REPUBLIC OF INDONESIA
MINISTRY OF PUBLIC WORKS
DIRECTORATE GENERAL CIPTA KARYA
DIRECTORATE OF SANITARY ENGINEERING

CONTRACT FOR CONSULTANT SERVICES
FOR
SURAKARTA WATER SYSTEM
NO. 01/WS-S/I/AID/78
AID LOAN 497-U-044

MONTHLY PROGRESS

# REPORT NO. 9
# JUNE 1979

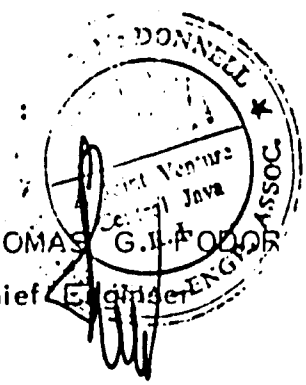
BURNS & McDONNELL ENGINEERING COMPANY, INC.
AND
TRANS-ASIA ENGINEERING ASSOCIATES, INC.
A JOINT VENTURE

REPORT NO. 9

# SURAKARTA WATER SYSTEM
# CONSULTING ENGINEERING SERVICES

## PROGRESS REPORT
## FOR THE MONTH OF JUNE
## 1979

SUBMITTED BY :



THOMAS G.I. ODOM
Chief Engineer

PREPARED BY :
BURNS & McDONNELL ENGINEERING CO., INC.
TRANS-ASIA ENGINEERING ASSOCIATES, INC.
A JOINT VENTURE .
KOTAK POS 105
SURAKARTA, INDONESIA

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# SECTION 1

## NARRATIVE SUMMARY

### 1A GENERAL

#### TRANSPORTING OFF-SHORE PURCHASED MATERIALS

Unloading and transporting the first and second shipments of pipes and fittings from port of Semarang to Surakarta Storage Area is continuing, and the work is on schedule.

#### STORAGE AREA

Site preparation and construction of the access road are 60% complete.

#### TRANSMISSION PIPELINE

The revised Contract Document for the construction of the Transmission Pipeline sections A & B has been completed, and it will be forwarded to Cipta Karya early part of July 1979.

#### GROUNDWATER EXPLORATION PROGRAM

Consulting and coordination services is continuing. Resistivity Survey are 75% complete.

#### MANAGEMENT AND O & M ASSISTANCE PROGRAM

Formal and On-the-Job training program for all phases of Water Utility activities is continuing, and the work is on schedule.

#### OFF-SHORE PURCHASES

Three utility vehicles, supplied by the Rohan Company, will be ready for shipment in August 1979 E.T.A. mid of September 1979.

Advertisement for prospective suppliers for furnishing meter valves, saddlestops, etc. has been made on June 14, 1979.

Commenced to prepare technical specifications for the following items which to be purchased off-shore.

Laboratory Equipment

Leak Survey Equipment including Pipe Locator

Resistivity Survey Equipment

# SECTION 2

# ADMINISTRATION

## 2A SUBMISSION/APPROVALS

The Surakarta Water Enterprise Organization Manual were submitted to DSE on June 26, 1979.

Addendum # 1 an attachment to the tender documents for furnishing materials and equipment off-shore, were submitted to DSE on June 20, 1979.

Consultant's Invoice No. 8 for May 1979 U.S. Dollar Reimbursible Expenses was submitted to Cipta Karya on June 6, 1979.

## 2B CONFERENCES

2B1 Memorandum of Monthly Conference
Appendix. X

Memorandum of Conference with Bina Marga
Appendix. XI

Meeting at Klaten Regent Office
Appendix. XII

Meeting at Semarang
Appendix. XIII

# SECTION 3

# S C H E D U L E S

## 3A PROGRESS

### 3A1 ON-SHORE TRANSPORTATION OF OFF-SHORE PURCHASED MATERIAL

Unloading and transporting the first and second shipments of pipes and appurtenances from Semarang Harbor to Surakarta Storage Area is 94% complete.

### 3A2

Tender Documents for the transportation of the last shipment of pipes and fittings will be ready for advertisement on July 15, 1979.

### 3A3

Tender Documents for the construction of the Transmission Pipeline sections A & B have been completed.
Pipeline construction is scheduled to start on September 1, 1979 .

### 3A4 GROUNDWATER INVESTIGATION AND DEVELOPMENT

Hydrogeological Data and Resistivity Survey Analysis is on schedule and is 75% complete.

For administrative reasons :

Prequalifying, tendering and awarding Drilling Contract has been delayed. Estimated starting date will be March 1, 1979.

### 3A5 MANAGEMENT ASSISTANCE TO SURAKARTA WATER ENTERPRISE

Surakarta Water Enterprise Organization Manual is complete, and was sent to the Enterprise for implementing the same. Progress is on schedule and the work is 50% complete.

3A6 OPERATION AND MAINTENANCE TECHNICAL ASSISTANCE TO SURAKARTA WATER ENTERPRISE

Schedule of On-site and Classroom training program for O & M personnel is 75% complete, advisory work is on schedule.

3A7 WATER METER MAINTENANCE PROGRAM

Meter Maintenance Specialist's arrival will be delayed, until, new test equipment and new meters arrive in Solo. Work rescheduled to start October 1, 1979.

3A8 Overall progress on the project is 35% complete, and is 45 calendar days behind schedule.

3B WORK SCHEDULED FOR NEXT MONTH

Continue coordination of shipping, unloading and transporting offshore purchased material.

Complete Tender Documents for transporting the last shipment of pipes and fittings. Assist for tendering, prepare report and recommendations and assist Cipta Karya for awarding the contract.

Continue Groundwater Data taking. Evaluate and interpret Resistivity Survey data.

Submit the revised contract documents for Cipta Karya and AID's approval. Continue investigation of prospective contractors for construction of Transmission Pipeline.
Assist in bid tendering.

Continue management advisory services to the Water Enterprise.
Continue assistance and supervision on the General Accounting Work.
Assist for implementing the Organization Manual.

Continue O & M assistance to the Water Enterprise. Complete the schedule of the On-site and Classroom training program.
Assist and supervise the O & M building construction.
Assist in starting the second O & M building construction.

# SECTION 4

# ENGINEERING AND MANAGEMENT

## 4A CONSTRUCTION OF TRANSMISSION PIPELINE

Land Easments for Right-of-Way
Design drawings showing recommended easment areas were presented to Bina Marga and all Regencies. The drawings incorporate revisions as requested. The Consultant received approval from the Regencies but, Bina Marga's permit still pending.

Off-shore Purchase of Pipeline Materials (Clow Corp.)
Awaiting the third shipment of pipes and fittings.
Assuming no delay in loading on ship at U.S. port, and 40 days ocean transit, the earliest possible arrival time at Semarang port is July 14, 1979.

On-shore Transportation of Off-shore Purchased Materials

Unloading and transporting the first and the second shipments of U.S. pipe furnished pipeline materials from Semarang port to Surakarta Storage Area is continuing and is 94% complete.

## 4B GROUNDWATER INVESTIGATION AND DEVELOPMENT

Hydrogeological data and interpretation of the first phase resistivity report is continuing. Work is on schedule.
See attached maps and report Appendix. XIV

## 4C MANAGEMENT ASSISTANCE PROGRAM

See attached report Appendix. XV

## 4D OPERATION AND MAINTENANCE ASSISTANCE PROGRAM

Assisted in planning a new building addition for the Surakarta Water Enterprise. A complete set of drawings were submitted to Cipta Karya for their comment and approval.

A schedule for On-site and Classroom training program for the O & M personnel is 75% complete, and detailed procedures on how to implement said schedule will be reviewed and discussed with all the personnel concerned.

Again, it is recommended that the Enterprise should hire 1 Bilingual Engineer with 1 or 2 years experience on Municipal Projects. Since, the Classroom and Training Program will be conducted in English, and there is no one in the Enterprise can speak the language, it is imperative that the Enterprise should look for someone, otherwise the program will be delayed.

# SECTION 5

# PERSONNEL

The Surakarta office personnel in June were as follows :

Thomas G. Fodor, Chief Engineer
arrived 25 December 1978 with spouse

Bernardo B. Bayongan, Management Specialist
arrived 5 November 1978

Joseph J. Palka, Drilling Specialist
arrived 22 March 1979
left 27 June 1979

A.F. Dengah, Counterpart Chief Engineer
arrived 8 November 1978

Suyatno Yuwono, Counterpart Hydrogeologist
arrived 5 January 1979

Mohammad Khalil, Materials Coordinator
arrived 2 October 1978

Dradjat Atmardjo, Office Manager
arrived 2 October 1978

Yonathan Djowie, Accountant
arrived 2 December 1978

Akhmad Aries, Draftsman
arrived 13 April 1979

Bambang Agus Salam, Inspector
arrived 1 May 1979

Mohammad Syarief Lembah, Inspector
arrived 1 May 1979

Aryani Karnasih, Administrative Clerk
hired 8 January 1979

Dewi Yuliati, Typist
hired 7 February 1979

Rubiyo, Clerk
hired 1 November 1978

Djumhan Hardhy, Expeditor
hired 2 January 1979

Pamudji Rahardjo, Driver
hired 2 October 1978

Budi Dwi Putranto, Driver
hired 4 January 1979

Suwarno Hadi, Office Boy
hired 1 November 1978

Mulyatmono, Watchman/Labourer
hired 9 October 1978

Harryanto Santoso, Interpreter/Labourer
hired 7 February 1979

Suparmanto Soekiman, Technical Translator
hired 14 February 1979

Ermita Thaher, Supply Clerk
hired 19 March 1979

Arum Munawar, Copy Machine Operator
hired 8 March 1978

Djoni Santoso, Driver
hired 1 May 1979

Gatot Bramono, Draftsman
hired 7 May 1979

Sutrisno, Driver
hired 2 April 1979

Sri Hartati, Secretary
hired 1 June 1979

# LETTERS SENT DURING JUNE 1979

| NUMBER & DATE | TO | FROM | SUBJECT |
|---|---|---|---|
| 118/BM/TAE/SKA/79<br>31 May 1979 | BM/TAE<br>Jakarta | BM/TAE<br>Surakarta | Monthly Account Report for the Month of May 1979 |
| 119/BM/TAE/SKA/79<br>1 June 1979 | Ministry of Public Works Directorate General of Cipta Karya Directorate of Sanitary Engineering Jakarta | do | Monthly Report No. 8 |
| 120/BM/TAE/SKA/79<br>5 June 1979 | Ministry of Public Works Directorate General of Cipta Karya Directorate of Sanitary Engineering Jakarta | do | Surakarta Water Project Monthly Progress Report No. 8 |
| 121/BM/TAE/SKA/79<br>5 June 1979 | Dinas Pekerjaan Umum Propinsi Dati I Jawa Tengah Wilayah Surakarta | do | Transmission Main Design Drawings |
| 122/BM/TAE/SKA/79<br>5 June 1979 | Central Java Potable Water Project Semarang | do | Surakarta Water Enterprise O & M Facilities Design Drawings |

LETTERS SENT DURING JUNE 1979 (cont'd)

| NUMBER & DATE | TO | FROM | SUBJECT |
|---|---|---|---|
| 123/BM/TAE/SKA/79<br>11 June 1979 | Ministry of Public Works<br>Directorate General of Cipta Karya<br>Directorate of Sanitary Engineering<br>Jakarta | BM/TAE<br>Surakarta | Monthly Progress Report No. 8 for May 1979 |
| 124/BM/TAE/SKA/79<br>12 June 1979 | Central Java Potable Water Project<br>Semarang | do | Personal |
| 125/BM/TAE/SKA/79<br>15 June 1979 | Burns & McDonnell Engineering Co., Inc.<br>PO Box 173<br>Kansas City<br>Mo. 64141<br>U.S.A. | do | Request for Handbooks |
| 126/BM/TAE/SKA/79<br>15 June 1979 | Head of Central Java Potable Water Project<br>Semarang | do | Request for Leave for Mr. B. Bayongan |
| 127/BM/TAE/SKA/79<br>15 June 1979 | PT GEODATA<br>PPM Building<br>Jalan Menteng Raya no. 9<br>Jakarta | do | Submittal of Contract of Soil Resistivity Studies |

LETTERS SENT DURING JUNE 1979 (cont'd)

| NUMBER & DATE | TO | FROM | SUBJECT |
|---|---|---|---|
| 128/BM/TAE/SKA/79<br>20 June 1979 | PT Sumber Tjipta Djaja<br>Jalan Cikini Raya no. 38<br>Jakarta | BM/TAE<br>Surakarta | Off-shore Purchased Materials |
| 129/BM/TAE/SKA/79<br>21 June 1979 | Ministry of Public Works<br>Directorate General of Cipta Karya<br>Directorate of Sanitary Engineering<br>Jakarta | do | Surakarta Water Enterprise O & M Manual |
| 130/BM/TAE/SKA/79<br>25 June 1979 | Central Java Clean Water Project<br>Semarang | do | Request for Mrs. Susilowati for Occupying Room at Jl. Brig. Jen. Sudiarto no. 534 Surakarta |
| 131/BM/TAE/SKA/79<br>26 June 1979 | SGV & CO<br>4 th Floor<br>Jl. Pattimura No. 20<br>Jakarta | do | Organization Manual of the Surakarta Water Enterprise |

LETTERS SENT DURING JUNE 1979 (cont'd)

| NUMBER & DATE | TO | FROM | SUBJECT |
|---|---|---|---|
| 132/BM/TAE/SKA/79<br>26 June 1979 | Director of Surakarta Water Enterprise<br>Jl. Bali 2 A<br>Surakarta | BM/TAE<br>Surakarta | Organization Manual of the Surakarta Water Enterprise |
| 133/BM/TAE/SKA/79<br>26 June 1979 | Ministry of Public Works<br>Directorate General of Cipta Karya<br>Directorate of Sanitary Engineering<br>Jakarta | do | Organization Manual of the Surakarta Water Enterprise |
| 134/BM/TAE/SKA/79<br>28 June 1979 | Central Java Clean Water Project<br>Semarang | do | Plastic Binding Machine |
| 135/BM/TAE/SKA/79<br>29 June 1979 | BM/TAE<br>Jakarta | do | Monthly Account Report for the Month of June 1979 |

# LETTERS RECEIVED DURING JUNE 1979

| NUMBER & DATE | TO | FROM | SUBJECT |
|---|---|---|---|
| 30 May 1979 | BM/TAE Surakarta | Burns & McDonnell Engineering Co., Inc. P O Box 173 Kansas City Mo. 64141 U.S.A. | Compliance Submittals Off-shore Purchased Materials List I |
| 472/Um/BTKL/79 26 May 1979 | do | Health Department of Indonesia Directorate of Health Service Directorate of Health Installation, Health Technique of Yogya Area, Yogyakarta | Price List for Water Sample Analysis |
| 54/Thn/VI/79 6 June 1979 | do | Electrical Technique Bureau " Mataram " Jl. Ketandan no. 23 Surakarta | Change Electrical Meter for Mr. J. Palka's House |

LETTERS RECEIVED DURING JUNE 1979 (cont'd)

| NUMBER & DATE | TO | FROM | SUBJECT |
|---|---|---|---|
| 220/PAM/VI/79<br>7 June 1979 | BM/TAE<br>Surakarta | Central Java<br>Potable Water<br>Project<br>Semarang | Preparation of<br>Pipe Stacking |
| 222/PAM.I/VI/79<br>9 June 1979 | do | Surakarta<br>Water Project<br>Surakarta | Dispensation Request on<br>Temporary Power Addition<br>for Mr. J. Palka's House |
| June 1979 | do | Central Java<br>Potable Water<br>Project<br>Semarang | Invitation to Party |
| 11 June 1979 | do | Burns &<br>McDonnell<br>Engineering<br>Co., Inc.<br>PO Box 173<br>Kansas City<br>Mo. 64141<br>U.S.A. | Correction for the Monthly<br>Progress Report No. 7 |
| 155/PAB/JT/VI/79<br>16 June 1979 | do | Central Java<br>Potable Water<br>Project<br>Semarang | Invitation to the Monthly<br>Progress Meeting |

LETTERS RECEIVED DURING JUNE 1979 (cont'd)

| NUMBER & DATE | TO | FROM | SUBJECT |
|---|---|---|---|
| 13 June 1979 | BM/TAE Surakarta | Burns & McDonnell Engineering Co., Inc. PO Box 173. Kansas City Mo. 64141 U.S.A. | Compliance Submittals Off-shore Purchased Materials List K |
| 159/PAB/JT/VI/79 19 June 1979 | do | Central Java Potable Water Project Semarang | Request for Exit/Re-entry Permit for Mr. T.G.Fodor and Mr. B. Bayongan |
| 164/PAB/JT/VI/79 20 June 1979 | do | Central Java Potable Water Project Semarang | Storaging Technical Equipment |
| 015/VI/1979 19 June 1979 | do | PT GEODATA PPM Building 2 nd Floor Menteng Raya no. 9 Jakarta | Cost for Performing Subsurface Electrical Resistivity Studies |
| 21 June 1979 | do | U.D. Cahaya Rukma Jl. Pandana-ran no. 119 Semarang | Price of Plastic Binding Machine |

LETTERS RECEIVED DURING JUNE 1979 (cont'd)

| NUMBER & DATE | TO | FROM | SUBJECT |
|---|---|---|---|
| 22 June 1979 | BM/TAE<br>Surakarta | Burns &<br>McDonnell<br>Engineering<br>Co., Inc.<br>PO Box 173<br>Kansas City<br>Mo. 64141<br>U.S.A | Installation of screen pipes |

SURAKARTA WATER PROJECT

REPORT OF MAN-MONTHS EXPENDED BY CONSULTANT

BURNS & McDONNELL/TRANS-ASIA ENGINEERING ASSOCIATES

| CONTRACT NUMBER 01/AS-S/AID/78 AID LOAN 497-U-044 | MAN-MONTHS | | | |
|---|---|---|---|---|
| | FOR JUNE, 1979 | CUMULATIVE THROUGH 30 JUNE | % OF TOTAL SCHEDULE | TOTAL IN CONTRACT SCHEDULE |
| **EXPATRIATES** | | | | |
| Principal | 0 | 0.3 | 15 | 2 |
| Liaison Engineer | 0.09 | 1.62 | 54 | 3 |
| Procurement Engineer | 0 | 6.5 | 100 | 6.5 |
| Chief Engineer | 0 | 7 | 35 | 20 |
| Pipeline Engineer | 0 | 0 | 0 | 16 |
| Hydrogeologist | 0 | 5.7 | 48 | 12 |
| Drilling Specialist | 0.8 | 2.8 | 23.3 | 12 |
| Management Specialist | 1 | 7.6 | 47.5 | 16 |
| O & M Specialist | 1 | 6.4 | 30.4 | 21 |
| Meter Specialist | 0 | 0 | 0 | 8 |
| EXPATRIATE TOTAL | 2.89 | 37.98 | 32.6 | 116.5 |
| **INDONESIAN PROFESSIONAL & TECHNICAL** | | | | |
| Counterpart Chief Engineer | 1 | 7.6 | 38 | 20 |
| Construction Supervisor | 0 | 0 | 0 | 14 |
| Hydrogeologist | 1 | 5.8 | 38.6 | 15 |
| Materials Coordinator | 1 | 9 | 64.2 | 14 |
| Inspectors | 2 | 4 | 8.3 | 48 |
| Draftsman | 1 | 4 | 25 | 16 |
| Translator | 1 | 4.8 | 40 | 12 |
| Accountant | 1 | 7 | 31.8 | 22 |
| INDON. PROF. & TECH. | 8 | 42.2 | 26.2 | 161 |
| **INDONESIAN ADMINISTRATIVE** | | | | |
| Office Manager | 1 | 9 | 45 | 20 |
| Secretary | 1 | 8 | 40 | 20 |
| Typist | 1 | 4.6 | 20.9 | 22 |
| Clerks | 3.8 | 20.5 | 46.5 | 44 |
| Drivers | 4 | 22 | 27.5 | 80 |
| Laborers | 4 | 28.3 | 17.6 | 160 |
| ADMINISTRATIVE TOTAL | 14.8 | 92.4 | 26.7 | 346 |

APPENDIX III

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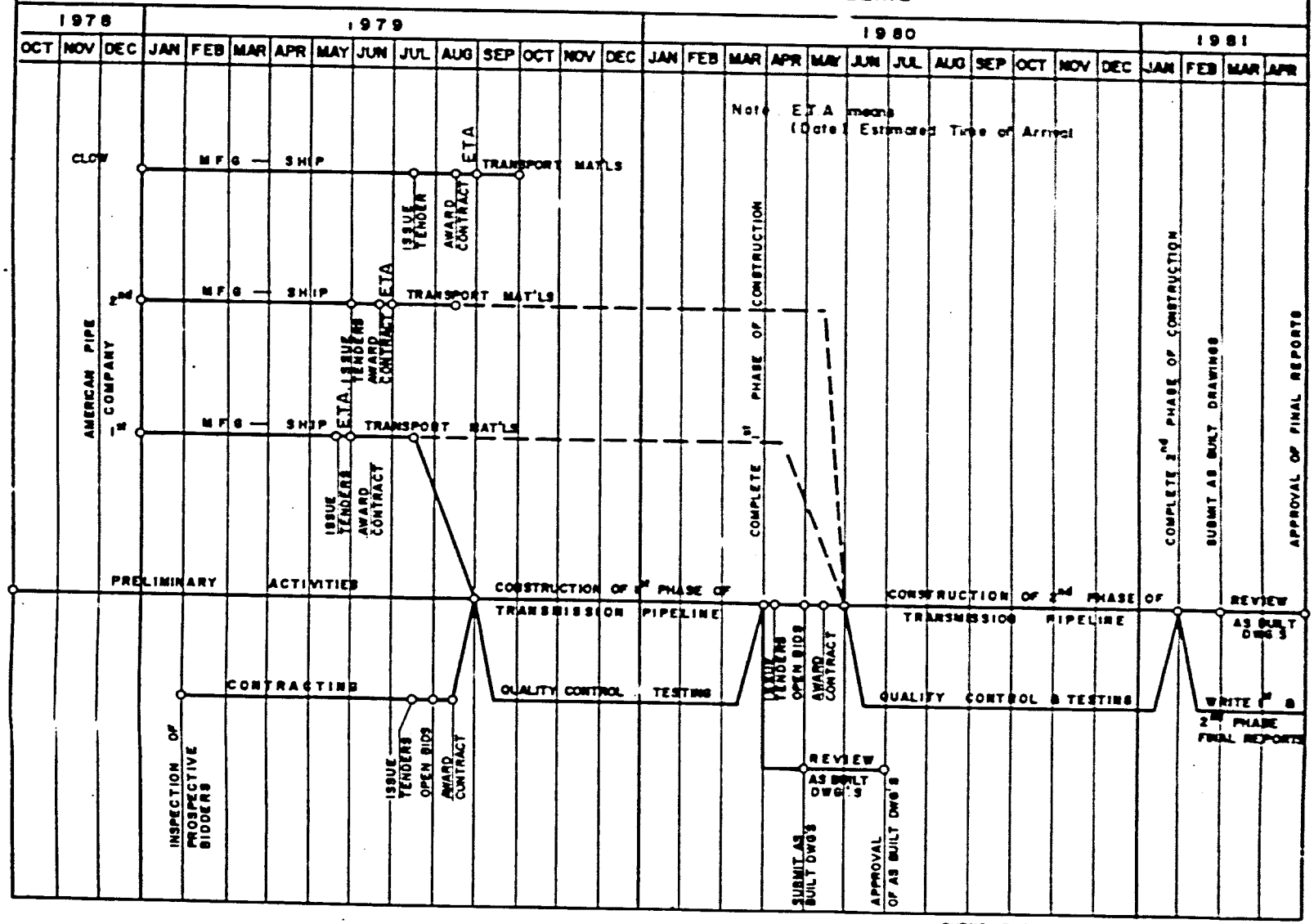
SURAKARTA WATER PROJECT
REPORT OF ENGINEERING COSTS
BURNS & MCDONNELL/TRANS-ASIA ENGINEERING ASSOC.

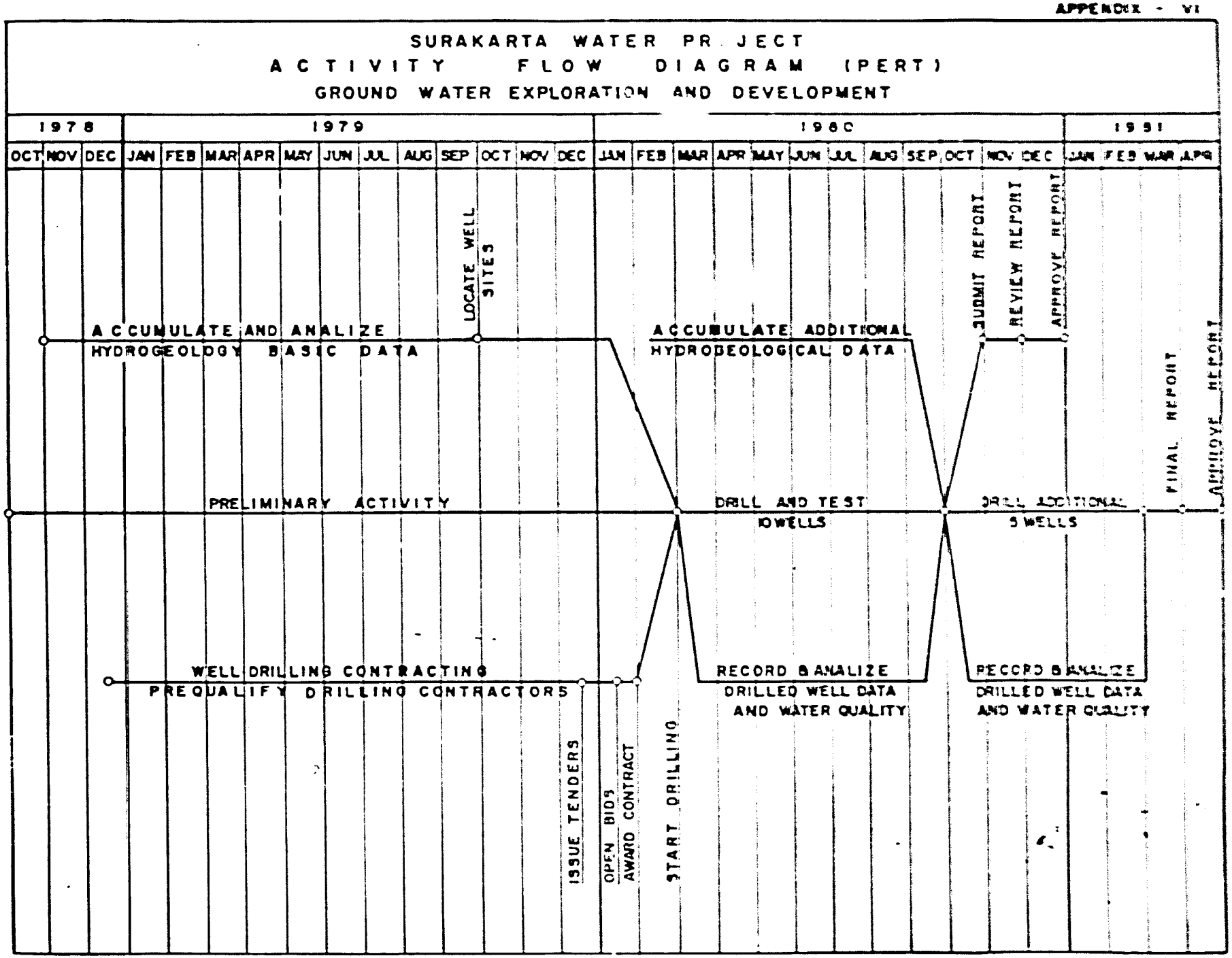
| CONTRACT NO. 01/WS-S/AID/78 SIGNED 26 OCT. 1978 START 1 JAN. 1978 END 31 JAN. 1981 REIMBURSABLE EXPENDITURES | COSTS FOR JUNE, 1979 | CUMULATIVE COSTS THROUGH JUNE, 1979 | | CUMULATIVE PAYMENTS THROUGH JUNE, 1979 | | | TOTAL BUDGET ESTIMATE FOR CONTRACT |
|---|---|---|---|---|---|---|---|
| | | AMOUNT | % OF TOTAL BUDGET ESTIMATE | AMOUNT RECEIVED IN JUNE | TOTAL AMOUNT RECEIVED THROUGH JUNE | % OF TOTAL BUDGET ESTIMATE | |
| **U S DOLLARS** | | | | | | | |
| Salaries and Related Costs | 14, 860. 06 | 216, 873. 77 | 35.3 | 16, 451. 06 | 202, 013. 71 | 32.9 | $612,922 |
| Transportation | 617. 93 | 11, 482. 47 | 18.9 | - | 10, 864. 54 | 17.9 | 60,638 |
| Equipment | - | - | - | - | - | - | 36,000 |
| Miscellaneous | - | 26, 981 | 81.3 | - | 26, 981 | 81.3 | 33,181 |
| Training | - | - | - | - | - | - | 14,544 |
| Contingencies | - | - | - | - | - | - | 75,729 |
| TOTAL DOLLARS | 15, 477. 99 | 255, 337. 24 | 30.6 | 16, 451. 06 | 239, 859. 25 | 28.8 | $833,014 |
| **INDONESIAN RUPIAH** | | | | | | | |
| Salaries | 7, 196, 667 | 21, 321, 666 | 29.9 | - | 8, 334, 999 | 11.7 | 71,150,000 |
| Transportation | 1, 892, 947 | 12, 320, 119 | 43.6 | - | 7, 831, 333 | 27.8 | 28,195,000 |
| Housing | - | 23, 200, 000 | 72.6 | - | 23, 200, 000 | 72.6 | 31,950,000 |
| Vehicle Costs | 670, 000 | 25, 157, 494 | 100.4 | - | 16, 832, 820 | 67.2 | 25,050,000 |
| Equipment Costs | 10, 000 | 5, 748, 310 | 43.6 | - | 4, 746, 610 | 36.1 | 13,153,000 |
| Miscellaneous | 1, 036, 305 | 10, 437, 405 | 42.3 | - | 7, 423, 305 | 30.1 | 24,670,000 |
| Contingencies | 717, 275 | 6, 639, 075 | 34.1 | - | 5, 785, 800 | 29.8 | 19,416,960 |
| TOTAL RUPIAH | 11, 523, 194 | 104, 823, 569 | 49.0 | - | 74, 154, 867 | 34.7 | 213,586,560 |

# SURAKARTA WATER PROJECT
## ACTIVITY FLOW DIAGRAM (PERT)
## CONSTRUCTION OF TRANSMISSION PIPELINE



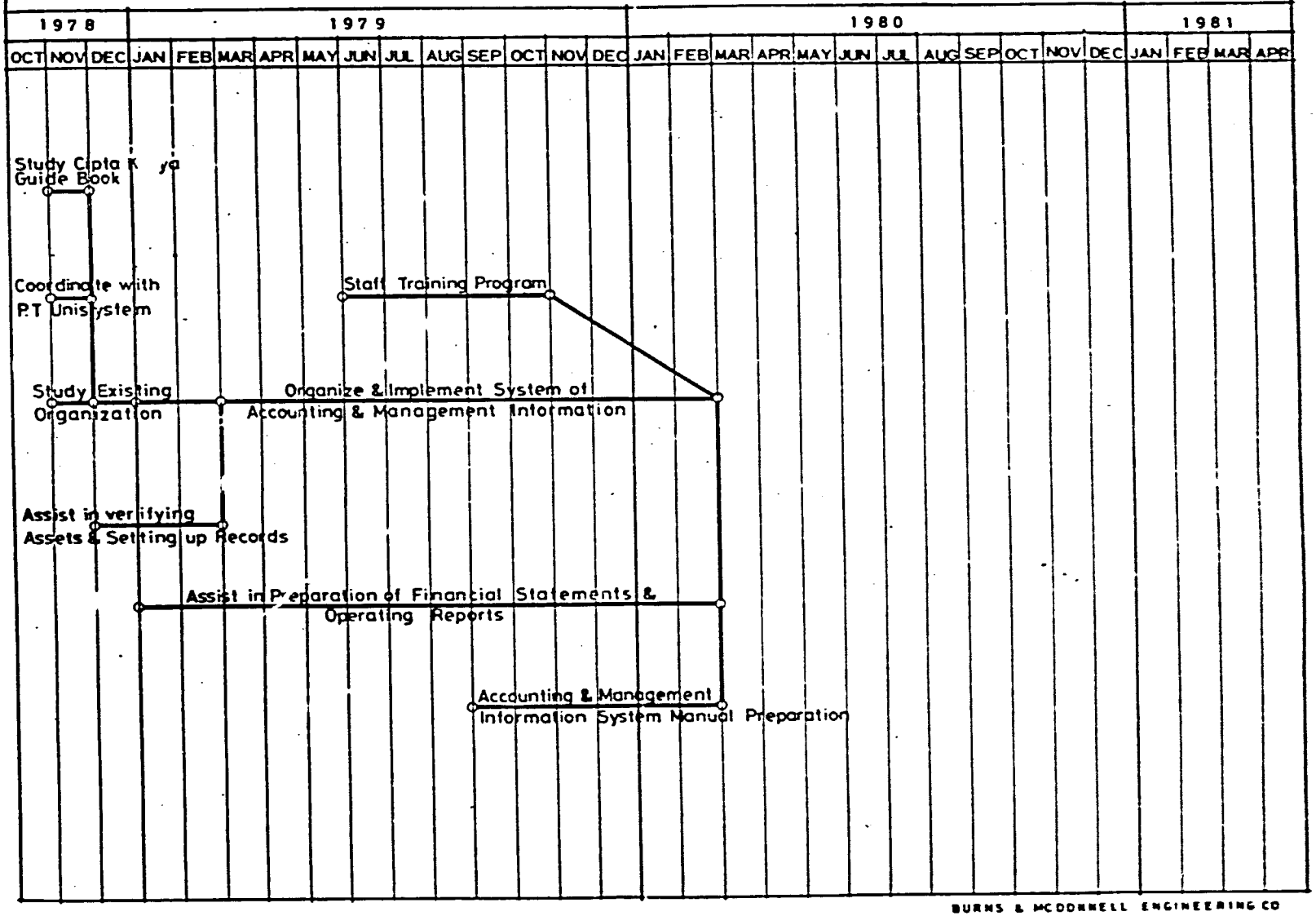

BURNS & McDONNELL ENGINEERING CO.
TRANS-ASIA ENGINEERING ASSOCIATES, INC

# SURAKARTA WATER PROJECT
## ACTIVITY FLOW DIAGRAM (PERT)
## GROUND WATER EXPLORATION AND DEVELOPMENT




BURNS & McDONNELL ENGINEERING CO

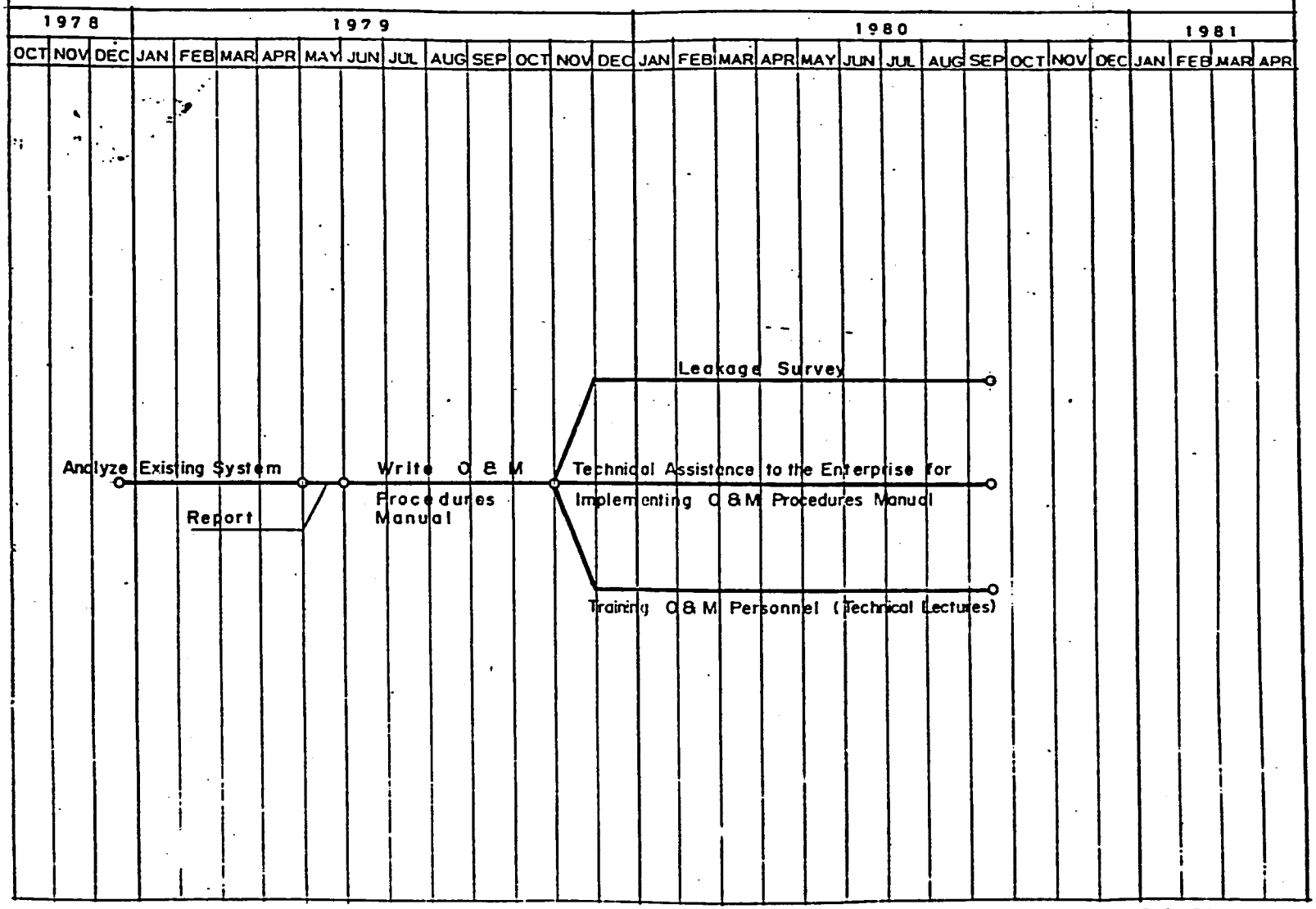
# SURAKARTA WATER PROJECT
## ACTIVITY FLOW DIAGRAM (PERT)
## MANAGEMENT ASSISTANCE TO SURAKARTA WATER ENTERPRISE




BURNS & MCDONNELL ENGINEERING CO
TRANS-ASIA ENGINEERING ASSOCIATES, INC.

APPENDIX. VIII

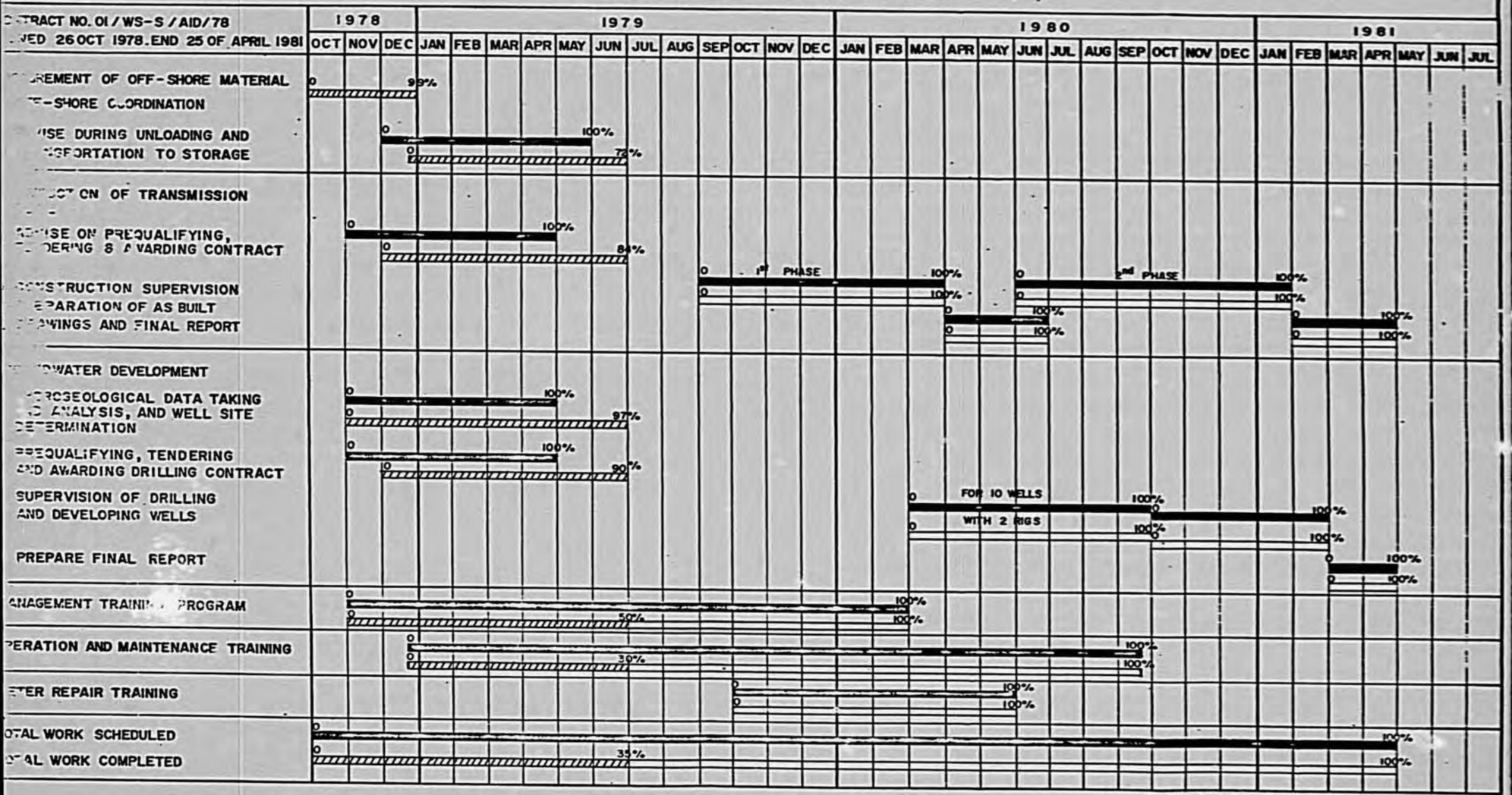
# SURAKARTA WATER PROJECT
## A C T I V I T Y  F L O W  D I A G R A M  (PERT)
## OPERATION AND MAINTENANCE ASSISTANCE PROGRAM




BURNS & MCDONNELL ENGINEERING CO.
TRANS-ASIA ENGINEERING ASSOCIATES, INC.

APPENDIX IX

# SURAKARTA WATER PROJECT
## SCHEDULE OF ENGINEERING ACTIVITIES
### PERCENT COMPLETED AT END OF JUNE 1979




BURNS & McDONNELL ENGINEERING CO.
TRANS ASIA ENGINEERING ASSOCIATES INC.

# MEMORANDUM OF MONTHLY CONFERENCE

Place : BM/TAE Office in Surakarta

Date : June 20, 1979

Attendance :

| | |
|---|---|
| Mr. Aziz | Directorate of Sanitary Engineering |
| Mr. Suwandi Sanudi | Directorate of Sanitary Engineering |
| Mr. Robert E. Davis | USAID - Jakarta |
| Mr. Eddie S. Kristiawan | USAID - Jakarta |
| Mr. Krisno Darusman | Central Java Clean Water Project |
| Mr. Harsono | Central Java Clean Water Project |
| Mrs. Sumaryati | Central Java Clean Water Project |
| Mr. Djoko | Central Java Clean Water Project |
| Mr. Soedarta | Surakarta Water Enterprise |
| Mr. Soelarno | Surakarta Water Enterprise |
| Mr. F. Midgett | BM/TAE Jakarta |
| Mr. T. Fodor | BM/TAE Surakarta |
| Mr. A.F. Dengah | BM/TAE Surakarta |
| Mr. Suyatno Y. | BM/TAE Surakarta |
| Mr. B. Bayongan | BM/TAE Surakarta |
| Mr. J. Palka | BM/TAE Surakarta |

Meeting opened at 10:00 a.m.

Tender Documents for drilling Test Wells were reviewed and discussed. Mr. Davis briefly explained the requirements on AID Financed Projects. In further discussion Mr. Davis stated that, AID Financed Projects generally require prequalification of prospective bidders for construction services. He requested that, the Consultant shall prepare a synopsis and prequalification questionnaire for AID's approval. After the submission, AID will arrange to have these Documents published in the Commerce Business Daily of the U.S. Dept. of Commerce and all other eligible countries.

Based upon the aboves, the Consultant opinion is that, a considerable time will ellapse, and the Project can'not proceed as scheduled.
Therefore : BM/TAE requested an approval for temporarily remove the Drilling Specialist from the Project, and reassign him when all the administrative requirements are resolved.

Further discussion was held over on the Consultant cost estimate which is nearly doubled over on the allocated budget. The Consultant explained the reasons of this overrun which is mainly due to the additional depth requirement to allocate potential aquifers.
Mr. Davis stated that, AID planning to have their own Hydrogeologist on the Project in September 1979 for reviewing the selected areas parallel with the Resistivity Survey reports. The Consultant has concurred.

Tender Documents for the construction of the Transmission Pipeline were reviewed and discussed. The Consultant reported one month slippage on the investigation of prospective Contractors, and also, one month slippage due to prequalification requirements bought up by USAID.

Written requests for permission to lay the Transmission Pipeline within their jurisdiction were sent to each Regency early part of June. Up to date , only Klaten Regency responded.

The conference ended at 12:30 p.m.

# MEMORANDUM OF CONFERENCE
# WITH BINA MARGA OF SURAKARTA

On June 1, 1979 a meeting with Bina Marga officials was held in their office in Surakarta. The scope of the proposed transmission pipeline construction were explained.

The discussion centered about Right-of-Way permit required prior commencing with the construction. BM/TAE outlined in detail the status of the problems and described design criteria being used.
Bina Marga offered suggestions concerning standard practices, inclusion of the future developments, currently, under consideration for enwidening the Surakarta-Yogya highway.

BM/TAE presented tentative plans, indicates the route of the pipeline passes through on properties under the jurisdiction of Bina Marga.
Bina Marga asked the Consultant to revise certain number of drawings suite to their general requirements, except for those minor areas requiring further study, Bina Marga concurred.

# MEETING AT KLATEN REGENT OFFICE

Meeting held at : Klaten Regent's meeting room
Time : 9:10 am to 11:10 am
Date : June 13, 1979
Subject : TRANSMISSION RIGHT OF WAY THROUGH KLATEN REGENCY
Attendance :

| | |
|---|---|
| - Mr. Soemanto | - Regent of Klaten |
| - Mr. Soeprapto | - Head of Development Division of Klaten |
| - Mr. Wismadi | - Heaf of Government Division of Klaten |
| - Mr. Soemintardjo | - Heaf of Public Works of Klaten |
| - Mr. Soegijono | - Head of Agraria, Klaten |
| - Mr. Wibowo | - Head of Klaten Water Office |
| - Mr. Harsono | - Central Java Water Project |
| - Mr. AF Dengah | - BM/TAE |

TOPICS DISCUSSED :

The principal subject was the installation of the section of the proposed pipe-line to be located within the Right-of-Way that under jurisdiction of Klaten Regency.
The Regent said that, the Department of Public Works has no objection to issue the Right - of - Way permit, if the requested minor correction to the Design Drawings was made.
BM/TAE has agreed to make certain revisions and resubmit the same prior July 10, 1979.

As soon as they received the corrected drawings a survey crew from D.P.W. will start to set Stake Markers for the proposed route of the pipeline, in co-operation with BM/TAE's personnel.

BM/TAE has requested permit for Drilling Test Wells at Klaten Regency.
The Regent has refused to issue the permit for the reason of that the new wells may outdraw the existing well production.

# MEETING AT SEMARANG

Meeting held on Tuesday, June 26, 1979, at 10:00 a.m. to 11:00 a.m. at Central Java Governor's Office, Semarang.

Attendance :

- Mayor of Surakarta & Staff
- Staff of Central Java Governor
- Staff of Surakarta Resident
- Regent of Klaten & Staff
- Central Java Public Works & Staff
- Central Java Clean Water Project & BM/TAE

Subject :

Confirmation on Central Java Governor's decision to give permission to city of Solo to use additional 250L/sec. of water from the Cokrotulung Spring.

The Regent of Klaten has approved the pipeline construction passes through on their properties. He expressed his concern over the facts that, since the city of Surakarta will consume an additional 250L/sec. of water previously has been used by Klaten, for irrigation purposes, and there is no any other sources for water other than drilling additional wells if is feasible.
Therefore, Central Java Public Works must allocate fund for Klaten, for drilling additional wells and Central Java Clean Water Project to submit Hydrogeological data of the region to Central Java Public Works and to the Governor of Central Java for further comments.

# GROUNDWATER EXPLORATION

Monthly Report the first of June - the 30th of June 1979

## I. INTRODUCTION

Based on the Preliminary Report of the Resistivity Investigation performed by P.T. GEODATA, the Consultant temporary conclusion is that the resistivity investigation can be grouped into two areas, as follows :

1. The Northern Area of Surakarta which is covering 17 sounding points (Plate 1 )
2. The Southern and Southwest Area of Surakarta which is is consisting of 33 sounding points (Plate 1)

## II. TENTATIVE SUB-SURFACE INTERPRETATION

The following interpretation is based on the preliminary report submitted by P.T. GEODATA in accordance with the work agreement No. 01/ WS-S/I/AID/78.
The field measurement was performed using the " Wenner Method " on May 7, 1979 up to May 19, 1979.
The expected results of investigation using Wenner Method are as follows :

1. Sub-surface lithologic condition based on specific resistivity that can be detected by the instrument.

2. Estimating the water table depth.
   The results of the interpretations are presented on the Geologic Section attached (plate 2, 3, 4, 5)

## II 01 THE NORTHERN AREA OF SURAKARTA

Based on the result of temporary interpretation, a conclusion can be drawn that aquifer which may be expected is sandstone having specific resistivity of 5 - 10 Ohm - m, the sandstone is estimated to be derived from Kabuh Formation.

If the estimation is proved to be true, groundwater can be obtained at the depth of about 60 mt up to 150 mt deep. It is not recommended to take groundwater at the depth of less than 60 meters, because it is afraid of contaminated by the surface infiltration (plate 2+3).
Recharge is estimated to be coming from the east, recharge is also expected to be coming from the local rainfall (vertical infiltration) .
2 (two) or 3 (three) aquifer layers are expected to be found, so that debit of 10 l/second is expected to be obtained from the well that will be bored at the depth of 125 - 150 mt.

## II.02 THE SOUTH-WEST AREA OF SURAKARTA

Differing from the areas mentioned before, this area is proved to have better groundwater exploration prospect. The expected aquifer is sandstone estimated to possess 15 - 50 Ohm - m resistivity (plate 3 & 4) greater groundwater capacity is expected to be obtained from aquifer that is thick enough. More than 20 l/second water can be obtained from each test well of 60 - 125 mt deep.
Good aquifer depth is found at about 60 mt deep, especially in the north of Brambang River area (plate 4, Section IV - IV$^1$), as to the South of Brambang River Area, the good aquifer Depth for producing municipal water is at the depth of 100 mt. or deeper (plate 4, section V - VI$^1$).
Recharge is expected to be coming from the slope of Mount Merapi, it is also expected to be coming from local rainfall.

## II.03 THE SOUTHERN AREA OF SURAKARTA

The southern areas of Surakarta is also proved to have good prospects although the south-west area gives more promissing prospects (plate 5). Heteraginous and the limited aquifer thiskness hinder the effort of ob - taining sufficient water, but it is expected to be able to obtain 10 l / second water at the depth of 125 meters in this area, for Test Well.

## II.04 KAMPUNG IMPROVEMENT PROJECT

The proposed Test Well in Pucangsawit area appears to be good enough, from the resistivity interpretation, aquifer will be found from the depth of 60 mt. (plate 3, Section X - X$^1$). It is estimated that the good drilling to the depth of 125 mt. is reasonable for obtaining sufficient water.

## III. CONCLUSION

### III 01 THE NORTHERN AREA OF SURAKARTA

Test Well drilling on this area can be performed, good groundwater lies deep enough beneath, at the depth of about 150 mt, the Test Well will give good prospect.

### III 02 THE SOUTHWEST AREA OF -SURAKARTA

This area appears to give best prospect in the groundwater exploration. Considering the resistivity interpretation, the northern area of Brambang River gives better prospect than the southern area of Brambang River ( plate 1 ).

### III 03 THE SOUTHERN AREA OF SURAKARTA

This area covering Pajang and its adjacent area, gives fairly good prospect also for groundwater exploration, more than one layer of aquifer will be discovered although not so thick, at the depth of 70 - 150 mt.

### III 04 KAMPUNG IMPROVEMENT PROJECT

Pucang Sawit area is good enough for Test Well purpose, aquifer will be discovered at the depth of 60 - 125 mt., but consideration of the existing well situated north of this area (University Building) must be taken, because the highly pumping rate of these wells may be interfere each other.

## IV RECOMMENDATIONS

This following recommendation is made, based on the recent data obtained, if some new data appear, it may be revised to be adjusted with the new data.

## IV 01 DRILLING SITES

Based on geological condition, priority and purpose, three areas are proposed to be drilling locations, namely :

1. The Northern area of Surakarta
2. The Southwest area of Surakarta
3. The Southern and in the City limit of Surakarta.

## IV 02 THE AMOUNT OF DRILLING WELLS

Considering the latest situation of the increasing drilling cost, inflation and limited budget, it is recommended that the amount of the proposed well will be as follows :

- 10 (ten) Test Wells
- 2 (two) Exploration Wells (continuous core sampling method), that will be utilized as Observation Well later.

The distribution of the preceding proposed wells are as follows :

1. It is considered to be better that for the Northern area of Surakarta, 2 (two) Test Wells and 1 (one) Exploration Well are to be drilled.
2. For Southwest area of Surakarta, 7 (seven) Test Wells and 1 (one) Exploration Well are proposed to be drilled.
3. For Kampung Improvement Project is proposed to drill 1 (one) Test Well in the Pucang Sawit area, or alternatively the Test Well is to be drilled near the existing deep well (Sangkrah or Kepatihan Well). That existing well will be utilized as an observation well, if the new Test Well is successful, it can be abandoned later.

## IV 03 DEPTH AND SIZE OF THE WELLS

The depth of the Test Wells is recommended to be 125 mt. to 150 mt., using 12" diameter of upper casing and 8" diameter of lower casing is reasonable for producing water of 30 - 40 L/sec.

For the Exploration Well, 150 mt. depth. is required to obtain subsurface lithologic condition, drill in 3"/4" diameter is suitable for continous core sampling, and it will be reamed out to 6" diameter for Observation Well.

## IV 04 RESISTIVITY INVESTIGATION

Stake out of all drilling sites will be given after completion of the Resistivity Study. Resistivity Investigation must be continued in the Southwest of Surakarta area, at least 20 sounding points are proposed. It is situated north of Brambang River (plate 1).
The reason of this recommendation is that, north of Brambang River area is much better than the south of Brambang River area, based on the previous resistivity interpretation ( item II.02 ).

# WELL DRILLING PROGRAM

Considering the last information received and the drilling experience on the adjacent investigated area, the time needed for accomplishing 1 (one) Test Well of about 150 mt. deep is 60 - 90 days, or say 80 days.
Accomplishing one (1) Exploration Well of about 150 mt. deep is 45 days.
So that it will take 800 days to accomplish 10 (ten) Test Wells and 90 days to accomplish 2 (two) Exploration Wells until final Observation Well.
By using 4 drilling rigs simultaneously, 10 (ten) Test Wells can be finished in $\frac{800}{4}$ days = 200 days, or say 7.5 months including disturbances etc.
By using 2 (two) drilling rigs simultaneously, 2 Exploration Wells can be finished in 1.5 month.
Mobilization take 0.5 month to perform , so the estimated total duration of drilling are : 7.5 + 1.5 + 0.5 = 9.5 months
Due to the additional equipment of 4 (four) drilling rigs working simultaneously, it requires additional personnels of 2 (two) Geologist Assistants and 2 (two) Drilling Specialist Assistants .

# SURAKARTA WATER ENTERPRISE
# MANAGEMENT ASSISTANCE PROGRAM
# PROGRESS REPORT NO. 9

## I. PERIOD COVERED

This report covers the period from June 1 to 30, 1979.

## II. WORK DONE

### A. General Accounting and Management Information

Assistance to the Accounting Staff in the general accounting work such as proper treatment of transactions, correct classification of accounts, and preparation of monthly financial reports. The May 1979 financial reports were finished and distributed to the various recipients on June 17, 1979.

### B. Organization Manual

Prepared Organization Manual based on the organization structure approved by the representatives from Cipta Karya, USIAD, Surakarta Water Enterprise and the Consultant, during their meeting in Jakarta on May 22, 1979. The Organization Manual is composed of

the organization structure, see Exhibit 1, and the job descriptions of the various officers such as the Supervisory Board, Director, Chief of Division, Chief of Department, and Chief of Section as follows :

- o Supervisory Board
- o Director
- o Chief - Finance and Administration Division
  - o Chief - Finance Department
    - o Chief - Financial Planning and Budgeting Section
    - o Chief - Accounting Section
    - o Chief - Billing Section
    - o Chief - Collection Section
    - o Cashier
  - o Chief - Administration and Customers Relation Department
    - o Chief - General Administration and Personnel Section
    - o Chief- Purchasing Section
    - o Chief - Warehousing Section
    - o Chief - Customers Relation Section
    - o Chief - Meter Reading Section
- o Chief - Technical Division
  - o Chief - Production Department
    - o Officer in charge - Artesian Wells
    - o Officer in charge - Cokrotulung Spring
    - o Officer in charge - Laboratory
  - o Chief - Operations and Maintenance Department
    - o Chief - Transmission Line Section
    - o Chief - Distribution System, Connection and Metering Section
    - o Chief - Leak Survey Section
    - o Officer in charge - Swimming Pool

- o Chief Plant, Shop, and Building Department
  - o Chief - Meter Shop Section
  - o Chief - Repair Shop Section
  - o Chief - Equipment Maintenance Section
  - o Chief - Building Maintenance Section
- o Chief - Project Engineering, Design and Construction Department
  - o Chief - Design Section
  - o Chief - Drafting Section
  - o Chief - Contracts and Specifications Section
  - o Chief - Project Inspection Section

The Organization Manual was prepared in English and Bahasa Indonesia. Initial copies were distributed to the following :

- o Ir. Oemarsidik Hadiasmoro, DSE, Cipta Karya
- o Director, Surakarta Water Enterprise
- o Chief - Finance and Administration Division, SWE
- o Chief - Technical Division, SWE
- o Chief Engineer (BM/TAE), Surakarta Water Project
- o SGV & CO.

C. Budgeting

Assisted and supervised the Financial Planning and Budgeting Section in the preparation of forms and worksheets needed in preparing the 1980 budget. These forms and worksheets were distributed to department heads and section heads together with the proper instructions on accomplishing them. Budget preparation shall be started on July 1979.

D. Starting June 1, 1979 the Water Enterprise adopted a new system in meter reading, billing and collection. The basic features and details of this system were already enumerated in my previous reports namely : Progress Report No. 5, dated March 1, 1979 and Progress Report No. 8, dated June 1, 1979.

As adopted in the new system the whole service area is divided into five districts. Reading of water meters shall be done according to district. Thus, reading of water meters of customers in District I shall be finished first before moving to District II and so on. Meter readers shall be rotated in their work assignment. Other activities such as bills preparation, bills examination, and bills distribution shall also be done by district.

Different collection due dates are assigned to each district. According to the policy of the Water Enterprise bills for a month shall become due the following month. Based on this policy bills for the month of June shall be collected in July without penalty charges. The consequence therefore, of this new system in relation to collection efficiency and work load distribution can be evaluated starting July 1979.

On various occasions during the month of June, I discussed with the officers and staff concerned in the meter reading, billing and collection, the different problems encountered in implementing the new system, as well as the solutions to these problems.

## III. WORK PROGRESS -- MANAGEMENT ASSISTANCE PROGRAM

The management assistance program to the Surakarta Water Enterprise is on schedule. Presented in Exhibit 2 is the scope of work and its status as of June 30, 1979.

IV. PROGRAM FOR NEXT MONTH

A. Continue monitoring implementation of the cycle billing system.

B. Supervise preparation of the 1980 budget.

C. Conduct test-check on meter reading.

D. Assist preparation of monthly reports.

Copy to :

1. Ir. Oemarsidik Hadiasmoro DIPL, SE
   Directorate General Cipta Karya

2. Bp. Soedarto, Director
   Surakarta Water Enterprise

3. Central Java Potable Water Project, Surakarta

4. Central Java Potable Water Project, Semarang

5. USAID, Jakarta

6. BM/TAE Jakarta

7. SGV & CO.

8. File

BBB/dy

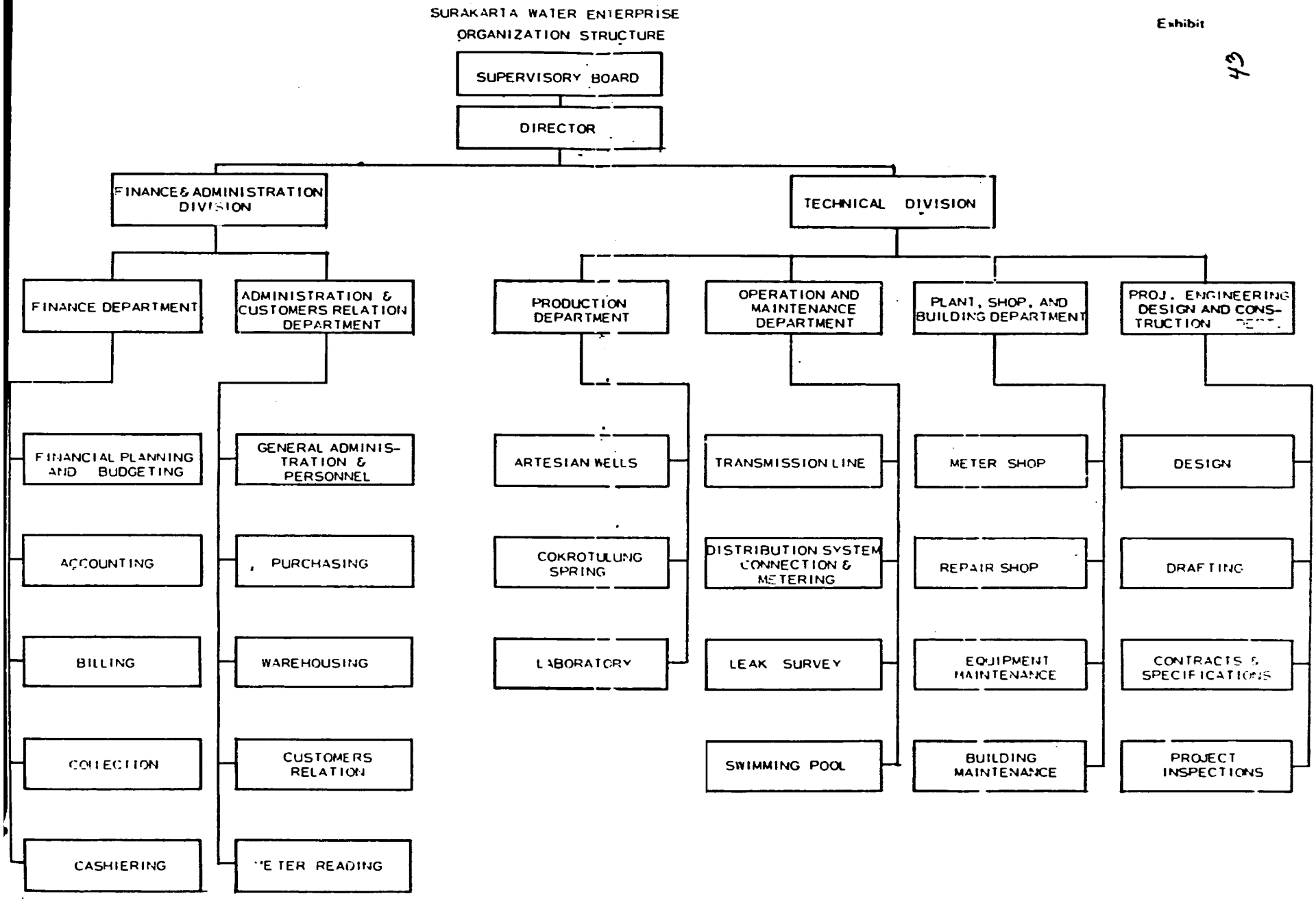


42
42

Exhibit

43

# SURAKARTA WATER ENTERPRISE
## ORGANIZATION STRUCTURE



SURAKARTA WATER ENTERPRISE

MANAGEMENT ASSISTANCE PROGRAM

AS OF JUNE 30, 1979

| Phase of Work | Status and Comment |
|---|---|
| 1. Review existing organization structure | 1. Done. The recommended organization structure was already approved by the representatives of Cipta Karya, USAID, SWE and the Consultant (BM/TAE) on May 22, 1979. |
| 2. Develop basic organization manual in English and Bahasa Indonesia. | 2. Done. Initial copies of the manual were distributed to the following:<br>o Director, Surakarta Water Enterprise<br>o Chief - Finance and Administration Division, Surakarta Water Enterprise<br>o Chief - Technical Division, Surakarta Water Enterprise<br>o Ir. Oemarsidik Hadiasmoro, Directorate General Cipta Karya<br>o Chief Engineer, BM/TAE, Surakarta Water Project<br>o SGV & CO. |
| 3. Preparation of short-term and long-term staffing requirement | 3. Done. Present personnel sufficient for the present operation. Additional personnel shall be hired as the need for them arises. |

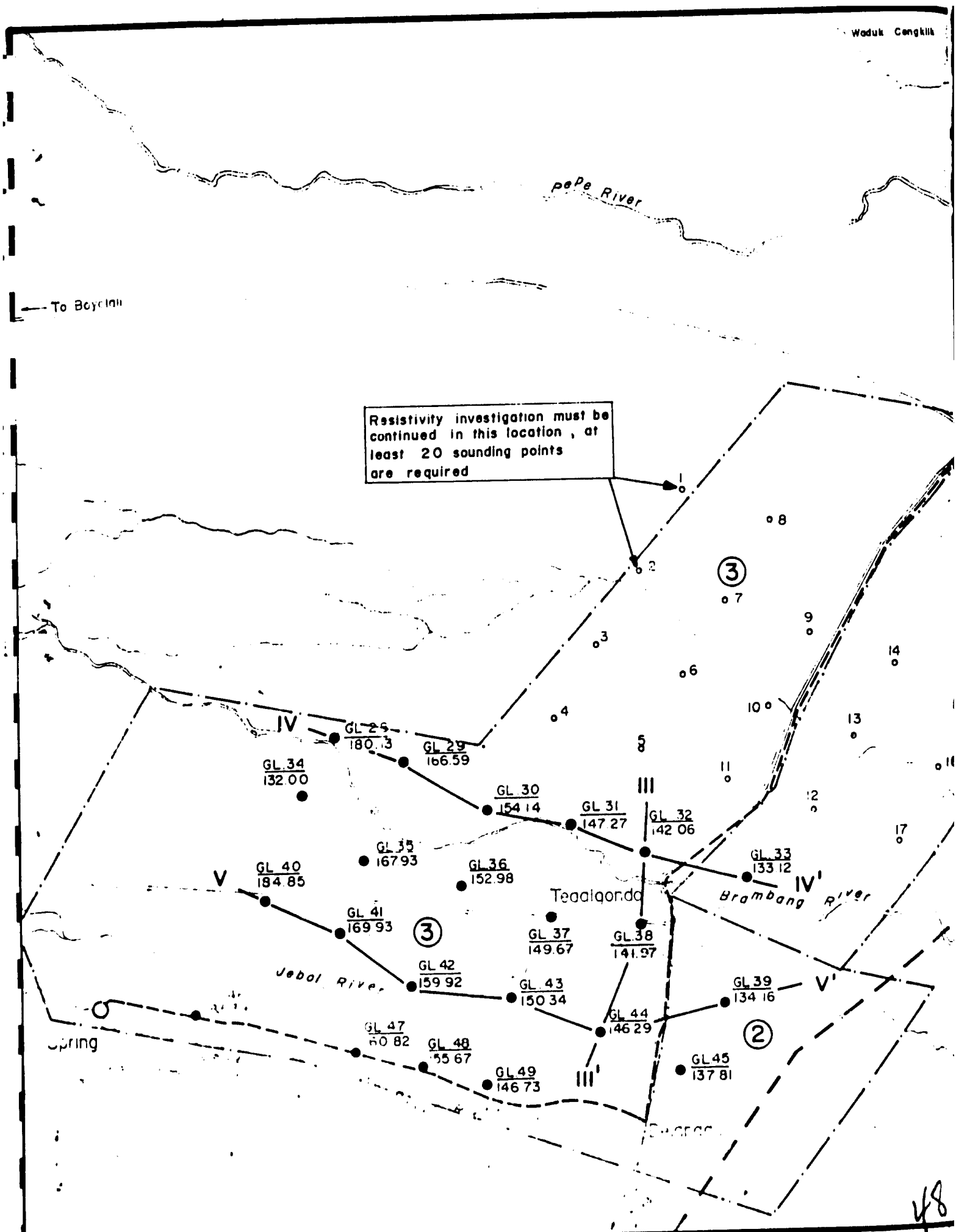
| | |
|---|---|
| 4. Recommendations on salary structure | 4. To do. |
| 5. Assistance in verifying the inventory of existing assets | 5. Done. Physical count of fixed assets was conducted on December 197[illegible]. |
| 6. Review present accounting systems and identify systems requirement | 6. Done. Recommendations to improve accounting system are incorporated in the design of the accounting and management information system. |
| 7. Design manual in Bahasa Indonesia containing accrual accounting and management information systems covering the following : | 7. Draft of manual already prepared and distributed to officers and staff of the Water Enterprise. The manual shall be finalized after the neces - sary changes during the implementation are effected. |
| a. General Accounting | a. Done. Implementation continuously being monitored. |
| b. Budgeting | b. Done. Preparation of 1980 budget to start on July 1979. |
| c. Meter Reading, Billing and Collection | c. Done. Cycle billing system start- ed on June 1, 1979. Currently being monitored. |
| d. Disbursements | d. Done. Some materials needed for implementation still being prepared. |
| e. Fixed assets accounting | e. Partly being implemented. Draft of manual for fixed assets accounting is in progress of preparation. |

| | |
|---|---|
| f. Payroll | f. Done. Necessary materials being prepared. Can be fully implemented on July 1979. |
| g. Purchasing | g. Done. Procedures being monitored. |
| h. Inventory Control | h. Done. Some prescribed forms are not yet used, although the present forms being used contain the same information as the recommended ones. |
| i. Work Order & Construction | i. Done. |
| 8. Conduct classroom, on the job, and demonstration training on the management and accounting system | 8. Done. On the job training is continuously being done. Additional classroom trainings shall be conducted. |
| 9. Assistance in periodic preparation of financial statements, operating reports and budgets for the use of internal management | 9. Done. Continuously being done monthly. |
| 10. Assistance in analysing the financial reports and their actual use in managing the Enterprise. | 10. To do. |
| 11. Assistance in rationalizing the water rate structure, and water rate increases, if any. | 11. Done. Assisted SWE in formulating new water rate to take effect on January 1980. It is now being reviewed by the Supervisory Board. |



4/6

| | |
|---|---|
| 12. Assistance in the preparation of reporting requirements of the national government, lending agencies, and other entities. | 12. To do. |
| 13. Review training needs of management and staff. | 13. To do. |
| 14. Prepare a training program in the administrative and management aspect of water utility enterprise which takes advantage of programs to be conducted at the national and regional level. | 14. To do. |
| 15. Prepare system of monitoring the progress of training program and the performance of participants. | 15. To do. |


Waduk Cengkik
pepe River
To Boyolali
Resistivity investigation must be continued in this location, at least 20 sounding points are required
1
2
3
4
5
6
7
8
9
10
11
12
13
14
17
IV
GL 26
180.13
GL 29
166.59
GL 34
132.00
GL 30
154.14
GL 31
147.27
GL 32
142.06
III
GL 35
167.93
GL 36
152.98
GL 33
133.12
IV'
V
GL 40
184.85
GL 41
169.93
Tegalgondo
Brambang River
GL 37
149.67
GL 38
141.97
Jebol River
GL 42
159.92
GL 43
150.34
GL 39
134.16
V'
GL 44
146.29
GL 47
60.82
GL 48
55.67
GL 49
146.73
III'
GL 45
137.81
2
Spring

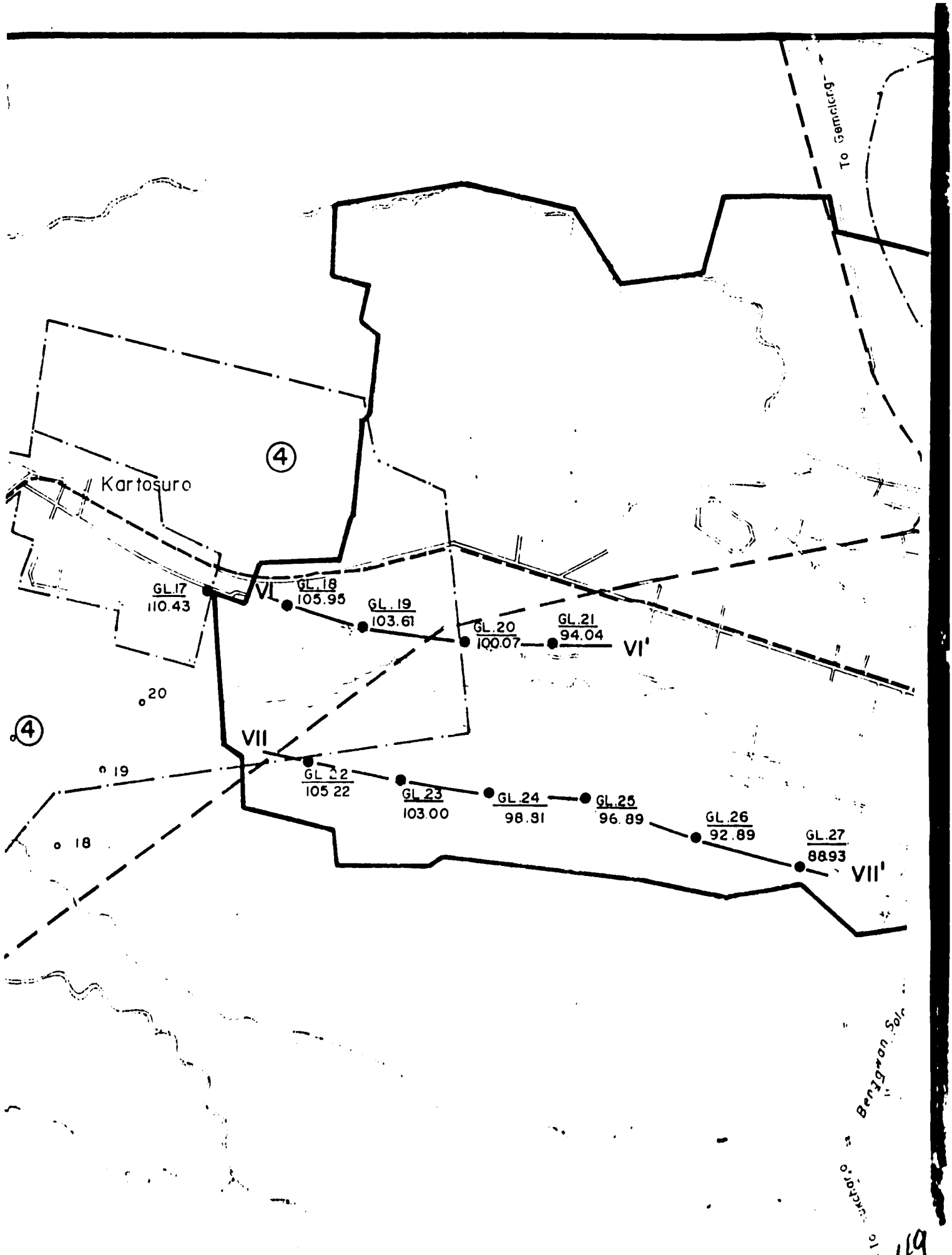
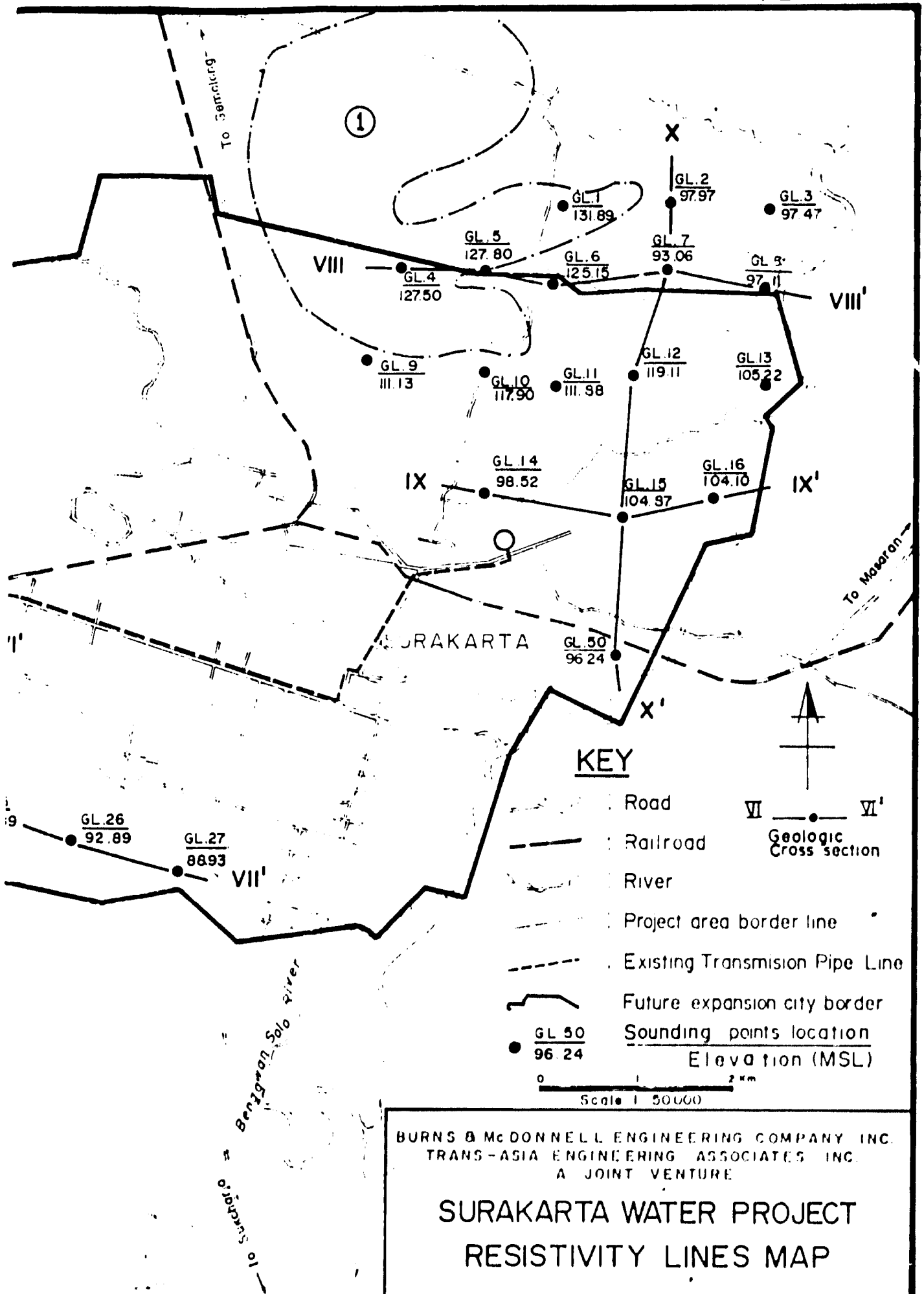

To Gemelerg
Kartosuro
④
GL.17
110.43
VI
GL.18
105.95
GL.19
103.61
GL.20
100.07
GL.21
94.04
VI'
20
④
VII
19
GL.22
105.22
GL.23
103.00
GL.24
98.91
GL.25
96.89
GL.26
92.89
GL.27
88.93
VII'
18
Bengaon Sol

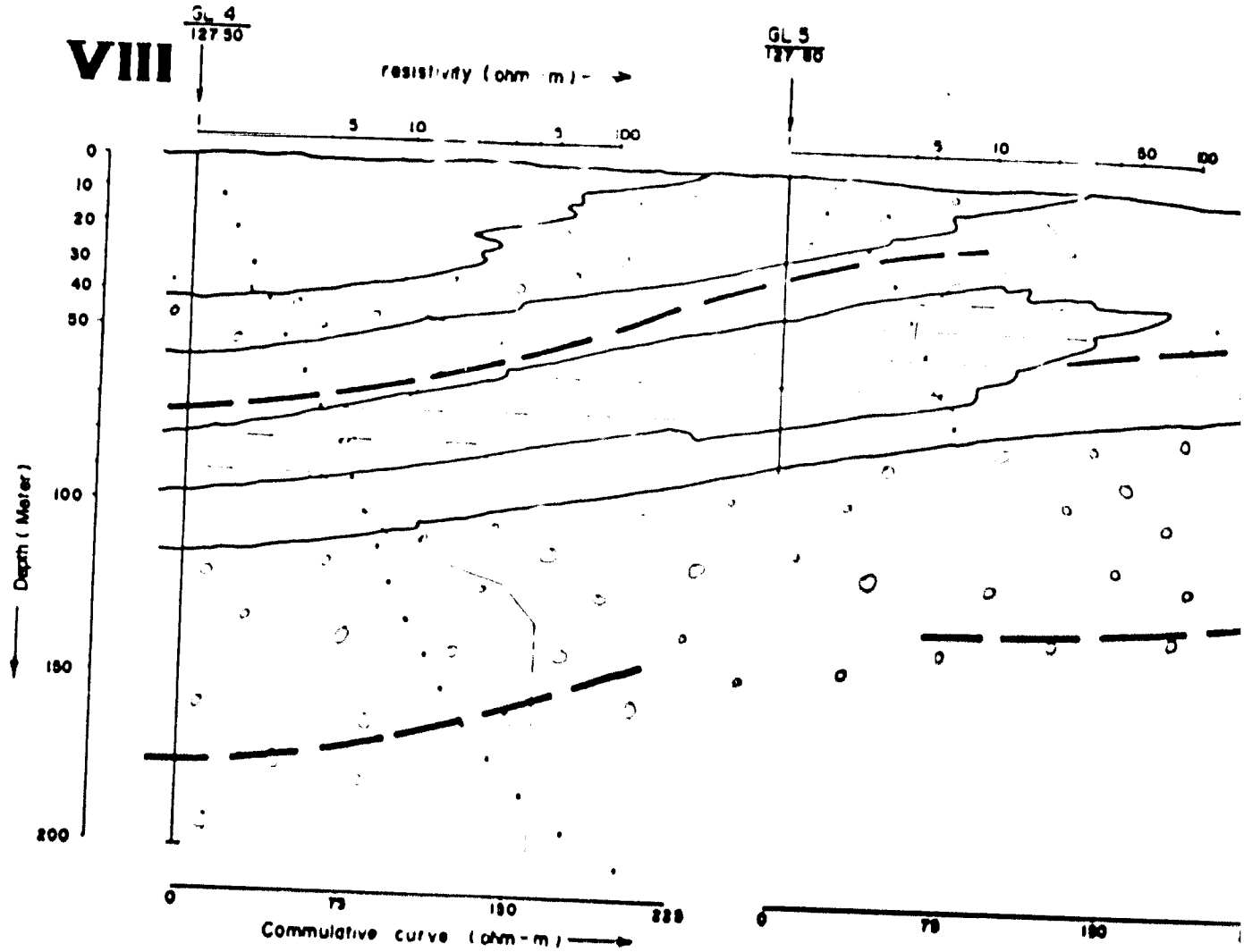
PLATE. 1

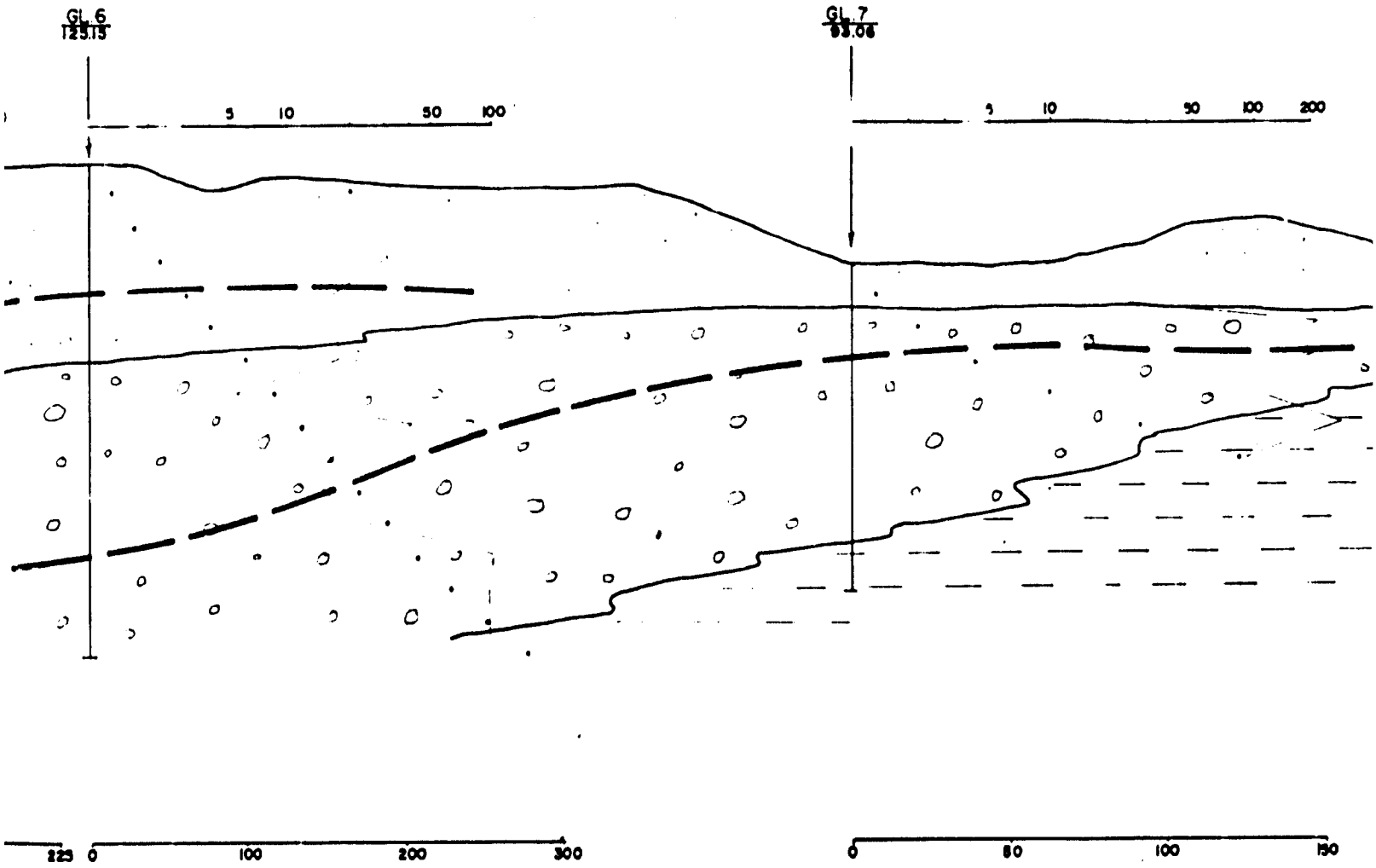



BURNS & McDONNELL ENGINEERING COMPANY INC.
TRANS-ASIA ENGINEERING ASSOCIATES INC.
A JOINT VENTURE

# SURAKARTA WATER PROJECT
# RESISTIVITY LINES MAP

# VIII

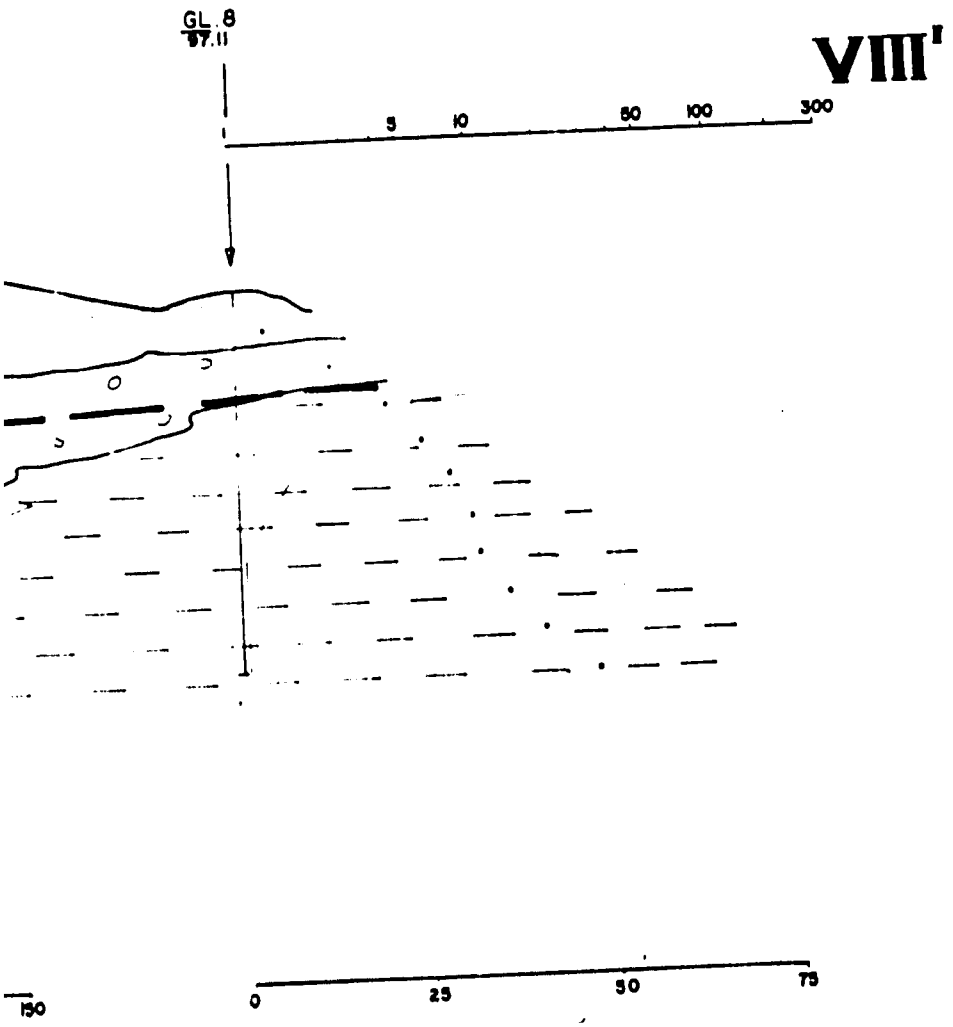

GL 4
127 50
GL 5
127 80
resistivity (ohm - m) →
5 10 5 100
5 10 80 100
0
10
20
30
40
50
100
150
200
Depth (Meter)
0 75 150 225
Commulative curve (ohm - m) →
0 75 150

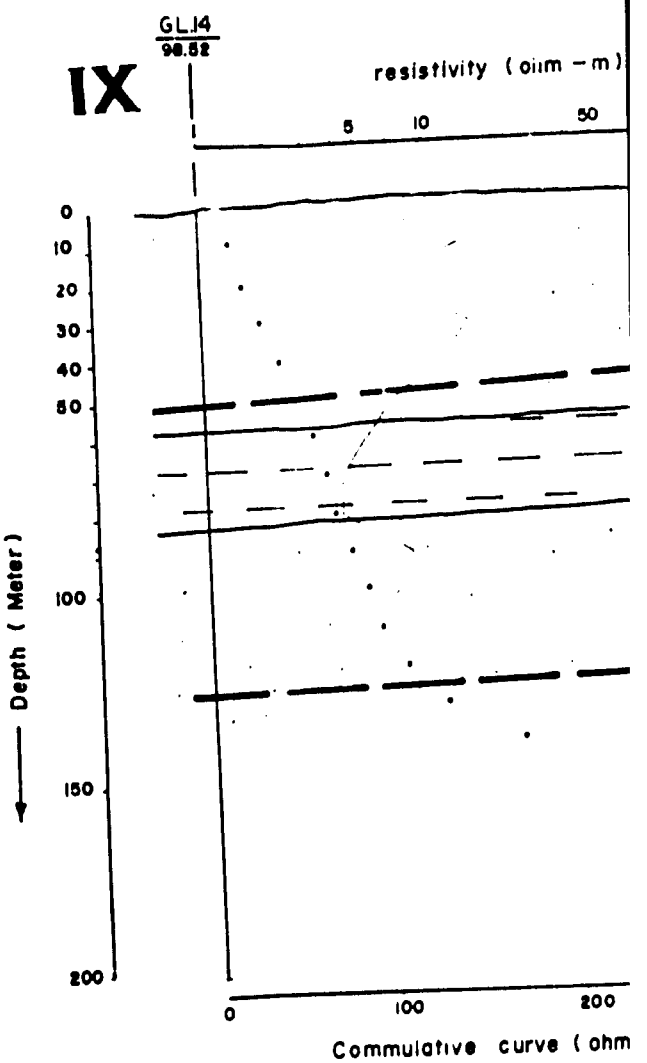


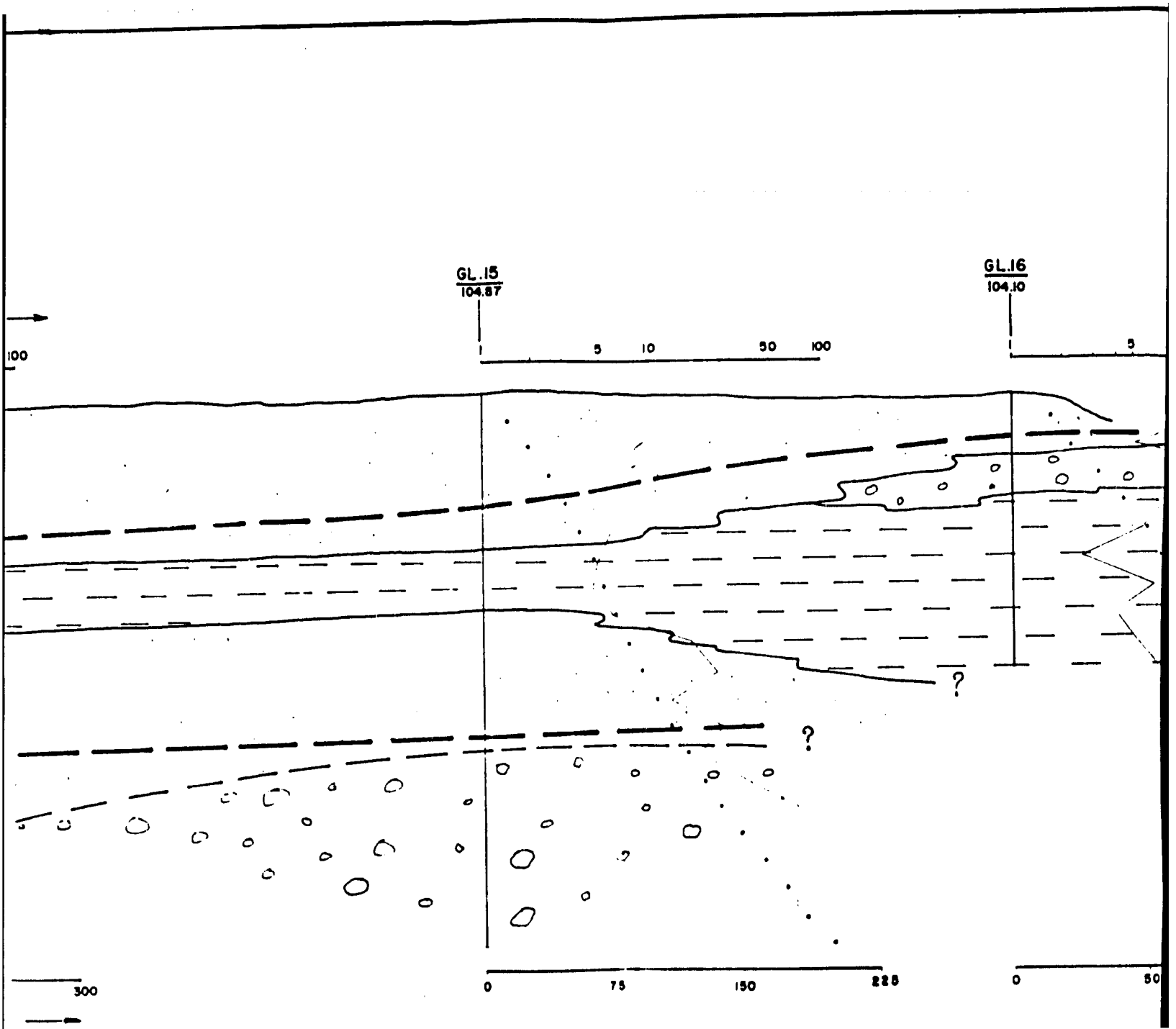

## LEGEND

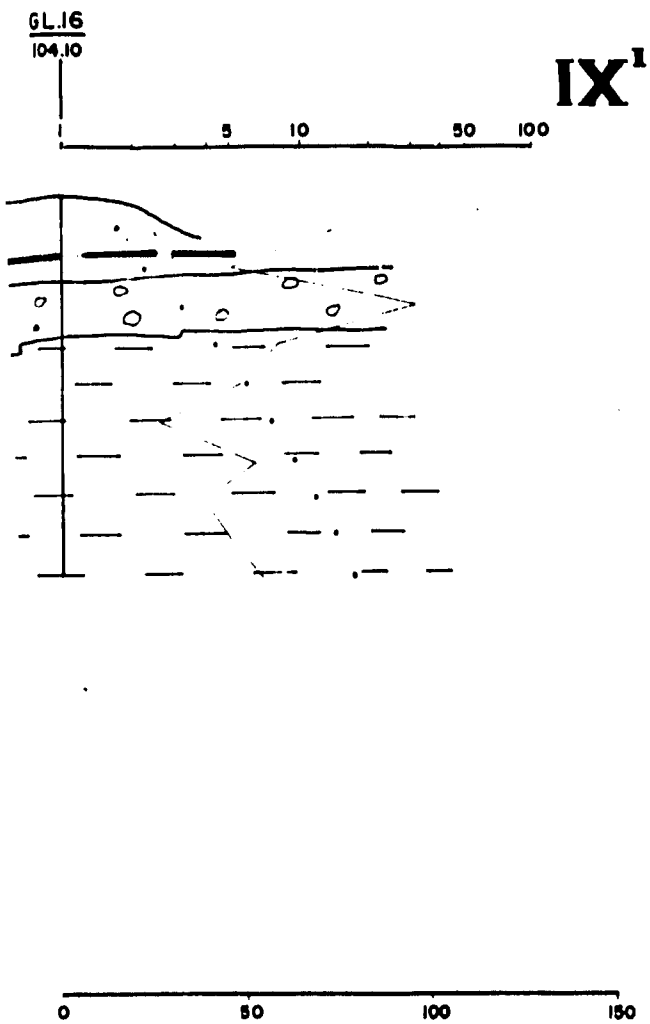
| | | RESISTIVITY |
|---|---|---|
| | CLAY OR TUFF | ρ < 5 ohm - m |
| | SANDSTONE | ρ 5 — 15 ohm - m |
| | LAHARIC BRECCIA WITH PEBBLES AND SANDSTONE LAYERS | ρ > 15 ohm — m |

WATER TABLE


GL.8
97.11
VIII'
5
10
50
100
300
150
0
25
50
75


GL.14
98.52
IX
resistivity ( ohm - m )
5
10
50
0
10
20
30
40
50
100
150
200
Depth ( Meter )
0
100
200
Commulative curve ( ohm


GL.15
104.87
GL.16
104.10
100
5
10
50
100
5
?
?
300
0
75
150
225
0
50




BURNS & McDONNELL ENGINEERING COMPANY INC
TRANS-ASIA ENGINEERING ACCOSIATES INC
A JOINT VENTURE

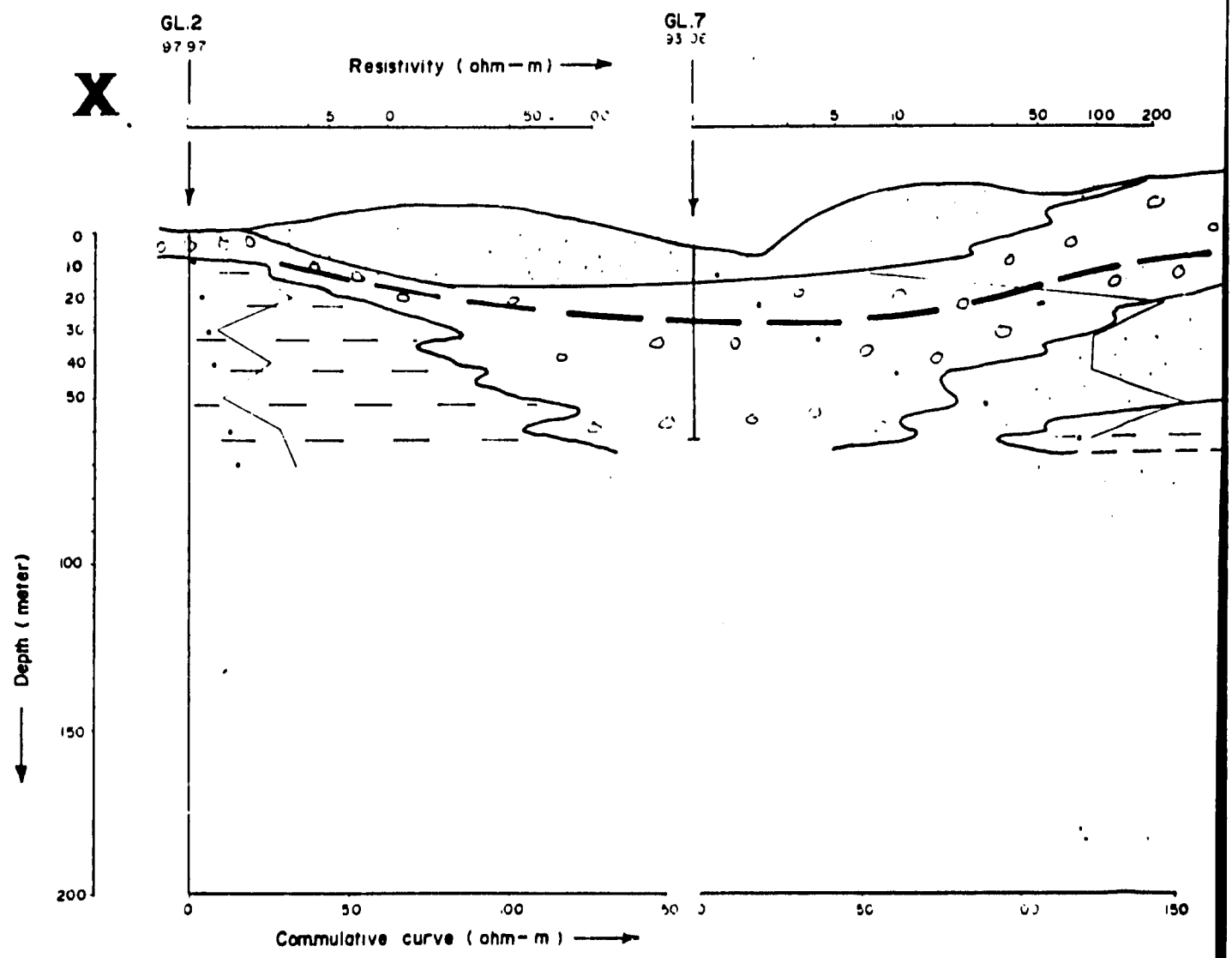
SURAKARTA WATER PROJECT

GEOLOGIC CROSS-SECTION
VIII — VIII' AND IX — IX'

BASED ON RESISTIVITY

SCALE HORIZONTAL 1 : 10.000
VERTICAL 1 : 2000

| RESISTIVITY INVESTIGATED BY | PREPARED BY | APPROVED BY |
|---|---|---|
| P.T. GEODATA | P T GEODATA | |
| DATE : | | |

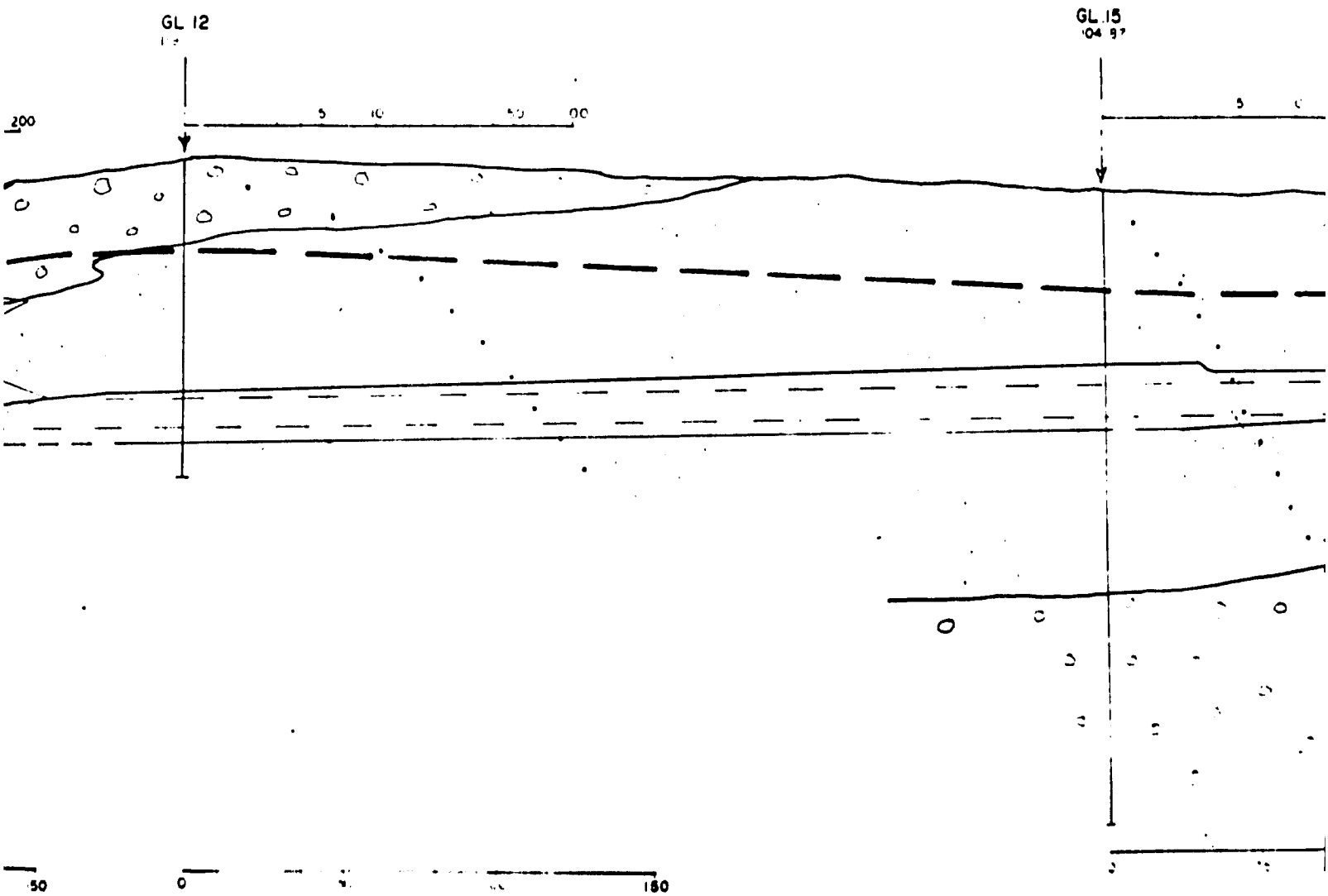



## LEGEND

RESISTIVITY

CLAY OR TUFF — ρ < 5 ohm – m

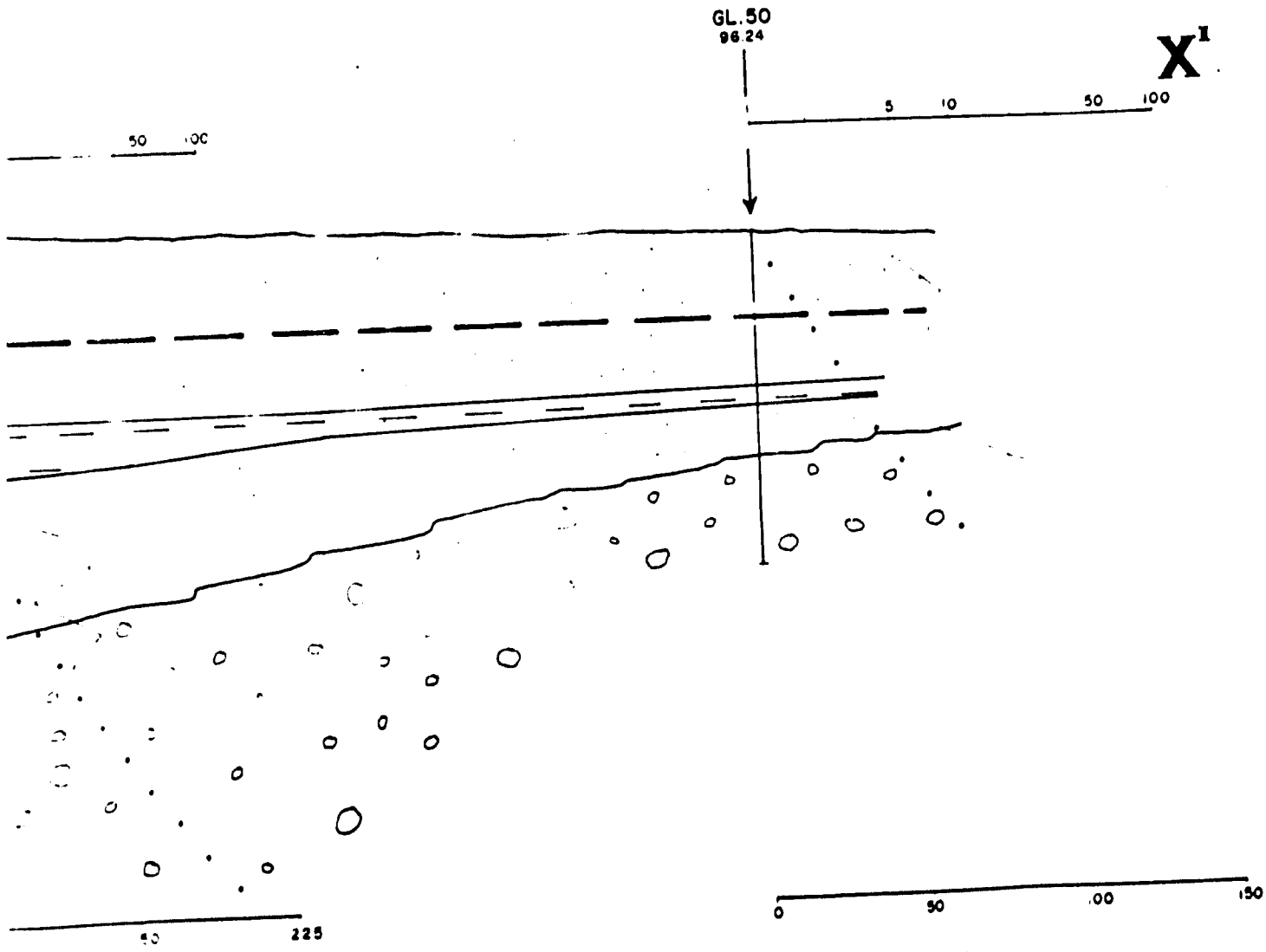
SANDSTONE — ρ 5 – 15 ohm – m

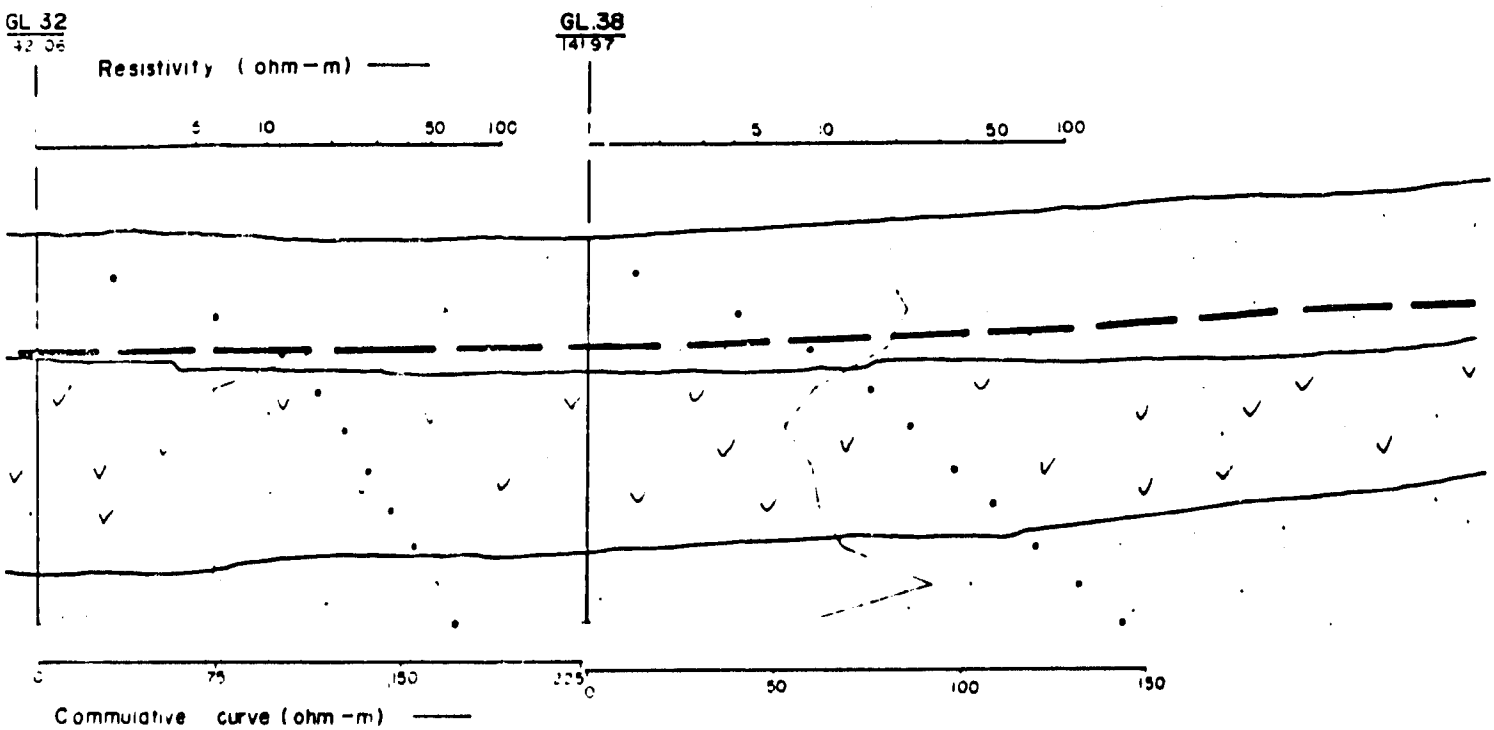



LAHARIC BRECCIA AND PEBBLES WITH SANDSTONE LAYERS

ρ 15 ohm - m

WATER TABLE


III
GL.50
96.24
X¹
5
10
50
100
50
100
0
0
20
30
40
0
0
50
100
150
225



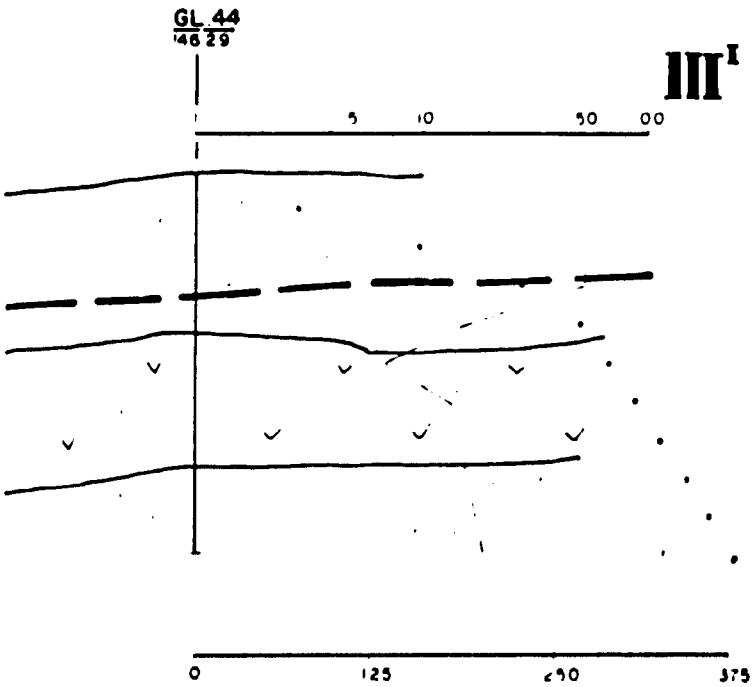

## LEGEND

RESISTIVITY

TUFF WITH LAYERS OF SAND — ρ < 5 – 15 ohm-m

SANDSTONE — ρ 15 — 50 ohm-m

WATER TABLE




BURNS & McDONNELL ENGINEERING COMPANY INC
TRANS-ASIA ENGINEERING ACCOSIATES INC
A JOINT VENTURE

SURAKARTA WATER PROJECT

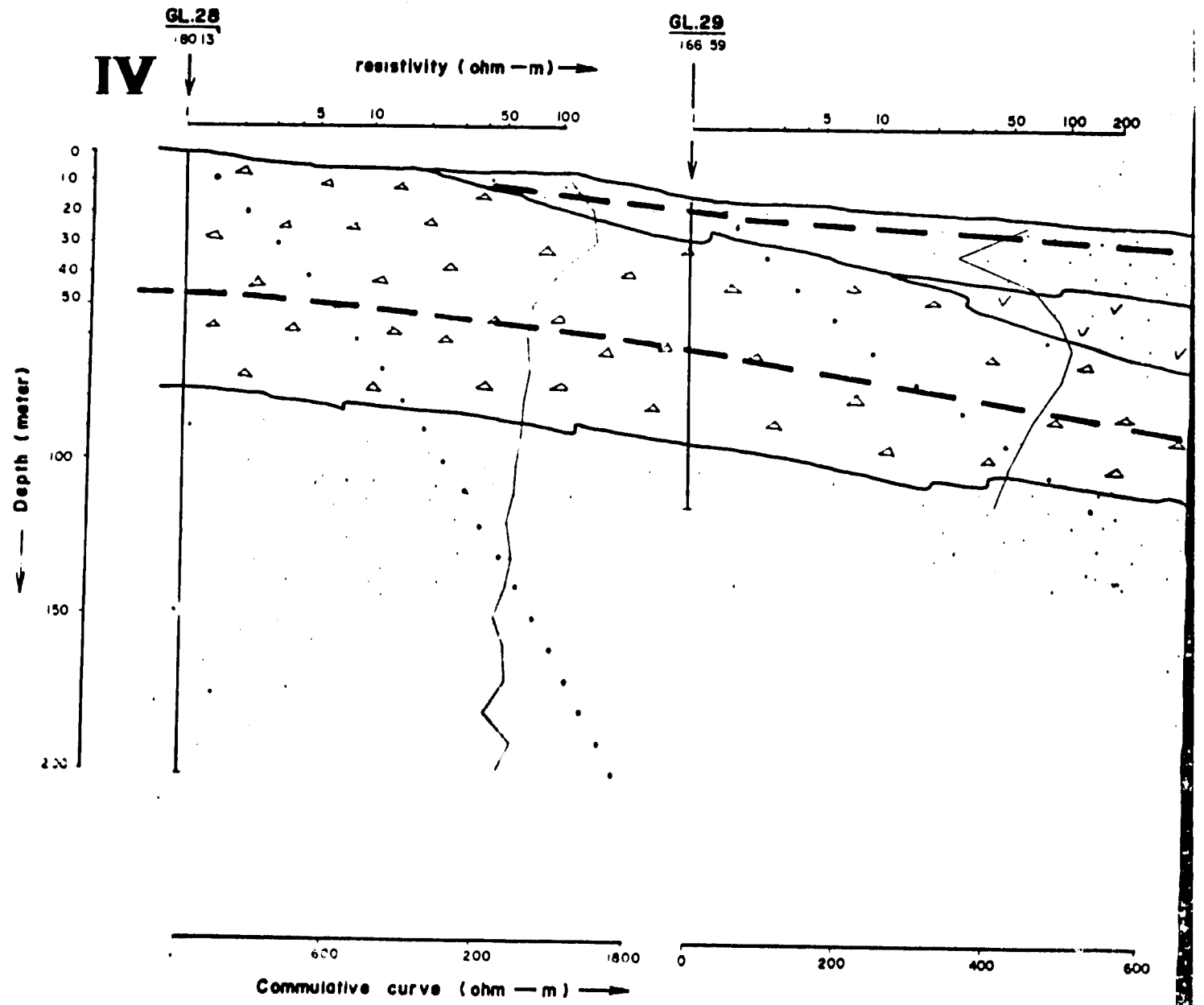
GEOLOGIC CROSS-SECTION

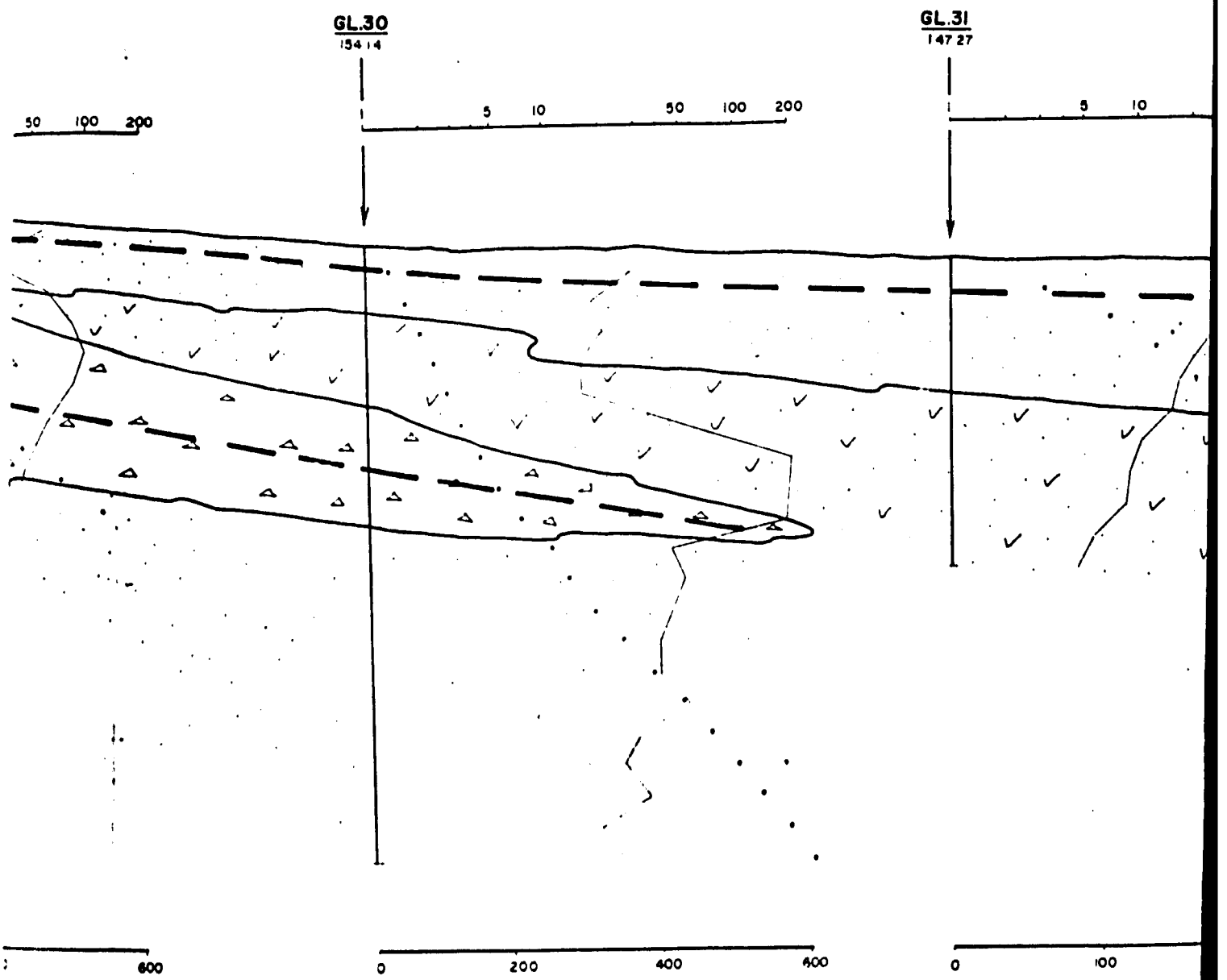
X — X' AND III — III'

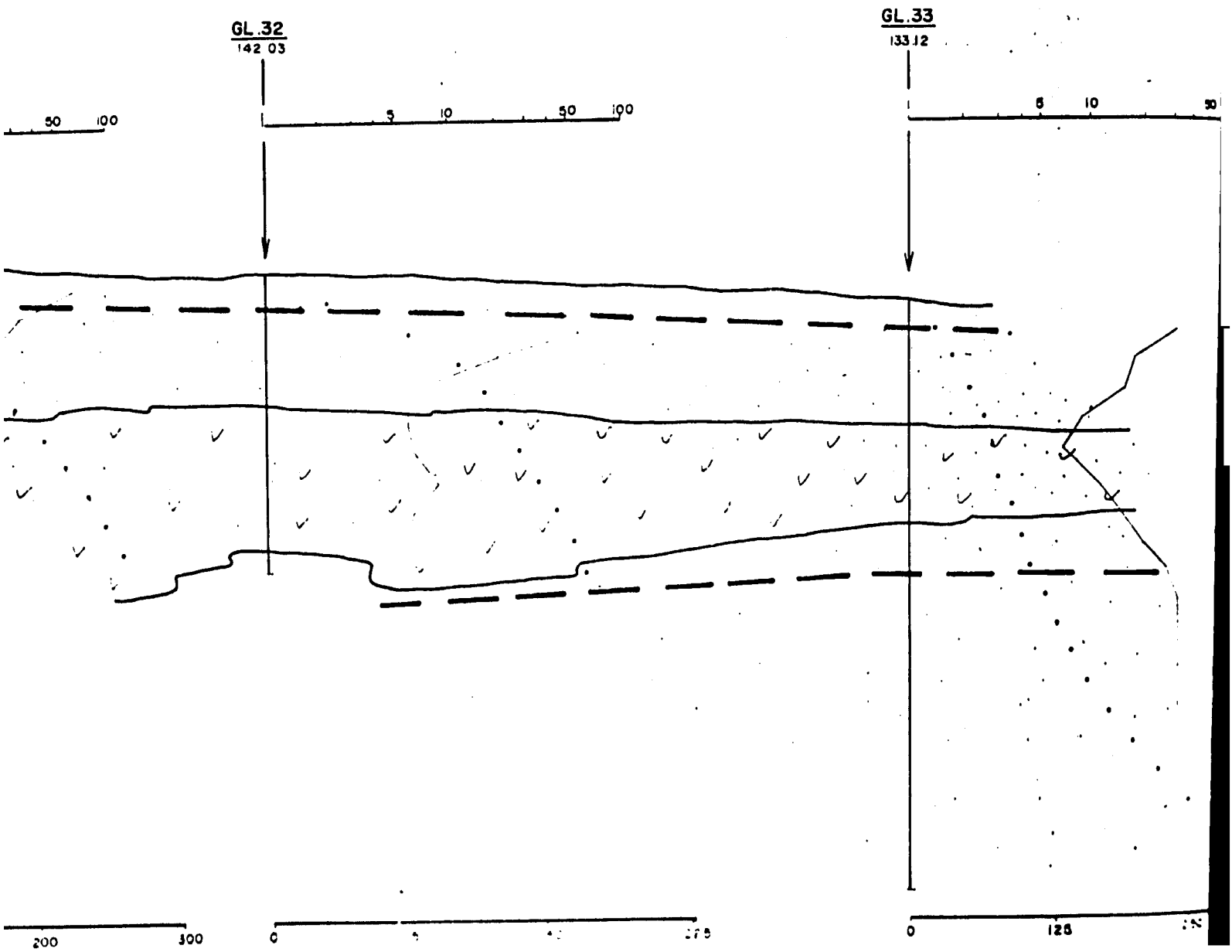
BASED ON RESISTIVITY

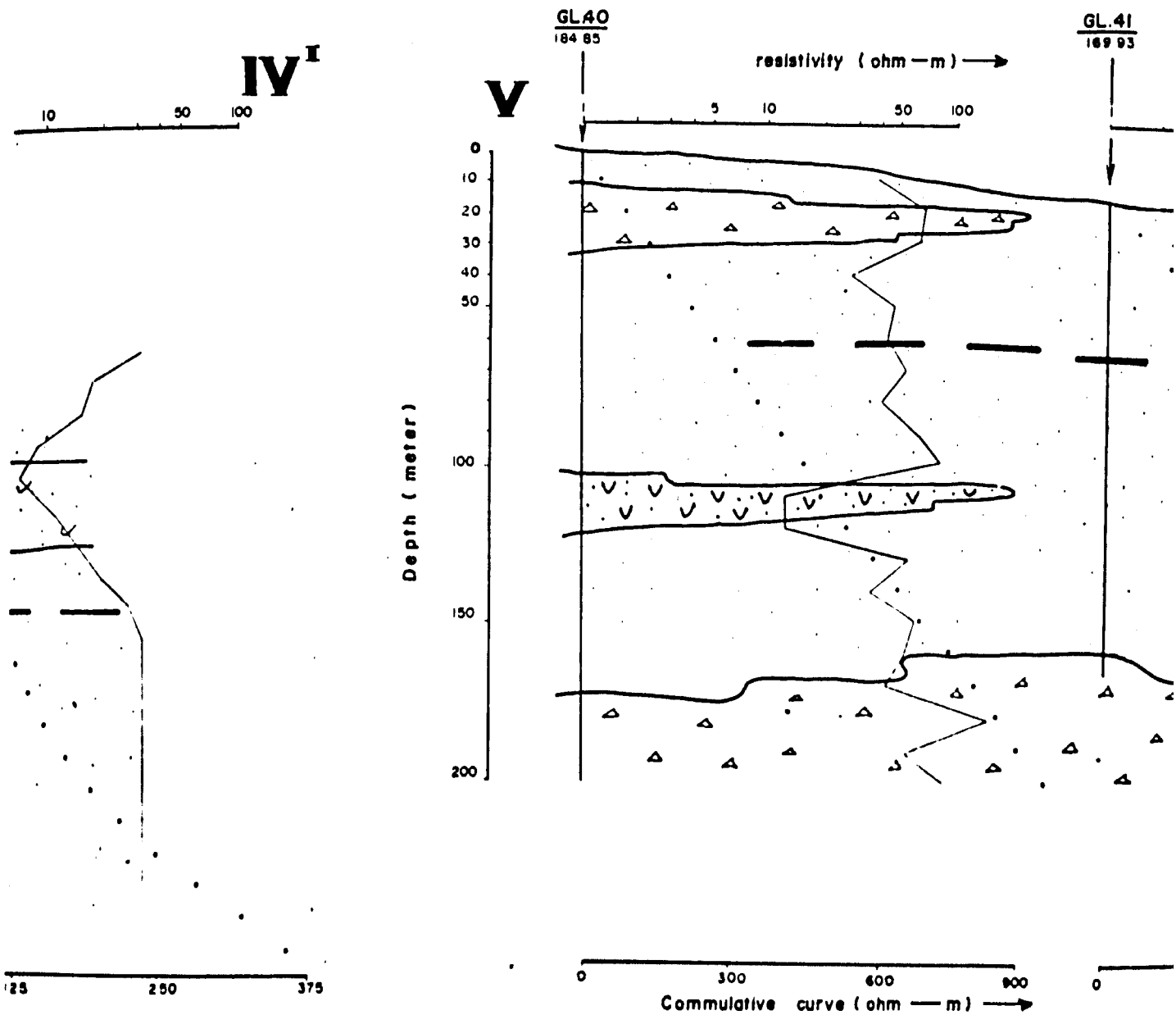
SCALE HORIZONTAL 1 : 10.000
VERTICAL 1 2 000

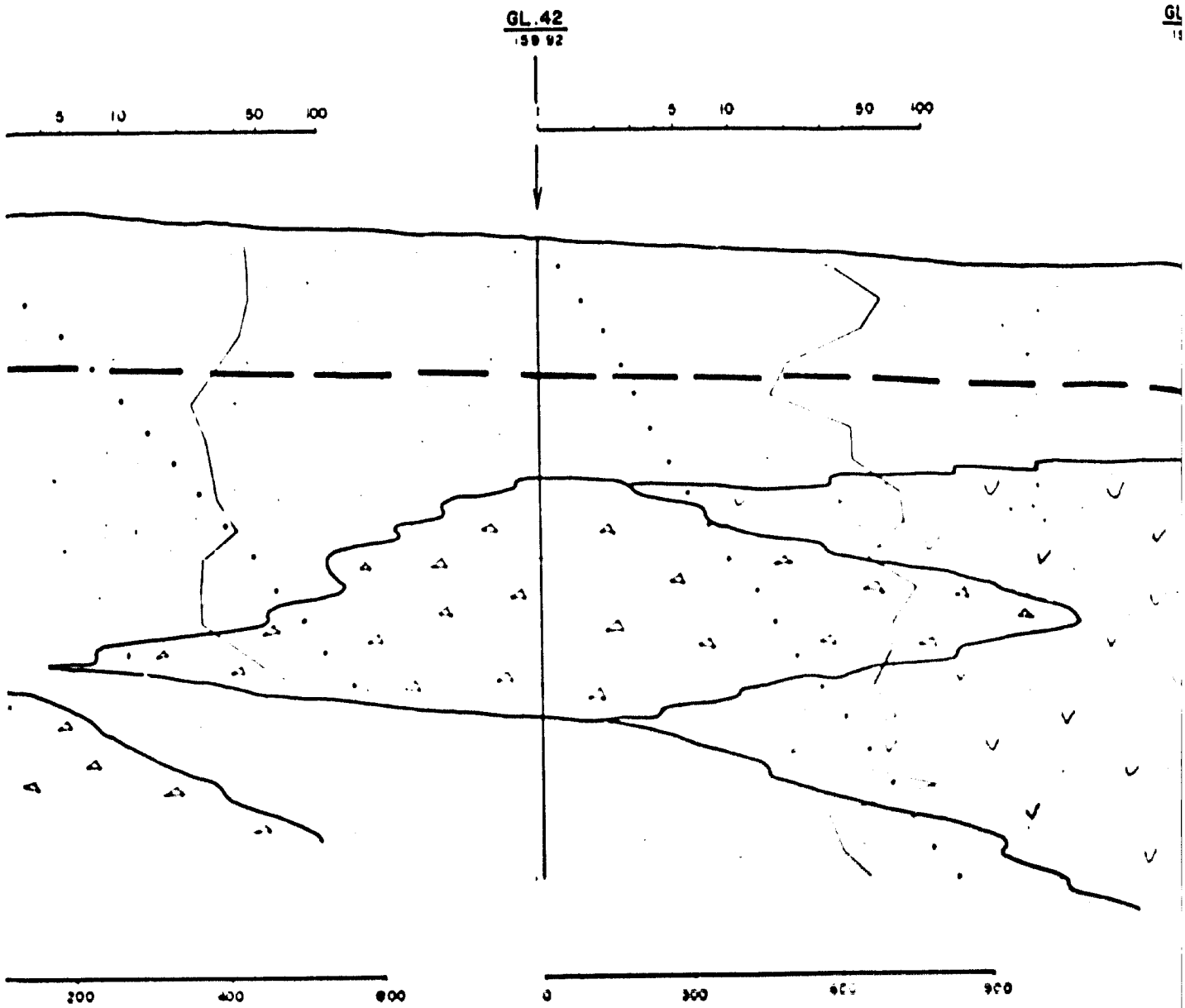
| RESISTIVITY INVESTIGATED BY | PREPARED BY | APPROVED BY |
|---|---|---|
| PT GEODATA | PT GEODATA | |
| DATE | | |

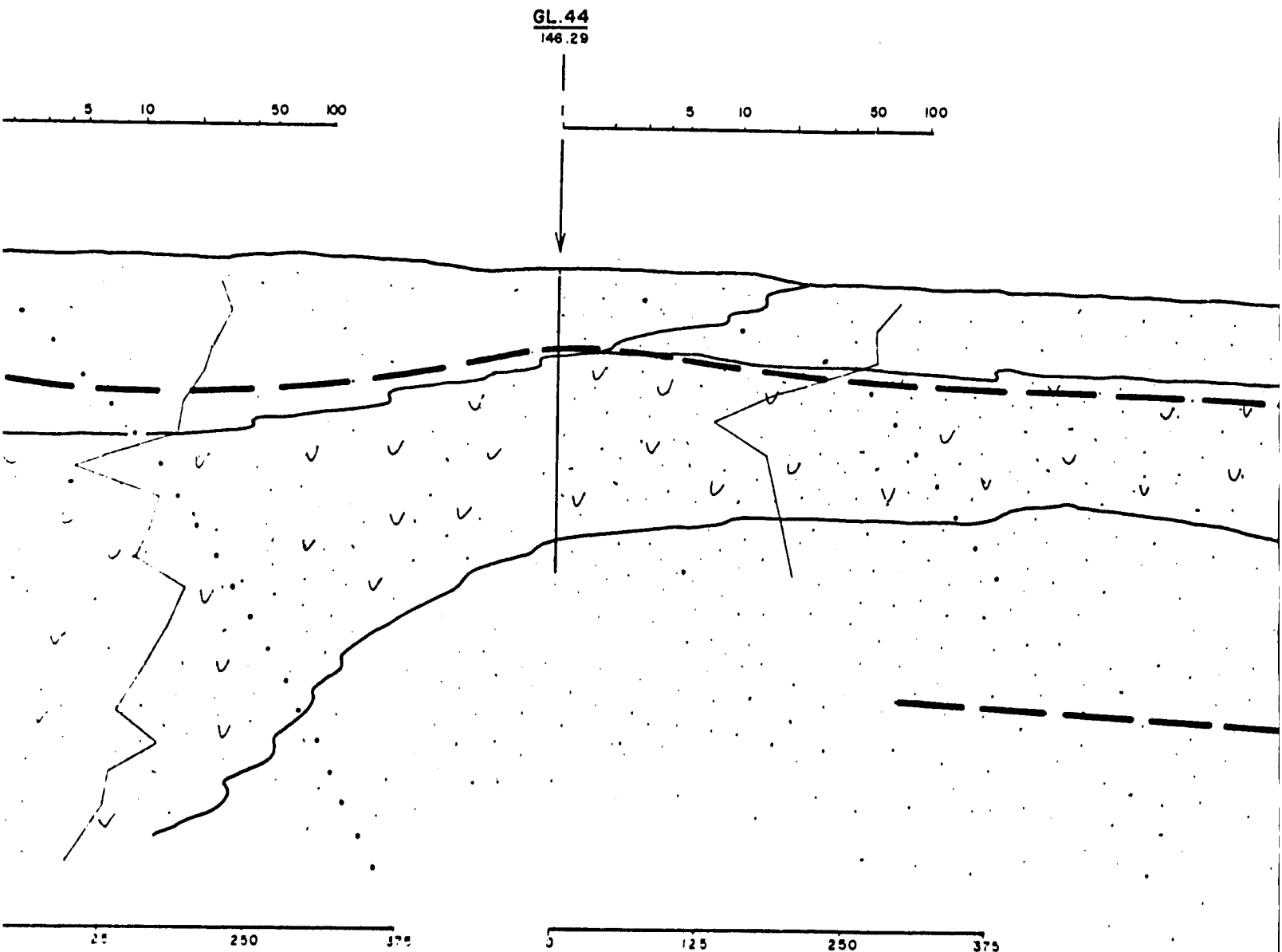

IV
GL.28
180 13
GL.29
166 59
resistivity (ohm — m) →
5 10 50 100
5 10 50 100 200
0
10
20
30
40
50
100
150
200
Depth (meter)
600 200 1800
0 200 400 600
Commulative curve (ohm — m) →


GL.30
154 14
GL.31
147 27
50 100 200
1 5 10 50 100 200
1 5 10
600
0 200 400 600
0 100


GL.32
142 03
GL.33
133.12
50
100
5
10
50
100
5
10
200
300
0
0
125


IV I
10
50
100
125
250
375
V
GL40
184 85
GL.41
169 93
resistivity ( ohm — m ) →
5
10
50
100
0
10
20
30
40
50
100
150
200
Depth ( meter )
0
300
600
900
0
Commulative curve ( ohm — m ) →


GL.42
5 10 50 100
1 5 10 50 400
200 400 800
0 300 900




LEGEND

WATER TABLE

TUFF WITH LAYER OF SA

SANDSTONE

LAHARIC BRECCIA WITH LE
OF PEBBLE


RESISTIVITY

ρ 5 — 15 ohm - m

ρ 15 — 50 ohm - m

ρ > 50 ohm - m

BURNS & McDONNELL ENGINEERING COMPANY INC
TRANS-ASIA ENGINEERING ACCOSIATES INC
A JOINT VENTURE

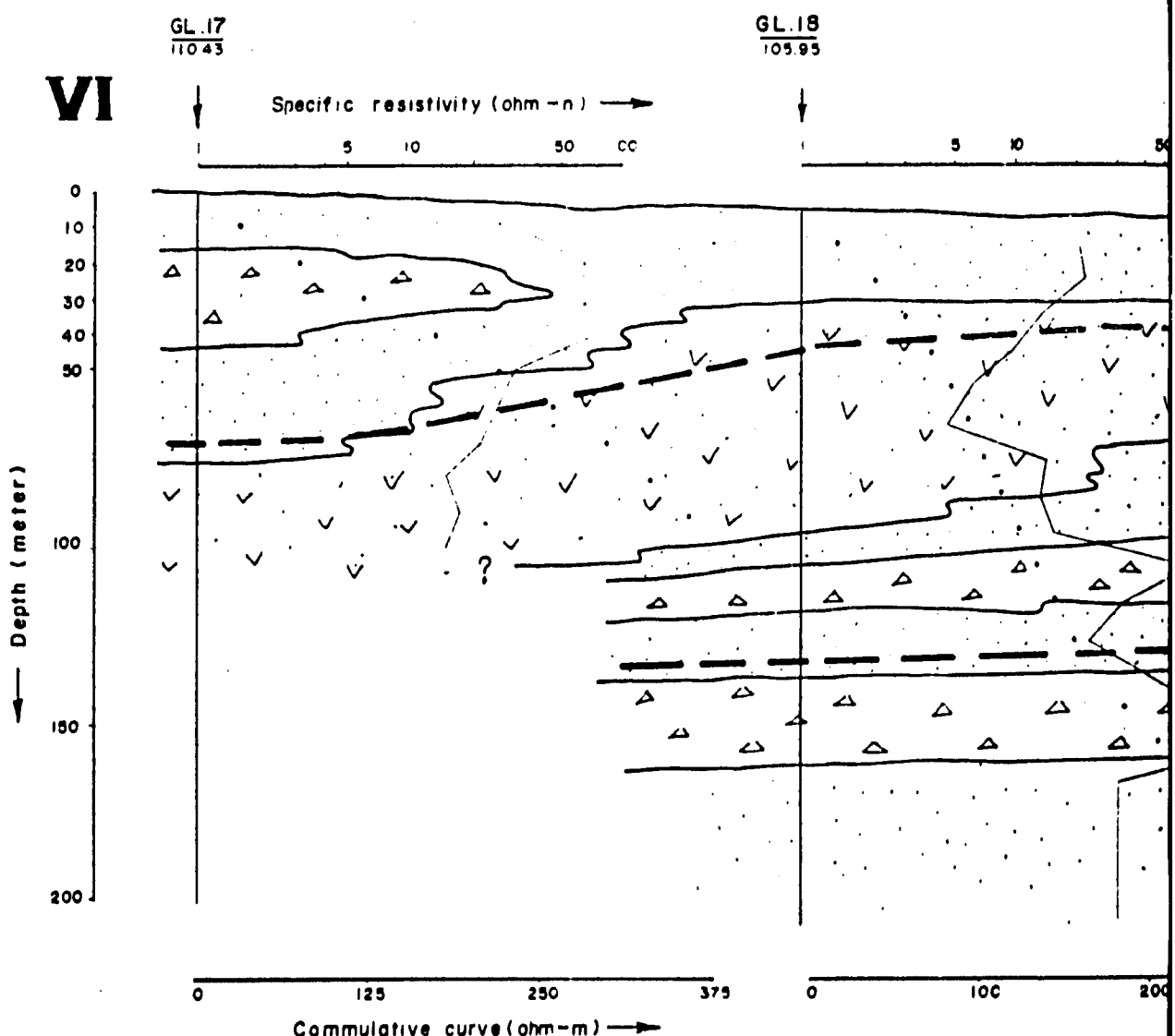
SURAKARTA WATER PROJECT

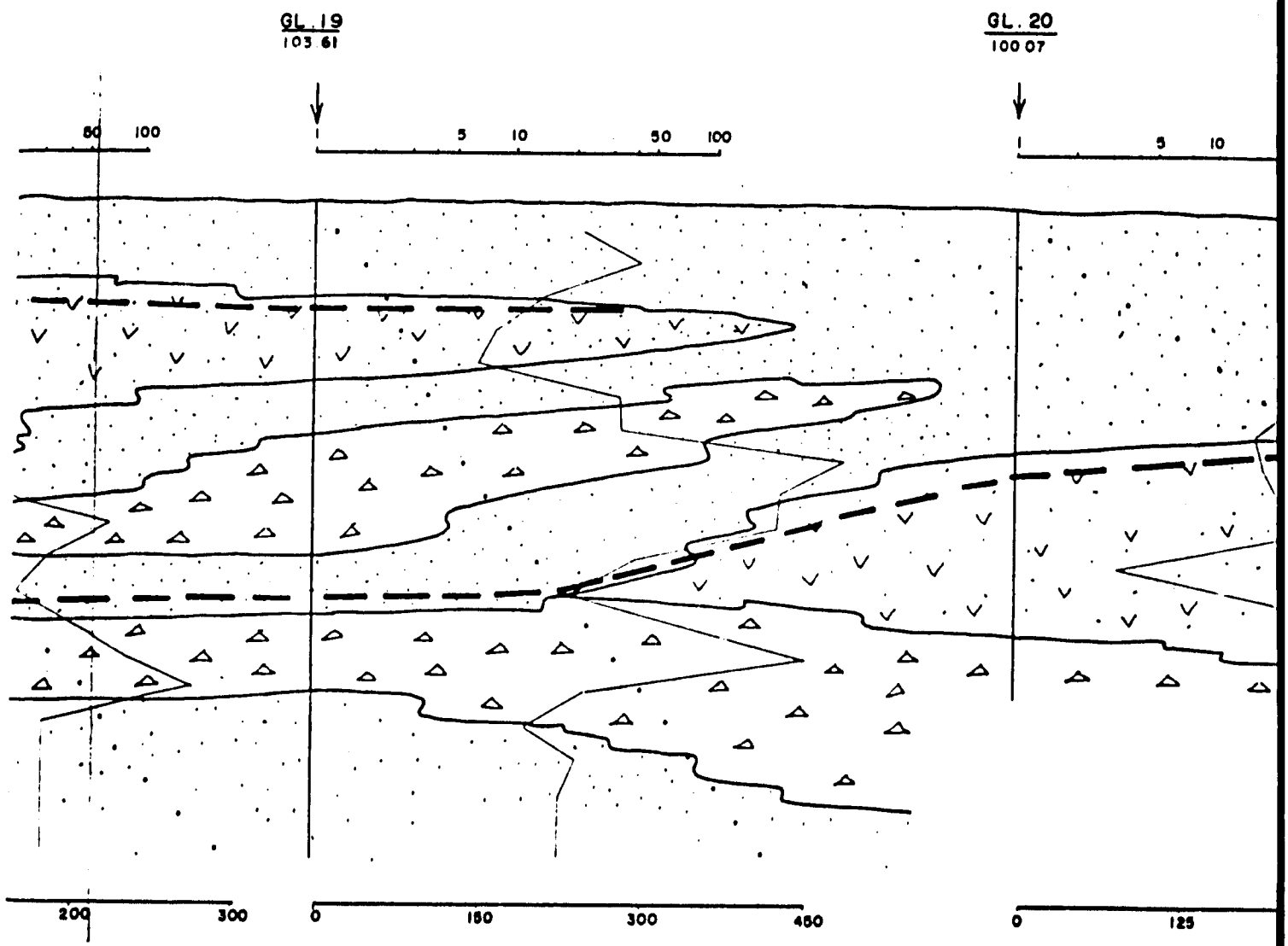
GEOLOGIC CROSS-SECTION
IV — IV' AND V — V'

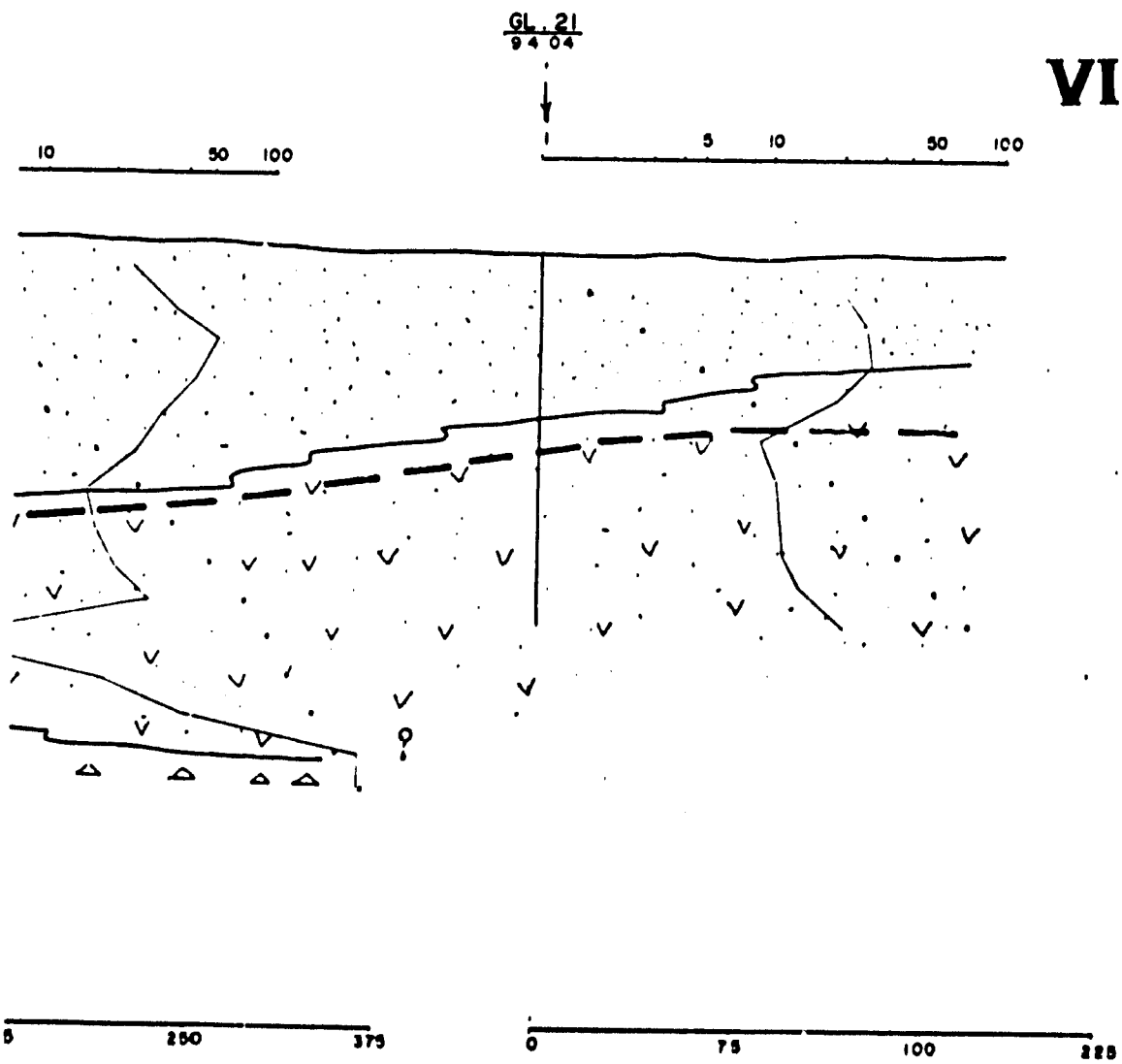
BASED ON RESISTIVITY

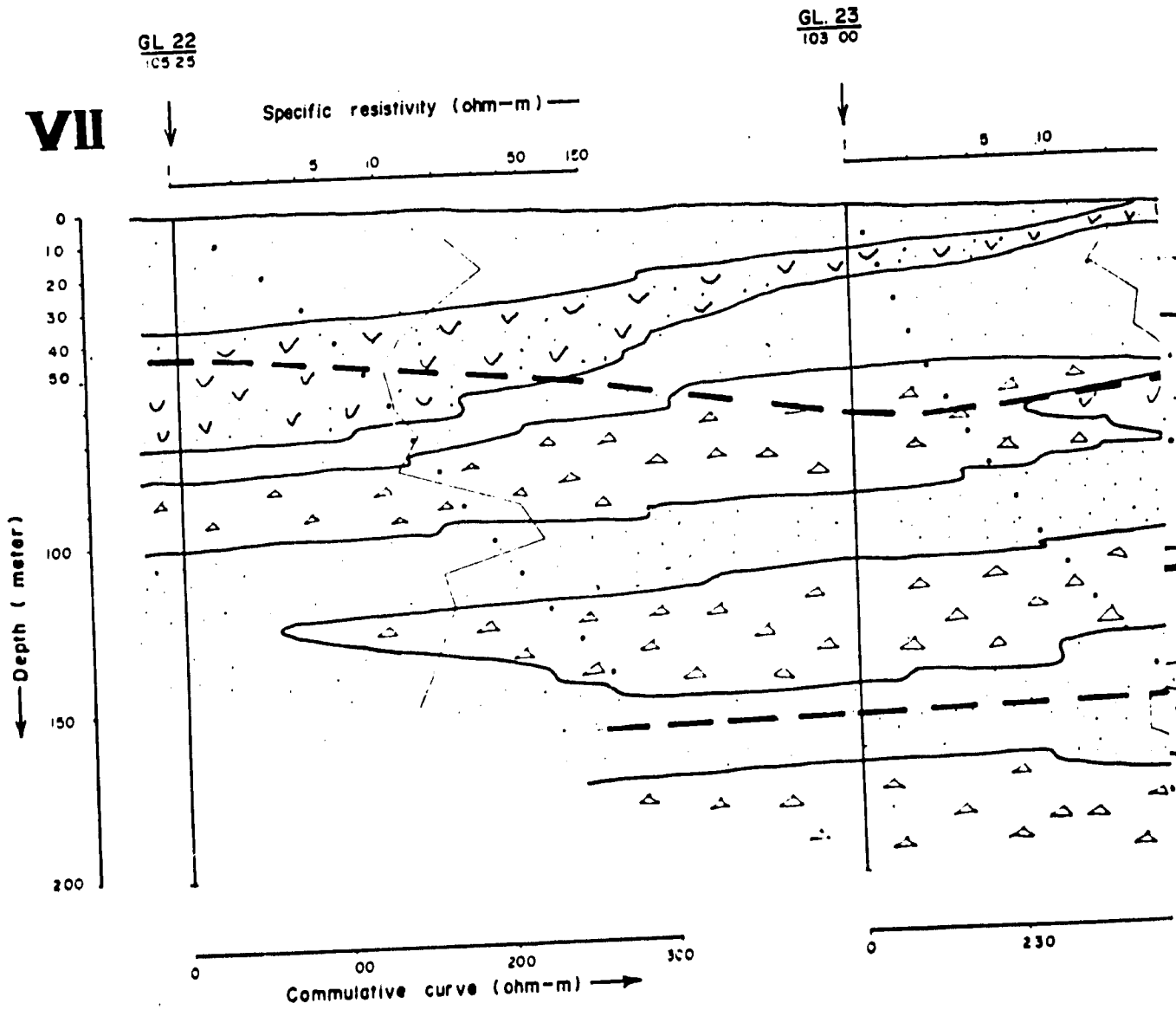
SCALE HORIZONTAL 1 : 10.000
VERTICAL 1 : 2 000

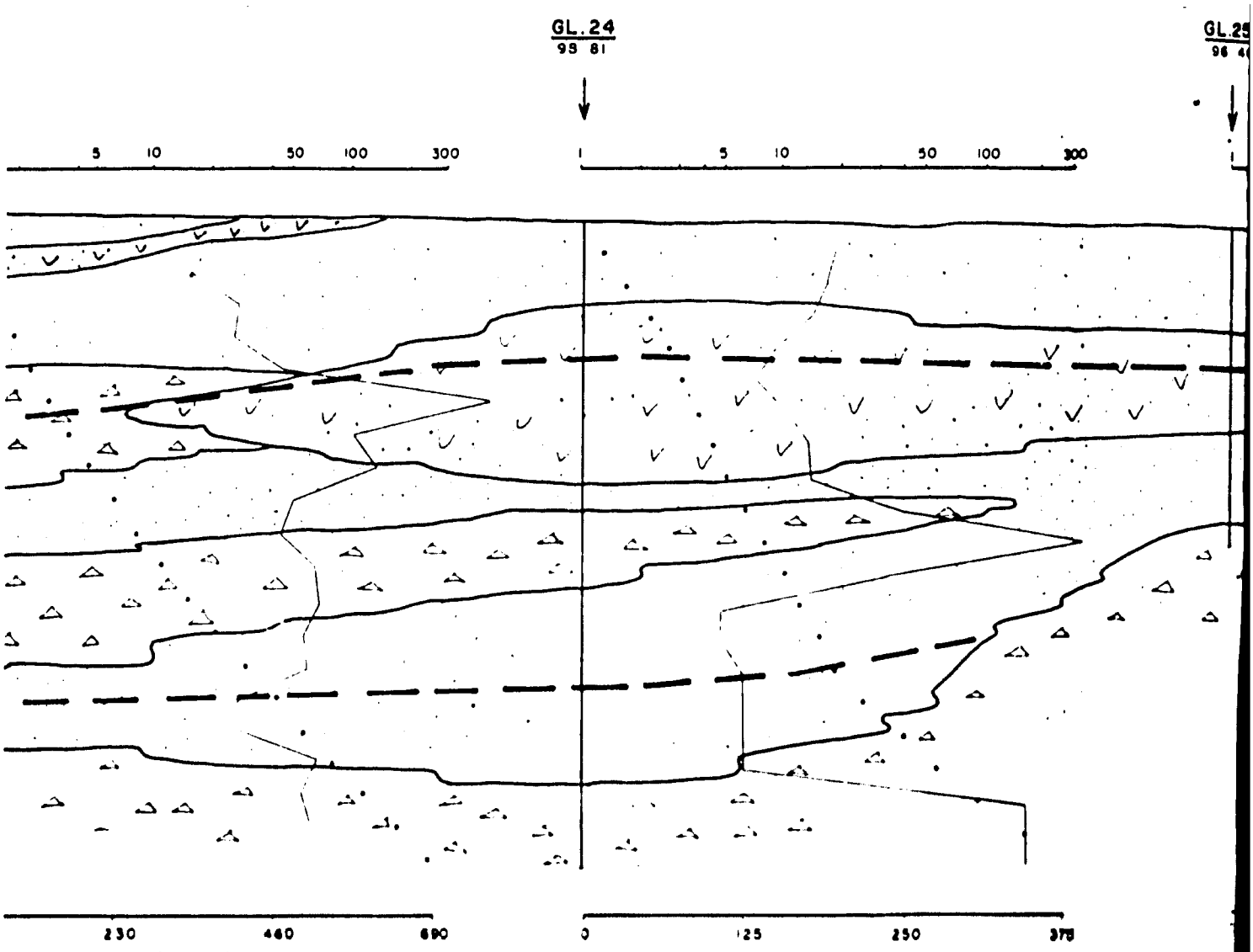
| RESISTIVITY INVESTIGATED BY | PREPARED BY | APPROVED BY |
|---|---|---|
| P.T. GEODATA | P.T. GEODATA | |
| DATE | | |


VI
GL.17
110.43
GL.18
105.95
Specific resistivity (ohm-n)
1
5
10
50
CC
0
10
20
30
40
50
100
150
200
Depth (meter)
?
0
125
250
375
0
100
Commulative curve (ohm-m)


GL. 19
103 61
GL. 20
100 07
50
100
5
10
50
100
1
5
10
200
300
0
150
300
450
0
125




VII
GL 22
105 25
GL. 23
103 00
Specific resistivity (ohm-m)
1
5
10
50
150
1
5
10
0
10
20
30
40
50
100
150
200
Depth ( meter)
0
00
200
300
Commulative curve (ohm-m)
0
230


GL.24
98 81
GL.25
5 10 50 100 300
1 5 10 50 100 300
230 460 690
0 125 250 375

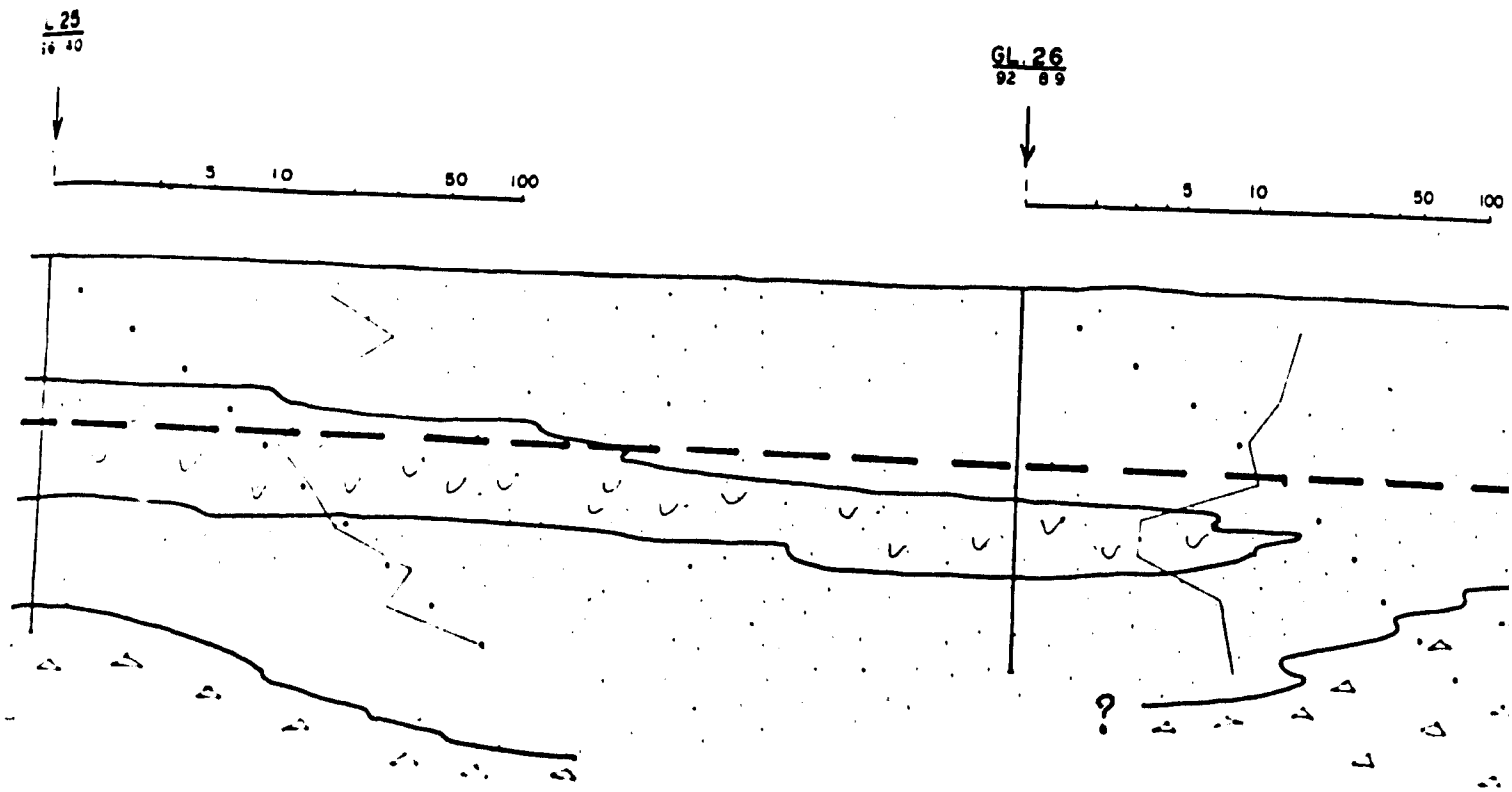
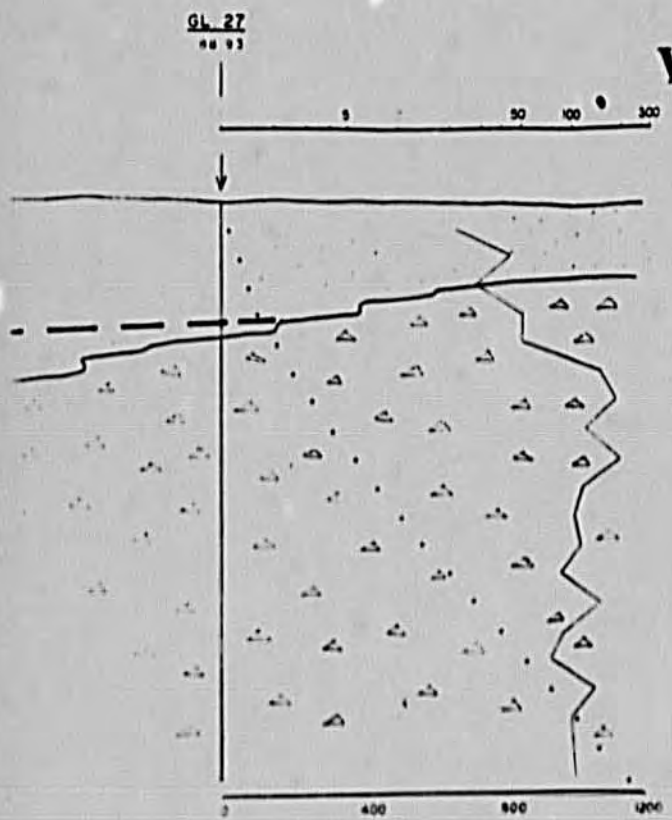

GL. 26
92 89
5 10 50 100
5 10 50 100
?

PLATE - 9




LEGEND

| | | RESISTIVITY |
|---|---|---|
| | TUFF WITH LAYERS OF SAND | ρ 5 — 15 ohm - m |
| | SANDSTONE | ρ 15 — 50 ohm - m |
| | LAHARIC, BRECCIA WITH STONE | ρ > 50 ohm - m |
| — — — | WATER TABLE | |

BURNS & McDONNELL ENGINEERING COMPANY INC
TRANS-ASIA ENGINEERING ACCOSIATES INC
A JOINT VENTURE

SURAKARTA WATER PROJECT

GEOLOGIC CROSS-SECTION
VI — VI' AND VII — VII'

BASED ON RESISTIVITY

SCALE HORIZONTAL 1 : 10.000
VERTICAL 1 : 2000

| RESISTIVITY INVESTIGATED BY | PREPARED BY | APPROVED BY |
|---|---|---|
| P.T. GEODATA | P.T. GEODATA | |
| DATE : | | |

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