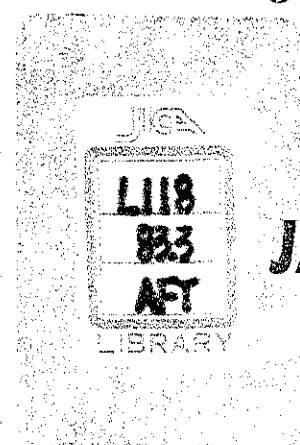


MASTER PLAN STUDY
ON
THE IMPROVEMENT PROJECT OF THE O & M
OF
MAGAT RIVER INTEGRATED IRRIGATION SYSTEM
IN THE
REPUBLIC OF THE PHILIPPINES

O & M DRAWINGS

JULY, 1987



JAPAN INTERNATIONAL COOPERATION AGENCY

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87-27

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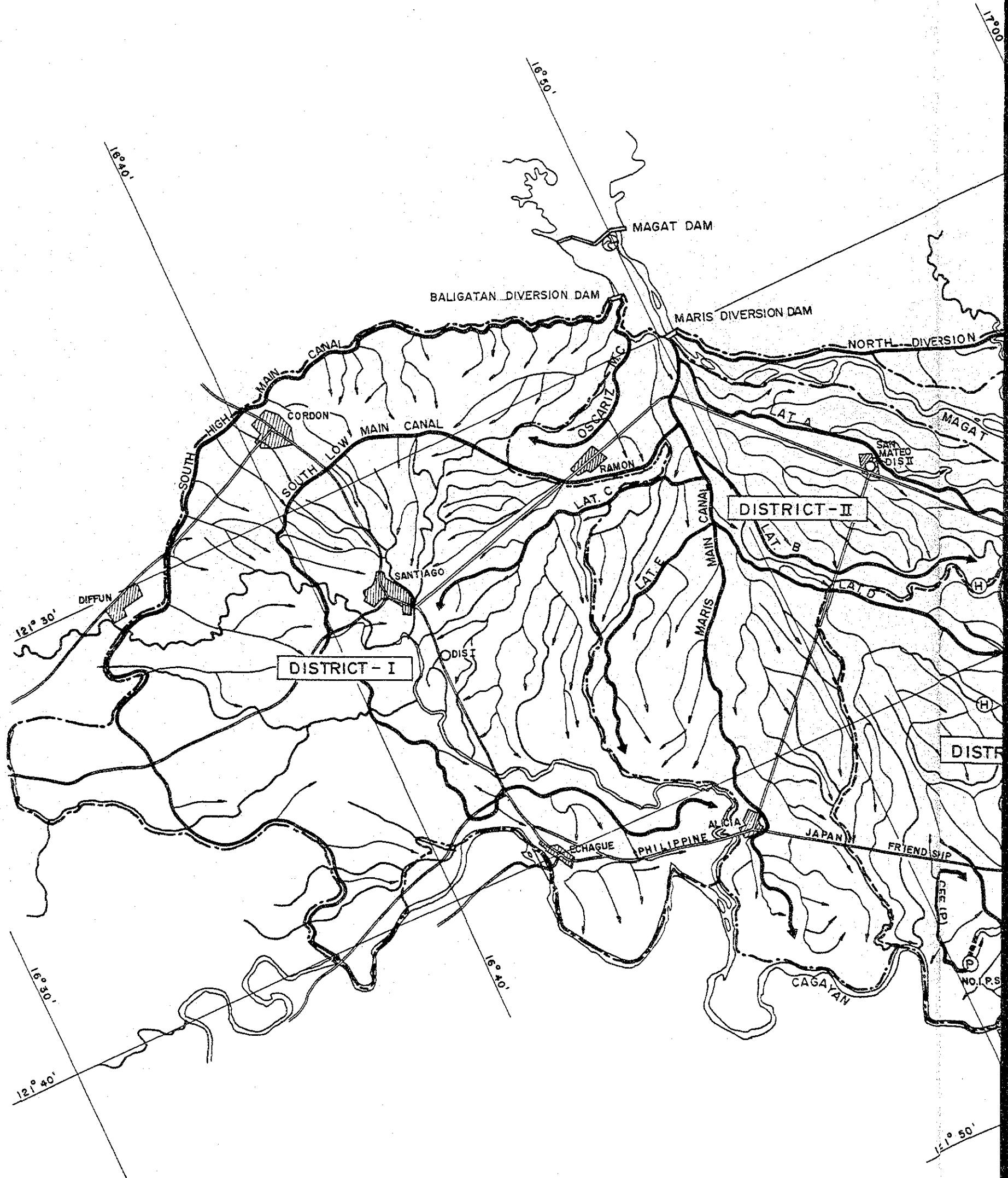


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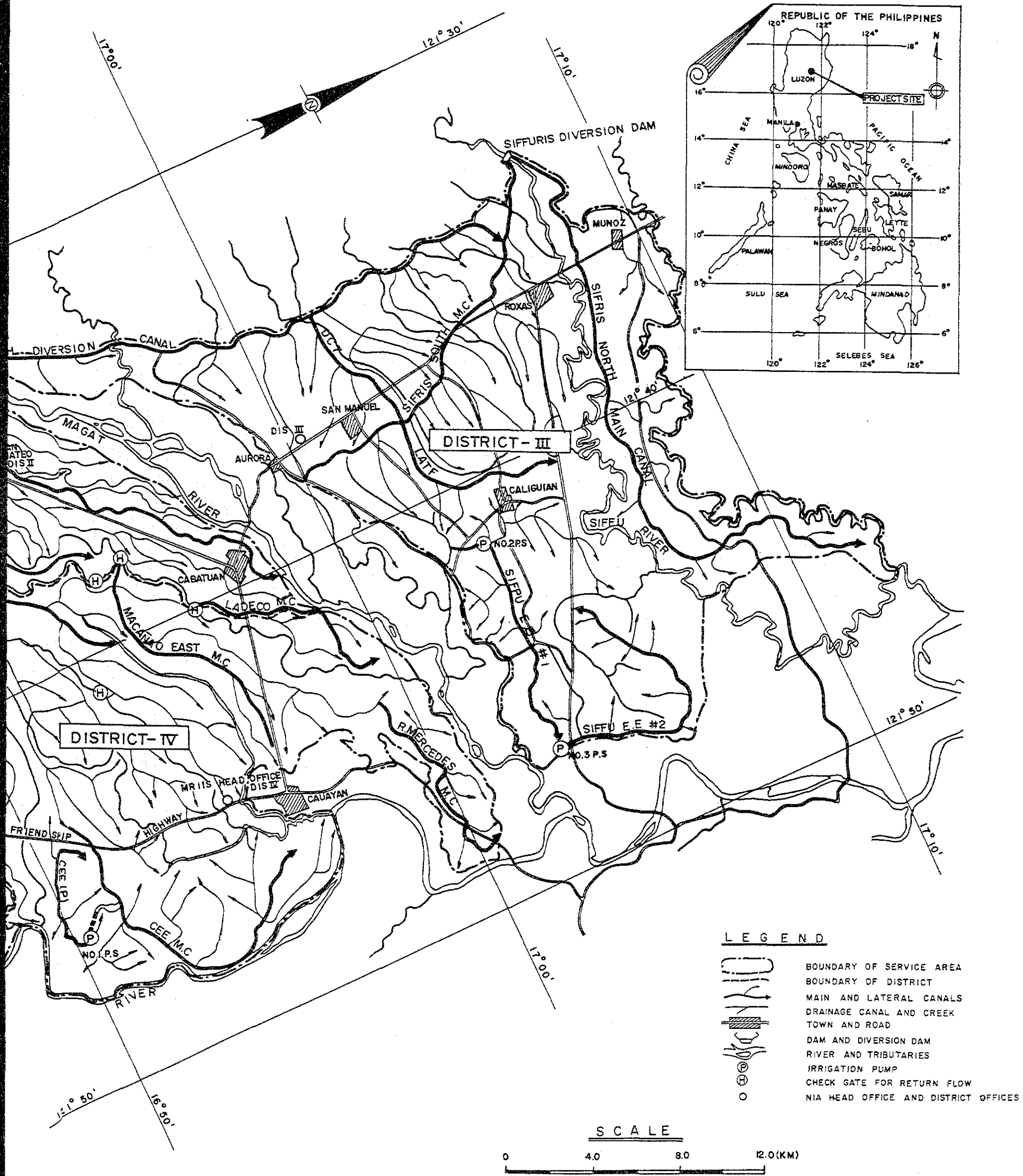
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GENERAL PLAN FOR MAGAT RIVER INTEGRATED IR

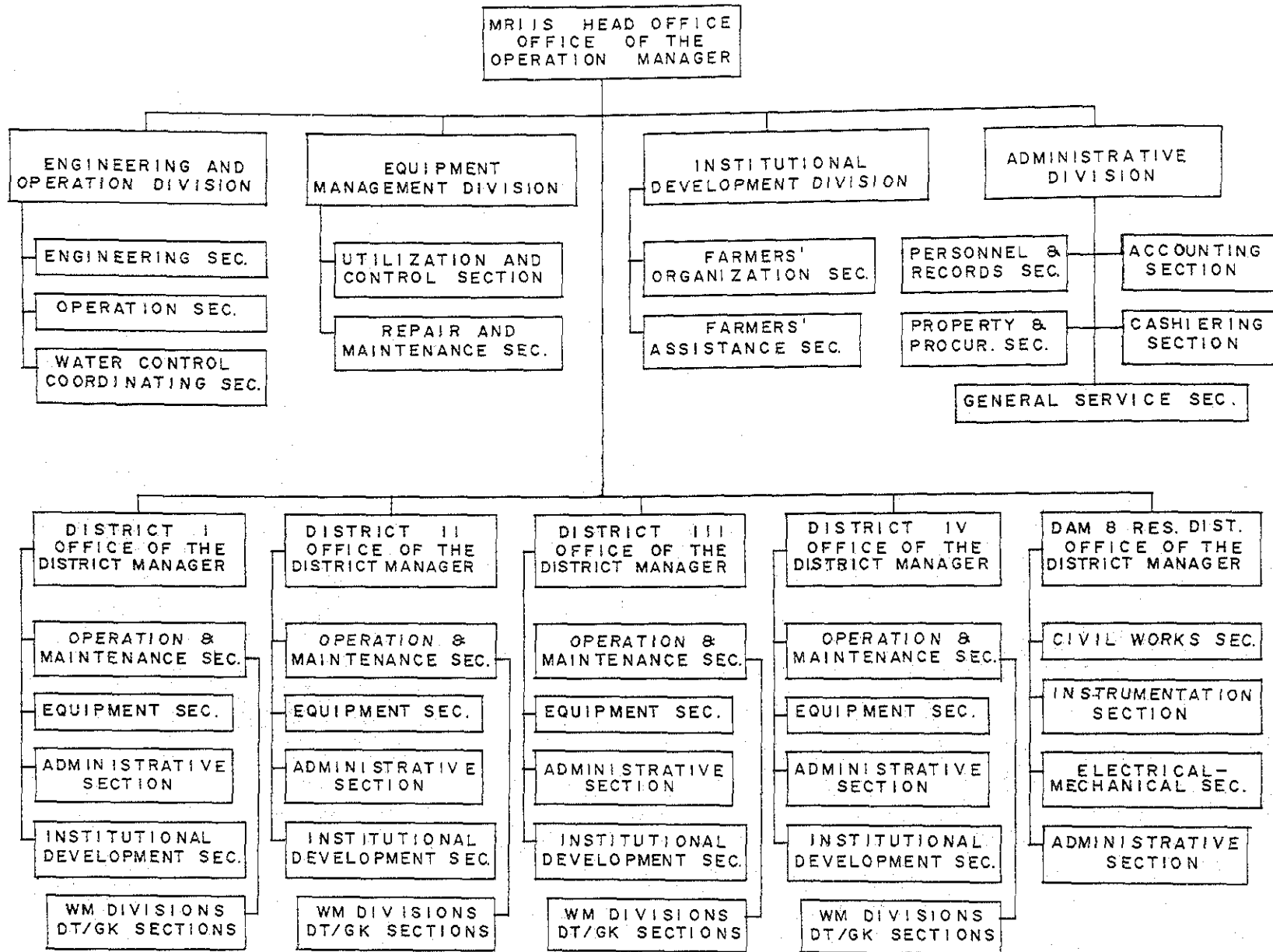


ATED IRRIGATION SYSTEM



ORGANIZATION AND STAFF FOR

ORGANIZATION CHART OF THE MRIIS



ORGANIZATION AND NUMBER FOR POSITION FOR HEAD OFFICE

OFFICE OF OPERATION MANAGER 1 - Department Manager B 1 - Secretary B 1 - Corporate Attorney B 1 - Management System Analyst A 1 - EDP Computer Programmer A 1 - Financial Analyst B 1 - Information Writer 2 - Data Controller B 1 - Clerk B Sub Total <u>10</u>	EQUIPMENT MANAGEMENT DIVISION 1 - Division Manager B 1 - Clerk B UTILIZATION & CONTROL SECTION 1 - Auto Repair General Foreman 1 - Engineer B 12 - Driver B REPAIR & MAINTENANCE SECTION 1 - Auto Repair General Foreman 1 - Automotive Equipment Inspector 1 - Mechanist B 3 - Mechanic B 1 - Painter 1 - Welder B 1 - Auto Electrician 1 - Mechanic A Sub Total <u>26</u>	ADMINISTRATIVE DIVISION 1 - Division Manager 1 - Clerk B PERSONNEL & RECORDS SECTION 1 - Personnel Officer 1 - Personnel Assistant B 1 - Records Assistant A 1 - Clerk B ACCOUNTING SECTION 1 - Senior Corporate Accountant B 1 - Corporate Accountant 2 - Corporate Bookkeeper A 3 - Accounting Clerk B 1 - Clerk B PROPERTY & PROCUREMENT SECTION 1 - Supply Officer C 1 - Storekeeper B 1 - Canvasser 1 - Clerk B CASHIERING SECTION 1 - Senior Cashier B 1 - Disbursing Officer B 1 - Cash Clerk GENERAL SERVICES SECTION 1 - Administrative Assistant A 2 - Radio Operator B 1 - Reproduction Machine Operator A 1 - Senior Security Guard 10 - Security Guard B 1 - Electrician A 4 - Janitor Sub Total <u>41</u>
ENGINEERING & OPERATION DIVISION 1 - Division Manager B 1 - Clerk B ENGINEERING SECTION 1 - Supervising Engineer B 1 - Senior Engineer B 1 - Engineer B 1 - Senior Draftsman A OPERATION SECTION 1 - Supervising Engineer B 1 - Senior Engineer B 1 - Engineer B 1 - Engineer A WATER CONTROL COORDINATING SECTION 1 - Supervising Engineer B 1 - Senior Engineer B 1 - Engineer B 1 - Senior Hydrologist B 1 - Hydrologist 1 - Engineering Aide C 3 - Gatekeeper 4 - Laborer Sub Total <u>23</u>	INSTITUTIONAL DEVELOPMENT DIVISION 1 - Division Manager B 1 - Clerk B FARMERS' ORGANIZATION SECTION 1 - Supervising Irrigators' Association Officer 1 - Farmers' Organization Specialist 1 - Farmers' Training Officer FARMERS' ASSISTANCE SECTION 1 - Farmers' Assistance Specialist 1 - Farmers Assistance Supervisor 1 - Economist B 1 - Clerk B Sub Total <u>9</u>	Grand Total <u>100</u>

FF FOR MRIIS O/M OFFICE

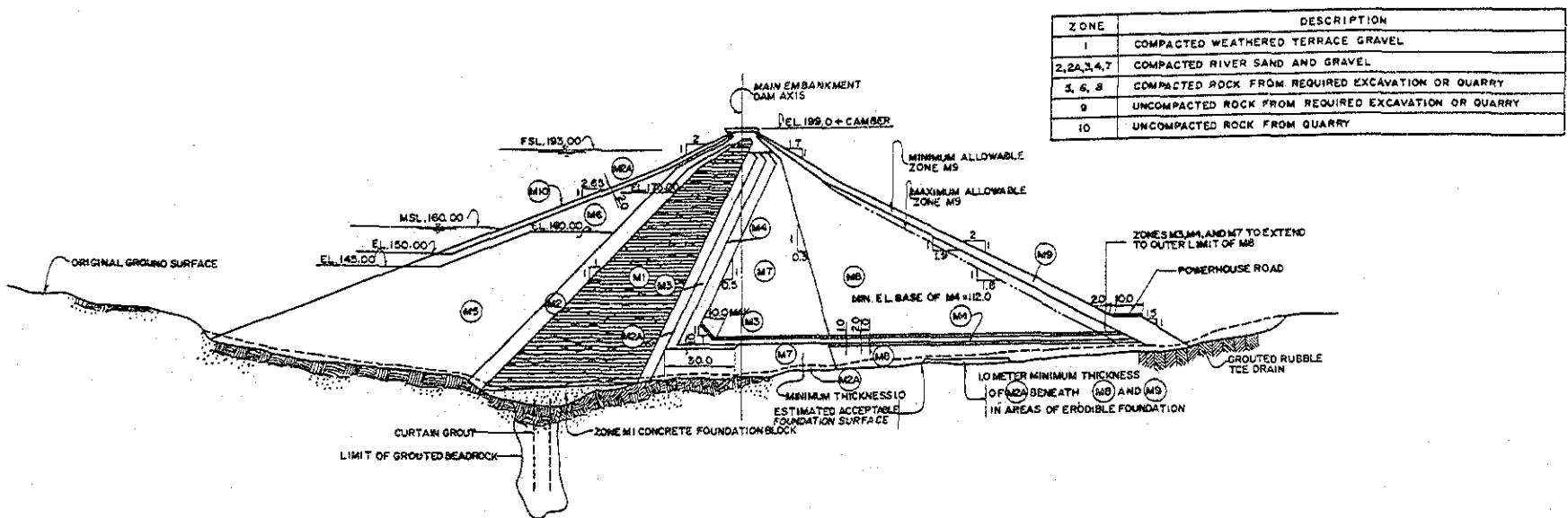
ORGANIZATION AND NUMBER OF POSITION FOR DAM 8 RESERVOIR DISTRICT

<p>OFFICE OF DISTRICT MANAGER 1 - District Manager C 1 - Draftsman B 1 - Clerk B <u>Sub Total</u> 3</p>	<p>INSTRUMENTATION SECTION 1 - Principal Engineer A 1 - Clerk B</p> <p>DRAINAGE GALLERIES, EMBANKMENT & SURFACE PIEZOMETER MONITORING UNIT 1 - Senior Engineer B 5 - Electronics Technician 2 - Engineering Aide C 2 - Engineering Aide B</p> <p>SURFACE SETTLEMENT DEFLECTION SURVEY & DOUBLE FLUID SETTLEMENT DEVICES MONITORING UNIT 1 - Senior Engineer A 4 - Electronics Technician 1 - Geodetic Engineering Assistant B</p> <p>HYDROLOGY & SEISMOLOGY UNIT 1 - Senior Engineer A 1 - Engineer B 3 - Hydrologist 1 - Electronics Technician 12 - Engineering Aide C 33 - Laborer <u>Sub Total</u> 69</p>	<p>1 - Heavy Equipmt. Operator 3 - Mechanic B 5 - Electrician A 3 - Plant Equipment Operator A 1 - Electronics Technician 1 - Welder B 1 - Painter B 3 - Laborer</p> <p>UNDERGROUND MECHANICAL-ELECTRICAL INSTALLATIONS UNIT 1 - Electrician B 2 - Electrician A 3 - Laborer</p> <p>MRIIS & BALIGATAN DIVERSION DAMS UNIT 1 - Engineer B 1 - Heavy Equipmt. Operator 1 - Mechanic B 1 - Electrician A 5 - Gate keeper 2 - Laborer <u>Sub Total</u> 51</p>
<p>CIVIL WORK SECTION 1 - Principal Engineer A 1 - Clerk B</p> <p>DAM & ROAD MAINTENANCE UNIT 1 - Senior Engineer B 1 - Engineer A 1 - Construction Foreman C 1 - Fishery Technologist 1 - Research Aide 1 - Engineman 8 - Laborer</p> <p>CAMP FACILITIES MAINTENANCE & COMMUNICATION UNIT 1 - Senior Engineer B 1 - Water Maintenance Supervisor 1 - Construction Foreman C 3 - Carpenter B 2 - Mason 1 - Plumber 2 - Electrician A 2 - Plant Equipment Operator A 3 - Telephone Operator A 4 - Pump Operator 9 - Laborer</p> <p>EQUIPMENT MANAGEMENT UNIT 1 - Senior Engineer B 1 - Dispatcher B 3 - Heavy Equipment Operator 11 - Driver B 1 - Mechanic B 1 - Auto Electrician 1 - Welder B 1 - Mechanic A <u>Sub Total</u> 66</p>	<p>ELECTRICAL-MECHANICAL SECTION 1 - Principal Engineer A 1 - Clerk B</p> <p>BALIGATAN OUTLET & POWER PLANT UNIT 1 - Senior Engineer A 2 - Engineer B 3 - Plant Mechanic B 3 - Plant Equipment Operator 1 - Laborer</p> <p>SPILLWAY, POWER INTAKE & DIVERSION TUNNEL INTAKE 1 - Senior Engineer B 3 - Engineer B</p>	<p>ADMINISTRATIVE SECTION 1 - Administrative Assistant B 1 - Clerk B 1 - Personnel Assist. B 2 - Clerk B 2 - Radio Operator B 4 - Janitor 1 - Corporate Bookkeeper A 2 - Collection Representative B 1 - Billing Clerk 1 - Property Custodian A 2 - Storekeeper B 1 - Cashier B 1 - Cash Clerk 1 - Senior Security Guard 39 - Security Guard 1 - Guesthouse Caretaker 1 - Cook B 1 - Food Server B <u>Sub Total</u> 63 <u>Grand Total</u> 252</p>

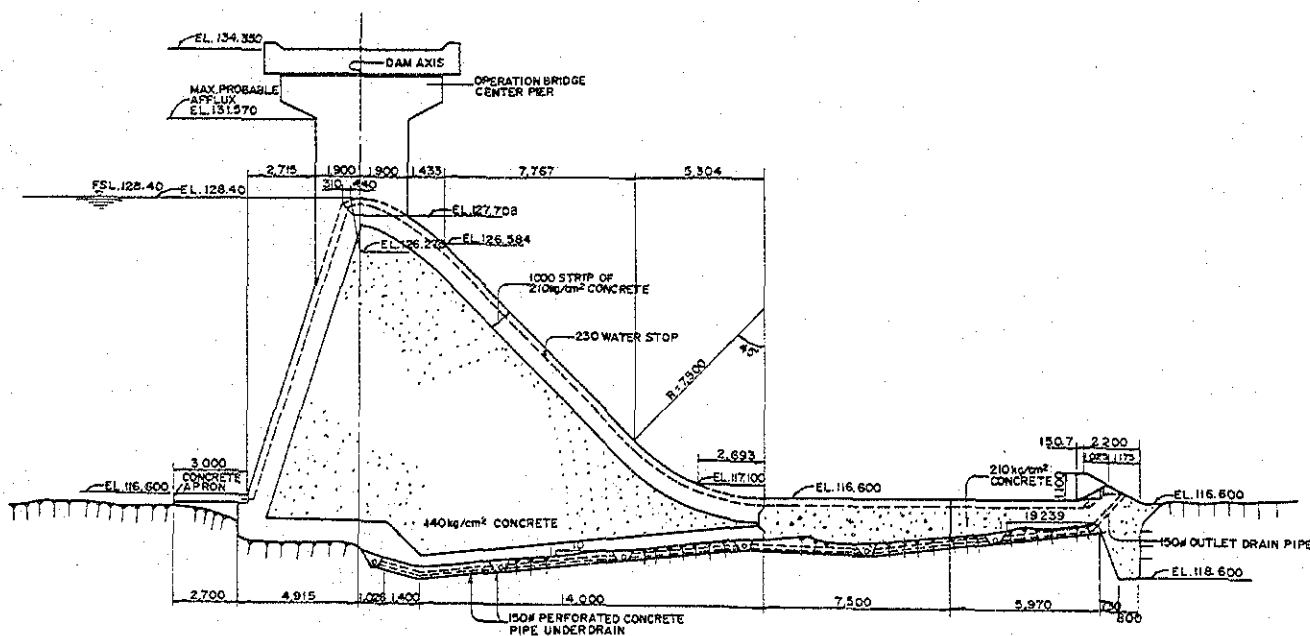
ORGANIZATION AND NUMBER OF POSITION FOR DISTRICT OFFICES IN SERVICE AREA

ORGANIZATION AND POSITION	DISTRICT OFFICES				ORGANIZATION AND POSITION	DISTRICT OFFICES			
	I	II	III	IV		I	II	III	IV
OFFICE OF DISTRICT MANAGER					EQUIPMENT MANAGEMENT SECTION				
Principal Engineer C	1	1	1	1	Senior Engineer B	1	1	1	1
Supervising Engineer B	1	1	1	1	Dispatcher B	1	1	1	1
Engineer B/Hydrologist	1	1	1	1	Heavy Equipment Operator	7	7	7	7
Draft man B	1	1	1	1	Driver B	10	10	10	8
Engineering Aide C	1	1	1	1	Mechanic B	2	2	2	1
Clerk B	1	1	1	1	Welder B	1	1	1	—
<u>Sub Total</u>	<u>6</u>	<u>6</u>	<u>6</u>	<u>6</u>	Auto Electrician	1	1	1	—
					Auto Serviceman	1	1	1	—
OPERATION & MAINTENANCE SECTION					<u>Sub Total</u>	<u>24</u>	<u>24</u>	<u>24</u>	<u>18</u>
Senior Engineer B	2	2	2	2	ADMINISTRATIVE SECTION				
Watermaster	27	28	24	26	Administrative Assistant B	1	1	1	—
Ditchtender	109	100	67	84	Personnel Assistant B	1	1	1	—
Gatekeeper	18	5	6	8	Corporate Bookkeeper A	1	1	1	—
Construction Foreman C	1	1	1	1	Accounting Clerk B	1	1	1	—
Geodetic Engineering Assistant A	1	1	1	1	Cashier B	1	1	1	—
Geodetic Engineering Aide B	1	1	1	1	Cash Clerk	1	1	1	—
Mason	1	1	1	1	Collection Representative B	2	2	2	2
Carpenter B	1	1	1	1	Billing Clerk	5	5	5	5
Plant Operator	—	—	6	3	Property Custodian A	1	1	1	—
<u>Sub Total</u>	<u>161</u>	<u>140</u>	<u>110</u>	<u>128</u>	Storekeeper B	1	1	1	1
					Radio Operator B	1	1	1	—
INSTITUTIONAL DEVELOPMENT SECTION					Security Guard B	5	8	5	—
Formers' Assistance Supervisor	1	1	1	1	Electrician A	1	1	1	—
Agriculturist	1	1	1	1	Clerk B	2	2	2	1
Irrigators' Organization Worker	2	2	2	2	Janitor	1	1	1	—
<u>Sub Total</u>	<u>4</u>	<u>4</u>	<u>4</u>	<u>4</u>	<u>Sub Total</u>	<u>25</u>	<u>28</u>	<u>25</u>	<u>9</u>
					<u>Grand Total</u>	<u>220</u>	<u>202</u>	<u>169</u>	<u>165</u>

OUTLINE OF DAM AND DIVERSION



TYPICAL EMBANKMENT SECTION OF MAGAT DAM



SECTION OF BALIGATAN DIVERSION DAM

SUMMARY OF DAM AND DIVERSION DAM

MAGAT DAM

1. RESERVOIR BASIN			
DRAINAGE AREA	4,143	KM ²	
ANNUAL MEAN RAINFALL	2,300	MM	
ANNUAL MEAN RUN-OFF	6,750	MCM	
ANNUAL MAXIMUM RUN-OFF	12,500	MCM	
ANNUAL MINIMUM RUN-OFF	3,300	MCM	
2. RESERVOIR			
RESERVOIR AREA (AT FULL SUPPLY LEVEL)	45	KM ²	
STORAGE CAPACITY	1,250	MCM	
EFFECTIVE STORAGE CAPACITY (WITHOUT SEDIMENTATION)	933	MCM	
(AFTER 50 YEARS OPERATION)	832	MCM	
HIGH WATER LEVEL	197	M	
FULL WATER LEVEL	193	M	
LOW WATER LEVEL	160	M	
3. DAM			
TYPE	INCLINED CORE EARTH AND ROCK-FILL TYPE		
DAM HEIGHT	114	M	
CREST LENGTH	4,160	M	
CREST WIDTH	12	M	
DAM VOLUME (FILL MATERIAL)	18	MCM	
(CONCRETE)	1	MCM	
CREST ELEVATION	201	M	

WIDTH	164	M
LENGTH	500	M
DISCHARGE CAPACITY	30,600	M ³ /S
RADIAL CREST GATE		
16.50 M x 19.05 M	7	UNITS
ELEVATION AT TOP OF GATE	193.50	M
OGEE CREST ELEVATION	174	M
ORIFFICE GATE		
6.00 M x 12.50 M	2	UNITS
5. POWER INTAKE		
INTAKE GATE	CLOSURE GATE AND BULKHEAD	
5.609 M x 5.80 M	6	UNITS
PENSTOCK D=5.50M, L=580M	4	UNITS
(2 UNITS ADDITIONAL AVAILABLE)		
DISCHARGE CAPACITY	480	M ³ /S
POWER GENERATION	3.60	MW
6. BALIGATAN INTAKE		
DISCHARGE CAPACITY	34	M ³ /S
INTAKE PIPE		
DIAMETER	#3000 ~ #2200	MM
LENGTH	293	M
INTAKE GATE	SPHERICAL VALVE	
INTAKE TUNNEL		
DIAMETER	4.40	M
LENGTH	151	M

2. DIVERSION DAM		
TYPE	OGEE CONCRETE WITH EMBANKMENT	
DAM HEIGHT		
DAM LENGTH		
CREST ELEVATION		
3. SPILL WAY		
TYPE	OGEE CONCRETE CHUTE WITH RADIAL GATE	
DISCHARGE CAPACITY		
CREST ELEVATION		
RADIAL CREST GATE	5.25 M x 3.8	
4. INTAKE		
RIGHT INTAKE (SOUTH HIGH MAIN CANAL)		
DISCHARGE CAPACITY		
SLUICE GATE	1.50 M x 1.45 M	
LEFT INTAKE (OSCARIZ MAIN CANAL)		
DISCHARGE CAPACITY		
SLUICE GATE	1.45 M x 1.45 M	

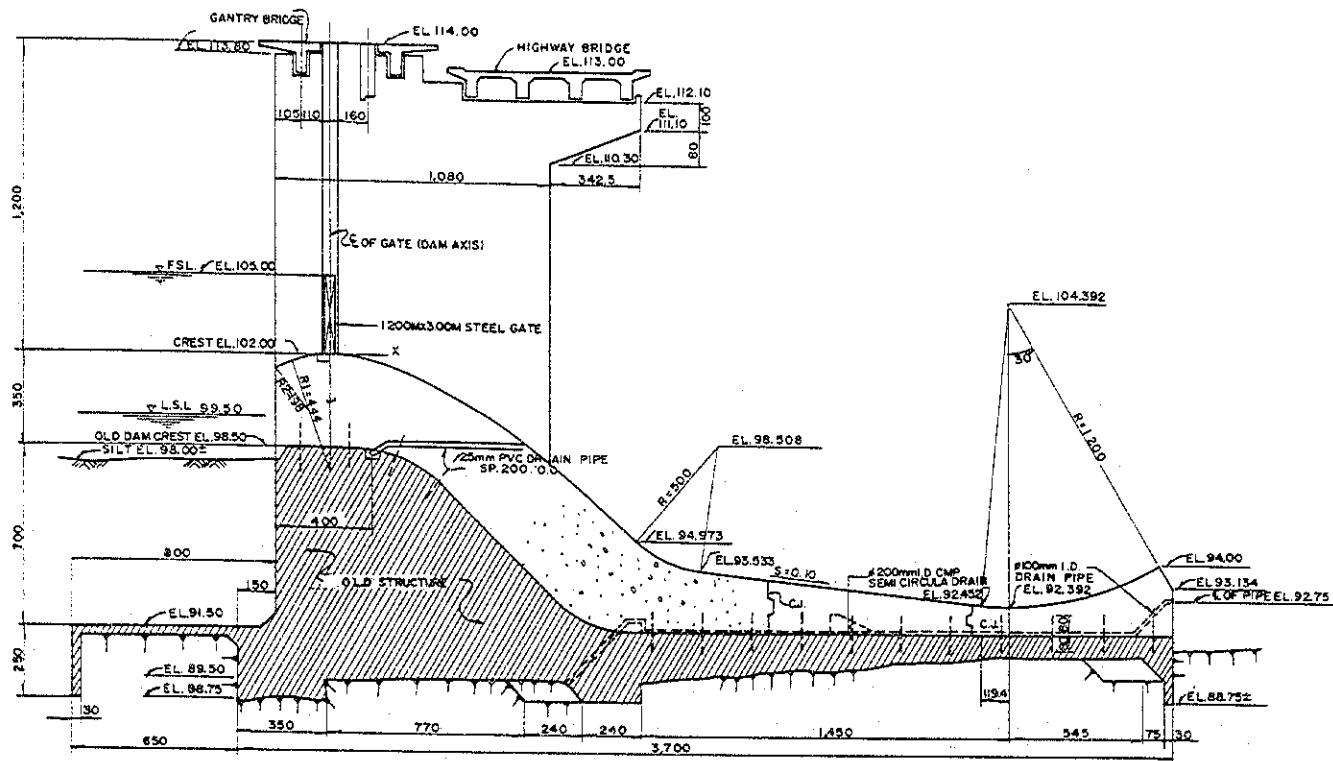
BALIGATAN DIVERSION DAM

1. RESERVOIR		
TOTAL STORAGE CAPACITY (AT FULL SUPPLY LEVEL)	120,000	M ³

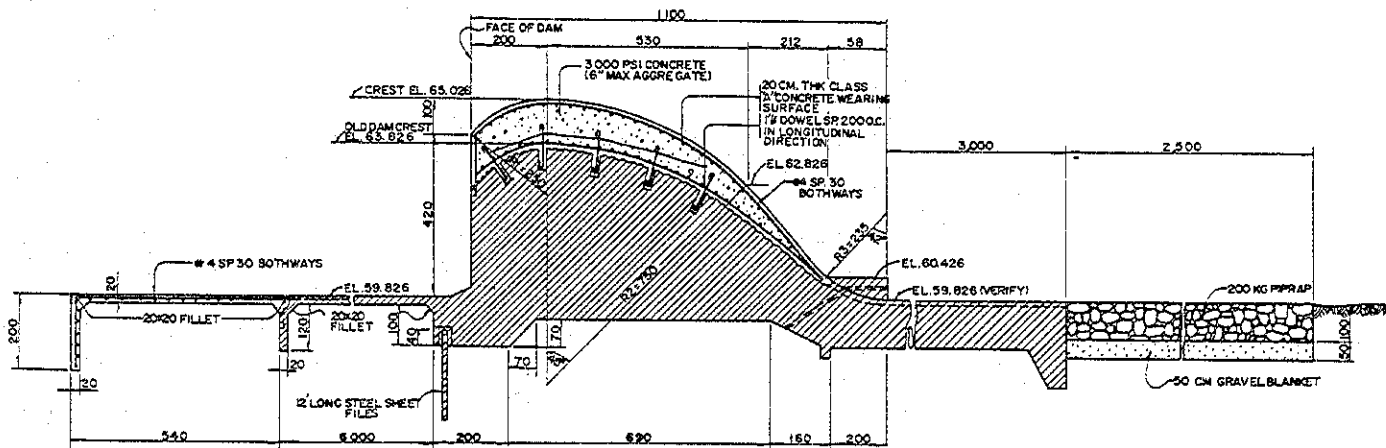
MARIS DIVERSION DAM		
1. RESERVOIR		
TOTAL STORAGE CAPACITY (AT FULL SUPPLY LEVEL)		
REGULATING CAPACITY		
FULL SUPPLY LEVEL		

4. SPILL WAY		
LOCATION	LEFT ABUTMENT OF DAM	
TYPE	OGEE WITH RADIAL GATE	

DIVERSION DAM



TYPICAL SECTION OF MARIS DIVERSION DAM



TYPICAL SECTION OF SIFFURIS DIVERSION DAM

EL 131.57 M
 EL 124.85 M

OGEE CONCRETE WITH FILL EMBANKMENT
 13.00 M

STRUCTURE)
 27.25 M
 270 M
 128.40 M

OGEE CONCRETE CHUT WITH RADIAL
 GATE
 CAPACITY 225 M³/S
 124.85 M
 GATE 5.25M x 3.80M 1 UNIT

(SOUTH HIGH MAIN CANAL)
 CAPACITY 26.0 M³/S
 1.50M x 1.45M 6 UNITS
 (SCARIZ MAIN CANAL)
 CAPACITY 7.7 M³/S
 1.45M x 1.45M 2 UNITS

IN DAM

CAPACITY
 (PLY LEVEL) 8 MCM
 CAPACITY 7.3 MCM
 EL 105 M

2. DIVERSION DAM
 TYPE OGEE CONCRETE TYPE
 DAM HEIGHT 13.5 M
 LENGTH (CREST LENGTH) 293.5 M
 (EMBANKMENT LENGTH) 290 M
 CREST ELEVATION (OGEE) 102 M
 (STOP LOG) 105 M

3. SPILL WAY
 TYPE OGEE WITH STOP LOG
 DISCHARG CAPACITY 30,600 M³/S
 STOP LOG GATE 12.00M x 3.00M 16 UNITS

4. SAND SLUICE WAY
 RIGHT SLUICE WAY
 SLUICE GATE 5.50M x 5.00M 2 UNITS
 LEFT SLUICE WAY
 SLUICE GATE 3.50M x 4.00M 1 UNIT

5. INTAKE
 RIGHT INTAKE (MARIS SOUTH MAIN CANAL)
 DISCHARGE CAPACITY 121.5 M³/S
 SLUICE GATE 2.10M x 1.80M 10 UNITS
 -do- 3.50M x 2.70M 2 UNITS
 LEFT INTAKE (NORTH DIVERSION CANAL)
 DISCHARGE CAPACITY 59 M³/S
 SLUICE GATE 3.50M x 2.40M 2 UNITS

DRAINAGE AREA 627 KM²
 ANNUAL MEAN RAINFALL 1,805 MM
 ANNUAL MEAN RUN-OFF 933 MCM
 ANNUAL MAXIMUM RUN-OFF 2,099 MCM
 ANNUAL MINIMUM RUN-OFF 289 MCM

2. DIVERSION DAM
 TYPE OGEE CONCRETE TYPE
 DAM HEIGHT 5.20 M
 CREST LENGTH 100 M
 CREST ELEVATION 65 M

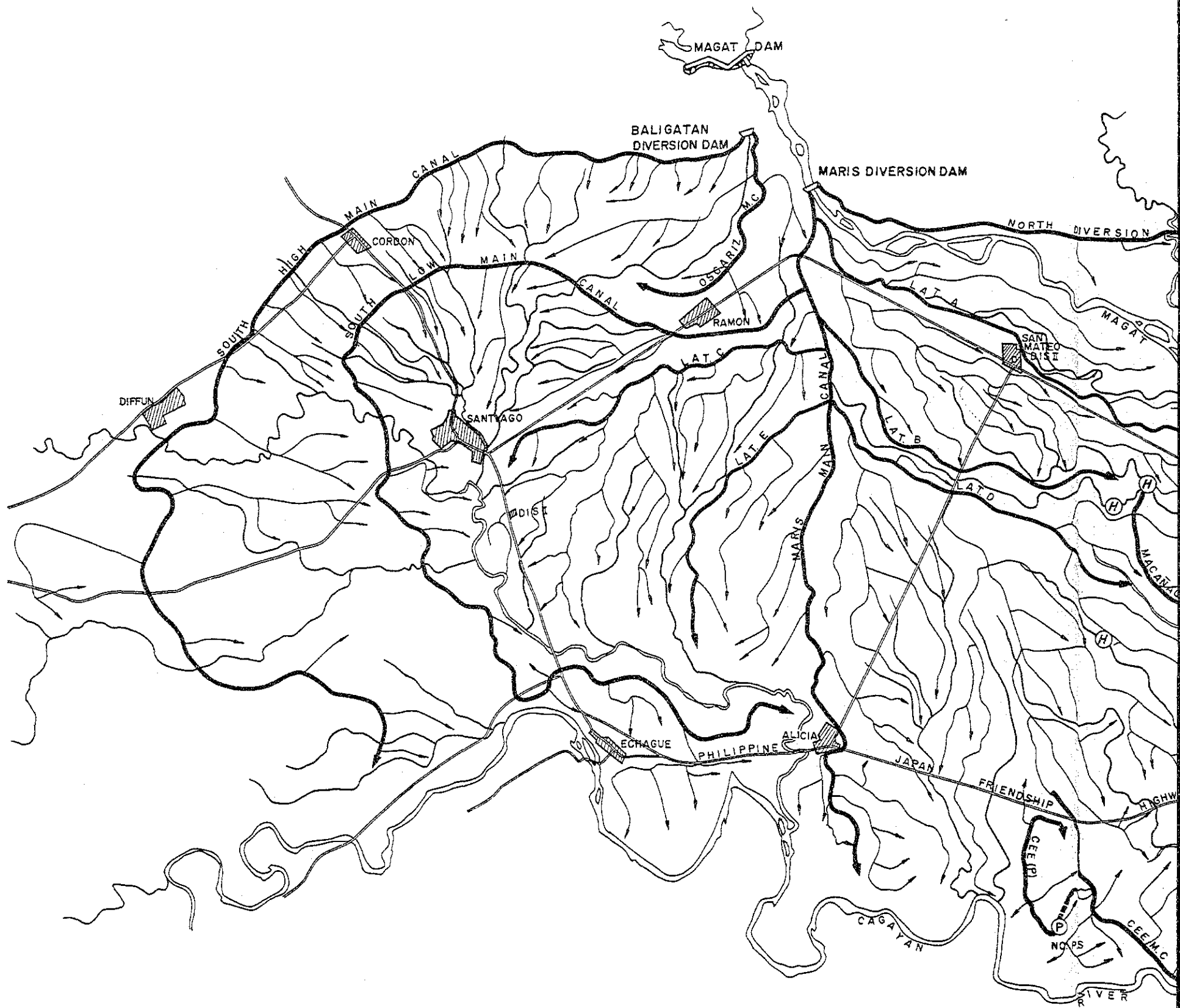
3. SAND SLUICE WAY
 RIGHT SLUICE WAY
 SLUICE GATE 4.89M x 4.12M 1 UNIT
 LEFT SLUICE WAY
 SLUICE GATE 2.44M x 2.44M 1 UNIT

4. INTAKE
 RIGHT INTAKE (SOUTH MAIN CANAL)
 DISCHARGE CAPACITY 13.6 M³/S
 SLUICE GATE 1.68M x 2.13M 3 UNITS
 LEFT INTAKE (NORTH MAIN CANAL)
 DISCHARGE CAPACITY 5.2 M³/S
 SLUICE GATE 1.68M x 2.13M 1 UNIT

SIFFURIS DIVERSION DAM

1. RESERVOIR

OUTLINE OF IRRIGATION



OUTLINE OF MAIN CANAL

NAME OF CANAL	SERVICE AREA (HA)	CANAL LENGTH (KM)	DESIGN DISCHARGE (M ³ /S)	AVE. SLOPE	AVE. VELOCITY (M/S)	NUMBER OF LATERAL	NUMBER OF CHECK	NUMBER OF TURN-OUT	NUMBER OF STRUCTURE
MARIS	40,496	27.4	121.50	0.0002	1.0~0.4	123	14	85	35
OSCARIZ	3,100	11.8	7.66	-do-	0.6	12	11	31	49
SOUTH HIGH	9,580	59.6	26.04	-do-	0.8~0.3	42	32	82	180
SOUTH LOW	7,920	48.6	17.56	-do-	0.8~0.4	33	32	104	108
NORTH DIVERSION	7,718	36.0	59.00	-do-	1.0~0.5	27	10	40	128
SIFFU SOUTH	7,520	27.0	14.06	-do-	0.7~0.3	17	3	20	75
SIFFU NORTH	2,959	25.0	5.23	-do-	0.6~0.4	12	6	27	63
MACAÑAO EAST	3,126	12.0	11.95	0.00025	0.8~0.3	6	7	40	16
LADECO	967	8.0	3.08	0.0002	0.5	3	-	3	20
R. MERCEDEZ	1,776	11.5	4.65	-do-	0.6~0.3	6	3	28	41
CAUAYAN E.E.	3,806	19.8	8.06	-do-	0.7~0.3	18	7	31	32
-do- (PUMP)	1,667	7.9	3.44	-do-	0.5~0.3	5	3	28	24
SIFFU E.E. #1	3,596	10.2	16.60	-do-	0.7~0.6	16	5	4	29
SIFFU E.E. #2	3,000	13.6	7.40	-do-	0.7~0.3	12	6	18	37
MACAÑAO WEST	171	3.0	0.48	0.0004	0.6~0.4	-	1	7	6
TOTAL	97,402	321.4				332	140	548	843

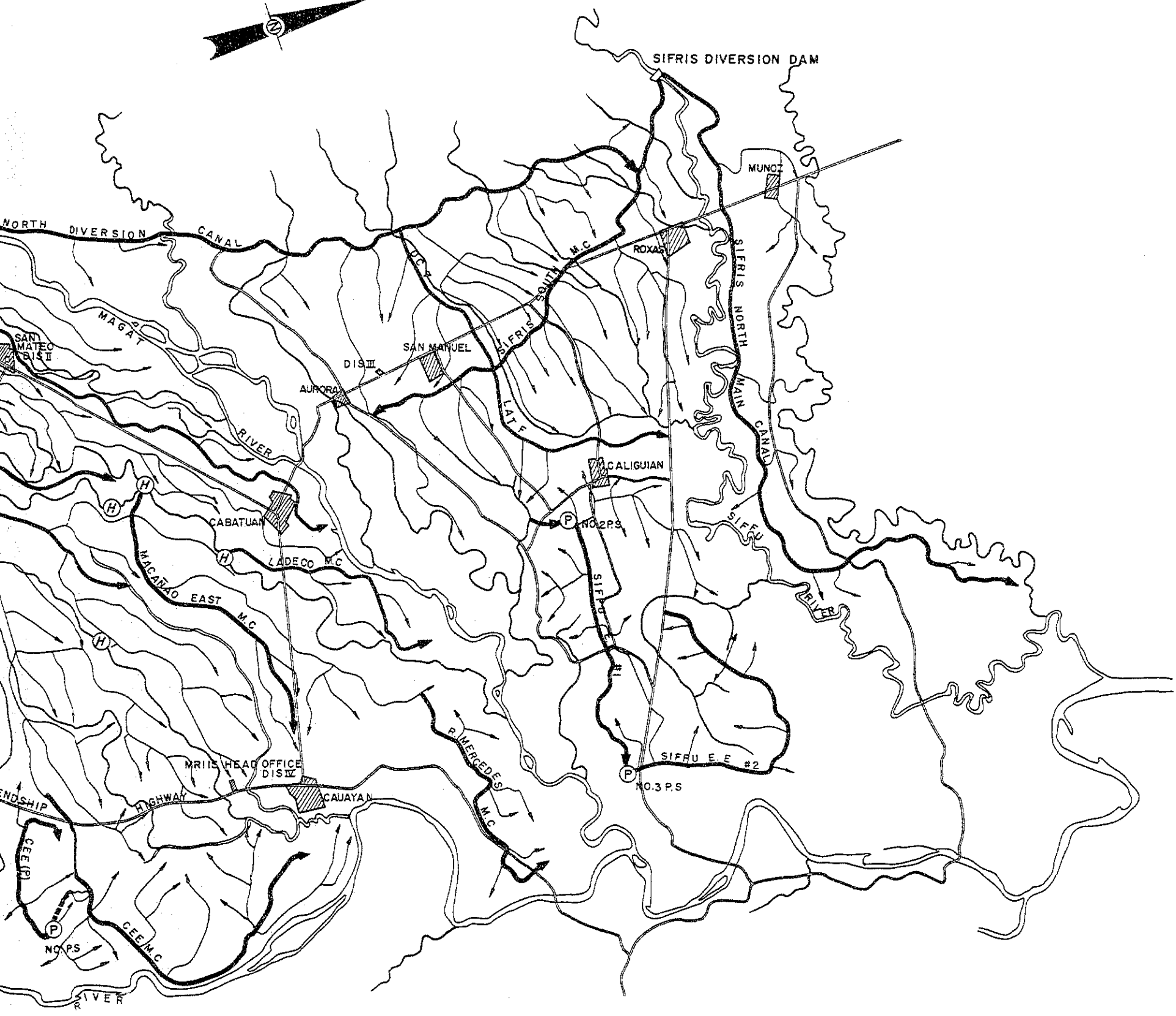
NOTE : TOTAL COVERING AREA OF NORTH DIVERSION CANAL IS 21 500 HAS INCLUSIVE SIFFU SOUTH AND SIFFU SOUTH EXTENSION AREA

OUTLINE OF LATERALS

NAME OF CANAL	SERVICE AREA (HA)	CANAL LENGTH (KM)	DESIGN DISCHARGE (M ³ /S)
1 MARIS	43,943	555.9	81.0
LATERAL A	7,447	150.2	22.0
LATERAL B	1,483	18.9	4.0
LATERAL C	7,079	119.4	10.0
LATERAL D	21,999	175.4	35.0
LATERAL E~J	5,935	92.0	9.0
2 OSCARIZ	2,239	40.7	5.0
3 SOUTH HIGH	7,337	104.8	20.0
4 SOUTH LOW	5,429	93.7	11.0
5 NORTH DIVERSION	13,475	99.6	46.0
6 SIFRIS SOUTH	5,710	54.5	9.0
7 SIFRIS NORTH	2,117	35.4	3.0
8 MACAÑAO EAST	3,850	27.9	9.0
9 LADECO	552	9.5	1.0
10 REINA MERCEDEZ	(1,081)	10.0	(3.0)
11 CAUAYAN E.E.	(2,900)	42.3	(6.0)
12 -do- (PUMP)	(716)	8.8	(1.0)
13 SIFFU E.E. #1	(3,171)	38.7	(7.0)
14 SIFFU E.E. #2	(2,483)	26.0	(6.0)
TOTAL	84,652	1,477.8	188.0

NOTE : NUMBERS IN () ARE OVERLAP

IRRIGATION CANAL SYSTEM



OUTLINE OF LATERAL CANAL

SERVICE AREA (HA)	CANAL LENGTH (KM)	DESIGN DISCHARGE (M ³ /S)	NUMBER OF LATERAL	NUMBER OF HEAD GATE	NUMBER OF CHECK GATE	NUMBER OF TURN-OUT	NUMBER OF STRUCTURE
3,943	555.9	81.58	123	103	81	1,213	992
7,447	150.2	22.09	30	33	32	326	297
1,483	18.9	4.53	2	2	1	65	37
7,079	119.4	10.96	27	19	13	178	105
1,999	175.4	35.00	39	33	32	444	389
5,935	92.0	9.00	25	16	3	200	164
2,239	40.7	5.21	12	8	7	68	68
7,337	104.8	20.25	42	35	10	243	245
5,429	93.7	11.30	33	26	—	207	294
3,475	99.6	46.40	27	25	11	168	187
5,710	54.5	9.21	17	19	4	97	114
2,117	35.4	3.11	12	9	5	47	140
3,850	27.9	9.37	6	5	3	60	57
552	9.5	1.74	3	—	—	—	33
1,081	10.0	(3.07)	6	5	—	25	33
2,900	42.3	(6.58)	18	16	8	93	116
(716)	8.8	(1.62)	5	4	1	13	25
3,171	36.7	(7.97)	16	7	5	79	102
2,483	26.0	(6.21)	12	12	5	37	56
4,652	1,47.8	188.17	332	274	140	2,350	2,462

NUMBERS IN () ARE OVERLAPPED WITH OTHERS

LEGEND

- DAM
- DIVERSION DAM
- PUMP
- WEIR ON THE CREEK
- MAJOR TOWN
- DISTRICT BOUNDARY
- MAIN CANAL
- LATERAL
- MAIN ROAD
- MAJOR RIVER
- CREEK

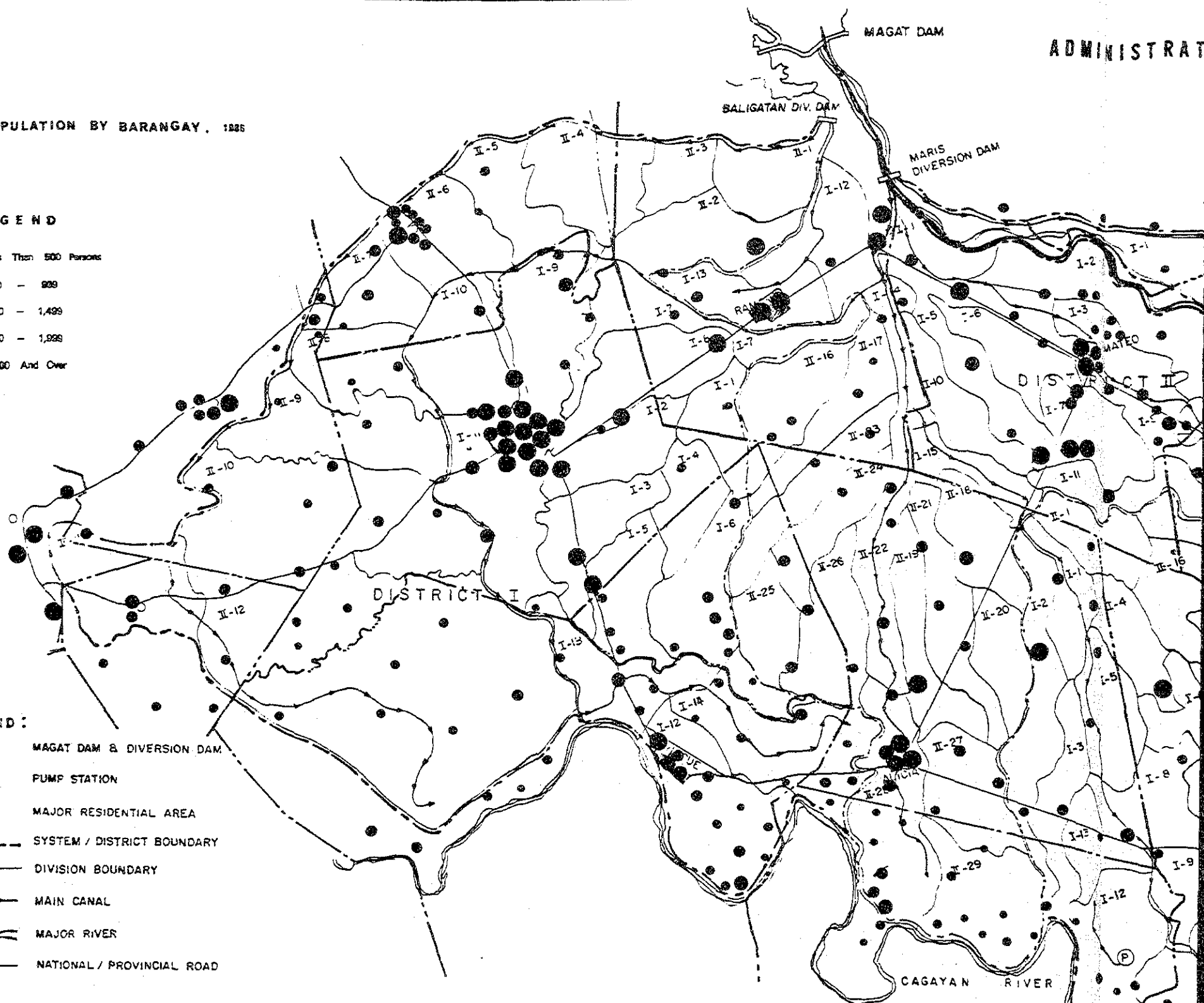
POPULATION BY BARANGAY, 1986

LEGEND

- Less Than 500 Persons
- 500 - 999
- 1,000 - 1,499
- 1,500 - 1,999
- 2,000 And Over

LEGEND:

- MAGAT DAM & DIVERSION DAM
- ⊙ PUMP STATION
- ▭ MAJOR RESIDENTIAL AREA
- - - SYSTEM / DISTRICT BOUNDARY
- DIVISION BOUNDARY
- MAIN CANAL
- MAJOR RIVER
- NATIONAL / PROVINCIAL ROAD



POPULATION AND HOUSEHOLD IN THE PROJECT AREA

Municipality	Number of Population (unit: persons)				Number of Household in 1986*2 (unit: houses)					Percent of Household (Total household = 100)		
	1975*1	1980*1	1986*2	Growth Rate (%/year)*3	Total	Non-Agricultural Household	Agricultural Household	Farm Operators Household	Farm Labor Household	Non-Agricultural Household	Farm Operators Household	Farm Labor Household
I. ISABELA Province												
1. Alicia	28,900	36,600	44,300	4.0	7,870	1,850	6,020	4,910	1,110	23.5	62.4	14.1
2. Angadanan	10,800	12,300	14,100	2.5	2,470	390	2,080	1,850	230	15.8	74.9	9.3
3. Aurora	17,100	19,300	20,400	1.6	3,570	660	2,910	2,430	480	18.5	68.1	13.4
4. Burgos	15,500	15,100	15,800	1.6	2,770	430	2,340	1,900	440	15.5	68.6	15.9
5. Cabatuan	18,800	21,400	23,800	2.2	4,110	1,270	2,840	2,360	480	30.9	57.4	11.7
6. Cauayan	30,600	42,300	57,100	5.8	10,200	4,480	5,720	4,470	1,250	43.9	43.8	12.3
7. Cordon	13,100	16,800	20,800	4.3	3,830	1,120	2,710	2,180	530	29.2	56.9	13.9
8. Echague	26,700	29,100	33,700	2.1	6,110	2,320	3,790	3,140	650	38.0	51.4	10.6
9. Gamu	11,100	13,000	14,400	2.4	2,540	550	1,990	1,520	470	21.7	59.8	18.5
10. Luma	8,300	9,700	11,900	3.3	2,090	310	1,780	1,520	260	14.8	72.7	12.5
11. Naguilian	1,700	2,100	2,100	1.9	330	110	220	200	20	33.3	60.6	6.1
12. Quirino	10,500	12,100	13,900	2.6	2,480	360	2,120	1,870	250	14.5	75.4	10.1
13. Ramon	17,800	30,800	39,000	7.4	7,550	3,590	3,960	3,280	680	47.5	43.4	9.1
14. Reina Mercedes	12,300	14,400	17,100	3.0	2,740	800	1,940	1,600	340	29.2	58.4	12.4
15. Roxas	28,000	32,000	36,200	2.4	6,330	1,570	4,760	3,580	1,180	24.8	56.6	18.6
16. San Isidro	9,700	11,500	12,500	2.3	2,280	320	1,960	1,640	320	14.0	71.9	14.1
17. San Manuel	14,500	18,000	20,700	3.5	3,810	570	3,240	2,500	740	15.0	65.6	19.4
18. San Mateo	34,500	41,200	47,700	3.0	8,200	1,940	6,260	5,280	980	23.7	64.4	11.9
19. Santiago	59,200	69,900	84,200	3.3	14,800	8,310	6,490	5,150	1,340	56.1	34.8	9.1
Sub-total	366,900	447,600	529,700	3.4	94,080	30,950	63,130	51,360	11,750	32.9	54.6	12.5
II. QUIRINO Province												
20. Cabarroguis	5,700	6,600	9,600	4.9	1,870	640	1,230	920	310	34.2	49.2	16.6
21. Diffun	12,500	14,300	18,500	3.6	3,280	1,050	2,230	1,880	350	32.0	57.3	10.7
22. Saguday	5,900	6,700	7,400	2.1	1,370	190	1,180	960	220	13.9	70.1	16.0
Sub-total	24,100	27,600	35,500	3.6	6,520	1,880	4,640	3,760	880	28.8	57.7	13.5
III. IFUGAO Province												
23. Portia	1,900	2,700	3,400	5.4	700	130	570	520	50	18.6	74.3	7.1
Total	392,900	477,900	568,600	3.4	101,300	32,960	68,340	55,660	12,680	32.5	55.0	12.5

Source: *1 ... Census of Population, NCSO, NEDA
 Note: *2 ... Estimated result based on the trend of Census of Population and Barangay survey in the Project area, 1986
 *3 ... Average annual growth rate for the last 11 years.

POPULATION

QUIRINO PROVINCE

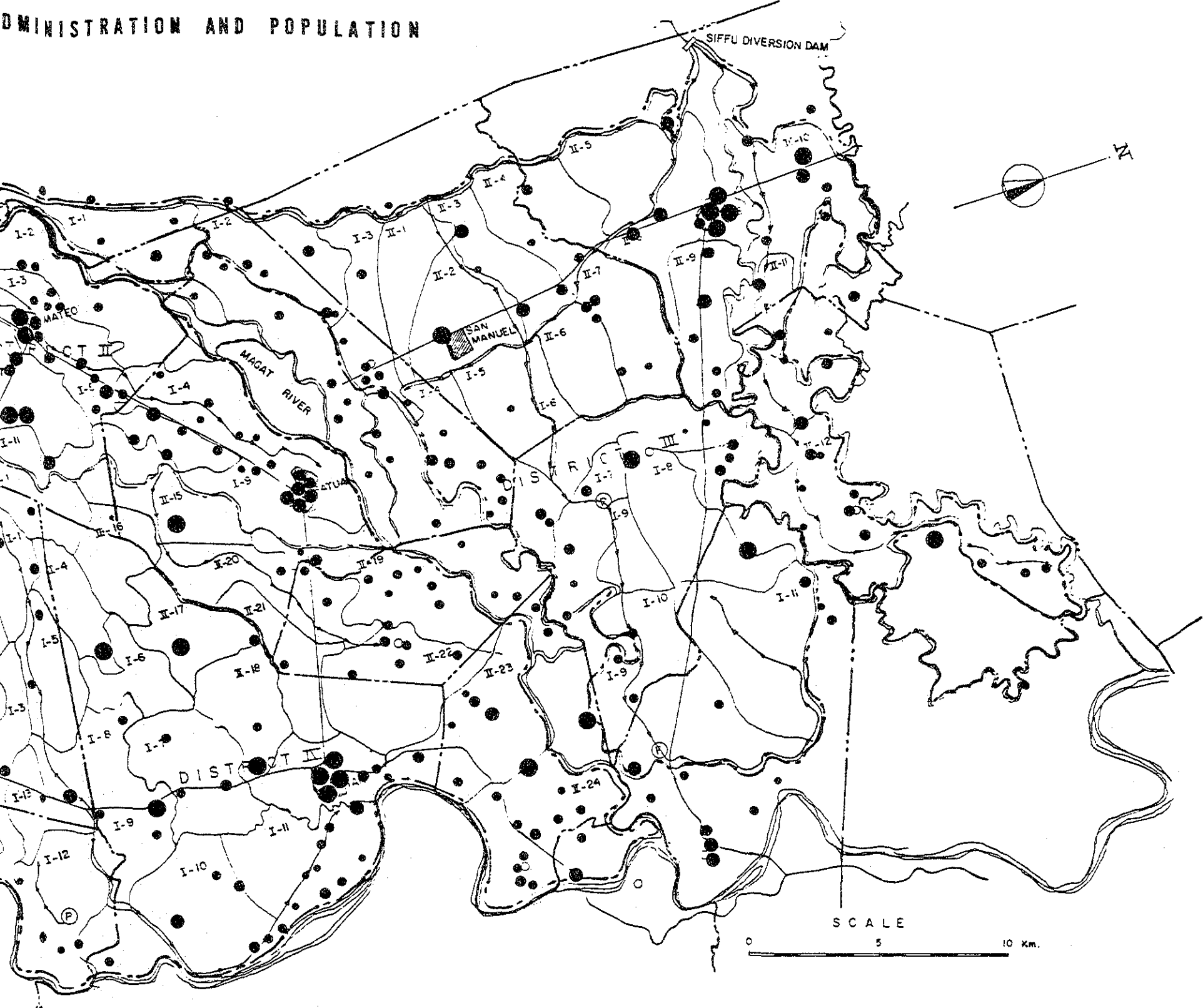
CABARROGUIS

SAGUDAY

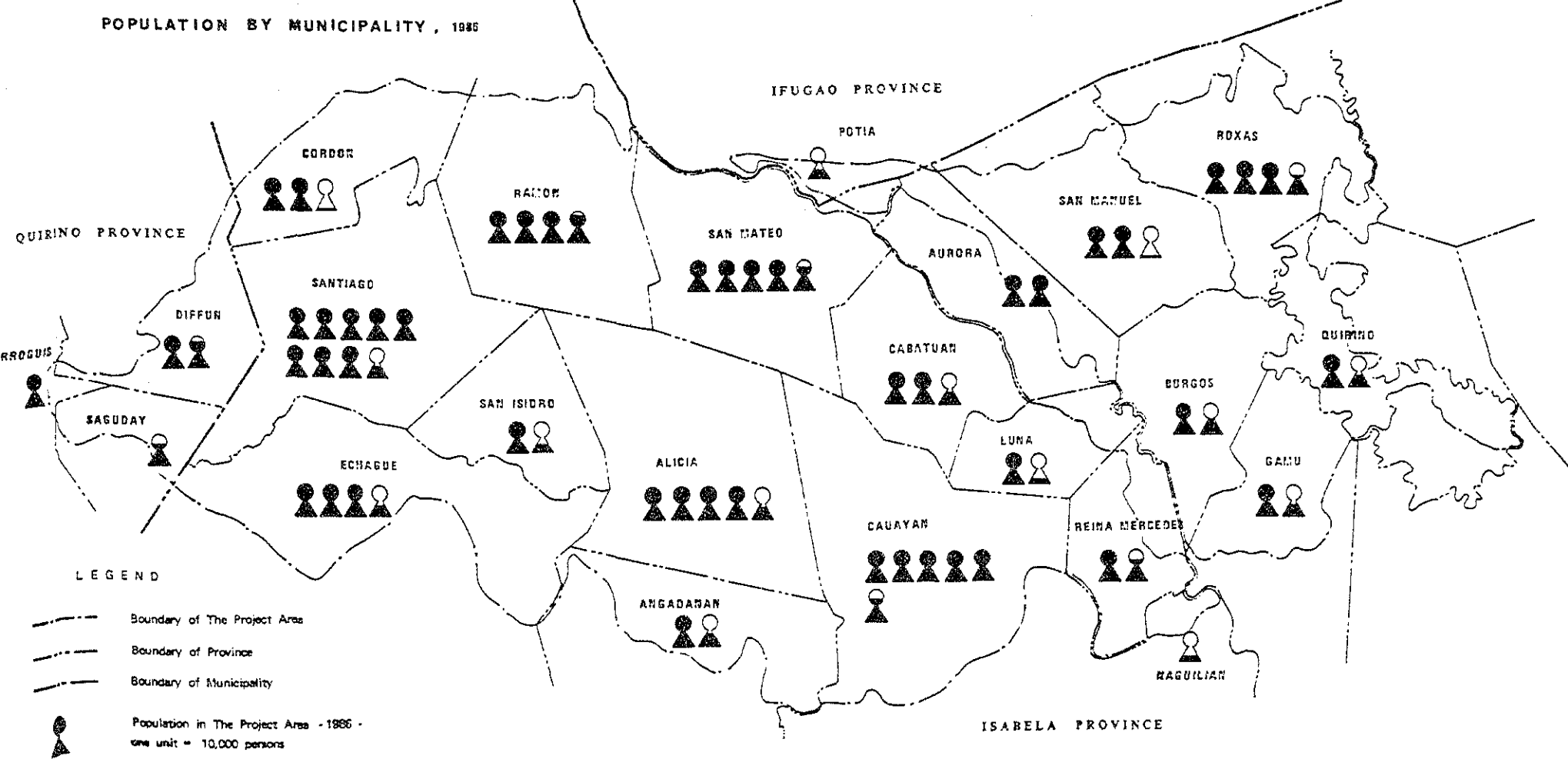
LEGEND

- Boundaries
- Boundaries
- Boundaries
- Population

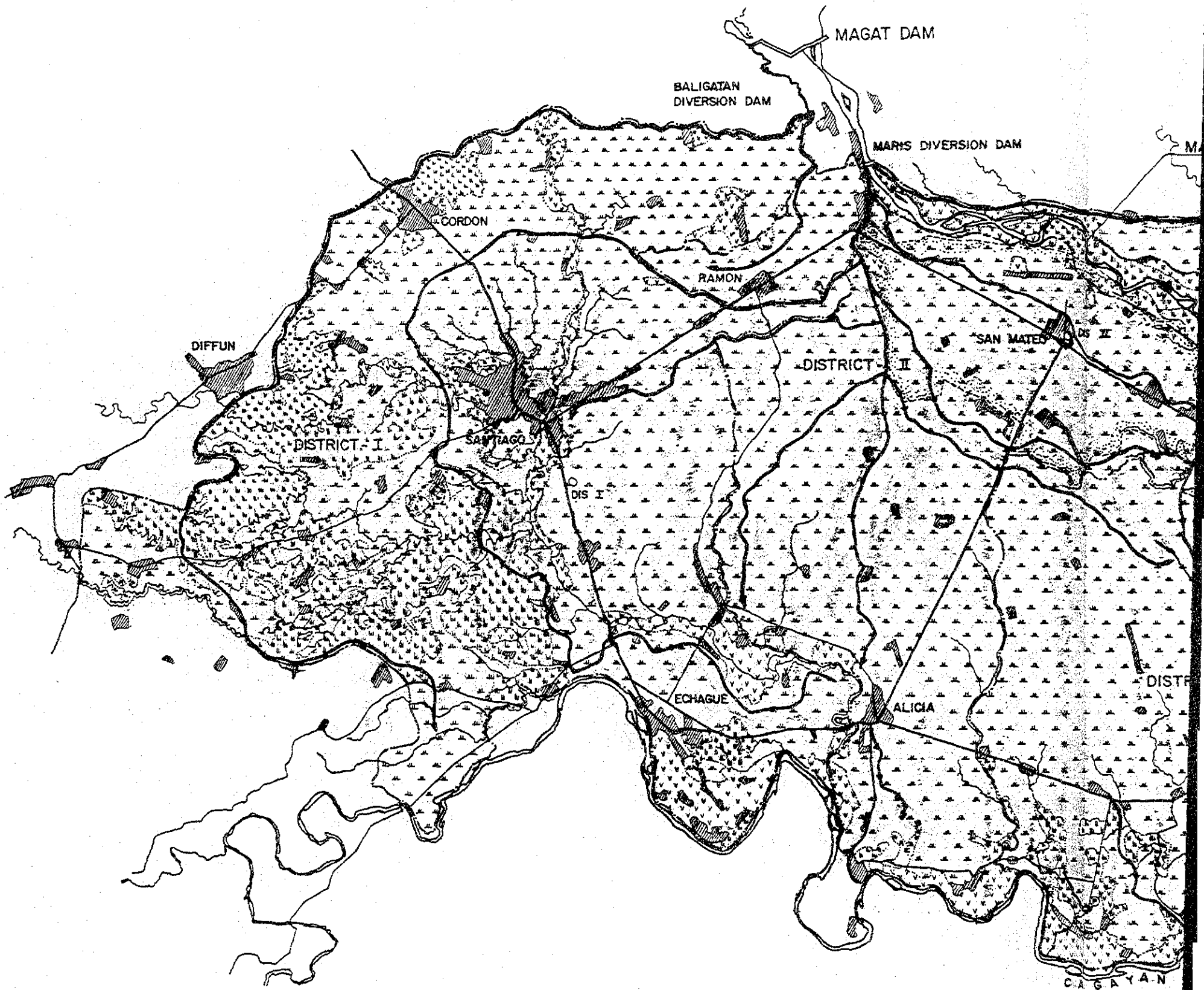
ADMINISTRATION AND POPULATION



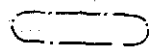
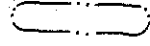



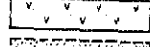
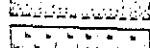



POPULATION BY MUNICIPALITY, 1986



LAND USE



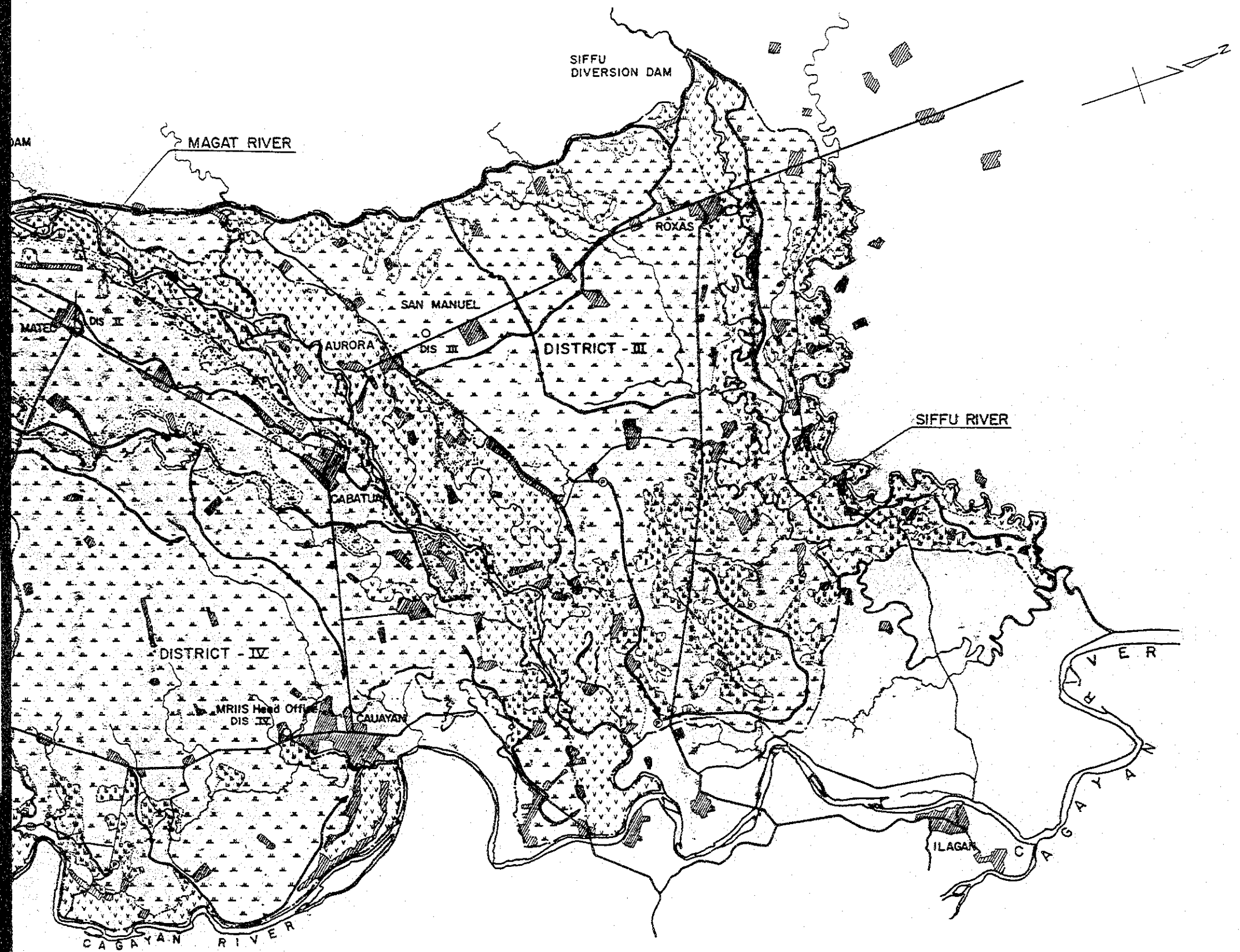
LEGEND:

	Boundary of the Project Area
	Boundary of the District
	National and Provincial Road
	River and Creek
	Main Irrigation Canal
	Paddy Field
	Upland Field
	Dual Soil Area
	Grassland and Woodland
	Residential Area

PADDY FIE
 UPLAND F
 GRASSLAN
 RESIDENT
 ROAD, RIV
 CANAL, C
 OTHERS

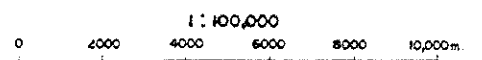
TO

LAND USE MAP

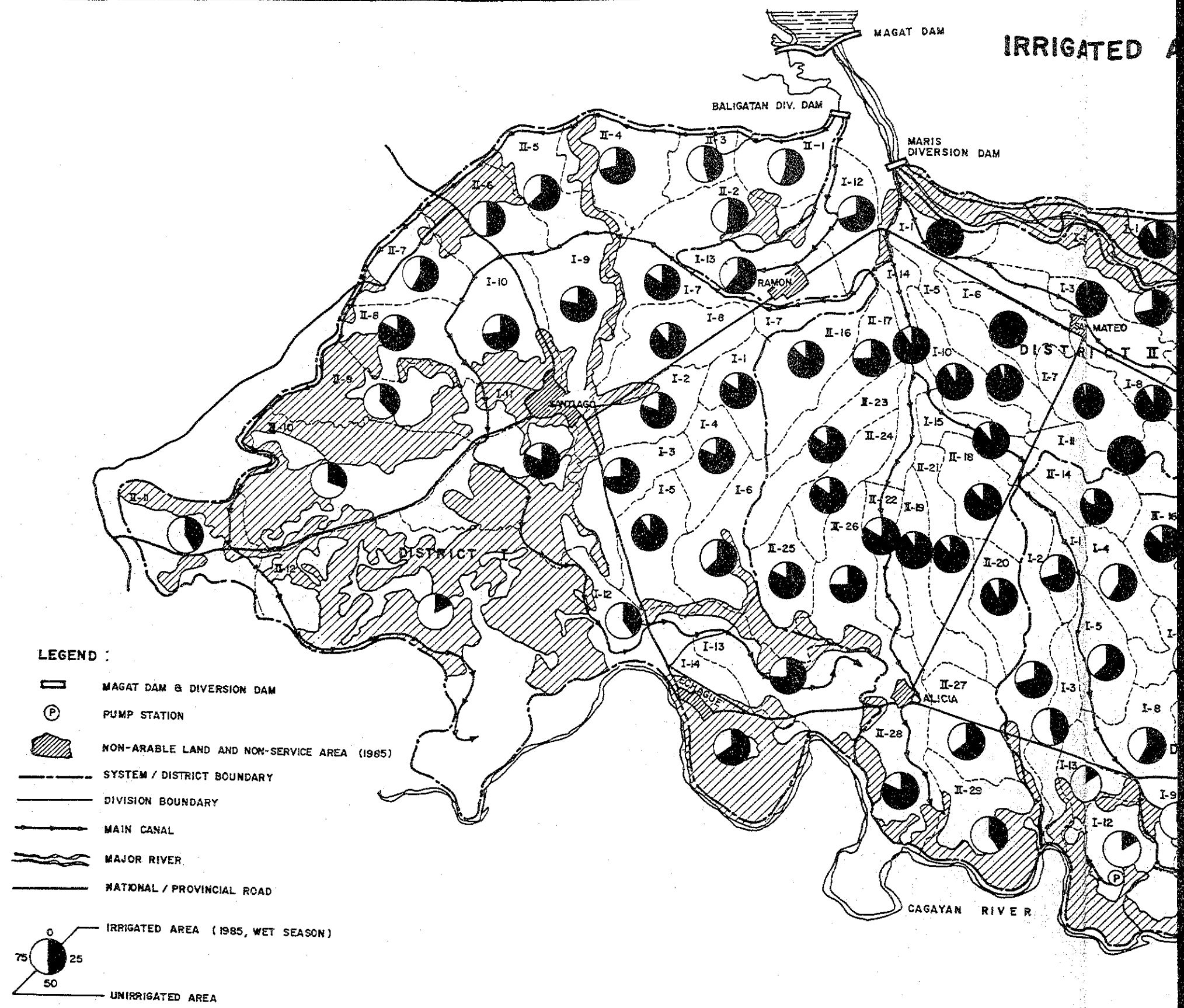


PRESENT LAND USE

PADDY FIELD	-	92,700 Ha.
UPLAND FIELD	-	21,600 Ha.
GRASSLAND, WOODLAND	-	22,000 Ha.
RESIDENTIAL AREA	-	5,600 Ha.
ROAD, RIVER COURSE	-	6,400 Ha.
CANAL, CREEK	-	3,900 Ha.
OTHERS	-	12,600 Ha.
TOTAL		164,800 Ha.



IRRIGATED AREA

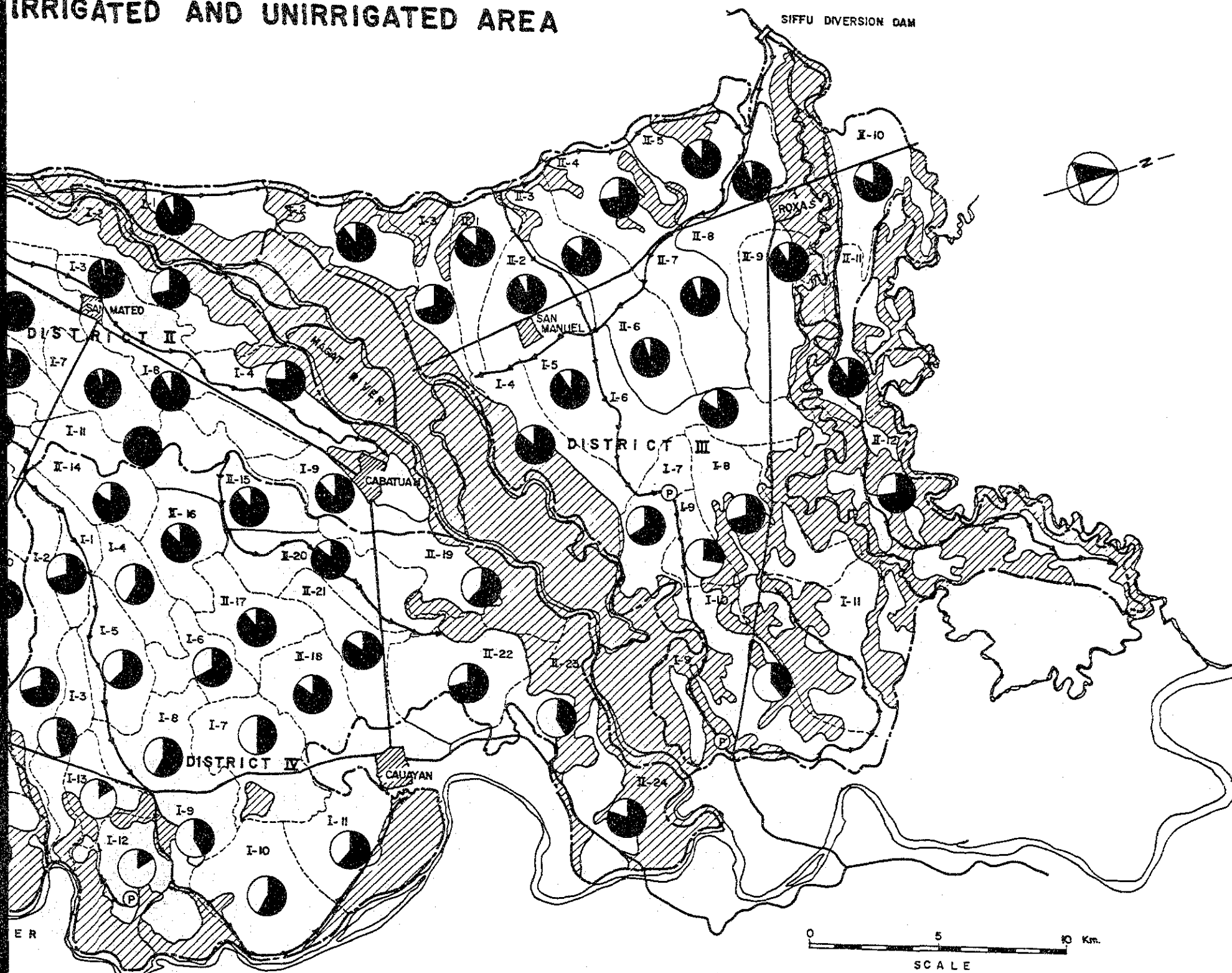


DISTRICT I												
WM Division	Projected Service Area (Ha)	Irrigated Area 1986				Unirrigated Area 1986 Wet Season						
		Wet Season (Ha)	Dry Season (Ha)	Total (Ha)	Undeveloped (Ha)	Lack of On-farm Facilities (Ha)	High Elevation (Ha)	Drainage Problem (Ha)	Financial Problems (Ha)	Others (Ha)		
I-1	803	722	90	676	84	81	-	-	-	70	11	
I-2	826	823	99	568	69	33	-	-	-	3	-	
I-3	900	713	79	668	74	187	100	-	-	80	7	
I-4	808	728	90	731	90	80	50	10	-	15	5	
I-5	855	756	88	747	87	99	2	15	-	70	12	
I-6	955	672	70	673	70	283	130	13	-	120	250	
I-7	1,035	848	82	846	82	187	100	-	-	72	15	
I-8	1,049	939	90	898	85	110	34	-	-	3	63	
I-9	1,241	1,006	81	872	70	235	-	-	-	18	27	
I-10	1,173	839	71	830	71	334	-	-	-	4	31	
I-11	861	781	91	767	89	80	52	-	-	7	16	
I-12	1,001	463	46	419	42	538	-	-	-	14	19	
I-13	765	576	75	571	75	189	-	-	-	5	100	
I-14	796	489	61	612	77	207	95	45	-	150	17	
II-1	899	562	63	559	66	140	125	-	-	10	45	
II-2	961	821	85	738	66	241	160	-	-	15	-	
II-3	734	493	67	408	56	241	160	-	-	10	21	
II-4	828	697	84	687	83	131	100	-	-	12	19	
II-5	800	641	80	558	70	159	150	-	-	6	3	
II-6	904	456	50	456	50	448	390	-	-	5	16	
II-7	603	495	82	507	84	108	45	-	-	5	16	
II-8	795	750	94	707	89	45	25	-	-	18	2	
II-9	791	365	46	347	43	426	330	-	-	2	50	
II-10	869	512	59	362	42	357	300	-	-	20	7	
II-11	1,736	1,122	65	981	57	614	500	-	-	50	14	
II-12	1,066	605	57	485	45	461	400	-	-	30	20	
Total	24,054	17,874	74	16,578	69	6,180	4,325	312	-	129	971	443

Source: MRIS DISTRICT OFFICES, NIA

DISTRICT II													
WM Division	Projected Service Area (Ha)	Irrigated Area 1986				Unirrigated Area 1986 Wet Season							
		Wet Season (Ha)	Dry Season (Ha)	Total (Ha)	Undeveloped (Ha)	Lack of On-farm Facilities (Ha)	High Elevation (Ha)	Drainage Problem (Ha)	Financial Problems (Ha)	Others (Ha)			
I-1	813	792	97	784	96	21	14	-	-	7	-	I-1 737	
I-2	978	693	71	688	70	285	2	-	-	2	-	I-2 843	
I-3	792	760	96	747	94	32	7	199	82	2	-	I-3 1,019	
I-4	948	785	83	686	72	163	40	6	16	3	-	I-4 1,186	
I-5	909	897	99	897	99	12	-	-	-	-	-	I-5 1,089	
I-6	845	838	99	838	99	7	-	-	2	10	-	I-6 1,062	
I-7	822	812	99	809	98	10	9	-	-	7	-	I-7 1,283	
I-8	902	857	95	852	94	45	33	5	2	4	-	I-8 1,143	
I-9	666	600	90	567	85	66	3	-	-	14	21	I-9 1,176	
I-10	734	702	96	711	97	32	-	-	-	5	3	I-10 3,000	
I-11	849	838	99	708	83	11	-	7	-	-	-	II-1 1,088	
I-12	832	575	69	565	68	257	116	111	30	-	-	I-12 981	
I-13	863	597	69	596	69	266	91	134	26	-	-	I-13 1,041	
I-14	820	799	97	704	86	21	1	2	-	3	11	I-14 1,029	
II-15	1,040	927	89	883	85	113	-	10	-	35	44	I-15 925	
II-16	1,136	1,052	93	855	75	84	20	43	5	-	10	I-16 1,076	
II-17	805	733	91	689	91	84	2	47	-	5	-	I-17 1,180	
II-18	760	676	89	689	91	84	2	36	10	31	5	I-18 1,010	
II-19	778	727	93	733	94	51	9	18	7	4	13	I-19 1,028	
II-20	891	837	94	859	96	54	3	4	18	9	12	I-20 1,058	
II-21	767	645	84	625	81	122	15	61	10	36	-	I-21 879	
II-22	931	804	86	806	87	127	18	13	-	35	51	I-22 1,010	
II-23	1,105	936	85	870	79	169	25	7	2	20	98	I-23 1,058	
II-24	911	709	78	741	81	202	6	-	49	2	143	I-24 98	
II-25	862	724	84	599	69	138	42	-	39	28	11	I-25 18	
II-26	1,050	718	68	723	69	332	108	170	22	13	11	I-26 8	
II-27	737	509	69	478	65	228	102	101	11	4	10	I-27 -	
II-28	922	464	50	563	61	458	105	299	15	16	13	I-28 10	
Total	24,468	21,006	86	20,331	83	3,462	776	1,273	366	293	469	285	Total 24,793

IRRIGATED AND UNIRRIGATED AREA

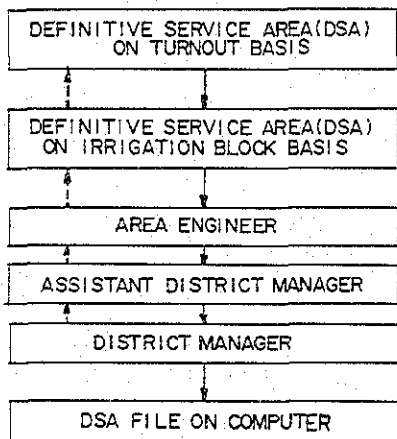


DISTRICT III												
W/M Division	Projected Service Area (Ha)	Irrigated Area 1986				Unirrigated Area 1986 Wet Season						
		Wet Season (Ha)	Dry Season (Ha)	Total (Ha)	Undeveloped (Ha)	Lack of On-farm Facilities (Ha)	High Elevation (Ha)	Drainage Problem (Ha)	Financial Problems (Ha)	Others (Ha)		
1	737	678	92	648	88	59	7	32	5	10	-	5
2	843	796	94	767	96	47	14	12	21	-	-	-
3	1,019	705	69	686	67	314	130	164	15	5	-	-
4	1,186	1,001	84	972	97	185	100	53	19	5	-	8
5	1,089	930	85	927	85	159	-	52	26	71	-	10
6	1,062	823	77	817	77	239	30	87	30	82	-	10
7	1,283	747	58	776	60	536	280	196	41	8	-	11
8	1,143	546	48	661	58	597	100	284	115	78	-	20
9	1,176	286	24	339	29	890	300	425	132	30	-	3
10	3,000	669	22	399	13	2,331	1,730	551	50	-	-	20
II-1	1,088	798	73	779	72	290	44	137	65	24	-	4
2	981	896	91	876	89	85	22	47	2	10	-	4
3	1,041	882	85	801	77	159	-	61	-	20	-	78
4	1,029	684	66	626	61	345	84	123	55	40	-	43
5	925	809	87	775	84	116	30	6	26	-	-	45
6	1,076	931	87	978	91	145	-	-	6	94	-	-
7	1,180	1,152	98	1,138	96	28	-	-	14	14	-	-
8	1,010	959	95	912	90	51	-	51	-	-	-	-
9	1,028	879	86	871	85	149	-	43	32	20	-	15
10	1,058	810	77	808	76	248	28	69	120	16	-	54
11	879	820	93	817	93	59	-	-	-	-	-	59
12	960	600	63	702	73	360	38	216	85	16	-	5
Total	24,793	17,401	70	17,075	69	7,392	2,937	2,663	859	543	-	390

DISTRICT IV												
W/M Division	Projected Service Area (Ha)	Irrigated Area 1986				Unirrigated Area 1986 Wet Season						
		Wet Season (Ha)	Dry Season (Ha)	Total (Ha)	Undeveloped (Ha)	Lack of On-farm Facilities (Ha)	High Elevation (Ha)	Drainage Problem (Ha)	Financial Problems (Ha)	Others (Ha)		
I-1	1,080	782	72	767	71	298	275	23	-	-	-	-
2	1,111	792	71	815	73	319	209	31	6	23	30	20
3	1,095	455	42	453	41	640	279	206	59	50	46	-
4	918	544	59	572	62	374	234	15	-	66	59	-
5	1,104	713	64	738	67	391	282	8	-	58	43	-
6	1,044	652	62	650	62	392	229	60	-	103	-	-
7	1,153	608	53	653	57	545	251	80	58	75	81	-
8	993	551	55	574	58	442	253	60	-	108	21	-
9	1,200	538	45	504	42	662	381	105	-	89	87	-
10	1,224	836	68	633	52	388	312	33	-	33	10	-
11	1,190	721	61	687	58	469	340	118	-	6	5	-
12	1,667	423	25	385	23	1,244	467	702	20	30	25	-
II-13	Transferred to WMT No. 12											
14	850	717	84	719	84	133	74	4	-	30	25	-
15	918	796	87	846	92	122	30	32	-	19	20	21
16	850	759	89	784	92	91	20	17	-	22	20	12
17	898	789	88	804	90	109	30	21	-	31	9	18
18	950	729	77	803	84	221	18	66	-	10	70	57
19	1,000	603	60	600	60	397	31	266	80	8	12	-
20	1,138	880	77	900	79	258	191	54	-	13	-	-
21	900	726	81	750	83	174	65	30	-	25	15	-
22	1,028	865	84	824	80	163	51	90	-	-	22	-
23	888	326	37	294	58	562	188	154	200	20	-	-
24	888	270	30	260	-	618	188	285	50	15	30	50
Total	24,087	15,075	63	15,015	62	9,012	4,398	2,460	473	834	608	239
Grand Total	97,402	71,356	73	68,999	71	26,046	12,436	6,708	1,698	1,799	2,048	1,357

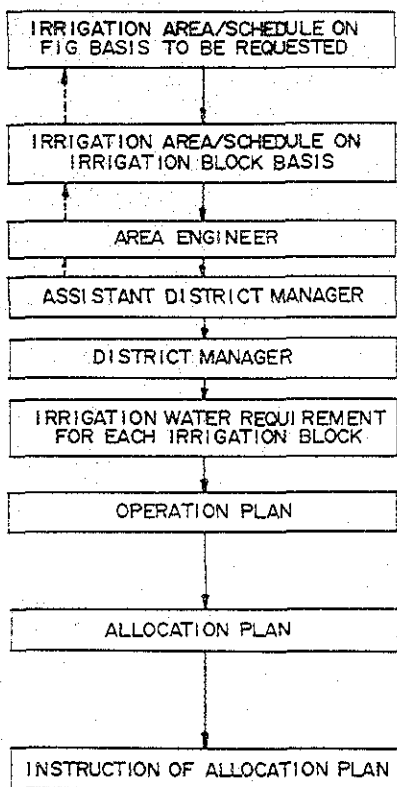
WATER REQUEST AND ALLOCAT

(1) PREPARATORY WORK



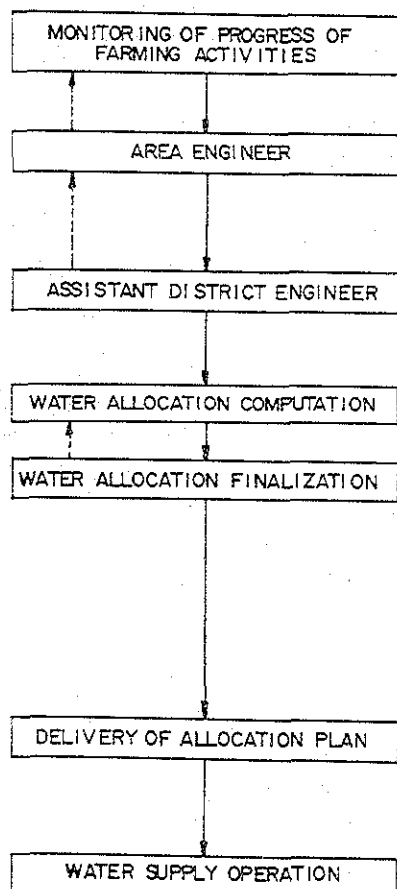
- 1-1 WM ESTIMATES THE SERVICE AREA TO BE IRRIGATED ON TURNOUT BASIS ACCURATELY BY USE OF CADASTRAL MAPS
- 1-2 WM SUMMARIZES DEFINITIVE SERVICE AREA ON IRRIGATION BLOCK BASIS, FORMULATED BASED ON CANAL FLOW DIAGRAM CONSIDERING AREA COMMANDED BY MAJOR CHECK & HEAD GATES AND DIVISION BOUNDARY
- 1-3 AREA ENGINEER SUMMARIZES AND CORRECTS DSA ON DIVISION BASIS
- 1-4 ASSISTANT DISTRICT MANAGER SUMMARIZES AND CORRECTS DSA ON DISTRICT BASIS
- 1-5 DISTRICT MANAGER REVIEWS AND APPROVES AND SUBMITS THEM TO WCCS, HEAD OFFICE
- 1-6 WCCS COLLECTS DEFINITIVE SERVICE AREA ON IRRIGATION BLOCK BASIS, ARRANGES AND FILES THEM ONTO COMPUTER DISK MEMORY

(2) REQUEST ALLOCATION PLAN OF IRRIGATION WATER



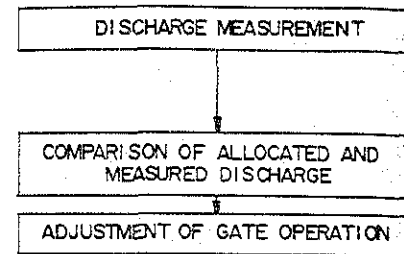
- 2-1 REQUEST AND ALLOCATION PLAN OF IRRIGATION WATER SHALL BE PREPARED AT LATEST ONE MONTH BEFORE COMING CROPPING SEASON FOR EACH MAJOR CANAL SYSTEMS. IA PREPARES IRRIGATION AREA/SCHEDULE TO BE REQUESTED BY FIG AND/OR FARMERS.
- 2-2 WM REVIEWS AND ADJUSTS AREA/SCHEDULE REQUESTED BY IA, AND SUMMARIZES THEM ON IRRIGATION BLOCK BASIS
- 2-3 AREA ENGINEER SUMMARIZES AND ADJUSTS THEM ON DIVISION BASIS
- 2-4 ASSISTANT DISTRICT MANAGER SUMMARIZES AND ADJUSTS THEM ON DISTRICT BASIS
- 2-5 DISTRICT MANAGER REVIEWS, APPROVES AND SUBMITS THEM TO WCCS
- 2-6 WCCS ESTIMATES PROMPTLY AND ACCURATELY IRRIGATION REQUIREMENT ON IRRIGATION BLOCK BASIS AT MAJOR CHECK/HEAD GATES BY MEANS OF COMPUTER PROCESSING
- 2-7 WCCS ADJUSTS IRRIGATION WATER REQUIREMENT ESTIMATED IN CONSIDERATION OF EFFECTIVE RAINFALL AVAILABLE, EXISTING STORAGE IN THE MAGAT RESERVOIR AND RUNOFF EXPECTED FROM RIVERS
- 2-8 BASED ON ABOVE ADJUSTMENT, MRHS HEAD OFFICE MANAGER DECIDES ALLOCATION PLAN OF IRRIGATION WATER ON IRRIGATION BLOCK BASIS AS WELL OF OUTFLOW AT RESERVOIR AND DIVERSION DAMS ON WEEKLY BASIS AND INSTRUCTS IT TO EACH DISTRICT MANAGER.
- 2-9 DISTRICT MANAGER INSTRUCTS WM AND IA TO KEEP PROGRAMMED ALLOCATION OF IRRIGATION WATER AS SCHEDULED IN COMING CROPPING SEASON

(3) ACTUAL OPERATION FOR REQUEST AND ALLOCATION



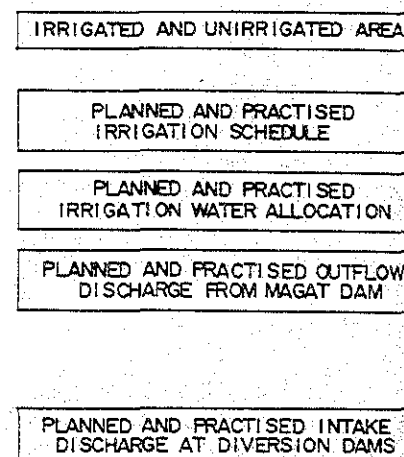
- 3-1 WM PATROLS AND MONITORS PROGRESS OF FARMING ACTIVITIES IN IRRIGATED AREA EVERY WEEK, REPORTS STAGE-WISE AREA TO BE IRRIGATED IN NEXT WEEK, AND SUBMITS AREAL DATA TO WCCS THROUGH AREA ENGINEER
- 3-2 AREA ENGINEER VALIDATES AREA UNDER IRRIGATION, CORRECTS AND SUMMARIZES AND SUBMITS THEM TO WCCS THROUGH ASSISTANT DISTRICT MANAGER TOGETHER WITH INFORMATION REGARDING AVAILABLE EFFECTIVE RAIN ON THE IRRIGATED PADDY
- 3-3 ASSISTANT DISTRICT MANAGER REVIEWS AND APPROVES DATA, AND REPORTS THEM TO WCCS TOGETHER WITH INFORMATION REGARDING THE AVAILABLE WATER RESOURCES IN DAMS AND RIVERS NOT LATER THAN FRIDAY EVENING
- 3-4 WCCS ESTIMATES IRRIGATION WATER REQUIREMENT OF SUCCEEDING WEEK ON IRRIGATION BLOCK BASIS BY USE OF COMPUTER
- 3-5 WCCS THEN ADJUSTS COMPUTED RESULTS AND FINALIZES DIVERSION WATER REQUIREMENTS ON IRRIGATION BLOCK BASIS TAKING INTO EXISTING STATUS OF WATER BALANCE SUCH AS STORAGE IN THE DAM, AVAILABLE FLOW IN RIVERS AS WELL AS EFFECTIVE RAINFALLS ON THE FIELD INTO CONSIDERATION. BASED ON THE REVISED COMPUTATION, DIVERSION WATER REQUIREMENT IS ACCUMULATED AT MAJOR CHECK/HEAD GATES AND ALSO AT IMPORTANT POINT OF DISCHARGE CONTROL. THIS WORK IS PROCESSED IN THE MORNING, MONDAY
- 3-6 ASSISTANT DISTRICT MANAGER RECEIVES FINALIZED WATER ALLOCATION PLAN FROM WCCS, CALLS O/M STAFFS OF DISTRICT FOR MEETING ON WEEKLY PRACTICE OF WATER OPERATION AND GIVES WMS NECESSARY INSTRUCTIONS
- 3-7 ACTUAL OPERATION OF IRRIGATION WATER SUPPLY IS MADE BY THIS INSTRUCTED WATER ALLOCATION PLAN BY THE CHECK AND HEAD GATE KEEPER UNDER THE MANAGEMENT OF WM

(4) MONITORING OF WATER SUPPLY PRACTICE



- 4-1 HYDROLOGICAL MEASUREMENT POINTS WITH IRRIGATION DISTRICT
- 4-2 HYDROLOGICAL MEASUREMENT POINTS WITH IRRIGATION DISTRICT
- 4-3 BASED ON MEASUREMENT, ASSISTANT DISTRICT MANAGER INSTRUCTS GATE KEEPERS TO ADJUST GATE OPERATION

(5) DATA MANAGEMENT



- 5-1 WM CONDUCTS SURVEY AND UNIRRIGATED AREA BASIS
- 5-2 WM CONDUCTS SURVEY AND UNIRRIGATED AREA BASIS
- 5-3 WCCS CONDUCTS SURVEY AND UNIRRIGATED AREA BASIS
- 5-4 HYDROLOGICAL DISTRICT PLANNED DISCHARGE NECESSARY INFLOW AND SE
- 5-5 DISTRICT MANAGER COMPARES CHARGE AT DAMS AND OT

DATA RELEVANT TO WATER MANAGEMENT ARE OBSERVED MONTHLY AND PERIODICALLY, AND COMPILED AT THE DISTRICT OFFICE. DATA ARE OBSERVED AND COLLECTED MAINLY BY WM, AND SENT TO WCCS, HEAD OFFICE THROUGH DISTRICT MANAGER. WCCS COMPILES SUCH DATA, AND PUBLISHES MONTHLY, YEARLY AND ALSO EFFECTIVELY UTILIZED TO EVALUATE ACTUAL OPERATION, AND PERIODICAL UPGRADING/IMPROVEMENT OF IRRIGATION SYSTEMS IS PROGRESSED ACCORDINGLY.

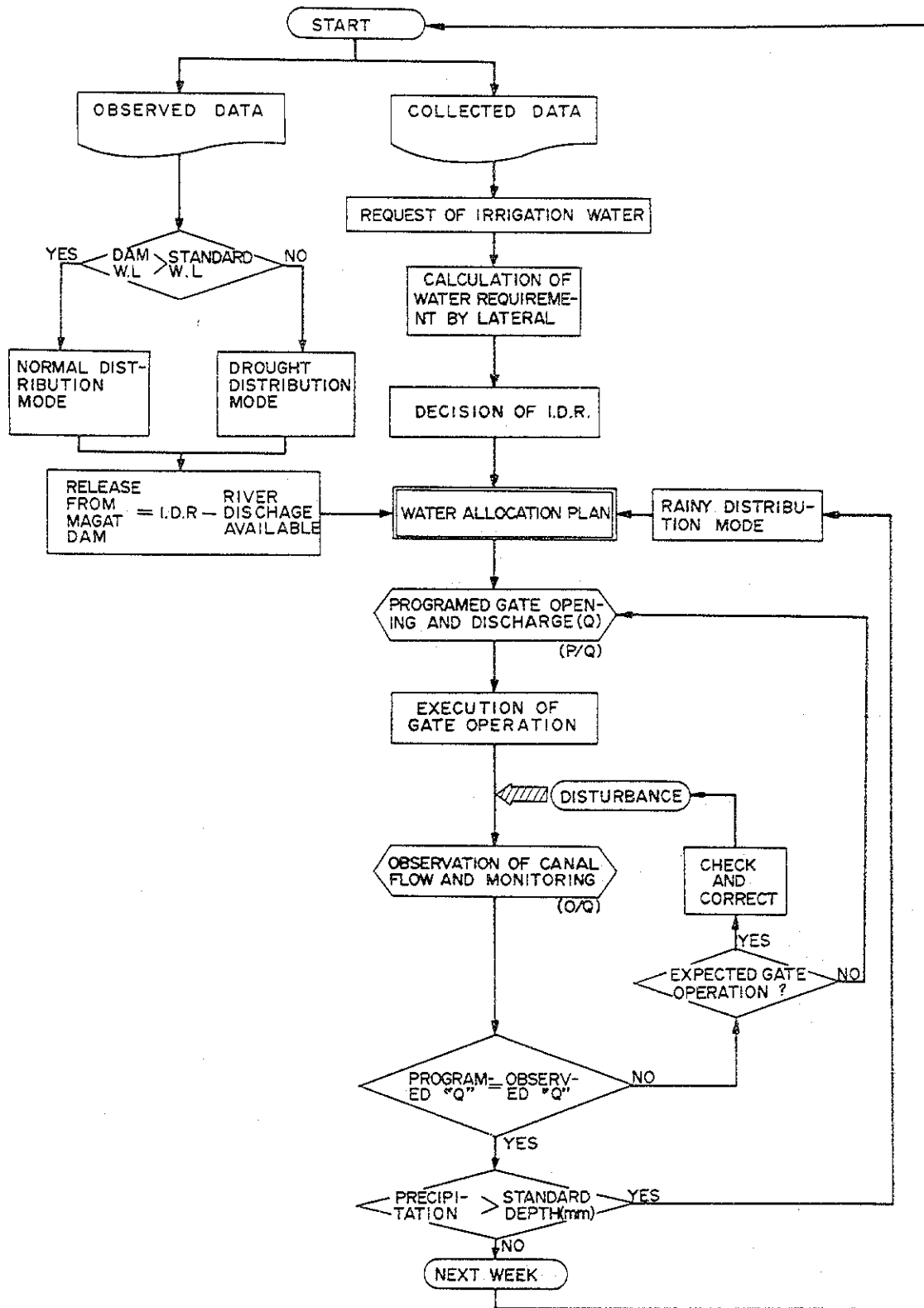
ALLOCATION RULE

FLOW CHART OF IRRIGATION WATER SUPPLY

WATER SUPPLY PRACTICE

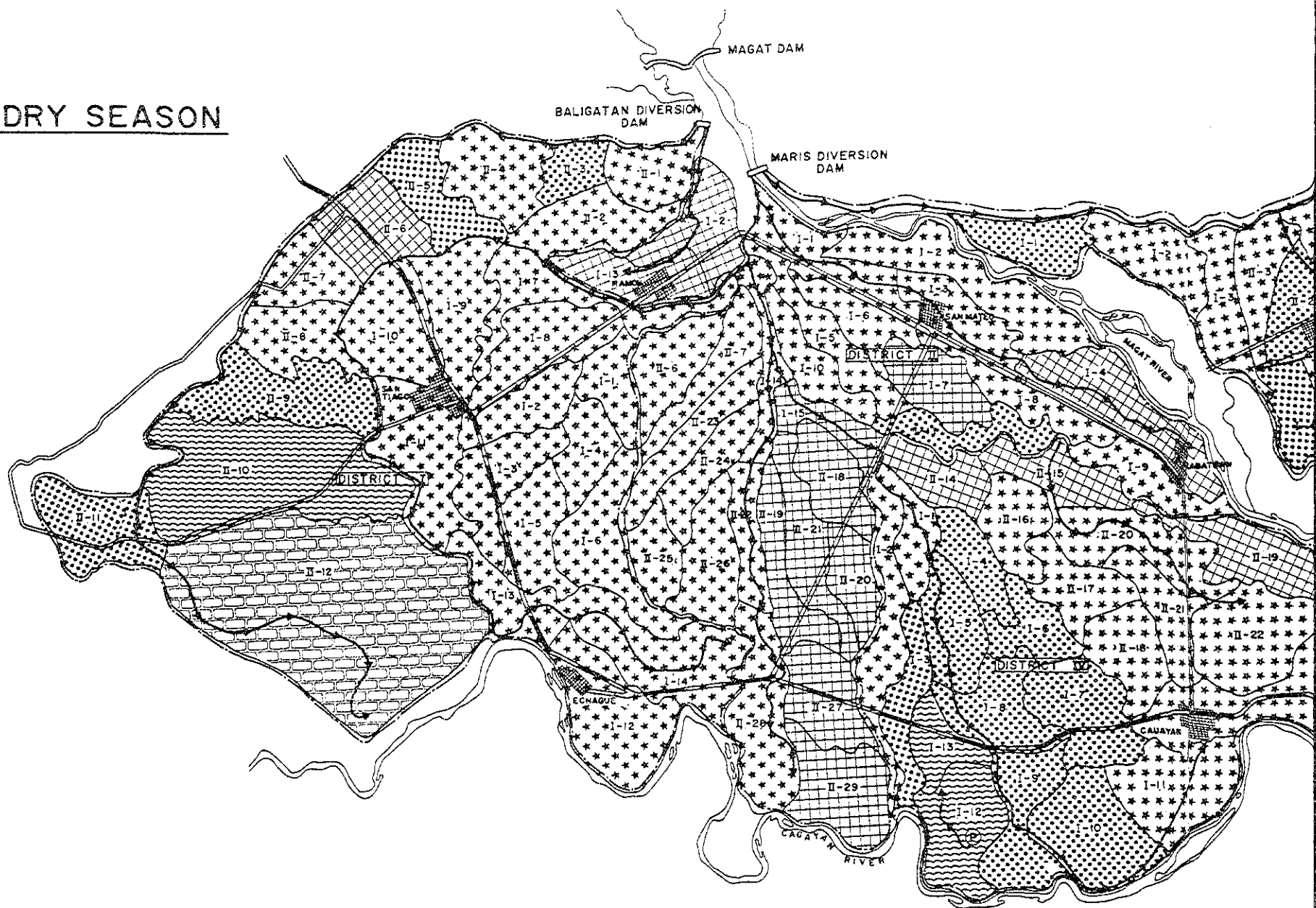
- 4-1 HYDROGRAPHER AND HIS TEAM CONDUCT DISCHARGE MEASUREMENT AT SPECIFIED CONTROL POINTS ALONG CANAL NETWORK IN ACCORDANCE WITH DESTINED SCHEDULE PREPARED BY THE DISTRICT MANAGER
- 4-2 HYDROGRAPHER REPORTS RESULT OF DISCHARGE MEASUREMENT IN COMPARISON OF ALLOCATED DISCHARGE TO ASSISTANT DISTRICT MANAGER
- 4-3 BASED ON DISCHARGE MEASUREMENT RESULTS, ASSISTANT DISTRICT MANAGER INFORMS AND INSTRUCTS WMS, IF NECESSARY, TO ADJUST GATE OPERATION AND TO RESTORE CANAL DISCHARGE AS ALLOCATED
- 5-1 WM COMPARES AND SUMMARIZES IRRIGATED AND UNIRRIGATED AREA ON FIG (TURNOUT) BASIS
- 5-2 WM COMPARES AND SUMMARIZES PLANNED AND PRACTISED IRRIGATION SCHEDULE ON FIG BASIS
- 5-3 WCCS COLLECTS DATA ON COMPARISON OF PLANNED AND ACTUAL ACHIEVEMENT OF WATER ALLOCATION PRACTICE
- 5-4 HYDROGRAPHER/HYDROLOGIST OF DAM & RES. DISTRICT COLLECTS DATA ON COMPARISON OF PLANNED AND ACTUAL ACHIEVEMENT OF OUTFLOW DISCHARGE FROM DAM, TOGETHER WITH OTHER NECESSARY HYDROLOGIC INFORMATION SUCH AS INFLOW, RAINFALL, EVAPORATION, SEEPAGE AND SEDIMENT DEPOSITS
- 5-5 DISTRICT HYDROGRAPHER COLLECTS DATA ON COMPARISON OF PLANNED AND PRACTISED DISCHARGE OF IRRIGATION INTAKE AT DIVERSION DAMS AND WEIRS, RIVER FLOWS AND SPILLS, AND OTHER HYDRO-METEOROLOGIC DATA

FOR MANAGEMENT ARE OBSERVED AND COLLECTED DAILY, WEEKLY, MONTHLY, AND COMPILED AT THE END OF MONTH OR CROPPING SEASON. DATA ARE COLLECTED MAINLY BY WM, HYDROGRAPHER AND/OR HYDROLOGIST, AND REPORTED TO OFFICE THROUGH DISTRICT OFFICE. WCCS SUMMARIZES AND PUBLISHES MONTHLY, SEASONAL AND ANNUAL REPORTS. DATA ARE USED TO EVALUATE ACTUAL PRACTICE OF WATER MANAGEMENT OPERATIONS AND TO BRING ABOUT IMPROVEMENT OF WATER MANAGEMENT SYSTEMS WILL BE

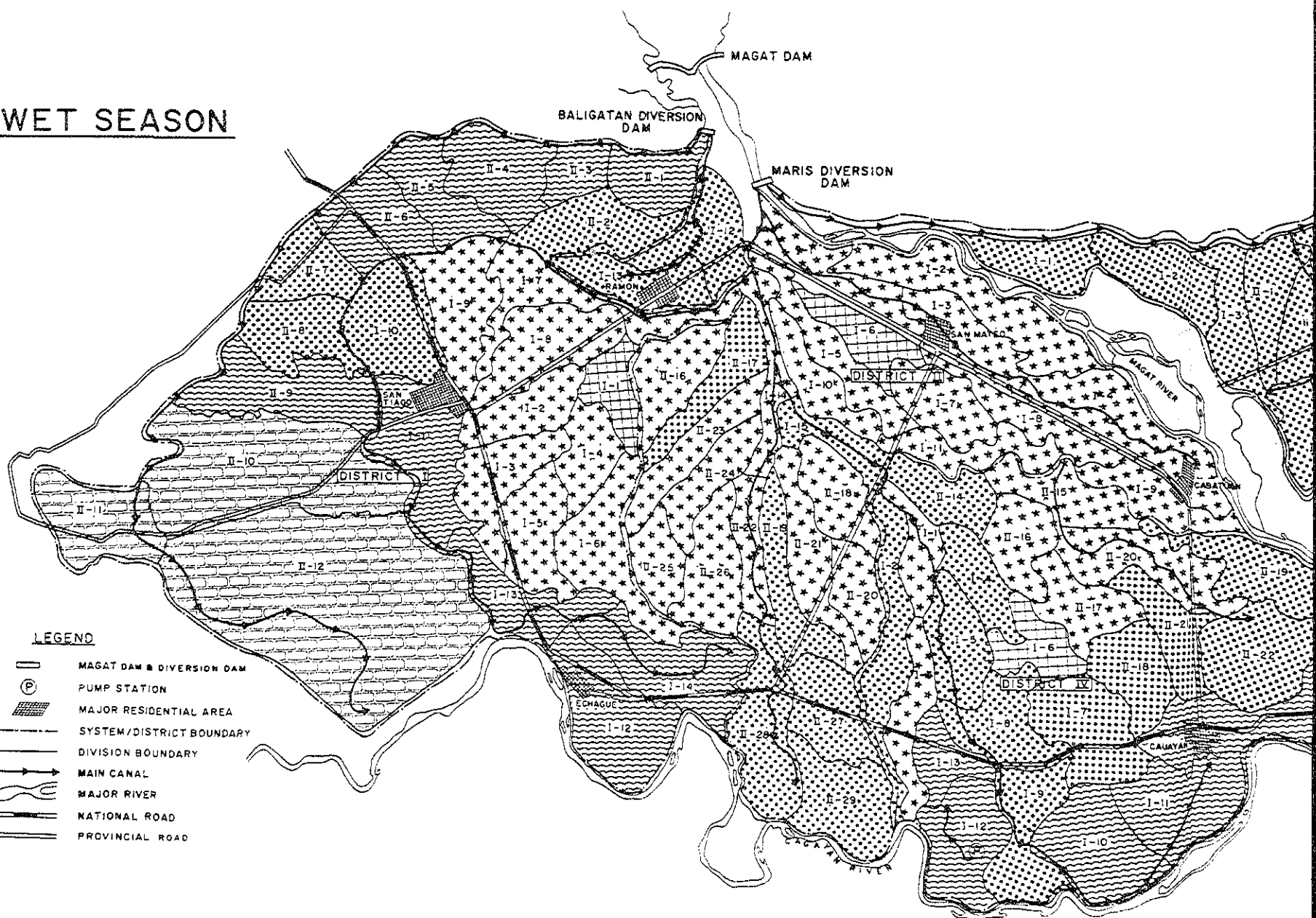


STARTING MONTH OF PRESENT PADDY CULTIVATION

DRY SEASON



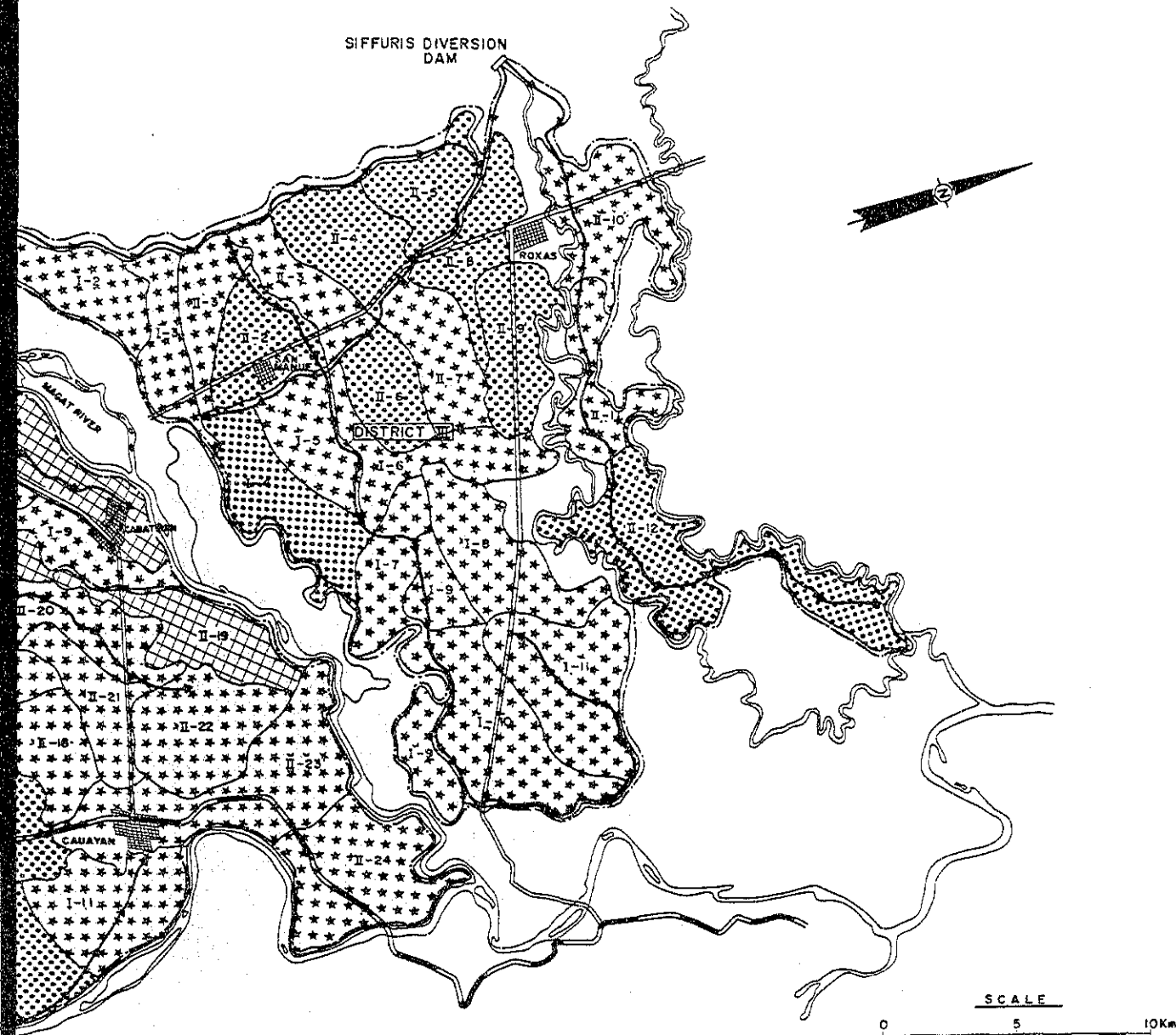
WET SEASON








LEGEND

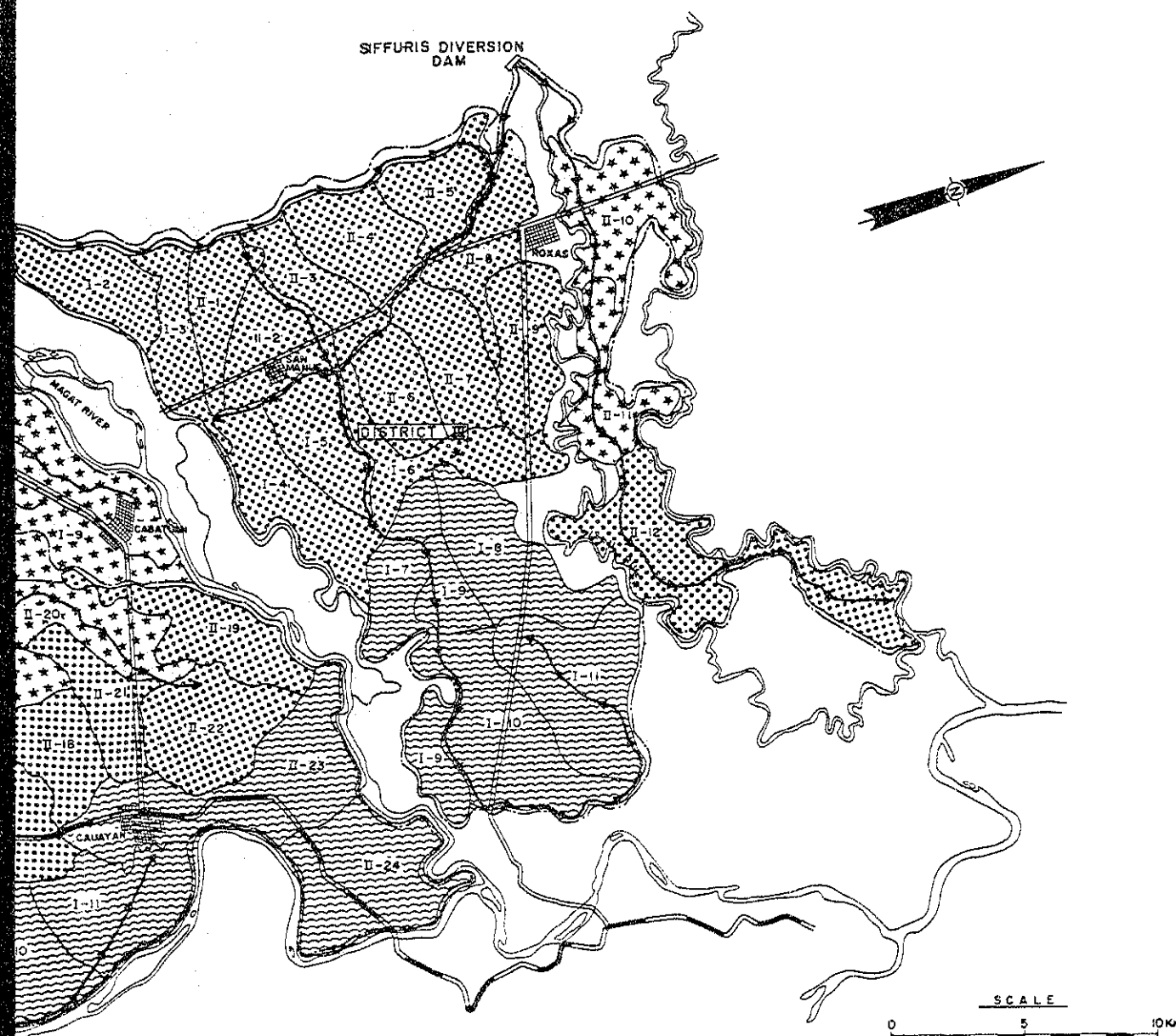
- MAGAT DAM & DIVERSION DAM
- PUMP STATION
- MAJOR RESIDENTIAL AREA
- SYSTEM/DISTRICT BOUNDARY
- DIVISION BOUNDARY
- MAIN CANAL
- MAJOR RIVER
- NATIONAL ROAD
- PROVINCIAL ROAD

CULTIVATION BY WATER MASTER DIVISION

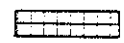
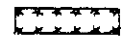

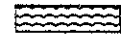
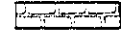


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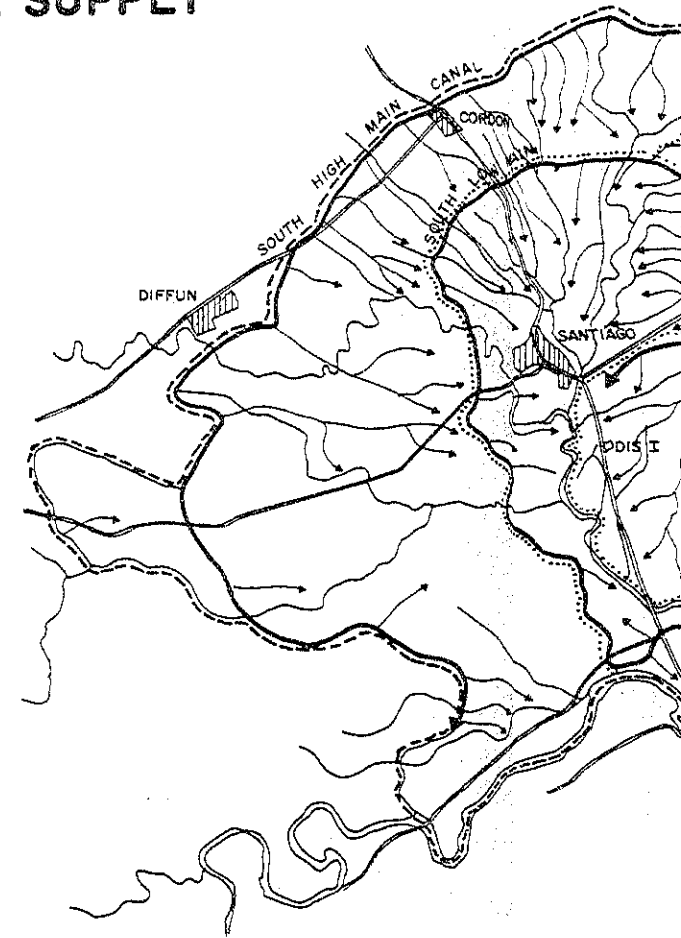
-  STARTING FROM NOVEMBER
-  STARTING FROM DECEMBER
-  STARTING FROM JANUARY
-  STARTING FROM FEBRUARY
-  STARTING FROM MARCH



LEGEND

-  STARTING FROM MAY
-  STARTING FROM JUNE
-  STARTING FROM JULY
-  STARTING FROM AUGUST
-  STARTING FROM SEPTEMBER

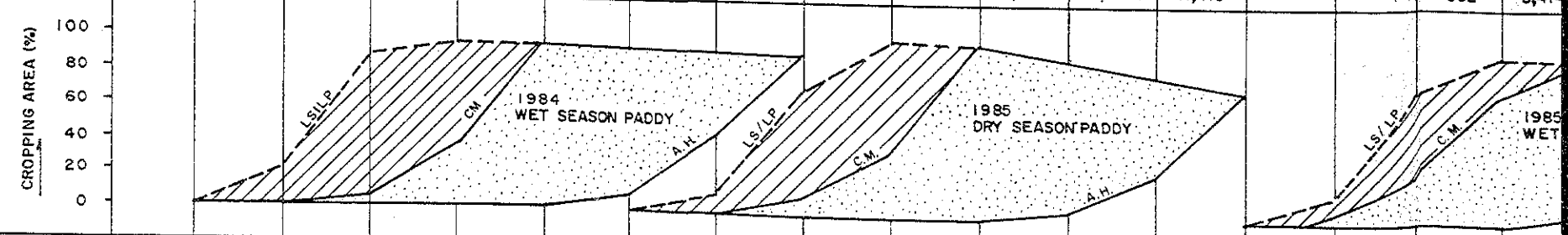
PRESENT CROPPING CALENDAR AND IRRIGATION WATER SUPPLY

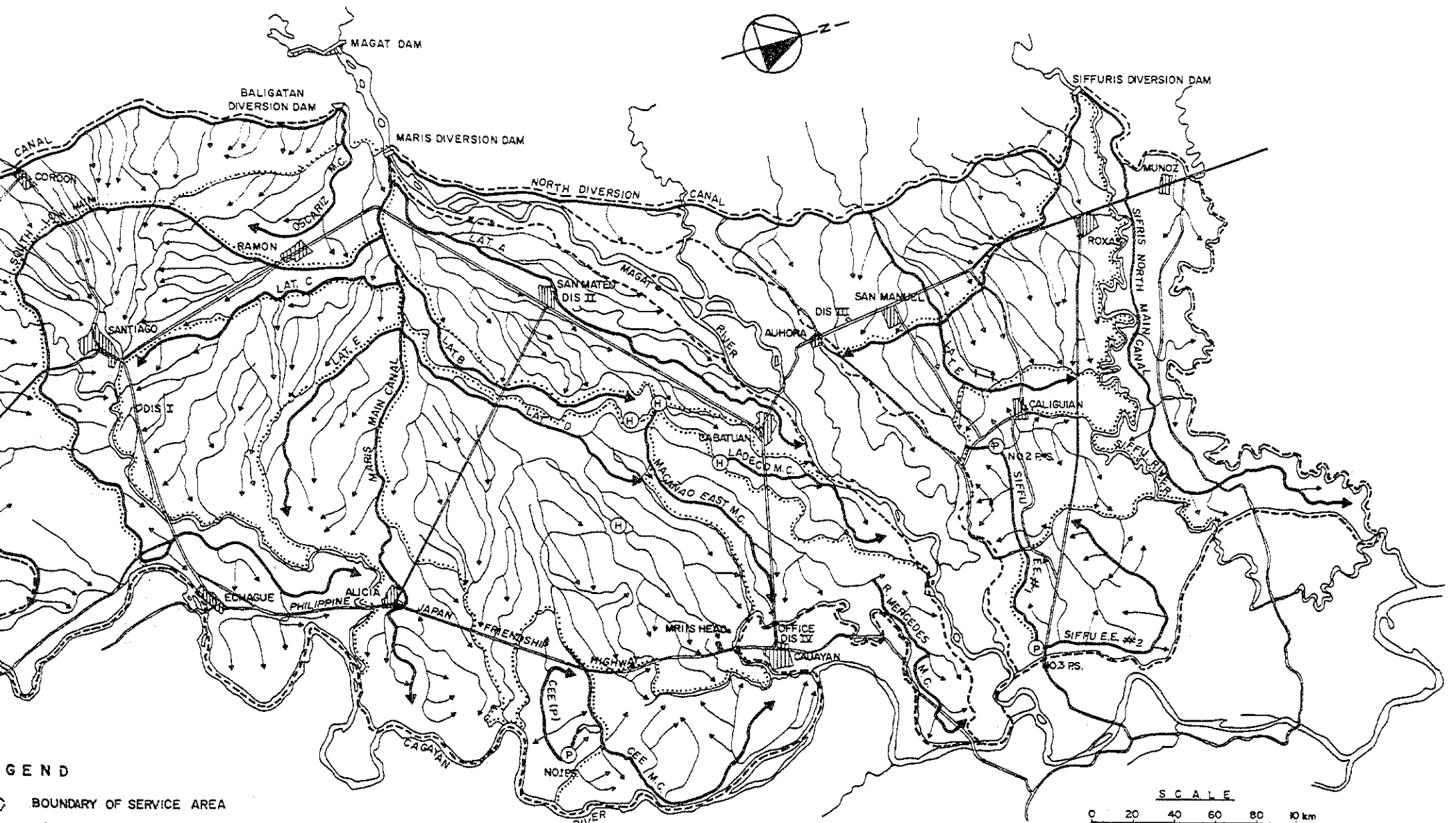


LEGEND

- BOUNDARY OF SERVICE
- MAIN IRRIGATION CANAL
- LATERAL IRRIGATION CANAL
- BOUNDARY OF SERVICE
- LATERAL CANAL

ITEM	1984												1985				
	APR.	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG
1. CROPPING AREA (HA)																	
DISTRICT - I																	
AREA UNDER LS/LP	3,200	15,992	23,470	15,528	11,738	4,720	4,902	22,300	13,797	8,483	3,896	2,884	4,740				
AREA UNDER CROP MAINTENANCE	—	—	1,327	10,370	17,163	21,871	7,166	3,817	7,820	18,868	13,564	6,442	1,771				
AREA HARVESTED	14,013	17,252	—	—	—	2,649	14,497	19,652	—	212	1,089	8,245	13,220				
DISTRICT - II																	
AREA UNDER LS/LP	12,160	2,066	19,205	17,285	12,369	9,240	2,505	16,953	16,942	10,634	2,565	1,574	118				
AREA UNDER CROP MAINTENANCE	—	—	1,530	11,297	17,476	14,417	15,330	3,557	10,374	19,697	18,785	11,177	1,434				
AREA HARVESTED	14,691	20,206	—	—	—	2,429	10,030	12,592	—	52	529	8,347	18,139				
DISTRICT - III																	
AREA UNDER LS/LP	—	—	14,575	7,534	2,000	—	3,051	18,540	11,297	5,771	2,500	—	—				
AREA UNDER CROP MAINTENANCE	6,737	11,216	1,425	8,466	13,930	11,582	3,540	1,524	6,749	14,275	17,268	15,120	2,784				
AREA HARVESTED	7,411	14,148	—	—	70	1,827	10,163	13,398	—	—	278	1,882	4,524				
DISTRICT - IV																	
AREA UNDER LS/LP	—	—	—	—	—	—	—	—	—	—	1,417	721	2,097				
AREA UNDER CROP MAINTENANCE	—	—	—	—	—	—	—	—	—	—	14,123	12,719	3,437				
AREA HARVESTED	—	—	—	—	—	—	—	—	—	—	366	2,097	11,532				
TOTAL																	
AREA UNDER LS/LP	15,360	18,058	57,250	40,347	26,107	13,960	10,458	57,793	42,036	24,988	10,378	5,179	9,739	14,135	47,309	2,477	12,315
AREA UNDER CROP MAINTENANCE	6,737	11,216	4,282	30,133	48,569	47,870	26,036	8,898	24,943	52,840	63,740	45,458	9,426	4,662	20,468	45,990	66,044
AREA HARVESTED	36,115	51,606	—	—	70	6,905	34,690	45,642	—	264	2,262	20,571	47,415	—	4	332	5,474
2. IRRIGATION WATER SUPPLY (MCM)																	
BALIGATAN DIVERSION DAM	7.3	10.4	15.3	16.6	18.7	16.9	12.6	15.4	21.8	19.7	19.4	17.5	5.3	5.3	17.3	28.8	37.7
MARIS DIVERSION DAM																	
MARIS MAIN CANAL	77.8	30.5	219.0	247.0	210.2	209.7	129.0	172.7	223.8	219.4	195.0	134.0	106.3	192.7	237.7	238.7	227.2
NORTH DIVERSION CANAL	15.0	6.4	41.8	47.2	44.5	31.1	29.3	36.2	45.1	61.4	59.0	46.5	11.1	35.1	55.8	64.5	51.5
SUB-TOTAL	92.8	36.9	260.8	294.2	254.7	240.8	158.3	208.9	268.9	280.8	254.0	180.5	117.4	227.8	293.5	303.2	278.5
SIFFURIS DIVERSION DAM																	
SIFFU NORTH MAIN CANAL	0.2	7.9	8.8	8.4	7.8	6.0	4.6	8.8	9.7	8.4	6.7	5.1	1.2	9.3	5.4	11.1	6.5
SIFFU SOUTH MAIN CANAL	3.8	3.3	15.9	11.3	11.0	14.4	5.6	11.2	17.2	7.6	1.6	2.4	0.0	5.5	7.3	15.0	18.2
SUB-TOTAL	4.0	11.2	24.7	19.7	18.8	20.4	10.2	20.0	29.6	16.0	8.3	7.5	1.2	14.8	12.7	26.1	24.7
TOTAL	104.41	58.8	300.8	330.5	292.2	278.1	181.1	244.3	317.6	316.5	281.7	205.5	123.9	247.9	323.5	358.1	340.9





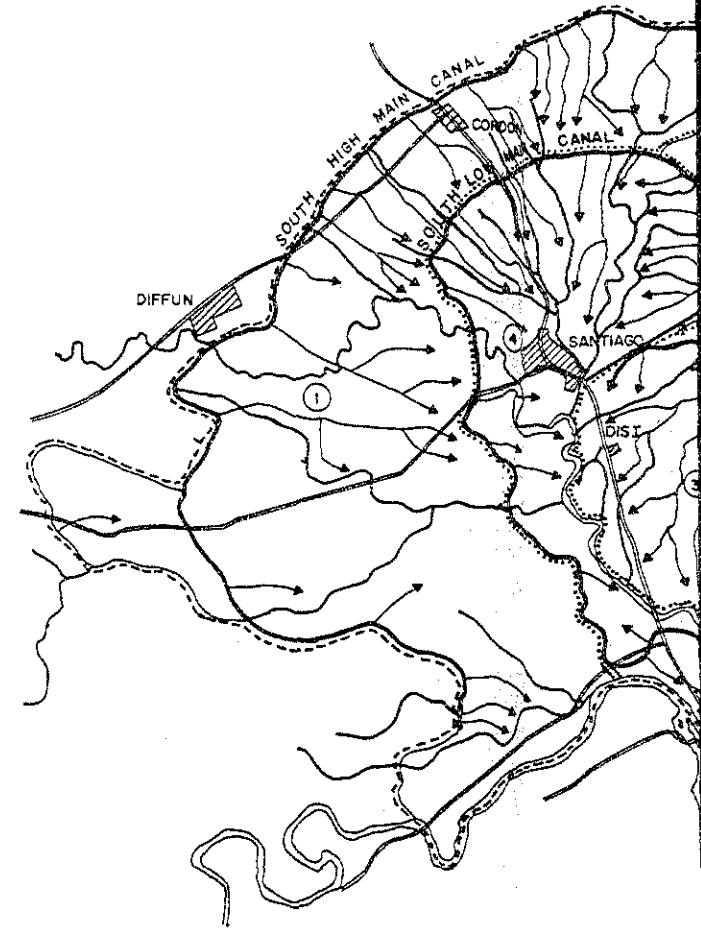
LEGEND
 BOUNDARY OF SERVICE AREA
 MAIN IRRIGATION CANAL
 LATERAL IRRIGATION CANAL
 BOUNDARY OF SERVICE AREA BY LATERAL CANAL

1985							1986												
JUNE	JULY	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	JAN
				5,649	10,327	6,037	2,647	2,445	642	—	14,043	13,723							
				8,612	5,373	11,083	16,384	15,536	12,860	3,491	206	4,572							
				8,618	12,757	—	—	1,142	3,818	13,187	6,285	1,633							
				11,317	13,348	5,763	2,397	797	38	—	11,478	12,982							
				4,139	6,207	13,195	17,261	18,455	10,137	1,060	231	6,959							
				16,200	19,874	—	618	1,418	9,156	18,271	10,065	—							
				—	11,596	8,762	3,101	804	—	—	11,421	15,979							
				5,535	3,007	7,396	13,899	16,772	16,528	1,285	1,684	1,246							
				11,773	16,766	—	—	54	621	15,864	—	—							
				1,344	9,706	8,194	4,401	1,191	—	—	7,130	14,743							
				7,994	2,893	6,342	11,623	14,373	14,371	3,206	—	—							
				6,737	11,968	—	7	55	1,199	12,364	15,040	876							
47,309	2,477	12,315	9,800	18,310	44,977	28,756	12,546	5,237	680	—	44,072	57,427							
20,468	45,990	66,049	48,355	25,814	17,480	38,016	59,167	65,136	53,896	9,042	437	13,653							
4	332	5,474	16,807	43,328	61,365	—	625	2,669	14,794	59,686	33,074	1,633							
17.3	28.8	37.7	31.7	20.9	22.7	22.5	37.7	33.8	37.4	17.6	35.5	46.3	43.4	40.7	33.2	5.8			
237.7	238.7	227.2	166.5	170.3	203.8	204.7	231.0	205.6	220.8	80.7	165.5	256.8	223.4	221.8	203.3	81.6			
55.8	64.5	51.3	36.4	29.5	27.0	34.5	60.7	44.2	57.9	26.2	35.5	64.1	58.3	50.4	40.6	17.8			
293.5	303.2	278.5	202.9	199.8	230.8	239.2	291.7	249.8	278.7	106.9	201.0	320.9	281.7	272.2	243.9	99.4			
5.4	11.1	6.5	4.3	5.6	7.3	13.0	10.7	9.2	8.9	1.3	4.9	4.9	9.0	7.4	7.8	0.0			
7.3	15.0	18.2	20.5	19.0	14.0	24.3	15.1	14.5	9.7	7.5	9.3	14.4	14.0	16.2	13.1	2.6			
12.7	26.1	24.7	24.8	24.6	21.3	37.3	25.8	23.7	18.6	8.8	14.2	19.3	23.0	23.6	20.9	2.6			
323.5	358.1	340.9	259.4	245.3	274.8	299.0	355.2	307.3	334.7	133.3	250.7	386.5	348.1	336.5	298.0	107.8			

PROPOSED IRRIGATION SCHEDULE AND DIVERSION WATER

PROPOSED CROPPING CALENDAR

AREA	TYPE	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	
SOUTH HIGH MAIN CANAL OSCARIZ MAIN CANAL (A=12,680 HA.)	(1)	[Cropping schedule for Area 1: Sowing in Apr, May, June, Aug, Nov, Dec, Jan, Feb, Mar]												
LAT. A, B, C-1 (EXCL. A-2) (A=8,072 HA.)	(2)	[Cropping schedule for Area 2: Sowing in Apr, May, June, Aug, Nov, Dec, Jan, Feb, Mar]												
LAT. A-2, C-3, C-4, D (EXCL. D-2) (A=17,712 HA.)	(3)	[Cropping schedule for Area 3: Sowing in Apr, May, June, Aug, Nov, Dec, Jan, Feb, Mar]												
SOUTH LOW MAIN CANAL LAT. D-2 (A=16,226 HA.)	(4)	[Cropping schedule for Area 4: Sowing in Apr, May, June, Aug, Nov, Dec, Jan, Feb, Mar]												
CAJAYAN EAST EXT. (A=5,473 HA.)	(5)	[Cropping schedule for Area 5: Sowing in Apr, May, June, Aug, Nov, Dec, Jan, Feb, Mar]												
LAT. E, F, G, H, J (A=6,406 HA.)	(6)	[Cropping schedule for Area 6: Sowing in Apr, May, June, Aug, Nov, Dec, Jan, Feb, Mar]												
RMC-MMN (A=2,914 HA.)	(7)	[Cropping schedule for Area 7: Sowing in Apr, May, June, Aug, Nov, Dec, Jan, Feb, Mar]												
MENC (A=3,126 HA.)	(8)	[Cropping schedule for Area 8: Sowing in Apr, May, June, Aug, Nov, Dec, Jan, Feb, Mar]												
SIFFU EAST EXT. (A=6,600 HA.)	(9)	[Cropping schedule for Area 9: Sowing in Apr, May, June, Aug, Nov, Dec, Jan, Feb, Mar]												
NORTH DIVERSION CANAL (A=3,074 HA.)	(10)	[Cropping schedule for Area 10: Sowing in Apr, May, June, Aug, Nov, Dec, Jan, Feb, Mar]												
SSMC, LAT A (A=2,967 HA.)	(11)	[Cropping schedule for Area 11: Sowing in Apr, May, June, Aug, Nov, Dec, Jan, Feb, Mar]												
SSMC, LAT B-H (A=5,173 HA.)	(12)	[Cropping schedule for Area 12: Sowing in Apr, May, June, Aug, Nov, Dec, Jan, Feb, Mar]												
SSMC (A=2,359 HA.)	(13)	[Cropping schedule for Area 13: Sowing in Apr, May, June, Aug, Nov, Dec, Jan, Feb, Mar]												
		APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	



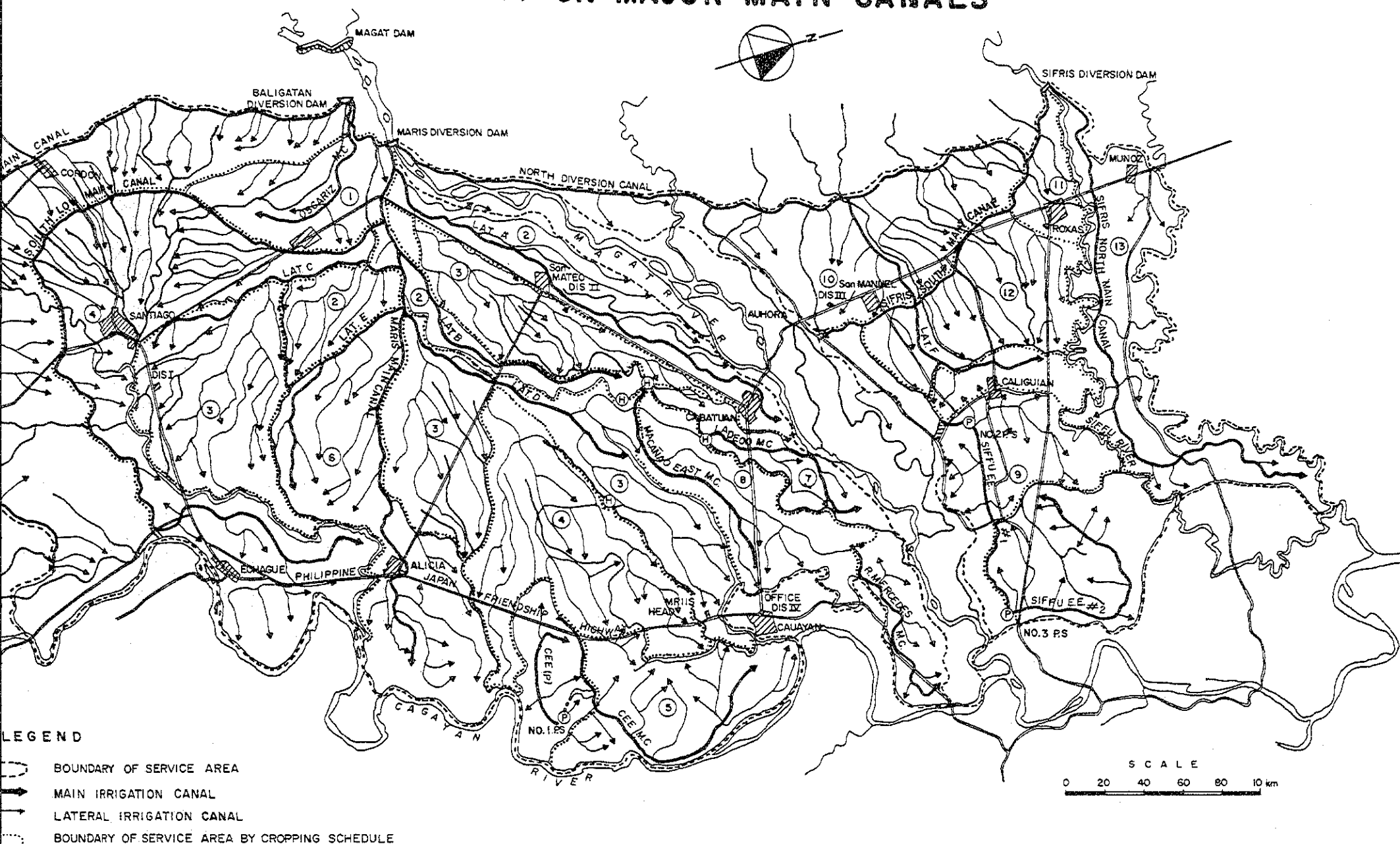
LEGEND

- BOUNDARY OF SERVICE AREA
- MAIN IRRIGATION CANAL
- LATERAL IRRIGATION CANAL
- BOUNDARY OF SERVICE AREA

DIVERSION WATER REQUIREMENT

IRRIGATION SYSTEM	AREA (HA.)	APRIL			MAY			JUNE			JULY			AUGUST			SEPTEMBER			OCTOBER			
		F	M	L	F	M	L	F	M	L	F	M	L	F	M	L	F	M	L	F	M		
I. IRRIGATION AREA (HA.)																							
1-1 BALIGATAN DIVERSION DAM	12,680	6,038	3,021	377			377	3,170	6,340	9,359	12,136	12,680	12,680	12,680	12,680	12,680	12,680	11,487	8,454	5,435	2,415		
SOUTH HIGH MAIN CANAL	9,580	4,562	2,281	285			285	2,395	4,790	7,071	9,169	9,580	9,580	9,580	9,580	9,580	9,580	8,679	6,387	4,106	1,825		
OSCARIZ MAIN CANAL	3,100	1,476	738	92			92	775	1,550	2,288	2,967	3,100	3,100	3,100	3,100	3,100	3,100	3,100	2,808	2,067	1,329	590	
1-2 MARIS DIVERSION DAM	73,603	18,777	12,411	6,239	1,691	41,664	52,551	58,510	64,230	68,069	71,324	73,572	73,603	73,603	69,670	56,392	40,959	27,211	19,188	13,191	1,533	12,411	
MARIS MAIN CANAL	53,889	2,606	2,838	12,500	26,369	41,438	50,653	53,107	53,882	53,889	53,889	53,889	53,889	53,889	49,956	36,678	21,245	8,230	2,151	417	1,533	12,411	
NORTH DIVERSION MAIN CANAL	7,074	5,895	4,211	2,526	842			842	2,526	4,211	5,895	7,074	7,074	7,074	7,074	7,074	7,074	7,074	7,074	6,998	5,727	4,042	2,526
MACAÑO	6,040	4,776	2,968	1,193	63	226	1,898	3,775	5,465	6,040	6,040	6,040	6,040	6,040	6,040	6,040	6,040	6,040	6,040	5,307	3,510	1,705	252
SIFFU EAST EXTENSION	6,600	5,500	3,929	2,357	786			786	2,357	3,929	5,500	6,569	6,600	6,600	6,600	6,600	6,600	6,600	6,600	6,529	5,342	3,771	2,357
1-3 SIFFURIS DIVERSION DAM	11,119	4,989	2,305	333	528	1,585	2,652	4,310	7,010	9,675	11,012	11,119	11,119	11,119	11,119	11,034	10,168	9,111	8,124	5,999	3,298		
SIFFU NORTH MAIN CANAL	2,959				528	1,585	2,652	2,959	2,959	2,959	2,959	2,959	2,959	2,959	2,874	2,008	951	85					
SIFFU SOUTH MAIN CANAL	8,160	4,989	2,305	333				1,351	4,051	6,716	8,053	8,160	8,160	8,160	8,160	8,160	8,160	8,160	8,039	5,999	3,298		
T O T A L	97,402	29,804	19,272	19,286	28,588	43,626	58,373	69,160	80,599	89,880	95,016	97,371	97,402	97,402	97,402	97,402	97,402	97,402	97,402	97,402	97,402	97,402	
II DIVERSION WATER REQUIREMENT (MCM)																							
2-1 BALIGATAN DIVERSION DAM		10,495	5,248	0,655		1,804	12,619	12,996	16,316	19,278	14,086	14,748	17,393	7,340	7,586	8,628	8,746	8,055	5,928	7,789	3,461	0,655	
SOUTH HIGH MAIN CANAL		7,929	3,965	0,495		1,362	9,534	9,819	12,327	14,565	10,642	11,142	13,141	5,546	5,732	6,519	6,608	6,086	4,479	5,885	2,615	0,495	
OSCARIZ MAIN CANAL		2,566	1,283	0,160		0,442	3,085	3,177	3,989	4,713	3,444	3,606	4,252	1,794	1,854	2,109	2,138	1,969	1,449	1,904	0,846	0,160	
2-2 MARIS DIVERSION DAM		34,288	22,268	10,724	2,973	95,008	112,378	64,679	75,487	80,961	109,749	112,798	123,956	65,545	62,964	54,160	46,708	25,306	14,831	14,536	4,558	10,724	
MARIS MAIN CANAL		4,529	2,265	0,284	-	72,673	93,720	103,249	48,867	52,058	54,957	82,065	85,735	93,940	52,845	49,020	38,891	32,201	11,298	2,186	0,695	4,529	
NORTH DIVERSION MAIN CANAL		10,606	7,575	4,546	1,498			3,453	6,988	9,282	9,986	10,374	10,209	3,942	4,505	5,205	4,407	4,561	4,658	5,879	4,149	1,498	
MACAÑO		9,258	5,360	1,653	0,078	1,288	9,129	9,138	9,921	8,061	8,382	9,012	10,281	5,079	5,235	5,936	5,988	5,192	3,642	2,477	0,231	0,078	
SIFFU EAST EXTENSION		9,895	7,068	4,241	1,397			3,221	6,520	8,661	9,316	9,679	9,526	3,679	4,204	4,128	4,112	4,255	4,345	5,485	3,872	1,397	
2-3 SIFFURIS DIVERSION DAM		9,267	4,353	0,640	2,342	4,646	6,532	7,925	13,496	17,192	14,382	13,454	15,963	6,679	6,889	7,739	7,553	6,411	5,276	7,424	4,019	0,640	
SIFFU NORTH MAIN CANAL					2,342	4,656	6,532	2,486	2,574	2,941	3,858	3,854	4,341	1,859	1,929	2,067	2,488	1,201	0,107				
SIFFU SOUTH MAIN CANAL		9,267	4,353	0,640																			
T O T A L		54,050	41,223	66,039	77,988	101,458	131,529	85,600	105,299	117,431	138,217	141,000	157,312	79,564	77,439	70,527	63,007	39,772	26,035	29,749	20,310	6,039	

IRRIGATION WATER REQUIREMENT ON MAJOR MAIN CANALS



M	OCTOBER					NOVEMBER			DECEMBER			JANUARY			FEBRUARY			MARCH			TOTAL (MCM)					
	M	L	F	M	L	F	M	L	F	M	L	F	M	L	F	M	L	F	M	L	WET SEASON	DRY SEASON	ANNUAL			
487	8,454	5,435	2,415	136		377	1,963	6,038	9,057	12,028	12,680	12,680	12,680	12,680	12,680	12,680	12,680	12,680	12,136	9,208						
679	6,387	4,106	1,825	103		285	1,483	4,562	6,843	9,092	9,580	9,580	9,580	9,580	9,580	9,580	9,580	9,580	9,169	6,957						
808	2,067	1,329	590	33		92	480	1,476	2,214	2,936	3,100	3,100	3,100	3,100	3,100	3,100	3,100	3,100	2,967	2,251						
7211	19,188	13,191	1,533	12,901	26,947	40,592	48,191	53,553	59,918	66,492	71,537	73,587	73,603	73,603	68,625	57,617	46,383	32,547	24,886							
1230	2,151	417	1,533	12,901	26,947	40,592	48,191	51,022	52,325	53,599	53,889	53,889	53,889	53,889	48,911	37,903	26,669	12,833	5,266							
7074	6,998	5,727	4,042	2,274	539			842	2,526	4,295	6,063	7,066	7,074	7,074	7,074	7,074	7,074	7,074	7,074	7,043						
3307	3,510	1,705	252					903	2,710	4,591	5,928	6,040	6,040	6,040	6,040	6,040	6,040	6,040	6,040	6,006						
6500	6,529	5,342	3,771	2,121	503			786	2,357	4,007	5,657	6,592	6,600	6,600	6,600	6,600	6,600	6,600	6,600	6,571						
9111	8,124	5,999	3,298	786				5,590	8,290	10,582	11,119	11,119	11,119	11,119	11,119	11,119	11,119	10,485	9,274	7,380						
951	85							2,959	2,959	2,959	2,959	2,959	2,959	2,959	2,959	2,959	2,952	2,325	1,268	235						
9160	8,039	5,999	3,298	786				2,631	5,331	7,623	8,160	8,160	8,160	8,160	8,160	8,160	8,160	8,160	8,006	7,145						
7809	35,766	24,625	15,311	18,218	27,988	40,969	50,154	65,181	77,265	89,102	95,336	97,386	97,402	97,402	92,424	81,416	69,548	53,957	41,474							
1055	5,928	7,789	3,461	0.213		0.996	3,556	8,498	10,953	14,722	11,915	11,306	14,422	15,961	16,175	13,095	18,753	18,118	15,134	MCM	MM	MCM	MM	MCM	MM	
1086	4,479	5,885	2,615	0.161		0.753	2,687	6,420	8,275	11,124	9,002	9,298	10,896	12,058	12,221	9,894	14,168	13,688	11,434	126.163	(1.317)	144.307	(1.506)	270.470	(2.823)	
1969	1,449	1,904	0,846	0.052		0.243	0,869	2,078	2,678	3,598	2,913	2,008	3,526	3,903	3,954	3,201	4,585	4,430	3,700	40.823	(1.316)	45.695	(1.474)	86.518	(2.790)	
1306	14,831	14,536	4,958	54,080	33,966	42,795	43,707	59,044	70,031	87,098	93,874	92,399	100,935	109,045	102,414	68,152	74,707	52,048	37,864	1,209,989	(1,644)	1,176,970	(1,599)	2,386,959	(3,243)	
1298	2,186	0,695	4,558	34,080	33,966	42,795	43,707	51,012	55,698	65,324	69,133	69,779	77,743	81,841	75,303	46,120	43,810	22,266	8,150	935,772	(1,736)	832,363	(1,545)	1,768,135	(3,281)	
14561	4,658	5,879	4,149	2,568	0,849			2,159	4,486	6,773	8,664	8,089	7,738	8,886	9,307	7,576	10,673	10,809	11,994	91,015	(1,286)	121,379	(1,716)	212,394	(3,002)	
15192	3,642	2,477	0,251					3,859	5,662	8,682	7,995	6,984	8,235	9,027	9,120	7,387	10,266	10,400	6,524	99,012	(1,639)	110,490	(1,829)	209,502	(3,468)	
18255	4,345	5,485	3,872	2,395	0,792			2,014	4,185	6,319	8,082	7,547	7,219	9,291	8,684	7,069	9,958	8,573	11,196	84,190	(1,276)	112,738	(1,708)	196,928	(2,964)	
16411	5,276	7,424	4,019	0,974		1,219	2,680	4,991	7,064	10,292	13,208	11,005	11,251	13,211	14,660	14,789	11,956	16,148	14,413	12,741	148,906	(1,339)	173,888	(1,564)	322,794	(2,903)
11201	0,107					1,214	2,419	3,121	2,406	2,374	2,915	3,253	3,242	3,606	3,966	4,022	3,213	3,694	2,015	0,412	43,215	(1,460)	41,852	(1,416)	85,067	(2,876)
15210	5,169	7,424	4,019	0,974		0,005	0,261	1,870	4,658	7,918	10,293	7,772	8,009	9,605	10,694	10,767	8,743	12,454	12,398	12,329	105,691	(1,295)	132,036	(1,618)	237,727	(2,913)
19772	26,035	29,749	20,310	40,230	36,826	46,471	52,254	74,606	91,276	115,028	116,794	115,956	128,568	139,666	133,378	93,203	109,608	84,579	65,739	1,525,881	(1,567)	1,540,86	(1,582)	3,066,741	(3,149)	