4) Total economic construction cost for the river improvement works is estimated at US$32.9 million consisting of the foreign currency portion of US$15.3 million and the local currency portion equivalent to US$17.6 million.

5) With the implementation of the above flood protection works, the present inundation area will be relieved from flood damages, except the damage caused by landside-water, so far as the flood is less than that of 40 year recurrence probability at the Surakarta area. The amount of the annual flood damage thus reduced or flood control benefit is estimated at US$5.54 million.

10. 3 RECOMMENDATIONS

(Irrigation)

1) The topographical map in the project area should be urgently revised with the necessary accuracy for the next stage of the detailed design, since the present map which had been prepared for this feasibility study is still unreliable.

2) River condition at the site of the Colo weir will be changed in the near future, since the river channel in the vicinity of the site will be cut short to construct the weir by Copure method. It seems to be quite laborious and difficult to analyse these hydraulic change theoretically. A hydraulic model test is, therefore, required before the implementation of the weir construction so that the main feature of the weir should be modified accordingly. As far as water-intake is concerned, the following technical items should be clarified by the test, namely, optimal direction of weir axis, optimal alignment of river channel at the upper stream and downstream of the weir, tendency of sandbar formation in front of intake structure, optimal sill of intake structure and sandflash, etc.

3) For attaining 2-1/2 paddy crops a year with the target yield, the present institutional set-up in the project area will need a drastic rehabilitation or reorganization together with the rehabilitation of the farm ditch and farm road with necessary density. It is, recommended that such institutional rehabilitation will be completed by 1982, the completion year for the irrigation facilities. For this end, the Government of Indonesia should take an immediate action to organize a study team to probe the present institutional problems in detail and to make concrete plans for rehabilitation or reorganization of the agricultural framework.

4) Since the project area, which is being irrigated with the water from the tributaries of the Sala river, will get the irrigation water from an entirely new water source, the Wonogiri reservoir, a considerable amount of irrigation water now being consumed in the project area will become available for an exclusive use in the non-project area which is spreading above the proposed canals in the upper reaches of the Sala river's tributaries. Thus, the cropping ratio during dry season in non-project area which is estimated at about 40% (or 9,000 ha out of 22,000 ha of technical and semi-technical area) will be improved to at least 65-70%.

Moreover, the yearly endowed capacity of water resources from Mt. Lawu seems to still have potential to irrigate non-project area. Consequently, agricultural development program of the same intensity as this project should be formulated in the non-project area in the near future.

It is recommended that investigation and study for the rehabilitation of the non-project area should be conducted for the early implementation in parallel with the Wonogiri irrigation project.

5) The hilly land of 1,500 ha in Sragen area has been excluded from the project and remains outside of the proposed irrigation system. There are two alternative methods for irrigating this area, that is (i) introducing a large-scale pumping system which depends on its irrigation water from the Sala river or the Upper Sala Main Canal and (ii) utilization of ground water. From the economic view point, development of the groundwater seems to be more feasible. It is, therefore, recommended that agricultural development program in the hilly land by utilizing the ground water should be prepared and executed as a development model.

(River Improvement)

1) For an early implementation of the project, detail designing of the river improvement works is recommended to be started as soon as possible. Major items to be executed by the Government of Indonesia for the detail design work are as follows;

i) Cross levelling along the proposed river channel and the tributaries proposed for improvement works at 100 m interval;

ii) Topographical maps with the scale of 1/5,000 for all the project area, 1/2,500 along the proposed river channel and 1/100 in and around the construction sites of the proposed riparian structures;

iii) Installation of several water gauge stations along the Sala river and its main tributaries, particularly up-and down-stream of the confluence of the Sala river with the K. Dengkeng and preparation of stage discharge curve;

iv) Collection and assimilation of the Sala river data by the Project Bengawan Sala Office so as it may serve as a kind of hydrological data bank;

v) Hydraulic model test for the confirmation of the adequacy of the length, direction and interval of the projected groins;

vi) Measurement of the sediment load of the Sala river for confirmation of the existing data; and

vii) Study on the proper utilization of the high water river bed after the project construction.

2) Since no river improvement works will be provided in the Sragen area, present flood damage in the area will remain the same even after implementing the project. However, the damage potential in the Sragen area will be increased, because of the higher agricultural productivity primarily due to proposed irrigation scheme. It is recommended to make further study for the execution of the river improvement works for the area.

3) Feasibility study on the improvement of the K. Dengkeng is recommended to be executed, because the considerable flood damage in the upstream area will not be reduced even if the main Sala river improvement works are completed, though most of the flood damage in the downstream area will be decreased considerably.

Major items of the work to be executed by the Government of Indonesia for the feasibility study are as follows:

i) Compilation of rainfall data and installation of new rain gauge and stage stations (The recommended sites are bridge sites in K.Kongklangan, in K. Simpan, in K. Lusah and the Paseban bridge site.

ii) Compilation of the inundation data in upstream reach; and

iii) Preparation of topographic map of 1:5,000 and survey of cross sections along the main river and the main tributaries.

4) Since the proposed river improvement work will bring a remarkable amelioration to the prevailing conditions, it should be implemented stage by stage with careful observation of change of the river channel conditions, the behavior of the flowing water, and so on. The river channel administration is one of the most important prerequisites for the proper maintenance of the river channel and, therefore, proper administrative system including flood protection organization should be studied.

5) Upon completion of the Wonogiri dam and the river improvement works, more effective flood control, through an early flood forecasting will be realized, thus decreasing flood damages considerably. Therefore, the study of hydrological net-work and flood forecasting system will have to be taken into consideration in the stage of the detailed design.

6) Land utilization in the emergency inundation areas, the retarding basin and the high water channel shall be subject to regulations. Since probable frequency of inundation is quite high in the areas of emergency inundation areas, the retarding basins and the high water channel, the areas will have to be utilized only for farmland.

7) There is a number of houses required to be moved for the implementation of the proposed river improvement works and there is a fear that it is likely to become the cause of social unrest. Therefore, the removal of houses will have to be carried out with utmost care to comply with the applicable laws and regulations. For the successful implementation, it is strongly recommended to perform further careful survey for the issues of the removal in the stage of the detail design.

Table 1 Name of Member of Survey Team, Counterparts and Advisory Group

Function	Expert	Counterparts
(A) Survey Team and Counterparts		
Team Leader	Mr. Yuzo Tokunaga	Ir. Soeminto
		Ir. Hartono Pramudo
		Ir. Hartoto
Project Economist	Mr. Toshikazu Tai	Drs. Mughni Labib
		Mr. Kusdibyo
		Mr. Saksono Hadi
Institutional Expert	Mr. Teru Sasaki	Mr. Sunarko
Hydrologist	Mr. Masahiro Asada	Drs. Wuryanto
Geologist	Mr. Shinichi Kudo	Mr. Sukamto
Liaison Officer	Mr. Takeshi Izumi	Drs. Bambang Trihariono
		Mr. Mulyanto
Irrigation Engineer	Mr. Hiroshi Yamamoto	Ir.Hendromoyo
Irrigation Structure Engr.	Mr. Hiroshi Yonehara	Mr. Muchsin Zaeni
Irrigation Engineer	Mr. Tsuneo Amano	Mr. Wukir Rahardjo
Soil-crop Expert	Mr. Kenjiro Onaka	Ir. Bambang Djoko Sregono
		Mr. Nurarudin Syah
Topographical Surveyor	Mr. Akira Goto	Mr. Pardi Hamidi
		Mr. Sudarmadi
		Mr. Sri Susanto
		Mr. Tri Wahono
River Engineer	Mr. Katsuhisa Abe	Ir. Trie Mulat Sunaryo
		Mr. Haryanto
River Design Engineer	Mr. Tamezo Uetsuki	Mr. Subroto
River Structure Engr.	Mr. Tsugiya Fukumoto	Ir. Suradji
Topographical Surveyor	Mr. Shigeo Oyanagi	Mr. H. J. Sutarno
		Mr. A. Maryudi
		Mr. Indartono
(B) Advisory Group		
Leader	Mr. Nobuo Aihara	
Irrigation	Mr. Shinichi Tsukahara	
	Mr. Katsuhiko Kimura	
River Improvement	Mr. Eiichi Yoshitake	
	Mr. Kuniomi Iwai	
Coordinator	Mr. Toshiyuki Kasai	
	Mr. Takanori Jibiki	

Table 2 Farmland Coming under the Project which is Irrigated by Different Water Sources

Seksi	Ranting	Water Source		Irrigation Area: Whole Area (ha)	Irrigation Area: Project Area (ha)	Ratio (%)
Karanganyar	Sukoharjo**	B.Papen, B.Geneng, B.Garotan/K.Jlantah (Wd. Mulur)	(T)	5,107	3,990	78
		B.Ambil[2]/K.Jlantah, B.Jatimatang	(1/2T)	2,733	440	16
		Rainfed area		-	3,860	-
	Bekonang	B.Kaliduren/K.Buret	(T)	631	70	11
		B.Dari/K.Umet	(T)	500	150	30
		B.Gemb.Truni/K.Samin	(T)	2,137	830	39
		Rainfed area		-	350	-
	Karanganyar	B.Gemb.Truni/K.Samin	(T)	2,183	490	22
		Rainfed area		-	100	-
	Tasikmadu	B.Kalougan/K.Siwaluh	(T)	2,022	510	25
		B.Jungkang/K.Siwaluh	(T)	624	400	64
		B.Lencong/K.Jirak, Cobor	(T)	450	60	13
		B.Pengin/K.Jirak, Cobor	(T)	900	900	100
		B.Ledok/K.Kumpul	(1/2T)	633	230	36
		Rainfed area		-	250	-
	Sub-total		(T)	14,554	7,400	51
			(1/2T)	3,366	670	20
			Rainfed area	-	4,560	-
Sragen		K.Jlamprang	(T)	4,336	2,080	48
		K.Sragen	(T)	3,755	510	14
		K.Sawur	(T)	3,137	1,630	52
		K.Kenatan	(T)	4,360	2,520	58
		K.Kenatan	(1/2T)	1,848	260	14
		Raimfed area		-	2,500	-
	Sub-total		(T)	15,592	6,740	43
			(1/2T)	1,848	260	14
			Rainfed area	-	2,500	-
Klaten	Delanggu	B.Kaligawe, B.Jetis, B.Tempel	(T)	1,268	300*	24
		B.Pogung, B.Grojagan, etc.	(1/2T)	-	770	-
Total	Technical irrigation area		(T)	31,414	14,440*	46
	Semi-technical irrigation area		(1/2T)	-	1,700	-
	Rainfed area (Including non-technical area)			-	7,060	-
					23,200	

Notes: 1)* : include inundation area of 300 ha.

2) B : Weir, K: River, Wd: Reservoir

3)**: include Dengkeng Region (T ... 110 ha, 1/2T ... 220 ha, Rainfed area ... 2,200 ha)

Table 3 Existing Pumps in the Project Area

No.	Name of pumps	Water source	Capacity (m^3/sec)	Power (P.S.)	Irrigation area (ha)
1	Mlale	Bengawan Sala	0.040	16	50
2	Kalibening	Kali Bening	0.015	30	-
3	Plosorejo	Plosorejo	0.030	16	90
4	Kauman	K. Jlamprang	0.010	8	20
5	Sogo	K. Sogo	0.010	8	25
6	Murong I	K. Kenatan	0.030	16	-
7	Murong II	K. Kenatan	0.025	15	200
8	Kaponan I	K. Gebang	0.023	16	40
9	Kaponan II	K. Gebang	0.035	20	50
10	Ngagol I	B. Sala	0.016	8	25
11	Ngagol II	B. Sala	0.016	8	25
12	Tenggak	B. Sala	0.040	16	50
13	Glonggong	Bend. Craken	0.045	16	25
14	Sribit	B. Sala	0.035	16	60
15	Gebang I	K. Jlamprang	0.015	16	25
16	Gebang II	K. Jlamprang	0.020	20	30
17	Bedoro	K. Kenatan	0.020	7	30
	Sub-total (Sragen)	17 sites	0.425		745
18	Parangjoho	B. Sala	0.070	27	100
19	Kriwen	B. Sala	0.150	50	420
20	Joho	Afyoer	0.015	1	15
21	Waru	K. Guworejo	0.016	15	16
22	Sidodadi	K. Grompol	0.050	47	101
23	Kebak	Bend. Kebak	0.016	15	20
24	Pulosari I	K. Manggis	0.015	15	20
25	Kemiri	Sroyo	0.016	15	17
26	Nangsri	K. Banaran	0.016	15	16
27	Pulosari II	K. Jelok	0.015	15	20
28	Jaten	K. Bulu	0.030	30	36
	Sub-total (Karanganyar)	11 sites	0.409		761
	Total	18 sites	0.834		1,506

Data source: Master plan (D.P.U. offices)

Table 4 Weirs in the Project Area

No.	Name of diversion weir	Irrigation area (ha) Wet season	Irrigation area (ha) Dry season	Remarks
1.	B. Ambil-ambil	223	0	
2.	B. Geneng	760	219	
3.	B. Pepen	4,028	1,530	WD.Mulur
4.	B. Langsur	(374)	(50)	
5.	B. Dari	331	30	
6.	B. Kaliduren	570	170	
7.	B. Gembong	2,137	990	
8.	B. Trani			
9.	B. Panouran	34	0	
10.	B. Karanng			
11.	B. Palur	45	45	
12.	B. Jumok	225	144	
13.	B. Dukuh	283	184	
14.	B. Kalongan	1,427	1,316	
15.	B. Jongkang	583	284	
16.	B. Kebak	210	129	
17.	B. Lungge	177	145	
18.	B. Pengin	891	482	
19.	B. Ledok	204	64	
20.	B. Banjarsari	460	187	
21.	B. Craken	208	67	
22.	B. Kedunggatot	2,033	599	
23.	B. Kedunggawe			
24.	B. Knhil			
25.	B. Gebang	459	162	
26.	B. Bonggo	488	163	
27.	B. Sepreh	253	80	
28.	B. Karas	124	31	
29.	B. Krapyak	314	103	
30.	B. Randu	256	121	
31.	B. Maren	74	27	
32.	B. Ngarum	603	218	
33.	B. Klenteng	938	311	
34.	B. Kedungsong	212	53	
35.	B. Nangsri	1,344	361	
36.	B. Kedungduren			
37.	B. Wineng	758	145	
38.	B. Piji	1,739	599	
1.	B. Garotan	319	0	
2.	B. Jatimalang	235	0	
3.	B. Pencit	250	0	
	Sub-total	804	0	

Data source: Seksi Irrigation Office.

No.	Name of reservoir	Storage capacity /1 Design	Storage capacity /1 Present	Irrigation area Wet season	Irrigation area Dry season	Remarks
		10^3m^3	10^3m^3	ha	ha	
1.	Mulur	4,935.0	3,435.0	4,028.0	1,530.0	
2.	Lalung	3,000.0 (5,000.0)	3,000.0 (5,000.0)	2,183.0 (5,677.0)	1,643.0	(under extension)
3.	Tewel	79.5	4.5	275.0	71.0	
4.	Kebangan	500.0	350.0	1,947.0	1,235.0	
5.	Gebyar	701.3	601.3	1,727.0	420.0	
6.	Brambang	103.6	93.6	709.0	185.0	
	T o t a l			10,869.0	5,084.0	(47%)

Data source: Seksi Irrigation Office (Karanganyar, Sragen)

/1: Not actual survey (Data source: Master plan)

Table 5 Present Land Use

(ha)

	Sragen	Karanganyar	Dengkeng	Total
Paddy Field				23,200
(Irrigated [1])	(7,000)	(7,740)	(1,100)	(15,840)
(Non-Irrigated [2])	(2,500)	(2,360)	(2,500)	(7,360)
Wet season paddy	7,290	8,210	3,030	18,530
Dry season paddy	1,970	3,390	560	5,920
Sugar cane	1,250	580	-	1,830
Polowijo crops	2,820	4,320	1,440	8,580
Total	13,330	16,500	5,030	34,860
Multi-cropping index				1.50

Table 6 Unit Yield at Present and Agricultural Products

	Unit Yield (t/ha)	Cropping Area (ha)	Products (t)
Paddy			
(Irrigated area)			
wet season	3.8	12,720	48,336
dry season	3.5	5,530	19,355
(Rainfed area)			
wet season	2.7	4,910	13,257
dry season	2.1	390	819
(Inundated area)	2.0	900	1,800
Sugar cane	92	1,830	168,360
Soybean	0.4	1,290	516
Peanuts	0.5	600	300
Maize	0.5	3,090	1,545
Cassava	3.3	3,600	11,880

Table 7 Runoff Characteristics

	Juranggempal	Jurug
95-day Discharge	40 m^3/s	127 m^3/s
Ordinary Water Discharge	16	41
Low-water Discharge	4.5	8
Droughty-water Discharge	1.5	3

Table 8 Discharge Capacities at the Bridge Sites

Description	Discharge Capacity	Bridge Width
	(m^3/s)	(m)
Nguter Railway Bridge	1,235	119
Nguter Road Bridge	750	106
Bacem Road Bridge	900	116
Mojo Railway Bridge	2,180	149
Jurug Railway Bridge	2,500	178
Jurug Road Bridge	2,200	169

Table 9 Future Land Use

(ha)

	Sragen	Karanganyar	Dengkeng	Total
Paddy Field				
Paddy	22,850	17,750	9,000	49,600
Sugar Cane	1,500	600	-	2,100
Total	24,350	18,350	9,000	51,700
Multi-cropping Index				2.23

Table 10 Crop Production on Future Without and With-Project

	Without-Project			With-Project		
	Unit Yield	Area	Pro-duction	Unit Yield	Area	Pro-duction
	(t/ha)	(ha)	(t)	(t/ha)	(ha)	(t)
Paddy						
Irrigated area wet season	4.0	12,720	50,880	5.5	49,600	272,800
dry season	3.7	5,530	20,461			
Rainfed area wet season	2.8	4,910	13,748			
dry season	2.2	390	858			
Inundated area wet season	2.0	900	1,800			
(Sub-Total)			(87,747)			(272,800)
Sugar Cane	92	1,830	168,360	120	2,100	252,000

Table 11 Economic and Financial Price of Farm Products

(Rp/ton)

	Econ. Price	Fin. Price
Paddy	59,000	45,000
Sugar cane	6,000	13,390
Peanuts	95,000	207,000
Soybean	69,000	139,000
Maize	28,000	47,000
Cassava	13,000	18,000

Table 12 Design Discharges

	Command area (ha)	Design Discharge (m^3/s)
Entire Irrigation area	23,200	29.5
Upper Sala Main Canal	19,600	24.3
Dengkeng Main Canal	3,600	5.2

Table 13 Discharge Distribution of the Design Flood

Sections	Design Discharge m3/s
From the Nguter Railway Bridge to the Dengkeng confluence	1,050
From the K. Dengkeng confluence to the K. Brambang confluence	1,550
From the K. Brambang confluence to the K. Samin confluence	1,800
From the K. Samin confluence to the Jurug Road Bridge	2,000

Table 14 Proposed Profile

Reaches	Proposed Profile	Original Profile
Upper Reaches of the Projected River Stretch	1/1,200	1/1,200
From the confluence with the K. Dengkeng to Nguter Railway Bridge	1/1,450	1/2,600
From Jurug to the Confluence with the K. Dengkeng	1/2,000	1/2,800
Lower Reach of the Project River Stretch	1/2,800	1/2,800

Table 15 Design Discharge for Low Water Channel

Reaches	Discharge Capacity m3/s
From the Nguter Railway Bridge to the K. Dengkeng confluence	550
From the K. Dengkeng confluence to the K. Brambang confluence	700
From the K. Brambang confluence	800
From the K. Samin confluence to the Jurug Road Bridge	900

Table 16 Discharge Capacity of Bridge Sites in Proposed Channel

Description	Discharge Capacity
	m^3/s
Nguter Railway Bridge	1,250
Nguter Road Bridge	1,060
Bacem Road Bridge	1,720
Mojo Railway Bridge	2,390
Jurug Railway Bridge	3,380
Jurug Road Bridge	3,680

Table 17 Principal Design Features of the New Nguter Bridge

Description	Features	
Location	Measuring point No. 88	(32.8 km upstream of Jurug road bridge)
Bridge Length	209 m	
Proposed Highwater Level	106.65 m	
Lower-Hange Height	108.15 m	
Levee Height	107.65 m	

Table 18 Principal Design Features of the New Bacem Bridge

Description	Features	
Location	Measuring point No. 26	(8.0 km upstream of Jurug road bridge)
Bridge Length	297.40 m	
Proposed Highwater Level	90.45 m	
Lower-Hange Height	91.95 m	
Levee Height	91.45 m	

Table 19 Cost Estimate (10^3 US$)

	Item	Foreign Portion	Local Portion	Total
(A)	River Improvement			
I.	Civil Works			
	Excavation	(1,424)	(5,390)	(6,814)
	Banking	(336)	(4,009)	(4,345)
	Spoil Bank	(156)	(578)	(734)
	Bank Protection	(1,636)	(2,570)	(4,206)
	Ground Sill	(7)	(7)	(14)
	Sluice Way	(1,747)	(833)	(2,580)
	Intercepting Drainage Channel	(-)	(156)	(156)
	Road for Construction Work	(100)	(100)	(200)
	Bridge	(412)	(127)	(539)
	Construction Machinery	(6,350)	(-)	(6,350)
	Sub-total	12,168	13,770	25,938
II.	Land Acquisition	(-)	1,344	1,344
III.	Contingency	1,832	2,136	3,968
IV.	Engineering and Administrative Expenses	1,300	350	1,650
	Total	15,300	17,600	32,900
(B)	Irrigation			
I.	Civil Works			
	Preparatory Works	(-)	(270)	(270)
	Colo Diversion Weir	(2,490)	(1,680)	(4,170)
	Main Canal	(10,150)	(8,570)	(18,720)
	Secondary Canal	(620)	(1,510)	(2,130)
	Farm Ditch	(-)	(1,330)	(1,330)
	Drainage	(-)	(2,060)	(2,060)
	Farm Road	(1,100)	(3,750)	(4,850)
	Construction Machinery	(4,614)	(156)	(4,770)
	Sub-total	18,974	19,326	38,300
II.	Land Acquisition & Compensation	-	200	200
III.	Contingency	2,816	2,884	5,700
IV.	Engineering & Administrative Expenses	2,000	500	2,500
	Total	23,790	22,910	46,700
	Grand Total (A+B)	39,090	40,510	79,600

Table 20 Net Incremental Income

Kind of Crops	Without-Project			With-Project			
	Cult.land (ha)	Net income (Rp/ha)	Total return (Rp)	Cult.land (ha)	Net income (Rp/ha)	Total return (Rp)	Difference (6) - (3) (Rp)
	1	2	3	4	5	6	7
Paddy							
Irrigated (wet)	12,720	139,230	1,771,005,600	49,600	209,800	10,406,080,000	7,963,013,500
Irrigated (dry)	5,530	121,530	672,060,900				
Rainfed (wet)	4,910	91,830	450,885,300	-	-	-	- 450,885,300
Rainfed (dry)	390	61,870	24,129,300	-	-	-	- 24,129,300
Inundated (wet)	900	96,160	86,544,000	-	-	-	- 86,544,000
Sugar Cane	1,830	346,800	634,644,000	2,100	487,730	1,024,233,000	389,589,000
Soybean	1,290	11,550	14,899,500	-	-	-	- 14,899,500
Peanut	600	18,020	10,812,000	-	-	-	- 10,812,000
Maize	3,090	2,290	7,076,100	-	-	-	- 7,076,100
Cassava	3,600	23,650	85,140,000	-	-	-	- 85,140,000
Total	34,860		3,757,196,700	51,700		11,430,313,000	7,673,116,300

(US$18,490,000)

Table 21 Summary of Annual Benefit

(10^3 US$)

Purpose	Annual Amount
Irrigation	17,770
Flood Control	5,540
Hydropower	1,350
Negative Benefit	-1,210
Total	23,450

Table 22 Summary of Economic Cost

(10^3 US$)

Purpose	Foreign Portion	Local Portion	Total
Dam & Reservoir	18,000	28,700	46,700
Hydropower	10,190	1,510	11,700
Irrigation	23,790	22,910	46,700
River Improvement	15,300	17,600	32,900
Total	67,280	70,720	138,000

Table 23 Annual OM & R Cost

(10^3 US$)

Item	Annual Amount
Dam & Reservoir	40
Hydropower	280
Irrigation	340
River Improvement	180
Total	840

Table 24 Annual Disbursement of Economic Cost

(10^3 US$)

	1976	1977	1978	1979	1980	1981	1982	1983	Total
Dam & Reservoir									
Foreign	1,200	700	3,400	7,800	4,000	-	-	-	18,000
Local	1,000	5,800	8,600	9,800	3,500	-	-	-	28,700
Total	2,200	6,500	12,000	17,600	8,400	-	-	-	46,700
Hydropower									
Foreign	200	-	-	7,080	2,910	-	-	-	10,190
Local	40	-	-	160	1,310	-	-	-	1,510
Total	240	-	-	7,240	4,220	-	-	-	11,700
Irrigation									
Foreign	-	1,200	4,140	5,760	5,250	4,050	3,390	-	23,790
Local	-	150	3,430	4,570	5,390	4,970	4,400	-	22,910
Total	-	1,350	7,570	10,330	10,640	9,020	7,790	-	46,700
River Improvement									
Foreign	-	600	2,410	2,670	2,170	2,380	2,060	3,010	15,300
Local	-	150	2,880	3,120	2,750	3,220	2,470	3,010	17,600
Total	-	750	5,290	5,790	4,920	5,600	4,530	6,020	32,900
Total									
Foreign	1,400	2,500	9,950	23,310	15,230	6,430	5,450	3,010	67,280
Local	1,040	6,100	14,910	17,650	12,950	8,190	6,870	3,010	70,720
Total	2,440	8,600	24,860	40,960	28,180	14,620	12,320	6,020	138,000

Table 25 Allocated Cost

(10^3 US$)

Sector	Foreign Portion	Local Portion	Total
Hydropower	10,190	1,510	11,700
Irrigation	35,140	41,000	76,140
River Improvement	21,950	28,210	50,160
Total	67,280	70,720	138,000

Table 26 IRR of the Project

Sector	IRR (%)
Irrigation	12.5
River Improvement	11.7
Power	8.9
Wonogiri Multipurpose Dam Project	12.1

Table 27 Sensitivity Test

Case	Build-up Period of Irrigation (year)	Price of Rice (%)	Construction Cost Increase (%)	IRR (%)
I	0 /1	0 /2	0 /3	12.1
II	+3	0	0	11.0
III	+5	0	0	10.6
IV	0	-10	0	10.9
V	0	-20	0	9.8
VI	0	0	+10	11.2
VII	0	0	+20	10.4
VIII	0	0	+30	9.7
IX	0	-10	+20	9.3
X	0	-20	+30	7.7
XI	+3	-10	+20	8.7
XII	+3	-20	+30	7.3
XIII	+5	-10	+20	8.4
XIV	+5	-20	+30	7.0

Note: /1 Irrigation benefit will attain its maximum in the 7th year after completion of the project

/2 US$270 = 1 ton of rice

/3 Proposed construction cost of US$138 million

Table 28 Typical Farm Budget with Paddy Field of 0.52 ha Future without-Project

Rainfed Area

	Area (ha)	Unit yield (t/ha)	Total yield (t)	Unit price (Rp/kg)	Total value (Rp)
I. Gross Income					
1. Farm income					
Wet/s paddy	0.52	2.8	1.46	45	65,700
Polowijo	0.44				26,660
Livestock					14,090
Sub-total					106,450
2. Non-farm Income					
Wage income & trade					7,980
Others					18,630
Sub-total					26,610
Total Gross Income					133,060

	Area (ha)	Unit amount (kg/ha)	Total amount (kg)	Unit price (Rp/kg)	Total cost (Rp)
II. Gross Outgo					
1. Farming Expenses					
(Paddy)					
Seed	0.52	35	18.2	125	2,275
Fertilizer	0.52	180	93.6	80	7,488
Chemicals	0.52	1	0.52	900	468
Labor cost	0.52				14,630
(Polowijo)					
Seed	0.44				3,690
Labor cost	0.44				2,520
Land tax	0.52				1,560
Interest on investment					3,860
Livestock					4,230
Sub-total					40,721
2. Living Expenses					
Food consumption					59,200
Other living expenses					32,890
Sub-total					92,090
Total Outgo					132,811
III. Net Reserve (or capacity to pay)					249

Irrigated Area

	Area (ha)	Unit yield (t/ha)	Total yield (t)	Unit price (Rp/kg)	Total value (Rp)
I. Gross Income					
1. Farm income					
Wet/s paddy	0.52	4.0	2.08	45	93,600
Dry/s paddy	0.22	3.7	0.81	45	36,450
Polowijo	0.18	-	-	-	10,910
Livestock	-	-	-	-	8,100
Sub-total	-	-	-	-	149,060
2. Non-farm income					
Wage income & trade					6,710
Others					15,650
Sub-total					-22,360
Total Gross Income					171,420

	Area (ha)	Unit amount (kg/ha)	Total amount (kg)	Unit price (Rp/kg)	Total value (Rp)
II. Gross Outgo					
1. Farming Expenses					
(Paddy)					
Seed	0.74	30	22.2	125	2,775
Fertilizer	0.74	270	199.8	80	15,984
Chemicals	0.74	2	1.48	900	1,332
Labor cost					26,760
(Polowijo)					
Seed	0.18				1,510
Labor cost					900
Land tax	0.52				2,080
Interest on investment					4,770
Livestock					2,670
Sub-total					58,781
2. Living Expenses					
Food consumption					65,780
Other living expenses					43,850
Sub-total					109,630
Total Outgo					168,411
III. Net Reserve (or capacity to pay)					3,009

Table 29 Typical Farm Budget with Paddy Field of 0.52 ha
(With Project)

	Area (ha)	Unit yield (t/ha)	Total yield (t)	Unit price (Rp/kg)	Total value (Rp)
I. Gross Income					
1. Farm Income					
Wet/s paddy	0.52	5.5	2.86	45	128,700
Dry/s paddy	0.52	5.5	2.86	45	128,700
Paddy (1/2)	0.26	5.5	1.43	45	64,350
Livestock					12,560
Sub-total					334,310
2. Non-farm Income					
Trade & others					21,290
Total Gross Income					355,600

	Area (ha)	Unit amount (kg/ha)	Total amount (kg)	Unit price (Rp/kg)	Total cost (Rp)
II. Gross Outgo					
1. Farming Expenses					
(Paddy)					
Seed	1.3	25	32.5	125	4,062
Fertilizer (Urea, TSP)	1.3	300	455	80	36,400
Chemicals					
- Insecticide	1.3	4	5.2	900	4,680
- Rodenticide	1.3	0.2	0.26	2.30	598
Labor cost	1.3				52,920
Land tax					2,600
Interest on investment					11,920
Livestock					3,770
Sub-total					116,950
2. Living Expenses					
Food consumption					76,160
Other living expenses					50,770
Sub-total					126,930
Total Outgo					243,880
III. Net Reserve (or capacity to pay)					111,720

Table 30 Fund Requirement for Construction
(Contract Base)

(10^3 US$)

Item	Foreign Portion	Local Portion	Total
Dam & Reservoir	26,970	88,250	115,220
Hydropower	14,010	2,520	16,530
Irrigation	31,520	44,430	75,950
River Improvement	19,150	35,160	54,310
Total	91,650	170,360	262,010

Note: The same costs as estimated in the previous feasibility study are basically applied for dam and hydropower except revising the land acquisition and resettlement cost for dam on the basis of the survey conducted by Gadjah Mada University in May, 1975. Final cost estimate of the dam and hydropower will be made in 1977.

Table 31 Fund Requirement for Construction
(Force Account Base)

Item	Foreign Portion	Local Portion	Total
Dam & Reservoir	26,970	88,250	115,220
Hydropower	14,010	2,520	16,530
Irrigation	34,270	47,880	82,150
River Improvement	27,700	35,480	63,180
Total	102,950	174,130	277,080

Note: The costs for dam and hydropower are estimated on the contract base.

Fig. 2 Present Cropping Pattern in Sragen Area

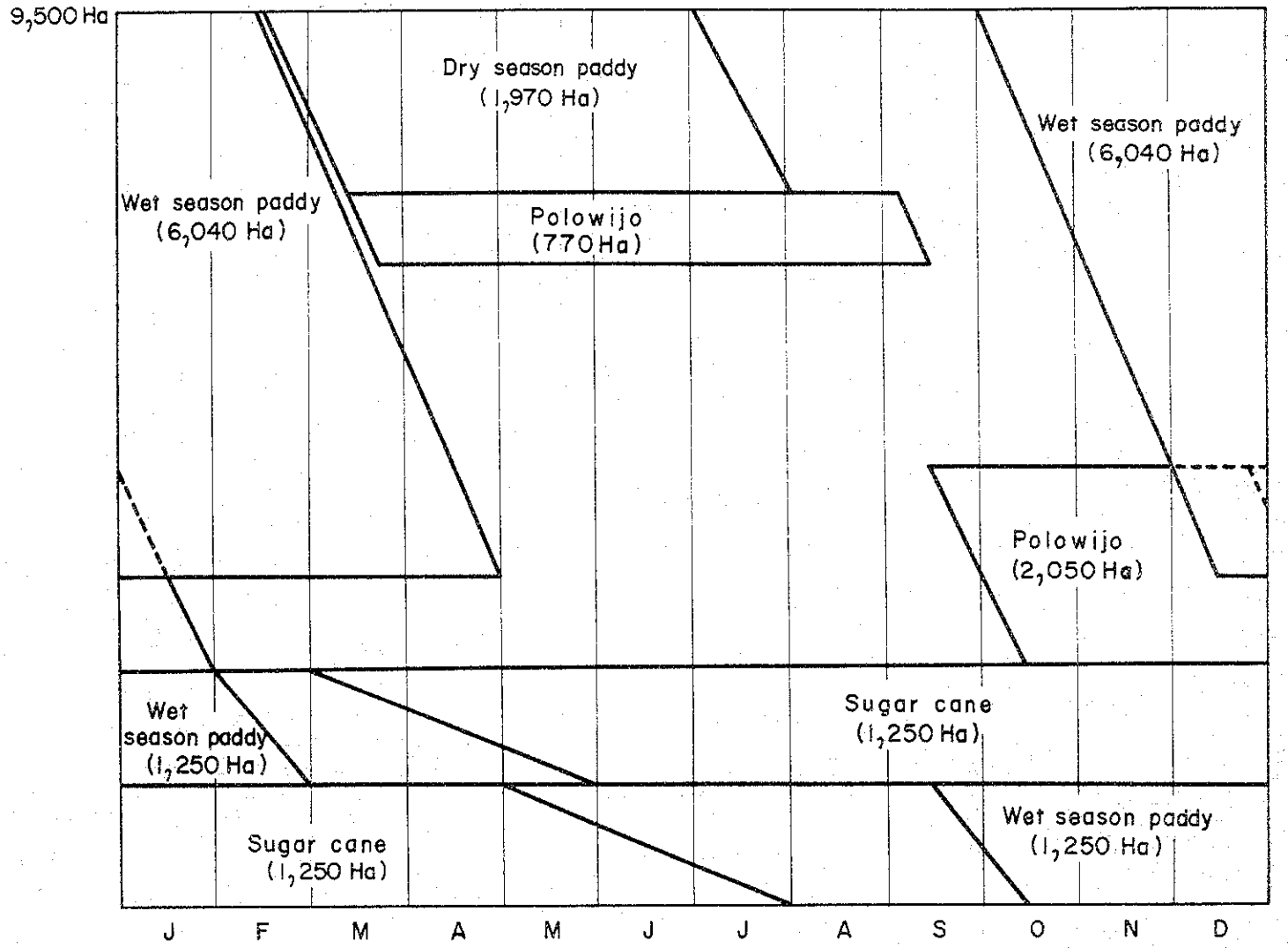


Fig. 3 Present Cropping Pattern in Karanganyar Area

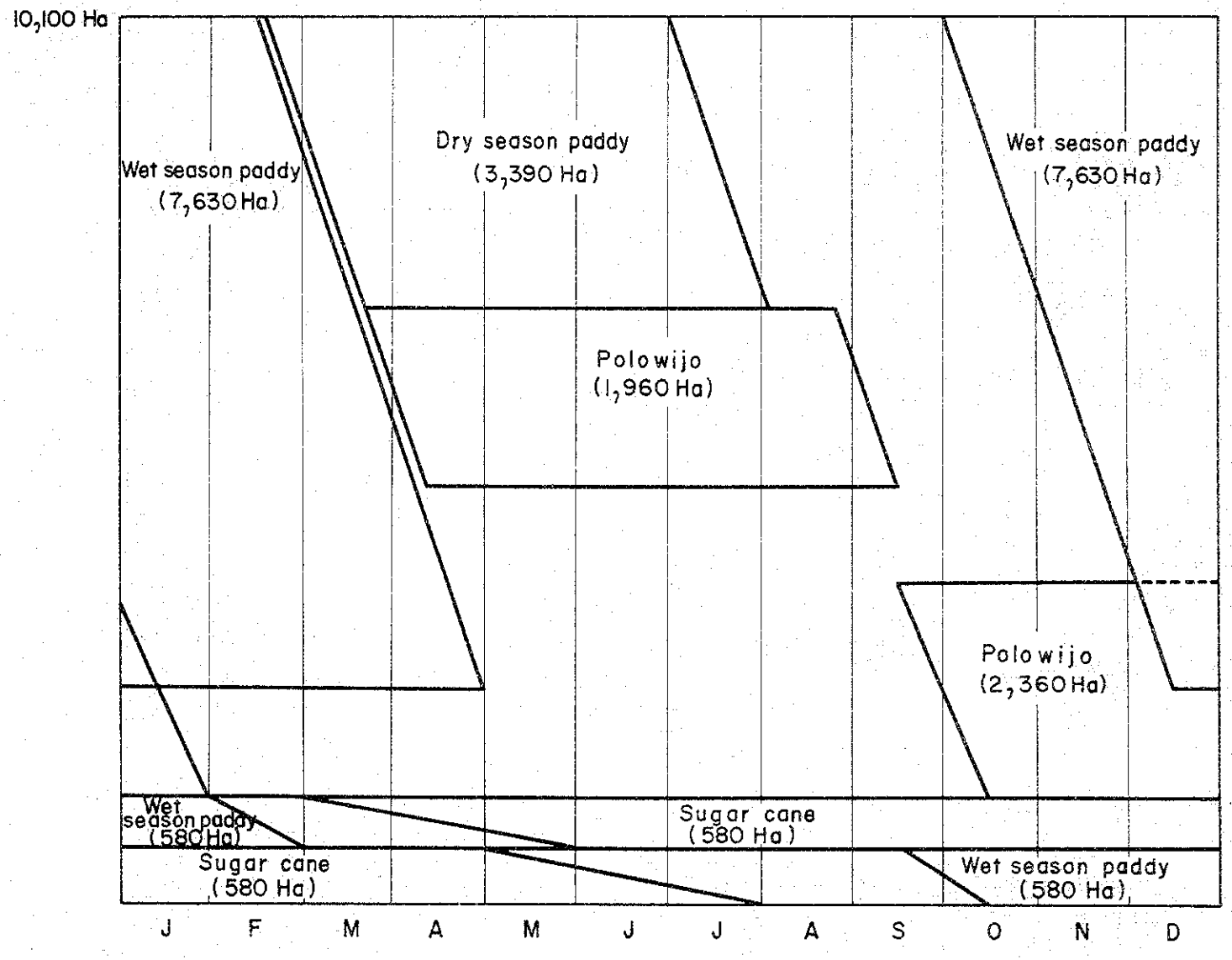


Fig.4 Present Cropping Pattern in Dengkeng Area

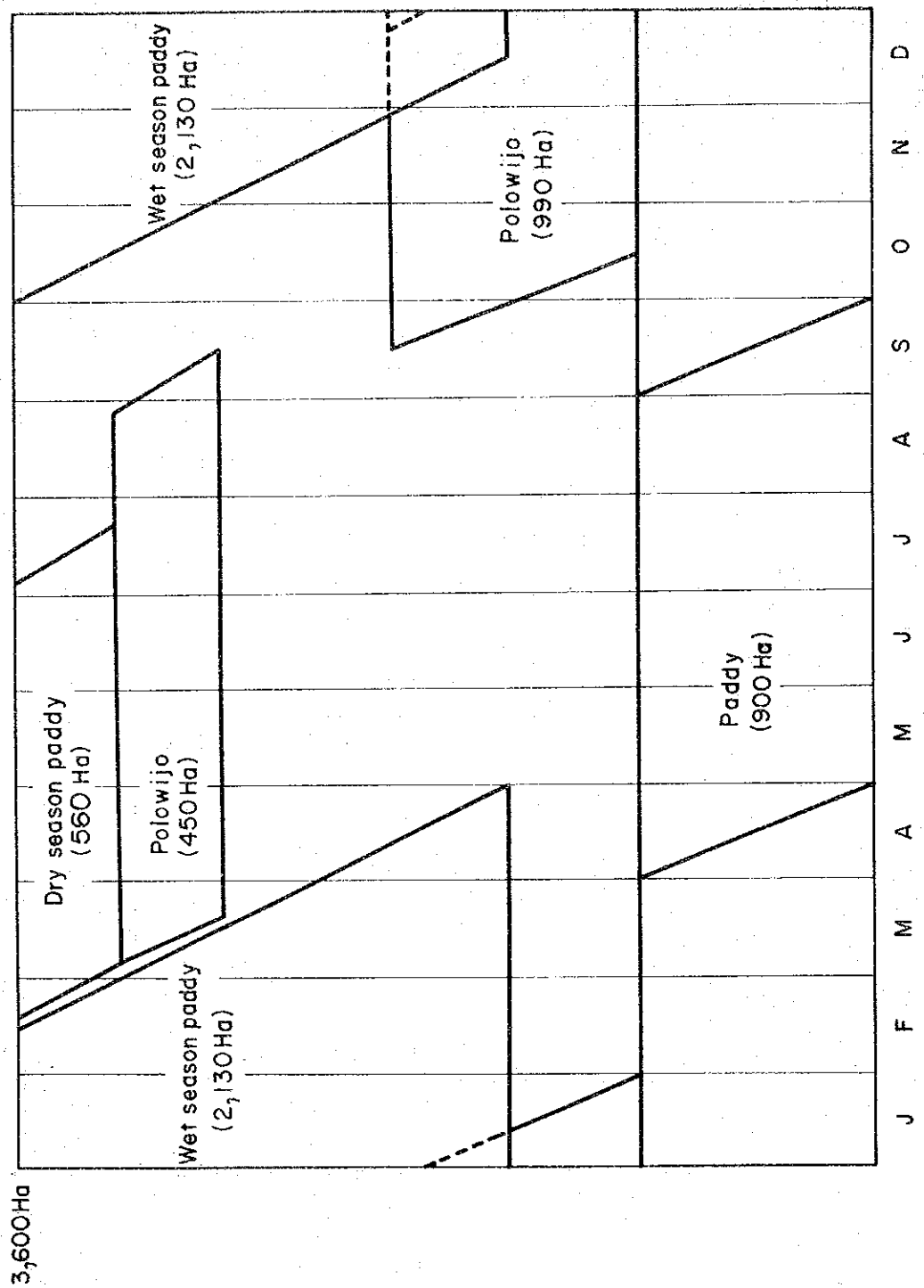


Fig.5 General Map of River Course

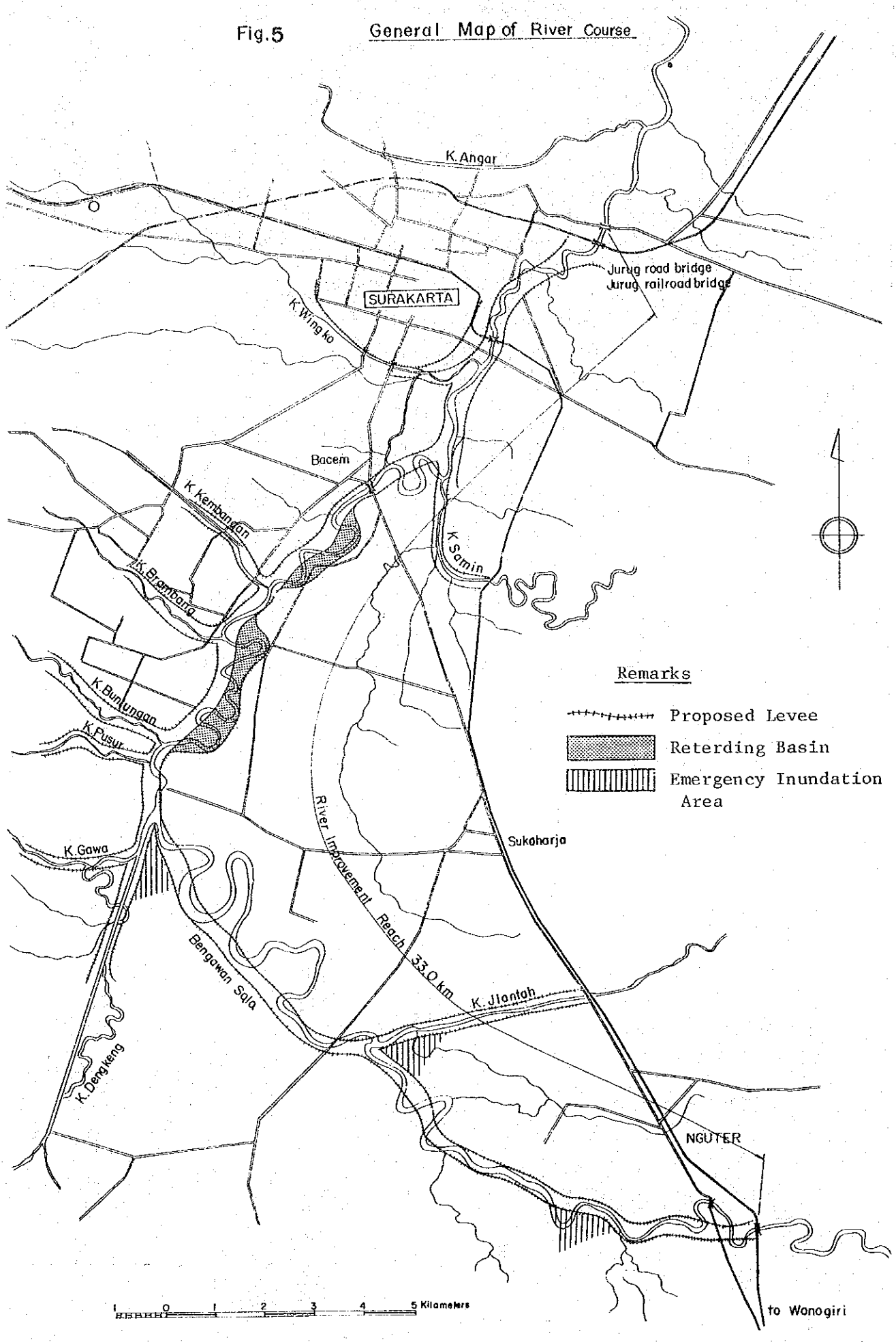
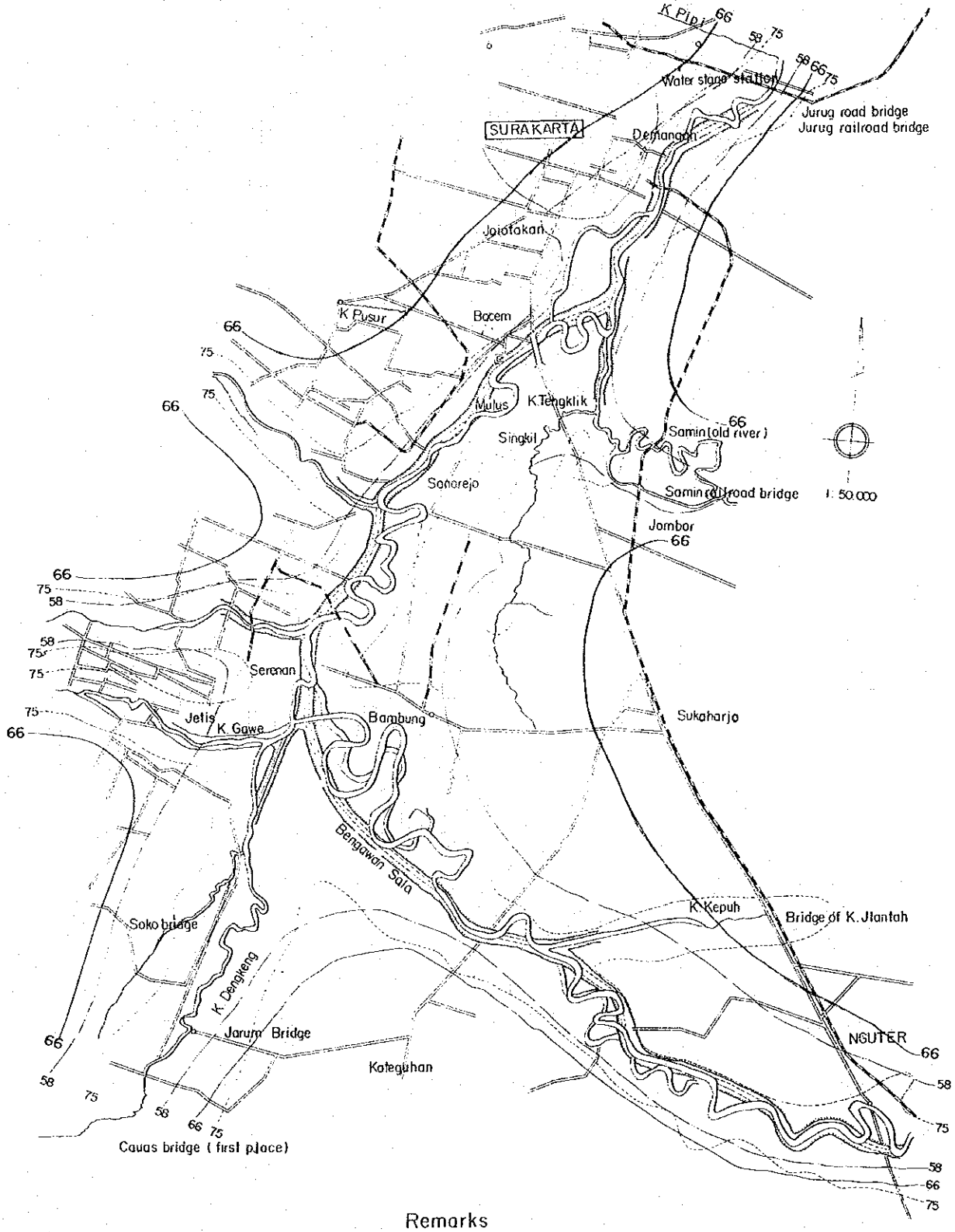


Fig. 6 INUNDATION AREA OF LARGE FLOOD



Remarks

——— Inundation area in 66 flood
- - - - - - in 75 flood
——·—— in 58 flood

Fig. 7 (a) LOCATION of EXISTING RIPARIAN STRUCTURE

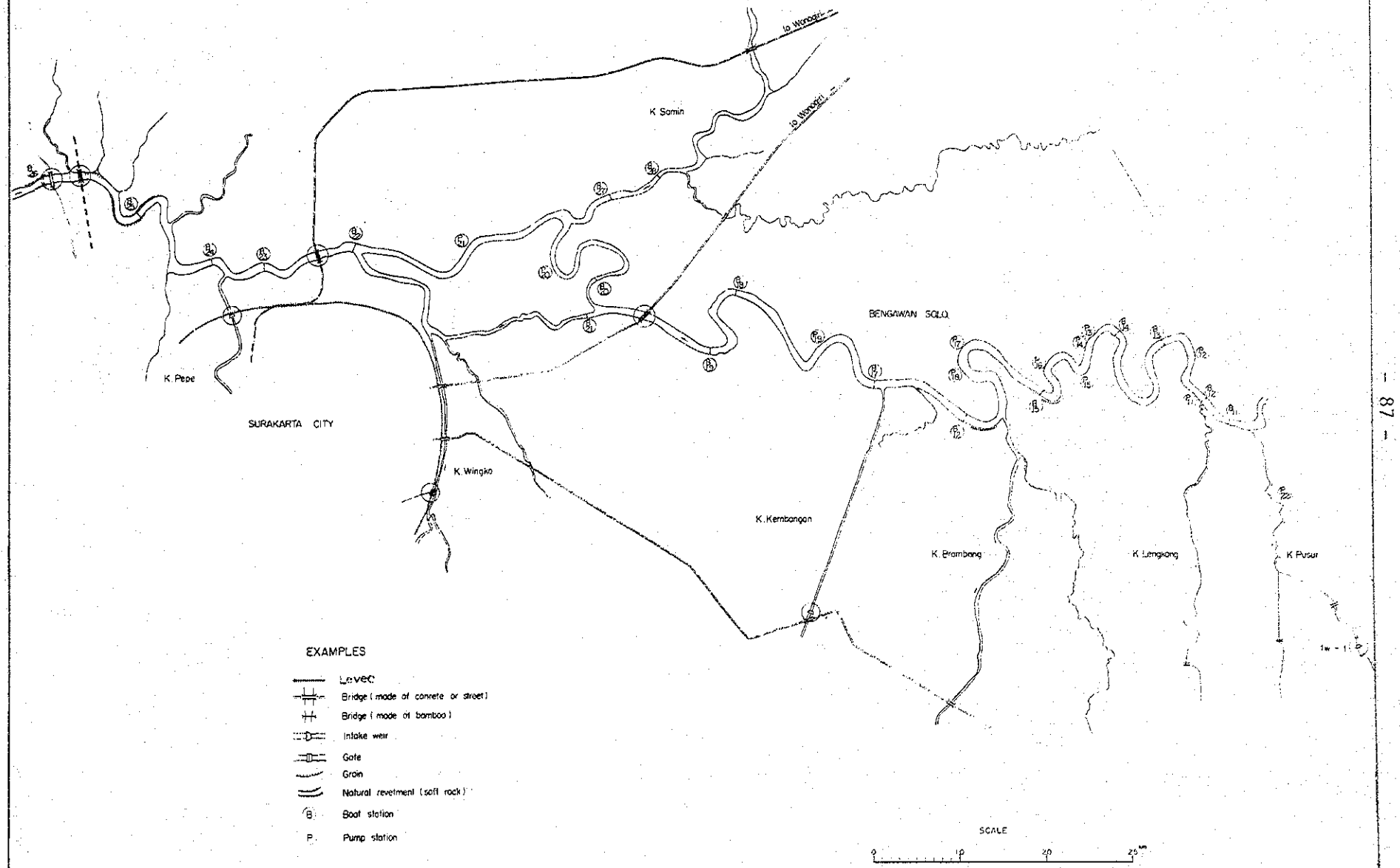


Fig. 7(b) LOCATION of EXISTING RIPARIAN STRUCTURE

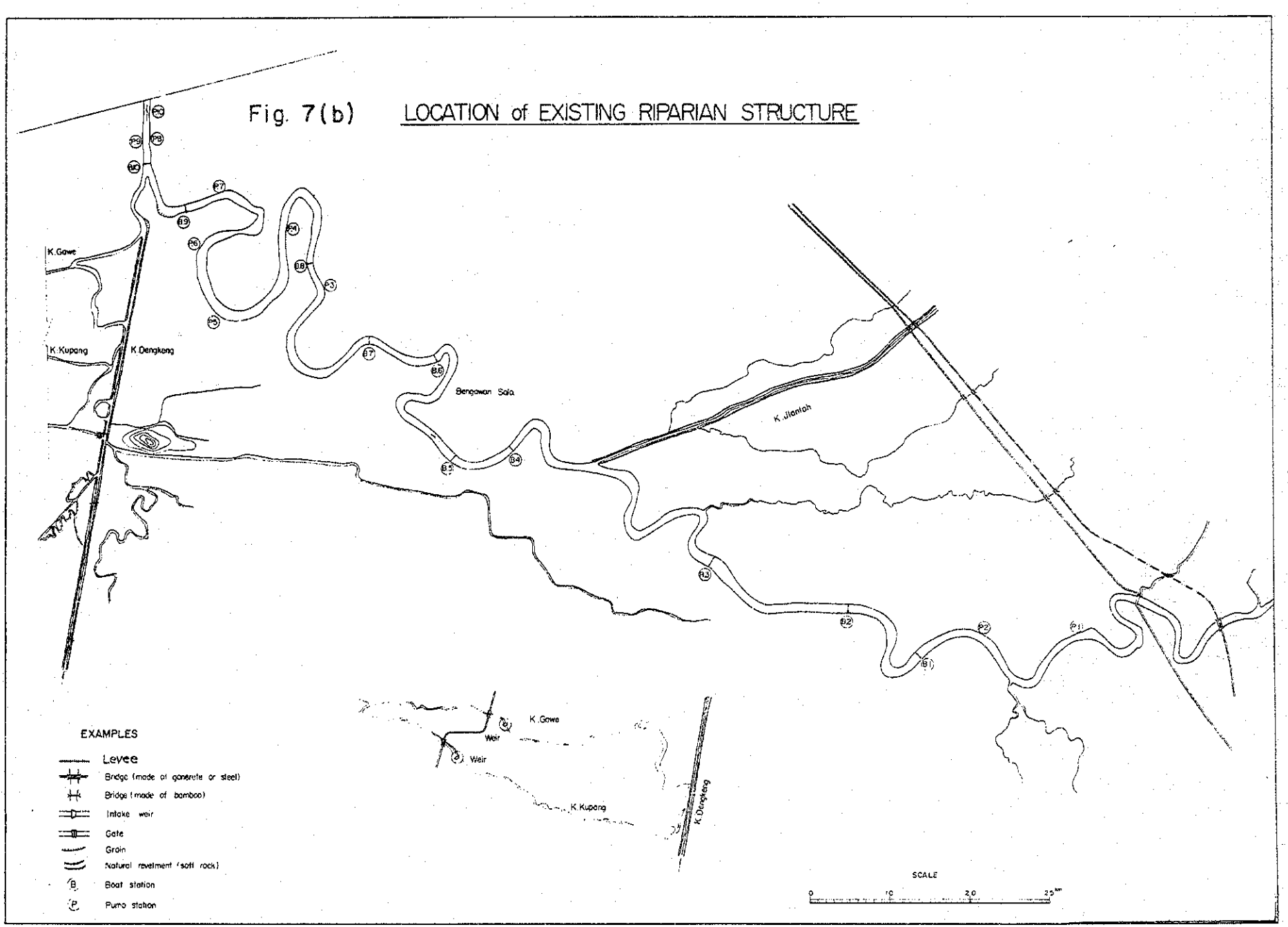


Fig. 8 Proposed Cropping Pattern

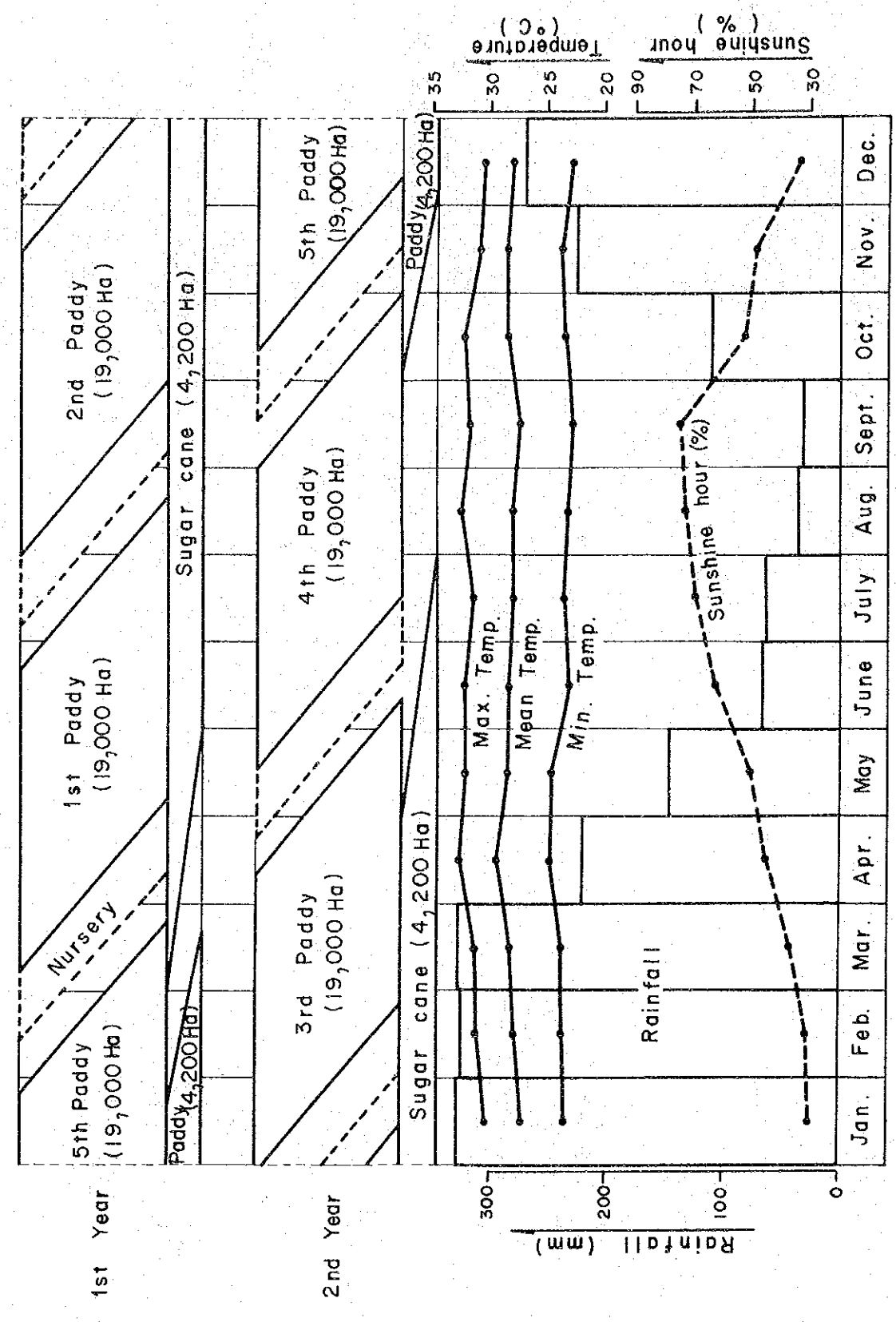
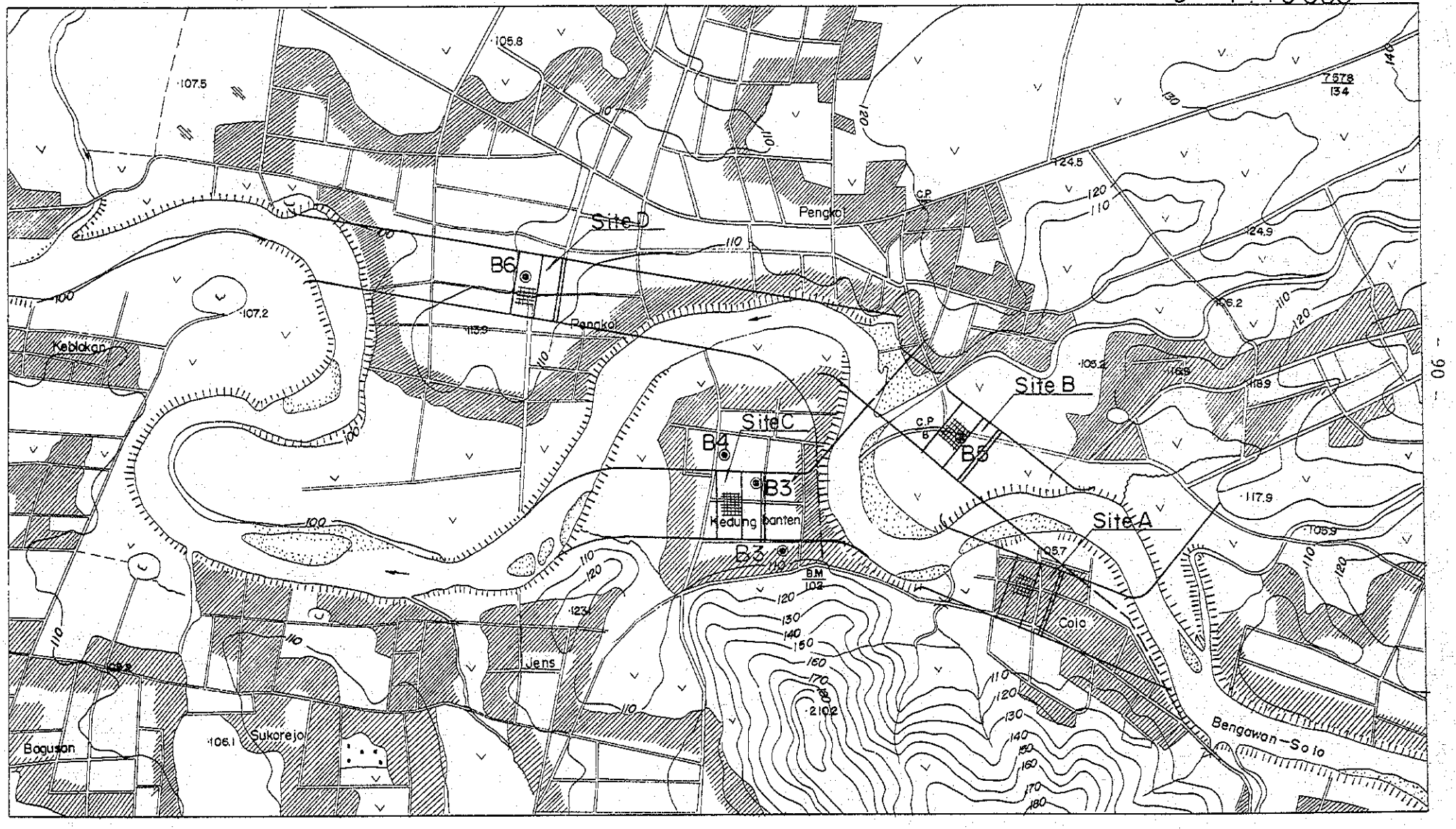


Fig. 9 Location Map of Colo Weir

S = 1 : 10000



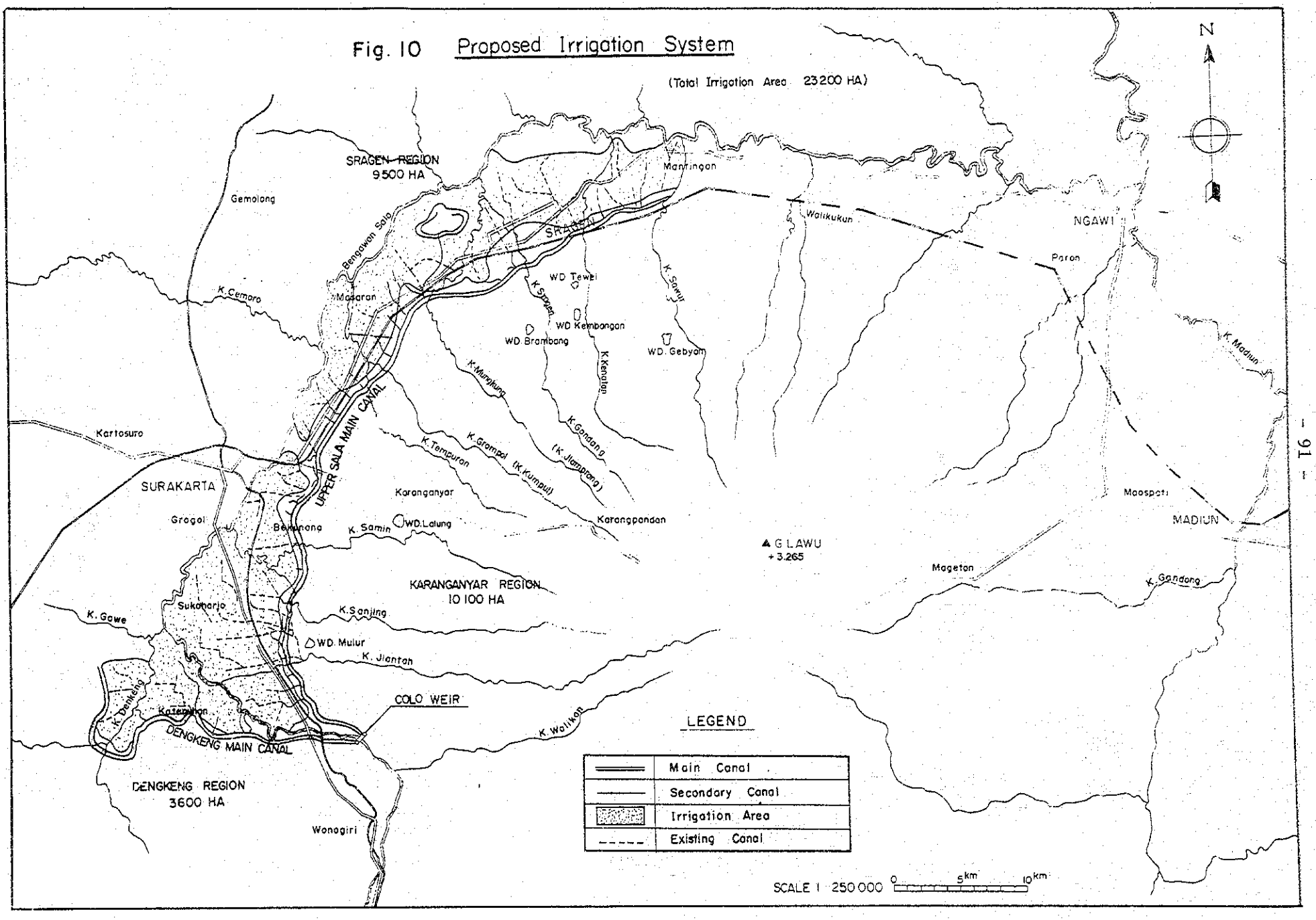


Fig. 10 Proposed Irrigation System
(Total Irrigation Area 23200 HA)
N
SRAGEN REGION
9500 HA
Gemolong
Bengawan Solo
SRAGEN
Manringan
Walikukun
NGAWI
Paron
K. Cemoro
Madiaran
WD Tewel
K. Sragen
K. Sawur
WD Kembangan
WD. Brambang
WD. Gebyah
K. Kenatan
K. Madiun
K. Mungkung
K. Gandang
K. Tempuran
K. Grompol (K. Kumpul)
(K. Jlamprang)
Kartosuro
UPPER SALA MAIN CANAL
SURAKARTA
Karanganyar
Maospati
MADIUN
Grogol
Bekonang
K. Samin
WD. Lalung
Karangpandan
G. LAWU
+ 3.265
Mageton
K. Gandong
KARANGANYAR REGION
10 100 HA
Sukoharjo
K. Gowe
K. Sanjing
WD. Mulur
K. Jlantah
COLO WEIR
K. Dengkeng
Kartasura
K. Wolikor
DENGKENG MAIN CANAL
DENGKENG REGION
3600 HA
Wonogiri
LEGEND
Main Canal
Secondary Canal
Irrigation Area
Existing Canal
SCALE 1 250 000
0
5km
10km

Fig. 11 Design Discharge Distribution (2,000 m^3/s – Case)

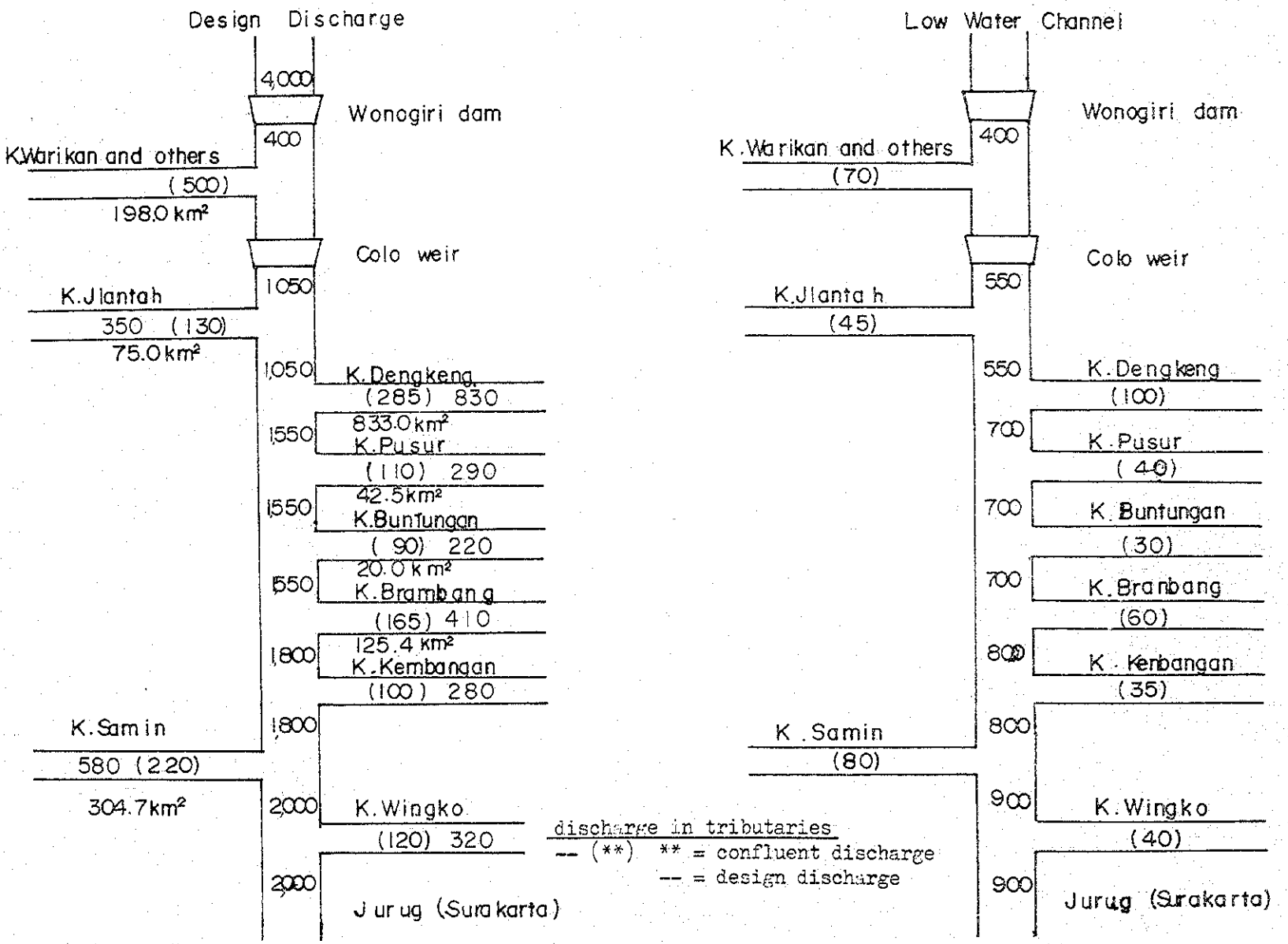


Fig.12 PROFILE of PROPOSED RIVER COURSE

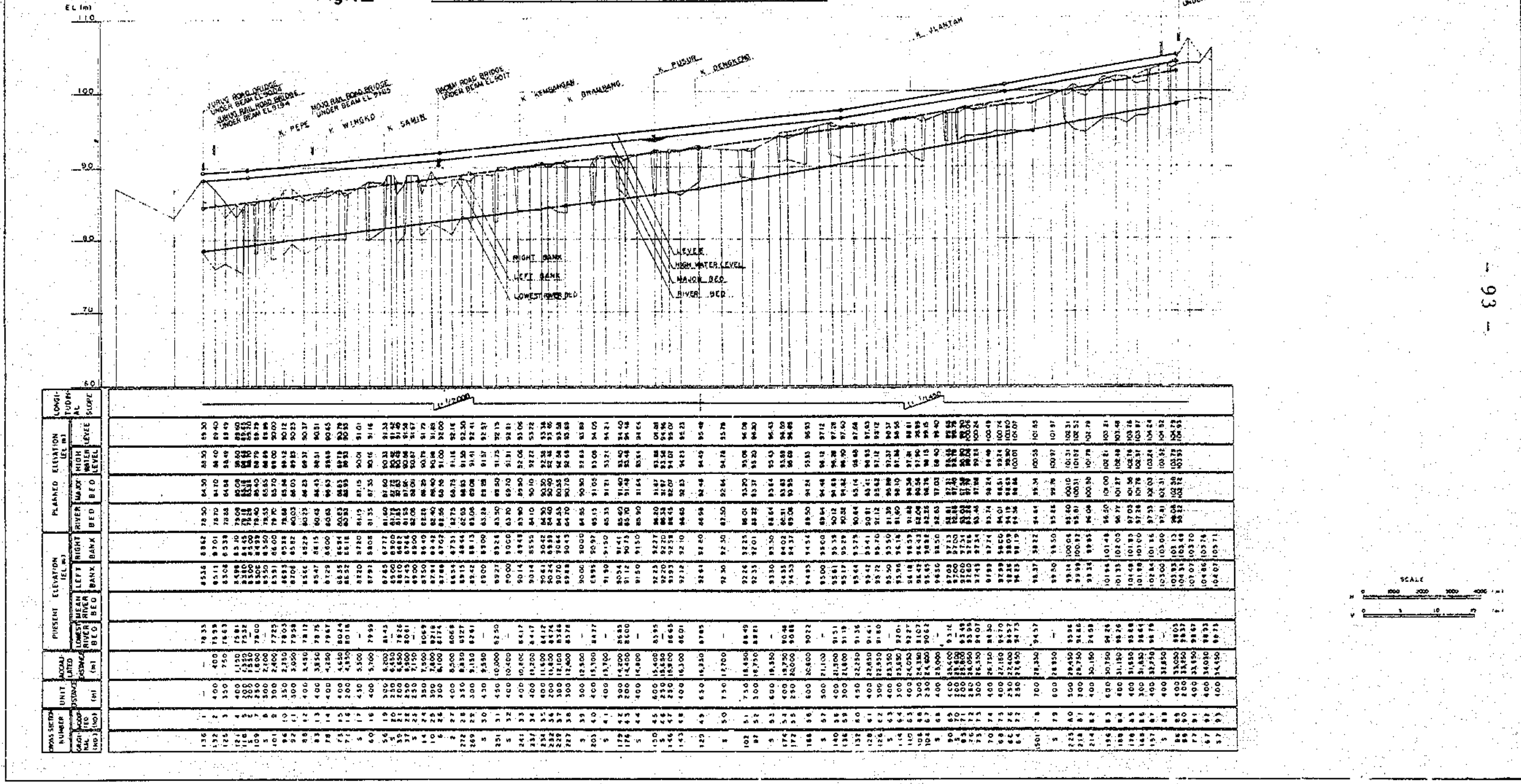
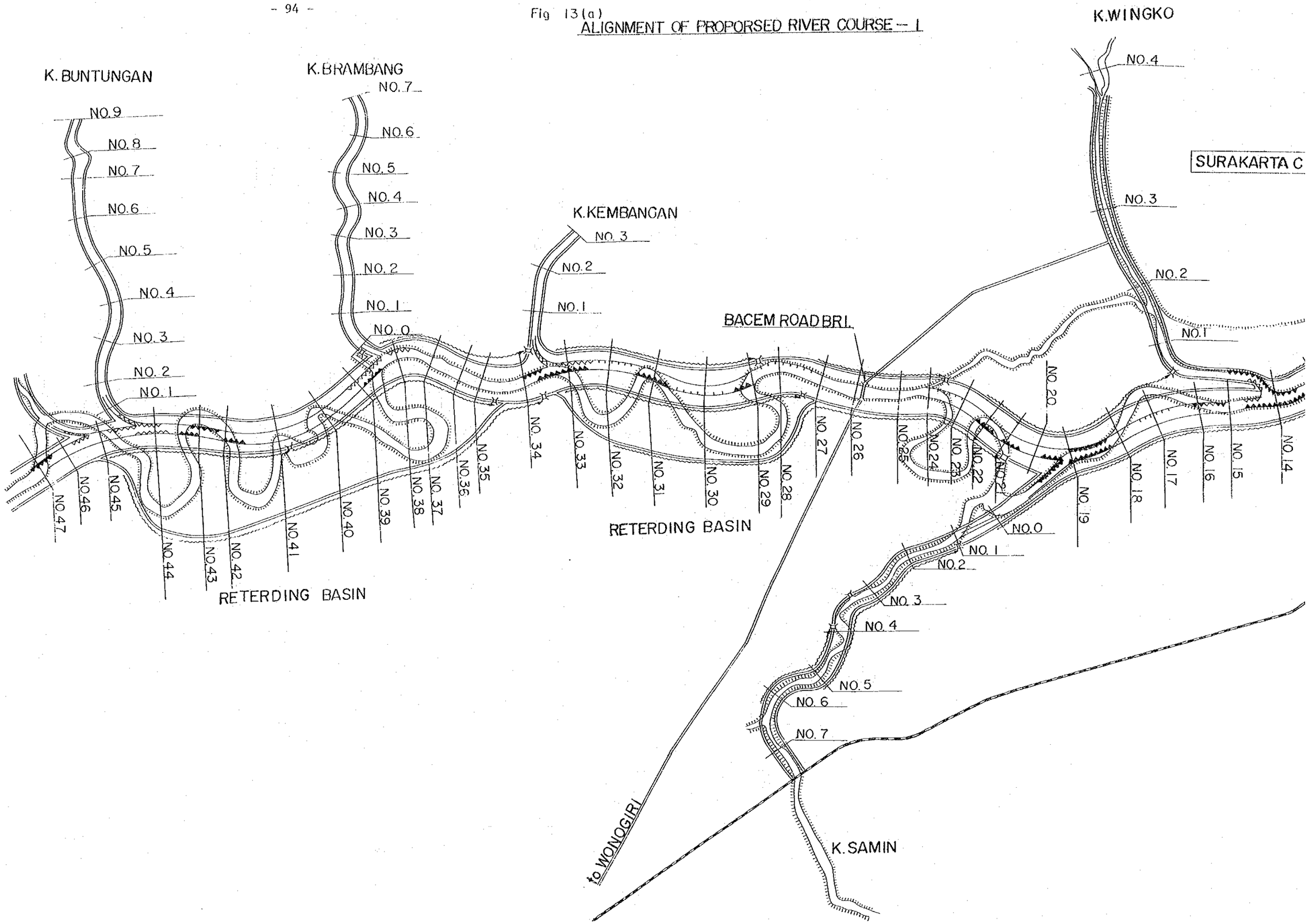


Fig 13(a)
ALIGNMENT OF PROPORSED RIVER COURSE — I



ER COURSE — I

K.WINGKO

SURAKARTA CITY

K.PEPE

)BRI.

JURUG ROAD BRI.

MOJO RAIL ROAD BRI.

JURUG RAIL ROAD BRI

K.SAMIN

REMARKS

Stone piching

Wire basket

Groin

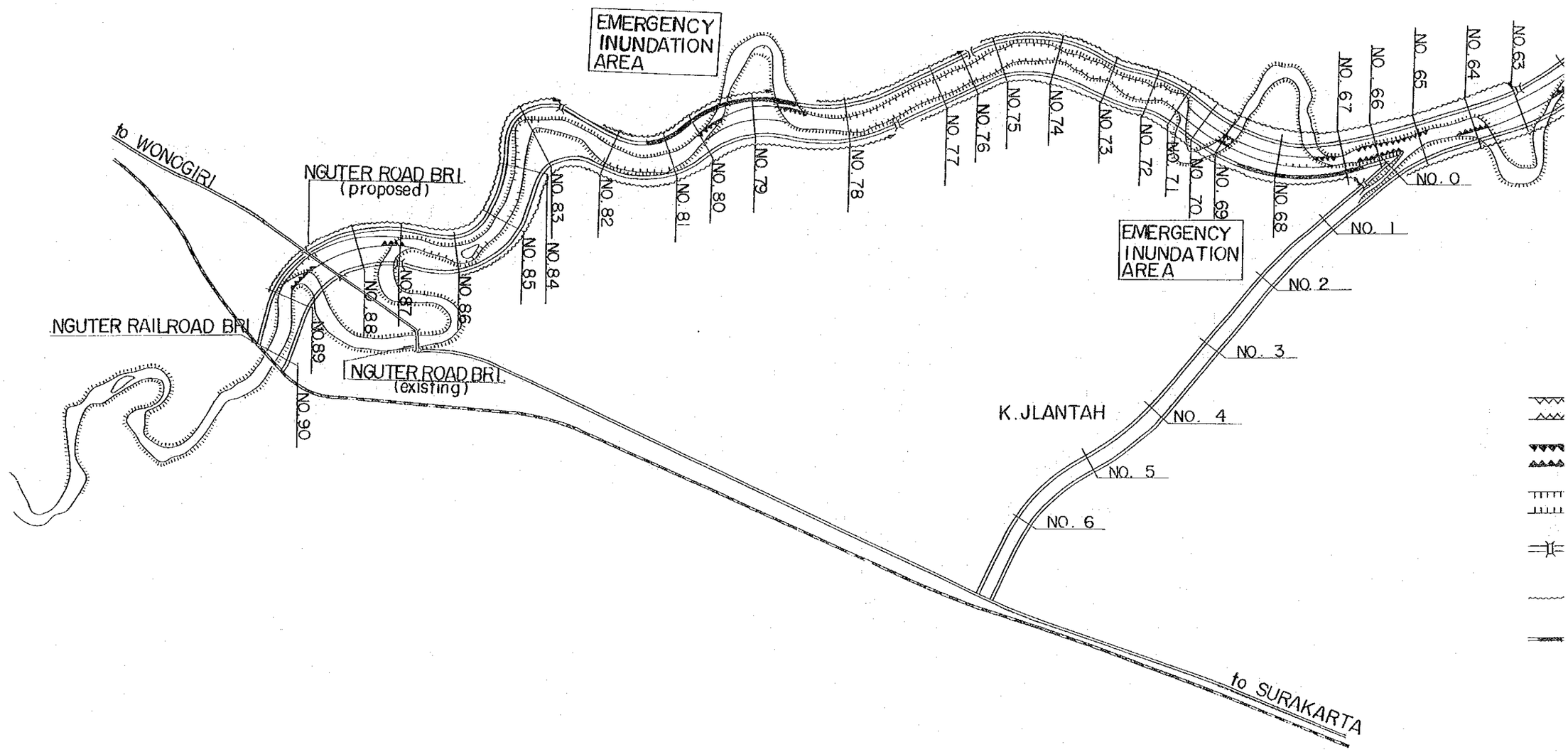
Sluice way

Intersepting drainage channel

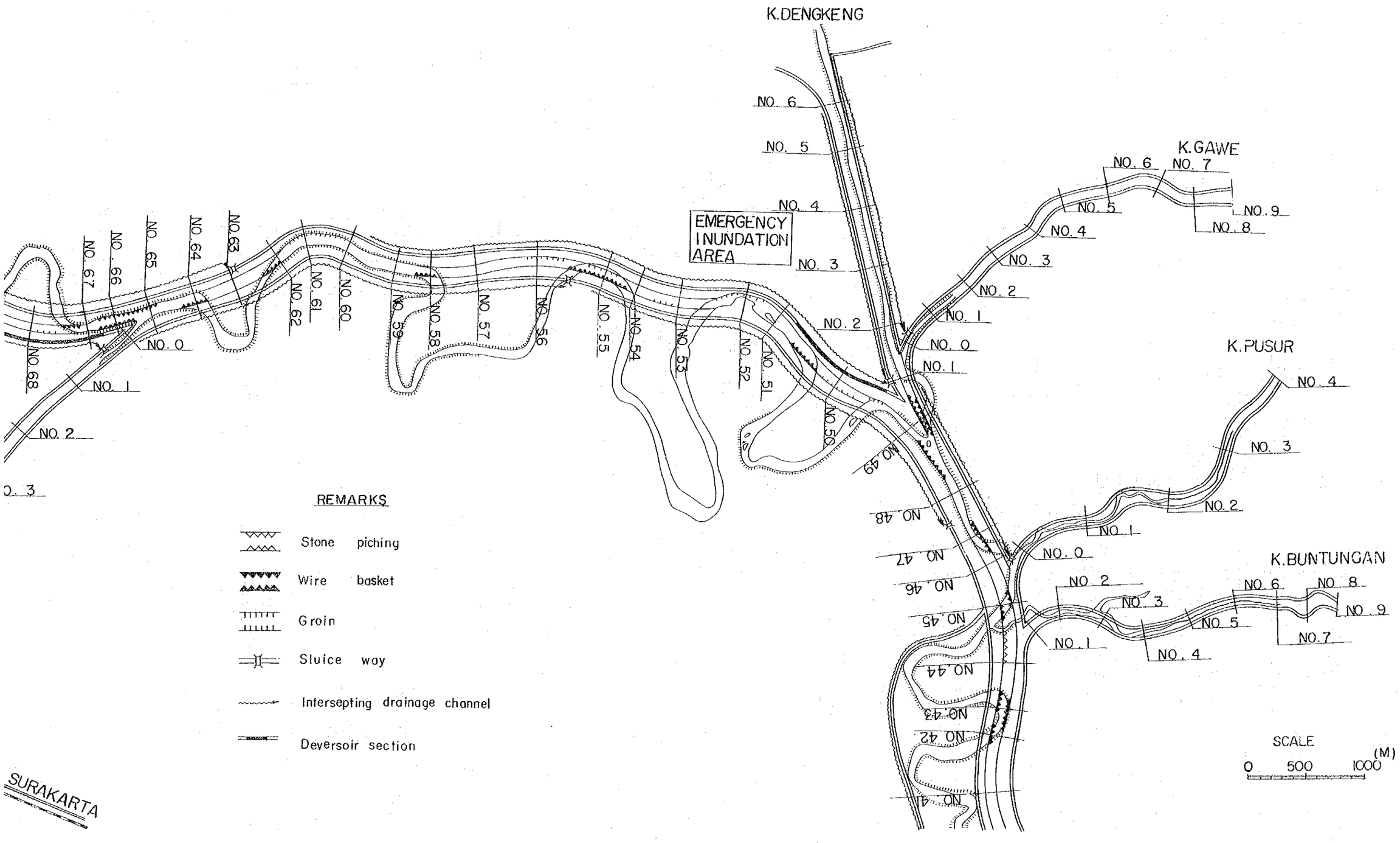
SCALE

0 500 1000(M)

Fig . 13 (b)
ALIGNMENT OF PROPOPSED RIVER COURSE-2



OF PROPOPSED RIVER COURSE-2



REMARKS

- Stone piching
- Wire basket
- Groin
- Sluice way
- Intersepting drainage channel
- Deversoir section

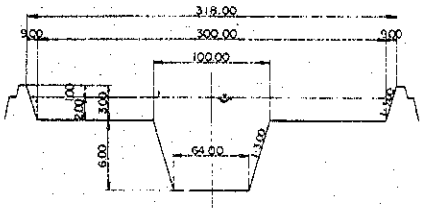
SURAKARTA

Fig. 14. PROPOSED STANDARD CROSS SECTIONS of BENGAWAN SALA

STANDARD CROSS SECTIONS of BENGAWAN SALA S : (H : 1/2,000 V : 1/200)

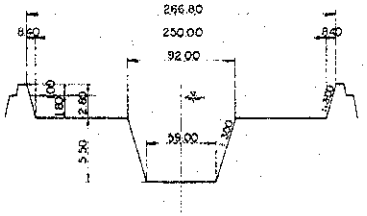
JURUG - CONFLUENCE of K.SAMIN

(Q = 2,000 m³/s)

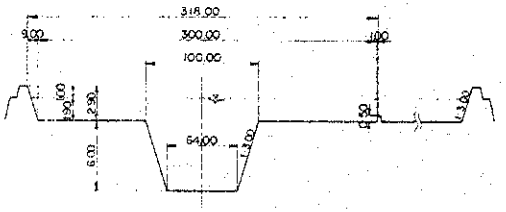


CONFLUENCE of BRAMBANG - CONFLUENCE OF K.DENGKENG

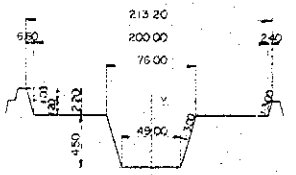
(Q = 1,550 m³/s)



RETARDING BASIN SECTION S : (H : 1/2,000 V : 1/200)

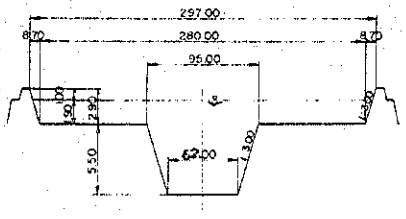


DEVERSOIR SECTION S : (H : 1/2,000 V : 1/200)



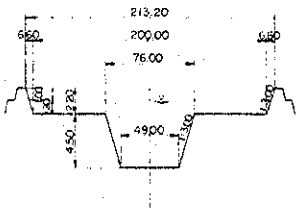
CONFLUENCE of K.SAMIN - CONFLUENCE of K.BRAMBANG

(Q = 1,800 m³/s)



CONFLUENCE of K.DENGKENG - NGUTER

(Q = 1,050 m³/s)



STANDARDCROSS SECTIN of LEVEE S : 1/200

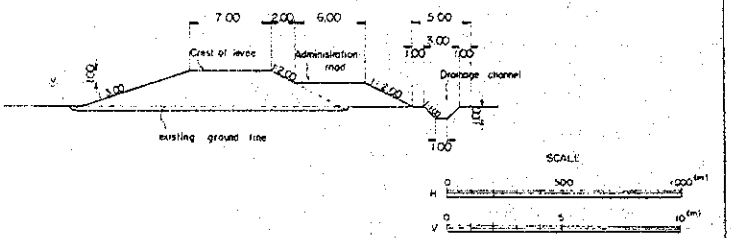


Fig. 15 Proposed Construction Schedule for Irrigation Works

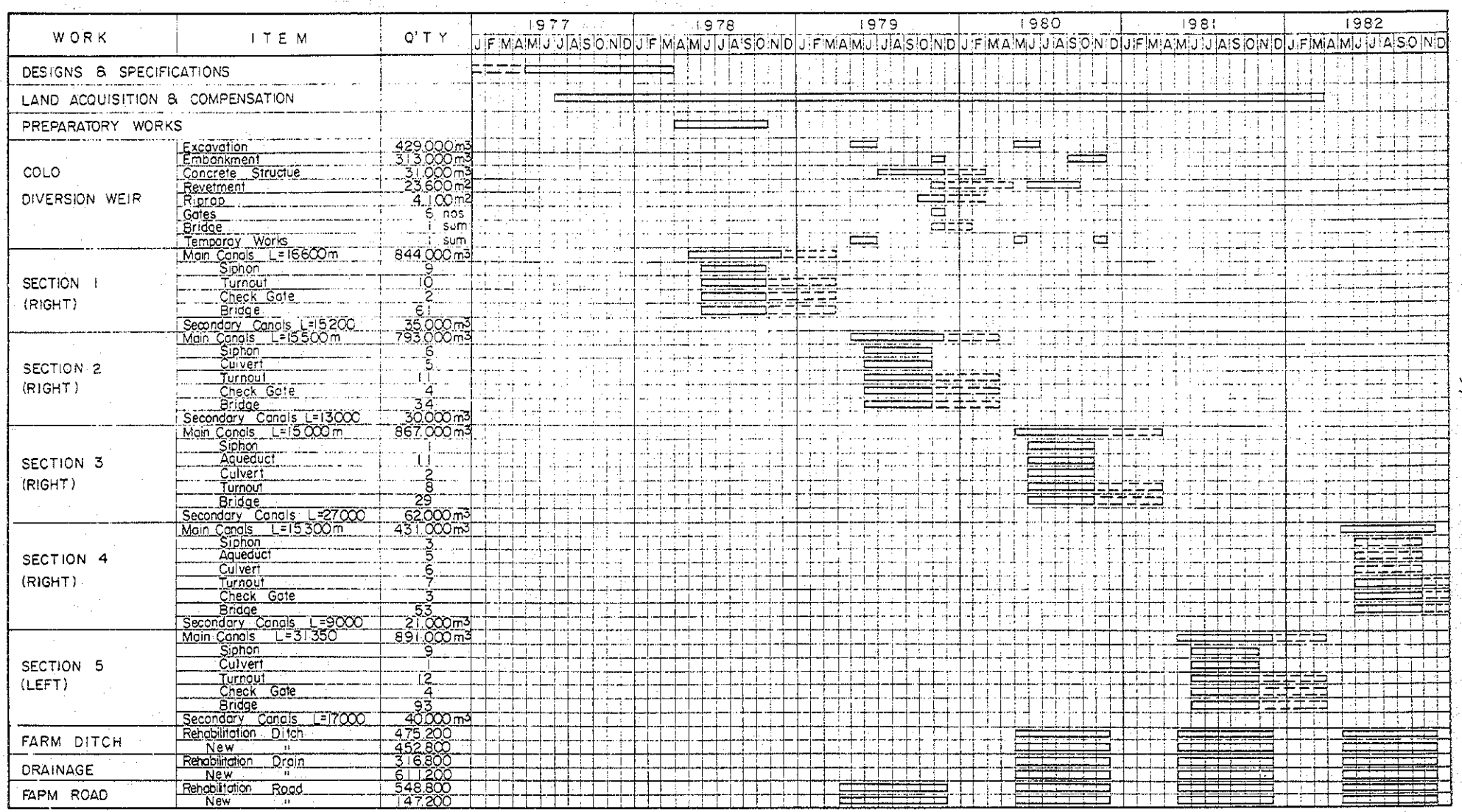


Fig.16 Work Section

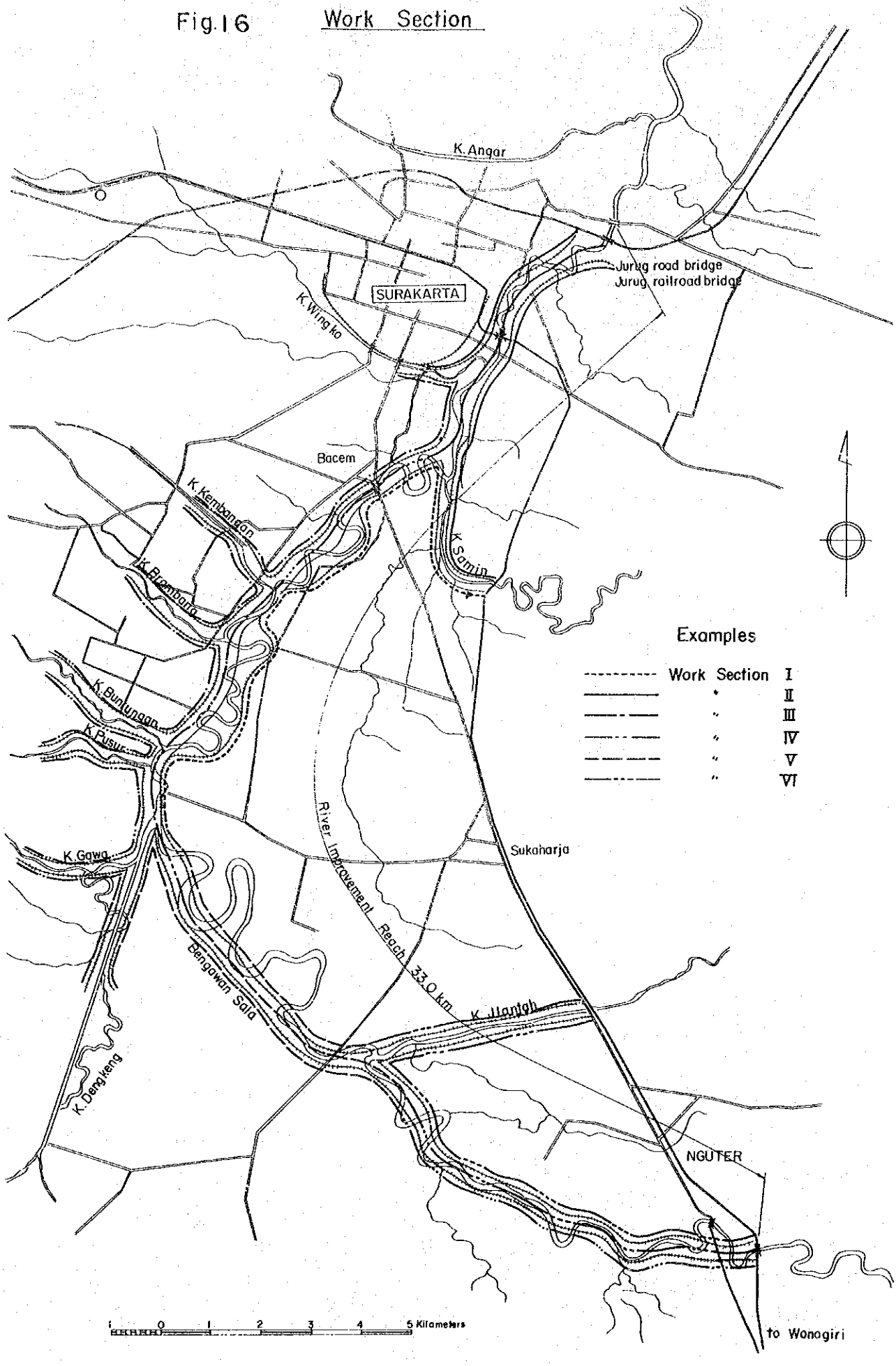
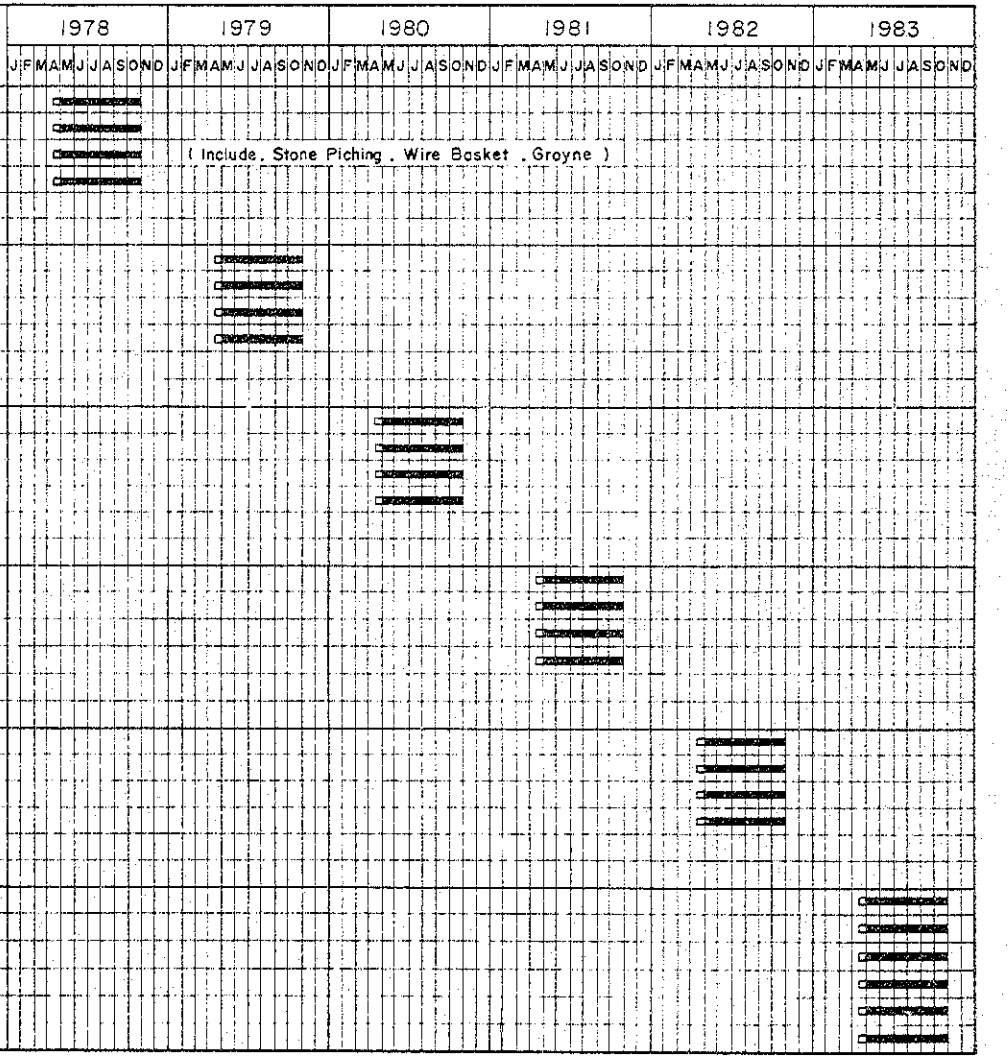


Fig.17 Proposed Construction Schedule for River Improvement Works

WORK SECTION	ITEM	UNIT	Q'ty
I	Excavation	m^3	$1,062 \times 10^3$
	Banking	m^3	953×10^3
	Bank protection		——
	Sluiceway	Place	5
	Groundsill		——
	Bridge	Place	——
II	Excavation	m^3	$1,184 \times 10^3$
	Banking	m^3	$1,032 \times 10^3$
	Bank protection		——
	Sluiceway	Place	7
	Groundsill		——
	Bridge	Place	——
III	Excavation	m^3	$1,108 \times 10^3$
	Banking	m^3	924×10^3
	Bank protection		——
	Sluiceway	Place	5
	Groundsill		——
	Bridge	Place	——
IV	Excavation	m^3	$1,371 \times 10^3$
	Banking	m^3	$1,228 \times 10^3$
	Bank protection		——
	Sluiceway	Place	3
	Groundsill		——
	Bridge	Place	——
V	Excavation	m^3	973×10^3
	Banking	m^3	877×10^3
	Bank protection		——
	Sluiceway	Place	4
	Groundsill		——
	Bridge	Place	——
VI	Excavation	m^3	$1,117 \times 10^3$
	Banking	m^3	983×10^3
	Bank protection		——
	Sluiceway	Place	8
	Groundsill	Place	2
	Bridge	Place	1



※ □ : Preparation

Fig.18 Organization Chart for Project Implementation

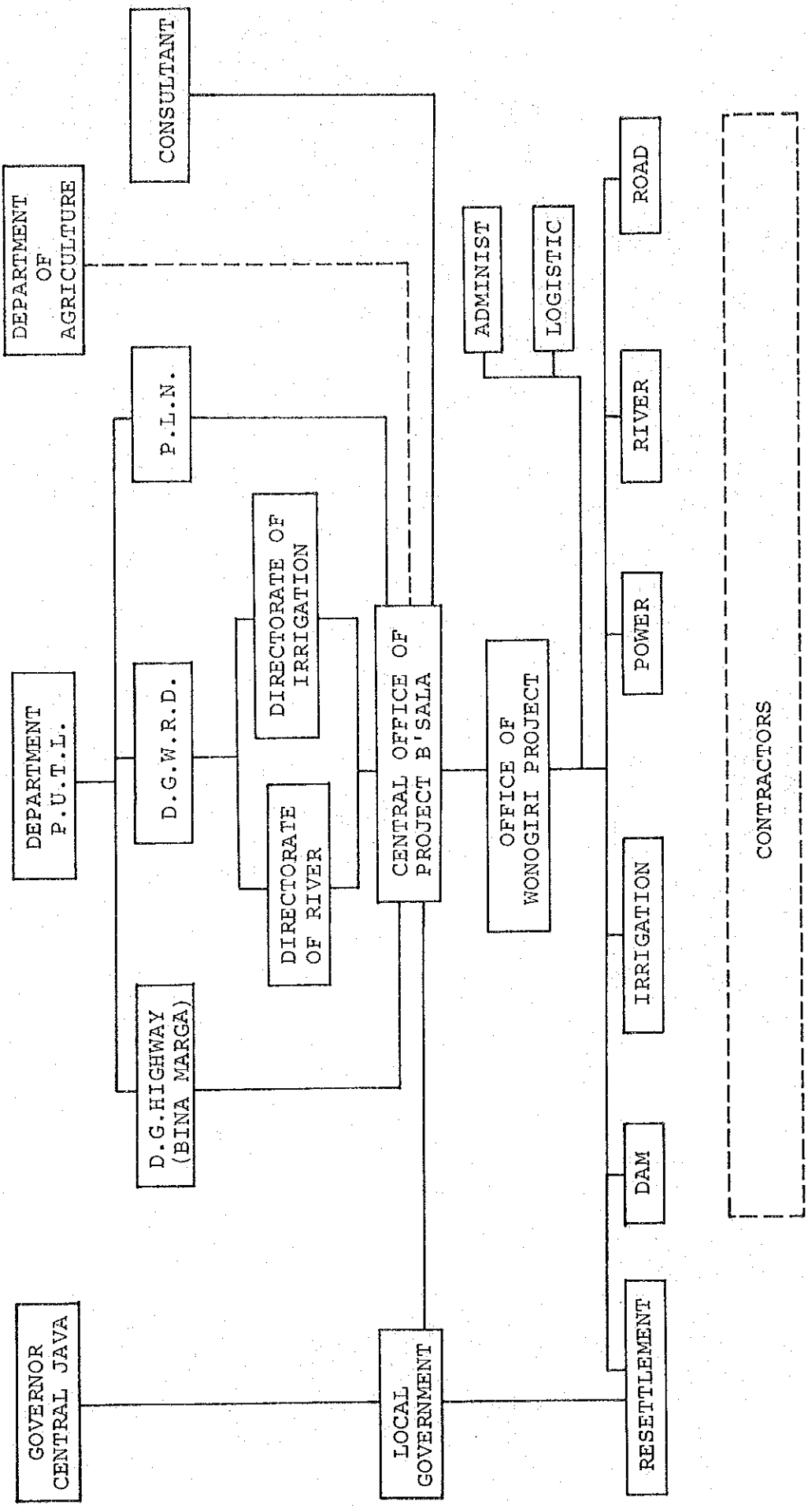


Fig. 19 Overall Organization

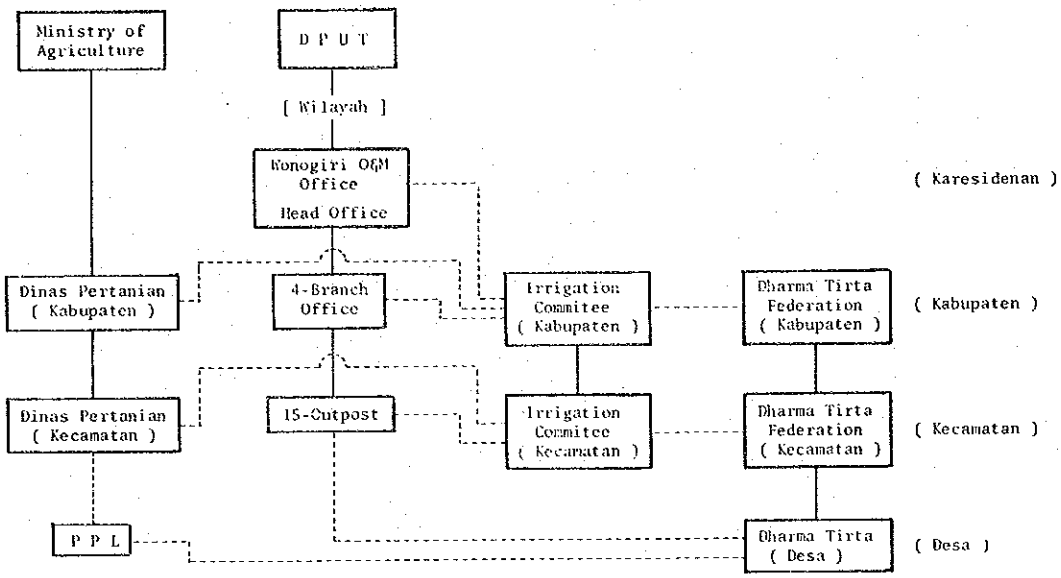
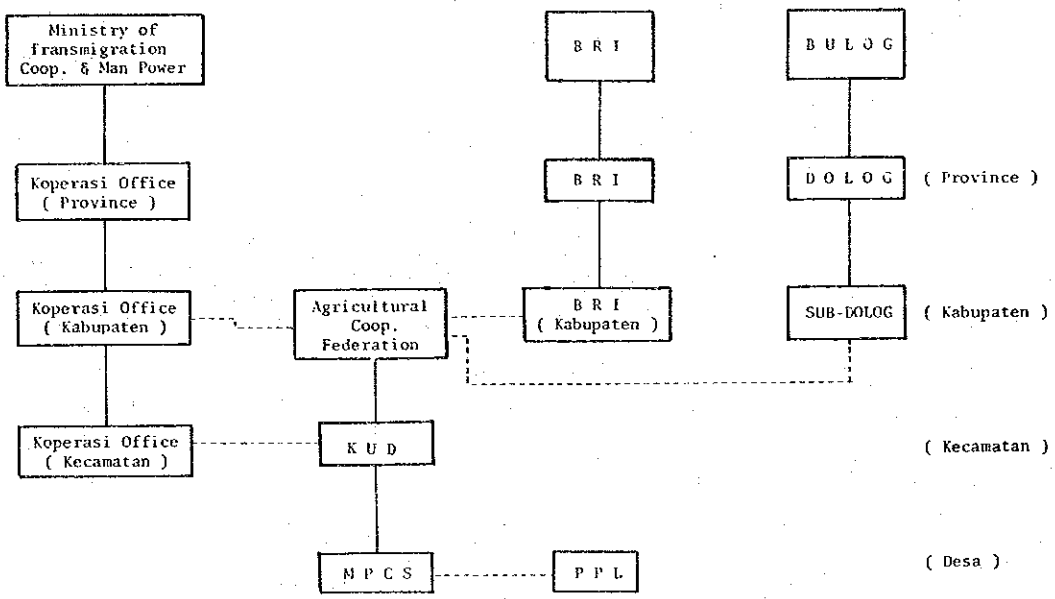


Fig. 20 Agricultural Cooperatives



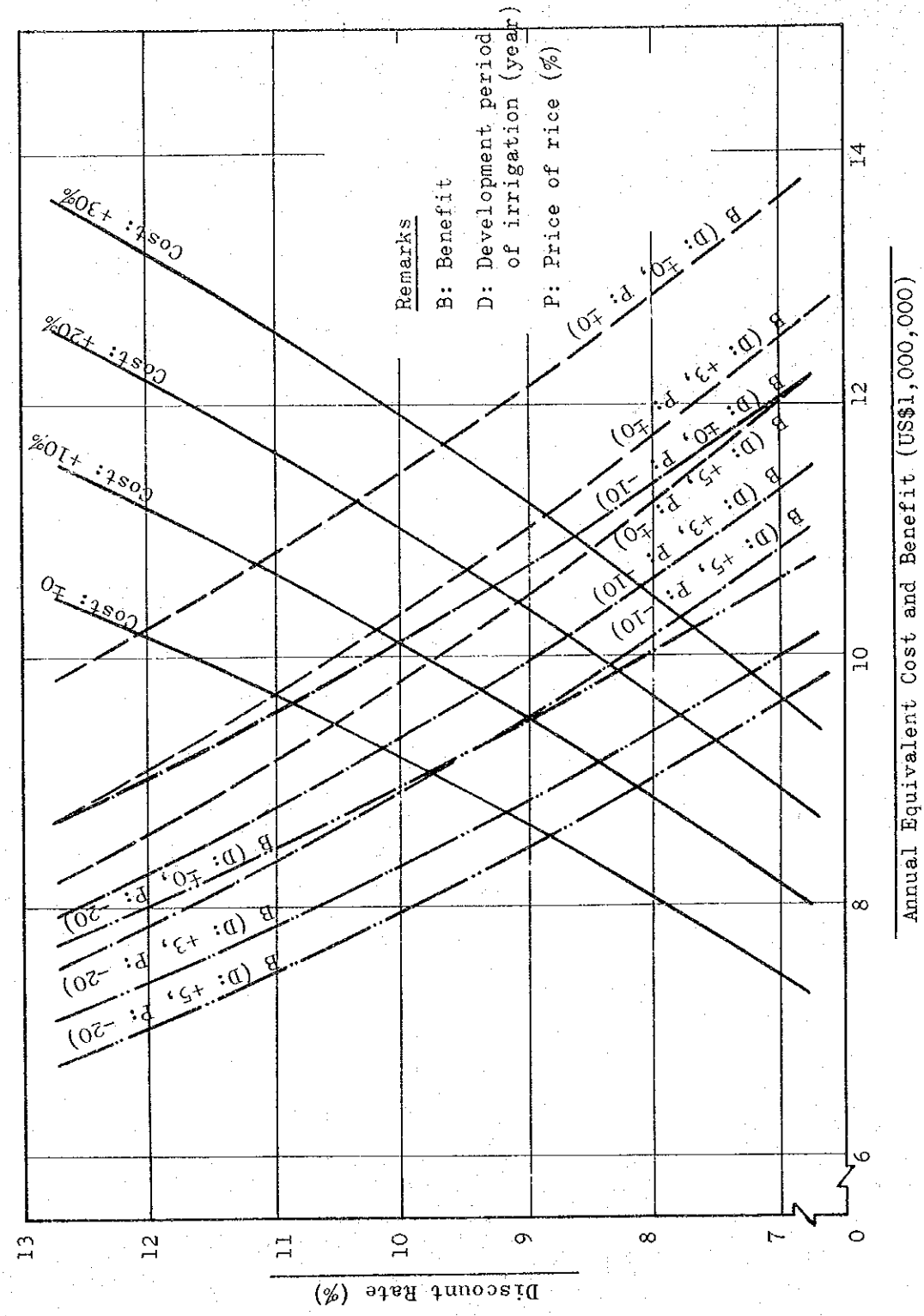
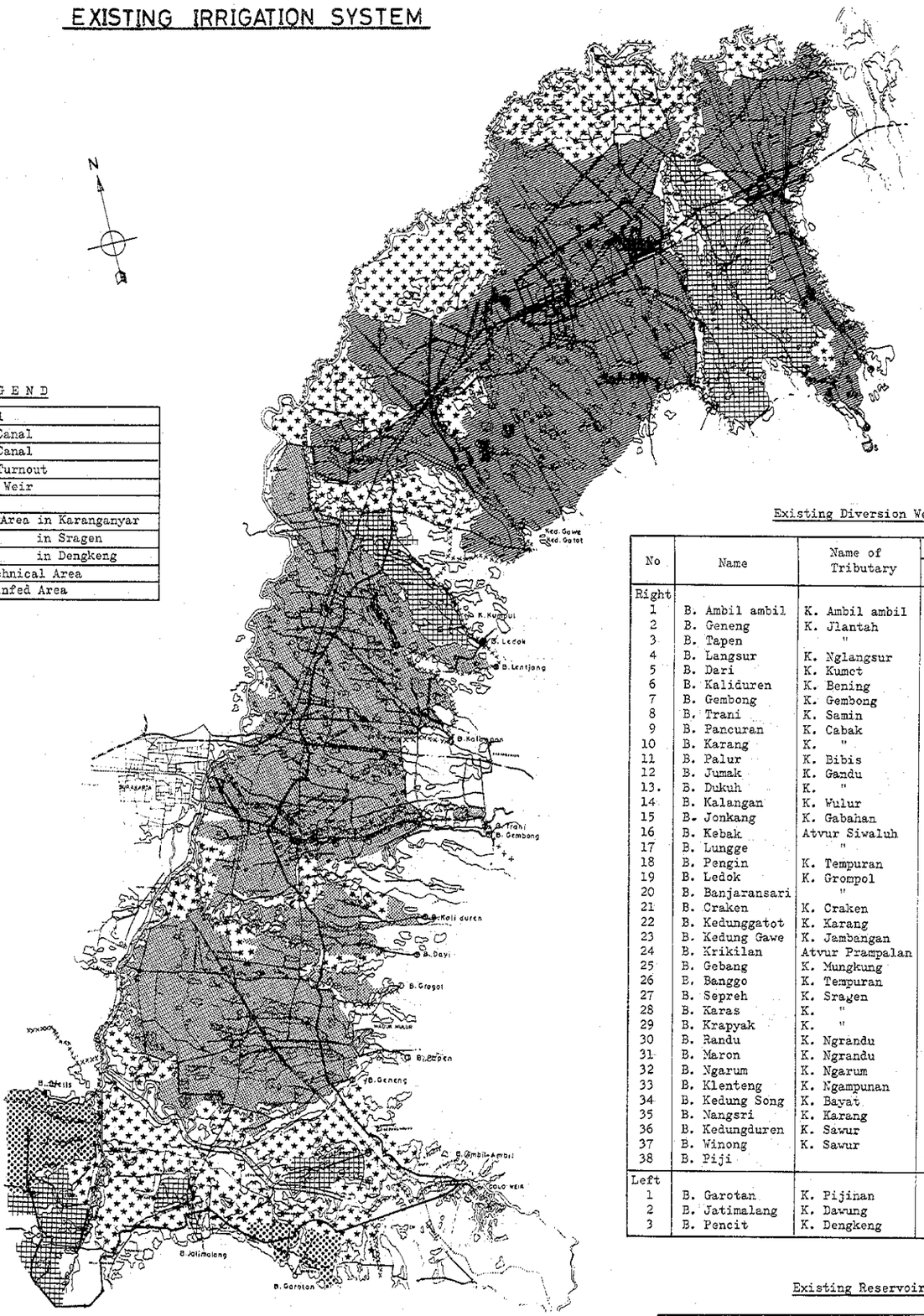


Fig. 21 Estimate of Internal Rate of Return

EXISTING IRRIGATION SYSTEM



LEGEND

———	Main Canal
———	Existing Canal
- - - - -	Proposed Canal
●	" Turnout
○	Diversion Weir
▨	Reservoir
▨	Technical Area in Karanganyar
▨	" in Sragen
▨	" in Dengkeng
▨	Semi – Technical Area
★★★★★	Non or Rainfed Area

SCALE
0 1 2 3 4 5KM

Existing Diversion Weir

No	Name	Name of Tributary	Irrigation Area Wet S. ha	Irrigation Area Dry S. ha
Right				
1	B. Ambil ambil	K. Ambil ambil	223	0
2	B. Geneng	K. Jlantah	760	219
3	B. Tapen	"	Reservier	
4	B. Langsur	K. Nglangsur	Mulur	
5	B. Dari	K. Kumot	331	30
6	B. Kaliduren	K. Bening	570	170
7	B. Gembong	K. Gembong	}	
8	B. Trani	K. Samin	2137	990
9	B. Pancuran	K. Cabak	}	
10	B. Karang	K. "	34	0
11	B. Palur	K. Bibis	45	45
12	B. Jumak	K. Gandu	225	144
13.	B. Dukuh	K. "	283	184
14	B. Kalangan	K. Wulur	1,427	1316
15	B. Jonkang	K. Gabahan	583	284
16	B. Kebak	Atvur Siwaluh	210	129
17	B. Lungge	"	177	145
18	B. Pengin	K. Tempuran	891	482
19	B. Ledok	K. Grompol	204	64
20	B. Banjaransari	"	460	187
21	B. Craken	K. Craken	208	67
22	B. Kedunggatot	K. Karang		
23	B. Kedung Gawe	K. Jambangan	} 2033	599
24	B. Krikilan	Atvur Prampalan		
25	B. Gebang	K. Mungkung	459	162
26	B. Banggo	K. Tempuran	488	113
27	B. Sepreh	K. Sragen	253	80
28	B. Karas	K. "	124	31
29	B. Krapyak	K. "	314	103
30	B. Randu	K. Ngrandu	256	121
31	B. Maron	K. Ngrandu	74	27
32	B. Ngarum	K. Ngarum	603	218
33	B. Klenteng	K. Ngampunan	938	311
34	B. Kedung Song	K. Bayat	212	53
35	B. Nangsri	K. Karang	1344	361
36	B. Kedungduren	K. Sawur		
37	B. Winong	K. Sawur	} 758	145
38	B. Piji			
Left				
1	B. Garotan	K. Pijinan	319	0
2	B. Jatimalang	K. Dawung	235	0
3	B. Pencit	K. Dengkeng	250	0

Existing Reservoir

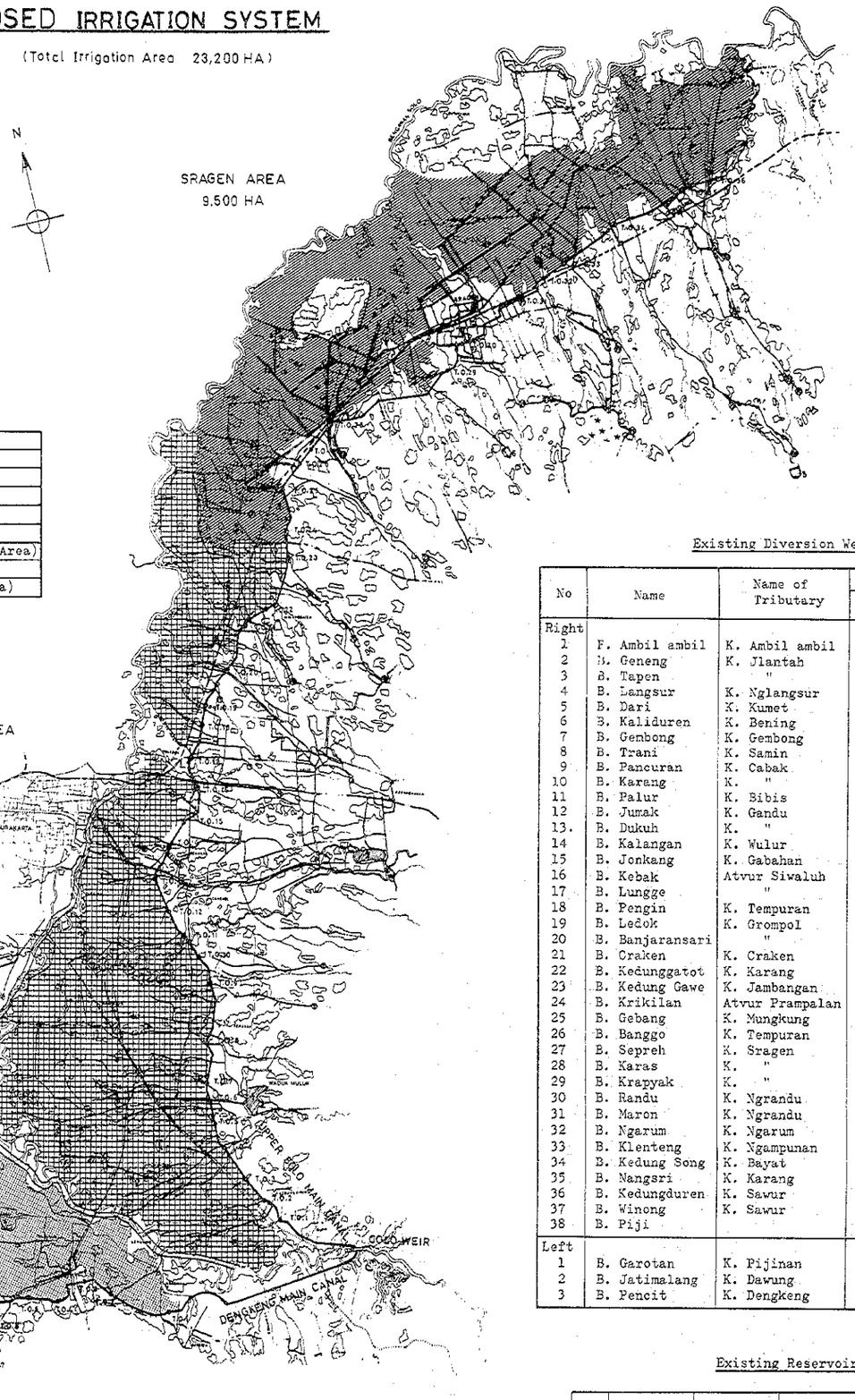
No	Name	Storage Capacity $10^3 m^3$	Reservoir Area ha	Irrigation Area Wet S ha	Irrigation Area Dry S ha
1	Mulur	4,935	100	4,028	1,530
2	Lalung	3,000	65	2,183	1,643
3	Tewel	79.5	3.4	275	71
4	Kebangan	500	13	1,947	1,235
5	Gebyar	701	100	1,727	420
6	Brambang	104	4	709	185

WONOGIRI IRRIGATION AND
UPPER SALA RIVER IMPROVEMENT
INDONESIA
IRRIGATION
EXISTING IRRIGATION SYSTEM

Date : July, 31, 1976 | DWG. NO WI-001

PROPOSED IRRIGATION SYSTEM

(Total Irrigation Area 23,200 HA)



LEGEND

———	Main Canal
———	Existing Canal
- - - - -	Proposed Canal
●	" Turnout
○	Diversion Weir
	Reservoir
	Project Area (Karanganyar Area)
	" (Sragen Area)
	" (Dengkeng Area)

Existing Diversion Weir

No	Name	Name of Tributary	Irrigation Area Wet S. ha	Irrigation Area Dry S. ha
Right				
1	F. Ambil ambil	K. Ambil ambil	223	0
2	B. Geneng	K. Jlantah	760	219
3	B. Tapen	"	Reservier	
4	B. Langsur	K. Nglangsur	Mulur	
5	B. Dari	K. Kumet	331	30
6	B. Kaliduren	K. Bening	570	170
7	B. Gembong	K. Gembong	} 2137	990
8	B. Trani	K. Samin		
9	B. Pancuran	K. Cabak		
10	B. Karang	K. "	} 34	0
11	B. Palur	K. Bibis	45	45
12	B. Jumak	K. Gandu	225	144
13.	B. Dukuh	K. "	283	184
14	B. Kalangan	K. Wulur	1427	1316
15	B. Jonkang	K. Gabahan	583	284
16	B. Kebak	Atvur Siwaluh	210	129
17	B. Lungge	"	177	145
18	B. Pengin	K. Tempuran	891	482
19	B. Ledok	K. Grompol	204	64
20	B. Banjaransari	"	460	187
21	B. Craken	K. Craken	208	67
22	B. Kedunggatot	K. Karang	} 2033	599
23	B. Kedung Gawe	K. Jambangan		
24	B. Krikilan	Atvur Prampalan		
25	B. Gebang	K. Mungkung	459	162
26	B. Banggo	K. Tempuran	488	113
27	B. Sepreh	K. Sragen	253	80
28	B. Karas	K. "	124	31
29	B. Krapyak	K. "	314	103
30	B. Randu	K. Ngrandu	256	121
31	B. Maron	K. Ngrandu	74	27
32	B. Ngarum	K. Ngarum	603	218
33	B. Klenteng	K. Ngampunan	938	311
34	B. Kedung Song	K. Bayat	212	53
35	B. Nangsri	K. Karang	1344	361
36	B. Kedungduren	K. Sawur	} 758	145
37	B. Winong	K. Sawur		
38	B. Piji			
Left				
1	B. Garotan	K. Pijinan	319	0
2	B. Jatimalang	K. Dawung	235	0
3	B. Pencit	K. Dengkeng	250	0

Existing Reservoir

No	Name	Storage Capacity 10^3 m3	Reservoir Area ha	Irrigation Area Wet S ha	Irrigation Area Dry S ha
1	Mulur	4,935	100	4,028	1,530
2	Lalung	3,000	65	2,183	1,643
3	Tewel	79.5	3.4	275	71
4	Kebangan	500	13	1,947	1,235
5	Gebyar	701	100	1,727	420
6	Brambang	104	4	709	185

WONOGIRI IRRIGATION AND
UPPER SALA RIVER IMPROVEMENT
INDONESIA
IRRIGATION
PROPOSED IRRIGATION SYSTEM

Date July. 31. 1976 | DWG NO. WI-002

GENERAL LAYOUT OF COLO WEIR

S = 1 : 1.000

Upper Sala Main Canal Works

Dengkeng Main Canal Works

Measuring Weir

Wet Stone Pitching

Blow Out

Intake

Sand Flush

Fore Apron

Rear Apron

Rip Rap

Flow

B

B

A

A

SECTION(B-B)

SECTION(A-A)

PROFILE

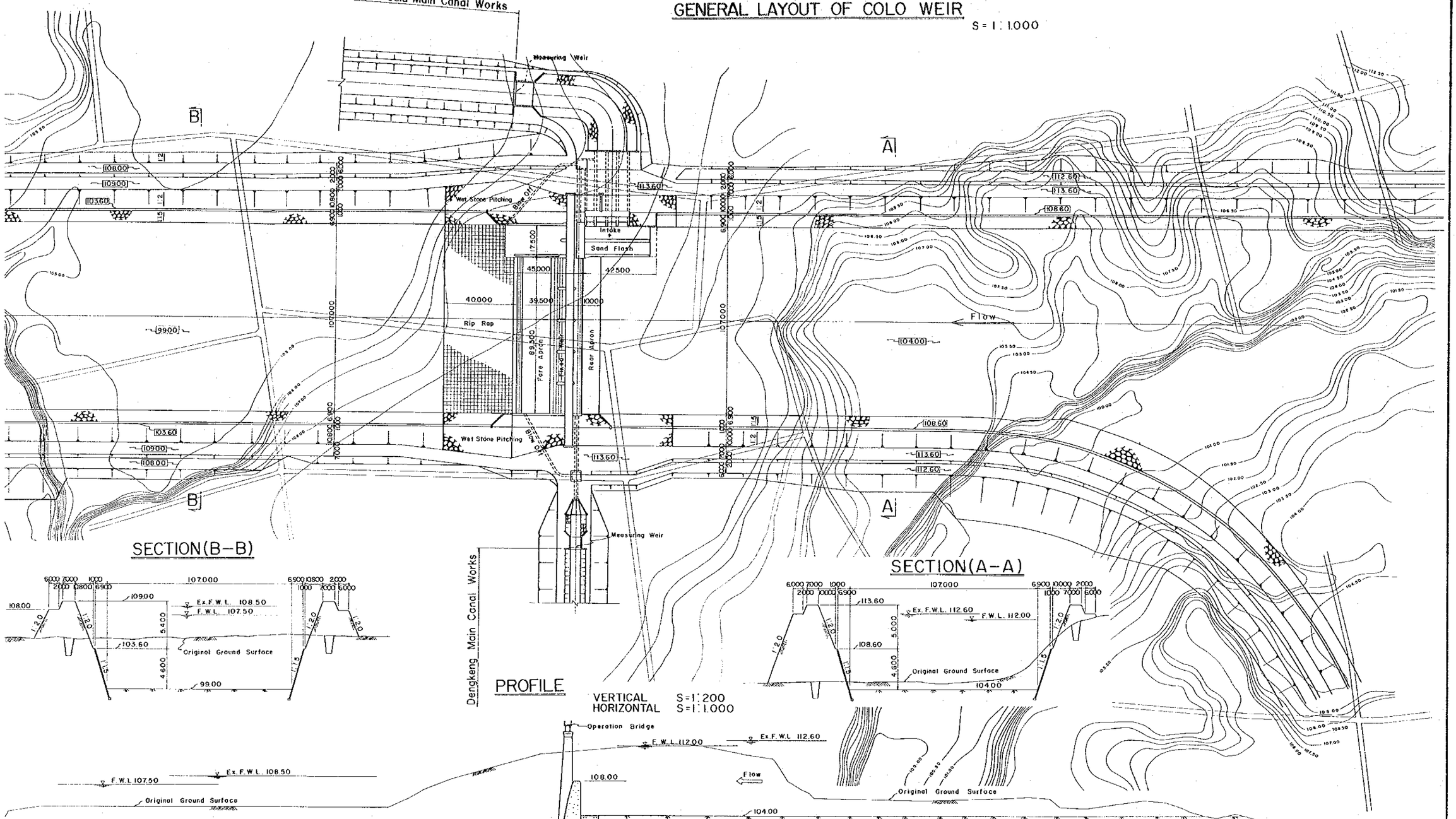
VERTICAL S=1:200
HORIZONTAL S=1:1.000

Ex.F.W.L. 108.50
F.W.L 107.50
Original Ground Surface
Ex.F.W.L. 112.60
F.W.L. 112.00
Operation Bridge
Rip Rap

0 50 100m

GENERAL LAYOUT OF COLO WEIR

S = 1 : 1.000

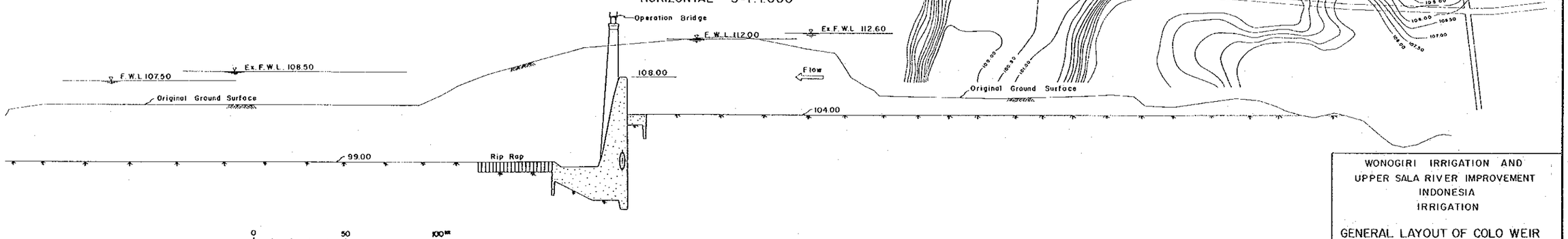


SECTION(B-B)

SECTION(A-A)

PROFILE

VERTICAL S=1:200
HORIZONTAL S=1:1.000

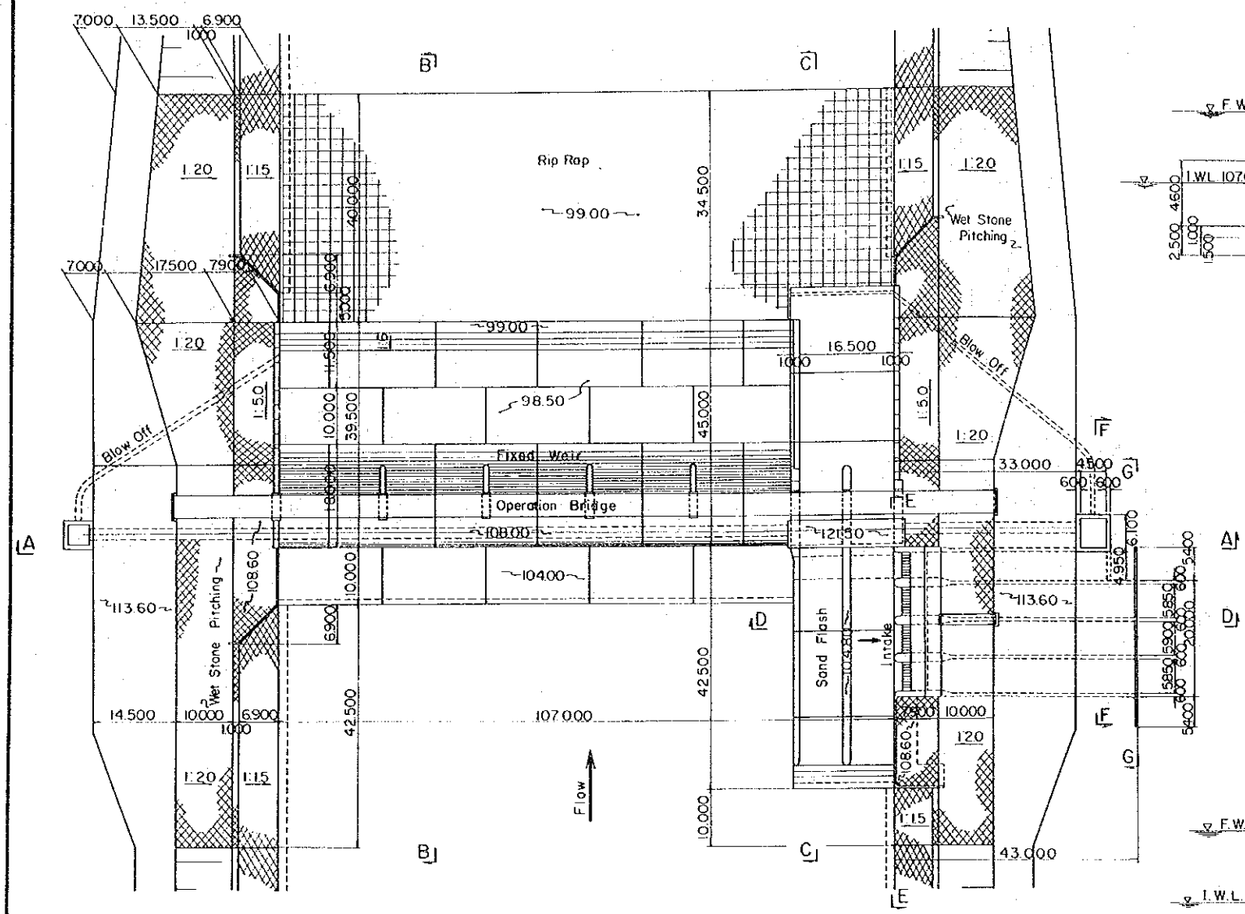


WONOGIRI IRRIGATION AND
UPPER SALA RIVER IMPROVEMENT
INDONESIA
IRRIGATION

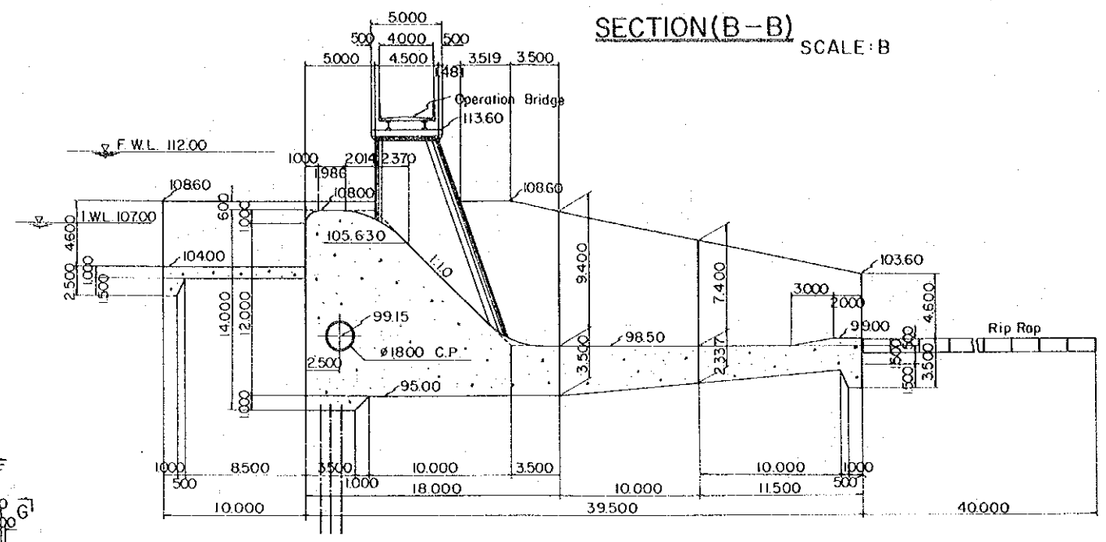
GENERAL LAYOUT OF COLO WEIR

Date : July. 31. 1976 | D.W.G. NO. WI-003

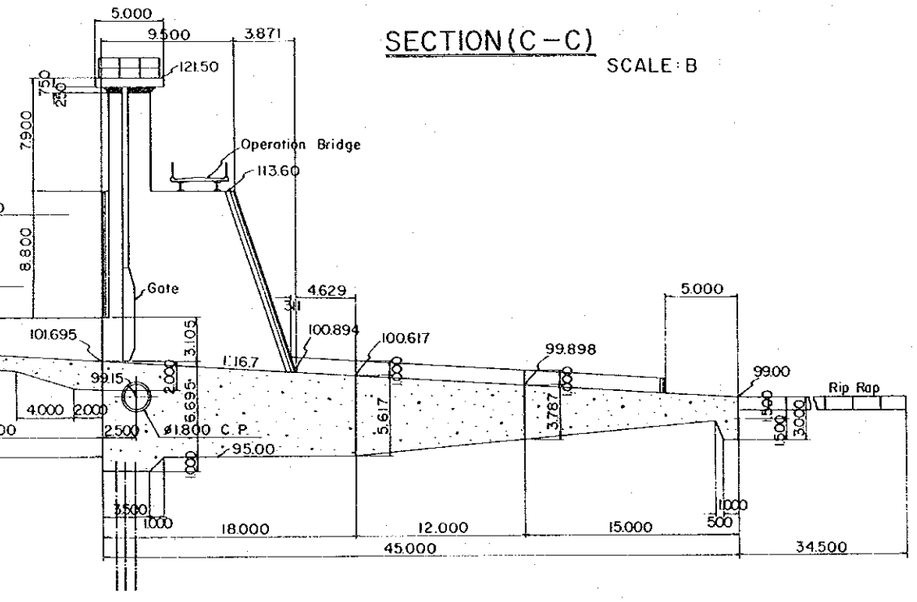
PLAN
SCALE : A



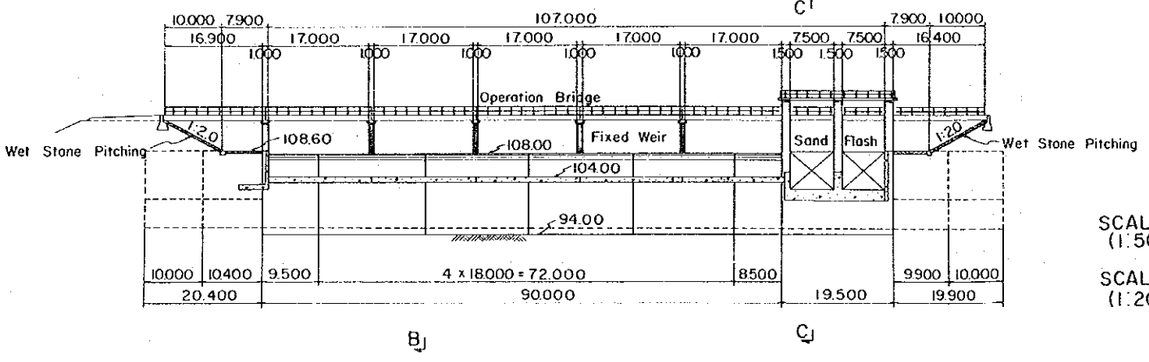
SECTION(B-B)
SCALE : B



SECTION(C-C)
SCALE : B



SECTION(A-A)
SCALE : A



SCALE : A (1:500)

SCALE : B (1:200)

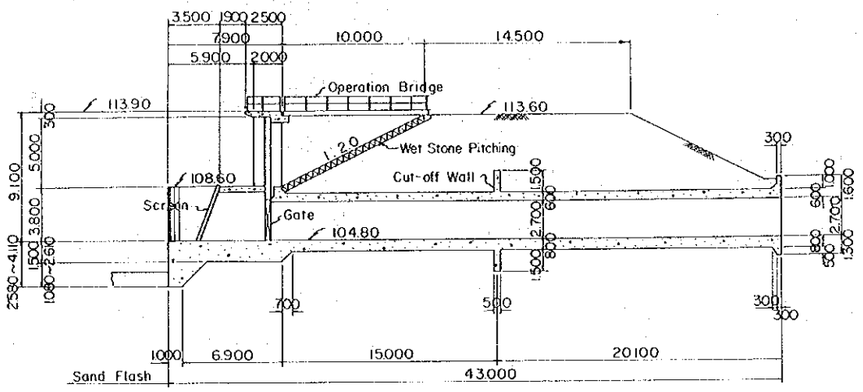
WONOGIRI IRRIGATION AND UPPER SALA RIVER IMPROVEMENT INDONESIA IRRIGATION

COLO WEIR

Date : July. 31. 1976 | D.WG NO. WI - 004

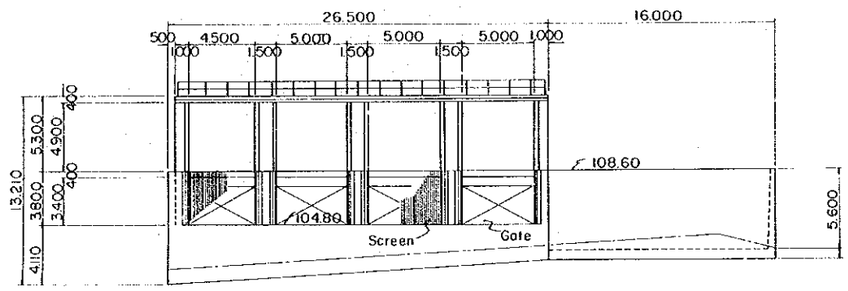
SECTION(D-D)

SCALE: B



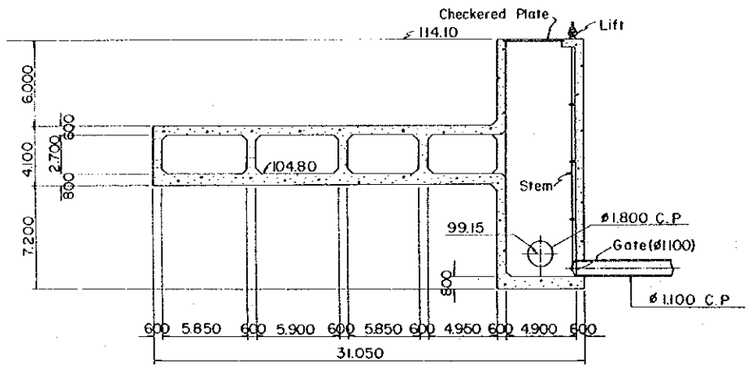
SECTION(E-E)

SCALE: B



SECTION(F-F)

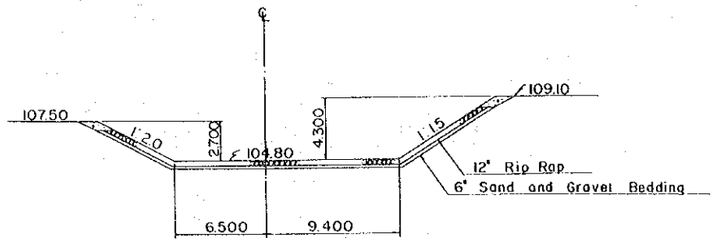
SCALE: B



RIGHT SIDE TRANSITION

SCALE: B

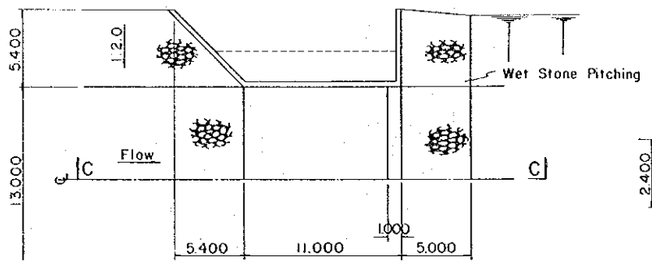
TALE FLONT



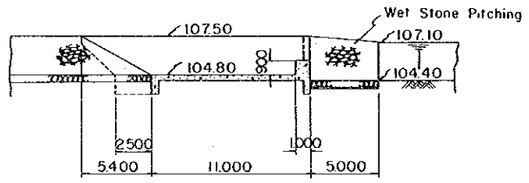
RIGHT SIDE MEASURING WEIR

PLAN

SCALE: B



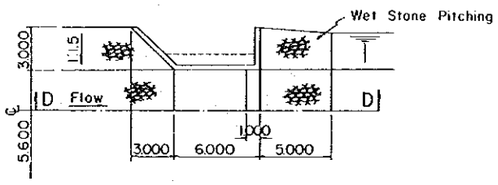
C - C



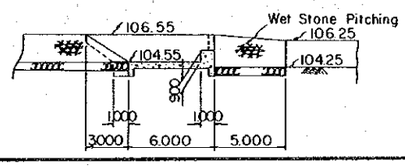
LEFT SIDE MEASURING WEIR

PLAN

SCALE: B



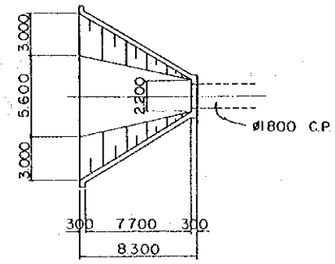
D - D



LEFT SIDE TRANSITION

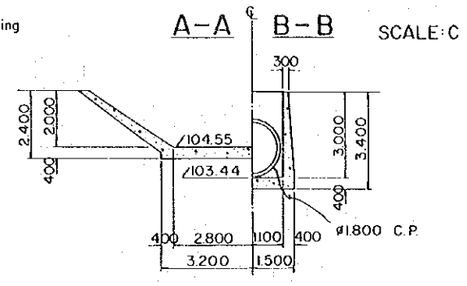
PLAN

SCALE: B



A-A B-B

SCALE: C



SCALE: B (1:200) 0 5 10 m

SCALE: C (1:100) 0 5 m

WONOGIRI IRRIGATION AND
UPPER SALA RIVER IMPROVEMENT
INDONESIA
IRRIGATION

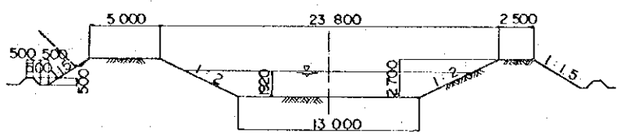
COLO WEIR

Date : July. 31. 1976 | D.W.G. NO. W1-005

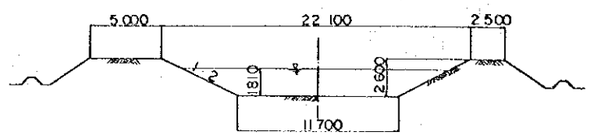
PROFILE OF UPPER SALA MAIN CANAL (I)

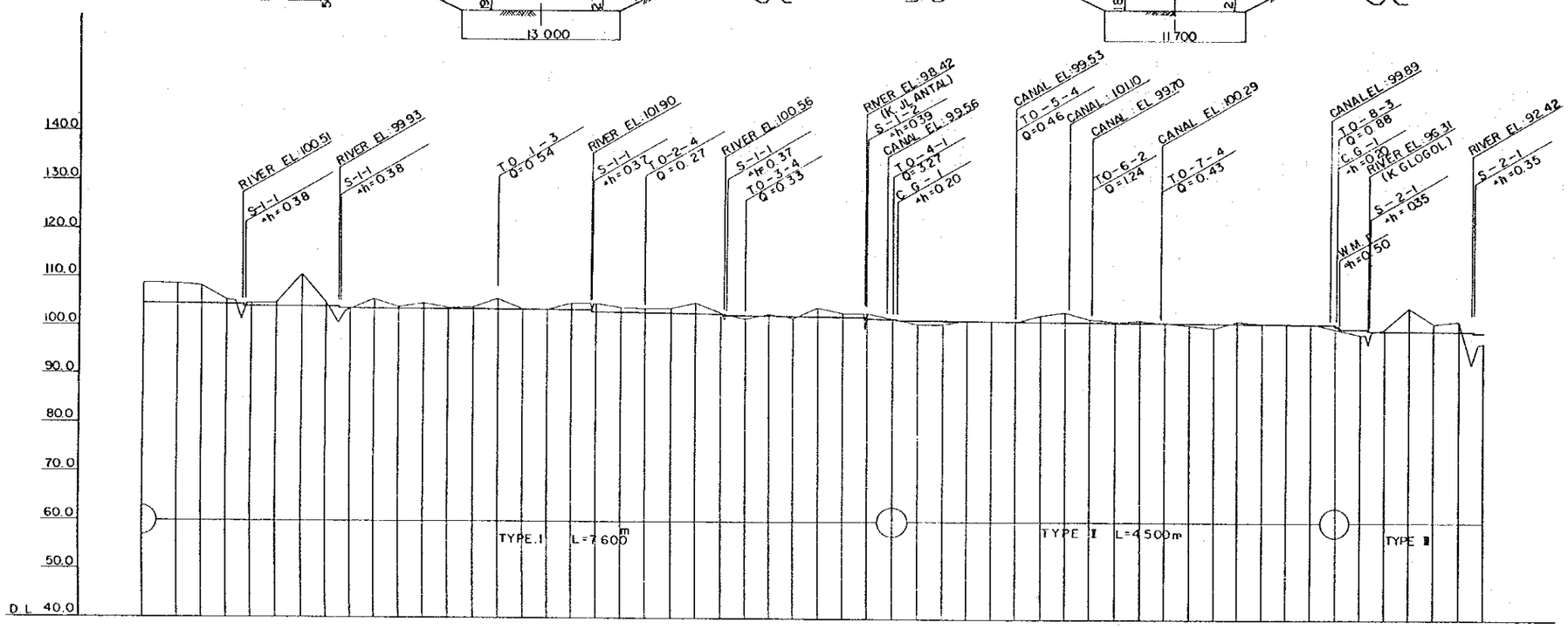
SCALE A

TYPE I SCALE B



TYPE II SCALE B





LEGEND

- T.O Turnout
- A Aqueduct
- S Siphon
- C.G Check Gate
- C Culvert
- WMF Water Measurement Facility

Station No	Dist	Accum Dist	Ground Elev	Bottom of Canal Surf	Water Surf	Top Bank	Hight of Embar	Depth of Ex.cd	Grade
-600	0	0	10834	10440	10632	10710		3.94	10440
-250	350	350	10836	10434				4.02	
NO.1	250	600	10780	10430				3.50	
-750	"	850	10500	10426				0.74	
-500	"	1100	10418	10385				0.33	
-250	"	1350	10412	10381				0.31	
NO.0	"	1600	10333	10377				6.56	
+250	"	1850	10406	10372				0.36	
+500	"	2100	10330	10331			0.01		
+750	"	2350	10507	10327				1.80	
NO.1	"	2600	10330	10323				0.07	
+250	"	2850	10435	10319				1.16	
+500	"	3100	10333	10315				0.18	
+750	"	3350	10330	10311				0.19	
NO.2	"	3600	10527	10306	10486			2.21	6000
+250	"	3850	10350	10302				0.48	
+500	"	4100	10270	10298			0.28		
+750	"	4350	10416	10294				1.22	
NO.3	"	4600	10422	10254				1.68	
+250	"	4850	10324	10250				0.74	
+500	"	5100	10293	10246	10435			0.47	
+750	"	5350	10339	10241				0.98	
NO.4	"	5600	10446	10237				2.09	
+250	"	5850	10219	10233			0.14		
+500	"	6100	10104	10193	10380		0.89		
+750	"	6350	10184	10189			0.05		
NO.5	"	6600	10139	10185			0.46		
+250	"	6850	10360	10181				1.79	
+500	"	7100	10231	10176				0.55	
+750	"	7350	10230	10135				0.95	6000
NO.6	"	7600	10104	10131	10318	10401	0.27	0.27	
+250	"	7850	10222	10111	10292	10371	0.85		
+500	"	8100	10228	10103			0.75		
+750	"	8350	10080	10099			0.19		
NO.7	"	8600	10074	10095			0.21		
+250	"	8850	10080	10090	10269		0.10		
+500	"	9100	10209	10086				1.22	
+750	"	9350	10280	10082				1.98	
NO.8	"	9600	10136	10078	10250			0.60	6000
+250	"	9850	10085	10074				0.11	
+500	"	10100	10096	10070				0.26	
+750	"	10350	10044	10065	10135		0.21		
NO.9	"	10600	10020	10061			0.41		
+250	"	10850	9980	10057			0.77		
+500	"	11100	10061	10053				0.08	
+750	"	11350	10072	10049				0.23	
NO.10	"	11600	10051	10045				0.06	
+250	"	11850	10037	10040			0.03		
+500	"	12100	9962	10036	10206	10256	0.74	0.26	
+750	"	12350	9848	10016	10186	10261	1.14		
NO.11	"	12600	9950	9962				4.80	
+250	"	12850	10400	9924					
+500	"	13100	9916	9920				1.77	
+750	"	13350	10145	9912				2.33	
NO.12	"	13600	9678	9873	10043	10181	1.95		

SCALE A

HORIZONTAL 0m 500 1000 1500

VERTICAL 0m 10 20

SCALE B

0m 5 10

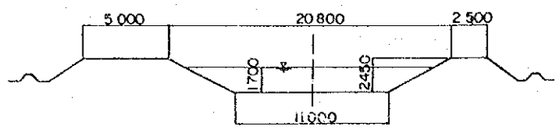
WONOGIRI IRRIGATION AND UPPER SALA RIVER IMPROVEMENT
INDONESIA
IRRIGATION
PROFILE & CROSS-SECTION OF UPPER SALA MAIN CANAL (I)

Date July. 31. 1976 | D.W.G. NO WI-006

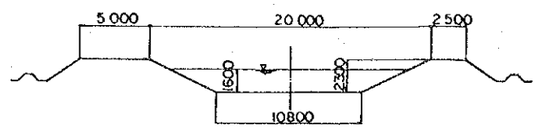
PROFILE OF UPPER SALA MAIN CANAL (2)

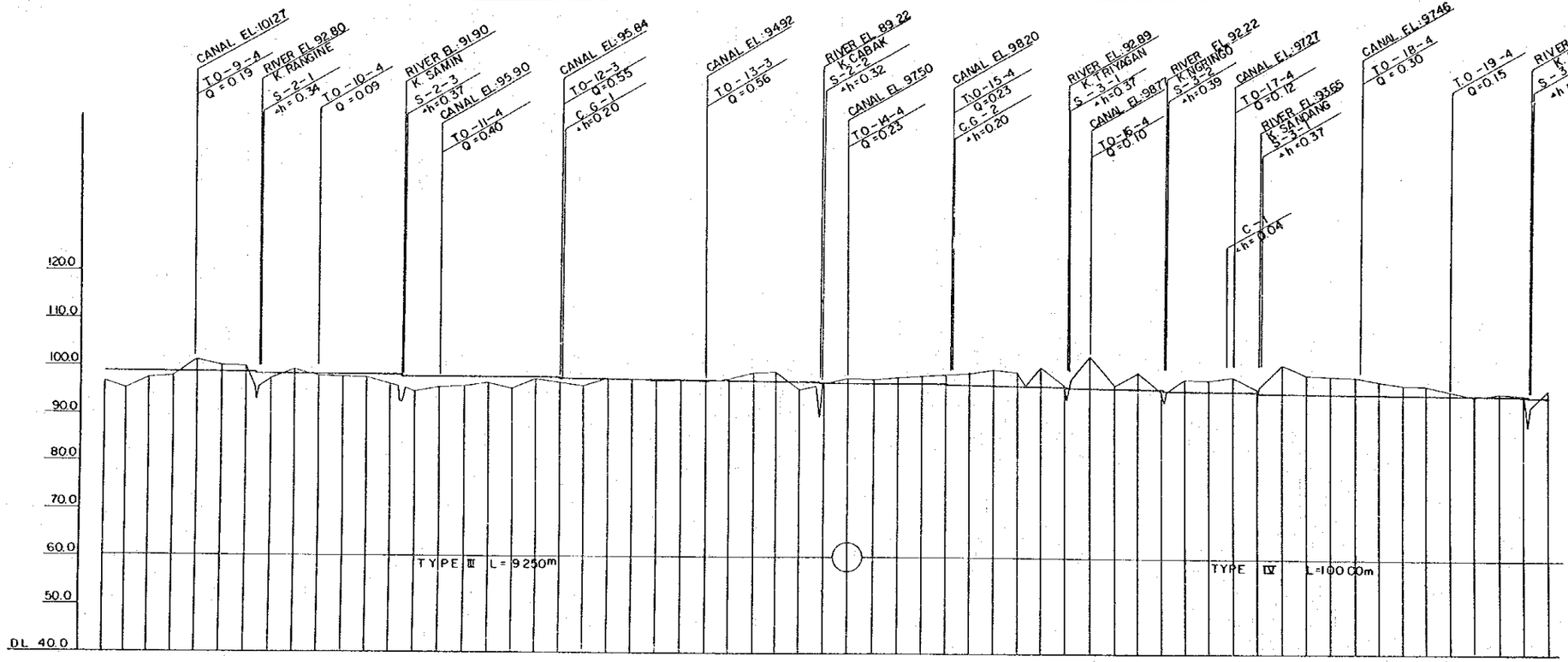
SCALE A

TYPE III SCALE B



TYPE IV SCALE B





Station No	Dist	Accum Dist	Ground Elev	Bottom of Canal	Water Surf	Top Bank	Hight of Embar	Depth of Exca	Grade
NO.12	0	13600	96.78	98.73	100.43	101.18	1.95		
+250	250	13850	95.18	98.69			3.51		
+500	"	14100	97.50	98.65			1.15		
+750	"	14350	97.80	98.61			0.81		
NO.13	"	14600	101.29	98.57	100.26			2.66	
+250	"	14850	99.98	98.53				1.45	
+500	"	15100	99.86	98.48				1.38	
+750	"	15350	97.27	98.11			0.84		
NO.14	"	15600	99.16	98.07			0.89	1.09	
+250	"	15850	97.84	98.03	99.72		0.19		
+500	"	16100	97.61	97.99			0.38		
+750	"	16350	97.48	97.95			0.47		
NO.15	"	16600	96.13	97.91			1.78		
+250	"	16850	94.50	97.51			3.01		
+500	"	17100	95.50	97.47	99.14		1.97		
+750	"	17350	95.60	97.42			1.82		
NO.16	"	17600	96.32	97.38			1.06		
+250	"	17850	96.07	97.34			1.27		
+500	"	18100	97.07	97.30			0.23		
+750	"	18350	96.43	97.26	98.93		0.83		
NO.17	"	18600	95.72	97.06	98.69		1.30		
+250	"	18850	97.07	97.02				0.09	
+500	"	19100	97.15	96.98				0.21	
+750	"	19350	96.60	96.94			0.29		
NO.18	"	19600	96.78	96.89			0.07		
+250	"	19850	96.50	96.85			0.31		
+500	"	20100	97.09	96.81	98.41			0.32	
+750	"	20350	98.52	96.77				1.79	
NO.19	"	20600	98.61	96.73				1.92	
+250	"	20850	94.92	96.69			1.72		
+500	"	21100	96.23	96.64			0.06		
+750	"	21350	97.42	96.29		96.70		1.17	
NO.20	"	21600	97.12	96.25	97.85	98.55		0.91	
+250	"	21850	97.55	96.21				1.38	
+500	"	22100	97.73	96.17				1.60	
+750	"	22350	98.04	96.13				1.96	
NO.21	"	22600	98.29	96.08	97.68			2.45	
+250	"	22850	99.07	96.04	97.46			3.27	
+500	"	23100	98.63	95.98				2.87	
+750	"	23350	99.78	95.92				4.06	
NO.22	"	23600	95.91	95.88				0.23	
+250	"	23850	101.90	95.84	96.85			6.62	
+500	"	24100	99.91	95.80				0.67	
+750	"	24350	98.74	95.76				3.55	
NO.23	"	24600	94.60	95.72			0.55		
+250	"	24850	97.19	95.68				2.46	
+500	"	25100	97.13	95.64				2.44	
+750	"	25350	97.81	94.61	96.17			3.20	
NO.24	"	25600	95.00	94.57				0.43	
+250	"	25850	100.16	94.17				5.99	
+500	"	26100	98.23	94.13				4.10	
+750	"	26350	98.00	94.09				3.91	
NO.25	"	26600	97.75	94.04	95.59			3.71	
+250	"	26850	96.77	94.00				2.77	
+500	"	27100	96.08	93.96				2.12	
+750	"	27350	95.85	93.92				1.93	
NO.26	"	27600	94.81	93.88	95.42			0.93	
+250	"	27850	93.75	93.84					
+500	"	28100	94.40	93.79				0.09	
+750	"	28350	94.10	93.74				0.61	
NO.27	"	28600	95.10	93.34	94.62	95.64		0.36	
								1.76	

SCALE A

HORIZONTAL 0m 500 1000 1500

VERTICAL 0m 10 20

SCALE B

0m 5 10

WONOGIRI IRRIGATION AND UPPER SALA RIVER IMPROVEMENT INDONESIA

IRRIGATION

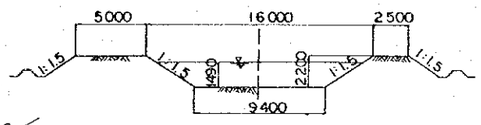
PROFILE & CROSS-SECTION OF UPPER SALA MAIN CANAL (2)

Date : July 31 1976 | D.W.G NO WI. 007

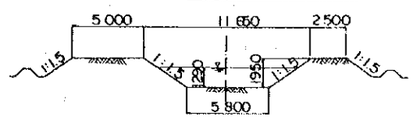
PROFILE OF UPPER SALA MAIN CANAL (3)

SCALE A

TYPE V SCALE B



TYPE VI SCALE B



Station No.	Dist.	Accum. Dist.	Ground Elev.	Bottom of Canal	Water Surf.	Top Bank	Hight of Embn.	Depth of Exca.	Grade
NO.27	0	28600	95.10	93.34	94.62	95.64		1.76	1/6000
+250	250	28650	96.60	93.29				3.31	
+500	"	29100	96.00	93.25				2.75	
+750	"	29350	97.40	93.17				4.23	
NO.28	"	29600	96.19	93.13	94.62			3.06	
+250	"	29850	96.85	93.05				3.80	
+500	"	30100	93.37	93.01				0.36	
+750	"	30350	94.14	92.63				1.51	
NO.29	"	30600	94.63	92.59				2.04	
+250	"	30850	91.90	92.55			0.65		
+500	"	31100	92.50	92.47			0.03		
+750	"	31350	93.40	92.43	93.92	94.73		0.97	
NO.30	"	31600	92.37	91.69	93.72	94.43		0.68	
+250	"	31850	91.92	91.62			0.09	0.30	
+500	"	32100	92.03	91.58				0.45	
+750	"	32350	91.26	91.35			0.19		
NO.31	"	32600	91.50	91.31	92.79		0.02		
+250	"	32850	91.24	91.26			4.31		
+500	"	33100	86.71	91.02				0.81	
+750	"	33350	91.79	90.98			1.15		
NO.32	"	33600	89.78	90.93			4.00		
+250	"	33850	86.89	90.89			0.10		
+500	"	34100	90.56	90.66				1.12	
+750	"	34350	91.74	90.62			0.45		
NO.33	"	34600	91.02	90.57			0.07		
+250	"	34850	90.60	90.53	91.96			1.05	
+500	"	35100	91.53	90.48					1/5500
+750	"	35350	90.10	90.43			0.33		
NO.34	"	35600	88.15	90.39			2.24		
+250	"	35850	87.30	90.34			3.04		
+500	"	36100	87.55	90.30	91.72		2.75		
+750	"	36350	89.40	90.25			0.85		
NO.35	"	36600	89.92	90.21			3.29		
+250	"	36850	91.50	89.99				1.51	
+500	"	37100	91.40	89.96				1.45	
+750	"	37350	90.20	89.90				0.30	
NO.36	"	37600	84.60	89.86			5.26		
+250	"	37850	87.70	89.63	91.04		1.93		
+500	"	38100	89.30	89.58			0.28		
+750	"	38350	92.70	89.53				3.17	
NO.37	"	38600	93.56	89.49				4.07	
+250	"	38850	95.13	89.44				5.69	
+500	"	39100	93.00	89.40	90.80			3.60	
+750	"	39350	95.28	89.35				5.93	
NO.38	"	39600	94.06	89.31				4.75	
+250	"	39850	94.28	89.26	90.60			5.02	
+500	"	40100	95.18	89.22				5.96	
+750	"	40350	95.00	89.17				5.83	
NO.39	"	40600	94.49	89.13				5.36	
+250	"	40850	92.84	89.08				3.76	
+500	"	41100	91.50	89.02				2.48	
+750	"	41350	90.50	88.97	90.31	91.17		1.53	1/6000
NO.40	"	41600	90.00	88.77	90.06	90.72		1.69	
+250	"	41850	90.06	88.31				1.95	
+500	"	42100	91.60	88.05				3.55	
+750	"	42350	87.90	87.98			0.08		
NO.41	"	42600	90.04	87.80				2.24	
+250	"	42850	90.50	87.74				2.76	
+500	"	43100	87.89	87.67				0.22	
+750	"	43350	90.21	87.61				2.60	
NO.42	"	43600	90.19	87.55	88.84	89.50		2.64	

LEGEND

- T.O — Turnout
- A — Aqueduct
- S — Siphon
- C.G — Check Gate
- C — Culvert
- W.M.F — Water Measurement Facility

SCALE A

HORIZONTAL 0m 500 1000 1500

VERTICAL 0m 10 20

SCALE B

0m 5 10

WONOGIRI IRRIGATION AND UPPER SALA RIVER IMPROVEMENT INDONESIA

IRRIGATION

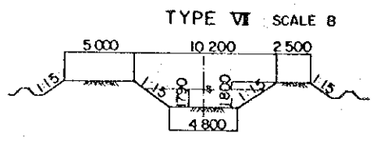
PROFILE & CROSS-SECTION OF UPPER SALA MAIN CANAL (3)

Date : July, 31 1976 | D.W.G. NO WI-008

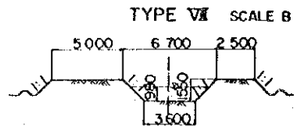
PROFILE OF UPPER SALA MAIN CANAL (4)

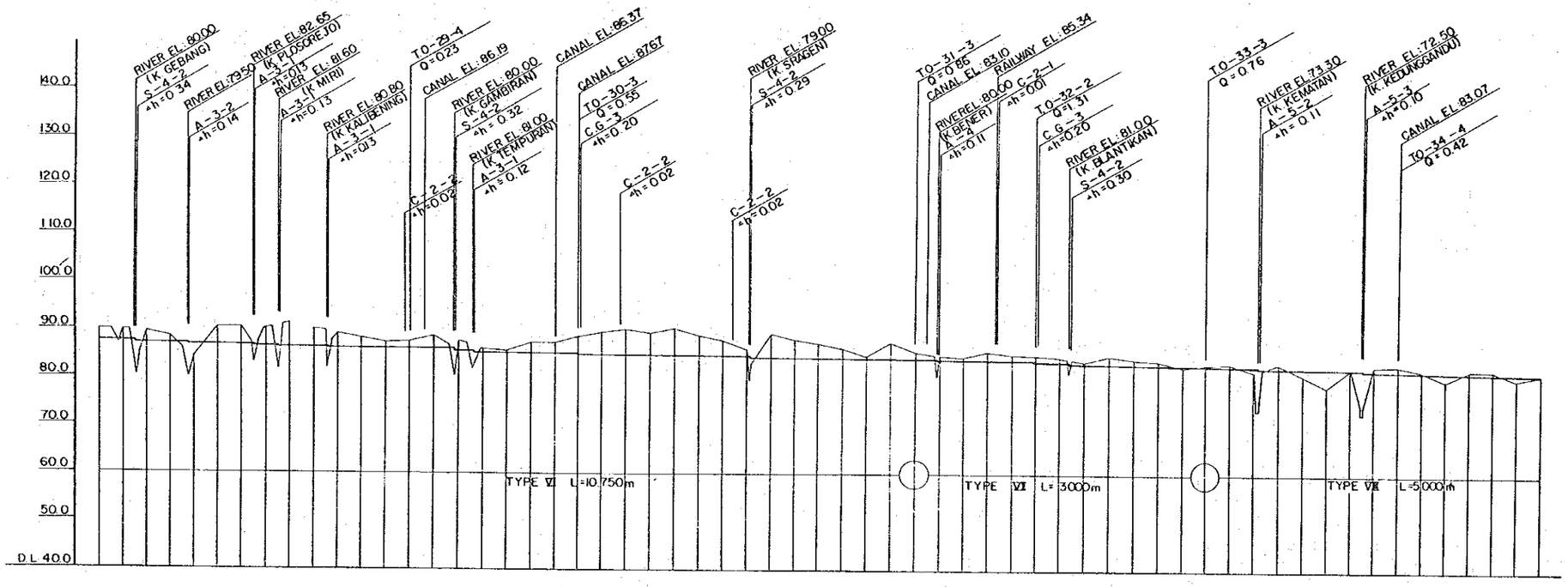
SCALE A

TYPE VI SCALE B



TYPE VII SCALE B





LEGEND

- T.O — Turnout
- A — Aqueduct
- S — Siphon
- C.G — Check Gate
- C — Culvert
- W.M.F — Water Measurement Facility

Station No	Dist	Accum Dist	Ground Elev.	Bottom of Canal	Water Surf.	Top Bank	Height of Embn.	Depth of Exca.	Grade
NO42	0	43600	90.19	87.55	88.84	89.50		2.64	
+250	250	43850	90.00	87.49				2.51	
+500	"	44100	89.50	87.10				2.40	
+750	"	44350	88.35	87.03			2.35	1.32	
NO43	"	44600	89.50	86.85				3.64	
+250	"	44850	90.43	86.79				3.78	
+500	"	45100	90.50	86.72				3.46	
+750	"	45350	90.00	86.54				5.08	
NO44	"	45600	91.44	86.36	87.65			3.80	
+250	"	45850	90.10	86.30				3.05	
+500	"	46100	89.20	86.15				2.35	
+750	"	46350	88.41	86.06				1.34	
NO45	"	46600	87.34	86.00				1.63	
+250	"	46850	87.55	85.92	87.18			2.88	
+500	"	47100	87.85	85.86				2.59	
+750	"	47350	88.08	85.49				0.64	
NO46	"	47600	85.96	85.32				0.39	
+250	"	47850	85.65	85.26				2.15	
+500	"	48100	87.34	85.19				2.14	
+750	"	48350	87.27	85.13				3.57	
NO47	"	48600	88.64	85.07	86.33			4.72	
+250	"	48850	89.53	84.97	86.06			5.27	
+500	"	49100	90.00	84.81				4.72	
+750	"	49350	89.39	84.67				5.64	
NO48	"	49600	90.25	84.61				4.38	
+250	"	49850	88.92	84.54				3.37	
+500	"	50100	87.85	84.48				1.49	
+750	"	50350	85.89	84.40				5.24	
NO49	"	50600	89.30	84.06				4.00	
+250	"	50850	88.00	84.00				3.18	
+500	"	51100	87.12	83.94				2.20	
+750	"	51350	86.08	83.88				0.85	
NO50	"	51600	84.66	83.81				3.54	
+250	"	51850	87.29	83.75				1.70	1/8360
+500	"	52100	85.39	83.69	84.88	85.64		1.16	
+750	"	52350	84.60	83.44		85.49		0.83	
NO51	"	52600	84.30	83.47				2.03	
+250	"	52850	85.43	83.40				1.48	
+500	"	53100	84.82	83.34				1.42	
+750	"	53350	84.70	83.28	84.47			1.25	
NO52	"	53600	84.27	83.02	84.06			0.70	
+250	"	53850	83.37	82.67				1.95	
+500	"	54100	84.55	82.60				1.34	
+750	"	54350	83.86	82.54				1.06	
NO53	"	54600	83.54	82.48				0.48	1/8235
+250	"	54850	82.30	82.42			0.12	0.87	
+500	"	55100	82.83	82.35	83.33	84.15		0.96	
+750	"	55350	83.15	82.28		83.90		0.32	
NO54	"	55600	81.40	82.21				1.05	
+250	"	55850	83.00	82.04				1.16	
+500	"	56100	80.59	81.97				0.23	
+750	"	56350	78.30	81.90				0.61	
NO55	"	56600	82.15	81.83				0.47	
+250	"	56850	82.72	81.67				0.20	
+500	"	57100	82.76	81.60	82.48				
+750	"	57350	81.76	81.53					
NO56	"	57600	79.84	81.46					
+250	"	57850	82.00	81.39					
+500	"	58100	81.78	81.31					
+750	"	58350	80.10	81.24					
NO57	"	58600	81.37	81.17	82.05	82.72		0.20	

SCALE A

HORIZONTAL 0m 500 1000 1500

VERTICAL 0m 10 20

SCALE B

0m 5 10

WONOGIRI IRRIGATION AND UPPER SALA RIVER IMPROVEMENT INDONESIA

IRRIGATION

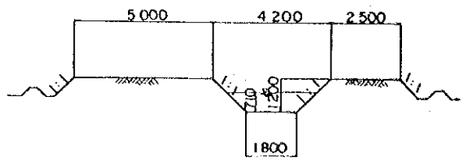
PROFILE & CROSS-SECTION OF UPPER SALA MAIN CANAL (4)

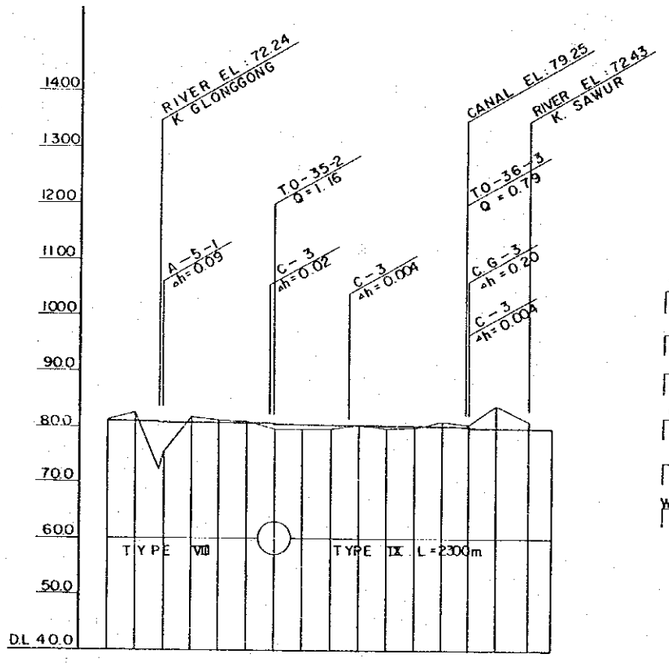
Date : July. 31 1976 | D.W.G. NO WI - 009

PROFILE OF UPPER SALA MAIN CANAL (5)

SCALE A

TYPE IX SCALE B





Station No.	Dist	Accum Dist	Ground Elev	Bottom of Canal	Water Surf	Top Bank	Hight of Embar	Depth of Exca	Grow
NO.57	0	58600	81.37	81.17	82.05	82.72		0.20	
+250	250	58610	82.56	81.10				1.46	
+500	"	59100	75.61	80.95			5.34		
+750	"	59350	81.87	80.88				0.99	
NO.58	"	59600	81.27	80.81				0.46	
+250	"	59850	81.17	80.74	81.53	82.20	0.98	0.43	80.65
+500	"	60100	79.67	80.65	81.36	81.85			
+750	"	60350	79.68	80.57			0.89		
NO.59	"	60600	79.82	80.48			0.66		
+250	"	60850	80.40	80.40			0.		
+500	"	61100	79.81	80.32			0.51		
+750	"	61350	80.08	80.23			0.15		
NO.60	"	61600	81.07	80.15				0.92	
+250	"	61850	80.31	80.07	80.78			0.24	
+500	"	62100	83.87	79.79	80.58			4.08	
+800	300	62400	81.00	79.69	80.40	80.89		1.31	79.98

3 000

LEGEND

- TO — Turnout
- A — Aqueduct
- S — Siphon
- CG — Check Gate
- C — Culvert
- W.M.F — Water Measurement Facility

SCALE A

HORIZONTAL: 0m 500 1000 1500

VERTICAL: 0m 10 20

SCALE B

0m 5

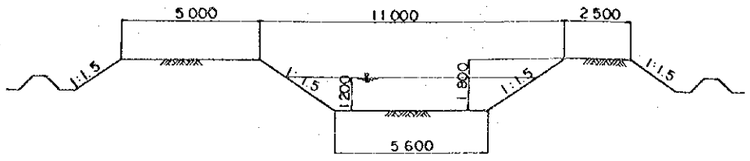
WONOGIRI IRRIGATION AND UPPER SALA RIVER IMPROVEMENT
INDONESIA
IRRIGATION
PROFILE & CROSS-SECTION OF UPPER SALA MAIN CANAL (5)

Date : July. 31. 1976 | D.W.G. NO WI-010

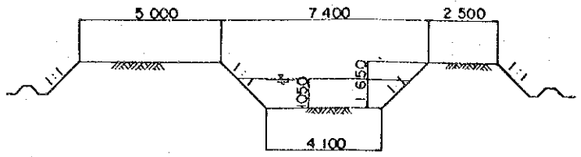
PROFILE OF DENGKENG MAIN CANAL (I)

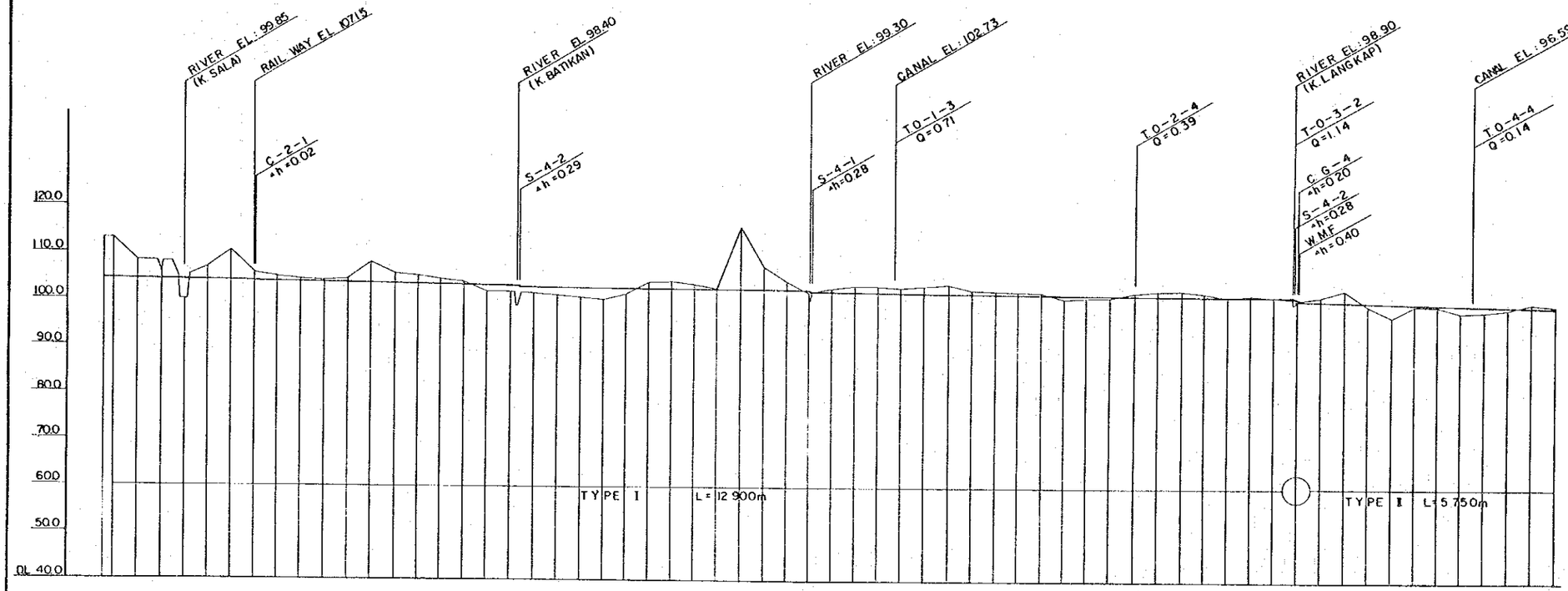
SCALE A

TYPE I SCALE B



TYPE X SCALE B





LEGEND

- T.O — Turnout
- A — Aqueduct
- S — Siphon
- C.G — Check Gate
- C — Culvert
- W.M.F — Water Measurement Facility

Station No	Dist	Accum. Dist	Ground Elev	Bottom of Canal	Water Surf	Top Bank	Hight of Embar	Depth of Exca	Grade
-500	0	0	113.00	104.25	105.45	108.05		8.75	
-500	100	100	113.00	104.23				8.77	
-250	250	350	108.00	104.16				3.84	
+NO.1	"	600	105.30	104.10	105.30			1.20	
-750	"	850	99.85	104.04			4.19		
-500	"	1100	106.70	103.98				2.72	
-250	"	1350	110.20	103.91				6.29	
+NO.0	"	1600	105.48	103.85				1.63	
+250	"	1850	104.70	103.77				0.93	
+500	"	2100	104.28	103.71				0.57	
+750	"	2350	103.86	103.65				0.21	
NO.1	"	2600	104.20	103.58				0.62	
+250	"	2850	107.70	103.52				4.18	
+500	"	3100	105.50	103.46				2.04	
+750	"	3350	104.90	103.40				1.50	
NO.2	"	3600	104.20	103.33				0.87	
+250	"	3850	103.50	103.27				0.23	
+500	"	4100	101.50	103.21			1.71		
+750	"	4350	101.59	103.15	104.35		1.56		
NO.3	"	4600	101.20	102.81			1.61		
+250	"	4850	101.80	102.75			1.95		
+500	"	5100	101.10	102.68			2.58		
+750	"	5350	99.80	102.62			2.82		
NO.4	"	5600	101.00	102.56			1.56		
+250	"	5850	101.35	102.50			1.02		
+500	"	6100	103.80	102.43			1.37		
+750	"	6350	103.25	102.37			0.88		
NO.5	"	6600	102.30	102.31			0.01		
+250	"	6850	115.20	102.25			12.95		
+500	"	7100	106.90	102.18			4.72		
+750	"	7350	103.77	102.12			1.65		
NO.6	"	7600	101.32	102.06			0.74		
+250	"	7850	102.20	101.73			0.47		
+500	"	8100	102.70	101.66			1.04		
+750	"	8350	102.83	101.60			1.23		
NO.7	"	8600	102.40	101.54	102.65		0.86		
+250	"	8850	102.88	101.48			1.40		
+500	"	9100	103.20	101.41			1.79		
+750	"	9350	102.01	101.35			0.66		
NO.8	"	9600	101.85	101.29			0.56		
+250	"	9850	101.80	101.23			0.57		
+500	"	10100	101.50	101.16			0.34		
+750	"	10350	103.30	101.10			0.80		
NO.9	"	10600	100.50	101.04			0.54		
+250	"	10850	100.98	100.98			0.48		
+500	"	11100	101.50	100.91	101.91		0.59		
+750	"	11350	101.95	100.85			1.10		
NO.10	"	11600	102.03	100.79			1.24		
+250	"	11850	101.50	100.73			0.77		
+500	"	12100	100.80	100.67			0.14		
+750	"	12350	101.00	100.60			0.40		
NO.11	"	12600	100.84	100.54			0.30		
+250	"	12850	100.00	100.21	102.01	102.01	0.21		
+500	"	13100	100.80	100.01	101.06	101.66	0.01		
+750	"	13350	100.23	99.48			1.25		
NO.12	"	13600	98.70	99.41			2.82		
+250	"	13850	96.50	99.34			0.71		
+500	"	14100	99.00	99.28			2.84		
+750	"	14350	98.95	99.21			0.28		
NO.13	"	14600	97.80	99.14			0.26		
+250	"	14850	97.90	99.07	100.09		1.54		
+500	"	15100	98.50	99.01			1.17		
+750	"	15350	99.55	98.94			0.51		
NO.14	"	15600	99.15	98.87	99.89	100.52		0.61	
								0.28	

1 / 4 000 — 3700

SCALE A

HORIZONTAL 0m 500 1000 1500

VERTICAL 0m 10 20

SCALE B

0m 5

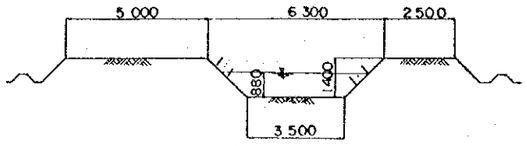
WONOGIRI IRRIGATION AND
UPPER SALA RIVER IMPROVEMENT
INDONESIA
IRRIGATION
PROFILE & CROSS-SECTION OF
DENGKENG MAIN CANAL (I)

Date July. 31. 1976 | D.W.G NO WI-011

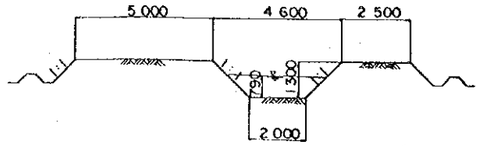
PROFILE OF DENGKENG MAIN CANAL (2)

SCALE A

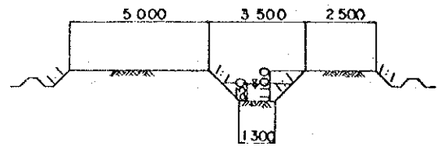
TYPE III SCALE B

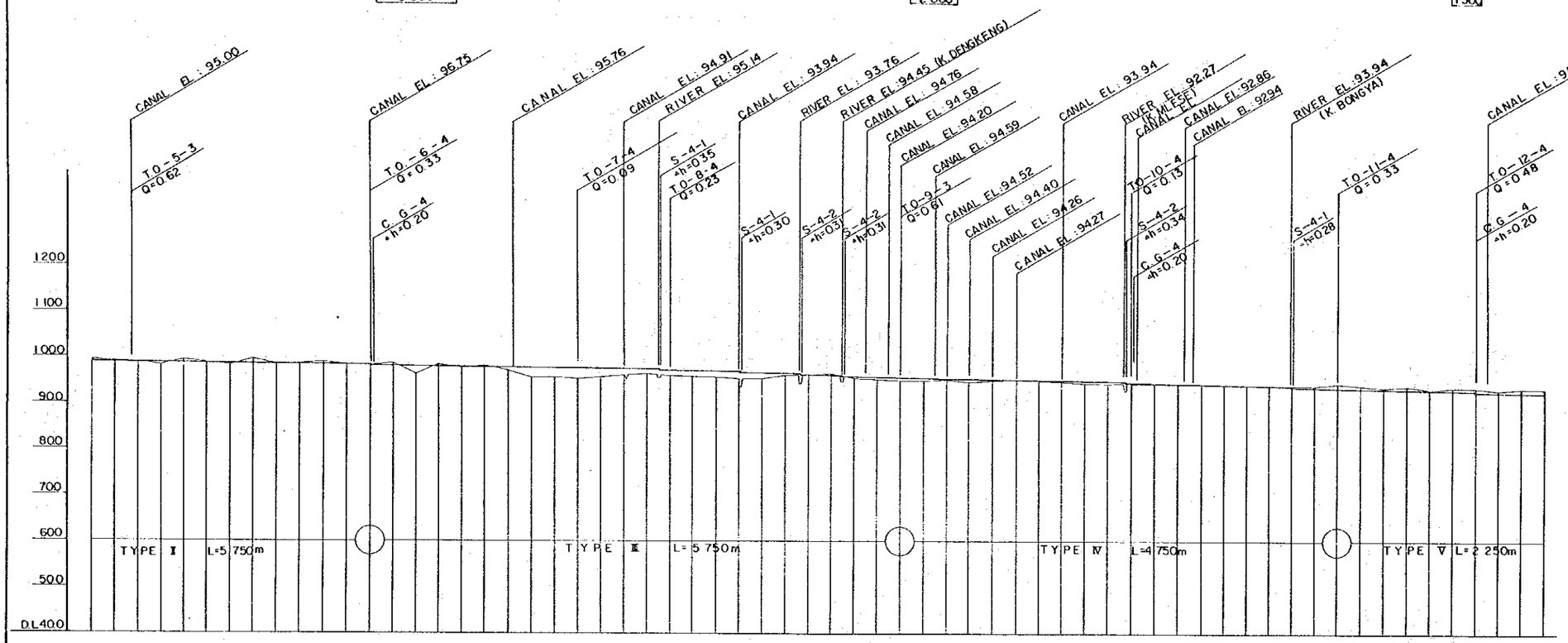


TYPE IV SCALE B



TYPE V SCALE B





LEGEND

- TO — Turnout
- A — Aqueduct
- S — Siphon
- C G — Check Gate
- C — Culvert
- W.M.F — Water Measurement Facility

Station No	Dist	Accum Dist	Ground Elev	Bottom of Canal	Water Surf	Top Bank	Hight of Embank	Depth of Excav	Grade
NO.14	0	15600	99.15	98.87	99.89	100.52		0.28	
+250	250	15850	99.06	98.80				0.26	
+500	"	16100	98.75	98.74	99.62		0.52	0.01	
+750	"	16350	98.15	98.67				0.70	
NO.15	"	16600	99.30	98.60				0.17	
+250	"	16850	98.70	98.53			0.32		
+500	"	17100	98.15	98.47				1.10	
+750	"	17350	99.50	98.40			0.13		
NO.16	"	17600	98.20	98.33	99.21			0.24	
+250	"	17850	98.50	98.26				0.50	
+500	"	18100	98.70	98.20				0.17	
+750	"	18350	98.30	98.13				98.06	98.06
NO.17	"	18600	97.96	97.86	98.94	99.71	0.08	97.86	97.86
+250	"	18850	98.45	97.80	98.74	99.26		0.65	
+500	"	19100	96.16	97.73			1.57		
+750	"	19350	98.10	97.66				0.44	
NO.18	"	19600	97.50	97.59			0.09		
+250	"	19850	97.85	97.53				0.32	
+500	"	20100	96.79	97.45			0.67		
+750	"	20350	95.30	97.39			2.09		
NO.19	"	20600	95.30	97.32			2.02		
+250	"	20850	95.00	97.26	98.11		2.26		
+500	"	21100	95.40	97.19			1.79		
+750	"	21350	95.70	97.12			1.42		
NO.20	"	21600	96.00	97.05			1.05		
+250	"	21850	95.60	96.65	97.44		1.05		
+500	"	22100	95.40	96.58			1.18		
+750	"	22350	95.20	96.51			1.31		
NO.21	"	22600	94.98	96.44			1.46		
+250	"	22850	94.96	96.09			1.13		
+500	"	23100	95.54	95.99			0.45		
+750	"	23350	95.60	95.66			0.06		
NO.22	"	23600	96.00	95.59			0.41		
+250	"	23850	95.00	95.22			0.22		
+500	"	24100	94.85	95.16			0.31		
+750	"	24350	94.60	95.09	95.88	96.49	0.49	95.09	95.09
NO.23	"	24600	94.62	95.02		96.29	0.40		
+250	"	24850	94.69	94.95			0.26		
+500	"	25100	94.34	94.88			0.54		
+750	"	25350	94.57	94.80			0.23		
NO.24	"	25600	94.60	94.73			0.13		
+250	"	25850	94.40	94.66			0.26		
+500	"	26100	94.25	94.59			0.34		
+750	"	26350	93.97	94.52			0.55		
NO.25	"	26600	93.89	94.45			0.56		
+250	"	26850	94.00	94.05	94.84		0.05		
+500	"	27100	93.82	93.78	94.57			0.04	
+750	"	27350	93.65	93.71			0.06		
NO.26	"	27600	93.60	93.64			0.04		
+250	"	27850	93.50	93.57			0.07		
+500	"	28100	93.41	93.49			0.08		
+750	"	28350	93.20	93.42			0.22		
NO.27	"	28600	93.01	93.35				0.15	
+250	"	28850	93.20	93.01				0.19	
+500	"	29100	93.78	92.94	93.66	93.94		0.84	92.94
+750	"	29350	93.44	92.86	93.57	94.04		0.58	
NO.28	"	29600	93.04	91.77				0.27	
+250	"	29850	93.23	92.69				0.54	
+500	"	30100	92.64	92.61				0.03	
+750	"	30350	93.09	92.52				0.57	
NO.29	"	30600	93.04	92.44	93.07			0.60	
+250	"	30850	92.56	92.16	92.87			0.40	
+500	"	31100	92.70	92.08				0.62	
+750	"	31350	92.65	92.00	92.63	93.10		0.65	92.00
				91.500					

SCALE A

HORIZONTAL 0m 500 1000 1500 VERTICAL 0m 10 20

SCALE B

0m 5

WONOGIRI IRRIGATION AND UPPER SALA RIVER IMPROVEMENT INDONESIA

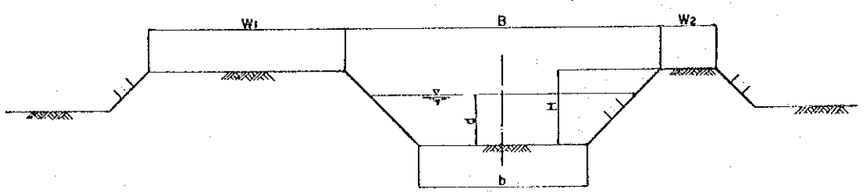
IRRIGATION

PROFILE & CROSS-SECTION OF DENGKENG MAIN CANAL (2)

Date July 31. 1976 | D.W.G. NO WI - 012

STANDARD CROSS SECTION

SECONDARY CANAL

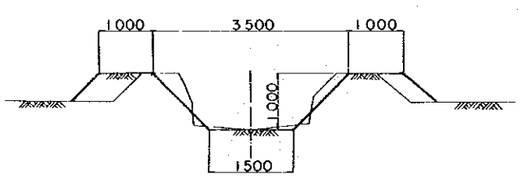


Data Table

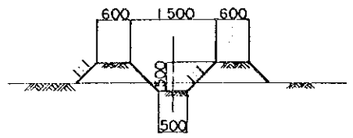
(Dimension m)

TYPE	Q	b	B	d	H	W1	W2	CANAL LENGTH
1	1.62 1.40	3.0	5.70	0.90	1.35	3.50	1.00	4 600
2	0.92 0.70	2.1	4.40	0.75	1.15	"	"	9 900
3	0.68 0.50	1.8	4.00	0.70	1.10	"	"	11 100
4	0.42 0.30	1.3	3.20	0.60	0.95	"	"	2 650
5	0.29 0.20	0.9	2.70	0.55	0.90	"	"	5 350
6	0.19 0.10	0.7	2.40	0.50	0.85	"	"	6 600
7	0.07	0.5	1.90	0.40	0.70	"	"	1 000

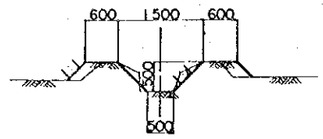
REHAVILITATION
Existing Canal



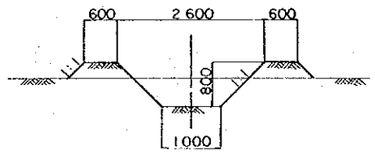
FARM DITCH



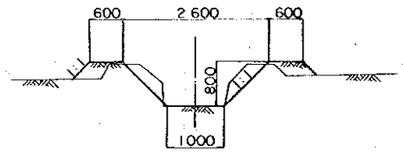
REHAVILITATION
Existing Ditch



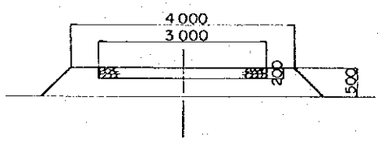
FARM DRAIN



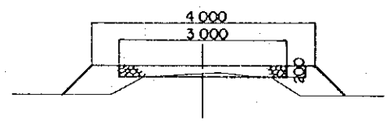
REHAVILITATION
Existing Drain



FARM ROAD



REHAVILITATION
Existing Road



SCALE 0 1 2 3 4 5M

WONOGIRI IRRIGATION AND
UPPER SALA RIVER IMPROVEMENT
INDONESIA
IRRIGATION
STANDARD CROSS-SECTION OF
SECONDARY CANAL & OTHERS

Date : July. 31. 1976 | D.W.G. NO. WI - 013