, and the remainder passes into the Belawan and Deli rivers. Tirtanadi collects 47,000 m^3/d from the eastern spring group which has a combined flow of 57,000 m^3/d. Therefore, about 10,000 m^3/d flows into the Deli river from these springs. If the other reported smaller springs were separate from the GSI estimates, another 4,000 m^3/d flows into the Petani branch of the Deli. Of the western group, 6,400 m^3/d flows into the Betimus branch of the Deli River, and perhaps as much as 15,000 m^3/d passes into the Tembengan and Bentar branches of the Belawan river.

A.2 FACILITIES

In 1908, the springs of Rumah Sumbul were developed to produce about 155 l/s. An additional 135 l/s were collected from the springs of Lau Bengklewang in 1929. These springs were served by a common transmission system. Springs on east side of the Medan-Brastagi Road were collected between 1958 and 1968. The Lau Kaban and Puang Aja springs (or the Sembahe springs) were collected to the Sembahe treatment facilities, and 260 l/s conveyed via the Rumah Sumbul and Lau Bengklewang transmission pipelines. The total production level in 1968 was about 550 l/s or 46,500 m^3/d and has continued to 1979.

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Spring water is collected from seepage areas by a series of excavated tunnels which are usually lined with brick to allow seepage into the tunnel. The collected flow passes along the bottom of the tunnel and enters a sump where the water flows into the collection pipeline. From the individual collectors, pipelines carry the spring waters to the central treatment facilities. Sufficient gravity head is available to allow aeration, chlorination and gravity flow through the entire treatment facility and then collection in a sump before the treated spring water enters the transmission pipelines to reach Medan. The Rumah Sumbul and Lau Bengklewang springs water are combined in a central chamber and then eventually combined with the spring waters from Puang Aja and Lau Kaban at Sembahe. The transmission pipelines follow the west or left bank of the Petani Branch of the Deli River and split near Deli Tua before entering the Medan distribution system.

A.3 WATER QUALITY

The water quality of the Sibolangit Springs is better than any other source. Additional analyses were conducted and confirm is good quality. The raw spring water has low pH and high CO_2 levels which are buffered and lowered by aeration before the water enters the transmission pipelines. Similarities between the four major spring sources suggest that the springs waters may arise from the same aquifer.

A.4 GEOLOGICAL OCCURENCE

The springs are located along a northwest-southeast line which parallels the contact to the south between the upper lahar and breccia and the lower andesitic tuffs of the Post - "Toba" volcanics. Available geological surveys of the area have not indicated the underlying geological structure or sources of the springs. Surface exposures of bedrock are isolated and do not provide clear evidence of the geological relationships of the springs to the volcanic deposits.

General interpretations of the available geological data suggest two possible sources for the springs, and perhaps both for different groups of springs (Figure A.1). The springs may arise from faults or formation contacts between different volcanic layers (Figure A.1). The

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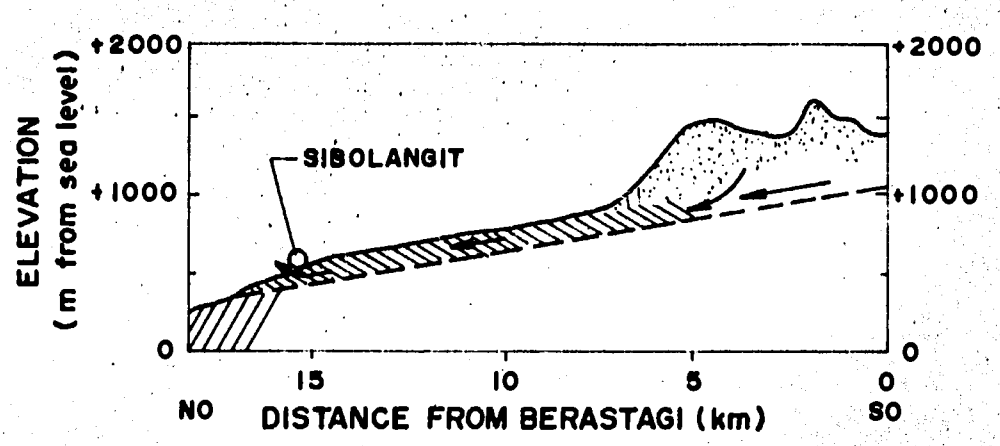
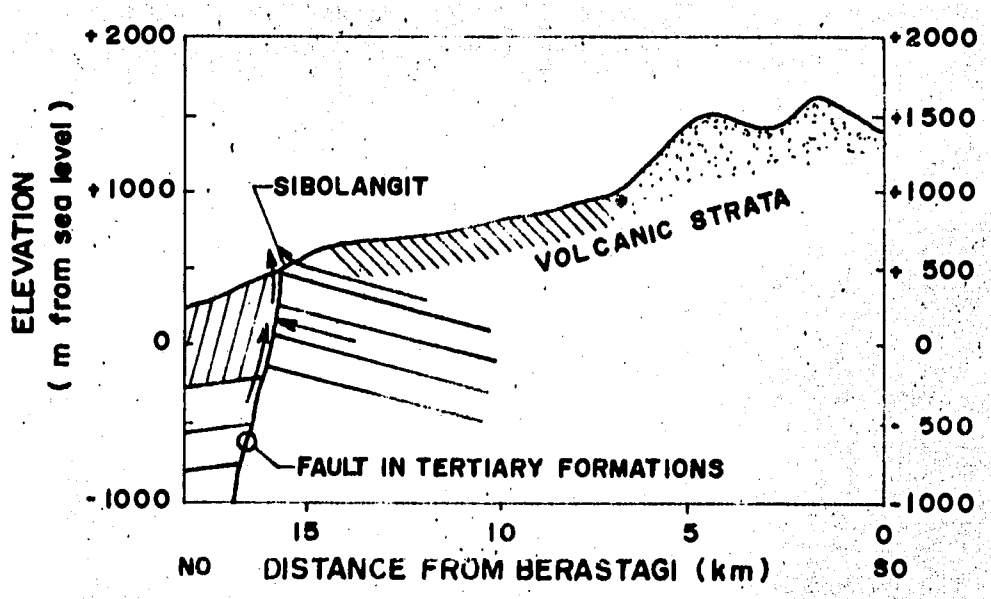
SCHEMATIC GEOLOGICAL CROSS-SECTIONS OF POTENTIAL SOURCES OF SIBOLANGIT SPRINGS

a. VOLCANIC OR SHALLOW SOURCES





map for the Belawan-Medan-Brastagi area indicates that the upper formation of the post-Toba volcanics is composed of lavas and breccias, and breccias cover the higher drainage basins of the Deli and Belawan rivers and from Sibolangit to Brastagi valley (about 15 kilometres). The upper breccia overlies the lower andestic tuff which forms the floor of the Brastagi valley and the hills between Sibolangit and Medan.

The contact between these formations winds back and forth across a zone of about one kilometre, and some of the upper breccia occur as long narrow remnants along several streams. Such occurrences suggest that the breccia may have flowed out into an irregular surface over the lower tuff. In some places, the breccias may have filled the old valleys eroded in the underlying tuff. The irregular contact surface between the two volcanic layers would tend to collect the rainfall which infiltrates into the breccia from the drainage divide of Gundaling-Sibayak down to Sibolangit. If an ancient valley had followed the same course as the Petani river, the contact between the breccia and tuff would concentrate the breccia groundwater and direct the groundwater flow along the old buried river course which passes through Sibolangit. Wherever modern erosion has cut through the filled river valley, groundwater moving along the contact would be discharged as springs.

A second potential source of groundwater in the area may be associated with the structure of the deeper Tertiary and overlying volcanic deposits in the Serengitrengit-Sembahe area (Figure A.1.b). The geological map indicates the presence of a northwest-southeast aligned fault in the Seruwai river, about five kilometres east of Sibolangit. Exposures of Seurula, Keutapang, and Barong formations of Tertiary age have been uplifted more than 1,000 m along the fault. This fault and others under the volcanic breccia may intercept groundwater moving in the Tertiary bedrock. Groundwater may also be forced to the surface by a large uplifted block of consolidated Tertiary bedrock which would form a sub-surface dam.

The most probable source could be defined more thoroughly by data from a single borehole placed along the Brastagi road at about 600 m elevation. Such a boring would indicate the geological character of the volcanic deposits and whether the contact between the volcanic strata is

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geological the source of the spring water. Analyses of the chemical composition of the well water would indicate whether it is similar to or different from that in the spring. Changes in the water level in the well should also be related to changes of spring flows.

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