

ANNEX J PROJECT EVALUATION

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Annex J PROJECT EVALUATION

J. 1 Project Benefit

With the carrying out of the project, direct benefit which can be estimated quantitatively are as follows:

- a. Benefit due to increase of agricultural produce
- b. Reduction of transportation cost for agricultural produce and production materials due to the improvement of the road network
- c. Erosion control due to construction of the reservoir and land reclamation

In addition to the direct benefits stated above, following indirect effects and/or benefits will be expected to activate the regional socio-economy:

- a. Increase of procurement for labor and materials due to construction
- b. Enlargement of employment opportunities due to increase of farming activities
- c. Stable supply of agricultural produce due to increase of production volume

1. 1 Agricultural Production Benefit

Breakdown of the agricultural production benefit of each case are shown in Table 1 to 3.

1. 2 Benefit by Improvement of Farm Roads

Economization expenses in transportation of agricultural products and in-input materials and reduction of bruise during transportation are expected by improvement of the farm roads. Benefit by improvement of farm road are estimated as shown below.

(1) Benefit of agricultural products

a) Present transportation volume:

Crops	Production	* (%)	Shipment Volume
Grape	100 ton	x 0.2 =	200 ton
annual crops	800 ton	x 0.12 =	100 ton
Total			300

* means shipment ratio among the total production in the project area.

b) Total cost of transportation 300 ton x 30 US\$ = 9,000 US\$

c) Reduction value of transportation from project area to Tarija city.

$$300 \text{ ton} \times (30 - 20 \text{ US\$}) = 3,000 \text{ US\$ (benefit)}$$

(2) Reduction value of in-put materials

a) $6,200 \text{ ton} \times 0.085 = 527 \text{ ton}$

b) $527 \text{ ton} \times (30 - 20 \text{ US\$}) = 5,270 \text{ US\$ (benefit)}$

* a) means transportation volume of the in-put materials with project x without project ratio = total in-put materials in the project area

b) means total input materials x (reduction value of transportation) = benefit

(3) Reduction of bruise

$$100 \text{ ton} \times 10 \times 0.1 = 100 \text{ US\$}$$

(Present shipment volume of vegetable x reduction value of transportation x ratio of reduction of bruise)

Total benefit of farm road improvement is estimated 8,370 US\$ by mentioned above items, (1), (2) and (3).

1. 3 Estimated Benefit by Erosion Control

It is estimated the benefit of the erosion control as below.

Benefit of erosion control

$$590 \text{ ha} \times 300 \text{ US\$} / 46 \text{ year}$$

(Increased agricultural land x Land value / Project life)

*Project life is excluded construction period.

J. 2 Evaluation of Project

Project evaluation is made of internal rate of return (in both financial and economic cases). Conditions of evaluation are as follows:

(1) Exchange rate between the Boliviano and US\$ is employed. US\$ 1.0 = B.S 3.0, the same conversion rate as in the estimate of construction cost.

(2) The life of the project is estimated to 50 years from the commencement of the detailed design of the project.

Results of the project evaluation (Financial Internal rate of return, F.I.R.R) at the each cases are shown in Table 1 (1) to (10).

The sensitivity analysis is also made with the following cases:

(1) Increased of estimated cost by 10%

(2) One year relay of the construction period

(3) Decrease of agricultural production benefits by 10%

(4) Combination of (1) and (3)

- (5) Increased agricultural benefit 10%
- (6) Decreased estimated cost 10%

Calculation results of sensitivity analysis is shown in Table 2(1) to (4).

Table J.1 Price Variation of Financial and Economic for Agricultural Products

Products	Unit	Financial Price	Economic Price	Conversion Factor
1. Mize	\$/kg	0.17	0.167	0.98
2. Wheat	\$/kg	0.19	0.185	0.97
3. Potatoes	\$/kg	0.09	0.09	1.0
4. Beans	\$/kg	0.16	0.16	1.0
5. Tomato	\$/kg	0.09	0.09	1.0
6. Carrot	\$/kg	0.09	0.09	1.0
7. Onion	\$/kg	0.11	0.11	1.0
8. Garlic	\$/kg	0.43	0.43	1.0
9. Alfalfa	\$/kg	89.0	8.90	1.0
10. Grape	\$/kg	0.30	0.30	1.0

Table J.2 Price Variation of Financial and Economic for Input Supplies

Input Supplies	Unit	Financial	Economic	Conversion
1. Seed				
- Mize	\$/kg	0.16	0.16	1.0
- Wheat	\$/kg	0.30	0.30	1.0
- Potatoes	\$/kg	0.11	0.11	1.0
- Beans	\$/kg	0.44	0.44	1.0
- Tomato	\$/kg	100.0	100.0	1.0
- Carrot	\$/kg	24.75	24.75	1.0
- Onion	\$/kg	35.5	35.5	1.0
- Garlic	\$/kg	1.17	1.17	1.0
- Alfalfa	\$/kg	3.64	3.64	1.0
- Grape	\$/ha	2,305	2,305	1.0
2. Fertilizer	\$/kg	0.48	0.40	0.83
3. Bactericide	\$/kg	9.0	8.2	0.91
4. Urea	\$/kg	0.46	0.36	0.78

Table J.3 Agricultural Production Benefit for each Cases (1)

Case 1

(UNIT:USS 1,000)

Crops	Area (ha)	Produc. (ton)	Prod. Val	Cost	Net Value
Mize	183	458	78	20	58
Wheat	183	366	70	16	54
Potato	122	2,257	203	58	145
Beans	122	317	51	12	38
Tomato	147	3,234	291	63	228
Onion	98	1,176	129	32	97
Carrot	61	732	66	17	49
Garlic	61	580	249	106	143
Alfalfa	245	12,005	245	22	223
Grape	479	7,664	2,299	476	1,823
Total	1,701	28,788	3,681	822	2,858

With Project:		Without Project:	
Production Value	3,681	Production Value	375
Production Cost	822	Production Cost	57
Increased Prod. Val.	3,306		
Increased Cost	766		

Case 2

(UNIT:USS 1,000)

Crops	Area (ha)	Produc. (ton)	Prod. Val.	Cost	Net Value
Mize	122	305	52	13	38
Wheat	183	366	70	16	54
Potato	122	2,257	203	58	145
Beans	183	476	76	18	58
Tomato	147	3,234	291	63	228
Onion	98	1,176	129	32	97
Carrot	61	732	66	17	49
Garlic	61	580	249	106	143
Alfalfa	245	12,005	245	22	223
Grape	357	5,712	1,714	355	1,359
Total	1,579	26,842	3,095	701	2,394

With Project:		Without Project:	
Production Value	3,095	Production Value	375
Production Cost	701	Production Cost	57
Increased Prod. Val.	2,720		
Increased Cost	644		

Case 3

(UNIT: USS 1,000)

Crops	Area (ha)	Produc. (ton)	Prod. Val	Cost	Net Value
Mize	61	153	26	7	19
Wheat	61	122	23	5	18
Potato	121	2,239	201	57	144
Beans	122	317	51	12	38
Tomato	147	3,234	291	63	228
Onion	98	1,176	129	32	97
Carrot	61	732	66	17	49
Garlic	61	580	249	106	143
Alfalfa	245	12,005	245	22	223
Grape	357	5,712	1,714	355	1,359
Total	1,334	26,269	2,995	677	2,319

With Project:		Without Project:	
Production Value	2,995	Production Value	375
Production Cost	677	Production Cost	57
Increased Prod. Val.	2,621		
Increased Cost	620		

Table J.3 Agricultural Production Benefit for each Cases (2)

Case 4

(Unit: US\$1,000)

Crops	Area (ha)	Produc. (ton)	Prod. Val.	Cost	Net Value
Mize	61	153	26	7	19
Wheat	61	122	23	5	18
Potato	121	2,239	201	57	144
Beans	61	159	25	6	19
Tomato	147	3,234	291	63	228
Onion	98	1,176	129	32	97
Carrot	61	732	66	17	49
Garlic	61	580	249	106	143
Alfalfa	245	12,005	245	22	223
Grape	357	5,712	1,714	355	1,359
Total	1,273	26,110	2,970	670	2,299

With Project:	Without Project:		
Production Value	2,970	Production Value	375
Production Cost	670	Production Cost	57
Increased Prod. Val.	2,595		
Increased Cost	613		

Case 5

(UNIT: US\$ 1,000)

Crops	Area (ha)	Produc. (ton)	Prod. Val.	Cost	Net Value
Mize	61	153	26	7	19
Wheat	61	122	23	5	18
Potato	121	2,239	201	57	144
Beans	61	159	25	6	19
Tomato	147	3,234	291	63	228
Onion	98	1,176	129	32	97
Carrot	0	0	0	0	0
Garlic	61	580	249	106	143
Alfalfa	245	12,005	245	22	223
Grape	357	5,712	1,714	355	1,359
Total	1,212	25,378	2,904	653	2,251

With Project:	Without Project:		
Production Value	2,904	Production Value	375
Production Cost	653	Production Cost	57
Increased Prod. Val.	2,529		
Increased Cost	597		

Case 6

(UNIT: US\$ 1,000)

Crops	Area (ha)	Produc. (ton)	Prod. Val.	Cost	Net Value
Mize	61	153	26	7	19
Wheat	61	122	23	5	18
Potato	121	2,239	201	57	144
Beans	61	159	25	6	19
Tomato	74	1,628	147	32	115
Onion	49	588	65	16	49
Carrot	61	732	66	17	49
Garlic	61	580	249	106	143
Alfalfa	245	12,005	245	22	223
Grape	357	5,712	1,714	355	1,359
Total	1,151	23,916	2,761	623	2,138

With Project:	Without Project:		
Production Value	2,761	Production Value	375
Production Cost	623	Production Cost	57
Increased Prod. Val.	2,386		
Increased Cost	567		

Table J.3 Agricultural Production Benefit for each Cases (3)

Case 7

(UNIT: DSS 1,000)

Crops	Area (ha)	Produc. (ton)	Prod. Val.	Cost	Net Value
Mize	61	153	26	7	19
Wheat	61	122	23	5	18
Potato	121	2,239	201	57	144
Beans	61	159	25	6	19
Tomato	74	1,628	147	32	115
Onion	49	552	61	16	45
Carrot	0	0	0	0	0
Garlic	61	580	249	106	143
Alfalfa	245	12,005	245	22	223
Grape	357	5,712	1,714	355	1,359
Total	1,090	23,148	2,691	606	2,085

With Project:

Production Value 2,691
 Production Cost 606
 Increased Prod. Val. 2,316
 Increased Cost 550

Without Project:

Production Value 375
 Production Cost 57

Case 8

(UNIT: USS 1,000)

Crops	Area (ha)	Produc. (ton)	Prod. Val.	Cost	Net Value
Mize	120	300	51	13	38
Wheat	120	240	46	10	35
Potato	120	2,220	200	57	143
Beans	120	312	50	12	38
Tomato	72	1,584	143	31	112
Onion	47	564	62	15	47
Carrot	0	0	0	0	0
Garlic	0	0	0	0	0
Alfalfa	120	5,880	120	11	109
Grape	234	3,744	1,123	233	891
Total	953	14,844	1,794	382	1,412

With Project:

Production Value 1,794
 Production Cost 382
 Increased Prod. Val. 1,570
 Increased Cost 349

Without Project:

Production Value 224
 Production Cost 33

Case 9-1

(Unit: USS1,000)

Crops	Area (ha)	Produc. (ton)	Prod. Val.	Cost	Net Value
Mize	128	320	54	14	40
Wheat	65	130	25	6	19
Potato	65	1,203	108	31	77
Beans	65	169	27	7	20
Tomato	0	0	0	0	0
Onion	0	0	0	0	0
Carrot	0	0	0	0	0
Garlic	0	0	0	0	0
Alfalfa	65	3,185	65	6	59
Grape	0	0	0	0	0
Total	388	5,007	279	63	216

With Project:

Production Value 279
 Production Cost 63
 Increased Prod. Val. 207
 Increased Cost 53

Without Project:

Production Value 72
 Production Cost 10

Table J.3 Agricultural Production Benefit for each Cases (4)

Case 9-2

(UNIT: US\$ 1,000)

Crops	Area (ha)	Produc. (ton)	Prod. Val.	Cost	Net Value
Mize	273	683	116	30	86
Wheat	136	272	52	12	40
Potato	136	2,516	226	64	162
Beans	136	354	57	14	43
Tomato	0	0	0	0	0
Onion	0	0	0	0	0
Carrot	0	0	0	0	0
Garlic	0	0	0	0	0
Alfalfa	136	6,664	136	12	124
Grape	0	0	0	0	0
Total	817	10,488	587	132	455

With Project:

Production Value

Production Cost

Increased Prod. Val.

Increased Cost

Without Project:

Production Value

Production Cost

	587	72
	132	10
	514	
	122	

Table J.4 Internal Rate of Return for each Cases (1)
Case - 1

(Unit: US\$)

YEAR	PROJECT COSTS				INCR. PROD. VALUE	PROJECT RETURN
	CONSTRUCT- ION COST	O & M COSTS	INCR. PROD. COST	TOTAL		
1	614,240	0	0	614,240	0	-614,240
2	3,455,100	0	0	3,455,100	0	-3,455,100
3	9,559,110	0	0	9,559,110	0	-9,559,110
4	5,566,550	0	0	5,566,550	0	-5,566,550
5	0	79,140	766,000	845,140	991,800	146,660
6	0	79,140	766,000	845,140	1,322,400	477,260
7	0	79,140	766,000	845,140	2,644,800	1,799,660
8	0	79,140	766,000	845,140	3,306,000	2,460,860
9	0	79,140	766,000	845,140	3,306,000	2,460,860
10	0	79,140	766,000	845,140	3,306,000	2,460,860
11	0	79,140	766,000	845,140	3,306,000	2,460,860
12	0	79,140	766,000	845,140	3,306,000	2,460,860
13	0	79,140	766,000	845,140	3,306,000	2,460,860
14	0	79,140	766,000	845,140	3,306,000	2,460,860
15	0	79,140	766,000	845,140	3,306,000	2,460,860
16	0	79,140	766,000	845,140	3,306,000	2,460,860
17	0	79,140	766,000	845,140	3,306,000	2,460,860
18	0	79,140	766,000	845,140	3,306,000	2,460,860
19	0	79,140	766,000	845,140	3,306,000	2,460,860
20	0	79,140	766,000	845,140	3,306,000	2,460,860
21	0	79,140	766,000	845,140	3,306,000	2,460,860
22	0	79,140	766,000	845,140	3,306,000	2,460,860
23	0	79,140	766,000	845,140	3,306,000	2,460,860
24	0	79,140	766,000	845,140	3,306,000	2,460,860
25	0	79,140	766,000	845,140	3,306,000	2,460,860
26	0	79,140	766,000	845,140	3,306,000	2,460,860
27	0	79,140	766,000	845,140	3,306,000	2,460,860
28	0	79,140	766,000	845,140	3,306,000	2,460,860
29	0	79,140	766,000	845,140	3,306,000	2,460,860
30	0	79,140	766,000	845,140	3,306,000	2,460,860
31	0	79,140	766,000	845,140	3,306,000	2,460,860
32	0	79,140	766,000	845,140	3,306,000	2,460,860
33	0	79,140	766,000	845,140	3,306,000	2,460,860
34	0	79,140	766,000	845,140	3,306,000	2,460,860
35	0	79,140	766,000	845,140	3,306,000	2,460,860
36	0	79,140	766,000	845,140	3,306,000	2,460,860
37	0	79,140	766,000	845,140	3,306,000	2,460,860
38	0	79,140	766,000	845,140	3,306,000	2,460,860
39	0	79,140	766,000	845,140	3,306,000	2,460,860
40	0	79,140	766,000	845,140	3,306,000	2,460,860
41	0	79,140	766,000	845,140	3,306,000	2,460,860
42	0	79,140	766,000	845,140	3,306,000	2,460,860
43	0	79,140	766,000	845,140	3,306,000	2,460,860
44	0	79,140	766,000	845,140	3,306,000	2,460,860
45	0	79,140	766,000	845,140	3,306,000	2,460,860
46	0	79,140	766,000	845,140	3,306,000	2,460,860
47	0	79,140	766,000	845,140	3,306,000	2,460,860
48	0	79,140	766,000	845,140	3,306,000	2,460,860
49	0	79,140	766,000	845,140	3,306,000	2,460,860
50	0	79,140	766,000	845,140	3,306,000	2,460,860
TOTAL	19,195,000	3,640,440	35,236,000	58,071,440	147,117,000	89,045,560

INTERNAL RATE OF RETURN

9.6%

Table J.4 Internal Rate of Return for each Cases (2)

Case - 2

(Unit: US\$)

YEAR	PROJECT COSTS				INCR. PROD. VALUE	PROJECT RETURN
	CONSTRUCT- ION COST	O & M COSTS	INCR. PROD. COST	TOTAL		
1	535,936	0	0	535,936	0	-535,936
2	3,014,640	0	0	3,014,640	0	-3,014,640
3	8,340,504	0	0	8,340,504	0	-8,340,504
4	4,856,920	0	0	4,856,920	0	-4,856,920
5	0	79,140	644,000	723,140	816,000	92,860
6	0	79,140	644,000	723,140	1,088,000	364,860
7	0	79,140	644,000	723,140	2,176,000	1,452,860
8	0	79,140	644,000	723,140	2,720,000	1,996,860
9	0	79,140	644,000	723,140	2,720,000	1,996,860
10	0	79,140	644,000	723,140	2,720,000	1,996,860
11	0	79,140	644,000	723,140	2,720,000	1,996,860
12	0	79,140	644,000	723,140	2,720,000	1,996,860
13	0	79,140	644,000	723,140	2,720,000	1,996,860
14	0	79,140	644,000	723,140	2,720,000	1,996,860
15	0	79,140	644,000	723,140	2,720,000	1,996,860
16	0	79,140	644,000	723,140	2,720,000	1,996,860
17	0	79,140	644,000	723,140	2,720,000	1,996,860
18	0	79,140	644,000	723,140	2,720,000	1,996,860
19	0	79,140	644,000	723,140	2,720,000	1,996,860
20	0	79,140	644,000	723,140	2,720,000	1,996,860
21	0	79,140	644,000	723,140	2,720,000	1,996,860
22	0	79,140	644,000	723,140	2,720,000	1,996,860
23	0	79,140	644,000	723,140	2,720,000	1,996,860
24	0	79,140	644,000	723,140	2,720,000	1,996,860
25	0	79,140	644,000	723,140	2,720,000	1,996,860
26	0	79,140	644,000	723,140	2,720,000	1,996,860
27	0	79,140	644,000	723,140	2,720,000	1,996,860
28	0	79,140	644,000	723,140	2,720,000	1,996,860
29	0	79,140	644,000	723,140	2,720,000	1,996,860
30	0	79,140	644,000	723,140	2,720,000	1,996,860
31	0	79,140	644,000	723,140	2,720,000	1,996,860
32	0	79,140	644,000	723,140	2,720,000	1,996,860
33	0	79,140	644,000	723,140	2,720,000	1,996,860
34	0	79,140	644,000	723,140	2,720,000	1,996,860
35	0	79,140	644,000	723,140	2,720,000	1,996,860
36	0	79,140	644,000	723,140	2,720,000	1,996,860
37	0	79,140	644,000	723,140	2,720,000	1,996,860
38	0	79,140	644,000	723,140	2,720,000	1,996,860
39	0	79,140	644,000	723,140	2,720,000	1,996,860
40	0	79,140	644,000	723,140	2,720,000	1,996,860
41	0	79,140	644,000	723,140	2,720,000	1,996,860
42	0	79,140	644,000	723,140	2,720,000	1,996,860
43	0	79,140	644,000	723,140	2,720,000	1,996,860
44	0	79,140	644,000	723,140	2,720,000	1,996,860
45	0	79,140	644,000	723,140	2,720,000	1,996,860
46	0	79,140	644,000	723,140	2,720,000	1,996,860
47	0	79,140	644,000	723,140	2,720,000	1,996,860
48	0	79,140	644,000	723,140	2,720,000	1,996,860
49	0	79,140	644,000	723,140	2,720,000	1,996,860
50	0	79,140	644,000	723,140	2,720,000	1,996,860
TOTAL	16,748,000	3,640,440	29,624,000	50,012,440	121,040,000	71,027,560

INTERNAL RATE OF RETURN

9.0%

Table J.4 Internal Rate of Return for each Cases (3)

Case - 3

(Unit: USS)

YEAR	PROJECT COSTS				INCR. PROD. VALUE	PROJECT RETURN
	CONSTRUCT- ION COST	O & M COSTS	INCR. PROD. COST	TOTAL		
1	507,008	0	0	507,008	0	-507,008
2	2,851,920	0	0	2,851,920	0	-2,851,920
3	7,890,312	0	0	7,890,312	0	-7,890,312
4	4,594,760	0	0	4,594,760	0	-4,594,760
5	0	79,140	620,000	699,140	786,300	87,160
6	0	79,140	620,000	699,140	1,048,400	349,260
7	0	79,140	620,000	699,140	2,096,800	1,397,660
8	0	79,140	620,000	699,140	2,621,000	1,921,860
9	0	79,140	620,000	699,140	2,621,000	1,921,860
10	0	79,140	620,000	699,140	2,621,000	1,921,860
11	0	79,140	620,000	699,140	2,621,000	1,921,860
12	0	79,140	620,000	699,140	2,621,000	1,921,860
13	0	79,140	620,000	699,140	2,621,000	1,921,860
14	0	79,140	620,000	699,140	2,621,000	1,921,860
15	0	79,140	620,000	699,140	2,621,000	1,921,860
16	0	79,140	620,000	699,140	2,621,000	1,921,860
17	0	79,140	620,000	699,140	2,621,000	1,921,860
18	0	79,140	620,000	699,140	2,621,000	1,921,860
19	0	79,140	620,000	699,140	2,621,000	1,921,860
20	0	79,140	620,000	699,140	2,621,000	1,921,860
21	0	79,140	620,000	699,140	2,621,000	1,921,860
22	0	79,140	620,000	699,140	2,621,000	1,921,860
23	0	79,140	620,000	699,140	2,621,000	1,921,860
24	0	79,140	620,000	699,140	2,621,000	1,921,860
25	0	79,140	620,000	699,140	2,621,000	1,921,860
26	0	79,140	620,000	699,140	2,621,000	1,921,860
27	0	79,140	620,000	699,140	2,621,000	1,921,860
28	0	79,140	620,000	699,140	2,621,000	1,921,860
29	0	79,140	620,000	699,140	2,621,000	1,921,860
30	0	79,140	620,000	699,140	2,621,000	1,921,860
31	0	79,140	620,000	699,140	2,621,000	1,921,860
32	0	79,140	620,000	699,140	2,621,000	1,921,860
33	0	79,140	620,000	699,140	2,621,000	1,921,860
34	0	79,140	620,000	699,140	2,621,000	1,921,860
35	0	79,140	620,000	699,140	2,621,000	1,921,860
36	0	79,140	620,000	699,140	2,621,000	1,921,860
37	0	79,140	620,000	699,140	2,621,000	1,921,860
38	0	79,140	620,000	699,140	2,621,000	1,921,860
39	0	79,140	620,000	699,140	2,621,000	1,921,860
40	0	79,140	620,000	699,140	2,621,000	1,921,860
41	0	79,140	620,000	699,140	2,621,000	1,921,860
42	0	79,140	620,000	699,140	2,621,000	1,921,860
43	0	79,140	620,000	699,140	2,621,000	1,921,860
44	0	79,140	620,000	699,140	2,621,000	1,921,860
45	0	79,140	620,000	699,140	2,621,000	1,921,860
46	0	79,140	620,000	699,140	2,621,000	1,921,860
47	0	79,140	620,000	699,140	2,621,000	1,921,860
48	0	79,140	620,000	699,140	2,621,000	1,921,860
49	0	79,140	620,000	699,140	2,621,000	1,921,860
50	0	79,140	620,000	699,140	2,621,000	1,921,860
TOTAL	15,844,000	3,640,440	28,520,000	48,004,440	116,634,500	68,630,060

INTERNAL RATE OF RETURN

9.1%

Table J.4 Internal Rate of Return for each Cases (4)

Case - 4

(Unit: US\$)

YEAR	PROJECT COSTS			TOTAL	INCR. PROD. VALUE	PROJECT RETURN
	CONSTRUCT- ION COST	O & M COSTS	INCR. PROD. COST			
1	492,000	0	0	492,000	0	-492,000
2	2,732,000	0	0	2,732,000	0	-2,732,000
3	7,569,000	0	0	7,569,000	0	-7,569,000
4	4,392,000	0	0	4,392,000	0	-4,392,000
5	0	79,140	613,000	692,140	778,500	86,360
6	0	79,140	613,000	692,140	1,038,000	345,860
7	0	79,140	613,000	692,140	2,076,000	1,383,860
8	0	79,140	613,000	692,140	2,595,000	1,902,860
9	0	79,140	613,000	692,140	2,595,000	1,902,860
10	0	79,140	613,000	692,140	2,595,000	1,902,860
11	0	79,140	613,000	692,140	2,595,000	1,902,860
12	0	79,140	613,000	692,140	2,595,000	1,902,860
13	0	79,140	613,000	692,140	2,595,000	1,902,860
14	0	79,140	613,000	692,140	2,595,000	1,902,860
15	0	79,140	613,000	692,140	2,595,000	1,902,860
16	0	79,140	613,000	692,140	2,595,000	1,902,860
17	0	79,140	613,000	692,140	2,595,000	1,902,860
18	0	79,140	613,000	692,140	2,595,000	1,902,860
19	0	79,140	613,000	692,140	2,595,000	1,902,860
20	0	79,140	613,000	692,140	2,595,000	1,902,860
21	0	79,140	613,000	692,140	2,595,000	1,902,860
22	0	79,140	613,000	692,140	2,595,000	1,902,860
23	0	79,140	613,000	692,140	2,595,000	1,902,860
24	0	79,140	613,000	692,140	2,595,000	1,902,860
25	0	79,140	613,000	692,140	2,595,000	1,902,860
26	0	79,140	613,000	692,140	2,595,000	1,902,860
27	0	79,140	613,000	692,140	2,595,000	1,902,860
28	0	79,140	613,000	692,140	2,595,000	1,902,860
29	0	79,140	613,000	692,140	2,595,000	1,902,860
30	0	79,140	613,000	692,140	2,595,000	1,902,860
31	0	79,140	613,000	692,140	2,595,000	1,902,860
32	0	79,140	613,000	692,140	2,595,000	1,902,860
33	0	79,140	613,000	692,140	2,595,000	1,902,860
34	0	79,140	613,000	692,140	2,595,000	1,902,860
35	0	79,140	613,000	692,140	2,595,000	1,902,860
36	0	79,140	613,000	692,140	2,595,000	1,902,860
37	0	79,140	613,000	692,140	2,595,000	1,902,860
38	0	79,140	613,000	692,140	2,595,000	1,902,860
39	0	79,140	613,000	692,140	2,595,000	1,902,860
40	0	79,140	613,000	692,140	2,595,000	1,902,860
41	0	79,140	613,000	692,140	2,595,000	1,902,860
42	0	79,140	613,000	692,140	2,595,000	1,902,860
43	0	79,140	613,000	692,140	2,595,000	1,902,860
44	0	79,140	613,000	692,140	2,595,000	1,902,860
45	0	79,140	613,000	692,140	2,595,000	1,902,860
46	0	79,140	613,000	692,140	2,595,000	1,902,860
47	0	79,140	613,000	692,140	2,595,000	1,902,860
48	0	79,140	613,000	692,140	2,595,000	1,902,860
49	0	79,140	613,000	692,140	2,595,000	1,902,860
50	0	79,140	613,000	692,140	2,595,000	1,902,860
TOTAL	15,185,000	3,640,440	28,198,000	47,023,440	115,477,500	68,454,060

INTERNAL RATE OF RETURN

9.4%

Table J.4 Internal Rate of Return for each Cases (5)

Case - 5

(Unit: US\$)

YEAR	PROJECT COSTS				INCR. PROD. VALUE	PROJECT RETURN
	CONSTRUCT- ION COST	O & M COSTS	INCR. PROD. COST	TOTAL		
1	479,968	0	0	479,968	0	-479,968
2	2,699,820	0	0	2,699,820	0	-2,699,820
3	7,469,502	0	0	7,469,502	0	-7,469,502
4	4,349,710	0	0	4,349,710	0	-4,349,710
5	0	65,800	597,000	662,800	758,700	95,900
6	0	65,800	597,000	662,800	1,011,600	348,800
7	0	65,800	597,000	662,800	2,023,200	1,360,400
8	0	65,800	597,000	662,800	2,529,000	1,866,200
9	0	65,800	597,000	662,800	2,529,000	1,866,200
10	0	65,800	597,000	662,800	2,529,000	1,866,200
11	0	65,800	597,000	662,800	2,529,000	1,866,200
12	0	65,800	597,000	662,800	2,529,000	1,866,200
13	0	65,800	597,000	662,800	2,529,000	1,866,200
14	0	65,800	597,000	662,800	2,529,000	1,866,200
15	0	65,800	597,000	662,800	2,529,000	1,866,200
16	0	65,800	597,000	662,800	2,529,000	1,866,200
17	0	65,800	597,000	662,800	2,529,000	1,866,200
18	0	65,800	597,000	662,800	2,529,000	1,866,200
19	0	65,800	597,000	662,800	2,529,000	1,866,200
20	0	65,800	597,000	662,800	2,529,000	1,866,200
21	0	65,800	597,000	662,800	2,529,000	1,866,200
22	0	65,800	597,000	662,800	2,529,000	1,866,200
23	0	65,800	597,000	662,800	2,529,000	1,866,200
24	0	65,800	597,000	662,800	2,529,000	1,866,200
25	0	65,800	597,000	662,800	2,529,000	1,866,200
26	0	65,800	597,000	662,800	2,529,000	1,866,200
27	0	65,800	597,000	662,800	2,529,000	1,866,200
28	0	65,800	597,000	662,800	2,529,000	1,866,200
29	0	65,800	597,000	662,800	2,529,000	1,866,200
30	0	65,800	597,000	662,800	2,529,000	1,866,200
31	0	65,800	597,000	662,800	2,529,000	1,866,200
32	0	65,800	597,000	662,800	2,529,000	1,866,200
33	0	65,800	597,000	662,800	2,529,000	1,866,200
34	0	65,800	597,000	662,800	2,529,000	1,866,200
35	0	65,800	597,000	662,800	2,529,000	1,866,200
36	0	65,800	597,000	662,800	2,529,000	1,866,200
37	0	65,800	597,000	662,800	2,529,000	1,866,200
38	0	65,800	597,000	662,800	2,529,000	1,866,200
39	0	65,800	597,000	662,800	2,529,000	1,866,200
40	0	65,800	597,000	662,800	2,529,000	1,866,200
41	0	65,800	597,000	662,800	2,529,000	1,866,200
42	0	65,800	597,000	662,800	2,529,000	1,866,200
43	0	65,800	597,000	662,800	2,529,000	1,866,200
44	0	65,800	597,000	662,800	2,529,000	1,866,200
45	0	65,800	597,000	662,800	2,529,000	1,866,200
46	0	65,800	597,000	662,800	2,529,000	1,866,200
47	0	65,800	597,000	662,800	2,529,000	1,866,200
48	0	65,800	597,000	662,800	2,529,000	1,866,200
49	0	65,800	597,000	662,800	2,529,000	1,866,200
50	0	65,800	597,000	662,800	2,529,000	1,866,200
TOTAL	14,999,000	3,026,800	27,462,000	45,487,800	12,540,500	67,052,700

INTERNAL RATE OF RETURN

9.3%

Table J.4 Internal Rate of Return for each Cases (6)

Case - 6

(Unit: US\$)

YEAR	PROJECT COSTS				INCR. PROD. VALUE	PROJECT RETURN
	CONSTRUCT- ION COST	O & M COSTS	INCR. PROD. COST	TOTAL		
1	468,224	0	0	468,224	0	-468,224
2	2,633,760	0	0	2,633,760	0	-2,633,760
3	7,286,736	0	0	7,286,736	0	-7,286,736
4	4,243,280	0	0	4,243,280	0	-4,243,280
5	0	65,800	567,000	632,800	715,800	83,000
6	0	65,800	567,000	632,800	954,400	321,600
7	0	65,800	567,000	632,800	1,908,800	1,276,000
8	0	65,800	567,000	632,800	2,386,000	1,753,200
9	0	65,800	567,000	632,800	2,386,000	1,753,200
10	0	65,800	567,000	632,800	2,386,000	1,753,200
11	0	65,800	567,000	632,800	2,386,000	1,753,200
12	0	65,800	567,000	632,800	2,386,000	1,753,200
13	0	65,800	567,000	632,800	2,386,000	1,753,200
14	0	65,800	567,000	632,800	2,386,000	1,753,200
15	0	65,800	567,000	632,800	2,386,000	1,753,200
16	0	65,800	567,000	632,800	2,386,000	1,753,200
17	0	65,800	567,000	632,800	2,386,000	1,753,200
18	0	65,800	567,000	632,800	2,386,000	1,753,200
19	0	65,800	567,000	632,800	2,386,000	1,753,200
20	0	65,800	567,000	632,800	2,386,000	1,753,200
21	0	65,800	567,000	632,800	2,386,000	1,753,200
22	0	65,800	567,000	632,800	2,386,000	1,753,200
23	0	65,800	567,000	632,800	2,386,000	1,753,200
24	0	65,800	567,000	632,800	2,386,000	1,753,200
25	0	65,800	567,000	632,800	2,386,000	1,753,200
26	0	65,800	567,000	632,800	2,386,000	1,753,200
27	0	65,800	567,000	632,800	2,386,000	1,753,200
28	0	65,800	567,000	632,800	2,386,000	1,753,200
29	0	65,800	567,000	632,800	2,386,000	1,753,200
30	0	65,800	567,000	632,800	2,386,000	1,753,200
31	0	65,800	567,000	632,800	2,386,000	1,753,200
32	0	65,800	567,000	632,800	2,386,000	1,753,200
33	0	65,800	567,000	632,800	2,386,000	1,753,200
34	0	65,800	567,000	632,800	2,386,000	1,753,200
35	0	65,800	567,000	632,800	2,386,000	1,753,200
36	0	65,800	567,000	632,800	2,386,000	1,753,200
37	0	65,800	567,000	632,800	2,386,000	1,753,200
38	0	65,800	567,000	632,800	2,386,000	1,753,200
39	0	65,800	567,000	632,800	2,386,000	1,753,200
40	0	65,800	567,000	632,800	2,386,000	1,753,200
41	0	65,800	567,000	632,800	2,386,000	1,753,200
42	0	65,800	567,000	632,800	2,386,000	1,753,200
43	0	65,800	567,000	632,800	2,386,000	1,753,200
44	0	65,800	567,000	632,800	2,386,000	1,753,200
45	0	65,800	567,000	632,800	2,386,000	1,753,200
46	0	65,800	567,000	632,800	2,386,000	1,753,200
47	0	65,800	567,000	632,800	2,386,000	1,753,200
48	0	65,800	567,000	632,800	2,386,000	1,753,200
49	0	65,800	567,000	632,800	2,386,000	1,753,200
50	0	65,800	567,000	632,800	2,386,000	1,753,200
TOTAL	14,632,000	3,026,800	26,082,000	43,740,800	106,177,000	62,436,200

INTERNAL RATE OF RETURN

9.0%

Table J.4 Internal Rate of Return for each Cases (7)

Case - 7

(Unit: US\$)

YEAR	PROJECT COSTS				INCR. PROD. VALUE	PROJECT RETURN
	CONSTRUCT- ION COST	O & M COSTS	INCR. PROD. COST	TOTAL		
1	463,424	0	0	463,424	0	-463,424
2	2,606,760	0	0	2,606,760	0	-2,606,760
3	7,212,036	0	0	7,212,036	0	-7,212,036
4	4,199,780	0	0	4,199,780	0	-4,199,780
5	0	79,140	550,000	629,140	694,800	65,660
6	0	79,140	550,000	629,140	926,400	297,260
7	0	79,140	550,000	629,140	1,852,800	1,223,660
8	0	79,140	550,000	629,140	2,316,000	1,686,860
9	0	79,140	550,000	629,140	2,316,000	1,686,860
10	0	79,140	550,000	629,140	2,316,000	1,686,860
11	0	79,140	550,000	629,140	2,316,000	1,686,860
12	0	79,140	550,000	629,140	2,316,000	1,686,860
13	0	79,140	550,000	629,140	2,316,000	1,686,860
14	0	79,140	550,000	629,140	2,316,000	1,686,860
15	0	79,140	550,000	629,140	2,316,000	1,686,860
16	0	79,140	550,000	629,140	2,316,000	1,686,860
17	0	79,140	550,000	629,140	2,316,000	1,686,860
18	0	79,140	550,000	629,140	2,316,000	1,686,860
19	0	79,140	550,000	629,140	2,316,000	1,686,860
20	0	79,140	550,000	629,140	2,316,000	1,686,860
21	0	79,140	550,000	629,140	2,316,000	1,686,860
22	0	79,140	550,000	629,140	2,316,000	1,686,860
23	0	79,140	550,000	629,140	2,316,000	1,686,860
24	0	79,140	550,000	629,140	2,316,000	1,686,860
25	0	79,140	550,000	629,140	2,316,000	1,686,860
26	0	79,140	550,000	629,140	2,316,000	1,686,860
27	0	79,140	550,000	629,140	2,316,000	1,686,860
28	0	79,140	550,000	629,140	2,316,000	1,686,860
29	0	79,140	550,000	629,140	2,316,000	1,686,860
30	0	79,140	550,000	629,140	2,316,000	1,686,860
31	0	79,140	550,000	629,140	2,316,000	1,686,860
32	0	79,140	550,000	629,140	2,316,000	1,686,860
33	0	79,140	550,000	629,140	2,316,000	1,686,860
34	0	79,140	550,000	629,140	2,316,000	1,686,860
35	0	79,140	550,000	629,140	2,316,000	1,686,860
36	0	79,140	550,000	629,140	2,316,000	1,686,860
37	0	79,140	550,000	629,140	2,316,000	1,686,860
38	0	79,140	550,000	629,140	2,316,000	1,686,860
39	0	79,140	550,000	629,140	2,316,000	1,686,860
40	0	79,140	550,000	629,140	2,316,000	1,686,860
41	0	79,140	550,000	629,140	2,316,000	1,686,860
42	0	79,140	550,000	629,140	2,316,000	1,686,860
43	0	79,140	550,000	629,140	2,316,000	1,686,860
44	0	79,140	550,000	629,140	2,316,000	1,686,860
45	0	79,140	550,000	629,140	2,316,000	1,686,860
46	0	79,140	550,000	629,140	2,316,000	1,686,860
47	0	79,140	550,000	629,140	2,316,000	1,686,860
48	0	79,140	550,000	629,140	2,316,000	1,686,860
49	0	79,140	550,000	629,140	2,316,000	1,686,860
50	0	79,140	550,000	629,140	2,316,000	1,686,860
TOTAL	14,482,000	3,640,440	25,300,000	43,422,440	103,062,000	59,639,560

INTERNAL RATE OF RETURN

8.8%

Table J.4 Internal Rate of Return for each Cases (8)

Case - 8

(Unit: US\$)

YEAR	PROJECT COSTS				INCR. PROD. VALUE	PROJECT RETURN
	CONSTRUCT- ION COST	O & M COSTS	INCR. PROD. COST	TOTAL		
1	433,120	0	0	433,120	0	-433,120
2	2,436,300	0	0	2,436,300	0	-2,436,300
3	6,740,430	0	0	6,740,430	0	-6,740,430
4	3,925,150	0	0	3,925,150	0	-3,925,150
5	0	79,140	349,000	428,140	471,000	42,860
6	0	79,140	349,000	428,140	628,000	199,860
7	0	79,140	349,000	428,140	1,256,000	827,860
8	0	79,140	349,000	428,140	1,570,000	1,141,860
9	0	79,140	349,000	428,140	1,570,000	1,141,860
10	0	79,140	349,000	428,140	1,570,000	1,141,860
11	0	79,140	349,000	428,140	1,570,000	1,141,860
12	0	79,140	349,000	428,140	1,570,000	1,141,860
13	0	79,140	349,000	428,140	1,570,000	1,141,860
14	0	79,140	349,000	428,140	1,570,000	1,141,860
15	0	79,140	349,000	428,140	1,570,000	1,141,860
16	0	79,140	349,000	428,140	1,570,000	1,141,860
17	0	79,140	349,000	428,140	1,570,000	1,141,860
18	0	79,140	349,000	428,140	1,570,000	1,141,860
19	0	79,140	349,000	428,140	1,570,000	1,141,860
20	0	79,140	349,000	428,140	1,570,000	1,141,860
21	0	79,140	349,000	428,140	1,570,000	1,141,860
22	0	79,140	349,000	428,140	1,570,000	1,141,860
23	0	79,140	349,000	428,140	1,570,000	1,141,860
24	0	79,140	349,000	428,140	1,570,000	1,141,860
25	0	79,140	349,000	428,140	1,570,000	1,141,860
26	0	79,140	349,000	428,140	1,570,000	1,141,860
27	0	79,140	349,000	428,140	1,570,000	1,141,860
28	0	79,140	349,000	428,140	1,570,000	1,141,860
29	0	79,140	349,000	428,140	1,570,000	1,141,860
30	0	79,140	349,000	428,140	1,570,000	1,141,860
31	0	79,140	349,000	428,140	1,570,000	1,141,860
32	0	79,140	349,000	428,140	1,570,000	1,141,860
33	0	79,140	349,000	428,140	1,570,000	1,141,860
34	0	79,140	349,000	428,140	1,570,000	1,141,860
35	0	79,140	349,000	428,140	1,570,000	1,141,860
36	0	79,140	349,000	428,140	1,570,000	1,141,860
37	0	79,140	349,000	428,140	1,570,000	1,141,860
38	0	79,140	349,000	428,140	1,570,000	1,141,860
39	0	79,140	349,000	428,140	1,570,000	1,141,860
40	0	79,140	349,000	428,140	1,570,000	1,141,860
41	0	79,140	349,000	428,140	1,570,000	1,141,860
42	0	79,140	349,000	428,140	1,570,000	1,141,860
43	0	79,140	349,000	428,140	1,570,000	1,141,860
44	0	79,140	349,000	428,140	1,570,000	1,141,860
45	0	79,140	349,000	428,140	1,570,000	1,141,860
46	0	79,140	349,000	428,140	1,570,000	1,141,860
47	0	79,140	349,000	428,140	1,570,000	1,141,860
48	0	79,140	349,000	428,140	1,570,000	1,141,860
49	0	79,140	349,000	428,140	1,570,000	1,141,860
50	0	79,140	349,000	428,140	1,570,000	1,141,860
TOTAL	13,535,000	3,640,440	16,054,000	33,229,440	69,865,000	36,635,560

INTERNAL RATE OF RETURN

6.5%

Table J.4 Internal Rate of Return for each Cases (9)

Case - 9-1

(Unit: US\$)

YEAR	PROJECT COSTS				INCR. PROD. VALUE	PROJECT RETURN
	CONSTRUCT- ION COST	O & M COSTS	INCR. PROD. COST	TOTAL		
1	208,992	0	0	208,992	0	-208,992
2	1,175,580	0	0	1,175,580	0	-1,175,580
3	3,252,438	0	0	3,252,438	0	-3,252,438
4	1,893,990	0	0	1,893,990	0	-1,893,990
5	0	41,160	53,000	94,160	124,200	30,040
6	0	41,160	53,000	94,160	165,600	71,440
7	0	41,160	53,000	94,160	207,000	112,840
8	0	41,160	53,000	94,160	207,000	112,840
9	0	41,160	53,000	94,160	207,000	112,840
10	0	41,160	53,000	94,160	207,000	112,840
11	0	41,160	53,000	94,160	207,000	112,840
12	0	41,160	53,000	94,160	207,000	112,840
13	0	41,160	53,000	94,160	207,000	112,840
14	0	41,160	53,000	94,160	207,000	112,840
15	0	41,160	53,000	94,160	207,000	112,840
16	0	41,160	53,000	94,160	207,000	112,840
17	0	41,160	53,000	94,160	207,000	112,840
18	0	41,160	53,000	94,160	207,000	112,840
19	0	41,160	53,000	94,160	207,000	112,840
20	0	41,160	53,000	94,160	207,000	112,840
21	0	41,160	53,000	94,160	207,000	112,840
22	0	41,160	53,000	94,160	207,000	112,840
23	0	41,160	53,000	94,160	207,000	112,840
24	0	41,160	53,000	94,160	207,000	112,840
25	0	41,160	53,000	94,160	207,000	112,840
26	0	41,160	53,000	94,160	207,000	112,840
27	0	41,160	53,000	94,160	207,000	112,840
28	0	41,160	53,000	94,160	207,000	112,840
29	0	41,160	53,000	94,160	207,000	112,840
30	0	41,160	53,000	94,160	207,000	112,840
31	0	41,160	53,000	94,160	207,000	112,840
32	0	41,160	53,000	94,160	207,000	112,840
33	0	41,160	53,000	94,160	207,000	112,840
34	0	41,160	53,000	94,160	207,000	112,840
35	0	41,160	53,000	94,160	207,000	112,840
36	0	41,160	53,000	94,160	207,000	112,840
37	0	41,160	53,000	94,160	207,000	112,840
38	0	41,160	53,000	94,160	207,000	112,840
39	0	41,160	53,000	94,160	207,000	112,840
40	0	41,160	53,000	94,160	207,000	112,840
41	0	41,160	53,000	94,160	207,000	112,840
42	0	41,160	53,000	94,160	207,000	112,840
43	0	41,160	53,000	94,160	207,000	112,840
44	0	41,160	53,000	94,160	207,000	112,840
45	0	41,160	53,000	94,160	207,000	112,840
46	0	41,160	53,000	94,160	207,000	112,840
47	0	41,160	53,000	94,160	207,000	112,840
48	0	41,160	53,000	94,160	207,000	112,840
49	0	41,160	53,000	94,160	207,000	112,840
50	0	41,160	53,000	94,160	207,000	112,840
TOTAL	6,531,000	1,893,360	2,438,000	10,862,360	9,397,800	-1,464,560

INTERNAL RATE OF RETURN 0%

Table J.4 Internal Rate of Return for each Cases (10)

Case - 9-2

(Unit: US\$)

YEAR	PROJECT COSTS				INCR. PROD. VALUE	PROJECT RETURN
	CONSTRUCT- ION COST	O & M COSTS	INCR. PROD. COST	TOTAL		
1	250,144	0	0	250,144	0	-250,144
2	1,407,060	0	0	1,407,060	0	-1,407,060
3	3,892,866	0	0	3,892,866	0	-3,892,866
4	2,266,930	0	0	2,266,930	0	-2,266,930
5	0	79,140	122,000	201,140	154,200	-46,940
6	0	79,140	122,000	201,140	205,600	4,460
7	0	79,140	122,000	201,140	411,200	210,060
8	0	79,140	122,000	201,140	514,000	312,860
9	0	79,140	122,000	201,140	514,000	312,860
10	0	79,140	122,000	201,140	514,000	312,860
11	0	79,140	122,000	201,140	514,000	312,860
12	0	79,140	122,000	201,140	514,000	312,860
13	0	79,140	122,000	201,140	514,000	312,860
14	0	79,140	122,000	201,140	514,000	312,860
15	0	79,140	122,000	201,140	514,000	312,860
16	0	79,140	122,000	201,140	514,000	312,860
17	0	79,140	122,000	201,140	514,000	312,860
18	0	79,140	122,000	201,140	514,000	312,860
19	0	79,140	122,000	201,140	514,000	312,860
20	0	79,140	122,000	201,140	514,000	312,860
21	0	79,140	122,000	201,140	514,000	312,860
22	0	79,140	122,000	201,140	514,000	312,860
23	0	79,140	122,000	201,140	514,000	312,860
24	0	79,140	122,000	201,140	514,000	312,860
25	0	79,140	122,000	201,140	514,000	312,860
26	0	79,140	122,000	201,140	514,000	312,860
27	0	79,140	122,000	201,140	514,000	312,860
28	0	79,140	122,000	201,140	514,000	312,860
29	0	79,140	122,000	201,140	514,000	312,860
30	0	79,140	122,000	201,140	514,000	312,860
31	0	79,140	122,000	201,140	514,000	312,860
32	0	79,140	122,000	201,140	514,000	312,860
33	0	79,140	122,000	201,140	514,000	312,860
34	0	79,140	122,000	201,140	514,000	312,860
35	0	79,140	122,000	201,140	514,000	312,860
36	0	79,140	122,000	201,140	514,000	312,860
37	0	79,140	122,000	201,140	514,000	312,860
38	0	79,140	122,000	201,140	514,000	312,860
39	0	79,140	122,000	201,140	514,000	312,860
40	0	79,140	122,000	201,140	514,000	312,860
41	0	79,140	122,000	201,140	514,000	312,860
42	0	79,140	122,000	201,140	514,000	312,860
43	0	79,140	122,000	201,140	514,000	312,860
44	0	79,140	122,000	201,140	514,000	312,860
45	0	79,140	122,000	201,140	514,000	312,860
46	0	79,140	122,000	201,140	514,000	312,860
47	0	79,140	122,000	201,140	514,000	312,860
48	0	79,140	122,000	201,140	514,000	312,860
49	0	79,140	122,000	201,140	514,000	312,860
50	0	79,140	122,000	201,140	514,000	312,860
TOTAL	7,817,000	3,640,440	5,612,000	17,069,440	22,873,000	5,803,560

INTERNAL RATE OF RETURN

2.4%

Table J.5 Sensitivity Analysis of Internal Rate of Return (1)
 Invested Exceeds Estimated Cost 10%

(Unit: US\$)

YEAR	PROJECT COSTS				TOTAL	INCR. PROD. VALUE	PROJECT RETURN
	CONSTRUCT- ION COST	REPLACE- MENT COST	O & M COSTS	INCR. PROD. COST			
1	541,200	0	0	0	541,200	0	-541,200
2	2,578,400	0	0	0	2,578,400	0	-2,578,400
3	6,825,500	0	0	0	6,825,500	0	-6,825,500
4	4,022,700	0	0	0	4,022,700	0	-4,022,700
5	0	0	1,278,000	613,000	1,891,000	715,087	-1,175,913
6	0	0	73,800	613,000	686,800	953,561	266,761
7	0	0	73,800	613,000	686,800	2,040,546	1,349,561
8	0	0	73,800	613,000	686,800	2,607,220	1,920,420
9	0	0	73,800	613,000	686,800	2,607,220	1,920,420
10	0	0	73,800	613,000	686,800	2,607,220	1,920,420
11	0	0	73,800	613,000	686,800	2,607,220	1,920,420
12	0	0	73,800	613,000	686,800	2,607,220	1,920,420
13	0	0	73,800	613,000	686,800	2,607,220	1,920,420
14	0	0	73,800	613,000	686,800	2,607,220	1,920,420
15	0	0	73,800	613,000	686,800	2,607,220	1,920,420
16	0	0	73,800	613,000	686,800	2,607,220	1,920,420
17	0	0	73,800	613,000	686,800	2,607,220	1,920,420
18	0	0	73,800	613,000	686,800	2,607,220	1,920,420
19	0	0	73,800	613,000	686,800	2,607,220	1,920,420
20	0	0	73,800	613,000	686,800	2,607,220	1,920,420
21	0	0	73,800	613,000	686,800	2,607,220	1,920,420
22	0	0	73,800	613,000	686,800	2,607,220	1,920,420
23	0	0	73,800	613,000	686,800	2,607,220	1,920,420
24	0	0	73,800	613,000	686,800	2,607,220	1,920,420
25	0	0	73,800	613,000	686,800	2,607,220	1,920,420
26	0	0	73,800	613,000	686,800	2,607,220	1,920,420
27	0	0	73,800	613,000	686,800	2,607,220	1,920,420
28	0	0	73,800	613,000	686,800	2,607,220	1,920,420
29	0	0	73,800	613,000	686,800	2,607,220	1,920,420
30	0	283,800	73,800	613,000	970,600	2,607,220	1,636,620
31	0	0	73,800	613,000	686,800	2,607,220	1,920,420
32	0	0	73,800	613,000	686,800	2,607,220	1,920,420
33	0	0	73,800	613,000	686,800	2,607,220	1,920,420
34	0	0	73,800	613,000	686,800	2,607,220	1,920,420
35	0	0	73,800	613,000	686,800	2,607,220	1,920,420
36	0	0	73,800	613,000	686,800	2,607,220	1,920,420
37	0	0	73,800	613,000	686,800	2,607,220	1,920,420
38	0	0	73,800	613,000	686,800	2,607,220	1,920,420
39	0	0	73,800	613,000	686,800	2,607,220	1,920,420
40	0	0	73,800	613,000	686,800	2,607,220	1,920,420
41	0	0	73,800	613,000	686,800	2,607,220	1,920,420
42	0	0	73,800	613,000	686,800	2,607,220	1,920,420
43	0	0	73,800	613,000	686,800	2,607,220	1,920,420
44	0	0	73,800	613,000	686,800	2,607,220	1,920,420
45	0	0	73,800	613,000	686,800	2,607,220	1,920,420
46	0	0	73,800	613,000	686,800	2,607,220	1,920,420
47	0	0	73,800	613,000	686,800	2,607,220	1,920,420
48	0	0	73,800	613,000	686,800	2,607,220	1,920,420
49	0	0	73,800	613,000	686,800	2,607,220	1,920,420
50	0	0	73,800	613,000	686,800	2,607,220	1,920,420
TOTAL	13,967,800	283,800	4,599,000	28,198,000	47,048,600	15,819,654	58,766,659

INTERNAL RATE OF RETURN (IRR) = 9.5%

Table J.5 Sensitivity Analysis of Internal Rate of Return (2)
 Extended Construction Period by One Year

(Unit: US\$)

YEAR	PROJECT COSTS				TOTAL	INCR. PROD. VALUE	PROJECT RETURN
	CONSTRUCT- ION COST	REPLACE- MENT COST	O & M COSTS	INCR. PROD. COST			
1	393,600	0	0	0	393,600	0	-393,600
2	1,875,200	0	0	0	1,875,200	0	-1,875,200
3	4,966,400	0	0	0	4,966,400	0	-4,966,400
4	2,925,600	0	0	0	2,925,600	0	-2,925,600
5	2,537,200	0	0	0	2,537,200	0	-2,537,200
6	0	0	1,278,000	613,000	1,891,000	715,087	-1,175,913
7	0	0	73,800	613,000	686,800	953,561	266,761
8	0	0	73,800	613,000	686,800	2,040,546	1,353,746
9	0	0	73,800	613,000	686,800	2,607,220	1,920,420
10	0	0	73,800	613,000	686,800	2,607,220	1,920,420
11	0	0	73,800	613,000	686,800	2,607,220	1,920,420
12	0	0	73,800	613,000	686,800	2,607,220	1,920,420
13	0	0	73,800	613,000	686,800	2,607,220	1,920,420
14	0	0	73,800	613,000	686,800	2,607,220	1,920,420
15	0	0	73,800	613,000	686,800	2,607,220	1,920,420
16	0	0	73,800	613,000	686,800	2,607,220	1,920,420
17	0	0	73,800	613,000	686,800	2,607,220	1,920,420
18	0	0	73,800	613,000	686,800	2,607,220	1,920,420
19	0	0	73,800	613,000	686,800	2,607,220	1,920,420
20	0	0	73,800	613,000	686,800	2,607,220	1,920,420
21	0	0	73,800	613,000	686,800	2,607,220	1,920,420
22	0	0	73,800	613,000	686,800	2,607,220	1,920,420
23	0	0	73,800	613,000	686,800	2,607,220	1,920,420
24	0	0	73,800	613,000	686,800	2,607,220	1,920,420
25	0	0	73,800	613,000	686,800	2,607,220	1,920,420
26	0	0	73,800	613,000	686,800	2,607,220	1,920,420
27	0	0	73,800	613,000	686,800	2,607,220	1,920,420
28	0	0	73,800	613,000	686,800	2,607,220	1,920,420
29	0	0	73,800	613,000	686,800	2,607,220	1,920,420
30	0	283,800	73,800	613,000	970,600	2,607,220	1,636,620
31	0	0	73,800	613,000	686,800	2,607,220	1,920,420
32	0	0	73,800	613,000	686,800	2,607,220	1,920,420
33	0	0	73,800	613,000	686,800	2,607,220	1,920,420
34	0	0	73,800	613,000	686,800	2,607,220	1,920,420
35	0	0	73,800	613,000	686,800	2,607,220	1,920,420
36	0	0	73,800	613,000	686,800	2,607,220	1,920,420
37	0	0	73,800	613,000	686,800	2,607,220	1,920,420
38	0	0	73,800	613,000	686,800	2,607,220	1,920,420
39	0	0	73,800	613,000	686,800	2,607,220	1,920,420
40	0	0	73,800	613,000	686,800	2,607,220	1,920,420
41	0	0	73,800	613,000	686,800	2,607,220	1,920,420
42	0	0	73,800	613,000	686,800	2,607,220	1,920,420
43	0	0	73,800	613,000	686,800	2,607,220	1,920,420
44	0	0	73,800	613,000	686,800	2,607,220	1,920,420
45	0	0	73,800	613,000	686,800	2,607,220	1,920,420
46	0	0	73,800	613,000	686,800	2,607,220	1,920,420
47	0	0	73,800	613,000	686,800	2,607,220	1,920,420
48	0	0	73,800	613,000	686,800	2,607,220	1,920,420
49	0	0	73,800	613,000	686,800	2,607,220	1,920,420
50	0	0	73,800	613,000	686,800	2,607,220	1,920,420
TOTAL	12,698,000	283,800	4,525,200	27,585,000	45,092,000	113,212,434	68,120,434

INTERNAL RATE OF RETURN (IRR) = 9.7%

Table J.5 Sensitivity Analysis of Internal Rate of Return (3)
10% less than Anticipation in Production Benefit

(Unit: US\$)

YEAR	PROJECT COSTS				TOTAL	INCR. PROD. VALUE	PROJECT RETURN
	CONSTRUCT- ION COST	REPLACE- MENT COST	O & M COSTS	INCR. PROD. COST			
1	492,000	0	0	0	492,000	0	-492,000
2	2,344,000	0	0	0	2,344,000	0	-2,344,000
3	6,205,000	0	0	0	6,205,000	0	-6,205,000
4	3,657,000	0	0	0	3,657,000	0	-3,657,000
5	0	0	1,278,000	613,000	1,891,000	644,047	-1,246,953
6	0	0	73,800	613,000	686,800	858,841	172,041
7	0	0	73,800	613,000	686,800	1,837,546	1,150,746
8	0	0	73,800	613,000	686,800	2,347,720	1,660,920
9	0	0	73,800	613,000	686,800	2,347,720	1,660,920
10	0	0	73,800	613,000	686,800	2,347,720	1,660,920
11	0	0	73,800	613,000	686,800	2,347,720	1,660,920
12	0	0	73,800	613,000	686,800	2,347,720	1,660,920
13	0	0	73,800	613,000	686,800	2,347,720	1,660,920
14	0	0	73,800	613,000	686,800	2,347,720	1,660,920
15	0	0	73,800	613,000	686,800	2,347,720	1,660,920
16	0	0	73,800	613,000	686,800	2,347,720	1,660,920
17	0	0	73,800	613,000	686,800	2,347,720	1,660,920
18	0	0	73,800	613,000	686,800	2,347,720	1,660,920
19	0	0	73,800	613,000	686,800	2,347,720	1,660,920
20	0	0	73,800	613,000	686,800	2,347,720	1,660,920
21	0	0	73,800	613,000	686,800	2,347,720	1,660,920
22	0	0	73,800	613,000	686,800	2,347,720	1,660,920
23	0	0	73,800	613,000	686,800	2,347,720	1,660,920
24	0	0	73,800	613,000	686,800	2,347,720	1,660,920
25	0	0	73,800	613,000	686,800	2,347,720	1,660,920
26	0	0	73,800	613,000	686,800	2,347,720	1,660,920
27	0	0	73,800	613,000	686,800	2,347,720	1,660,920
28	0	0	73,800	613,000	686,800	2,347,720	1,660,920
29	0	0	73,800	613,000	686,800	2,347,720	1,660,920
30	0	283,800	73,800	613,000	970,600	2,347,720	1,377,120
31	0	0	73,800	613,000	686,800	2,347,720	1,660,920
32	0	0	73,800	613,000	686,800	2,347,720	1,660,920
33	0	0	73,800	613,000	686,800	2,347,720	1,660,920
34	0	0	73,800	613,000	686,800	2,347,720	1,660,920
35	0	0	73,800	613,000	686,800	2,347,720	1,660,920
36	0	0	73,800	613,000	686,800	2,347,720	1,660,920
37	0	0	73,800	613,000	686,800	2,347,720	1,660,920
38	0	0	73,800	613,000	686,800	2,347,720	1,660,920
39	0	0	73,800	613,000	686,800	2,347,720	1,660,920
40	0	0	73,800	613,000	686,800	2,347,720	1,660,920
41	0	0	73,800	613,000	686,800	2,347,720	1,660,920
42	0	0	73,800	613,000	686,800	2,347,720	1,660,920
43	0	0	73,800	613,000	686,800	2,347,720	1,660,920
44	0	0	73,800	613,000	686,800	2,347,720	1,660,920
45	0	0	73,800	613,000	686,800	2,347,720	1,660,920
46	0	0	73,800	613,000	686,800	2,347,720	1,660,920
47	0	0	73,800	613,000	686,800	2,347,720	1,660,920
48	0	0	73,800	613,000	686,800	2,347,720	1,660,920
49	0	0	73,800	613,000	686,800	2,347,720	1,660,920
50	0	0	73,800	613,000	686,800	2,347,720	1,660,920
TOTAL	12,698,000	283,800	4,599,000	28,198,000	45,778,800	104,292,394	58,513,594

INTERNAL RATE OF RETURN (IRR) = 9.0%

Table J.5 Sensitivity Analysis of Internal Rate of Return (4)
Overlapped (1) and (3)

(Unit: US\$)

YEAR	PROJECT COSTS				TOTAL	INCR. PROD. VALUE	PROJECT RETURN
	CONSTRUCT- ION COST	REPLACE- MENT COST	O & M COSTS	INCR. PROD. COST			
1	541,200	0	0	0	541,200	0	-541,200
2	2,578,400	0	0	0	2,578,400	0	-2,578,400
3	6,825,500	0	0	0	6,825,500	0	-6,825,500
4	4,022,700	0	0	0	4,022,700	0	-4,022,700
5	0	0	1,278,000	613,000	1,891,000	644,047	-1,246,953
6	0	0	73,800	613,000	686,800	858,841	172,041
7	0	0	73,800	613,000	686,800	1,837,546	1,150,746
8	0	0	73,800	613,000	686,800	2,343,220	1,656,420
9	0	0	73,800	613,000	686,800	2,343,220	1,656,420
10	0	0	73,800	613,000	686,800	2,343,220	1,656,420
11	0	0	73,800	613,000	686,800	2,343,220	1,656,420
12	0	0	73,800	613,000	686,800	2,343,220	1,656,420
13	0	0	73,800	613,000	686,800	2,343,220	1,656,420
14	0	0	73,800	613,000	686,800	2,343,220	1,656,420
15	0	0	73,800	613,000	686,800	2,343,220	1,656,420
16	0	0	73,800	613,000	686,800	2,343,220	1,656,420
17	0	0	73,800	613,000	686,800	2,343,220	1,656,420
18	0	0	73,800	613,000	686,800	2,343,220	1,656,420
19	0	0	73,800	613,000	686,800	2,343,220	1,656,420
20	0	0	73,800	613,000	686,800	2,343,220	1,656,420
21	0	0	73,800	613,000	686,800	2,343,220	1,656,420
22	0	0	73,800	613,000	686,800	2,343,220	1,656,420
23	0	0	73,800	613,000	686,800	2,343,220	1,656,420
24	0	0	73,800	613,000	686,800	2,343,220	1,656,420
25	0	0	73,800	613,000	686,800	2,343,220	1,656,420
26	0	0	73,800	613,000	686,800	2,343,220	1,656,420
27	0	0	73,800	613,000	686,800	2,343,220	1,656,420
28	0	0	73,800	613,000	686,800	2,343,220	1,656,420
29	0	0	73,800	613,000	686,800	2,343,220	1,656,420
30	0	283,800	73,800	613,000	970,600	2,343,220	1,372,620
31	0	0	73,800	613,000	686,800	2,343,220	1,656,420
32	0	0	73,800	613,000	686,800	2,343,220	1,656,420
33	0	0	73,800	613,000	686,800	2,343,220	1,656,420
34	0	0	73,800	613,000	686,800	2,343,220	1,656,420
35	0	0	73,800	613,000	686,800	2,343,220	1,656,420
36	0	0	73,800	613,000	686,800	2,343,220	1,656,420
37	0	0	73,800	613,000	686,800	2,343,220	1,656,420
38	0	0	73,800	613,000	686,800	2,343,220	1,656,420
39	0	0	73,800	613,000	686,800	2,343,220	1,656,420
40	0	0	73,800	613,000	686,800	2,343,220	1,656,420
41	0	0	73,800	613,000	686,800	2,343,220	1,656,420
42	0	0	73,800	613,000	686,800	2,343,220	1,656,420
43	0	0	73,800	613,000	686,800	2,343,220	1,656,420
44	0	0	73,800	613,000	686,800	2,343,220	1,656,420
45	0	0	73,800	613,000	686,800	2,343,220	1,656,420
46	0	0	73,800	613,000	686,800	2,343,220	1,656,420
47	0	0	73,800	613,000	686,800	2,343,220	1,656,420
48	0	0	73,800	613,000	686,800	2,343,220	1,656,420
49	0	0	73,800	613,000	686,800	2,343,220	1,656,420
50	0	0	73,800	613,000	686,800	2,343,220	1,656,420
TOTAL	13,967,800	283,800	4,599,000	28,198,000	47,048,600	104,098,894	57,050,294

INTERNAL RATE OF RETURN (IRR) = 8.3%

Table J.5 Sensitivity Analysis of Internal Rate of Return (5)
Increased 10% of Production Benefit

(Unit: US\$)

YEAR	PROJECT COSTS				TOTAL	INCR. PROD. VALUE	PROJECT RETURN
	CONSTRUCT- ION COST	REPLACE- MENT COST	O & M COSTS	INCR. PROD. COST			
1	492,000	0	0	0	492,000	0	-492,000
2	2,344,000	0	0	0	2,344,000	0	-2,344,000
3	6,205,000	0	0	0	6,205,000	0	-6,205,000
4	3,657,000	0	0	0	3,657,000	0	-3,657,000
5	0	0	1,278,000	613,000	1,891,000	786,596	-1,104,404
6	0	0	73,800	613,000	686,800	1,048,281	361,481
7	0	0	73,800	613,000	686,800	2,243,546	1,556,746
8	0	0	73,800	613,000	686,800	2,866,720	2,179,920
9	0	0	73,800	613,000	686,800	2,866,720	2,179,920
10	0	0	73,800	613,000	686,800	2,866,720	2,179,920
11	0	0	73,800	613,000	686,800	2,866,720	2,179,920
12	0	0	73,800	613,000	686,800	2,866,720	2,179,920
13	0	0	73,800	613,000	686,800	2,866,720	2,179,920
14	0	0	73,800	613,000	686,800	2,866,720	2,179,920
15	0	0	73,800	613,000	686,800	2,866,720	2,179,920
16	0	0	73,800	613,000	686,800	2,866,720	2,179,920
17	0	0	73,800	613,000	686,800	2,866,720	2,179,920
18	0	0	73,800	613,000	686,800	2,866,720	2,179,920
19	0	0	73,800	613,000	686,800	2,866,720	2,179,920
20	0	0	73,800	613,000	686,800	2,866,720	2,179,920
21	0	0	73,800	613,000	686,800	2,866,720	2,179,920
22	0	0	73,800	613,000	686,800	2,866,720	2,179,920
23	0	0	73,800	613,000	686,800	2,866,720	2,179,920
24	0	0	73,800	613,000	686,800	2,866,720	2,179,920
25	0	0	73,800	613,000	686,800	2,866,720	2,179,920
26	0	0	73,800	613,000	686,800	2,866,720	2,179,920
27	0	0	73,800	613,000	686,800	2,866,720	2,179,920
28	0	0	73,800	613,000	686,800	2,866,720	2,179,920
29	0	0	73,800	613,000	686,800	2,866,720	2,179,920
30	0	283,800	73,800	613,000	970,600	2,866,720	1,896,120
31	0	0	73,800	613,000	686,800	2,866,720	2,179,920
32	0	0	73,800	613,000	686,800	2,866,720	2,179,920
33	0	0	73,800	613,000	686,800	2,866,720	2,179,920
34	0	0	73,800	613,000	686,800	2,866,720	2,179,920
35	0	0	73,800	613,000	686,800	2,866,720	2,179,920
36	0	0	73,800	613,000	686,800	2,866,720	2,179,920
37	0	0	73,800	613,000	686,800	2,866,720	2,179,920
38	0	0	73,800	613,000	686,800	2,866,720	2,179,920
39	0	0	73,800	613,000	686,800	2,866,720	2,179,920
40	0	0	73,800	613,000	686,800	2,866,720	2,179,920
41	0	0	73,800	613,000	686,800	2,866,720	2,179,920
42	0	0	73,800	613,000	686,800	2,866,720	2,179,920
43	0	0	73,800	613,000	686,800	2,866,720	2,179,920
44	0	0	73,800	613,000	686,800	2,866,720	2,179,920
45	0	0	73,800	613,000	686,800	2,866,720	2,179,920
46	0	0	73,800	613,000	686,800	2,866,720	2,179,920
47	0	0	73,800	613,000	686,800	2,866,720	2,179,920
48	0	0	73,800	613,000	686,800	2,866,720	2,179,920
49	0	0	73,800	613,000	686,800	2,866,720	2,179,920
50	0	0	73,800	613,000	686,800	2,866,720	2,179,920
TOTAL	12,698,000	283,800	4,599,000	28,198,000	45,778,800	27,347,383	81,568,583

INTERNAL RATE OF RETURN (IRR) = 11.4%

Table J.5 Sensitivity Analysis of Internal Rate of Return (6)
Decreased 10% of Estimated Cost

(Unit: US\$)

YEAR	PROJECT COSTS				TOTAL	INCR. PROD. VALUE	PROJECT RETURN
	CONSTRUCT- ION COST	REPLACE- MENT COST	O & M COSTS	INCR. PROD. COST			
1	442,800	0	0	0	442,800	0	-442,800
2	2,109,600	0	0	0	2,109,600	0	-2,109,600
3	5,584,500	0	0	0	5,584,500	0	-5,584,500
4	3,291,300	0	0	0	3,291,300	0	-3,291,300
5	0	0	1,278,000	613,000	1,891,000	715,087	-1,175,913
6	0	0	73,800	613,000	686,800	953,561	266,761
7	0	0	73,800	613,000	686,800	2,040,546	1,353,746
8	0	0	73,800	613,000	686,800	2,607,220	1,920,420
9	0	0	73,800	613,000	686,800	2,607,220	1,920,420
10	0	0	73,800	613,000	686,800	2,607,220	1,920,420
11	0	0	73,800	613,000	686,800	2,607,220	1,920,420
12	0	0	73,800	613,000	686,800	2,607,220	1,920,420
13	0	0	73,800	613,000	686,800	2,607,220	1,920,420
14	0	0	73,800	613,000	686,800	2,607,220	1,920,420
15	0	0	73,800	613,000	686,800	2,607,220	1,920,420
16	0	0	73,800	613,000	686,800	2,607,220	1,920,420
17	0	0	73,800	613,000	686,800	2,607,220	1,920,420
18	0	0	73,800	613,000	686,800	2,607,220	1,920,420
19	0	0	73,800	613,000	686,800	2,607,220	1,920,420
20	0	0	73,800	613,000	686,800	2,607,220	1,920,420
21	0	0	73,800	613,000	686,800	2,607,220	1,920,420
22	0	0	73,800	613,000	686,800	2,607,220	1,920,420
23	0	0	73,800	613,000	686,800	2,607,220	1,920,420
24	0	0	73,800	613,000	686,800	2,607,220	1,920,420
25	0	0	73,800	613,000	686,800	2,607,220	1,920,420
26	0	0	73,800	613,000	686,800	2,607,220	1,920,420
27	0	0	73,800	613,000	686,800	2,607,220	1,920,420
28	0	0	73,800	613,000	686,800	2,607,220	1,920,420
29	0	0	73,800	613,000	686,800	2,607,220	1,920,420
30	0	283,800	73,800	613,000	970,600	2,607,220	1,636,620
31	0	0	73,800	613,000	686,800	2,607,220	1,920,420
32	0	0	73,800	613,000	686,800	2,607,220	1,920,420
33	0	0	73,800	613,000	686,800	2,607,220	1,920,420
34	0	0	73,800	613,000	686,800	2,607,220	1,920,420
35	0	0	73,800	613,000	686,800	2,607,220	1,920,420
36	0	0	73,800	613,000	686,800	2,607,220	1,920,420
37	0	0	73,800	613,000	686,800	2,607,220	1,920,420
38	0	0	73,800	613,000	686,800	2,607,220	1,920,420
39	0	0	73,800	613,000	686,800	2,607,220	1,920,420
40	0	0	73,800	613,000	686,800	2,607,220	1,920,420
41	0	0	73,800	613,000	686,800	2,607,220	1,920,420
42	0	0	73,800	613,000	686,800	2,607,220	1,920,420
43	0	0	73,800	613,000	686,800	2,607,220	1,920,420
44	0	0	73,800	613,000	686,800	2,607,220	1,920,420
45	0	0	73,800	613,000	686,800	2,607,220	1,920,420
46	0	0	73,800	613,000	686,800	2,607,220	1,920,420
47	0	0	73,800	613,000	686,800	2,607,220	1,920,420
48	0	0	73,800	613,000	686,800	2,607,220	1,920,420
49	0	0	73,800	613,000	686,800	2,607,220	1,920,420
50	0	0	73,800	613,000	686,800	2,607,220	1,920,420
TOTAL	11,428,200	283,800	4,599,000	28,198,000	44,509,000	15,819,654	71,310,654

INTERNAL RATE OF RETURN (IRR) = 11.0%

ANNEX K TOPOGRAPHIC SURVEY

ANNEX K TOPOGRAPHIC SURVEY

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ANNEX K TOPOGRAPHIC SURVEY

K.1 General

In parallel with the feasibility study of the project, preparation of the topographic maps covering the whole project area on a scale of 1 to 5,000 with contour interval of two meters were made under the technical cooperation of JICA in 1989. These topographic maps were compiled on the basis of aerial photography which had been taken in 1987.

During the course of feasibility study, additional survey works were conducted to get the detailed information necessary for preliminary design of irrigation facilities.

Survey works were carried out by conventional ground survey and vertical controls were established by differential leveling with double rodded lines in close circuit. Elevations were connected to the control points established by JICA in 1989 being derived from the mean sea level datum.

K.2 Available Topographic Maps

Topographic maps available for the study of the project formulation are listed below. These maps cover the whole and/or a part of the project area.

- a) Source : IGM (Instituto Geografico Militar)
Aerial photography August, 1967
Map Compilation 1970
Sheet : 6629I, 6629II
Scale : 1 : 50,000
- b) Source : IGM
Aerial photography 1972
Map Compilation 1973
Sheet : SF 20-5, SF 20-6
Scale : 1 : 250,000
- c) Source : EL PROYECTO DE DESARROLLO AGRICOLA Y RURAL EN SANTA ANA, TARIJA prepared by JICA
Aerial photography 1987
Map Compilation 1989

Sheet : Num 1 to Num 9 Total 9 sheets
Scale : 1 : 5,000
- d) Source : Topographic map of Santa Ana reservoir Area Surveyed by CODETAR in 1988
Sheet : 2 sheets
Scale : 1 : 2,000
- e) Source : Topographic map of Santa Ana Dam site surveyed by CODETAR in 1989
Sheet : 1 sheet
Scale : 1 : 500

K.3 Items of Survey Works

Following survey works were executed by JICA Study team including counterpart personnel concerned to obtain more detailed information for the project.

a) Profiling

Santa Ana Dam Axis	:	500 m
Sedimentation Dam Axis No. 1	:	150 m
" No. 2	:	130 m
" No. 3	:	183 m
" No. 4	:	141 m
" No. 5	:	139 m
Canal Route (3 routes)	:	30.2 Km

b) Topographic survey

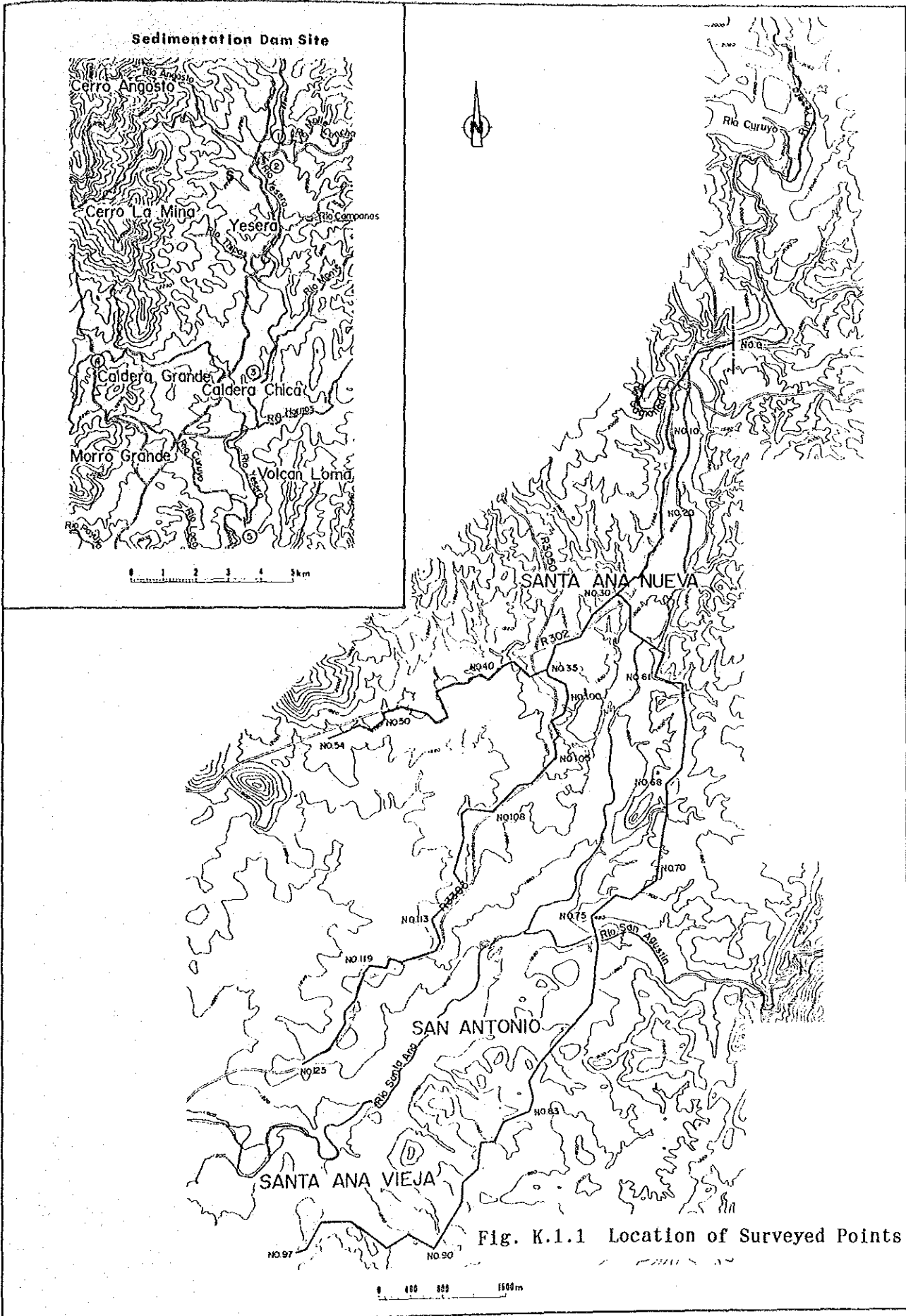
Sedimentations Dam site No. 1	:	2.4 ha
" No. 2	:	3.2 ha
" No. 3	:	5.4 ha
" No. 4	:	5.5 ha

K.4 Survey Results

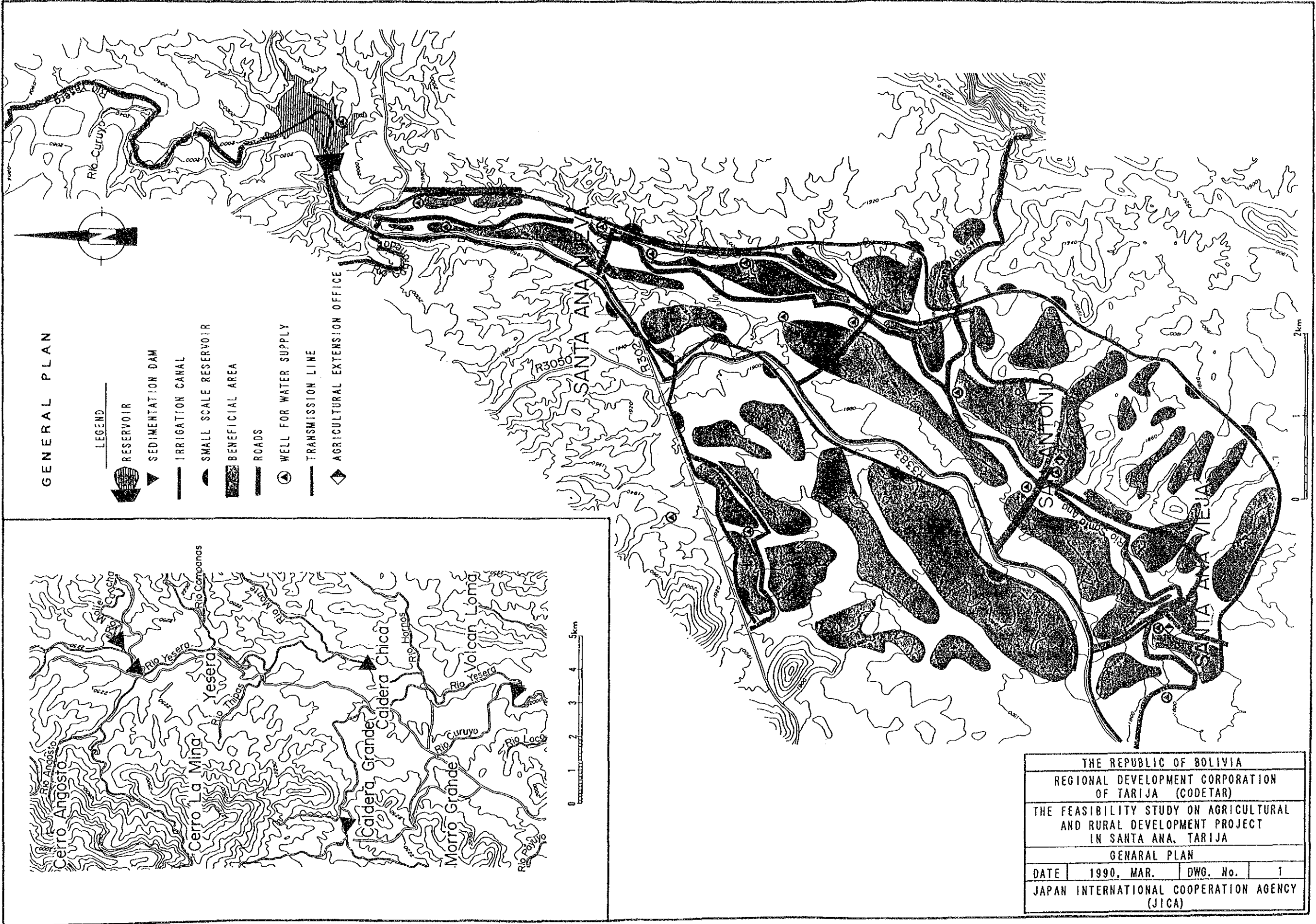
Profiles of Santa Ana dam and sedimentation dams to be used for design works were taken with 20 meter intervals of surveyed point and were plotted in a drawing on horizontal and vertical scale of 1 to 500. Moreover, profiles of proposed canal routes were taken with 100 meters intervals of surveyed point and were plotted in a drawing on horizontal scale of 1 to 10,000 vertical scale of 1 to 500.

The beginning and end points of the canal routes were connected to the control and points established by the Mapping team of JICA. Results are as follows (as shown on Fig. K.1.1).

Canal	Length	Error of closure	Section
Main Canal No. 0 to No. 54	9.1 Km	1.85 m	Control point No. 5
Secondary Canal 1 No. 30 to No. 97	12.3 Km	0.86 m	Surveyed point No. 30 to Control point No. 11
Secondary Canal 1 No. 35 to No. 127	7.3 Km	0.91 m	Surveyed point No. 35 to Control point No. 13

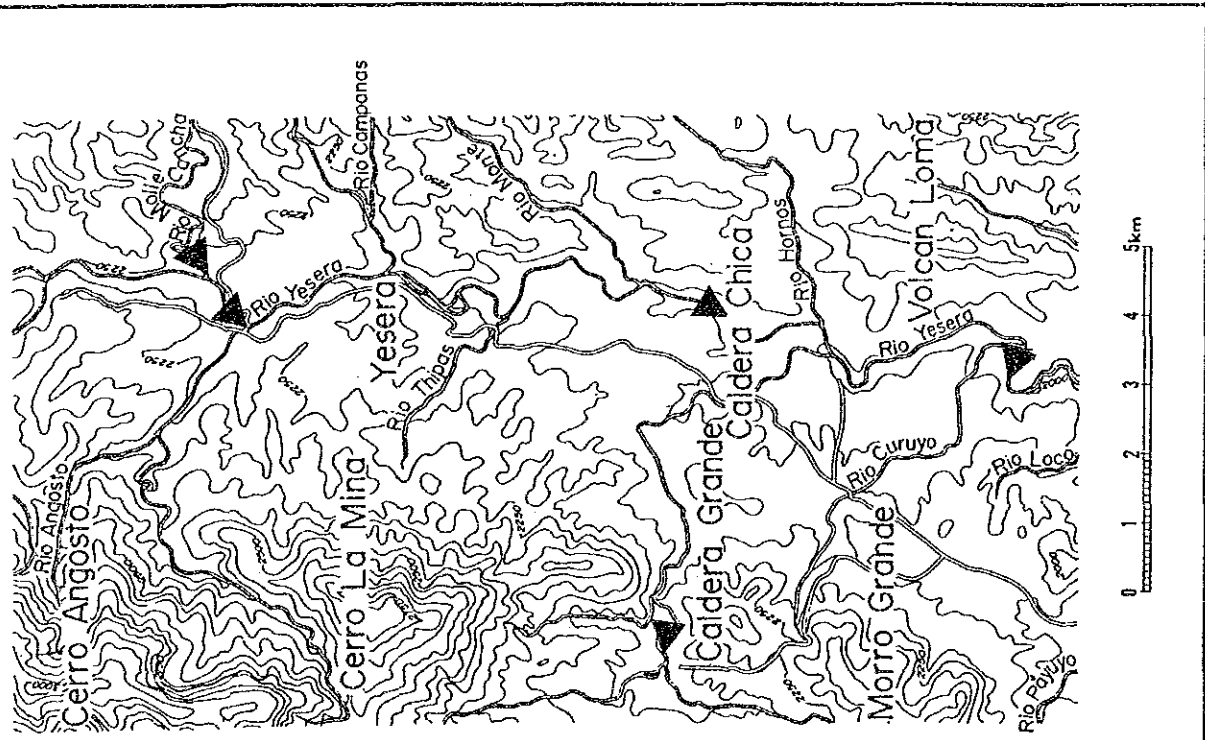


ANNEX L DRAWINGS

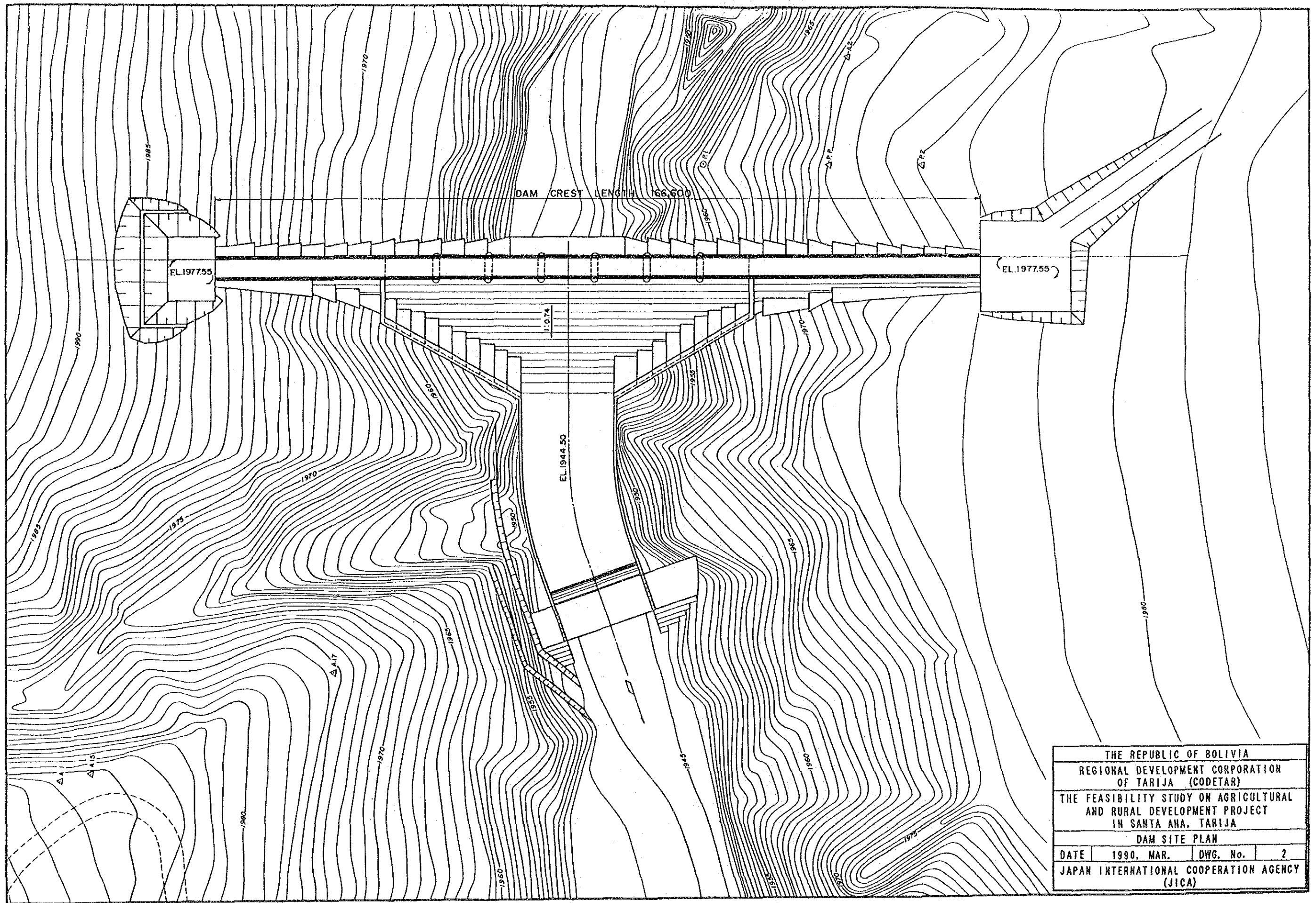


GENERAL PLAN

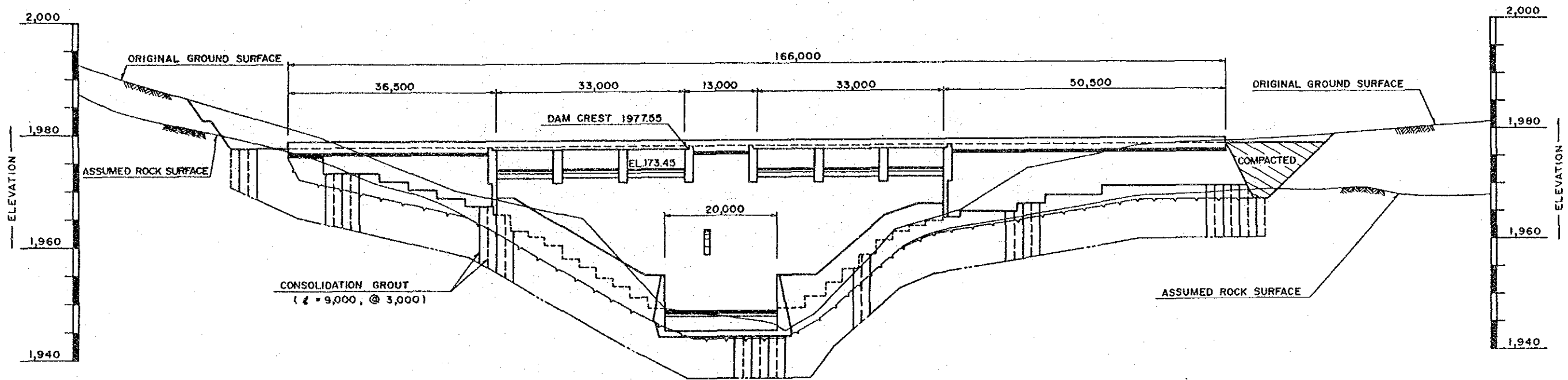
- LEGEND
- RESERVOIR
 - SEDIMENTATION DAM
 - IRRIGATION CANAL
 - SMALL SCALE RESERVOIR
 - BENEFICIAL AREA
 - ROADS
 - WELL FOR WATER SUPPLY
 - TRANSMISSION LINE
 - AGRICULTURAL EXTENSION OFFICE



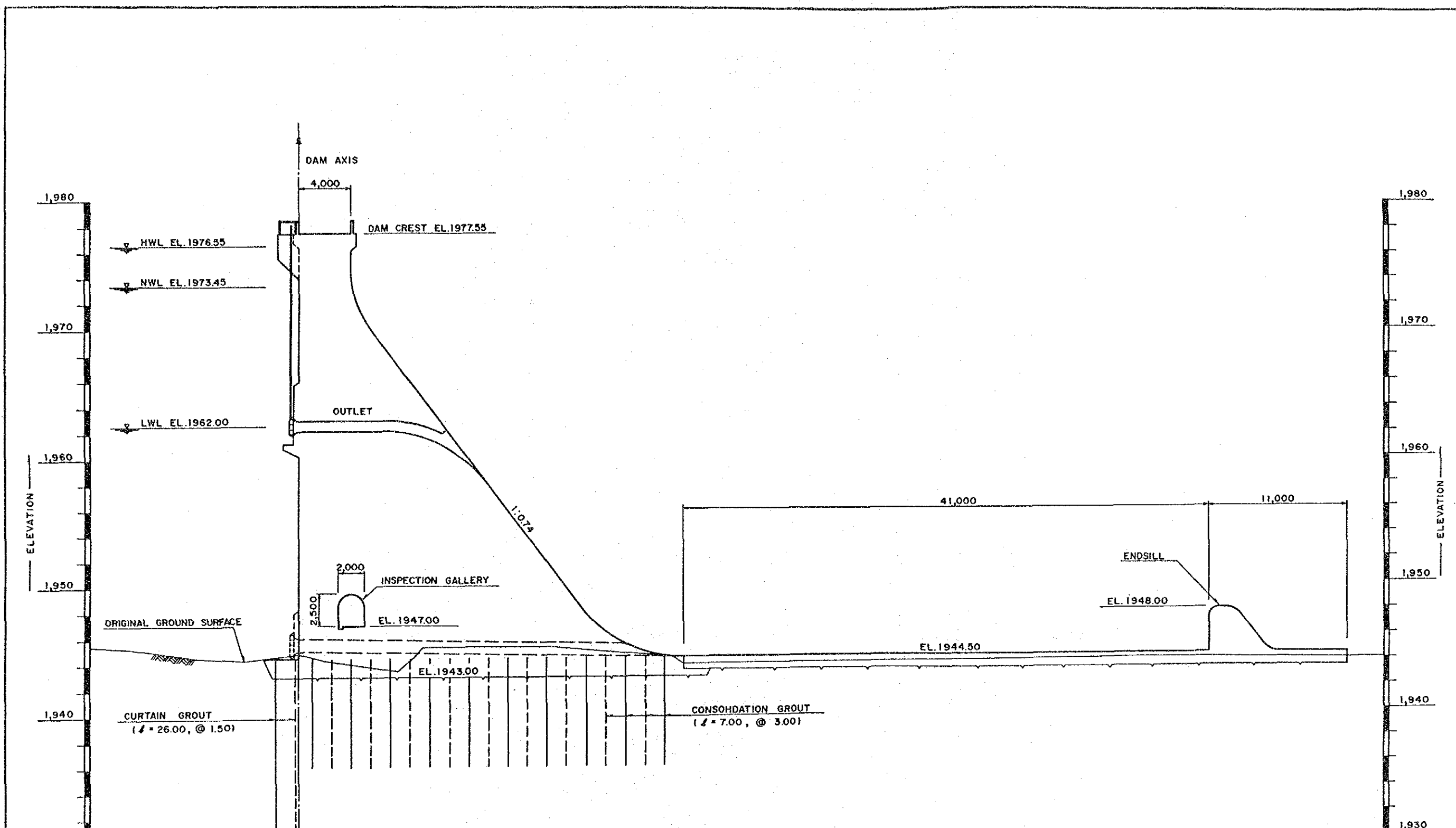
THE REPUBLIC OF BOLIVIA			
REGIONAL DEVELOPMENT CORPORATION OF TARIJA (CODETAR)			
THE FEASIBILITY STUDY ON AGRICULTURAL AND RURAL DEVELOPMENT PROJECT IN SANTA ANA, TARIJA			
GENERAL PLAN			
DATE	1990, MAR.	DWG. No.	1
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)			



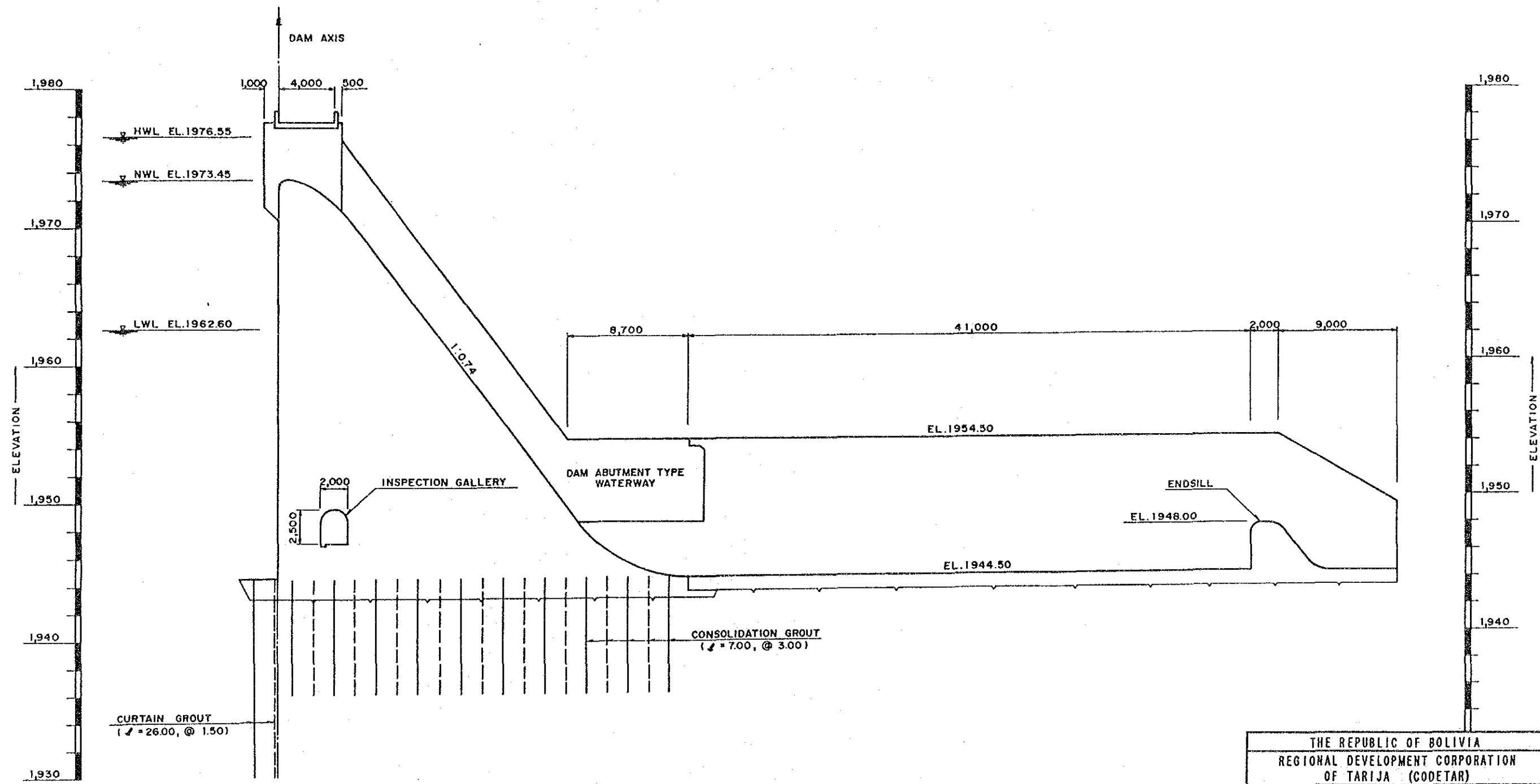
THE REPUBLIC OF BOLIVIA			
REGIONAL DEVELOPMENT CORPORATION OF TARIJA (CODETAR)			
THE FEASIBILITY STUDY ON AGRICULTURAL AND RURAL DEVELOPMENT PROJECT IN SANTA ANA, TARIJA			
DAM SITE PLAN			
DATE	1990, MAR.	DWG. No.	2
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)			



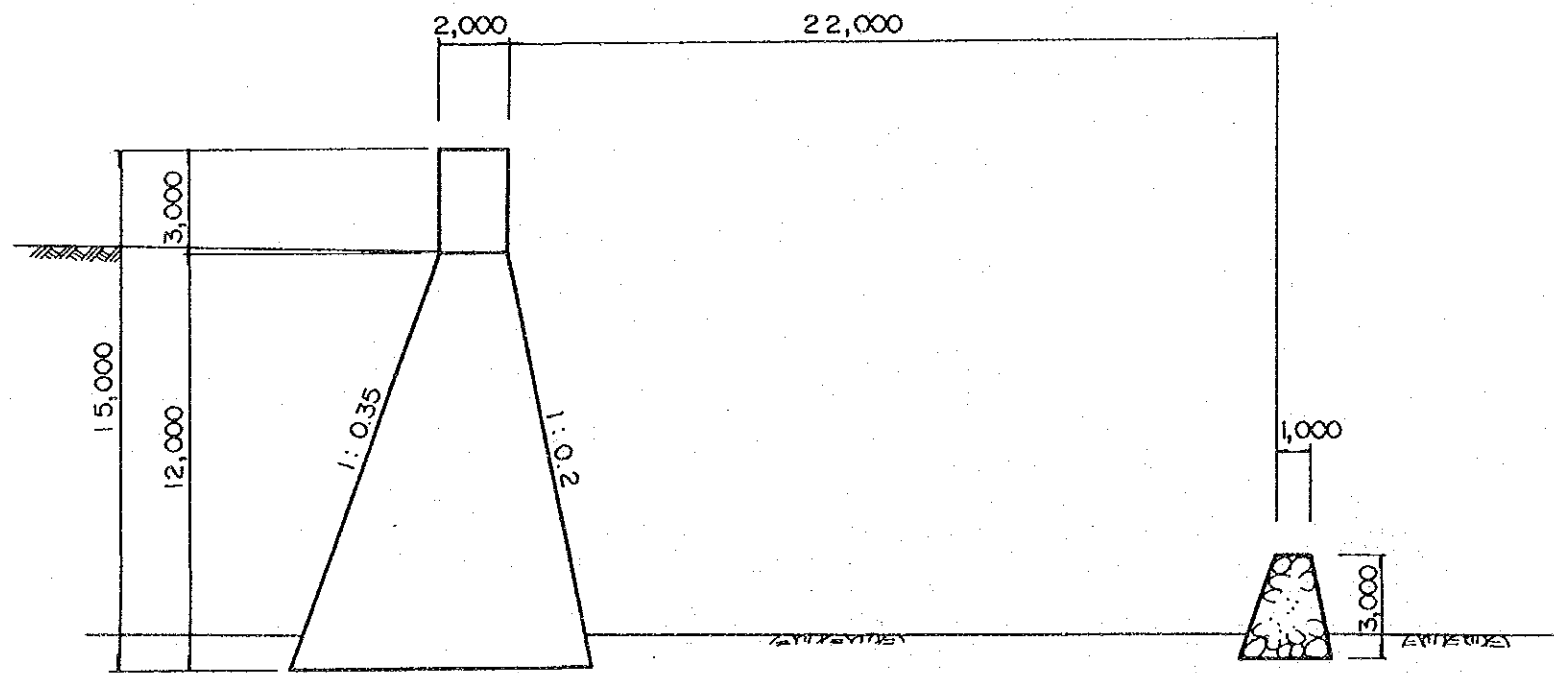
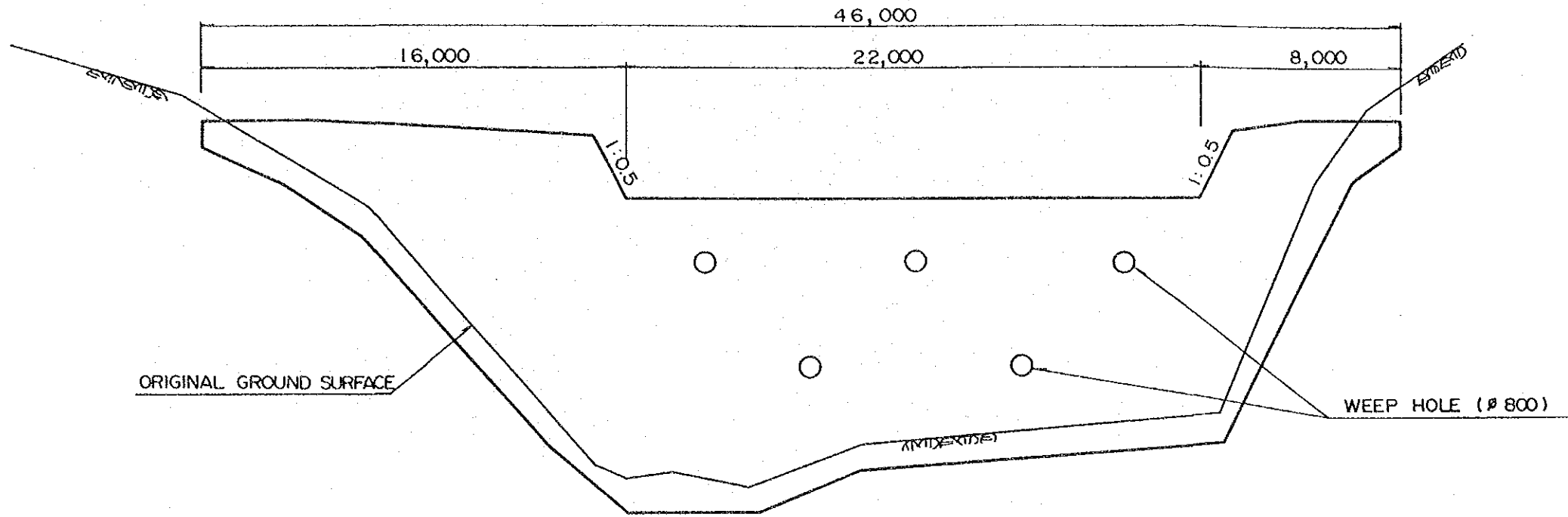
THE REPUBLIC OF BOLIVIA			
REGIONAL DEVELOPMENT CORPORATION			
OF TARIJA (CODETAR)			
THE FEASIBILITY STUDY ON AGRICULTURAL			
AND RURAL DEVELOPMENT PROJECT			
IN SANTA ANA, TARIJA			
DAM TYPICAL PROFILE			
DATE	1990, MAR.	DWG. No.	3
JAPAN INTERNATIONAL COOPERATION AGENCY			
(JICA)			



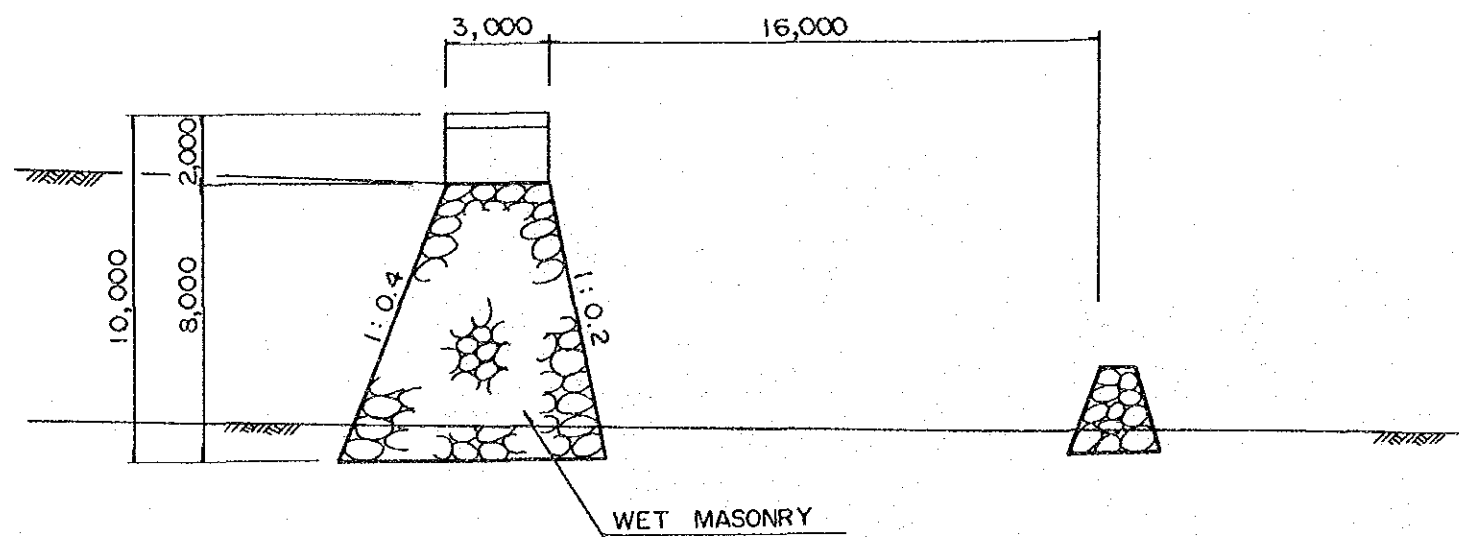
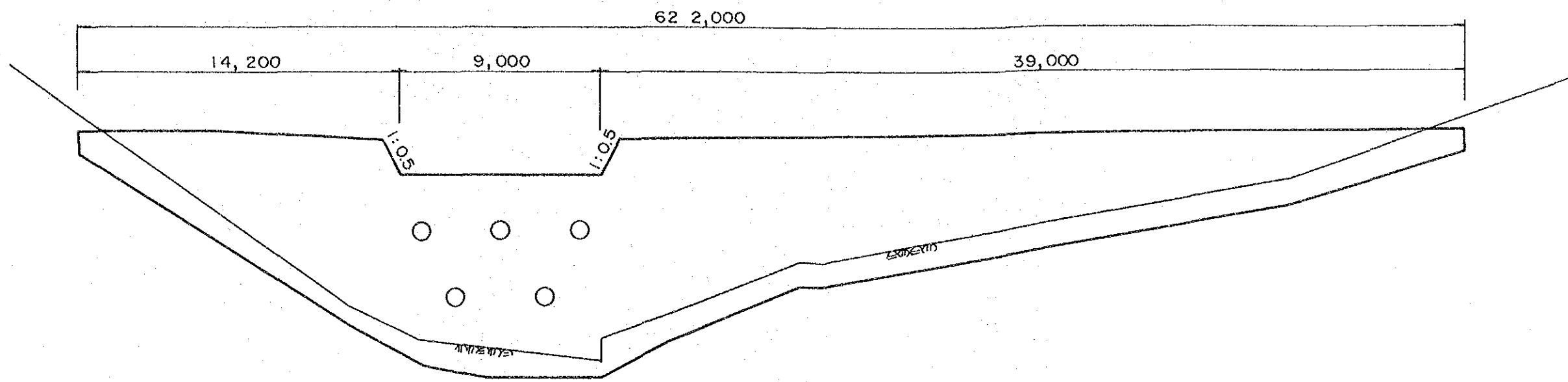
THE REPUBLIC OF BOLIVIA			
REGIONAL DEVELOPMENT CORPORATION OF TARIJA (CODETAR)			
THE FEASIBILITY STUDY ON AGRICULTURAL AND RURAL DEVELOPMENT PROJECT IN SANTA ANA, TARIJA			
DAM TYPICAL SECTION (1/2)			
DATE	1990. MAR.	DWG. No.	4
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)			



THE REPUBLIC OF BOLIVIA			
REGIONAL DEVELOPMENT CORPORATION OF TARIJA (CODETAR)			
THE FEASIBILITY STUDY ON AGRICULTURAL AND RURAL DEVELOPMENT PROJECT IN SANTA ANA, TARIJA			
DAM TYPICAL SECTION (2/2)			
DATE	1990, MAR.	DWG. No.	5
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)			

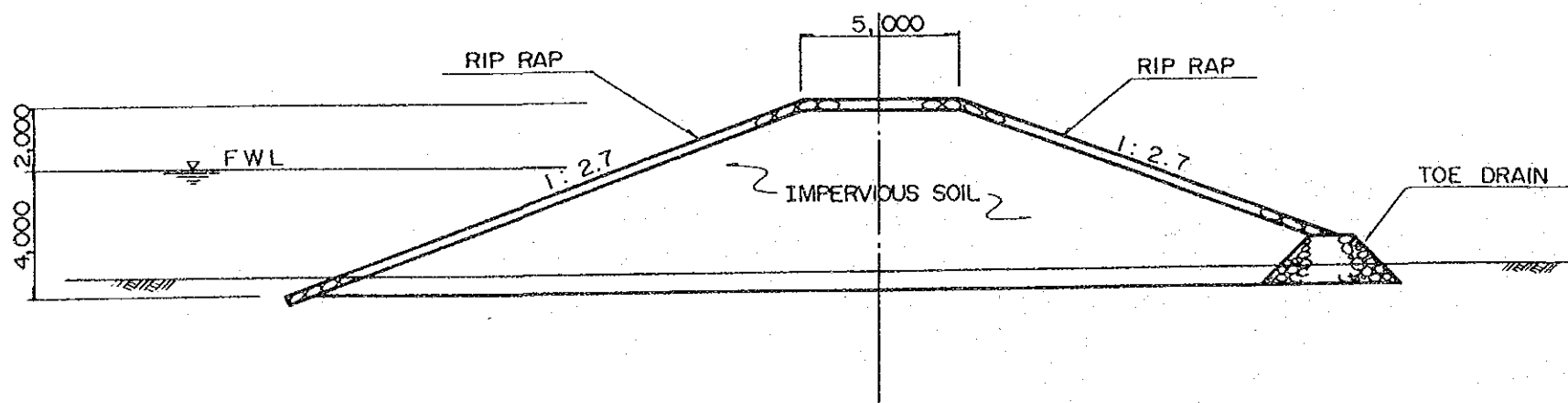
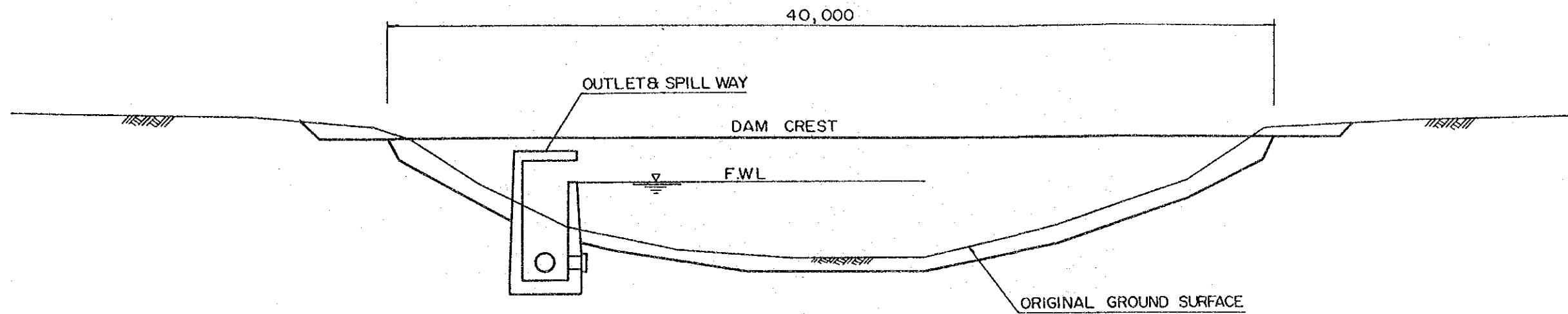


THE REPUBLIC OF BOLIVIA			
REGIONAL DEVELOPMENT CORPORATION OF TARIJA (CODETAR)			
THE FEASIBILITY STUDY ON AGRICULTURAL AND RURAL DEVELOPMENT PROJECT IN SANTA ANA, TARIJA			
SABO DAM (1/2)			
DATE	1990. MAR.	DWG. No.	6
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)			

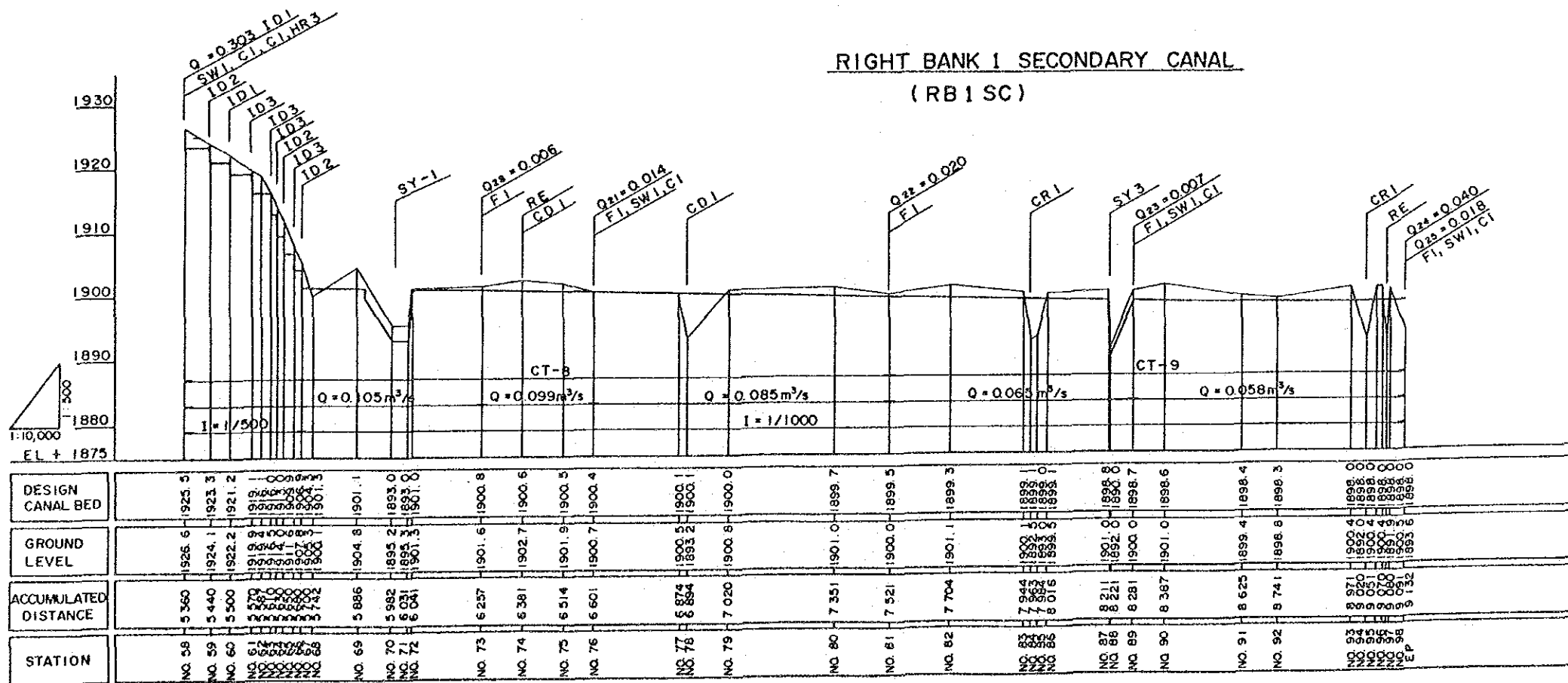
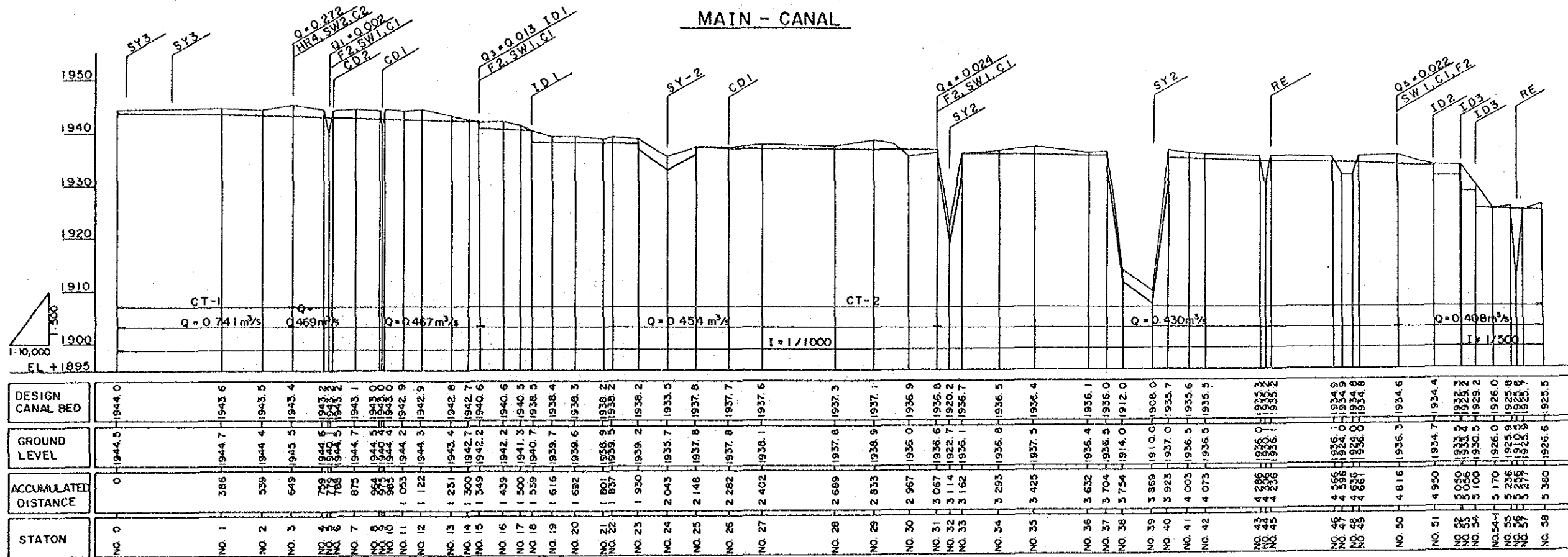


WET MASONRY

THE REPUBLIC OF BOLIVIA			
REGIONAL DEVELOPMENT CORPORATION OF TARIJA (CODETAR)			
THE FEASIBILITY STUDY ON AGRICULTURAL AND RURAL DEVELOPMENT PROJECT IN SANTA ANA, TARIJA			
SABO DAM (2/2)			
DATE	1990, MAR.	DWG. No.	7
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)			



THE REPUBLIC OF BOLIVIA			
REGIONAL DEVELOPMENT CORPORATION OF TARIJA (CODETAR)			
THE FEASIBILITY STUDY ON AGRICULTURAL AND RURAL DEVELOPMENT PROJECT IN SANTA ANA, TARIJA			
RESERVOIR			
DATE	1990, MAR.	DWG. No.	8
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)			



LEGEND	
SY -	Syphon
CD -	Cross Drain
CR -	Road Crossing
HR -	Head Regulator
F -	Farm Turnout
SW -	Split Way
C -	Check Gate
ID -	Inclined Drop
RE -	Small scale Reservoir
CT -	Canal Type

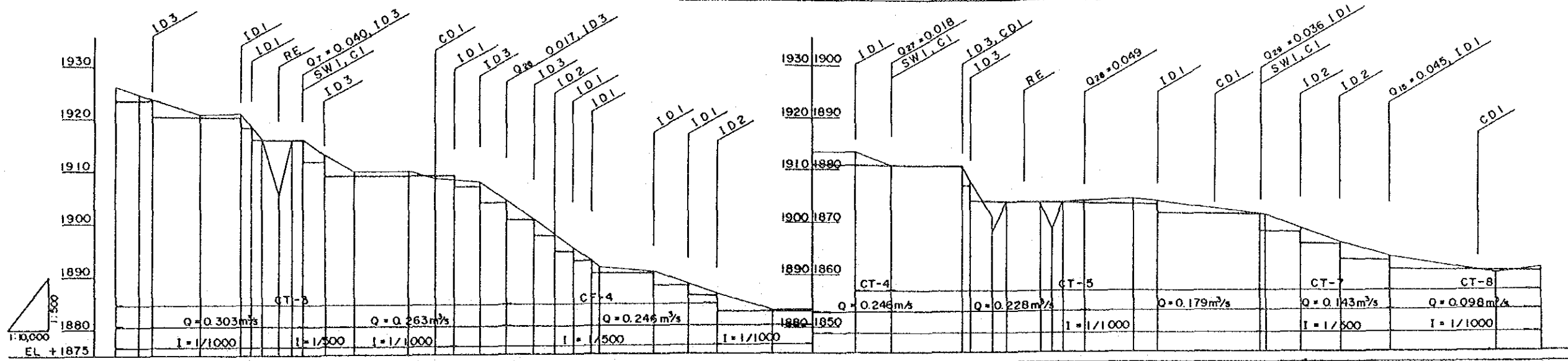
THE REPUBLIC OF BOLIVIA
REGIONAL DEVELOPMENT CORPORATION
OF TARIJA (CODETAR)

THE FEASIBILITY STUDY ON AGRICULTURAL
AND RURAL DEVELOPMENT PROJECT
IN SANTA ANA, TARIJA

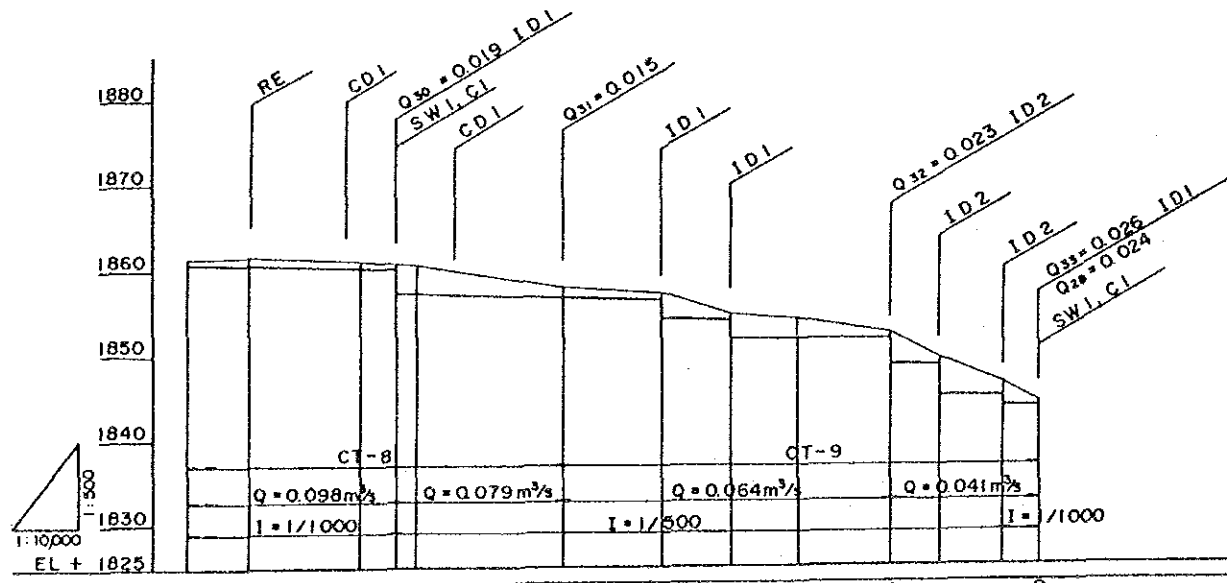
CANAL PROFILE (1/4)

DATE	1990, MAR.	DWG. No.	9
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)			

RIGHT BANK 2 SECONDARY CANAL (RB2 SC)



DESIGN CANAL BED	NO. 0	NO. 1	NO. 2	NO. 3	NO. 4	NO. 5	NO. 6	NO. 7	NO. 8	NO. 9	NO. 10	NO. 11	NO. 12	NO. 13	NO. 14	NO. 15	NO. 16	NO. 17	NO. 18	NO. 19	NO. 20	NO. 21	NO. 22	NO. 23	NO. 24	NO. 25	NO. 26	NO. 27	NO. 28	NO. 29	NO. 30	NO. 31	NO. 32	NO. 33	NO. 34	NO. 35	NO. 36	NO. 37	NO. 38	NO. 39	NO. 40	NO. 41	NO. 42	NO. 43	NO. 44														
GROUND LEVEL	1926.6	1924.5	1923.8	1920.8	1920.8	1918.5	1916.0	1915.9	1915.8	1913.1	1909.7	1909.3	1909.8	1908.5	1908.3	1908.0	1904.5	1900.8	1897.9	1895.3	1894.9	1891.3	1889.8	1890.6	1888.5	1888.1	1886.5	1885.9	1883.2	1883.1	1882.9	1890.5	1879.0	1871.0	1873.9	1873.9	1873.8	1873.7	1874.0	1873.7	1874.2	1873.6	1874.3	1873.4	1873.3	1873.3	1871.2	1870.8	1869.0	1868.6	1866.4	1865.8	1865.2	1863.5	1862.9	1860.2	1860.5	1861.2	1860.3
ACCUMULATED DISTANCE	0	86	130	311	451	500	541	601	651	692	780	875	1084	1186	1250	1355	1450	1550	1630	1700	1750	1807	2000	2130	2250	2455	2760	2894	3152	3192	3281	3332	3468	3500	3543	3623	3816	3900	4308	4328	4450	4600	4647	4793	5198	5372													
STATION	NO. 0	NO. 1	NO. 2	NO. 3	NO. 4	NO. 5	NO. 6	NO. 7	NO. 8	NO. 9	NO. 10	NO. 11	NO. 12	NO. 13	NO. 14	NO. 15	NO. 16	NO. 17	NO. 18	NO. 19	NO. 20	NO. 21	NO. 22	NO. 23	NO. 24	NO. 25	NO. 26	NO. 27	NO. 28	NO. 29	NO. 30	NO. 31	NO. 32	NO. 33	NO. 34	NO. 35	NO. 36	NO. 37	NO. 38	NO. 39	NO. 40	NO. 41	NO. 42	NO. 43	NO. 44														



DESIGN CANAL BED	NO. 44	NO. 45	NO. 46	NO. 47	NO. 48	NO. 49	NO. 50	NO. 51	NO. 52	NO. 53	NO. 54	NO. 55	EP
GROUND LEVEL	1861.2	1861.5	1859.9	1860.5	1857.7	1857.8	1857.1	1854.8	1854.0	1852.4	1849.7	1846.7	1844.6
ACCUMULATED DISTANCE	5372	5512	5768	5850	5891	6236	6467	6627	6787	7000	7120	7250	7344
STATION	NO. 44	NO. 45	NO. 46	NO. 47	NO. 48	NO. 49	NO. 50	NO. 51	NO. 52	NO. 53	NO. 54	NO. 55	EP

LEGEND

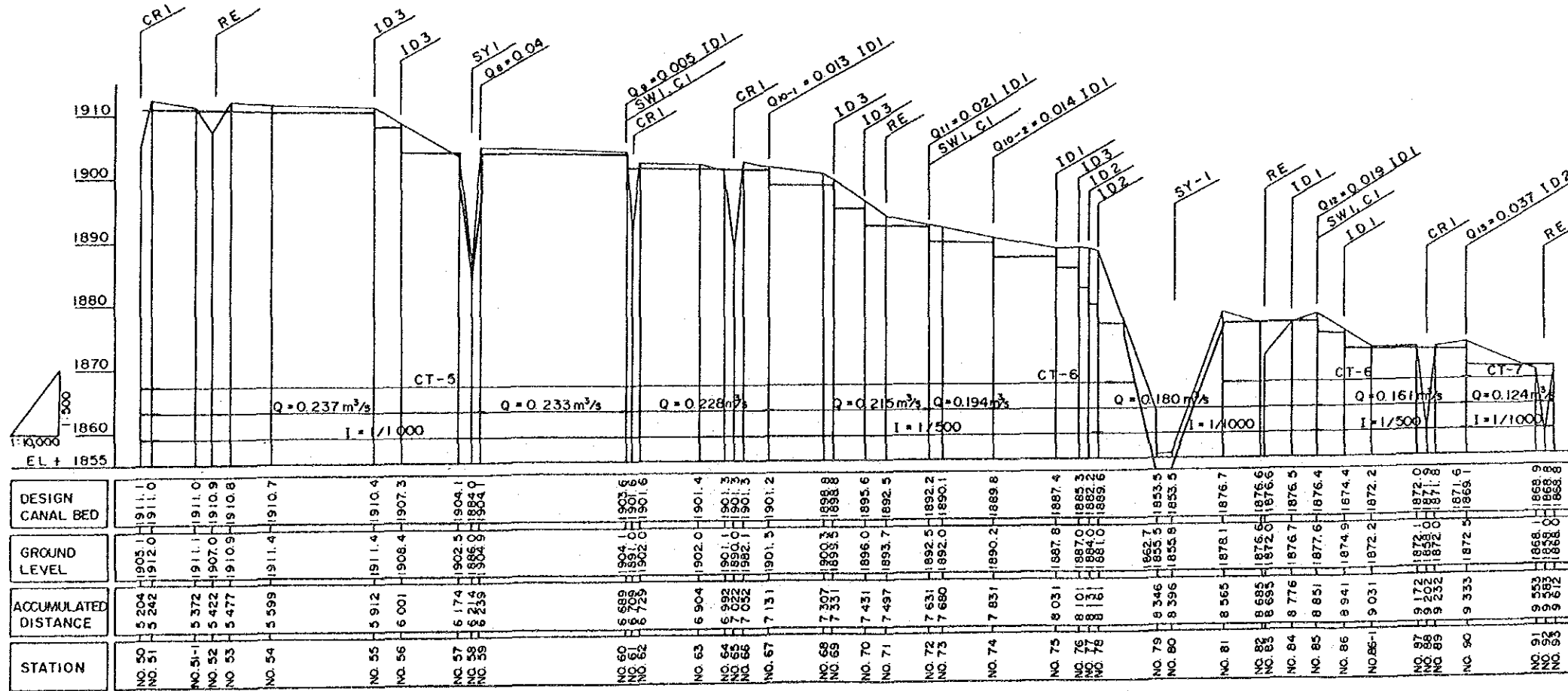
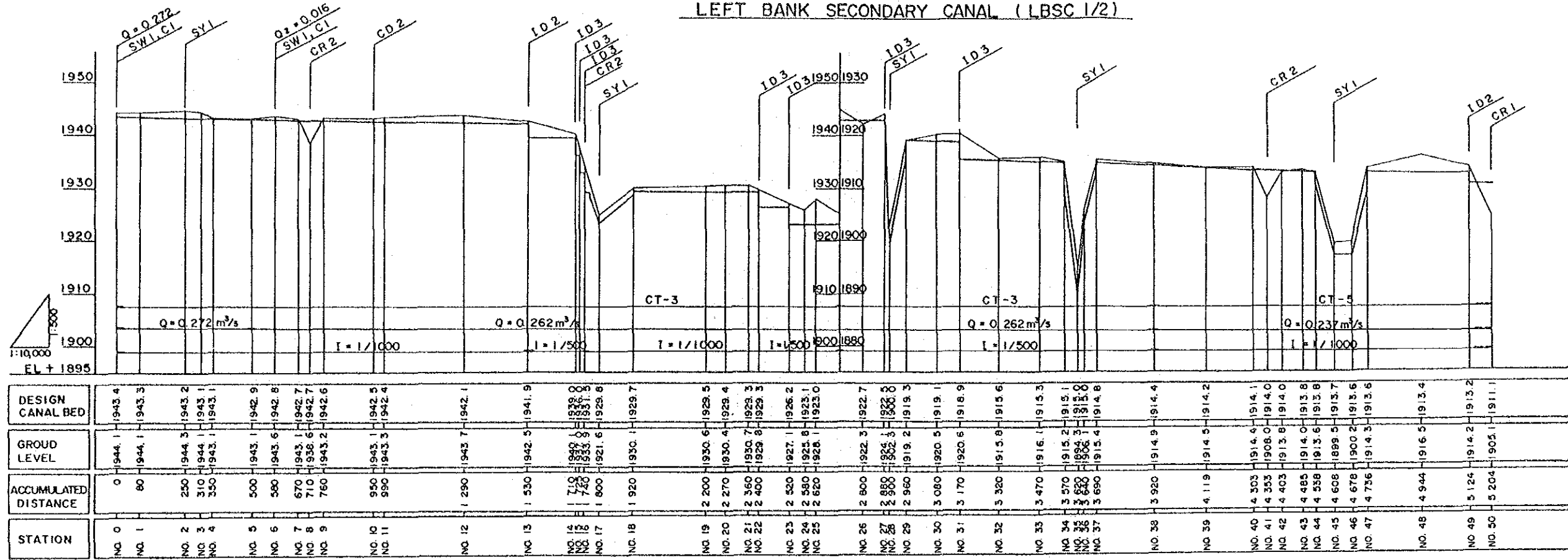
- SY- : Syphon
- CD- : Cross Drain
- CR- : Road Crossing
- HR- : Head Regulator
- F- : Farm Turnout
- SW : Spill Way
- C- : Check Gate
- ID- : Inclined Drop
- RE : Small scale Reservoir
- CT- : Canal Type

THE REPUBLIC OF BOLIVIA
 REGIONAL DEVELOPMENT CORPORATION
 OF TARIJA (CODETAR)
 THE FEASIBILITY STUDY ON AGRICULTURAL
 AND RURAL DEVELOPMENT PROJECT
 IN SANTA ANA, TARIJA
 CANAL PROFILE (2/4)

DATE	1990, MAR.	DWG. No.	10
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JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

LEFT BANK SECONDARY CANAL (LBSC 1/2)

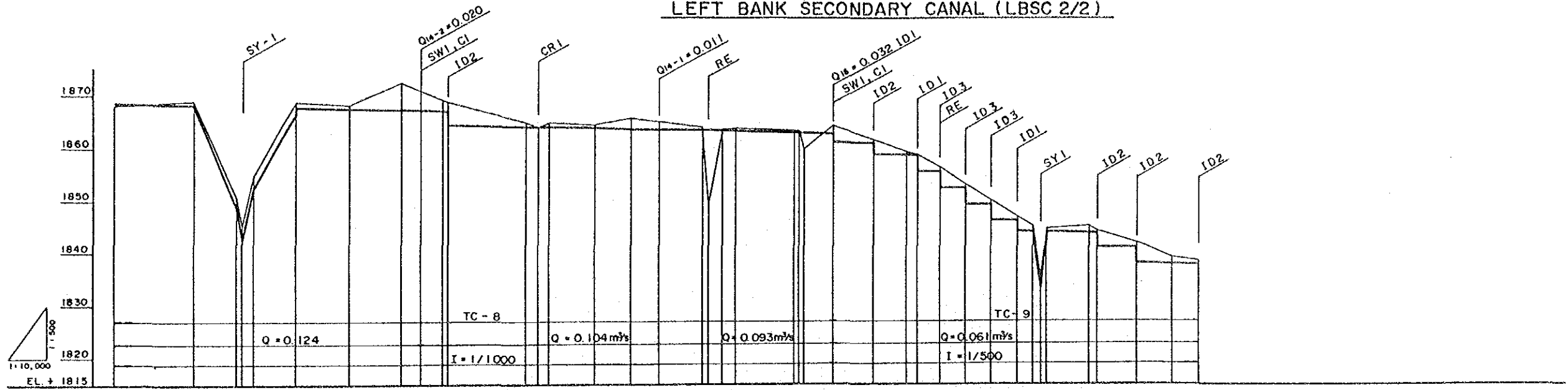


LEGEND

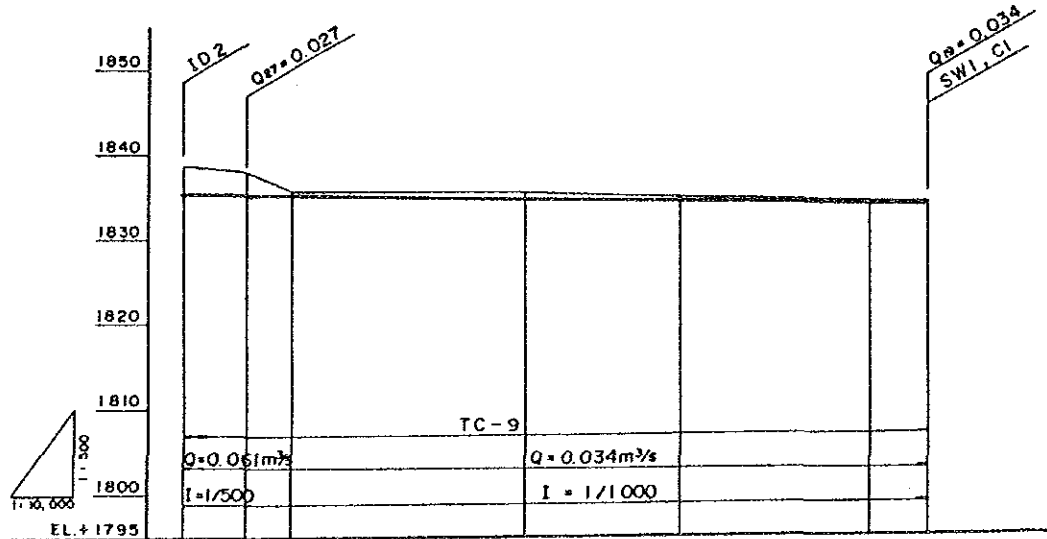
- SY - Syphon
- CD - Cross Drain
- CR - Road Crossing
- HR - Head Regulator
- F - Form Turnout
- SW - Spill Way
- C - Check Gate
- ID - Inclined Drop
- RE - Small scale Reservoir
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THE REPUBLIC OF BOLIVIA
 REGIONAL DEVELOPMENT CORPORATION
 OF TARIJA (CODETAR)
 THE FEASIBILITY STUDY ON AGRICULTURAL
 AND RURAL DEVELOPMENT PROJECT
 IN SANTA ANA, TARIJA
 CANAL PROFILE (3/4)
 DATE 1990, MAR. DWG. No. 11
 JAPAN INTERNATIONAL COOPERATION AGENCY
 (JICA)

LEFT BANK SECONDARY CANAL (LBSC 2/2)



DESIGN CANAL BED	1866.8	1868.5	1849.0	1843.0	1853.0	1868.1	1868.0	1867.9	1867.6	1867.6	1864.8	1864.8	1864.8	1864.8	1864.5	1864.5	1864.2	1864.2	1864.2	1864.2	1864.1	1864.1	1863.8	1863.8	1863.6	1861.5	1859.3	1859.3	1856.0	1852.8	1849.6	1846.9	1844.8	1844.0	1844.7	1844.3	1844.3	1841.5	1838.7	1836.5
GROUND LEVEL	1866.0	1869.6	1851.0	1845.1	1855.0	1868.1	1868.4	1872.4	1868.9	1867.6	1865.0	1845.0	1865.0	1864.6	1864.5	1864.5	1864.2	1864.2	1864.2	1864.2	1864.1	1864.1	1863.5	1863.5	1863.6	1861.9	1859.8	1859.0	1856.4	1853.3	1850.2	1847.1	1845.2	1844.0	1844.7	1844.3	1844.3	1842.0	1839.3	1836.5
ACCUMULATED DISTANCE	0	99.13	1007.3	1009.3	1013.3	1029.7	1049.0	1068.3	1084.4	1086.1	1115.7	1120.7	1124.7	1142.5	1156.7	1183.7	1186.6	1190.7	1195.7	1218.7	1220.7	1222.7	1232.7	1248.1	1260.1	1264.7	1273.1	1283.1	1293.1	1303.1	1309.1	1312.2	1314.2	1330.7	1333.1	1348.1	1362.9	1373.1		
STATION	No. 93	No. 94	No. 95	No. 96	No. 97	No. 98	No. 99	No. 100	No. 101	No. 102	No. 103	No. 104	No. 105	No. 106	No. 107	No. 108	No. 109	No. 110	No. 111	No. 112	No. 113	No. 114	No. 115	No. 116	No. 117	No. 118	No. 119	No. 120	No. 121	No. 122	No. 123	No. 124	No. 125	No. 126	No. 127	No. 128	No. 129	No. 130		



DESIGN CANAL BED	1838.5	1835.9	1835.8	1835.2	1834.9	1834.4	1834.3
GROUND LEVEL	1838.8	1838.2	1835.9	1835.8	1835.4	1835.2	1835.0
ACCUMULATED DISTANCE	1373.1	1387.6	1398.9	1453.2	1489.3	1534.1	1547.8
STATION	No. 130	No. 131	No. 132	No. 133	No. 134	No. 135	No. E.P.

LEGEND	
SY -	Syphon
CD -	Cross Drain
CR -	Road Crossing
HR -	Head Regulator
F -	Farm Turnout
SW -	SPill Way
C -	Check Gate
ID -	Inclined Drop
RE -	Smallscale Reservoir
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THE REPUBLIC OF BOLIVIA
 REGIONAL DEVELOPMENT CORPORATION
 OF TARIJA (CODETAR)
 THE FEASIBILITY STUDY ON AGRICULTURAL
 AND RURAL DEVELOPMENT PROJECT
 IN SANTA ANA, TARIJA
 CANAL PROFILE (4/4)
 DATE 1990, MAR. DWG. No. 12
 JAPAN INTERNATIONAL COOPERATION AGENCY
 (JICA)

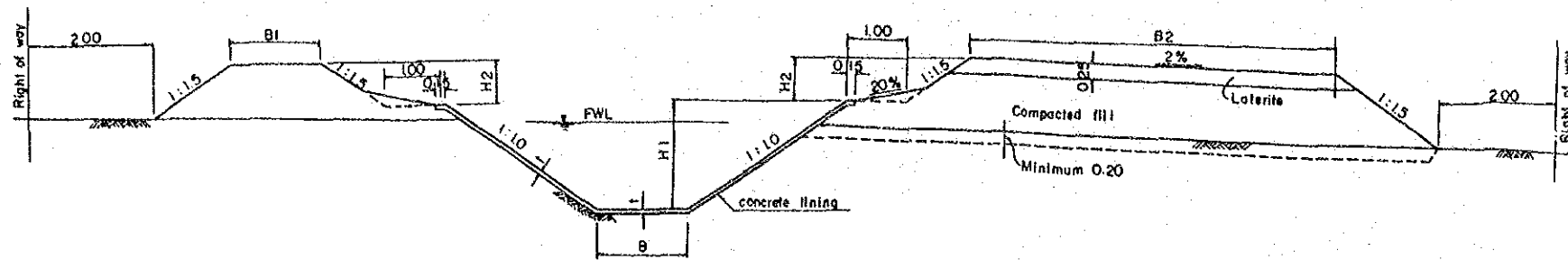


TABLE OF DIMENSIONS FOR INCLINED DROP

TYPE	H1 _m	L1 _m	L2 _m	REMARKS
ID-1	2.00	4.60	3.50	--
ID-2	2.50	5.60	4.00	--
ID-3	3.00	6.60	5.00	--

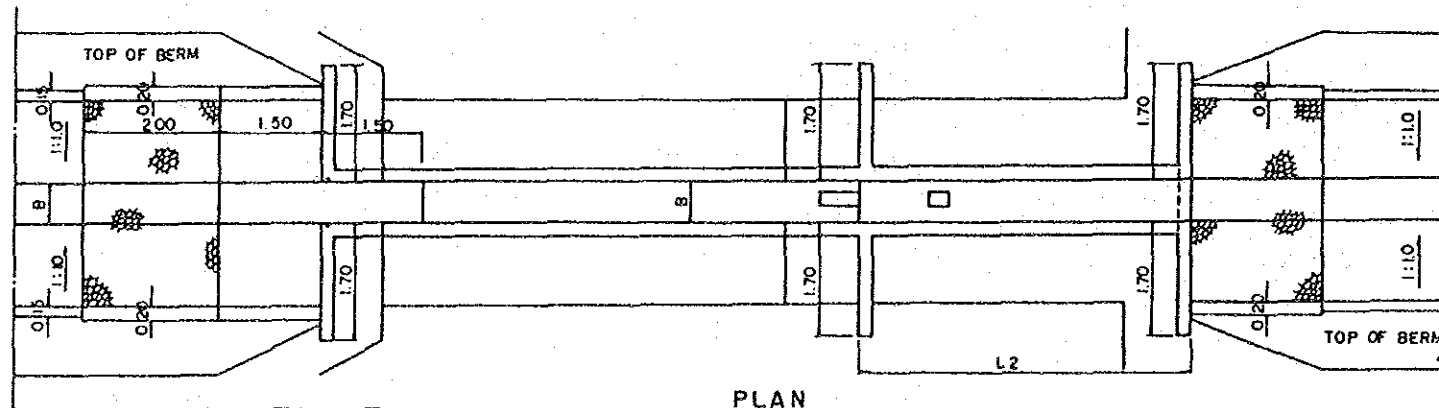
LINED CANAL CROSS SECTION DETAILS

TYPE	Q _{m³/sec}	B _m	B1 _m	B2 _m	H1 _m	H2 _m	l _{cm}
CT-1	0.74 ~ 0.46	0.50	1.00	2.00	0.90	0.45	15
CT-2	0.46 ~ 0.30	0.50	1.00	2.00	0.70	0.75 0.45	15
CT-3	0.30 ~ 0.25	0.50	1.00	1.50	0.70	0.40	15
CT-4	0.25 ~ 0.24	0.40	1.00	1.50	0.70	0.40	15
CT-5	0.24 ~ 0.18	0.40	1.00	1.50	0.65	0.40	15
CT-6	0.18 ~ 0.14	0.40	1.00	1.50	0.60	0.40	15
CT-7	0.14 ~ 0.12	0.30	1.00	1.50	0.60	0.40	15
CT-8	0.12 ~ 0.07	0.30	1.00	1.50	0.55	0.40	15
CT-9	0.07 ~ 0.01	0.30	1.00	1.50	0.45	0.40	15

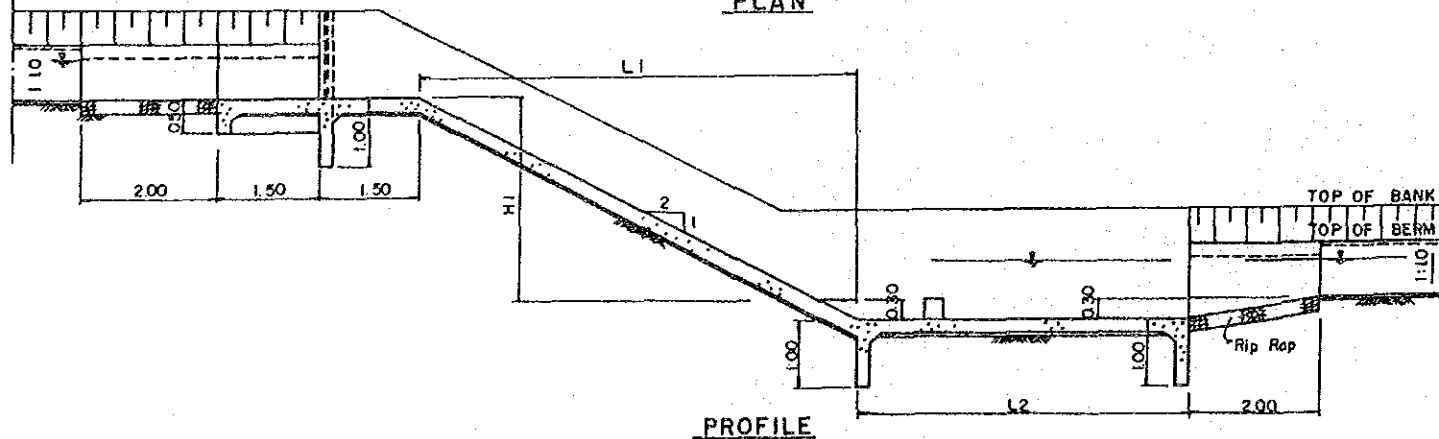
LINED CANAL

TABLE OF DIMENSIONS FOR SPILL WAY

TYPE	Q _{Max} (CMS)	L1 _m	D _m	H1	REMARKS
SW-1	Less than 0.50	3.00	0.50	1.00	--
SW-2	0.50 ~ 0.74	6.00	0.50	1.40	--



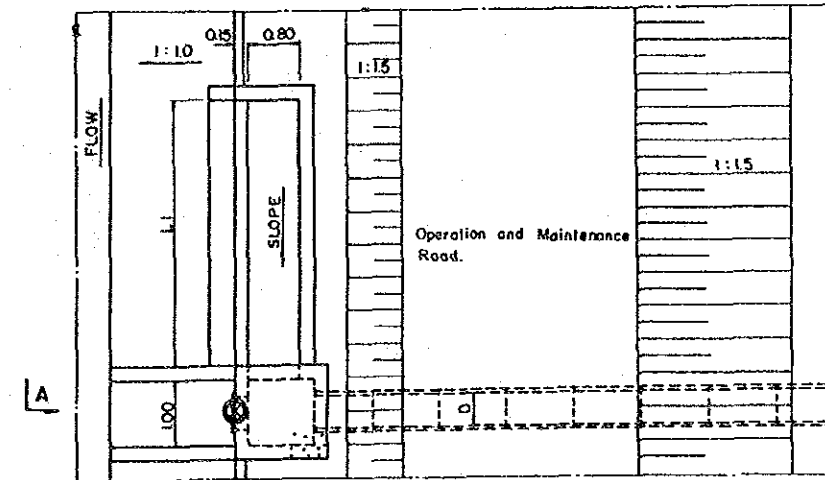
PLAN



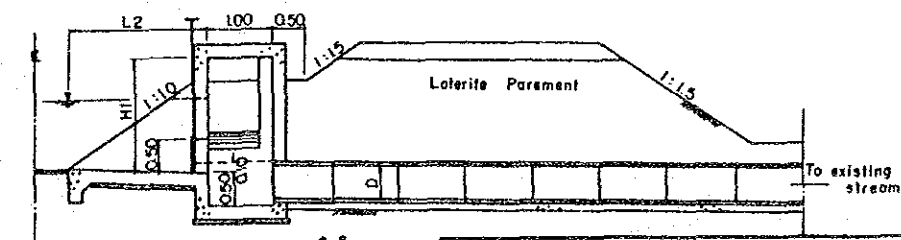
PROFILE

INCLINED DROP

Not to scale



PLAN



SECTION A'

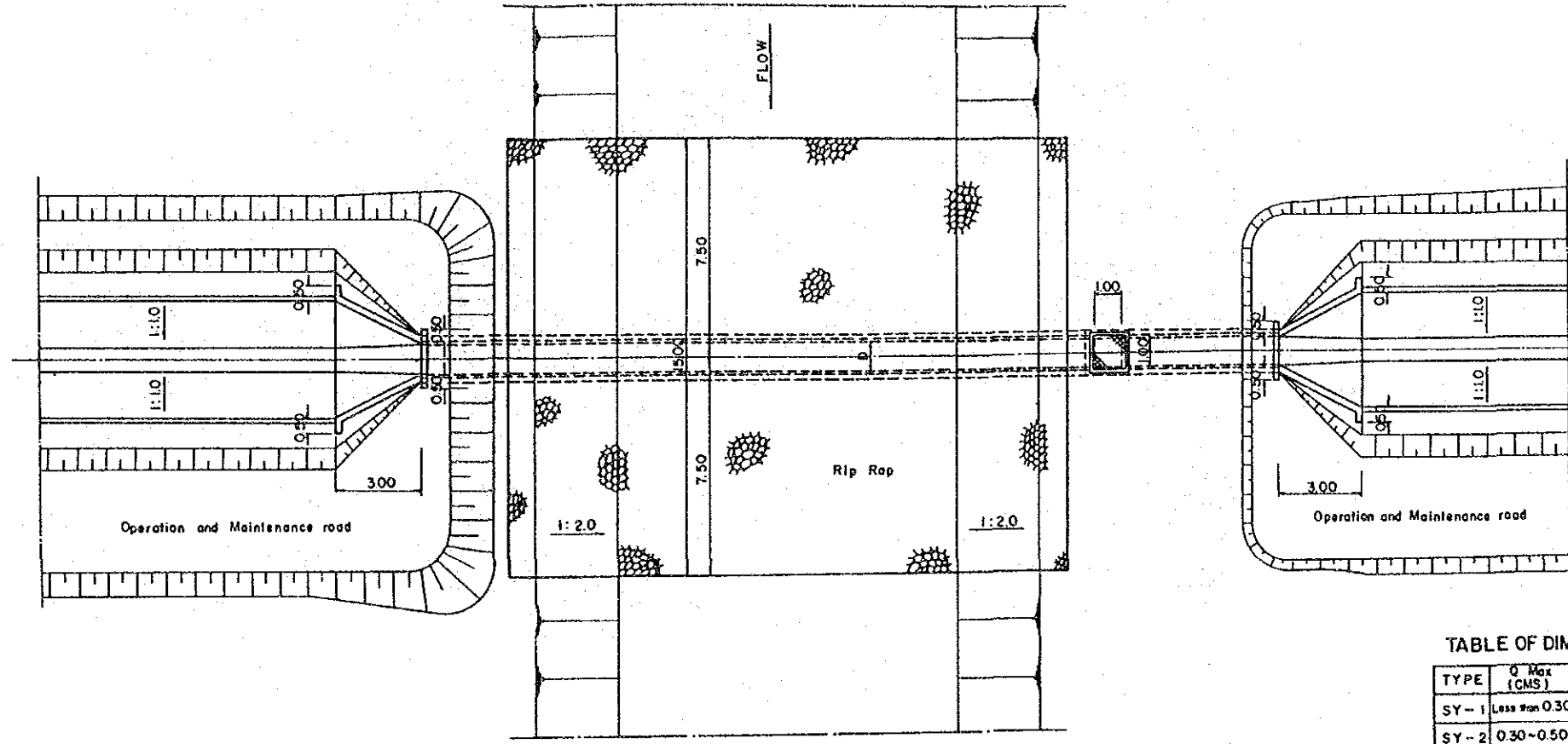
SPILL WAY

Not to scale

THE REPUBLIC OF BOLIVIA			
REGIONAL DEVELOPMENT CORPORATION OF TARIJA (CODETAR)			
THE FEASIBILITY STUDY ON AGRICULTURAL AND RURAL DEVELOPMENT PROJECT IN SANTA ANA, TARIJA			
CANAL RELATED STRUCTURE (1/4)			
DATE	1990. MAR.	DWG. No.	13
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)			

SYPHON

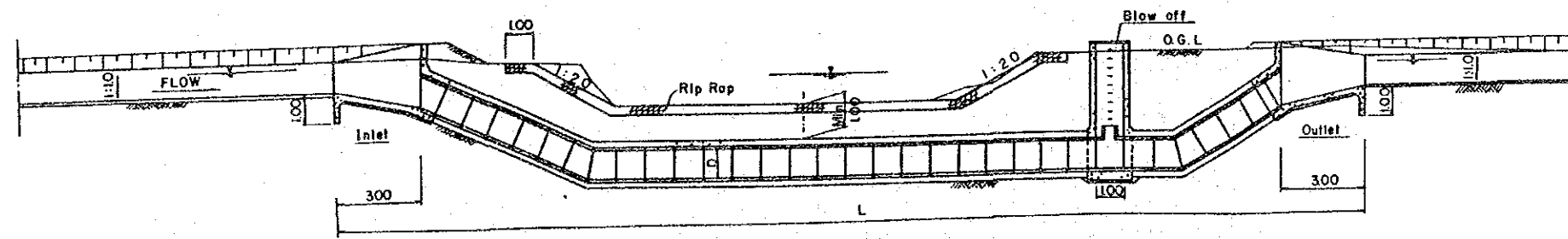
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PLAN

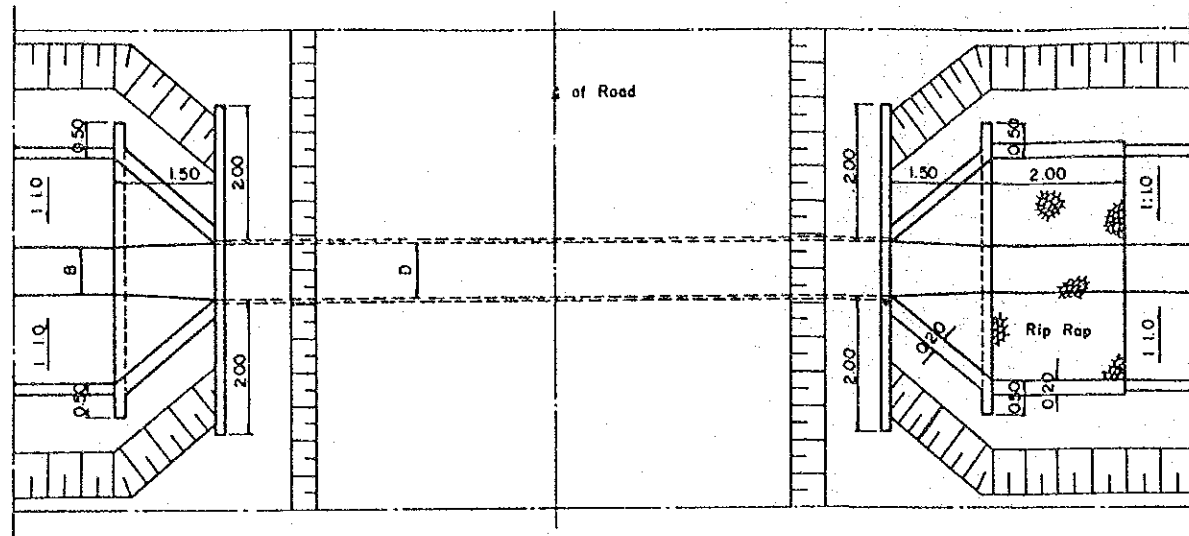
TABLE OF DIMENSIONS FOR SYPHON

TYPE	Q ² Max (CMS)	TYPE OF BARRELL	D m
SY-1	Less than 0.30	Pre-Cast concrete pipe	0.60
SY-2	0.30-0.50	"	0.80
SY-3	0.50-0.74	"	1.00

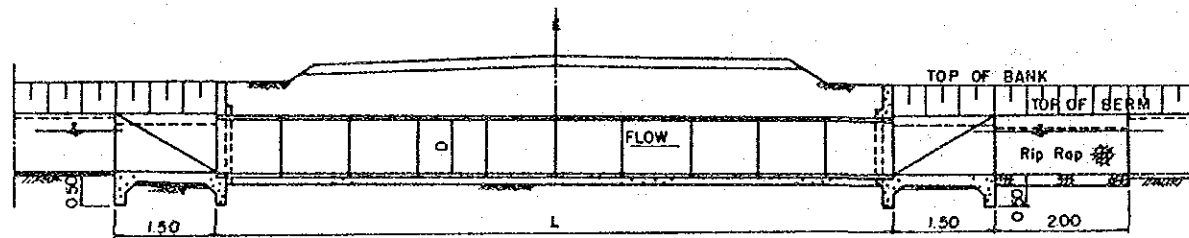


PROFILE (in case of pre cast concrete pipe)

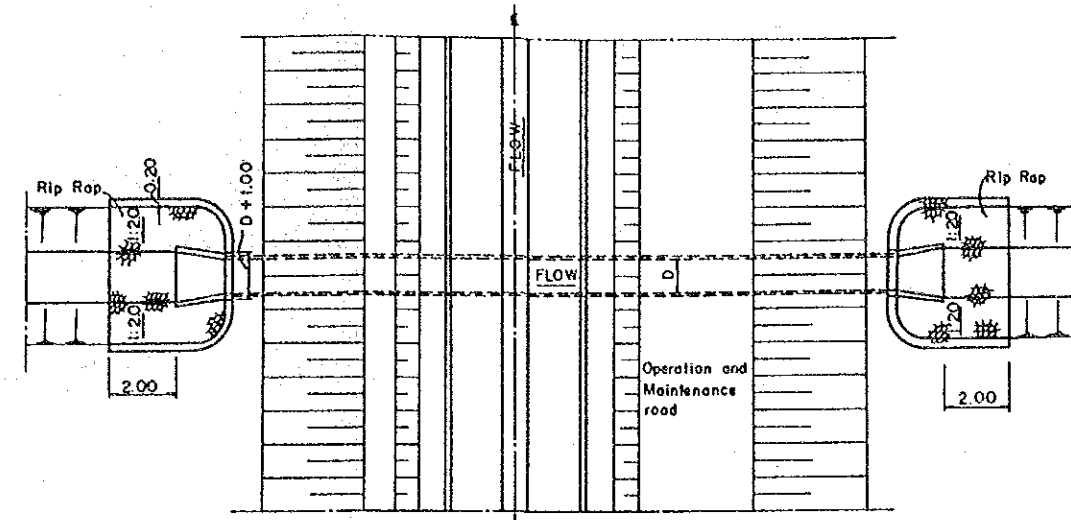
THE REPUBLIC OF BOLIVIA
 REGIONAL DEVELOPMENT CORPORATION
 OF TARIJA (CODETAR)
 THE FEASIBILITY STUDY ON AGRICULTURAL
 AND RURAL DEVELOPMENT PROJECT
 IN SANTA ANA, TARIJA
 CANAL RELATED STRUCTURE (2/4)
 DATE 1990, MAR. DWG. No. 14
 JAPAN INTERNATIONAL COOPERATION AGENCY
 (JICA)



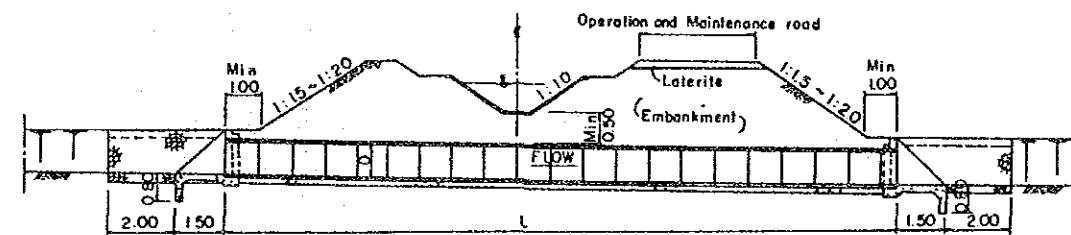
PLAN



PROFILE (in case of pre-cast concrete pipe)



PLAN



PROFILE (in case of corrugate pipe)

ROAD CROSSING

Not to scale

TABLE OF DIMENSIONS FOR CROSSING STRUCTURE

TYPE	Q Max. (CMS)	TYPE OF BARREL	D _m	REMARKS
CR-1	Less than 0.25	Pre-Cast-concrete pipe	0.50	--
CR-2	0.25~0.45	"	0.70	--
CR-3	0.45~0.74	"	0.80	--

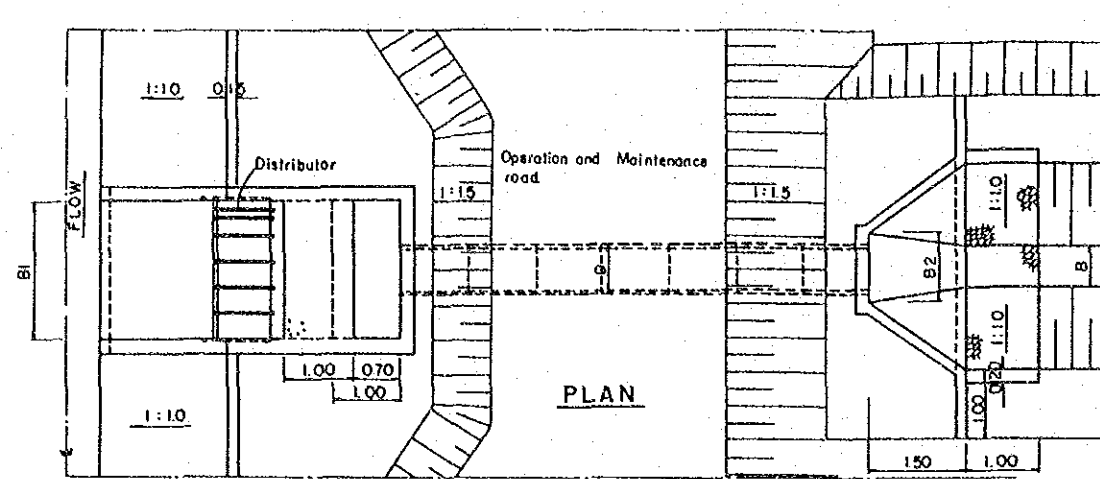
CROSS DRAIN

Not to scale

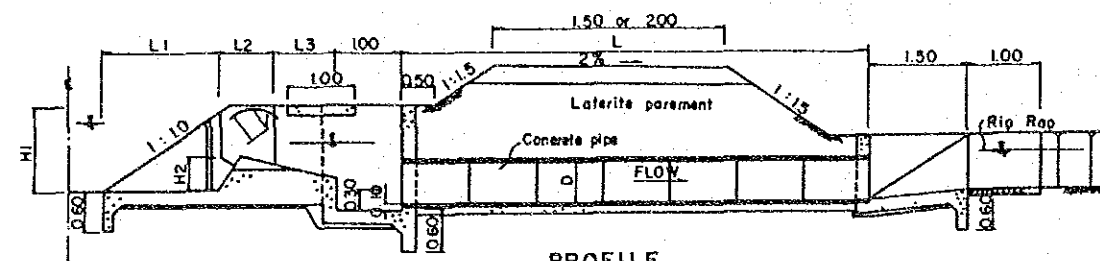
TABLE OF DIMENSIONS FOR CROSS DRAIN

TYPE	Q Max. (CMS)	TYPE OF BARREL	D _m	REMARKS
CD-1	Less than 0.50	CORRUGATE Pipe	0.90	--
CD-2	0.50~0.74	"	1.20	--

THE REPUBLIC OF BOLIVIA			
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THE FEASIBILITY STUDY ON AGRICULTURAL AND RURAL DEVELOPMENT PROJECT IN SANTA ANA, TARIJA			
CANAL RELATED STRUCTURE (3/4)			
DATE	1990. MAR.	DWG. No.	15
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)			



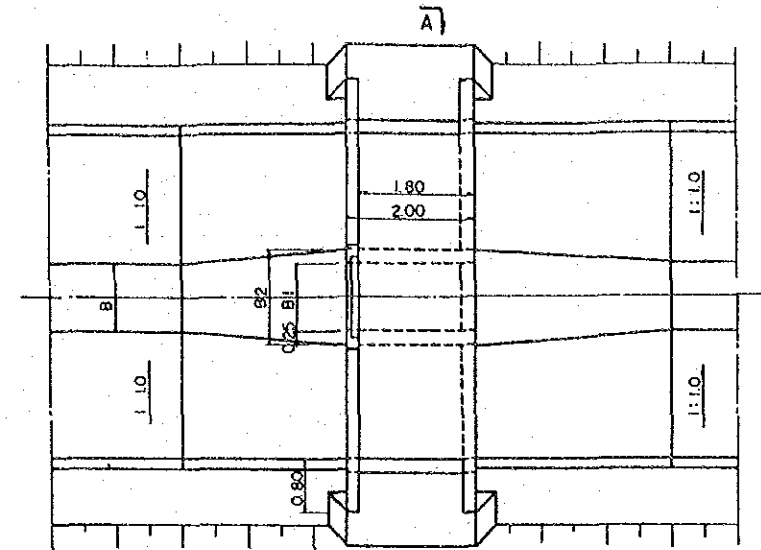
PLAN



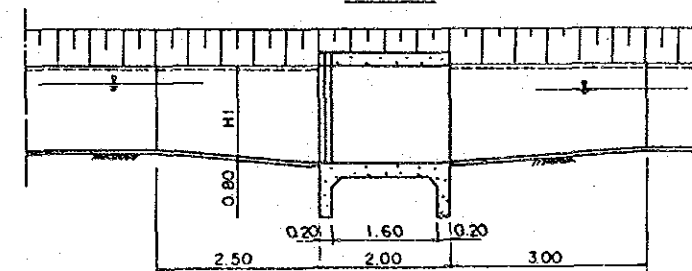
PROFILE

HEAD REGULATOR

Not to scale



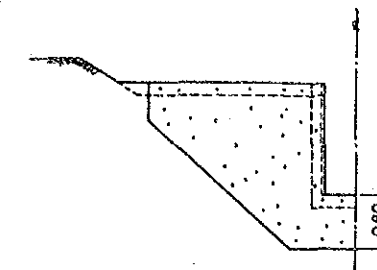
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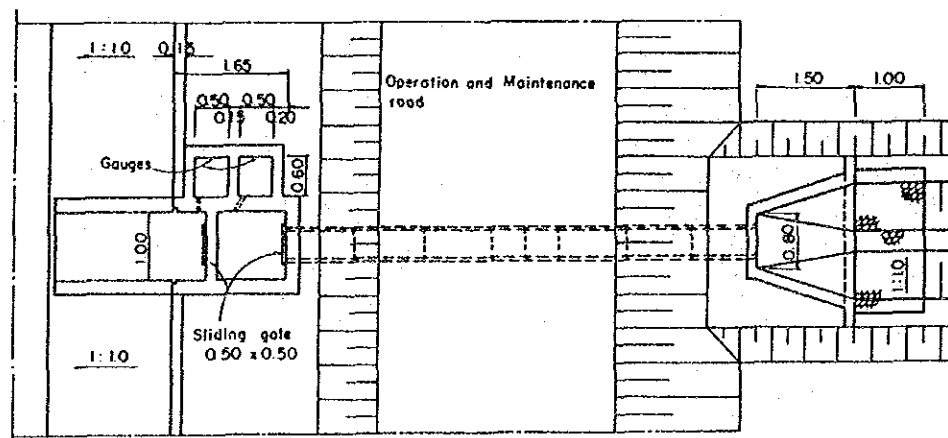
PROFILE

CHECK STRUCTURE

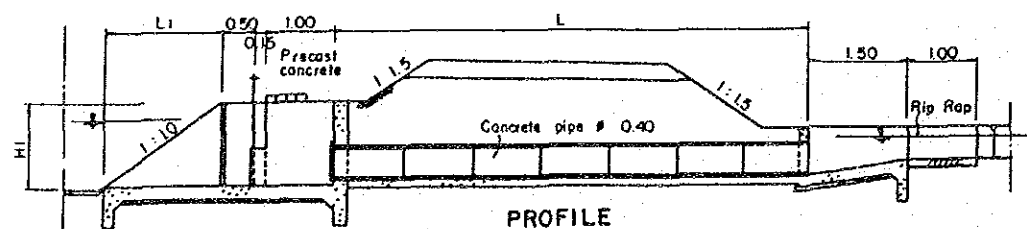
Not to scale



SECTION A-A



PLAN



PROFILE

FARM TURNOUT

Not to scale

TABLE OF DIMENSIONS FOR HEAD REGULATOR

TYPE	Q Max (CMS)	B1 m	B2 m	D m	No. of Pipe Bore	H1 m	H2 m	L1 m	L2 m	L3 m
HR 1	Less than 0.15	0.80	0.90	0.50	1	1.10	0.40	1.10	0.30	0.50
HR 2	0.15 ~ 0.30	1.60	0.90	0.50	1	1.30	0.50	1.30	0.40	0.60
HR 3	0.30 ~ 0.50	2.00	1.00	0.60	1	1.30	0.50	1.30	0.80	1.00
HR 4	0.50 ~ 0.74	2.00	1.80	0.60	2	1.30	0.50	1.30	0.80	1.00

TABLE OF DIMENSIONS FOR FARM TURNOUT

TYPE	H1 m	L1 m
F-1	0.80	1.20
F-2	1.20	1.80

TABLE OF DIMENSIONS FOR CHECK STRUCTURE

TYPE	Q Max (CMS)	B1 m	B2 m	H1 m
C-1	Less than 0.50	0.60	1.00	1.00
C-2	0.5 ~ 0.74	1.00	1.40	1.40

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 THE FEASIBILITY STUDY ON AGRICULTURAL
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 IN SANTA ANA, TARIJA
 CANAL RELATED STRUCTURE (4/4)
 DATE 1990. MAR. DWG. No. 16
 JAPAN INTERNATIONAL COOPERATION AGENCY
 (JICA)

ANNEX L DRAWINGS

LIST OF DRAWINGS

DRW. NO.	TITLE
1	GENERAL PLAN
2	DAM SITE PLAN
3	DAM TYPICAL PROFILE
4	DAM TYPICAL SECTION (1/2)
5	DAM TYPICAL SECTION (2/2)
6	SABO DAM (1/2)
7	SABO DAM (2/2)
8	RESERVOIR
9	CANAL PROFILE (1/4)
10	CANAL PROFILE (2/4)
11	CANAL PROFILE (3/4)
12	CANAL PROFILE (4/4)
13	CANAL RELATED STRUCTURE (1/4)
14	CANAL RELATED STRUCTURE (2/4)
15	CANAL RELATED STRUCTURE (3/4)
16	CANAL RELATED STRUCTURE (4/4)

