

PD-AAL-317  
ISN 12929

199026200/52

Library



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. 41  
FEBRUARY 1982

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

# 2-Way Memo

Subject: Surakarta Water Project  
Loan 497-U-044

To : Mr. Hasan Hasan  
Chief Engineer  
ASIA/PD  
AID/W

**INSTRUCTIONS**

Use routing symbols whenever possible.

**SENDER (Originator of message):**  
Use brief, informal language.  
Conserve space.  
Forward original and one copy.

**RECEIVER (Replier to message):**  
Reply below the message, keep one copy, return one copy.

DATE OF MESSAGE	ROUTING SYMBOL
3/10/82	PTE
SIGNATURE OF ORIGINATOR	
<i>David E. Warner</i>	
TITLE OF ORIGINATOR	
Project Officer	

FOLD INITIAL MESSAGE FOLD

Transmitted herewith are two copies of Surakarta Water Project Monthly Report for February 1982.

REPLY MESSAGE

*Received 3/24  
Thanks!  
— Jack L.M.*

From : David E. Warner  
USAID/Box 4  
Jakarta, Indonesia

DATE OF REPLY	ROUTING SYMBOL
03/24/82	
SIGNATURE OF REPLIER	
<i>[Signature]</i>	
TITLE OF REPLIER	

BURNS & McDONNELL Engineering Co.

Architect - Engineers

A JOINT VENTURE

Consultants - Planners

TRANS-ASIA Engineering Associates, Inc.

Please Reply to: Kotak Pos 105  
Surakarta

053/BM/TAE/SKA/82  
03 March 1982

Mr. Soesanto Mertodiningrat, Director  
Directorate of Sanitary Engineering  
Directorate General Cipta Karya  
Jl. Pattimura No. 20  
Kebayoran Baru  
Jakarta Selatan

Subject : Contract for the Consultant Services for  
Surakarta Water System No. 01/WS.S/I/AGD/78  
dated 28 October 1978 as Amended 23 July 1981.


Dear Sir,

In accordance with Section 4.12 and Appendix I of the  
subject Contract, we are pleased to submit fifteen  
copies of the Monthly Report No. 41 for the month of  
February 1982.

We trust that this report will meet with your approval.

Very truly yours,

BURNS & MC DONNELL ENGINEERING CO.  
TRANS-ASIA ENGINEERING ASSOCIATES, INC.



J.F. BAUCOM  
ACTING CHIEF ENGINEER



cc	: CJWSP	Semarang	(10 copies)
	USAID	Jakarta	( 5 copies)
	BM/TAE	Jakarta	( 2 copies)
	Burns & Mc Donnell	Kansas City	( 1 copy )
	CJWSP I	Surakarta	( 1 copy )
	SWE	Surakarta	( 1 copy )
	Mayor of Surakarta	Surakarta	( 1 copy )
	File		

JFB/yp.

## TABLE OF CONTENTS

SECTION	TITLE	PAGE
I	GENERAL	1
I-A	NARRATIVE SUMMARY	1
I-B	PROBLEMS AND PROPOSED SOLUTIONS	3
II	ADMINISTRATION	4
II-A	SUBMISSIONS/APPROVALS	4
II-B	CONTRACT STATUS	4
II-C	PERSONNEL	4
III	ENGINEERING AND MANAGEMENT	7
III-A	OFF-SHORE PURCHASED MATERIALS	7
III-B	CONSTRUCTION SUPERVISION	8
III-C	GROUNDWATER EXPLORATION AND WELL DEVELOPMENT PROGRAM	12
III-D	MANAGEMENT ASSISTANCE PROGRAM	13
III-E	O & M TRAINING AND ASSISTANCE PROGRAM	13
III-F	METER REPAIR TRAINING PROGRAM	15
III-G	NEW WATER DISTRIBUTION NETWORK DESIGN	15
III-H	CONFERENCES	15
III-J	ACTIVITIES PLANNED FOR NEXT MONTH	18

Cont'd ....

TABLE OF CONTENTS  
(CONTINUED)

SECTION	TITLE	PAGES
IV	APPENDICES	
I	REPORT OF MAN-MONTHS EXPENDED BY THE CONSULTANT	1 of 1
II	REPORT ON ENGINEERING COSTS	1 of 1
III	CHART-TECHNICAL WORK APPROACH	1-3 of 3
IV	MAP OF SURAKARTA PROJECT COMPLETION STATUS	1 of 1
V	MAP OF 1985 DISTRIBUTION SYSTEM SHOWING PHASES - REPLACEMENT PROGRAM	1 of 1
VI	CONSULTANT LETTER NO. 83/BM/TAE/82 WITH PROPOSAL EVALUATION WELL WATER PUMPING EQUIPMENT	1-6 of 6
VII	REPORT ON KALI PUSUR FLOOD DAMAGE TO THE SURAKARTA WATER PROJECT SOURCE AT CORROTULUNG SPRINGS, FEBRUARY 1982.	1-14 of 14
VIII	PHOTOGRAPH OF POOR WORKMANSHIP BY SWE	1 of 1

SECTION I  
G E N E R A L

I-A NARRATIVE SUMMARY

Identification of the final forty three public latrines was provided by DPU and the drawings have been revised accordingly. The Consultant has proposed that the Phase III contractor be assigned two of the new units to upgrade for the one that was razed by DPU shortly after he began work (see Monthly Report No. 38) as the total cost for the two would be less than that for the one torn down. Tender Documents for the balance of the public latrines upgrading are being prepared.

The distribution main contractors are nearing completion of their work. The replacement of the old transmission main along Jl. Kol. Su-tarto has been completed and test approved. During the test some of the old piping within the pipe gallery shifted and the Surakarta Water Enterprise is taking the opportunity to undertake repairs to the reservoir while it is out of service. Other replacement piping is being laid as indicated on Appendix V. The contractors are still working the stream and drainage span work and one of the contractors has paid to the Railway Enterprise costs for his crossing.

Notice to Proceed was issued by the Director General Cipta Karya on 04 February 1982 for the procurement of Operations and Maintenance tool and equipment list reported as approved in the

previous report. The Consultant has issued the purchase orders and is preparing a draft for an amendment to the Contract in order for Cipta Karya to obtain the necessary proforma letter of credit which will be used for import tax exemption.

Meetings were held 17 and 18 February 1982 in the offices of Cipta Karya for the evaluation of quotations received for the water well pumping equipment obtained by the Consultant in the United States (see Appendix VI.) An agreement was reached in the latter meeting to purchase the lowest responsive bid for the various items on the list. It is anticipated the Director General will issue his Notice to Proceed with that procurement by mid March.

Approval was also provided to purchase from local suppliers the proposed radio equipment and a shop air compressor for the Surakarta Water Enterprise. By month's end, the radio equipment was being used.

The leak survey was again started as expected the first of the month but was hindered during the month for various reasons. Primarily due to the Kali Pusur which overflowed its banks at Cokrotulung on the evening of 17 February 1982. This flood was not as high as those of December 1980 and February 1981 but was much more destructive. A report was made and is included herein as Appendix VII.

The Surakarta Water Enterprise is starting to install a section of the new distribution pipe along Jl. Jajar in order to supply the housing area assigned for the City management which is under construction in Kecamatan Laweyan. The

Project will reimburse the installation costs when the FY 1982/1983 DIP is made available. Tender Documents are being reviewed for issue to the prospective contractors for Phase III distribution mains in the very near future.

#### I-B PROBLEMS AND PROPOSED SOLUTIONS

Excessive leakage around Surakarta has been the subject of various means of communication and continues to be a major problem. Prime consideration must be devoted to rectifying the situation by the Surakarta Water Enterprise without further delay. With the employment of radio equipment, it is believed the most severe leaks can now be reported to the Base Station operator by any other radio equipped organization provided the Surakarta Water Enterprise uses it 24 hours per day as they are supposed to.

Poor workmanship continues to be evident in the Surakarta Water Enterprise regarding the new service connections being made. Several tests were delayed on the Phase I & II work because of the service connections made by personnel of the Surakarta Water Enterprise leaked. Sometimes it was found new service clamps were of the wrong pipe size so rubber straps were used by the installer in an effort to stop the leak, also concrete. Sometime, for the lack of a proper tool, the man tried to punch a hole through the distribution main instead of drilling - that broke the pipe and again rather than properly fixing the damage it was covered up. Personnel of the Surakarta Water Enterprise should be terminated for cause when such conditions are found when it is known who does the work and that he has been through O & M training (see Appendix VIII for photograph of such work).



SECTION II  
ADMINISTRATION

II-A SUBMISSIONS/APPROVALS.

Consultant's Invoice No. 41 for January 1982 U.S. Dollar reimbursible expenses was submitted to Cipta Karya on 06 February 1982 and was approved by Cipta Karya on 09 February 1982.

Consultant's Rupiah Invoice No. 26 for January 1982 submitted to Cipta Karya on 12 February 1982 was approved on the same date.

These submittals are in accordance with the Contract Appendix II, Page II-15.

II-B CONTRACT STATUS.

Appendix I shows the continuation of Consultant's effort in man-months from the beginning of the Contract.

Appendix II shows the billings of approved expenditures to date.

II-C PERSONNEL.

The Surakarta Office personnel in February 1982 were as follows :

## Expatriates

- James F. Baucom, Acting Chief Engineer  
arrived 26 September 1979
- Albert G. Ringler, O & M Specialist  
arrived 09 May 1980

### Indonesian Professional and Technical :

- Mohammad Khalil, Materials Coordinator  
arrived 09 October 1978
- Mohamad Syarif Lembah, Construction Supervisor  
arrived 01 May 1979
- Gatot Bramono, Inspector  
arrived 19 November 1979
- Soewanto, Inspector  
arrived 11 March 1980
- Abdul Rasyid, Inspector  
arrived 11 June 1981
- Susena, Draftsman  
arrived 20 October 1980

Administrative :

- Dradjat Atmardjo, Office Manager  
arrived 02 October 1978
  
- Haryani Pulyastuti, Secretary  
hired 17 November 1980
  
- Rubiyo, Clerk  
hired 01 November 1978
  
- Pamudji Rahardjo, Driver  
hired 02 October 1978
  
- Sutrisno, Driver  
hired 02 April 1979
  
- Puranto, Driver  
hired 17 October 1980
  
- Tukino, Office Boy/Labor  
hired 10 November 1980

SECTION III  
ENGINEERING AND MANAGEMENT

III-A OFF-SHORE PURCHASED MATERIALS	US.\$ COMMITTED	% PAID (ASSUMED)	US. \$ BAL. DUE
III-A-1 Direct Cipta Karya Procurement Contract			
III-A-1-1 American Cast Iron Pipe Co. Ductile Iron Pipe & Fittings Contract certified complete 01/02/80	2,595,511.60	100	- 0 -
III-A-1-2 Colcorindo Raya Flow Metering Equipment Contract certified complete 07/04/80	3,462.00	100	- 0 -
III-A-1-3 Rohm Corporation Water Meters, Repairs Parts- Tools & Equipment Contract certified complete 06/07/81	668,712.83	90	66,871.28
III-A-1-4 Clow Corporation Casting, Auto Air Vents & Valves. Contract certified complete 15/05/81	125,912.00	100	- 0 -
III-A-1-5 Ford Meter Box Company Brass Valves Parts & Acces- sories. Contract certified complete 12/02/81	390,775.15	100	- 0 -
Sub Total III-A-1 :	3,784,373.58	98.233	66,871.28

III-A-2 Special Equipment Procurement/Consultant Contract

III-A-2-1 Western International Leak Detectors & Pipe Locators	2,496.14	100	- 0 -
III-A-2-2 Kennedy/Madlene Distribution Network Valves Complete	58,546.40	100	- 0 -
III-A-2-3 Laboratory Equipment-Variou Sources - Complete	11,303.54	100	- 0 -
III-A-2-4 Publication & Reference Data Various Sources - Complete	1,465.85	100	- 0 -
III-A-2-5 Repair Parts For Clow Various Sources - Complete	228.51	100	- 0 -
III-A-2-6 O & M Facility Outfitting Various Sources - Partial	83,901.30	0.25	83,694.12
Sub Total III-A-2 :	<u>157,941.74</u>	<u>47.01</u>	<u>83,694.12</u>
Total US \$	3,942,315.32	96.181	150,565.40

Bids were received and evaluated by the Consultant for the water well pumping equipment. Two meetings at the offices of Cipta Karya provided agreement on the selection of equipment and the best responsive bid (see Appendix VI ). Approval to proceed will be forthcoming during the month of March.

III-B CONSTRUCTION SUPERVISION

The Phase I contractor installed his pipe under the railroad tracks along with various stream crossings.

He has successfully tested the new  $\phi$  450 mm AC pipe installed to replace the old transmission main along Jl. Kol. Sutarto. After it is flushed and Surakarta Water Enterprise is finished with repairs to the Jabres reservoir, the replacement main will be put into service. This same contractor is fabricating the bridge crossing over the Kali Anyur. When in place it will be connected to the branch tee at the new transmission main thus completing a replacement from Jl. Tagore north to the Pasar Nusukan (see Appendix V). The Phase I contractor has installed approximately 5 % more pipe than was scheduled. His total contract completion stands at 76.257 %.

The Phase II contractor has devoted most of the month of February installing fire hydrants, pipe along miscellaneous Jalans and stream crossings. His pipe installed totals presently approximately 2 % more than was scheduled. His total contract completion stands at 70.39 %.

The Surakarta Water Enterprise has been requested by the Mayor of Surakarta to do what is necessary to provide water to the new housing area being built to accommodate the City employees in the western part of the City. They have selected to do part of the Phase III work by installing  $\phi$  200 mm PVC pipe from the Section "C" transmission main terminal up Jl. Jajar. The Project will reimburse them when the FY 1982/1983 funds are available.

Activities that relate solely to the installation of pipe, valves and fittings have been done as is noted below :

<u>PHASE</u>	<u>KELURAHAN</u>	<u>%</u> <u>INSTALLED</u>	<u>%</u> <u>TESTED</u>
I	Jebres	91.2	63.7
I	Manahan	100	100
I	Kratonan	100	100
I	Gilingan	99.1	95.8
I	Jagalan	100	100
I	Kampung Sewu	100	-0-
I	Kestalan	100	-0-
I	Kepatihan Wetan	100	100
I	Replacement - Various Loc.	90.2	50.2
TOTAL PH. I		99.9+00	79.7+00
II	Semanggi	100	100
II	Danukusuman	100	100
II	Serengan	100	67.8
II	Tipes	85.6	71.9
II	Panularan	100	64.7
II	Misc. Jalan-Variou Loc.	88.6	14.6
II	Replacement - Various Loc.	10.8	-0-
TOTAL PH. II		97.9+00	75.9

Both contractors will endeavor to complete all remaining work during the month of March as is the policy of the Project. Some work which was to have been given to them as a change order is now most probably going to be held for the next phase of the distribution network to be tendered. The tender documents for Phase III are presently being reviewed and will be issued to prospective contractors as advised by the Project. Present overall completion status of the distribution piping construction stands at 63.9 %.

Progress on the bath houses and public latrines was not as great as it should have been because of financial situations of the contractors. It was necessary that they complete 20 to 25 % of their work before submitting their first bill. Most waited until 30% had been done before doing so and it proved to be too long when they were faced with the administrative delay regarding handling payments. All three contractors are to have received their first payment by the end of February so work should pick up again. The Surakarta DPU returned the list of the balance of 43 public latrines with new identifications and the drawings were modified accordingly. It was found that two of the 43 locations could be upgraded for the value of the one previously razed by DPU for a street widening project. It is anticipated approval will be received to make the change. The remainder 41 public latrines will be offered for bids as soon as possible. The anticipated budget will exceed the U.S. Dollar 100,000.00 by slightly over ten percent. As funds were not completely spent for the water well pumping and O & M equipment, it will be presented for approval to reallocate funds from one "DRA" to allow all of the available public latrines to be upgraded.

The entire bath house/public latrine construction work is considered to be 42.2 % complete at this time. The bath houses overall are considered to be 61 % as compared with 12.3 % completion of the planned 103 public latrines. Completion status of the individual contract phases is as follows :



<u>PHASE</u>	<u>ITEM</u>	<u>PER</u>	<u>TOTAL</u>
I	BH 3-4	75.6	17.127
I	BH 3-6	98.4	30.526
I	BH 3-8	51.5	13.073
I	14 Public Latrines	12.2	2.540
TOTAL PHASE I			63.266
II	BH 3-1	53.3	10.377
II	BH 3-3	65.8	11.186
II	BH 3-5	19.7	3.515
II	BH 3-7	62.7	11.018
II	15 Public Latrines	34.6	9.711
TOTAL PHASE II			45.807
III	BH 3-2	61.6	10.458
III	BH 3-9	62.0	9.542
III	BH 3-10	56.5	8.802
III	31 Public Latrines	10.9	5.691
TOTAL PHASE III			34.495

Work on bath house No. 3-5 was halted after the adjacent river flooded the area but it is thought work may be able to start again with the addition of 80 centimeters of fill to the area and raise the walls a like amount. There is excess fill now from the replacement transmission main work in the nearby area of Jebres which has been offered by the Consultant as a solution for both cleanup and fill.

### III-C GROUNDWATER EXPLORATION AND WELL DEVELOPMENT PROGRAM

Completed.

Completed.

III-E O & M TRAINING AND ASSISTANCE PROGRAM

The leak survey was started again first of February but only minimal effort was made to repair any of the deficiencies recorded. As with previous areas canvassed most if not all meters had not been read in many months. Several locations were found in a very small area to be receiving water from previously cut distribution pipes which were not properly capped or plugged when the service was discontinued. Appendices IV and V indicate the areas covered by the leak survey and the work underway or completed with regard to the replacement program.

The Consultant received a Notice of Award to proceed with the procurement of all O & M equipment and tools. Before month end all Purchase Orders were written and sent to the various suppliers. The items designated to be procured locally were also handled in a manner so that USAID can reimburse purchase of the shop air compressor and radio equipment. The radio equipment was received and in use before the end of February on funds provided by the Surakarta Water Enterprise. The Project has been asked to temporarily finance the purchase of the shop air compressor.

Several days of productivity were lost as a direct result of the flood on the night of 17 February at Cokrotulung. A good bit of damage resulted to Surakarta Water Enterprise property. The emergency pipe which spanned the Kali Pusur was des-

troyed along with the bridge on which it was installed. Also lost was several cubic meters of the south embankment. The falls also receded to the encasement of the  $\phi$  450 mm transmission main stream crossing. That pipeline is two meters from the centerline of the new  $\phi$  500 mm pipeline which was installed under this project and which lays upstream of the older pipeline. Neither of the two pipelines failed however a void did result and river water coursed under both so that remedial work is required. The Surakarta Water Enterprise was given recommendations immediately by the Consultant and a report confirming those recommendations is included herein as Appendix VII. The Mayor of Surakarta is to be commended for his actions and concern during the emergency. Appreciation of the people of Surakarta was extended to the Military and Boy Scouts who worked to shore up the area around the pipelines and to the Citizen Band Radio Club who set up a radio at Cokrotulung 24 hours per day monitoring the river and coordinating activities between there and Surakarta through use of the designated emergency Channel 37.

During the test on the replacement  $\phi$  450 mm at Jebres the valve inside the pipe gallery of the reservoir was closed. Although this was previously tested to 7 atmospheres, during this test the tee adjacent to the valve moved 3 centimeters north. The space which was in the sleeve coupling at that location was taken up completely so the pipe could not separate but did cause a leak. The pipe will be disassembled at the affected joint and repositioned a spacer will be installed within the sleeve coupling to prevent a recurrence.

To facilitate testing the asbestos cement pipe the Consultant wrote a special test procedure. Past experience has shown the pipe will absorb water to some extent and will swell as does wood when wet. By allowing the pipeline to absorb water without pressure for at least four days, there resulted a good test.

The Consultant has requested the Project to proceed with the necessary modifications to the existing O & M facilities by building the warehouse shelving, bins, shop tables and the equipment foundations. As of this writing nothing has been done.

#### III-F METER REPAIR TRAINING PROGRAM

Completed.

#### III-G NEW WATER DISTRIBUTION NETWORK DESIGN

Completed.

#### III-H CONFERENCES

02 February 1982 : Coordination meeting with the two distribution main contractors and SWE wherein it was pointed out SWE was to make an exploratory excavation near Pasar Legi to determine exact condition of the existing main to verify need to replace it. The Contractors were cautioned to not use more than one gasket per flanged joint.

03 February 1982 : Coordination meeting with the three contractors involved with bath houses and public latrines wherein it was stated the latrine work should be completed prior to starting another. It was also suggested Phase II and Phase III contractors submit their invoices.

09 February 1982 : Coordination meeting with the two distribution main contractors wherein Phase I contractor was instructed to complete connections to the  $\phi$  500 mm transmission main first priority as the northern part of the City needs supply of the water from it. After that, the replacement of the  $\phi$  450 mm pipe along Jl. Kol. Sutarto may be done. Phase II advised there is a greater quantity of stream crossings than scheduled - he was referred to Page II-3 of the Contract Documents.

10 February 1982 : Coordination meeting with the three contractors involved with bath houses and public latrines wherein approval was given to the use of a bronze ground key stop at the service connections provided by the contractor along with the submitted floor drain. It was stated the new float valves must be one inch size. The faucet as submitted by Phase II was not approved - it was suggested he use same as was installed at BH 3-6. The Phase II contractor was given approval to use an existing foundation found at PL III-Ci-1 while excavating for the septic tank as one of the walls of that septic tank.

11 February 1982 : Site visitation by representatives of USAID including the Director - Office of Project Development - Bureau for Asia out of Washington and the Deputy Director of The World Bank, Jakarta. A briefing of the Project and goals/accomplishments was provided followed by a tour of the Bath Houses

under construction and Public Hydrants already in use by the public.

16 February 1982 : Coordination meeting with the two distribution main contractors wherein Phase I contractor advised he had paid for his crossing of the railroad and the other contractor was advised to do the same.

17 February 1982 : Coordination meeting with the three contractors involved with bath houses and public latrines wherein it was indicated a time extension would be requested due to problems as have been encountered with DPU. All contractors were cautioned to coordinate service connections to the distribution mains with SWE.

Meeting in the offices of Directorate of Sanitary Engineering - Logistics, Jakarta to review bids received for the water well pumping equipment. Of the six main items of the Tender Documents, it was agreed in this meeting that all parties could accept those submitted lowest for items 2, 3, 4 and 6. Item 1 and 5 were submitted by a company which handled pumps of which part originated outside the USAID approved Code 911 Countries. The Consultant was requested to obtain more information from the supplier regarding the percentage of the pump parts value which was imported to the United States in relation to the total offeral price for the item for export from the United States. Question of spare parts was also raised. Regarding the lower price to use Indonesia Flag carrier for the generator sets, USAID approved it. Final decisions on all items was tabled to the next meeting scheduled for 18 February 1982.

18 February 1982 : Meeting at the Conference Room of the Directorate of Sanitary Engineering in Jakarta to complete review of proposals submitted for the water well pumping equipment. It was agreed in this meeting to proceed with the lowest responsive bid for each item regardless of the circumstances with the understanding information would still be obtained for USAID on the pumps so that they can proceed to obtain necessary waivers if required. It was further agreed to purchase one spare pump unit for each well which consisted of pump, motor and cable. For the generator sets, the spare parts were established and agreed to be of approximately ten percent of the value of the original bid. All agreements were confirmed by the Consultant (see Appendix VI).

22 February 1982 : Meeting with SWE regarding the Flood damage at Cokrotulung and the Consultant's recommendations for corrective action (see Appendix VII for the complete report).

23 February 1982 : Coordination meeting with the two distribution main contractors wherein final items of work were discussed. It was stressed that all work should be complete by the end of March.

### III-J ACTIVITIES PLANNED FOR NEXT MONTH

Continue with all construction activity. Follow up on water well pumping equipment procurement. Prepare Tender Documents for the balance of public latrine restoration work. Prepare Tender Documents for Phase III distribution main work. Hold final inspections where Phase I and Phase II contractors call for them. Continue with leak survey and replacement programs. Train SWE people in the proper use and care of the radio equipment as part of the O-J-T of the O & M training.

APP  
I-A

**SURAKARTA WATER PROJECT**  
**REPORT OF MAN-MONTHS EXPENDED BY CONSULTANT**  
**BURNS & McDONNELL / TRANS-ASIA ENGINEERING ASSOCIATES**

CONTRACT NUMBER OI/WS-S/AID/78 AID LOAN 497-U-044	MAN - MONTHS				
	FOR FEBRUARY 1982	CUMULATIVE THROUGH FEBRUARY 1982	TOTAL IN CONTRACT SCHEDULE	% OF TOTAL USED PER SCHEDULE	BALANCE
<b>EXPATRIATES</b>					
PROCUREMENT ENG. CHIEF ENGINEER	0 0	9.19 26.2	14.5 30	63.3 87.3	5.31 3.8
CONSTRUCTION SPECIALIST LIAISON OFFICER	1 0.16	29.1 4.99	36 7.5	80.8 66.5	6.9 2.51
PRINCIPAL	0	0.17	2	8.5	1.83
HYDROGEOLOGIST DRILLING SPECIALIST	0 0	8.1 10.5	12 12	67.5 87.5	3.9 1.5
O & M SPECIALIST METER SPECIALIST	1 0	36.4 8	41.5 8	87.7 100	5.1 0
MANAGEMENT SPECIALIST SPECIALIST	0 0	20.2 0	21 3	96.1 0	0.8 3
DESIGN SPECIALIST	0	12	12	100	0
EXPATRIATE TOTAL	2.16	164.05	199.5	87.6	24.65



**INDONESIAN PROFESSIONAL & TECHNICAL**

COUNTERPART CHIEF ENG. CONSTRUCTION SUPERVISOR	0 1	28.6 19.5	33 36	86 54.1	4.4 16.5
HYDROGEOLOGIST MATERIALS COORDINATOR	0 1	20.7 41	26 48	79.6 85.4	5.3 7
INSPECTORS DRAFTSMAN	3 1	122 52	146 66	83.5 78.7	24 14
ACCOUNTANT TECHNICAL TRANSLATOR	0 0	34 17.8	32 18	106.2 98.8	(2) 0.2
DESIGN ENGINEER SPEC. / COST ESTIMATOR	0 0	6 4.6	8 3	75 153.3	2 (1.6)
SR. SURVEYOR / PLOTTER	0	5.4	5	108	(0.4)
SURVEYOR INSTRUMENTMAN	0 0	5 6.3	5 5	100 126	0 (1.3)
<b>INDON. PROF. &amp; TECH.</b>	<b>6.0</b>	<b>362.9</b>	<b>431</b>	<b>84.2</b>	<b>68.1</b>

**INDONESIAN ADMINISTRATIVE**

OFFICE MANAGER SECRETARY ( B: - LINGUAL )	1 1	41 39.6	48 54	85.4 73.3	7 14.4
TYPIST CLERKS	0 1	27.2 102.6	51 88	53.3 116.6	23.8 (14.6)
DRIVERS LABORERS	3 1	162.3 168.2	223 258	72.7 65.2	60.7 89.8
RODMEN / CHAINMEN	0	13.8	10	138.0	(3.8)
<b>ADMINISTRATIVE TOTAL</b>	<b>7.0</b>	<b>554.7</b>	<b>732</b>	<b>75.7</b>	<b>177.3</b>

I-8

II-A

SURAKAR  
REPORT OF  
BURNS & McDONNELL/TI

CONTRACT NO. OI/WS-S/AID/78 SIGNED 26 OCT. 1978 START 1 JAN. 1978 END 30 SEP. 1982	COSTS FOR		CUMULATIVE COSTS THROUGH	
	FEBRUARY 1982		AMOUNT	% OF TOTAL BUDGET ESTIMATE
REIMBURSABLE EXPENDITURES				
US				
Salaries and Related Costs	13,595.66	1,008,828.92	89.1	
Transportation	-	73,631.72	88.3	
Equipment	-	12,455.36	77.8	
Miscellaneous	-	63,563.48	109.4	
Contingencies	-	53,543.45	84.6	
<b>TOTAL DOLLARS</b>	<b>13,595.66</b>	<b>1,212,022.93</b>	<b>88.5</b>	
INDON				
Salaries	3,461,000	176,951,384	79.0	
Transportation	1,055,100	72,261,603	86.0	
Housing	-	64,000,000	101.6	
Vehicle Costs	621,000	50,489,972	94.0	
Equipment Costs	-	24,610,860	101.4	
Miscellaneous	159,770	83,865,480	91.3	
Contingencies	-	33,144,580	99.7	
<b>TOTAL RUPIAH</b>	<b>5,296,870 *</b>	<b>505,323,879</b>	<b>88.1</b>	

\* Through Invoice No.

II-B

A WATER PROJECT  
 ENGINEERING COSTS  
 TRANS-ASIA ENGINEERING ASSOC.

CUMULATIVE PAYMENTS THROUGH			TOTAL BUDGET ESTIMATE FOR CONTRACT
AMOUNT RECEIVED IN FEBRUARY 1982	TOTAL AMOUNT RECEIVED THROUGH FEBRUARY 1982	% OF TOTAL BUDGET ESTIMATE	
DOLLARS			
15,775.74	995,233.26	87.9	1,132,179
-	73,631.72	88.3	83,343
-	12,455.36	77.8	16,000
-	63,563.48	109.4	56,063
-	53,543.45	84.6	63,271
15,775.74	1,198,427.27	88.5	1,352,356
ASIAN RUPIAH			
-	163,329,217	72.9	223,759,250
-	68,331,483	81.4	83,952,600
-	64,000,000	101.6	62,975,000
-	48,029,472	89.4	53,675,000
-	24,610,860	101.4	24,253,000
-	82,362,140	89.7	91,810,000
-	33,144,580	99.7	33,236,460
-	483,807,752	84.3	573,661,310

26 January 1982



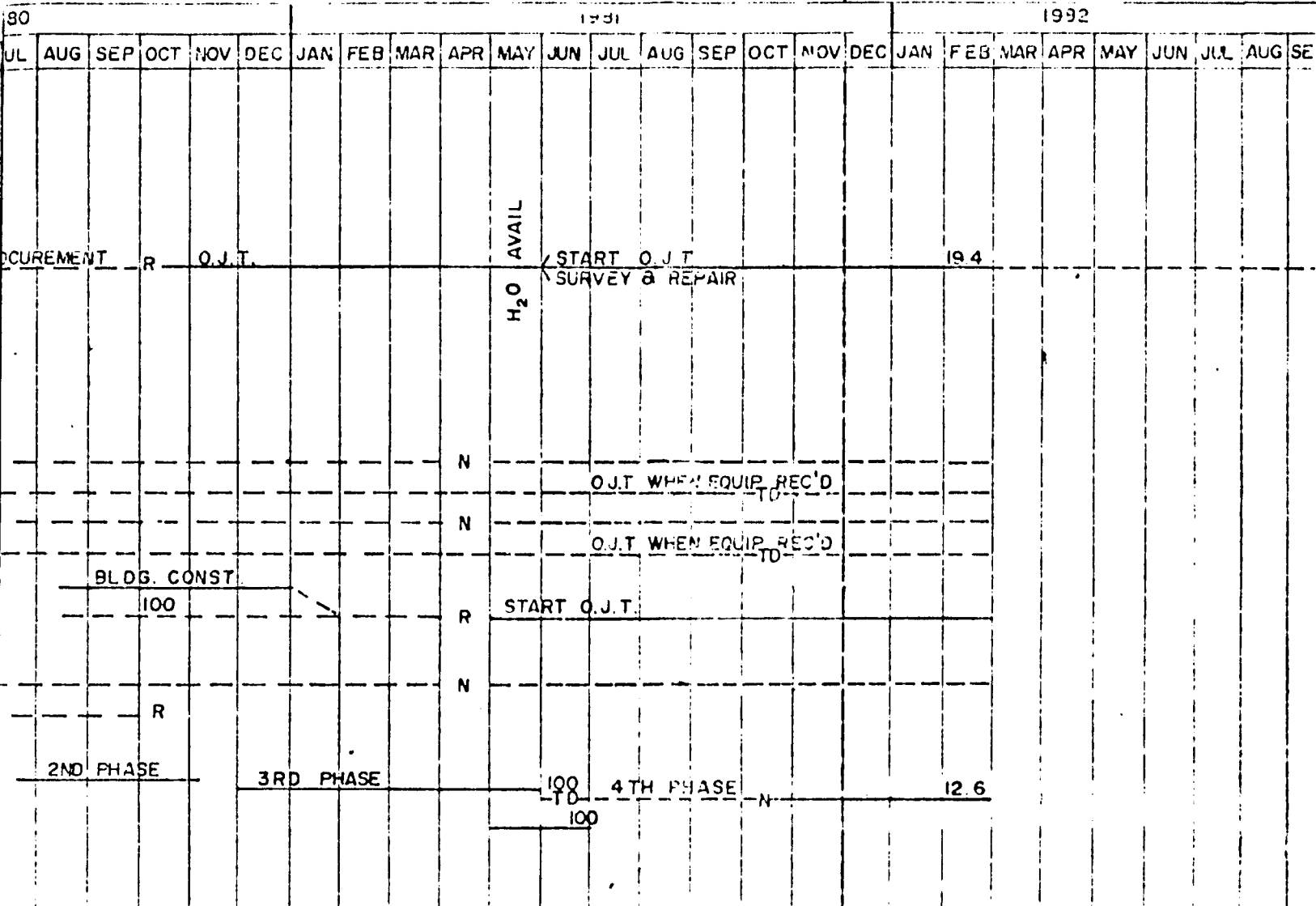












82

END OF CONTRACT

LEGEND

- A = SUBMITTAL DATA APPROVAL
- C = COMPLETE / CERTIFIED
- N = NOTICE TO PROCEED
- P = PORT ARRIVAL
- Q = QUOTATION REVISED
- R = RECEIVED AT JOBSITE
- S = SHIPPED (S'NO SHIPMENT SAME SOURCE)
- FI = FINAL INSPECTION
- TO = TENDER DOCUMENTS
- 0-100 = PERCENTAGE CONSIDERED COMPLETE
- (EST) = ESTIMATED
- T = TERMINATED

100

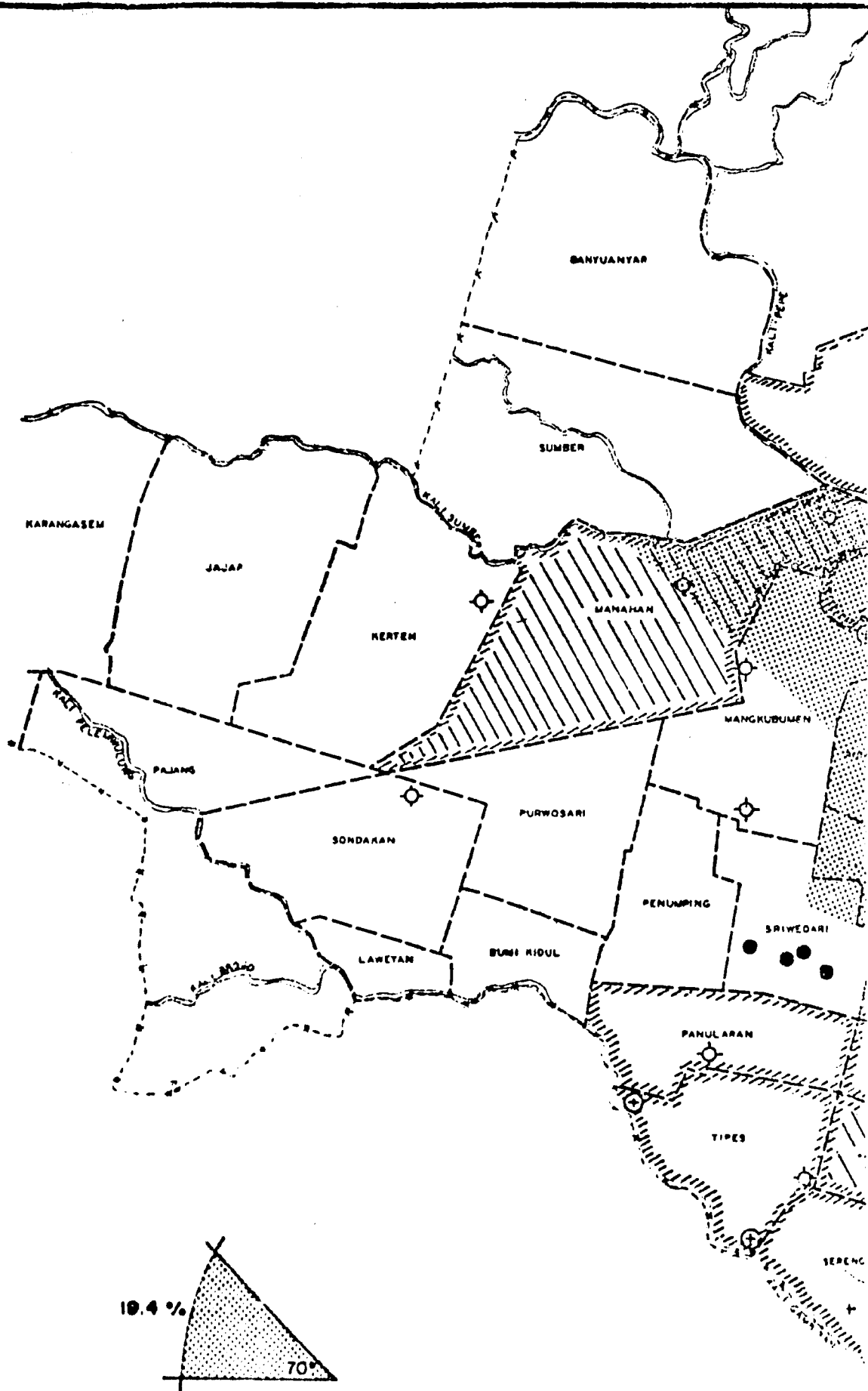
100

100

100

100

100



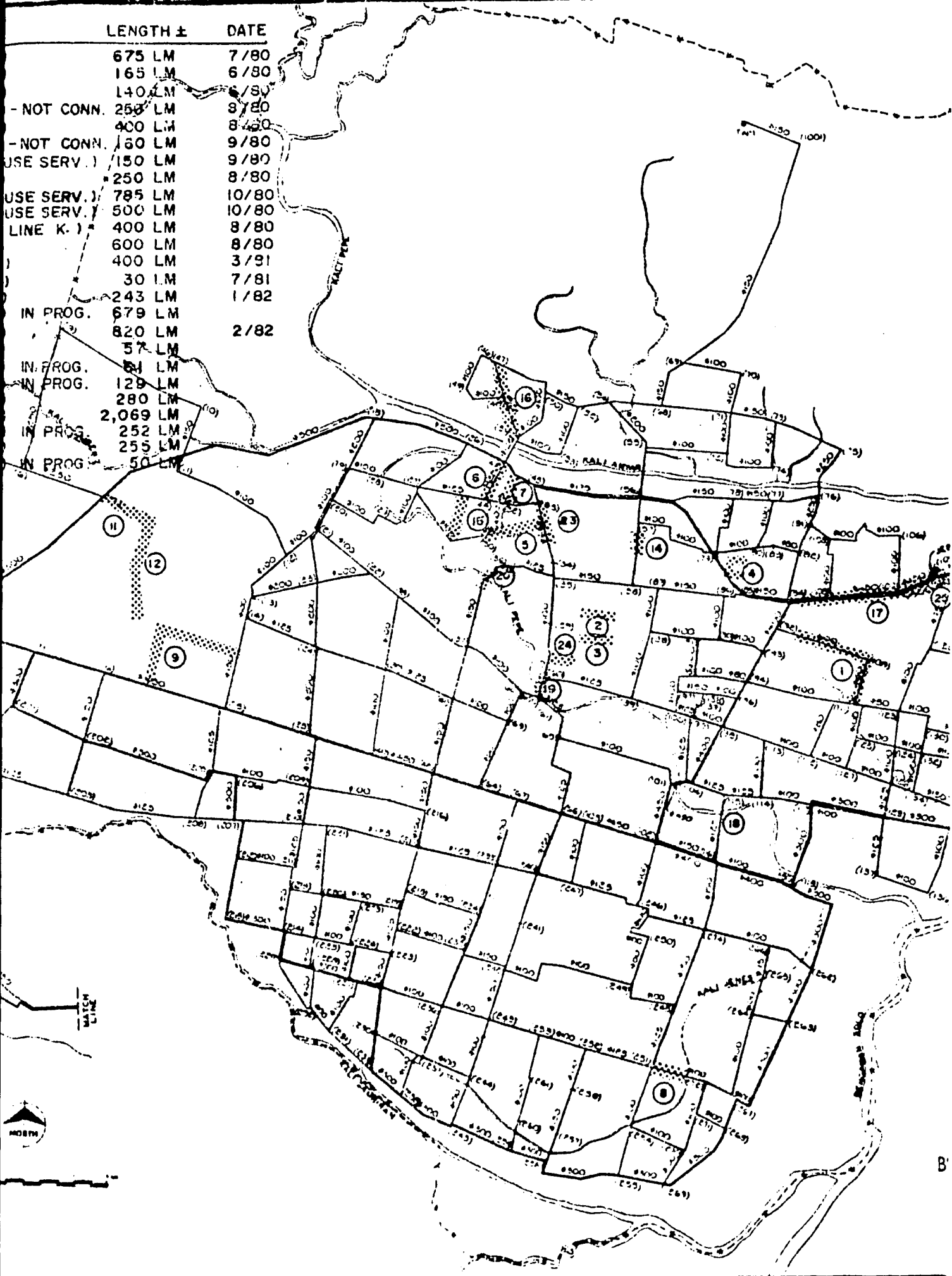
LEAK SURVEY COMPLETION  
( SHADED AREA )

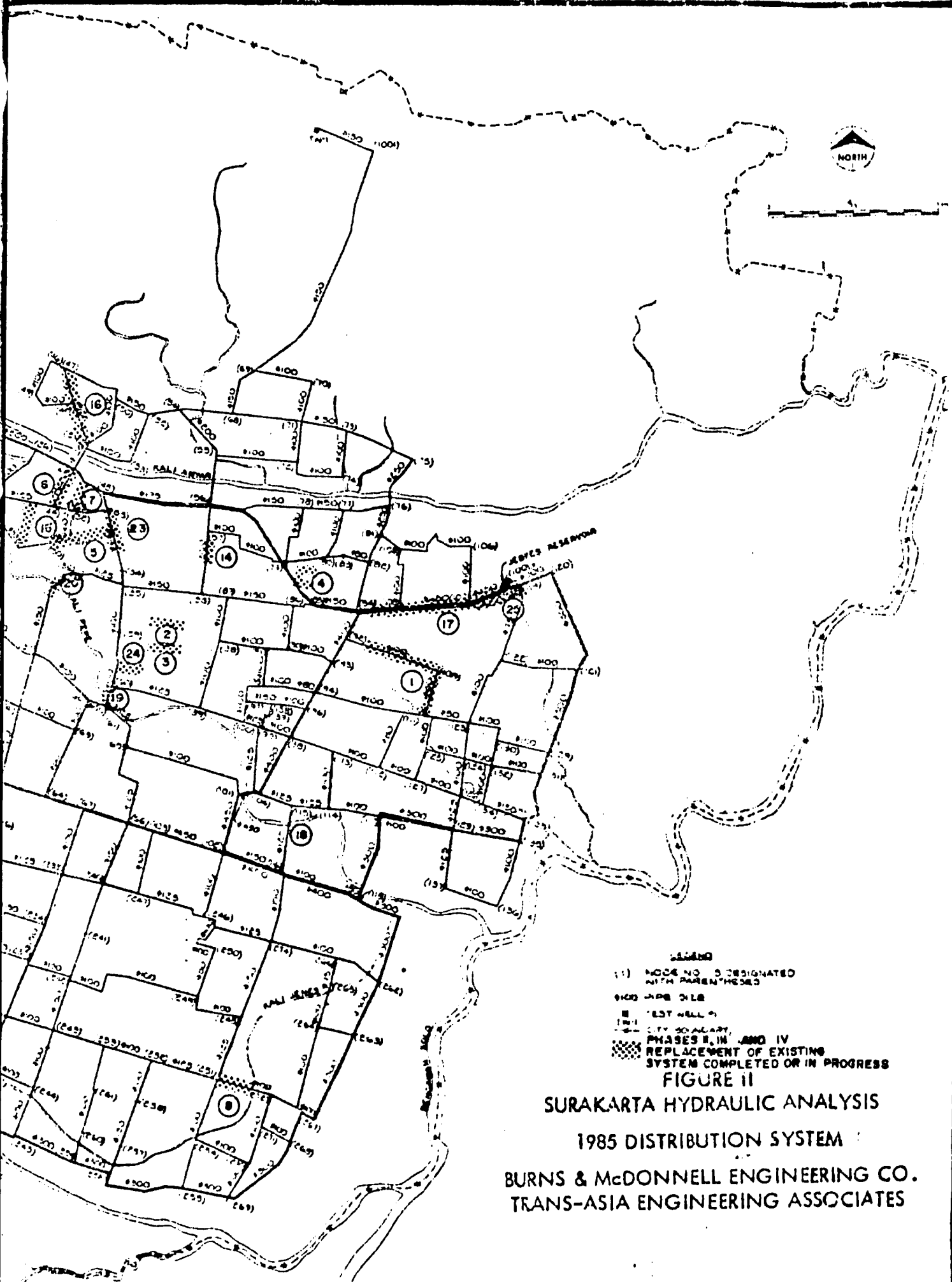






	LENGTH ±	DATE
	675 LM	7/80
	165 LM	6/80
	140 LM	6/80
- NOT CONN.	250 LM	8/80
	400 LM	8/80
- NOT CONN.	160 LM	9/80
USE SERV. )	150 LM	9/80
	250 LM	8/80
USE SERV. )	785 LM	10/80
USE SERV. )	500 LM	10/80
LINE K. )	400 LM	8/80
	600 LM	8/80
	400 LM	3/91
	30 LM	7/81
	243 LM	1/82
IN PROG.	679 LM	
	820 LM	2/82
	57 LM	
IN PROG.	61 LM	
IN PROG.	129 LM	
	280 LM	
IN PROG.	2,069 LM	
	252 LM	
IN PROG.	255 LM	
	50 LM	





**LEGEND**  
 (1) NODE NO. DESIGNATED WITH PARENTHESES  
 1000 PIPE DIA  
 TEST WELL  
 CITY BOUNDARY  
 PHASES II, III AND IV  
 REPLACEMENT OF EXISTING SYSTEM COMPLETED OR IN PROGRESS

**FIGURE II  
 SURAKARTA HYDRAULIC ANALYSIS**

**1985 DISTRIBUTION SYSTEM**

**BURNS & McDONNELL ENGINEERING CO.  
 TRANS-ASIA ENGINEERING ASSOCIATES**

BURNS & McDONNELL Engineering Co.Architect - EngineersA JOINT VENTUREConsultants - PlannersTRANS-ASIA Engineering Associates, Inc.

Please Reply to: c/o. Sahid Jaja  
P.O. Box 41  
JANURU

Our Ref. : 63/EM/TEI/82

18 February 1982

DATE RCVD:

Ir. M. Soesanto Martodiningrat,  
Director,  
Directorate of Sanitary Engineering,  
Directorate General Cipta Karya,  
Ministry of Public Works,  
Jalan Pattinura, 20,  
JAKARTA SELATAN.

Dear Sir,

Subject : Request for Approval to Proceed with Procurement  
of Well Water Lifting Equipment for  
Samsarta Water Supply Project

Reference : 1. Our Letter No. 71/EM/TEI/82 Dated 16 February  
1982 of the same subject  
2. Meeting at Office of USA Logistics in Jakarta  
17 February 1982  
3. Meeting this date in USA Conference Room with  
Members of your staff, Fender Distribution, USAID,  
FAS-1, FEAN-Solo and the undersigned

The results of referenced meetings has been to procure subject  
equipment identified in attachment and enclosure of our  
reference (1) letter above with your approval as follows :

- A. IAW Fluor - A Division of IAW Inc., P.O. Box 989,  
Statesville, North Carolina 28677 - Mr. Paul Shaw  
to supply Items 1 and 3 plus one extra pumping unit  
for well 1 (2 units total) for a total price of  
\$14,500.00 (Fourteen Thousand Five Hundred  
and 00/100).
- B. ENCLAVE INTERNATIONAL - 75 Larkin Street, San Francisco,  
California 94109 - Mr. G.L. Villaverde to supply Items  
2 and 4 for a total price of \$18,924.00 (Eighteen  
Thousand Nine Hundred and 24/100).



BURNS & McDONNELL Engineering Co.Architect - Engineers A JOINT VENTURE Consultants - PlannersTRANS-ASIA Engineering Associates, Inc.

- 2 -

Ir. H. Soesanto Martodiningrat  
 Director  
 Dit. of Sanitary Engineering  
 Dit. Gen. Cipta Karya  
 Ministry of Public Works  
 Our Ref. : 63/14/192/82

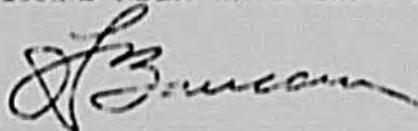
18 February 1982

- C. CHLORINATORS INCORPORATED - 733 Northeast Dixie Highway, Jensen Beach, Florida 33457 - Mr. Joseph P. Hentz to supply Item 3 for a total price CIF Serarang of U.S. Dollars four thousand six hundred thirty (US\$ 4,630.00).
- D. CUMMINS MID-AMERICA, INC. - Industrial Division, 1203 Czech, North Kansas City, Missouri 64116 - Mr. Frank Parish to supply Item 4 for a total price CIF Serarang of U.S. Dollars seventy four thousand nine hundred twenty five (US\$ 74,925.00) to be shipped via IT Djakarta Lloyd Ship Lines plus up to U.S. Dollars seven thousand five hundred (US\$ 7,500.00) in recommended spare parts.

By proceeding with all of the above, of the two hundred thousand Dollars allowance for these things per Implementation Letter No. 8, the total budget will be US\$ 156,439.66 (U.S. Dollars One Hundred Fifty Six Thousand Four Hundred Thirty Nine and 66/100).

We trust this will keep you well informed and look forward to receiving your early approval to proceed in this manner.

Very truly yours,  
 BURNS & McDONNELL ENGINEERING CO./  
 TRANS-ASIA ENGINEERING ASSOC., INC.



J.F. HUGGON  
 Acting Chief Engineer

JFB/rs.

cc. : Mr. Asif Sauredihardja - DSE	Mr. Hari Wahyudi - FAB-1
Mr. Soesanto Martodiningrat - DSE	Mr. Djosefani - PDAN-Sole
Mr. David S. Vainer - USJTD	Mr. C.M. Copleman - EN/TAI
Mr. Kristian Sarusman - COMEP	Mr. N. Goodnow - BMD, JCC File

PROPOSAL EVALUATION  
WELL WATER PUMPING EQUIPMENT  
FOR THE  
SURAKARTA WATER SUPPLY PROJECT

VI-3

Supplier	Equipment List Items					
	1 Pumps and well casing	2 Pipe, fittings valves & acces.	3 Chlorina- tion equip.	4 Generator & transf. switch	5 Starter/ breaker equip. & cable	6 Transmission main connection
1. Byron Jackson Pump Division	\$ 55,171	-	-	-	-	-
2. TRW Pleuger	\$ 24,974	-	-	-	\$ 12,336	-
3. Gould Pumps	No bid	-	-	-	-	-
4. Hayward Tyler	No bid	-	-	-	-	-
5. MacLane Int'l. A. (Proforma No.1)	-	* \$ 18,994.66	-	-	-	incl. w/2
B. (Proforma No.2)	-	\$ 22,064.63	-	-	-	incl. w/2
6. The Rohan Co.	-	\$ 23,290	-	-	-	\$ 4,831
7. Chlorinators, Inc.	-	-	\$ 4,630	-	-	-
8. Hydro Instruments	-	-	\$ 6,075	-	-	-
9. Capital Controls	-	-	\$ 6,905	-	-	-
10. Wallace & Tiernan	-	-	No bid	-	-	-
11. Cummins Mid America A. (U.S. Flag Ship)	-	-	-	\$ 77,413	-	-
B. (Indonesian Ship)	-	-	-	\$ 74,925	-	-
12. Sam Brown Co. A. Kohler Equip.	-	-	-	\$ 98,325	-	-
B. Waukesha Equip.	-	-	-	\$ 234,089	-	-
13. Dean Machinery	-	-	-	\$ 136,910	-	-
14. Katolight Corp.	-	-	-	No bid	-	-
15. Comet Industries	-	-	-	No bid	-	-
16. Custom Control	-	-	-	-	\$ 20,800	-
17. General Electric	-	-	-	-	No bid	-
18. Westinghouse	-	-	-	-	No bid	-
19. Allen Bradley	-	-	-	-	No bid	-

Note : \* Corrected price

030180 Form GCO-78

BURNS MOB FSC

PLEUGERSUB STSE

PLEUGERSUB STSE  
OUR TLX NRK 061296  
FEBRUARY 22, 1982

ATTN: MR. WESTON GOODNOW

REF: PROJECT 78-277-2-001  
INDONESIA

REF OUR DISCUSSION THIS MORNING REGARDING OUR QUOTATION, WISH TO  
ADVISE AS FOLLOWS:

1) RAW COSTS OF PUMP AND MOTOR ASSEMBLIES -

(A) Q101-4 - \$2,662.00

(B) P104-3 - \$2,110.00

2) PRICES FOR SPARE SET OF PUMPS WILL BE \$6,989.00 AND \$6,091.00  
FOR Q101 AND P104 UNITS RESPECTIVELY AS PER OUR QUOTATION OF  
JANUARY 22, 1982.

STAN EPAN  
PLEUGERSUB STSE

BURNS MOB FSC





Cummins Mid-America, Inc.  
Industrial Division  
1203 Ozark  
North Kansas City, Missouri  
64116

2

Burns & McDonnell Engineering Co.  
4800 East 63rd Street  
Kansas City, Missouri 64141

Date: Feb. 24, 1982

Proposal No: 4031

Attention: Weston Goodnow P.E.

Reference: Surakarta, Indonesia Water Project - Project 78-877-2-001  
Item #4 - Generator and Transfer Switch

CUMMINS MID-AMERICA, INC. INDUSTRIAL DIVISION proposes to deliver to you the machinery described herein, f.o.b. of origin at prices stated in accordance with the terms and conditions on the back of this quotation.

We are pleased to submit the following spare parts list for NT 855 GC rated 155 K.W. and NTA 855 GC rated 200 K.W.

Parts listed below are applicable to both units.

- 1 AR 07110 Main bearing set
- 1 3006737 Rear cover seal
- 1 3004316 Accessory drive pulley seal
- 2 204586 Thermostat
- 2 186780 Thermostat seal
- 2 215356 Water pump belts
- 2 178708 Fan belts
- 1 200519 Alternator belt
- 12 214950 Rod bearings
- 12 WF 2051 Corrosion resistor
- 6 FS 1201 Fuel filter
- 1 3008101 Cylinder head
- 1 3000886 Water pump
- 1 3014456 Engine gasket set

Parts listed below are applicable to NT 855 GC (155 K.W.) unit only.

- 6 3018329 Injector
- 3 3014602 Cylinder kits

Note: 3014602 cylinder kit contains the following part numbers that are common to both units:

- 3 213740 Liners
- 3 215091 Packing
- 3 183049 Packing
- 3 215090 Crevice seals
- 2 P10-6632 Air cleaner element
- 2 P10-6641 Air cleaner element

Phone: 1-816-474-5080

Diesel Gas Engine Power Accessories for Construction • Electric Power Generation

Industrial • Irrigation • Mining • • • SALES / RENTALS / PARTS / SERVICE

Cummins Mid-America, Inc.  
3527 Gardner Avenue  
Kansas City, Missouri 64120  
1-816-483-4313

Cummins Mid-America, Inc.  
3637 East Kearney  
Springfield, Missouri 65603  
1-417-882-0777

Cummins Mid-America, Inc.  
1907 East 20th Street  
Joplin, Missouri 64801  
1-417-823-1561

Cummins Mid-America, Inc.  
15580 South 169 Highway  
Olathe, Kansas 66061  
1-913-782-9470

Cummins Mid-America, Inc.  
502 E. Main  
Chanute, Kansas 66720  
316-431-4661

Proposal No.: 4031  
 February 24, 1982  
 Page 2.

Parts listed below are applicable to the NTA 855 GC only (200 K.W.).

3	3017958	Piston & pin
6	3018843	Injectors
2	148295	Cooler o'rings
2	216486	After cooler gasket
2	195952	After cooler o'rings
2	P11-6453	Air cleaner element
2	P11-6446	Air cleaner element

Parts listed below are for the A.C. generator.

1	3020009	Regulator
1	3020020	Rectifier assembly
1	2020...1	Surge suppressor

Full price C.I.F. Port of Semarang.....\$7,430.00

Note: Above parts list is for spare parts only. It does not contain enough parts to overhaul units.

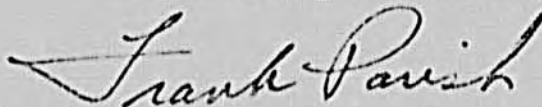
Delivery: 120 - 180 days from date of approved order

Terms: Per your Bid Solicitation

Note: Above price does not include taxes if applicable.

Note: Above price is firm based on order within 60 days from date of this document.

Respectfully submitted,



Frank Parish:jc

Manager - Generator Sales

R E P O R T  
KALI PUSUR FLOOD DAMAGE TO THE  
SURAKARTA WATER PROJECT SOURCE  
AT KOROTULUNG SPRINGS  
FEBRUARY 1982

A. General

On Wednesday February 17, 1982 at approximately 19.00 hours the Kali Pusur reached flood stage at Cokrotulung flowing over the riprap protective embankments on both north and south sides. The turbulence caused as a direct result thereof began to undermine foundations to the bridge and led to the destruction of said bridge, pipe carried by said bridge for emergency purposes, drainage structures, riprap retaining walls and seriously endangered the entire water supply to Surakarta by the erosion of the riverbed to and under the two transmission main which cross to the City side of the Kali Pusur from the Spring.

The attached photographs indicate the condition of the area in February 1981 following a similar situation and the present condition.

Based upon site investigations beginning the day following the flood, the following damage occurred and is recapitulated herein.

B. Damage

1. Erosion

1.1. Picture No. 1 shows the aerial view of the area from down stream of the falls towards the west and Mt. Merapi.

1.1.1. Picture No. 1A is the same picture with the eroded areas superimposed in red ink.

1.2. Picture No. 2 shows the aerial view of the area from upstream of the falls towards the east and the Surakarta/Yogyakarta highway.

1.2.1. Picture No. 2A is the same picture with the eroded areas superimposed in red ink.

- 1.3. Picture No. 3 is from the north embankment upstream of the falls and shows soil erosion around air valve vault and concrete cutoff wall of new  $\varnothing$  500mm transmission main stream crossing. In the background is a complete view of the south embankment erosion.
- 1.4. Picture No. 4 shows the collapse of the upstream riprap and exposed pipe encasement of the new  $\varnothing$  500mm transmission main on the right.
- 1.5. Picture No. 5 is a closeup view of the flow of water under the new  $\varnothing$  500mm transmission main and cutoff wall with riprap still good atop of the pipe encasement.
- 1.6. Picture No. 6 is a closeup view of the most southern end of the concrete pipe encasement and erosion near the new  $\varnothing$  500mm transmission main.
- 1.7. Picture No. 7 shows the erosion of the water falls from where they were on the right to the pipe encasement of the  $\varnothing$  450mm transmission main plus the depression beyond the new  $\varnothing$  500mm transmission main which allowed flow under the pipe encasements and cutoff wall.
- 1.8. Picture No. 8 is a closeup view of the void between the  $\varnothing$  450 transmission main concrete encasement and the riprap protection above.
- 1.9. Picture No. 9 shows the balance of erosion of the south embankment past the drainage structure from the Division Chamber.
2. Drainage Structures and Piping
  - 2.1. Picture No. 10 shows the square drainage pit broken from drain line at 11 o'clock from it to the Division Chamber and discharge drain to the left towards the hydroelectric plant.



3. Bridge and Emergency Ø 300mm Piping
- 3.1. Picture No. 11 shows the remains of the bridge and Ø 300mm pipe which crossed the Kali Pusur from the pump adjacent to the main spring to the Grit Chamber.
- 3.2. Picture No. 12 shows the emergency pipe and its support beam and large tree to the left which may have been involved as its exact origin is unknown.
- 3.3. Picture No. 13 Shows only water where the south side of the bridge once stood, and at the level from which this photo was taken.

C. Salvage

1. Emergency Ø 300mm mechanical joint pipe and fittings may be reused after some means of support is provided.

D. Facts of the Project

1. The present Surakarta Water Supply Project is funded by a loan from the United States (U.S.A.I.D.) to the amount of U.S. \$6,800,000 for materials and services and from DIP, ABF funds for installation/construction contracts.
2. The total Project completion in February is 89.9% with 86% of the total funds expended.
3. Work on new Ø 500mm transmission main and all required modifications to the structures at Cokrotalung Springs was accepted from the construction contractor in October 1980.
4. The Kali Pusur crested at 210.10 meters above sea level (MSL) on 28 December 1980.
5. The Kali Pusur crested at 210.25 MSL on 03 February 1981 and Consultant recommended that PDAM-Surakarta build a protection wall inside Division Chamber to protect drinking water.

5. The Kali Pusur crested at 209.92 MASHL on 17 February 1982 and was kept from mixing with the Surakarta drinking water supply by the protection wall built by PDAM in the Division Chamber.
6. The new transmission main was put into service from Cokrotulung Springs to the Kartasura reservoir on 08 December 1980.

E. Causes of Problem

1. The rainy season of the area extends for a period of approximately six to seven months. The three floods noted above all occurred from 28 December to 17 February - the latter half of the rainy season when soil is at its highest saturation point.
2. The Kali Pusur receives its water shed on the slopes of Mt. Merapi and the foothills therefrom.
3. The Kali Pusur at Cokrotulung is narrowed to approximately twenty meters at the area affected by this report which causes water to stock up when the volume is increased by heavy rains upstream.

F. Recommendations of the Consultant

1. Immediate
  - 1.1. Fill voids in stream channel and riprap with mass concrete including the area under the transmission mains pipe encasements.
  - 1.2. Construct a cutoff wall downstream of the old  $\varnothing$  450mm transmission main adjacent to its concrete encasement using the design of the newer transmission main of this Project.
  - 1.3. Replace embankment riprap on south side of Kali Pusur with the intent of completely replacing the work during the dry season.

- 1.4. Replace emergency  $\phi$  300mm pipe across the Kali Pusur using a cable support anchored at the wall of the spring and the tunnel.

2. This Year in Dry Season

- 2.1. Remove all riprap and straighten the south embankment so that the Kali Pusur will be at least thirty meters in width.
- 2.2. extend the two transmission main stream crossings further south at the lower elevation to accommodate wider stream.
- 2.3. Construct a reinforced concrete wall on the south side to protect area from erosion and to contain spring waters to the south of it.
- 2.4. Construct an ogee curved wall at the face of the falls along the entire width with reinforced concrete to prevent future undercutting of the river bed.
- 2.5. Inspect the riprap upstream of the transmission main stream crossings for voids and fill with mass concrete where found.
- 2.6. Inspect all other stream crossings from Cokrotalung to Sukakarta and repair as may be required. This to become annual standard procedure for PDAM.
3. Future
  - 3.1. Refrain from placing any material in the river bed that may create turbulence.
  - 3.2. Conduct periodic river cleaning activities to remove collected debris in the affected area.
  - 3.3. Reconstruct a permanent pedestrian bridge.
  - 3.4. Reshape river upstream and install restraint structures at intervals to break velocity of center of Kali Pusur and catch debris.
4. Budget
  - 4.1. Preliminary projections of the work involved would indicate a budget of at least Rupiah ONE HUNDRED SEVENTY SEVEN MILLION TWO HUNDRED SIXTY THOUSAND (Rp. 177,260,000/-) would be required.



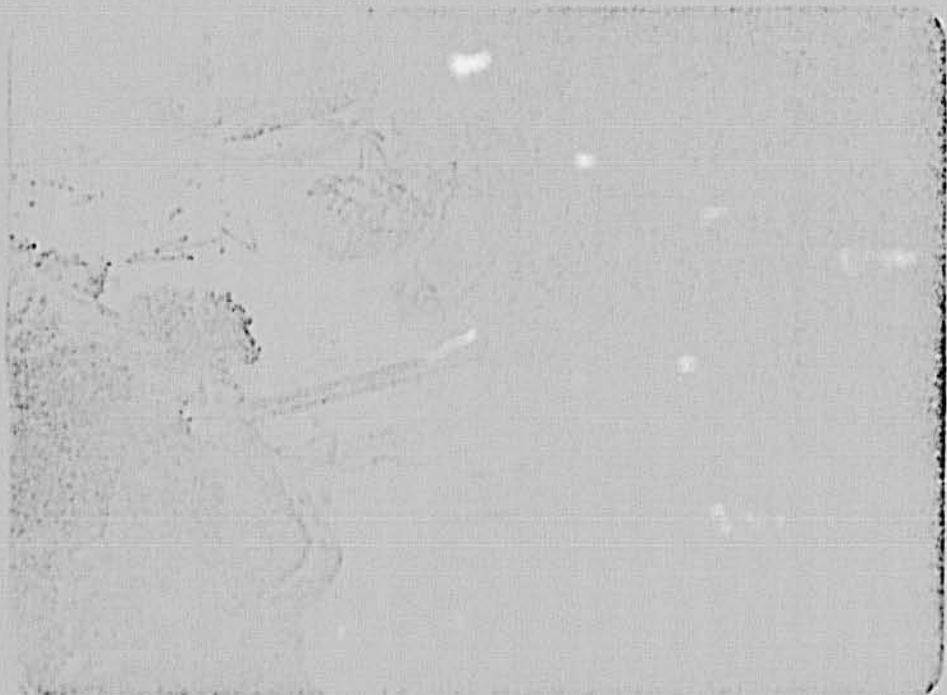
Picture 1 : Aerial view of the area from down stream of the falls towards the west and Mt. Merapi.



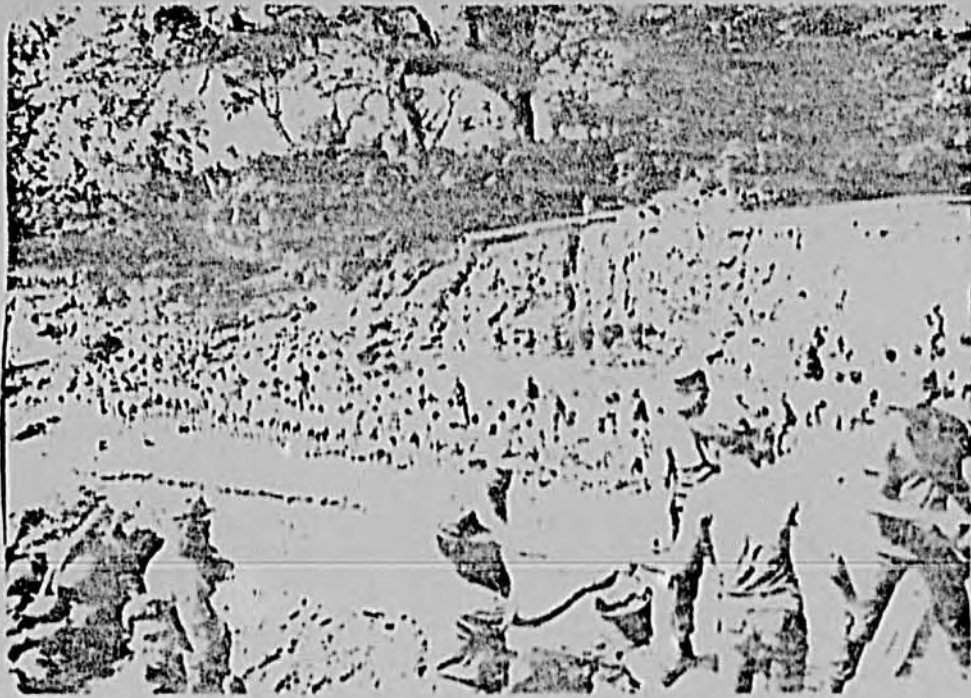
Picture 1 A : the same picture with the eroded areas super imposed in red ink.



Picture 2 : Aerial view of the area from upstream of the falls towards the east and the Surakarta/Yogyakarta highway.



Picture 2 A : the same picture with the circled areas super imposed in red ink.

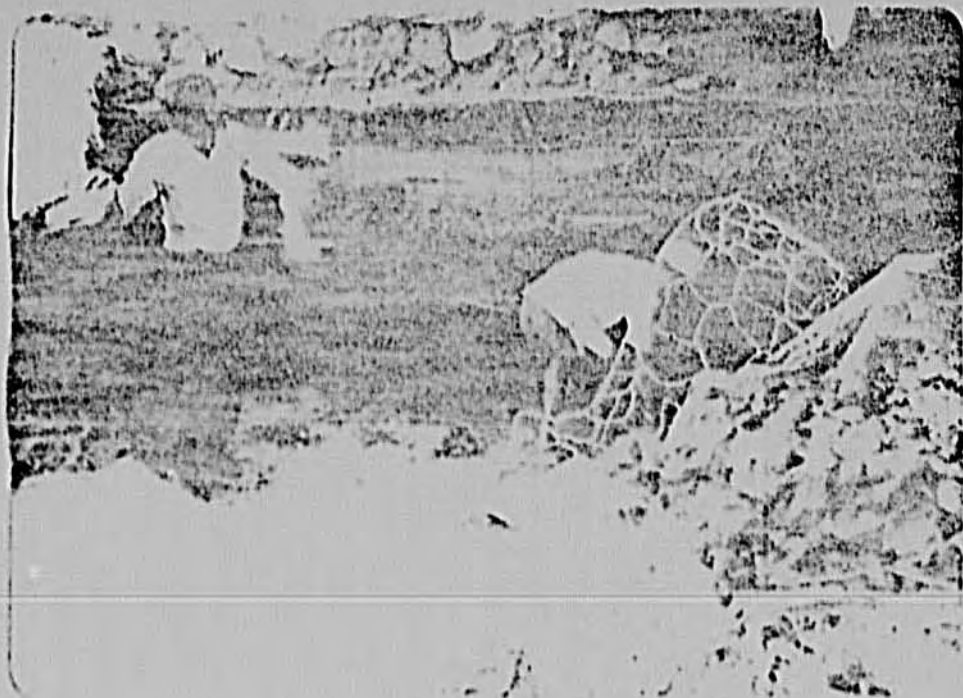


Picture 3 : north embankment upstream of the falls, shows soil erosion around air valve vault and concrete cutoff wall of new  $\phi$  500 mm transmission main

stream crossing. In the background is a complete view of the south embankment erosion.



Picture 4 : the collapse of the upstream riprap and exposed pipe encasement of the new  $\phi$  500 mm transmission main on the right.



Picture 5 : a closeup view of the flow of water under the new  $\phi$  500 mm transmission main and cutoff wall with riprap still good at pipe encasement.



Picture 6 : a closeup view of the most southern end of the concrete pipe encasement and erosion near the new  $\phi$  500 mm transmission main.



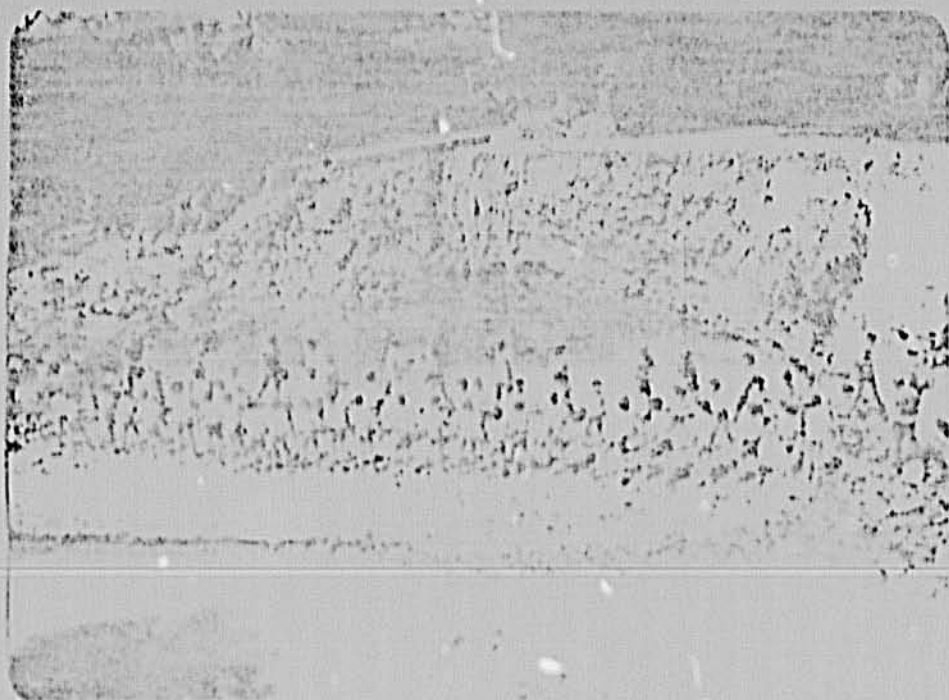
Picture 7 : the erosion of the water falls from where they were on the right to the pipe encasement of the  $\phi$  450 mm transmission main plus the depression

beyond the new  $\phi$  500 mm transmission which allowed flow under the pipe encasements and cutoff wall.

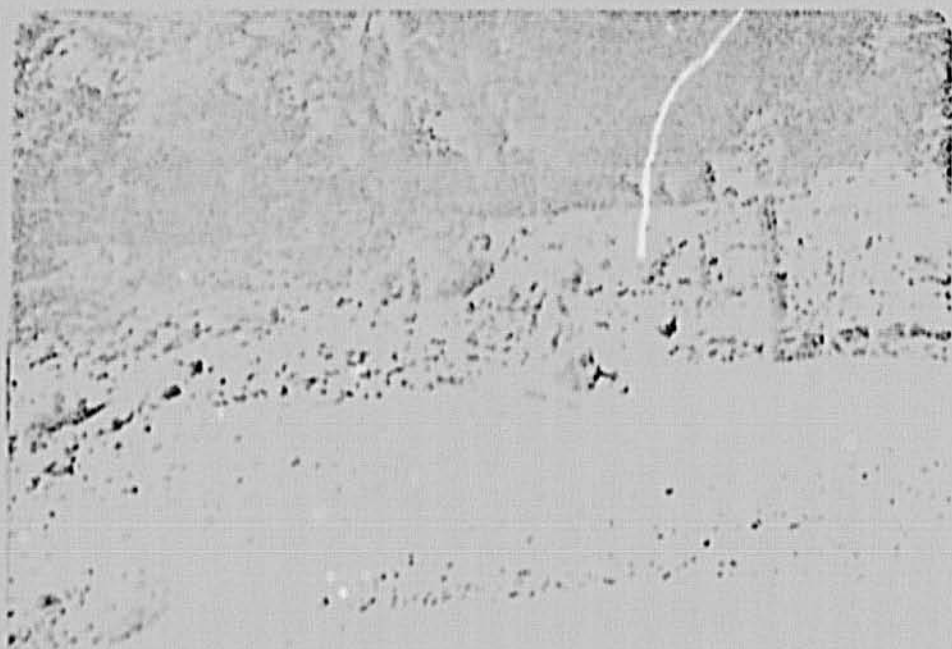


Picture 8 : a closeup view of the void between the  $\phi$  450 mm transmission main concrete encasement and riprap protection above.





Picture 9 : shows the balance of erosion of the south embankment past the drainage structure from the Division chamber.



Picture 10 : shows the square drainage pit broken from drain line at 11 o'clock from it to the Division chamber and discharge drain to the left towards the hydroelectric plant.



Picture 11 : shows the remains of the bridge and 300 mm pipe which crossed to Kali Basin from the pump adjacent to main spring to the G&T Chamber.



Picture 12 : shows the emergency pipe and its support beam and large tree to the left which may have been involved as its exact origin

is unknown.



Picture 13: shows only water  
where the south side of the  
bridge once stood, and at the  
level from which this photo  
was taken



TOP PHOTO: SWL men cut split pipe section out with rubber wrap around service clamp.



LEFT PHOTO: Closure of removed section of pipe shows a  $\varnothing$  200mm service clamp installed upon a  $\varnothing$  150mm PVC pipe, rubber was an attempt to stop leak which was followed by placing concrete atop of the rubber wrapping.

BOTTOM PHOTO: SWL men to use the same amount sized service clamp on a new pipe section above stopped and instructed again to use matching sized clamp and pipe.

BUNTON AW