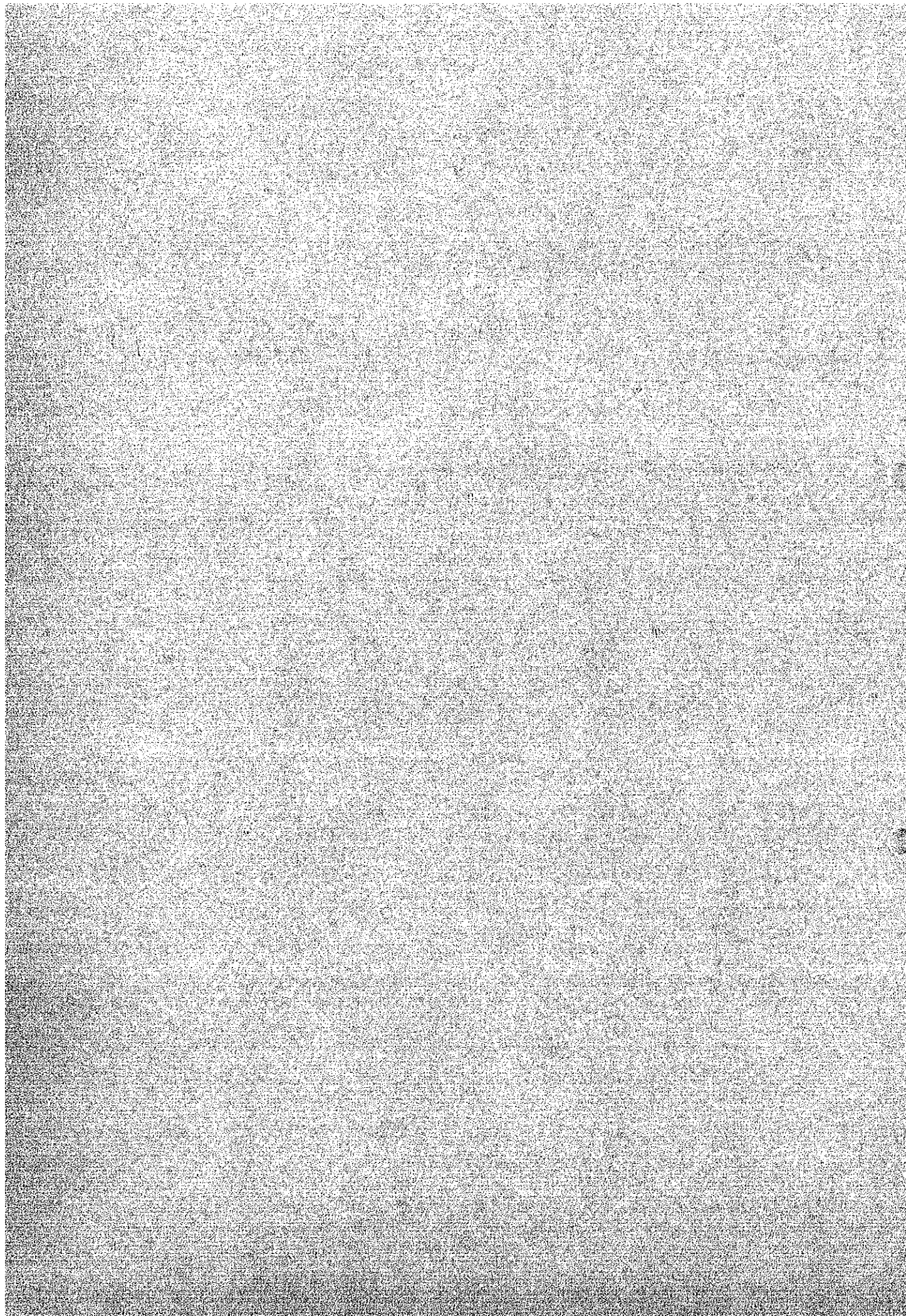


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- No. 116 SAMPLE DESIGN, HAMYANG, DAM
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ERRATA SHEET FOR ANNEXES

<u>Page</u>	<u>Paragraph</u>	<u>Line</u>	<u>Error</u>	<u>Correction</u>
A 4	3	4	126	130
A 10	4	6	(Fig. A 2)	(Table A 6)
A 11	1	2	Fig. A 3.	Fig. A 2.
A 16	-	5	256	266
A 16	-	5	698	692
H 5	3	-	<u>Seongnam</u> 5,000	delete
H 7	8	2	1979	1977
H 8	4	2	K-27	27
H 15	2	1	Banwed	Banweol
H 24	3	7	(H 2.2.3)	(H 2.2.4(5))
H 44	5	3	H-14	H-13-3
H 44	5	5	H-13-3	H-14
H 44	5	6	H-13-3	H-14
H 44	5	7	H-14	H-13-3
H 44	5	8	H-13-3	H-14
H 72	-	last	A 3	A 2
H 80	-	last	220.0	22.0
I 6	4	2	Tables I 2 and I 4	Table I 2
I 6	4	6	construction	construction (Table I 4)
I 7	2	2	constant	variable
I 16	1. Investment Cost	3	Tunnel	Trunk main
I 16	1. Investment Cost	4	Trunk main	Tunnel
I 17	2.3	3	15 days	115 days
I 17	3	1	Equipment	Equivalent
J 26	-	5	Generation	Generation (%)

<u>Page</u>	<u>Paragraph</u>	<u>Line</u>	<u>Error</u>	<u>Correction</u>
P 6	1	7 to 12	and Ganhyeon operation	, Ganhyeon, Hamyang and Juam dam shemes.
P 8	1	8	\$ 70/m ³	\$ 7.0/m ³
P 17	-	4	Mainstream	Diversion
P 17	-	4	Diversion	Songcheon
P 34	3	6	2,268,000	2,269
P 42	6	3	44	55
P 42	II	last	Sub-total	Total
P 48	3.2	2	(D mm x L km)	(D m x L km)
P 48	5.2	1	(3.7 km ³ /s)	(3.7 m ³ /s)
P 50	3.2	2	(D mm x L km)	(D m x L km)
P 52	3.2	2	(D mm x L km)	(D m x L km)
Q 6	1	11 & 12	and Hamyang second trial.	Hamyang, and Juam dams.
Q 14	1	1	both the main stream plan	the main stream plan under both the constant and variable draft operations
Q 14	1	2 to 6	The optimum and Route C.	Delete
Q 15	1	1	nine	12
Q 16	1	7	E: B + C	E: Energy value doubled
Q 16	1	8	F: B + C + D	F: B + C
Q 16	1	last	-	G: B + C + D
Q 60	-	-	Table Q 42	Delete

REMARKS TO THE ADDENDUM

This ADDENDUM contains the results of additional studies and modifications of ANNEXES and DRAWINGS which were submitted in August 1979 prior to the MAIN REPORT.

The additional studies are based on the comments of the Government of Korea on the draft Final Report and focussed mainly to the three points as summarized below:

- (i) a study on hydropower benefit assuming that the price of Bunker C fuel oil is raised by two times compared with that in June 1978;
- (ii) a study of Juam dam scheme equipped with a power station;
- (iii) a sample study of EIRR calculation assuming that the M&I and agricultural water supply benefit streams are identical with the cost streams of pertaining alternative facilities.

This ADDENDUM consists of Tables, Figures and Drawings, which are all prefixed by "Revised" or "Additional".

Tables: The "Revised" Tables herein compiled supersede the Tables previously compiled in ANNEXES I, P and Q. The title and number of the corresponding Tables are identical. The "Additional" Tables Q 39' and Q 39" should be inserted between Tables Q 39 and Q 40 in ANNEX Q. Similarly, the "Additional" Tables Q 41' and Q 41" should be inserted between Tables Q 40 and Q 43. Other "Additional" Tables than the above are numbered by continued numbers of the previous or "Revised" Tables.

Figures: The "Revised" Figs. supersede the previous Figs. of the same numbers and titles in ANNEXES P and Q. The "Additional" Fig. Q 5 is a continuation of the "Revised" Fig. Q 5. The "Additional" Fig. Q 6 should be inserted next to the "Revised" Fig. Q 5.

Drawings: The DRAWINGS No. 116, 117 and 118 are additionally prepared and the former two of them supersede the previous DRAWING No. 113.

Errata Sheet for ANNEXES is also included herein.

Revised Table I 2 OUTLINE OF M&I PIPELINE SYSTEM
ASSOCIATED WITH THE YEONGGYE DAM

Operation Method	Constant Draft	Variable Draft
1. Net Water Supply Capacity (m ³ /s)	2.1	6.2
2. Yeonggye-Gwangyang Pipeline		
2.1 Nominal capacity (10 ³ m ³ /d)	177	536
2.2 Dimensions (D mm x L km x Nos)	1,500 x 36 x 1	1,760 x 36 x 2
2.3 Primary treatment plant (10 ³ m ³ /d)	212	644
3. Hadong-Gwangyang Pipeline		
3.1 Nominal capacity (10 ³ m ³ /d)	-	640
3.2 Intake pump water head (m)	-	56
3.3 Intake pump capacity (PS x Nos)	-	7,000 x 2
3.4 Trunk main (D mm x L km x Nos)	-	1,800 x 17.5 x 2
3.5 Tunnel (D m x L km x Nos)	-	2.5 x 1.5 x 1
3.6 Primary treatment plant (10 ³ m ³ /d)	-	768

Remarks; The nominal capacity of Hadong-Gwangyang pipeline was determined for some stages assuming that a number of M&I alternatives are constructed in stages based on the variable draft operation.

Revised Table P 2 Continued (2)

Name of Dam		Tmha	Juaan			
			Main Stream Plan		Diversion Plan	
River System			Nagdong		Seomjin	
1. Hydrology						
Catchment area	km ²		1,230		1,010	
Annual rainfall	mm		995		1,382	
Annual inflow	10 ⁶ m ³		725		702	
2. Reservoir						
Reservoir operation		C	V	V	C	V
Flood water surface	El. m	194	188	112	121	121
High water surface	El. m	192	185	111	120	120
Low water surface	El. m	158	158	85	85	85
Drawdown	m	34	27	26	35	35
Gross storage (HWS)	10 ⁶ m ³	1,060	723	528	860	860
Dead storage	10 ⁶ m ³	140	140	80	80	80
Active storage	10 ⁶ m ³	920	583	448	780	780
Flood control space	10 ⁶ m ³	100	115	30	48	48
Surface area (HWS)	km ²	48	38	31	44	44
3. Dam						
Type	-	CG	CG	CG	CG	CG
Crest elevation	El. m	196	190	114	123	123
Height	m	87	81	60	69	69
Crest length	m	467	410	384	410	410
Volume	10 ³ m ³	728	610	460	610	610
Design flood	m ³ /s	4,500	4,500	6,200	6,200	6,200
River outlet capacity for variable draft operation	m ³ /s	-	2 x 13.4 = 26.8	2 x 13.6 = 27.2	-	1 x 9.4 = 9.4
4. Power Facilities for Constant Draft Operation						
Maximum discharge	m ³ /s	92.6	-	-	23.6	-
Rated net head	m	61.2	-	-	40.1	-
Installed capacity	MW	2 x 23.8 = 47.6	-	-	1 x 7.9 = 7.9	-
Re-regulating dam		attached	-	-	-	-
Transmission line	kV x cct x km	154 x 2 x 46	-	-	66 x 1 x 30	-

Revised Table P 3 Continued (2)

Name of Dam		Bonghwa	Hamyang
River System		Nagdong	Nagdong
1. Hydrology			
Catchment area	km ²	1,135	264
Annual rainfall	mm	1,033	1,422
Annual inflow	10 ⁶ m ³	695	276
2. Reservoir			
Reservoir operation	-	C	C
Flood water surface	El. m	300	393
Normal high water surface	El. m	297	392
Low water surface	El. m	259	339
Drawdown	m	38	53
Gross storage (NHWL)	10 ⁶ m ³	1,004	292
Dead storage	10 ⁶ m ³	323	40
Active storage	10 ⁶ m ³	681	252
Flood control capacity	10 ⁶ m ³	100	8
Surface area (NHWL)	km ²	28	7
3. Dam			
Type	-	CG	R
Crest elevation	El. m	302	396
Height	m	129	94
Crest length	m	607	452
Volume	10 ³ m ³	1,723	4,380
Design flood	m ³ /s	6,000	3,400
4. Power Facilities			
Maximum discharge	m ³ /s	83.5	9.3
Rated net head	m	102.6	161.1
Installed capacity	MW	2 x 36.0 = 72.0	12.6
Re-regulating dam	-	none	none
Transmission line	kV x cct x km	154 x 2 x 28	66 x 1 x 46

Revised Table P 4 Continued (3)

(1978 price level excluding interest during construction)

Unit: \$ 10³

Name of Dam	Juam (HWS El. 111 m)	Juam (HWS El. 120 m)
Dam		
1. Dam		
Civil works	31,098	38,591
Metalworks	6,480	5,920
Flood forecasting system	1,177	1,177
Sub-total	38,755	45,688
2. Compensation		
Relocation cost of road & other ground facilities	24,000	25,700
Land compensation	38,400	45,000
3. Engineering Fee	3,876	4,569
4. Contingency	21,006	24,191
Dam Total	126,037	145,148
Power Facilities		
1. Power Facilities		
Civil works	-	443
Metalworks	-	430
Generating equipment	-	3,768
Transmission line & substation	-	490
Sub-total	-	5,131
2. Engineering Fee	-	513
3. Contingency	-	1,129
Power Facilities Total	-	6,773

Revised Table P 5 Continued (2)

(1978 price level excluding interest during construction)

Unit: \$ 10³

Name of Dam	Bonghwa	Hamyang
Construction Cost		
1. Dam		
Civil works	93,648	58,954
Metalworks	6,998	3,982
Flood forecasting system	946	170
Sub-total	101,592	63,106
2. Power Facilities		
Civil works	13,887	6,666
Metalworks	2,957	842
Generating equipment	9,591	2,722
Transmission line & substation	2,346	698
Sub-total	28,781	10,928
Direct Cost Total	130,373	74,034
3. Compensation		
Relocation cost of road & other ground facilities	5,680	2,870
Land compensation	17,550	7,460
4. Engineering Fee		
Engineering Fee	13,037	7,403
5. Contingency		
Contingency	33,328	18,353
Grand Total	199,968	110,120

Additional Table P 10 Continued (2)

(1978 price level)

Power Facilities	Unit	Unit Price (\$)	Juam HWL El. 120 m	
			Quantity	Amount (\$ 10 ³)
I CIVIL WORKS				
1. Preparatory Works				
- Access road	km	20,000	1	20
- Construction facilities	LS	-	-	24
Sub-total				44
2. Intake & Penstock				
- Concrete	m ³	45	233	10
- Steel bar	ton	450	12	5
- Miscellaneous	LS	-	-	5
Sub-total				20
3. Powerhouse, Substructure				
- Excavation	m ³	2.5	3,700	9
- Concrete	m ³	55	1,600	88
- Steel bar	ton	450	80	36
- Miscellaneous	LS	-	-	20
Sub-total				153
4. Powerhouse				
- Superstructure	space volume m ³	55	4,000	220
5. Tailrace				
- Excavation	m ³	2.5	1,000	2
- Concrete	m ³	45	50	2
- Steel bar	ton	450	2	1
- Miscellaneous	LS	-	-	1
Sub-total				6
Total				443
II METALWORKS				
- Intake trashrack	ton	2,000	18	36
- Intake gate	ton	5,500	25	138
- Steel penstock	ton	2,000	92	184
- Tailrace gate	ton	4,500	16	72
Total				430

Revised Table P 14 BREAKDOWN OF CONSTRUCTION COST OF HAMYANG
MULTIPURPOSE DAM FOR SAMPLE DESIGN

(1978 price level)

Dam	Unit	Unit Price (\$)	Hamyang	
			Quantity	Amount (\$ 10 ³)
I CIVIL WORKS				
1. Preparatory Works				
- Access road	km	80,000	11	880
- Construction facilities	LS	-	-	3,287
Sub-total				4,167
2. Diversion Tunnel				
- Tunnel excavation	m ³	25	121,000	3,025
- Lining concrete	m ³	60	39,000	2,340
- Steel bar	ton	500	3,900	1,950
- Miscellaneous	LS	-	-	2,195
Sub-total				9,510
3. Dam				
- Excavation	m ³	3.0	679,000	2,037
- Embankment	m ³	7.0	4,377,000	30,639
- Foundation treatment	LS	-	-	3,268
- Miscellaneous	LS	-	-	1,797
Sub-total				37,741
4. Spillway				
- Excavation	m ³	4.0	1,180,000	4,720
- Concrete	m ³	45	42,000	1,890
- Steel bar	ton	450	1,260	567
- Miscellaneous	LS	-	-	359
Sub-total				7,536
Total				58,954
II METALWORKS				
- Diversion gate	ton	4,000	300	1,200
- Spillway gate	ton	5,200	510	2,652
- River outlet facilities	LS	-	-	130
Total				3,982

Revised Table P 14 Continued (2)

Power Facilities	Unit	Unit Price (\$)	Hamyang	
			Quantity	Amount (\$ 10 ³)
I CIVIL WORKS				
1. Preparatory Works				
- Access road	km	60,000	11.5	690
- Construction facilities	LS	-	-	338
Sub-total				1,028
2. Intake				
- Excavation	m ³	4.0	4,530	18
- Concrete	m ³	45	2,040	92
- Steel bar	ton	450	62	28
- Miscellaneous	LS	-	-	14
Sub-total				152
3. Intake Gate Shaft				
- Shaft excavation	m ³	25	364	9
- Concrete	m ³	60	160	10
- Steel bar	ton	450	10	4
- Miscellaneous	LS	-	-	5
Sub-total				28
4. Headrace Tunnel				
- Tunnel excavation	m ³	30	48,500	1,455
- Lining concrete	m ³	74	22,200	1,643
- Steel bar	ton	500	1,330	665
- Miscellaneous	LS	-	-	752
Sub-total				4,515
5. Surge Tank				
- Shaft excavation	m ³	25	3,400	85
- Concrete	m ³	60	980	59
- Steel bar	ton	450	60	27
- Miscellaneous	LS	-	-	34
Sub-total				205

Revised Table P 14 Continued (3)

Power Facilities	Unit	Unit Price (\$)	Hamyang	
			Quantity	Amount (\$ 10 ³)
I CIVIL WORKS (Continued)				
6. Penstock				
- Open excavation	m ³	4.0	10,800	43
- Concrete, block, etc.	m ³	50	2,850	142
- Steel bar	ton	450	86	39
- Miscellaneous	LS	-	-	56
Sub-total				280
7. Powerhouse, Substructure				
- Excavation	m ³	2.5	9,000	22
- Concrete	m ³	55	3,300	182
- Steel bar	ton	450	165	74
- Miscellaneous	LS	-	-	42
Sub-total				320
8. Powerhouse				
- Superstructure	space volume m ³	5	2,500	138
II METALWORKS				
- Intake trashrack	ton	2,000	14	28
- Intake gate	ton	5,500	20	110
- Steel penstock	ton	2,000	325	650
- Tailrace gate	ton	4,500	12	54
Total				842

Revised Table Q 1 Continued (2)

Proposed ^{/1} Dam Scheme	High Water Surface (El. m)	Net Water Supply Capacity (m ³ /s)	Construction Start	Year of Commission	Target Year
Bonghwa (C)	267	1.4	1985.1	1990.1	1990.5
	276	3.0	1985.1	1990.1	1991.1
	285	4.0	1985.1	1990.1	1991.6
Imha (C)	180	11.9	1985.1	1990.1	1995.5
	185	13.7	1985.1	1990.1	1996.5
	192	15.6	1985.1	1990.1	1997.4
Imha (V)	180	19.2	1985.1	1990.1	1999.3
	185	22.0	1985.1	1990.1	2000.7
	192	24.2	1985.1	1990.1	2001.9
Hamyang (C)	376	2.8	1985.1	1990.1	1991.0
	384	3.7	1985.1	1990.1	1991.4
	392	4.6	1985.1	1990.1	1991.9
Juam Main Stream (C)	114	14.3	1981.0	1986.0	1987.8
	117	15.7	1981.0	1986.0	1989.9
	120	17.7	1981.0	1986.0	1993.2
Juam Main Stream (V)	108	25.5	1981.0	1986.0	2006.8
	111	27.2	1981.0	1986.0	2009.7
	114	28.7	1981.0	1986.0	2012.3
	117	30.3	1981.0	1986.0	2015.2
	120	32.7	1981.0	1986.0	2019.3
Juam Diversion (V) Route A	114	21.2	1981.0	1986.0	1999.2
	117	22.5	1981.0	1986.0	2001.6
	120	24.4	1981.0	1986.0	2005.1
Juam Diversion (V) Route B	114	23.2	1981.0	1986.0	2002.9
	117	24.7	1981.0	1986.0	2005.7
	120	26.8	1981.0	1986.0	2009.5
Juam Diversion (V) Route C	114	21.2	1981.0	1986.0	1999.2
	117	22.5	1981.0	1986.0	2001.6
	120	24.4	1981.0	1986.0	2005.1

Remarks; ^{/1} C: Constant draft operation
V: Variable draft operation

Revised Table Q 10 HAMYANG DAM COST

High Water Surface	El. m	376	384	392
1. Dam Cost				
Dam type		----- Rockfill -----		
Flood water surface	El. m	377	385	393
Dam crest	El. m	380	388	396
Financial Investment Cost				
- Civil work	\$ 10 ⁶	59.65	68.83	77.82
- Metalwork	\$ 10 ⁶	5.30	5.36	5.48
- Compensation: Land	\$ 10 ⁶	7.81	8.40	8.95
: Ground facilities	\$ 10 ⁶	2.86	3.04	3.44
Total	\$ 10⁶	75.62	85.63	95.69
Economic Investment Cost				
- Civil work	\$ 10 ⁶	56.67	65.39	73.93
- Metalwork	\$ 10 ⁶	5.04	5.09	5.21
- Ground facilities	\$ 10 ⁶	2.71	2.88	3.27
Total	\$ 10⁶	64.42	73.36	82.41
Annual Equivalent of Cost				
- Investment	\$ 10 ⁶	6.17	7.03	7.90
- Replacement	\$ 10 ⁶	0.05	0.05	0.05
- O & M	\$ 10 ⁶	0.31	0.35	0.40
Total	\$ 10⁶	6.53	7.43	8.35
2. Power Facilities Cost				
Installed Capacity	MW	10.1	11.6	12.6
Financial Investment Cost				
- Civil work	\$ 10 ⁶	8.57	8.70	8.79
- Metal & generating equipment	\$ 10 ⁶	5.09	5.45	5.69
Total	\$ 10⁶	13.66	14.15	14.48
Economic Investment Cost				
- Civil work	\$ 10 ⁶	8.14	8.27	8.35
- Metal & generating equipment	\$ 10 ⁶	4.84	5.18	5.41
Total	\$ 10⁶	12.98	13.45	13.76
Annual Equivalent of Cost				
- Investment	\$ 10 ⁶	1.25	1.29	1.32
- Replacement	\$ 10 ⁶	0.04	0.05	0.05
- O & M	\$ 10 ⁶	0.32	0.34	0.34
Total	\$ 10⁶	1.61	1.68	1.71

Revised Table Q 14 ANNUAL EQUIVALENT OF M&I WATER SUPPLY BENEFIT

Han River Basin			Unit: \$ 10 ⁶					
Name of Alternative Dams			Gwangju	Jongho-	Gwangju	Weonsong	Yeonju	Total
			I	weon	II	B		
1. Output	(m ³ /s)		14.1	17.1	7.4	44.4	8.2	
2. Accumulation of (1)	(m ³ /s)		14.4	31.5	38.9	83.3	91.5	
3. Capitalized Cost	(\$ 10 ⁶)		4.67	6.03	4.16	12.55	10.08	
4. Annual Equivalent of Cost								
4.1 Year of commission			2008.6	2011.2	2014.3	2015.6	2023.6	
4.2 Annual equivalent of cost	(\$ 10 ⁶)		4.67	4.94	2.68	7.32	3.18	
Proposed Dam Scheme	HWS	Net Water Supply Capacity						
	(El. m)	(m ³ /s)						
Bamseonggol	292.5	7.5			4.23			4.23
	300	9.3			5.23			5.23
	305	9.8			5.51			5.51
Inje	315	1.6			0.87			0.87
	324.5	2.7			1.54			1.54
	332.6	3.7			2.09			2.09
Hongcheon (C)	110	10.5		3.71				3.71
	115	14.4		5.08				5.08
	120	17.7		6.26				6.26
Hongcheon (V)	110	77.6	4.67	4.94	2.68	6.38	-	18.67
	115	84.8	4.67	4.94	2.68	7.32	0.58	20.19
	120	90.9	4.67	4.94	2.68	7.32	2.95	22.56
Hongcheon (C)	109	5.3	1.72					1.72
	114	11.6	3.77					3.77
	117	13.9	4.49					4.49
Dalcheon (V)	109	60.4	4.67	4.94	2.68	3.54		15.83
	114	74.8	4.67	4.94	2.68	5.92		18.21
	117	79.8	4.67	4.94	2.68	6.74		19.03
Ganhyeon (C)	103	7.8	2.52					2.52
	108.5	10.5	3.41					3.41
	111.4	12.8	4.13					4.13
Ganhyeon (V)	103.5	63.2	4.67	4.94	2.68	4.01		16.30
	108.5	74.3	4.67	4.94	2.68	5.84		18.13
	111.4	78.2	4.67	4.94	2.68	6.48		18.77

Nagdong River Basin

Name of Alternative Dams			Mungyeong	Gimcheon	Goreyeong	Total
1. Output	(m ³ /s)		10.2	4.3	19.2	
2. Accumulation of (1)	(m ³ /s)		10.2	14.5	-	
3. Annual Equivalent of Cost						
3.1 1st stage construction			4.85	4.71	7.68	
	(El. m)	(m ³ /s)				
Bonghwa	267	0.6		0.66		0.66
	276	1.5		1.64		1.64
	285	2.3		2.52		2.52
Imha (C)	180	8.4	3.99			3.99
	185	9.9	4.71			4.71
	192	11.3	5.37			5.37
Imha (V)	180	14.3			5.72	5.72
	185	15.8			6.32	6.32
	192	18.3			7.26	7.26
Hamyang	376	1.3		1.44		1.44
	384	2.0		2.17		2.17
	392	2.7		2.96		2.96

Revised Table Q 16 JUSTIFICATION OF POWER PURPOSE

Dam Scheme	Annual Equivalents						B - C if energy benefit doubled (\$ 10 ⁶)
	HWS (El. m)	Installed capacity (MW)	Power benefit (\$ 10 ⁶)	Energy benefit (\$ 10 ⁶)	Cost (\$ 10 ⁶)	B - C (\$ 10 ⁶)	
I. Under 5-hr daily operation							
Bamseonggol	292.5	37.4	2.28	2.01	2.60	1.69	3.70
	300	46.5	2.76	2.25	3.00	2.01	4.26
	305	49.7	2.90	2.35	3.10	2.15	4.50
Inje	315	75.0	4.66	3.96	7.00	1.62	5.58
	324.5	93.8	5.68	4.48	8.00	2.16	6.64
	332.6	105.5	6.29	4.83	8.70	2.42	7.25
Hongcheon	110	51.6	3.10	2.82	3.10	2.82	5.64
	115	62.1	3.62	3.13	3.60	3.15	6.28
	120	72.9	4.12	3.45	4.20	3.37	6.82
Gujeol	743.5	40.2	2.73	2.11	4.60	0.24	2.35
	747	46.2	3.13	2.23	4.90	0.46	2.69
	748	48.4	3.28	2.28	5.20	0.36	2.64
Dalcheon	109	18.1	1.13	1.15	2.91	-0.63	0.52
	114	28.5	1.69	1.43	3.74	-0.62	0.81
	117	33.2	1.92	1.57	4.11	-0.62	0.95
Ganhyeon	103.5	16.6	0.93	0.95	2.53	-0.65	0.30
	108.5	21.6	1.15	1.12	2.92	-0.65	0.47
	111.4	25.0	1.29	1.22	3.21	-0.70	0.52
Bonghwa	267	40.2	2.39	2.26	3.50	1.15	3.41
	276	49.2	2.82	2.53	4.10	1.25	3.78
	285	58.0	3.23	2.80	4.50	1.53	4.33
Imha	180	34.7	2.05	1.79	2.90	0.94	2.73
	185	40.5	2.33	1.96	3.10	1.19	3.15
	192	47.6	2.64	2.18	3.30	1.52	3.70
Hamyang	376	37.4	2.36	2.04	4.87	-0.47	1.57
	384	45.6	2.85	2.27	5.41	-0.29	1.98
	392	52.0	3.20	2.45	5.85	-0.20	2.25
Juam	114	21.0	1.06	1.12	2.51	-0.33	0.79
	117	24.0	1.19	1.21	2.63	-0.23	0.98
	120	28.1	1.37	1.32	2.87	-0.18	1.14

Dam Scheme	HWS (El. m)	Installed capacity (MW)	Annual Equivalentents				B - C if energy benefit doubled (\$ 10 ⁶)
			Power benefit (\$ 10 ⁶)	Energy benefit (\$ 10 ⁶)	Cost (\$ 10 ⁶)	B - C (\$ 10 ⁶)	
<u>II. Under 18-hr daily operation</u>							
Dalcheon	109	5.0	0.32	1.15	1.00	0.47	1.62
	114	7.9	0.47	1.43	1.10	0.80	2.23
	117	9.2	0.53	1.57	1.20	0.90	2.47
Ganhyeon	103.5	4.6	0.26	0.95	0.90	0.31	1.26
	108.5	6.0	0.32	1.12	1.10	0.34	1.46
	111.4	6.9	0.36	1.22	1.10	0.48	1.70
Hamyang	376	10.1	0.64	1.99	1.61	1.02	3.01
	384	11.6	0.72	2.08	1.68	1.12	3.20
	392	12.6	0.76	2.13	1.71	1.18	3.31
Juam	114	5.8	0.30	1.12	0.79	0.63	1.75
	117	6.7	0.33	1.21	0.81	0.73	1.94
	120	7.8	0.38	1.32	0.83	0.87	2.19

Revised Table Q 26 NET M&I WATER SUPPLY CAPACITY TO BE SUPPLIED FROM EXISTING AND PROPOSED FACILITIES AND ESTIMATED ANNUAL EQUIVALENT OF M&I WATER SUPPLY BENEFIT OF JUAM DAM

Unit: \$ 10⁶

MAIN STREAM PLAN

HWS (El. m)	108	111	114	117	120
Target Year	2006.8	2009.7	2012.3	2015.2	2019.3
Net M&I Water Supply Capacity (m ³ /s)	18.8	20.4	21.8	23.4	25.6
1. Alternative Facilities Costs					
1.1 Yeonggye dam	8.52	8.90	9.04	9.21	9.42
1.2 Yeonggye-Gwanggang pipeline	10.76	11.10	11.30	11.52	11.72
1.3 Hadong-Gwangyang pipeline	11.41	11.77	12.03	12.25	12.51
1.4 Existing pipeline	2.90	2.90	2.90	2.90	2.90
Total	33.59	34.67	35.27	35.88	36.55
2. Project Associated Facilities Cost					
2.1 Hadong-Gwangyang pipeline	12.92	13.32	13.62	13.87	14.16
2.2 Existing pipeline	3.03	3.03	3.03	3.03	3.03
Total	15.95	16.35	16.65	16.90	17.19
3. Annual Equivalent of M&I Benefit					
1-2	17.64	18.32	18.62	18.98	19.36

DIVERSION PLAN

Route	A			B	C
HWS (El. m)	114	117	120	114	120
Target Year	1999.2	2001.6	2005.1	2002.9	2005.1
Net M&I Water Supply Capacity (m ³ /s)	14.7	16.0	17.9	16.7	17.9
1. Alternative Facilities Costs					
1.1 Yeonggye dam	7.52	7.84	8.29	8.00	8.29
1.2 Yeonggye-Gwangyang pipeline	9.58	9.99	10.54	10.22	10.54
1.3 Hadong-Gwangyang pipeline	9.98	10.51	11.21	10.79	11.21
1.4 Existing pipeline	2.90	2.90	2.90	2.90	2.90
Total	29.98	31.24	32.94	31.91	32.94
2. Project Associated Facilities Cost					
2.1 Diversion tunnel	1.56	1.62	1.66	1.25	2.08
2.2 Yeonggye dam	-	-	-	3.92	-
2.3 Diversion pipeline	9.48	9.96	10.64	9.94	14.81
2.4 Existing pipeline	3.03	3.03	3.03	3.03	3.03
Total	14.07	14.61	15.33	18.14	19.92
3. Annual Equivalent of M&I Benefit					
1-2	15.91	16.63	17.61	13.77	13.02

Revised Table Q 30 SCALE COMPARISON
HONGCHEON DAM (V)

High Water Surface	El. m	110	115	120
Flood water surface	El. m	111	116	121
Low water surface	El. m	93	93	93
Active storage	10 ⁶ m ³	513	720	954
Flood control space	10 ⁶ m ³	38.0	44.7	52.3
Draft	10 ⁶ m ³	794	909	1,064
Net water supply	m ³ /s	79.4	86.3	93.0
Available for downstream power	10 ⁶ m ³	265	303	355
Maximum discharge	m ³ /s	-	-	-
Rated water head	m	-	-	-
Installed capacity	MW	-	-	-
Firm peak output	MW	-	-	-
Effective power	MW	-	-	-
Annual energy output	GWh	-	-	-
Downstream water head	m	35.0	35.0	35.0
Downstream energy increase	GWh	21.6	24.7	29.0
Total energy	GWh	21.6	24.7	29.0
Annual Benefit				
M&I	\$ 10 ⁶	18.67	20.19	22.56
Irrigation	\$ 10 ⁶	1.19	1.24	1.28
Flood control	\$ 10 ⁶	0.29	0.31	0.32
Power	\$ 10 ⁶	0.49	0.56	0.66
Production foregone	\$ 10 ⁶	-1.48	-1.67	-1.87
Total	\$ 10⁶	19.16	20.63	22.95
Annual Cost				
Dam	\$ 10 ⁶	6.91	7.56	8.22
Power facilities	\$ 10 ⁶	-	-	-
Total	\$ 10⁶	6.91	7.56	8.22
B - C	\$ 10⁶	12.25	13.07	14.73

Remarks; Hongcheon town approximately at El. 125 m

Revised Table Q 33 SCALE COMPARISON
DALCHEON DAM (V)

High Water Surface	El. m	109	114	117
Flood water surface	El. m	110	115	118
Low water surface	El. m	101	101	101
Active storage	10 ⁶ m ³	200	390	540
Flood control space	10 ⁶ m ³	31.9	44.1	53.2
Draft	10 ⁶ m ³	415	618	696
Net water supply	m ³ /s	61.5	76.5	81.3
Available for downstream power	10 ⁶ m ³	138	206	180
Maximum discharge	m ³ /s	-	-	-
Rated water head	m	-	-	-
Installed capacity	MW	-	-	-
Firm peak output	MW	-	-	-
Effective power	MW	-	-	-
Annual energy output	GWh	-	-	-
Downstream water head	m	11.5	11.5	11.5
Downstream energy increase	GWh	3.7	5.5	6.2
Total energy	GWh	3.7	5.5	6.2
Annual Benefit				
M&I	\$ 10 ⁶	15.83	18.21	19.03
Irrigation	\$ 10 ⁶	1.05	1.17	1.21
Flood control	\$ 10 ⁶	0.60	0.68	0.71
Power	\$ 10 ⁶	0.08	0.13	0.14
Production foregone	\$ 10 ⁶	-2.67	-3.26	-3.62
Total	\$ 10 ⁶	14.89	16.93	17.47
Annual Cost				
Dam	\$ 10 ⁶	5.07	5.49	5.75
Power facilities	\$ 10 ⁶	-	-	-
Total	\$ 10 ⁶	5.07	5.49	5.75
B - C	\$ 10 ⁶	9.82	11.44	11.72

Remarks; Goesan town approximately at El. 117 m

Revised Table Q 35 SCALE COMPARISON
GANHYEON DAM (V)

High Water Surface	El. m	103.5	108.4	111.4
Flood water surface	El. m	105.5	110.4	113.4
Low water surface	El. m	91	91	91
Active storage	10 ⁶ m ³	265	425	540
Flood control space	10 ⁶ m ³	58.9	78.2	91.7
Draft	10 ⁶ m ³	432	597	666
Net water supply	m ³ /s	64.5	75.5	79.7
Available for downstream power	10 ⁶ m ³	144	199	222
Maximum discharge	m ³ /s	-	-	-
Rated water head	m	-	-	-
Installed capacity	MW	-	-	-
Firm peak output	MW	-	-	-
Effective power	MW	-	-	-
Annual energy output	GWh	-	-	-
Downstream water head	m	11.5	11.5	11.5
Downstream energy increase	GWh	3.9	5.3	6.0
Total energy	GWh	3.9	5.3	6.0
Annual Benefit				
M&I	\$ 10 ⁶	16.30	18.13	18.77
Irrigation	\$ 10 ⁶	1.07	1.16	1.19
Flood control	\$ 10 ⁶	0.75	0.84	0.70
Power	\$ 10 ⁶	0.09	0.12	0.14
Production foregone	\$ 10 ⁶	-2.43	-2.69	-2.80
Total	\$ 10 ⁶	15.78	17.56	18.00
Annual Cost				
Dam	\$ 10 ⁶	2.46	3.13	3.52
Power facilities	\$ 10 ⁶	-	-	-
Total	\$ 10 ⁶	2.46	3.13	3.52
B - C	\$ 10 ⁶	13.32	14.43	14.48

Remarks; Weonju City at approximately El. 115 m

Revised Table Q 39 SCALE COMPARISON
HAM YANG DAM (C)

High Water Surface	El. m	376	384	392
Flood water surface	El. m	377	385	393
Low water surface	El. m	338	339	339
Active Storage	10 ⁶ m ³	151	201	251
Flood control space	10 ⁶ m ³	5.3	6.4	7.7
Draft	10 ⁶ m ³	170	199	220
Net water supply	m ³ /s	2.8	3.7	4.6
Available for downstream power	10 ⁶ m ³	59	78	97
Maximum discharge	m ³ /s	7.2	8.4	9.3
Rated water head	m	167.3	164.0	161.1
Installed capacity	MW	10.1	11.6	12.6
Firm peak output	MW	8.4	9.3	9.6
Effective power	MW	9.3	10.5	11.1
Annual energy output	GWh	87.1	90.9	93.2
Downstream water head	m	10.1	10.1	10.1
Downstream energy increase	GWh	1.4	1.8	2.3
Total energy	GWh	88.5	92.7	95.5
Annual Benefit				
M&I	\$ 10 ⁶	1.44	2.17	2.96
Irrigation	\$ 10 ⁶	0.63	0.75	0.88
Flood control	\$ 10 ⁶	0.04	0.05	0.05
Power	\$ 10 ⁶	2.66	2.84	2.94
Production foregone	\$ 10 ⁶	-0.28	-0.30	-0.32
Total	\$ 10⁶	4.49	5.51	6.51
Annual Cost				
Dam	\$ 10 ⁶	6.53	7.43	8.34
Power facilities	\$ 10 ⁶	1.61	1.68	1.71
Total	\$ 10⁶	8.14	9.11	10.05
B - C	\$ 10⁶	-3.65	-3.60	-3.56

Additional Table Q 39' SCALE COMPARISON
JUAM MAIN STREAM (C)

High Water Surface	El. m	114	117	120
Flood water surface	El. m	115	118	121
Low water surface	El. m	85	85	85
Active storage	10 ⁶ m ³	530	630	780
Flood control space	10 ⁶ m ³	35.8	41.3	47.6
Draft	10 ⁶ m ³	452	494	559
Net water supply	m ³ /s	14.3	15.7	17.7
Available for downstream power	10 ⁶ m ³	-	-	-
Maximum discharge	m ³ /s	19.1	20.9	23.6
Rated water head	m	36.4	37.9	39.4
Installed capacity	MW	5.8	6.7	7.8
Firm peak output	MW	2.7	2.9	3.2
Effective power	MW	4.3	4.8	5.5
Annual energy output	GWh	49.0	52.8	57.9
Downstream water head	m	-	-	-
Downstream energy increase	GWh	-	-	-
Total energy	GWh	49.0	52.8	57.9
Annual Benefit				
M&I	\$ 10 ⁶	8.69	10.32	12.60
Irrigation	\$ 10 ⁶	0.52	0.59	0.69
Flood control	\$ 10 ⁶	0.16	0.18	0.21
Power	\$ 10 ⁶	1.42	1.54	1.70
Production foregone	\$ 10 ⁶	-1.67	-1.76	-1.88
Total	\$ 10⁶	9.12	10.87	13.32
Annual Cost				
Dam	\$ 10 ⁶	8.01	8.35	8.75
Power facilities	\$ 10 ⁶	0.79	0.81	0.83
Total	\$ 10⁶	8.80	9.16	9.58
B - C	\$ 10⁶	0.32	1.71	3.74

Additional Table Q 39"

SCALE COMPARISON
JUAM MAIN STREAM (Semi-variable)

High Water Surface	El. m	114	117	120
Flood water surface	El. m	115	118	121
Low water surface	El. m	85	85	85
Active storage	10^6 m ³	530	630	780
Flood control space	10^6 m ³	35.8	41.3	47.6
Draft	10^6 m ³	455	497	553
Net water supply	m ³ /s	20.4	22.2	24.6
Available for downstream power	10^6 m ³	-	-	-
Maximum discharge	m ³ /s	18.1	19.7	21.9
Rated water head	m	36.4	37.9	39.4
Installed capacity	MW	5.6	6.4	7.4
Firm peak output	MW	2.74	2.95	3.21
Effective power	MW	4.17	4.68	5.31
Annual energy output	GWh	48.08	51.73	56.10
Downstream water head	m	-	-	-
Downstream energy increase	GWh	-	-	-
Total energy	GWh	48.08	51.73	56.10
Annual Benefit				
M&I	\$ 10^6	15.20	16.13	17.26
Irrigation	\$ 10^6	0.79	0.84	0.88
Flood control	\$ 10^6	0.16	0.18	0.21
Power	\$ 10^6	1.39	1.50	1.64
Production foregone	\$ 10^6	-1.67	-1.76	-1.88
Total	\$ 10^6	15.87	16.89	18.11
Annual Cost				
Dam	\$ 10^6	8.01	8.35	8.75
Power facilities	\$ 10^6	0.79	0.81	0.82
Total	\$ 10^6	8.80	9.16	9.57
B - C	\$ 10^6	7.07	7.73	8.54

Revised Table Q 41 SCALE COMPARISON
JUAM DIVERSION (V)

ROUTE A

High Water Surface	El. m	114	117	120
Flood water surface	El. m	115	118	121
Low water surface	El. m	85	85	85
Active Storage	10 ⁶ m ³	530	630	780
Flood control space	10 ⁶ m ³	35.8	41.3	47.6
Draft	10 ⁶ m ³	372	413	473
Net water supply	m ³ /s	21.2	22.5	24.4
Available for downstream power	10 ⁶ m ³	-	-	-
Maximum discharge	m ³ /s	-	-	-
Rated water head	m	-	-	-
Installed capacity	MW	-	-	-
Firm peak output	MW	-	-	-
Effective power	MW	-	-	-
Annual energy output	GWh	-	-	-
Downstream water head	m	-	-	-
Downstream energy increase	GWh	-	-	-
Total energy	GWh	-	-	-
Annual Benefit				
M&I	\$ 10 ⁶	15.91	16.63	17.61
Irrigation	\$ 10 ⁶	0.81	0.85	0.88
Flood control	\$ 10 ⁶	0.16	0.18	0.21
Power	\$ 10 ⁶	-	-	-
Production foregone	\$ 10 ⁶	-1.67	-1.76	-1.88
Total	\$ 10 ⁶	15.21	15.90	16.82
Annual Cost				
Dam	\$ 10 ⁶	8.01	8.35	8.75
Power facilities	\$ 10 ⁶	-	-	-
Total	\$ 10 ⁶	8.01	8.35	8.75
B - C	\$ 10 ⁶	7.20	7.55	8.07

Additional Table Q 41' SCALE COMPARISON
JUAM DIVERSION (V) (2)

ROUTE B

High Water Surface	El. m	114	117	120
Flood water surface	El. m	115	118	121
Low water surface	El. m	85	85	85
Active Storage	10 ⁶ m ³	530	630	780
Flood control space	10 ⁶ m ³	35.8	41.3	47.6
Draft	10 ⁶ m ³	372	413	473
Net water supply	m ³ /s	23.2	24.7	26.8
Available for downstream power	10 ⁶ m ³	-	-	-
Maximum discharge	m ³ /s	-	-	-
Rated water head	m	-	-	-
Installed capacity	MW	-	-	-
Firm peak output	MW	-	-	-
Effective power	MW	-	-	-
Annual energy output	GWh	-	-	-
Downstream water head	m	-	-	-
Downstream energy increase	GWh	-	-	-
Total energy	GWh	-	-	-
Annual Benefit				
M&I	\$ 10 ⁶	13.77	14.02	14.46
Irrigation	\$ 10 ⁶	0.86	0.89	0.92
Flood control	\$ 10 ⁶	0.16	0.18	0.21
Power	\$ 10 ⁶	-	-	-
Production foregone	\$ 10 ⁶	-1.67	-1.76	-1.88
Total	\$ 10 ⁶	13.12	13.33	13.71
Annual Cost				
Dam	\$ 10 ⁶	8.01	8.35	8.75
Power facilities	\$ 10 ⁶	-	-	-
Total	\$ 10 ⁶	8.01	8.35	8.75
B - C	\$ 10 ⁶	5.11	4.98	4.96

Additional Table Q 41" SCALE COMPARISON
 JUAM DIVERSION (V) (3)

ROUTE C

High Water Surface	El. m	114	117	120
Flood water surface	El. m	115	118	121
Low water surface	El. m	85	85	85
Active Storage	10 ⁶ m ³	530	630	780
Flood control space	10 ⁶ m ³	35.8	41.3	47.6
Draft	10 ⁶ m ³	372	413	473
Net water supply	m ³ /s	21.2	22.5	24.4
Available for downstream power	10 ⁶ m ³	-	-	-
Maximum discharge	m ³ /s	-	-	-
Rated water head	m	-	-	-
Installed capacity	MW	-	-	-
Firm peak output	MW	-	-	-
Effective power	MW	-	-	-
Annual energy output	GWh	-	-	-
Downstream water head	m	-	-	-
Downstream energy increase	GWh	-	-	-
Total energy	GWh	-	-	-
Annual Benefit				
M&I	\$ 10 ⁶	11.77	12.31	13.04
Irrigation	\$ 10 ⁶	0.81	0.85	0.88
Flood control	\$ 10 ⁶	0.16	0.18	0.21
Power	\$ 10 ⁶	-	-	-
Production foregone	\$ 10 ⁶	-1.67	-1.76	-1.88
Total	\$ 10⁶	11.07	11.58	12.25
Annual Cost				
Dam	\$ 10 ⁶	8.01	8.35	8.75
Power facilities	\$ 10 ⁶	-	-	-
Total	\$ 10⁶	8.01	8.35	8.75
B - C	\$ 10⁶	3.06	3.23	3.50

Revised Table Q 43 JUSTIFIED DAM SCHEMES

<u>Name of Dam Plan</u>	<u>Operation Method</u>	<u>HWS (El. m)</u>
1. Bamseonggol	C	305
2. Hongcheon	C	120
3. Hongcheon	V	120
4. Dalcheon	V	117
5. Ganhyeon	V	111.4
6. Imha	C	192
7. Imha	V	185
8. Juam Main Stream	C	120
9. Juam Main Stream	V	111
10. Juam Diversion - Route A	V	120
- Route B	V	114
- Route C	V	120

Remarks; C: Constant draft operation
V: Variable draft operation

Revised Table Q 44 ALTERNATIVE FACILITIES COST OF
M&I WATER SUPPLY IN THE HAN
AND NAGDONG RIVER BASINS

Unit: \$ 10⁶

(Net Water Supply Capacity)	Bamseonggol (C) (9.8 m ³ /s)	Hongcheon (C) (17.7 m ³ /s)
1. Name of Alternative Dam	Gwangju (II)	Janghoweon
1.1 Net supply capacity (m ³ /s)	9.8	17.7
1.2 Accumulation of 1.1 (m ³ /s)	9.8	17.7
2. Construction Start	2003.6	2003.6
3. Investment Cost	43.48	27.51
3.1 Civil work	(36.54)	(19.07)
3.2 Metalwork	(6.94)	(8.44)
4. Replacement Cost	6.25	7.60
5. Annual Cost	1.30	3.54

(Net Water Supply Capacity)	Hongcheon (V) (90.9 m ³ /s)				
1. Name of Alternative Dam	Gwangju (I)	Jang- howeon	Gwangju (II)	Weonsong (B)	Yeoju
1.1 Net supply capacity (m ³ /s)	14.4	17.1	7.4	44.4	7.6
1.2 Accumulation of 1.1 (m ³ /s)	14.4	31.5	38.9	83.3	90.9
2. Construction Start	2003.6	2006.2	2009.3	2010.6	2018.6
3. Investment Cost	28.30	26.58	32.83	72.73	58.46
3.1 Civil work	(21.28)	(18.43)	(27.59)	(42.48)	(28.38)
3.2 Metalwork	(7.02)	(8.15)	(5.24)	(30.25)	(30.08)
4. Replacement Cost	6.32	7.34	4.72	27.23	27.07
5. Annual Cost	1.90	3.42	0.98	5.34	3.49

Remarks : C : Constant draft operation

V : Variable draft operation

Revised Table Q 44 Continued (2)

Unit: \$ 10⁶

(Net Water Supply Capacity)	Dalcheon (V) (79.8 m ³ /s)			
	Gwangju (I)	Jang- howeon	Gwangju (II)	Weonson (B)
1. Name of Alternative Dam				
1.1 Net supply capacity (m ³ /s)	14.4	17.1	7.4	40.9
1.2 Accumulation of 1.1 (m ³ /s)	14.4	31.5	38.9	79.8
2. Construction Start	2003.6	2006.2	2009.3	2010.6
3. Investment Cost	28.30	26.58	32.83	67.00
3.1 Civil work	(21.28)	(18.43)	(27.59)	(39.13)
3.2 Metalwork	(7.02)	(8.15)	(5.24)	(27.87)
4. Replacement Cost	6.32	7.34	4.72	25.08
5. Annual Cost	1.90	3.42	0.98	4.92

(Net Water Supply Capacity)	Ganhyeon (V) (78.2 m ³ /s)			
	Gwangju (I)	Jang- howeon	Gwangju (II)	Weonson (B)
1. Name of Alternative Dam				
1.1 Net supply capacity (m ³ /s)	14.4	17.1	7.4	39.3
1.2 Accumulation of 1.1 (m ³ /s)	14.4	31.5	38.9	78.2
2. Construction Start	2003.6	2006.2	2009.3	2010.6
3. Investment Cost	28.30	26.58	32.83	64.38
3.1 Civil work	(21.28)	(18.43)	(27.59)	(37.60)
3.2 Metalwork	(7.02)	(8.15)	(5.24)	(26.78)
4. Replacement Cost	6.32	7.34	4.72	24.10
5. Annual Cost	1.90	3.42	0.98	4.73

Revised Table Q 44 Continued (C)

Unit: \$ 10⁶

(Net Water Supply Capacity)	Imha (C) (11.3 m ³ /s)	Imha (V) (15.8 m ³ /s)
	Mungyeong	Georyeong
1. Name of Alternative Dam		
1.1 Net supply capacity (m ³ /s)	11.3	15.8
1.2 Accumulation of 1.1 (m ³ /s)	11.3	15.8
2. Construction Start	1985.1	1985.1
3. Investment Cost	47.15	46.31
3.1 Civil work	(38.45)	(39.06)
3.2 Metalwork	(8.70)	(7.25)
4. Replacement Cost	7.83	6.53
5. Annual Cost	0.79	1.83

Revised Table Q 45 ALTERNATIVE FACILITIES COST OF
 JUAM DAM (MAIN STREAM PLAN) FOR
 M&I WATER SUPPLY

CONSTANT DRAFT OPERATION

Unit: \$ 10⁶

Order of Construction	Alternative Yeonggye Dam	
	1	2
1. Net Supply Capacity (m ³ /s)	6.2	3.45
2. Accumulation of 1 (m ³ /s)	6.2	9.65
3. Construction Start	1981.0	1982.5
4. Investment Cost	37.96	21.12
4.1 Civil works	(34.92)	(19.43)
4.2 Metalworks	(3.04)	(1.69)
5. Replacement Cost	2.74	1.52
6. Annual Cost	0.25	0.14

Order of Construction	Alternative Yeonggye-Gwangyang Pipeline		
	1 & 2	3	4
1. Capacity (m ³ /s)	6.2	3.1	0.35
2. Accumulation of 1 (m ³ /s)	6.2	9.3	9.65
3. Construction Start	1984.0	1985.5	1990.6
4. Investment Cost	49.46	24.73	2.79
4.1 Civil works	(6.62)	(3.31)	(0.37)
4.2 Metalworks	(42.84)	(21.42)	(2.42)
5. Replacement Cost	38.56	19.28	2.18
6. Annual Cost	0.84	0.42	0.05

Revised Table Q 45 Continued (2)

CONSTANT DRAFT OPERATION

Unit: \$ 10⁶

Order of Construction	Hadong-Gwangyang Pipeline		
	1	2	3
1. Capacity (m ³ /s)	3.5	3.7	1.35
2. Accumulation of 1 (m ³ /s)	3.5	7.2	8.55
3. Construction Start	1984.0	1984.0	1988.7
4. Investment Cost	26.12	28.04	9.46
4.1 Civil works	(7.55)	(7.81)	(2.32)
4.2 Metalworks	(18.57)	(20.23)	(7.14)
5. Replacement Cost	16.71	18.21	6.43
6. Annual Cost	1.17	1.12	0.39

O & M Cost of Existing Pipeline

1. Fixed Cost	0.74
2. Material Cost	0.14
3. Energy Cost	2.02
Total	2.90

Additional Table Q 45 Continued (3)

VARIABLE DRAFT OPERATION

Unit: \$ 10⁶

Order of Construction	Alternative Yeonggye Dam		
	1	2	3
1. Net Supply Capacity (m ³ /s)	6.2	6.2	6.2
2. Accumulation of 1 (m ³ /s)	6.2	12.4	18.6
3. Construction Start	1981.0	1982.5	1993.3
4. Investment Cost	37.96	37.96	37.96
4.1 Civil works	(34.92)	(34.92)	(34.86)
4.2 Metalworks	(3.04)	(3.04)	(3.04)
5. Replacement Cost	2.74	2.74	2.74
6. Annual Cost	0.25	0.25	0.25

Order of Construction	Alternative Yeonggye-Gwangyang Pipeline				
	1 & 2	3	4	5	6
1. Capacity (m ³ /s)	6.2	3.1	3.1	3.1	3.1
2. Accumulation of 1 (m ³ /s)	6.2	9.3	12.4	15.5	18.6
3. Construction Start	1984.0	1985.5	1990.6	1996.3	2002.2
4. Investment Cost	49.46	24.73	24.73	24.73	24.65
4.1 Civil works	(6.62)	(3.31)	(3.31)	(3.31)	(3.30)
4.2 Metalworks	(42.84)	(21.42)	(21.42)	(21.42)	(21.35)
5. Replacement Cost	38.56	19.28	19.28	19.28	19.22
6. Annual Cost	0.84	0.42	0.42	0.42	0.42

Additional Table Q 45 Continued (4)

VARIABLE DRAFT OPERATION

Unit: \$ 10⁶

Order of Construction	Hadong-Gwangyang Pipeline				
	1	2	3	4	5
1. Capacity (m ³ /s)	3.5	3.7	3.7	3.7	2.9
2. Accumulation of l (m ³ /s)	3.5	7.2	10.9	14.6	17.5
3. Construction Start	1984.0	1984.0	1988.7	1995.5	2002.3
4. Investment Cost	26.12	28.04	25.93	28.04	20.32
4.1 Civil works	(7.55)	(7.81)	(6.36)	(7.81)	(4.98)
4.2 Metalworks	(18.57)	(20.23)	(19.57)	(20.23)	(15.34)
5. Replacement Cost	16.71	18.21	17.61	18.21	13.80
6. Annual Cost	1.17	1.12	1.08	1.12	0.85

O & M Cost of Existing Pipeline

1. Fixed Cost	0.74
2. Material Cost	0.14
3. Energy Cost	2.02
Total	2.90

Revised Table Q 46 ASSOCIATED FACILITIES COST OF
 JUAM DAM (MAIN STREAM PLAN) FOR
 M&I WATER SUPPLY

CONSTANT DRAFT OPERATION

Unit: \$ 10⁶

Order of Construction	Hadong-Gwangyang Pipeline		
	1	2	3
1. Capacity (m ³ /s)	3.5	3.7	1.35
2. Accumulation of 1 (m ³ /s)	3.5	7.2	8.55
3. Construction Start	1984.0	1984.0	1988.7
4. Investment Cost	26.12	28.04	9.46
4.1 Civil works	(7.55)	(7.81)	(2.32)
4.2 Metalworks	(18.57)	(20.23)	(7.14)
5. Replacement Cost	16.71	18.21	6.43
6. Annual Cost	1.69	1.58	0.56

O & M Cost of Existing Pipeline

1. Fixed Cost	0.74
2. Material Cost	0.15
3. Energy Cost	2.14
Total	3.03

Additional Table Q 46 Continued (2)

VARIABLE DRAFT OPERATION

Unit: \$ 10⁶

Order of Construction	Hadong-Gwangyang Pipeline				
	1	2	3	4	5
1. Capacity (m ³ /s)	3.5	3.7	3.7	3.7	2.9
2. Accumulation of 1 (m ³ /s)	3.5	7.2	10.9	14.6	17.5
3. Construction Start	1984.0	1984.0	1988.7	1995.5	2002.3
4. Investment Cost	26.12	28.04	25.93	28.04	20.32
4.1 Civil works	(7.55)	(7.81)	(6.36)	(7.81)	(4.98)
4.2 Metalworks	(18.57)	(20.23)	(19.57)	(20.23)	(15.34)
5. Replacement Cost	16.71	18.21	17.61	18.21	13.80
6. Annual Cost	1.69	1.58	1.54	1.58	0.85

O & M Cost of Existing Pipeline

1. Fixed Cost	0.74
2. Material Cost	0.15
3. Energy Cost	2.14
Total	3.03

Revised Table Q 47 ALTERNATIVE FACILITIES COST OF
 JUAM DAM (DIVERSION PLAN) FOR
 M&I WATER SUPPLY

ROUTE A

Unit: \$ 10⁶

Order of Construction	Alternative Yeonggye Dam		
	1	2	3
1. Net Supply Capacity (m ³ /s)	6.2	6.2	3.7
2. Accumulation of 1 (m ³ /s)	6.2	12.4	16.10
3. Construction Start	1981.0	1982.5	1993.3
4. Investment Cost	37.96	37.96	22.65
4.1 Civil works	(34.92)	(34.92)	(20.84)
4.2 Metalworks	(3.04)	(3.04)	(1.81)
5. Replacement Cost	2.74	2.74	1.63
6. Annual Cost	0.25	0.25	0.15

Order of Construction	Alternative Yeonggye-Gwangyang Pipeline				
	1 & 2	3	4	5	6
1. Capacity (m ³ /s)	6.2	3.1	3.1	3.1	0.6
2. Accumulation of 1 (m ³ /s)	6.2	9.3	12.4	15.5	16.1
3. Construction Start	1984.0	1985.5	1990.6	1996.3	2002.0
4. Investment Cost	49.46	24.73	24.73	24.73	4.79
4.1 Civil works	(6.62)	(3.31)	(3.31)	(3.31)	(0.64)
4.2 Metalworks	(42.84)	(21.42)	(21.42)	(21.42)	(4.15)
5. Replacement Cost	38.56	19.28	19.28	19.28	3.73
6. Annual Cost	0.84	0.42	0.42	0.42	0.08

Revised Table Q 47 Continued (2)

ROUTE A

Unit: \$ 10⁶

Order of Construction	Hadong-Gwangyang Pipeline				
	1	2	3	4	5
1. Capacity (m ³ /s)	3.5	3.7	3.7	3.7	0.4
2. Accumulation of 1 (m ³ /s)	3.5	7.2	10.9	14.6	15.0
3. Construction Start	1984.0	1984.0	1988.7	1995.5	2002.3
4. Investment Cost	26.12	28.04	25.93	28.04	2.80
4.1 Civil works	(7.55)	(7.81)	(6.36)	(7.81)	(0.69)
4.2 Metalworks	(18.57)	(20.23)	(19.57)	(20.23)	(2.11)
5. Replacement Cost	16.71	18.21	17.61	18.21	1.90
6. Annual Cost	1.17	1.12	1.08	1.12	1.08

O & M Cost of Existing Pipeline

1. Fixed Cost	0.74
2. Material Cost	0.14
3. Energy Cost	2.02
Total	2.90

Additional Table Q 47 Continued (3)

ROUTE B

Unit: \$ 10⁶

Order of Construction	Alternative Yeonggye Dam		
	1	2	3
1. Net Supply Capacity (m ³ /s)	6.2	6.2	2.5
2. Accumulation of 1 (m ³ /s)	6.2	12.4	14.9
3. Construction Start	1981.0	1982.5	1993.3
4. Investment Cost	37.96	37.96	15.31
4.1 Civil works	(34.92)	(34.92)	(14.08)
4.2 Metalworks	(3.04)	(3.04)	(1.23)
5. Replacement Cost	2.74	2.74	1.10
6. Annual Cost	0.25	0.25	0.10

Order of Construction	Alternative Yeonggye-Gwangyang Pipeline			
	1 & 2	3	4	5
1. Capacity (m ³ /s)	6.2	3.1	3.1	2.5
2. Accumulation of 1 (m ³ /s)	6.2	9.3	12.4	14.9
3. Construction Start	1984.0	1985.5	1990.6	1996.3
4. Investment Cost	49.46	24.73	24.73	19.94
4.1 Civil works	(6.62)	(3.31)	(3.31)	(2.67)
4.2 Metalworks	(42.84)	(21.42)	(21.42)	(17.27)
5. Replacement Cost	38.56	19.28	19.28	15.55
6. Annual Cost	0.84	0.42	0.42	0.34

Additional Table Q 47 Continued (4)

ROUTE B

Unit: \$ 10⁶

Order of Construction	Hadong-Gwangyang Pipeline			
	1	2	3	4
1. Capacity (m ³ /s)	3.5	3.7	3.7	2.9
2. Accumulation of 1 (m ³ /s)	3.5	7.2	10.9	13.8
3. Construction Start	1984.0	1984.0	1988.7	1995.5
4. Investment Cost	26.12	28.04	25.93	21.98
4.1 Civil works	(7.55)	(7.81)	(6.36)	(6.12)
4.2 Metalworks	(18.57)	(20.23)	(19.57)	(15.86)
5. Replacement Cost	16.71	18.21	17.61	14.27
6. Annual Cost	1.17	1.12	1.08	0.88

O & M Cost of Existing Pipeline

1. Fixed Cost	0.74
2. Material Cost	0.14
3. Energy Cost	2.02
Total	2.90

Additional Table Q 47 Continued (5)

ROUTE C

Unit: \$ 10⁶

Order of Construction	Alternative Yeonggye Dam		
	1	2	3
1. Net Supply Capacity (m ³ /s)	6.2	6.2	3.7
2. Accumulation of l (m ³ /s)	6.2	12.4	16.10
3. Construction Start	1981.0	1982.5	1993.3
4. Investment Cost	37.96	37.96	22.65
4.1 Civil works	(34.92)	(34.92)	(20.84)
4.2 Metalworks	(3.04)	(3.04)	(1.81)
5. Replacement Cost	2.74	2.74	1.63
6. Annual Cost	0.25	0.25	0.15

Order of Construction	Alternative Yeonggye-Gwangyang Pipeline				
	1 & 2	3	4	5	6
1. Capacity (m ³ /s)	6.2	3.1	3.1	3.1	0.6
2. Accumulation of l (m ³ /s)	6.2	9.3	12.4	15.5	16.1
3. Construction Start	1984.0	1985.5	1990.6	1996.3	2002.0
4. Investment Cost	49.46	24.73	24.73	24.73	4.79
4.1 Civil works	(6.62)	(3.31)	(3.31)	(3.31)	(0.64)
4.2 Metalworks	(42.84)	(21.42)	(21.42)	(21.42)	(4.15)
5. Replacement Cost	38.56	19.28	19.28	19.28	3.73
6. Annual Cost	0.84	0.42	0.42	0.42	0.08

Additional Table Q 47 Continued (6)

ROUTE C

Unit: \$ 10⁶

Order of Construction	Hadong-Gwangyang Pipeline				
	1	2	3	4	5
1. Capacity (m ³ /s)	3.5	3.7	3.7	3.7	0.4
2. Accumulation of 1 (m ³ /s)	3.5	7.2	10.9	14.6	15.0
3. Construction Start	1984.0	1984.0	1988.7	1995.5	2002.3
4. Investment Cost	26.12	28.04	25.93	28.04	2.80
4.1 Civil works	(7.55)	(7.81)	(6.36)	(7.81)	(0.69)
4.2 Metalworks	(18.57)	(20.23)	(19.57)	(20.23)	(2.11)
5. Replacement Cost	16.71	18.21	17.61	18.21	1.90
6. Annual Cost	1.17	1.12	1.08	1.12	1.08

O & M Cost of Existing Pipeline

1. Fixed Cost	0.74
2. Material Cost	0.14
3. Energy Cost	2.02
Total	2.90

Revised Table Q 48 ASSOCIATED FACILITIES COST OF
 JUAM DAM (DIVERSION PLAN) FOR
 M&I WATER SUPPLY

ROUTE A

Unit: \$ 10⁶

Order of Construction	Diversion Pipeline				
	1	2	3	4	5
1. Capacity (m ³ /s)	3.7	3.7	3.7	3.7	0.2
2. Accumulation of 1 (m ³ /s)	3.7	7.4	11.1	14.8	15.0
3. Construction Start	1984.0	1984.0	1989.1	1995.9	2002.7
4. Investment Cost	32.30	31.88	31.88	31.88	1.72
4.1 Civil works	(3.94)	(3.94)	(3.94)	(3.94)	(0.21)
4.2 Metalworks	(28.36)	(27.94)	(27.94)	(27.94)	(1.51)
5. Replacement Cost	25.52	25.15	25.15	25.15	1.36
6. Annual Cost	0.54	0.48	0.48	0.48	0.03

Diversion Tunnel		O & M Cost of Existing Pipeline	
1. Capacity (m ³ /s)	15.0	1. Fixed Cost	0.74
2. Construction Start	1983.0	2. Material Cost	0.15
3. Investment Cost	17.66	3. Energy Cost	2.14
3.1 Civil works	(17.31)		
3.2 Metalworks	(0.35)	<u>Total</u>	3.03
4. Replacement Cost	0.32		
5. Annual Cost	0.09		

Additional Table Q 48 Continued (2)

ROUTE B

Unit: \$ 10⁶

order of Construction	Diversion Pipeline			
	1	2	3	4
1. Capacity (m ³ /s)	3.7	3.7	3.7	2.7
2. Accumulation of 1 (m ³ /s)	3.7	7.4	11.1	13.8
3. Construction Start	1984.0	1984.0	1989.1	1995.9
4. Investment Cost	27.21	27.21	27.21	19.86
4.1 Civil works	(3.94)	(3.94)	(3.94)	(2.88)
4.2 Metalworks	(23.27)	(23.27)	(23.27)	(16.98)
5. Replacement Cost	20.94	20.94	20.94	15.28
6. Annual Cost	0.50	0.50	0.50	0.36

Diversion Tunnel		O & M Cost of Existing Pipeline	
1. Capacity (m ³ /s)	11.8	1. Fixed Cost	0.74
2. Construction Start	1983.0	2. Material Cost	0.15
3. Investment Cost	13.22	3. Energy Cost	2.14
3.1 Civil works	(12.62)		
3.2 Metalworks	(0.60)	Total	3.03
4. Replacement Cost	0.54		
5. Annual Cost	0.07		

Additional Table Q 48 Continued (3)

ROUTE C

Unit: \$ 10⁶

Order of Construction	Diversion Pipeline				
	1	2	3	4	5
1. Capacity (m ³ /s)	3.7	3.7	3.7	3.7	0.2
2. Accumulation of 1 (m ³ /s)	3.7	7.4	11.1	14.8	15.0
3. Construction Start	1984.0	1984.0	1989.1	1995.9	2002.7
4. Investment Cost	42.40	42.40	42.40	42.40	2.29
4.1 Civil works	(5.28)	(5.28)	(5.28)	(5.28)	(0.29)
4.2 Metalworks	(37.12)	(37.12)	(37.12)	(37.12)	(2.00)
5. Replacement Cost	33.41	33.41	33.41	33.41	1.80
6. Annual Cost	0.90	0.90	0.90	0.90	0.05

Diversion Tunnel		O & M Cost of Existing Pipeline	
1. Capacity (m ³ /s)	15.0	1. Fixed Cost	0.74
2. Construction Start	1983.0	2. Material Cost	0.15
3. Investment Cost	22.00	3. Energy Cost	2.14
3.1 Civil works	(20.84)		
3.2 Metalworks	(1.16)	Total	3.03
4. Replacement Cost	1.04		
5. Annual Cost	0.11		

Revised Table Q 49 CONVERSION OF M&I ALTERNATIVE FACILITIES COST TO M&I BENEFIT

Year in Order	Bamseonggol (C)			Hongcheon (C)			Imha (C)		
	M&I Alter- native ^{/1}	Net Water ^{/2}	M&I ^{/3}	M&I Alter- native	Net Water	M&I	M&I Alter- native	Net Water	M&I
	Cost (\$ 10 ⁶)	Supply (m ³ /s)	Benefit (\$ 10 ⁶)	Cost (\$ 10 ⁶)	Supply (m ³ /s)	Benefit (\$ 10 ⁶)	Cost (\$ 10 ⁶)	Supply (m ³ /s)	Benefit (\$ 10 ⁶)
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
1	5.44	-	-	3.44	-	-	5.89	-	-
2	10.87	-	-	6.88	-	-	11.79	-	-
3	10.87	-	-	6.88	-	-	11.79	-	-
4	10.87	-	-	6.88	-	-	11.79	-	-
5	5.44	-	-	3.44	-	-	5.89	-	-
6	1.30	2.77	1.68	3.54	2.77	1.10	0.79	0.76	0.48
7	1.30	8.32	5.06	3.54	8.32	3.29	0.79	2.29	1.45
8	1.30	9.80	5.96	3.54	13.86	5.48	0.79	3.85	2.44
9	.	9.80	5.96	.	17.70	7.00	.	5.41	3.43
10	.	9.80	5.96	.	.	.	.	6.97	4.42
11	.	.	.	.	.	.	.	8.53	5.41
12	.	.	.	.	.	.	.	10.07	6.38
13	.	.	.	.	.	.	.	11.30	7.16
14	.	.	.	.	.	.	.	.	.
15	.	.	.	.	.	.	.	.	.
16	.	.	.	.	.	.	.	.	.
17	.	.	.	.	.	.	.	.	.
18	ditto	.	.	.	.	.	.	.	.
19	.	.	.	ditto	.	.	ditto	.	.
20	.	.	.	.	.	.	.	.	.
.
.
.
.
30	1.30	.	.	3.54	.	.	0.79	.	.
31	2.08	.	.	4.49	.	.	1.77	.	.
32	2.86	ditto	ditto	5.44	.	.	2.75	.	.
33	2.86	.	.	5.44	.	.	2.75	.	.
34	2.86	.	.	5.44	.	.	2.75	.	.
35	2.08	.	.	4.49	.	.	1.77	.	.
36	1.30	.	.	3.54	.	.	0.79	.	.
37	1.30	.	.	.	ditto	ditto	.	ditto	ditto
38	.	.	.	.	.	.	.	.	.
39	.	.	.	.	.	.	.	.	.
40	.	.	.	.	.	.	.	.	.
41	.	.	.	.	.	.	.	.	.
42	ditto	.	.	ditto	.	.	ditto	.	.
43	.	.	.	.	.	.	.	.	.
44	.	.	.	.	.	.	.	.	.
45	.	.	.	.	.	.	.	.	.
46	.	.	.	.	.	.	.	.	.
47	.	.	.	.	.	.	.	.	.
48	.	.	.	3.54	17.70	7.00	0.79	11.30	7.16
49	.	.	.	3.54	17.70	7.00	0.79	11.30	7.16
50	1.30	9.80	5.96	3.54	17.70	7.00	0.79	11.30	7.16
T.P.W. ^{/4}	45.88	75.47 ^{/5}	45.89	50.99	128.91	50.98	44.73	70.57	44.72

/1 : See Table Q 44

/2 : Annual increase of net water supply ; 5.544 m³/s/year (Han basin)

/3 : M&I benefit is calculated as follows.

$$(3) = \frac{\text{T.P.W. of (1)}}{\text{T.P.W. of (2)}} \times (2)$$

/4 : Total Present Worth (Discount rate ; 8 %)

/5 : Total present worth in column (2) is calculated assuming the unit value of net water supply is \$ 1/m³/s.

Revised Table Q 49 Continued (2)

Year in Order	Juam (C) : Main Stream						Hongcheon (V)		
	M&I Alternative Cost		Project Associ- ated Cost (\$ 10 ⁶)	(1)+(2)-(3) (\$ 10 ⁶)	Net Water Supply (m ³ /s)	M&I Benefit (\$ 10 ⁶)	M&I	Net Water Supply (m ³ /s)	M&I Benefit (\$ 10 ⁶)
	Dam	Associ- ated					Alter- native Cost (\$ 10 ⁶)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	4.75	-	-	4.75	-	-	3.54	-	-
2	12.13	-	-	12.13	-	-	7.08	-	-
3	14.77	-	-	14.77	-	-	7.08	-	-
4	14.77	51.81	27.08	39.50	-	-	10.40	-	-
5	10.03	64.18	27.08	47.13	-	-	10.19	-	-
6	2.89	18.40	6.30	14.99	5.56	8.30	8.55	2.77	1.23
7	0.39	6.45	6.30	0.54	6.21	9.27	12.65	8.32	3.68
8	0.39	11.23	11.03	0.59	6.85	10.22	22.52	13.86	6.14
9	0.39	11.23	11.03	0.59	7.49	11.18	31.71	19.40	8.59
10	.	8.24	6.86	1.77	8.14	12.15	31.71	24.95	11.05
11	.	8.24	6.86	1.77	8.73	13.03	27.60	30.49	13.50
12	.	6.89	6.86	0.42	9.27	13.84	15.39	36.04	15.96
13	.	6.89	.	.	9.65	14.40	11.64	41.58	18.41
14	.	.	.	.	.	.	11.64	47.12	20.86
15	.	.	.	.	.	.	11.64	52.67	23.32
16	.	.	.	.	.	.	18.95	58.21	25.77
17	.	.	.	.	.	.	26.26	63.76	28.23
18	.	.	.	.	.	.	26.26	69.30	30.68
19	.	.	.	.	.	.	26.26	74.84	33.13
20	ditto	ditto	ditto	ditto	.	.	18.95	80.39	35.59
21	.	.	.	.	.	.	15.13	85.93	38.04
22	.	.	.	.	.	.	15.13	90.90	40.25
23	.	.	.	.	.	.	.	.	.
24	.	.	.	.	.	.	.	.	.
25	.	.	.	.	.	.	.	.	.
26	.	.	.	.	.	.	ditto	.	.
27	.	.	.	.	.	.	.	.	.
28	.	.	.	.	ditto	ditto	.	.	.
29	.	.	.	.	.	.	.	.	.
30	0.39	.	.	0.42	.	.	15.13	.	.
31	0.73	.	.	0.76	.	.	15.92	.	.
32	1.27	.	.	1.30	.	.	16.71	.	.
33	1.46	6.89	6.86	1.49	.	.	16.71	.	.
34	1.46	43.63	24.32	20.77	.	.	17.63	ditto	ditto
35	1.11	53.27	24.32	30.06	.	.	17.76	.	.
36	0.58	16.53	6.86	10.25	.	.	16.97	.	.
37	0.39	6.89	6.86	0.42	.	.	17.56	.	.
38	.	10.11	10.08	0.42	.	.	20.63	.	.
39	.	10.11	10.08	0.42	.	.	23.12	.	.
40	.	7.98	6.86	1.51	.	.	23.12	.	.
41	.	7.98	.	1.51	.	.	22.53	.	.
42	ditto	6.89	.	0.42	.	.	18.53	.	.
43	.	.	.	0.42	.	.	15.13	.	.
44	.	.	.	.	.	.	15.13	.	.
45	.	ditto	ditto	.	.	.	15.13	.	.
46	.	.	.	ditto	.	.	18.15	.	.
47	.	.	.	.	.	.	21.90	.	.
48	0.39	6.89	6.86	0.42	9.65	14.40	21.90	90.90	40.25
49	0.39	6.89	6.86	0.42	9.65	14.40	21.90	90.90	40.25
50	0.39	6.89	6.86	0.42	9.65	14.40	18.51	90.90	40.25
T.P.W.	49.32	158.11	101.32	106.12	71.10	106.11	183.91	415.39	183.93

Revised Table Q 49 Continued (3)

Year in Order	Dalcheon (V)			Ganhyeon (V)			Imha (V)		
	M&I Alter- native Cost (\$ 10 ⁶)	Net Water Supply (m ³ /s)	M&I Benefit (\$ 10 ⁶)	M&I Alter- native Cost (\$ 10 ⁶)	Net Water Supply (m ³ /s)	M&I Benefit (\$ 10 ⁶)	M&I Alter- native Cost (\$ 10 ⁶)	Net Water Supply (m ³ /s)	M&I Benefit (\$ 10 ⁶)
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
1	3.54	-	-	3.54	-	-	5.79	-	-
2	7.08	-	-	7.08	-	-	11.58	-	-
3	7.08	-	-	7.08	-	-	11.58	-	-
4	10.40	-	-	10.40	-	-	11.58	-	-
5	10.19	-	-	10.19	-	-	5.79	-	-
6	8.55	2.77	1.11	8.55	2.77	1.10	1.83	0.76	0.45
7	12.65	8.32	3.32	12.65	8.32	3.31	1.83	2.29	1.35
8	21.81	13.86	5.53	21.48	13.86	5.51	1.83	3.85	2.27
9	30.28	19.40	7.74	29.63	19.40	7.72	.	5.41	3.20
10	30.28	24.95	9.96	29.63	24.95	9.92	.	6.97	4.12
11	26.17	30.49	12.17	25.52	30.49	12.13	.	8.53	5.04
12	14.68	36.04	14.38	14.35	36.04	14.34	.	10.07	5.95
13	11.22	41.58	16.59	11.03	41.58	16.54	.	11.62	6.86
14	.	47.12	18.80	.	47.12	18.74	.	13.16	7.77
15	.	52.67	21.02	.	52.67	20.95	.	14.71	8.69
16	.	58.21	23.23	.	58.21	23.15	.	15.80	9.33
17	.	63.76	25.44	.	63.76	25.36	ditto	.	.
18	.	69.30	27.65	.	69.30	27.57	.	.	.
19	.	74.84	29.86	.	74.84	29.77	.	.	.
20	.	79.80	31.84	ditto	78.20	31.11	.	.	.
21	ditto	.	.	.	.	.	.	.	.
22	.	.	.	.	.	.	.	.	.
.
.
.
.
30	11.22	.	.	11.03	.	.	1.83	.	.
31	12.01	.	.	11.82	.	.	2.65	.	.
32	12.80	.	.	12.61	.	.	3.46	.	.
33	12.80	.	.	12.61	.	.	3.46	ditto	ditto
34	13.72	.	.	13.53	.	.	3.46	.	.
35	13.85	ditto	ditto	13.66	.	.	2.65	.	.
36	13.06	.	.	12.87	.	.	1.83	.	.
37	13.65	.	.	13.46	ditto	ditto	.	.	.
38	16.46	.	.	16.14	.	.	.	.	.
39	18.67	.	.	18.24	.	.	.	.	.
40	18.67	.	.	18.24	.	.	.	.	.
41	18.08	.	.	17.65	.	.	.	.	.
42	14.36	.	.	14.04	.	.	ditto	.	.
43	11.22	.	.	11.03	.	.	.	.	.
44	11.22	.	.	.	.	.	.	.	.
45	11.22	.	.	.	.	.	.	.	.
46	11.22	.	.	.	.	.	.	.	.
47	11.22	.	.	.	.	.	.	.	.
48	11.22	79.80	31.84	.	78.20	31.11	1.83	15.80	9.33
49	11.22	79.80	31.84	.	78.20	31.11	1.83	15.80	9.33
50	11.22	79.80	31.84	11.03	78.20	31.11	1.83	15.80	9.33
T.P.W.	155.39	389.45	155.40	153.24	385.24	153.25	52.53	88.93	52.52

/1 : Annual increase of net water supply of Nagdong basin is as follows.

1991 - 1995 : 1.560 m³/s/year
 After 1996 : 1.544 m³/s/year

Revised Table Q 49 Continued (4)

Year in Order	Juam (V) : Main Stream					
	M&I		Project Associ- ated Cost (\$ 10 ⁶)	(1)+(2)-(3) (\$ 10 ⁶)	Net Water Supply (m ³ /s)	M&I Benefit (\$ 10 ⁶)
	Alternative Cost					
	Dam (\$ 10 ⁶)	Associ- ated (\$ 10 ⁶)	(3)	(4)	(5)	(6)
(1)	(2)	(3)	(4)	(5)	(6)	
1	4.75	-	-	4.75	-	-
2	14.24	-	-	14.24	-	-
3	18.98	-	-	18.98	-	-
4	18.98	51.81	27.08	43.71	-	-
5	14.24	64.18	27.08	51.34	-	-
6	5.00	18.40	6.30	17.10	5.56	9.20
7	0.50	6.45	6.30	0.65	6.21	10.28
8	0.50	19.42	19.27	0.65	6.85	11.34
9	0.50	19.42	19.27	0.65	7.49	12.40
10	0.50	19.90	7.84	12.56	8.14	13.47
11	0.50	19.90	7.84	12.56	8.73	14.45
12	0.50	7.95	7.84	0.61	9.27	15.34
13	5.25	7.95	7.84	5.36	9.81	16.24
14	9.99	7.95	7.84	10.01	10.35	17.13
15	9.99	21.97	21.86	10.01	10.89	18.02
16	9.99	34.34	21.86	22.47	11.43	18.92
17	5.25	21.44	9.42	17.27	11.97	19.81
18	0.75	9.49	9.42	0.82	12.52	20.72
19	.	9.49	9.42	0.82	13.06	21.61
20	.	9.49	9.42	0.82	13.60	22.51
21	.	9.49	9.42	0.82	14.14	23.40
22	.	32.02	19.58	13.19	14.68	24.29
23	.	32.02	19.58	13.19	15.23	25.21
24	ditto	10.76	10.63	0.88	15.77	26.10
25	.	.	.	.	16.31	26.99
26	.	.	.	.	16.85	27.89
27	.	ditto	ditto	ditto	17.39	28.78
28	.	.	.	.	17.94	29.69
29	.	.	.	.	18.48	30.58
30	0.75	10.76	10.63	0.88	18.60	30.78
31	1.09	10.76	10.63	1.22	.	.
32	1.78	10.76	10.63	1.91	.	.
33	2.13	10.76	10.63	2.26	.	.
34	2.13	47.50	28.09	21.54	.	.
35	1.78	57.14	28.09	30.83	.	.
36	1.09	20.40	10.63	10.86	.	.
37	0.75	10.76	10.63	0.88	.	.
38	0.75	19.57	19.44	0.88	.	.
39	0.75	19.57	19.44	0.88	.	.
40	0.75	20.40	10.63	10.52	ditto	ditto
41	0.75	20.40	10.63	10.52	.	.
42	0.75	10.76	10.63	0.88	.	.
43	1.09	10.76	10.63	1.22	.	.
44	1.44	10.76	10.63	1.57	.	.
45	1.44	19.87	19.74	1.57	.	.
46	1.44	29.51	19.74	11.21	.	.
47	1.09	20.40	10.63	10.86	.	.
48	0.75	10.76	10.63	0.88	.	.
49	0.75	10.76	10.63	0.88	.	.
50	0.75	10.76	10.63	0.88	18.60	30.78
T.P.W.	75.58	215.70	136.59	154.69	93.47	154.69

Additional Table Q 49 Continued (5)

Juam (V) : Diversion Route A						
Year in Order	Alternative Cost		Project	(1)+(2)-(3) (\$ 10 ⁶)	Net Water Supply (m ³ /s)	M&I Benefit (\$ 10 ⁶)
	Dam (\$ 10 ⁶)	Associ- ated (\$ 10 ⁶)	Associ- ated Cost (\$ 10 ⁶)			
	(1)	(2)	(3)	(4)	(5)	(6)
1	4.75	-	-	4.75	-	-
2	14.24	-	-	14.24	-	-
3	18.98	-	4.42	14.56	-	-
4	18.98	51.81	40.92	29.87	-	-
5	14.24	64.18	36.51	41.91	-	-
6	5.00	18.40	4.14	19.26	5.56	9.02
7	0.50	6.45	4.14	2.81	6.21	10.08
8	0.50	19.42	22.81	-2.89	6.85	11.12
9	0.50	19.42	22.81	-2.89	7.49	12.16
10	0.50	19.90	4.62	15.78	8.14	13.21
11	0.50	19.90	4.62	15.78	8.73	14.17
12	0.50	7.95	4.62	3.83	9.27	15.05
13	3.33	7.95	4.62	6.66	9.81	15.92
14	6.16	7.95	4.62	9.49	10.35	16.80
15	6.16	21.97	20.56	7.57	10.89	17.68
16	6.16	34.34	20.56	19.94	11.43	18.55
17	3.33	21.44	5.10	19.67	11.97	19.43
18	0.65	9.49	5.10	5.04	12.52	20.32
19	.	9.49	5.10	5.04	13.06	21.20
20	.	9.49	5.10	5.04	13.60	22.07
21	.	9.49	5.10	5.04	14.14	22.95
22	.	13.29	5.96	7.98	14.68	23.83
23	.	13.29	5.96	7.98	15.23	24.72
24	ditto	9.69	5.13	5.21	15.77	25.60
25	.	.	.	.	16.10	26.13
26	.	.	.	.	.	.
27	.	.	.	ditto	.	.
28	.	ditto	ditto	.	.	.
29	.	.	.	.	.	.
30	0.65	.	.	5.21	.	.
31	0.99	.	.	5.55	.	.
32	1.68	9.69	5.13	6.24	.	.
33	2.03	9.69	5.21	6.51	.	.
34	2.03	46.43	30.63	17.83	.	.
35	1.68	56.07	30.55	27.20	.	.
36	0.99	19.33	5.13	15.19	.	.
37	0.65	9.69	5.13	5.21	ditto	ditto
38	0.65	18.50	17.71	1.44	.	.
39	0.65	18.50	17.71	1.44	.	.
40	0.65	19.33	5.13	14.85	.	.
41	0.65	19.33	.	14.85	.	.
42	0.65	9.69	.	5.21	.	.
43	0.85	9.69	.	5.41	.	.
44	1.06	9.69	.	5.62	.	.
45	1.06	18.80	ditto	14.73	.	.
46	1.06	28.44	.	24.37	.	.
47	0.85	19.33	.	15.05	.	.
48	0.65	9.69	.	5.21	.	.
49	0.65	9.69	.	5.21	.	.
50	0.65	9.69	5.13	5.21	16.10	26.13
T.P.W.	70.38	206.51	130.78	146.11	90.02	146.11

Additional Table Q 49 Continued (6)

Juan (V) : Diversion Route B						
Year in Order	M&I Alternative Cost		Project Associ- ated Cost (\$ 10 ⁶)	(1)+(2)-(3) (\$ 10 ⁶)	Net Water Supply (m ³ /s)	M&I Benefit (\$ 10 ⁶)
	Dam (\$ 10 ⁶)	Associ- ated (\$ 10 ⁶)				
	(1)	(2)	(3)	(4)	(5)	(6)
1	4.75	-	4.74	0.01	-	-
2	14.24	-	9.48	4.76	-	-
3	18.98	-	12.79	6.19	-	-
4	18.98	51.81	43.30	27.49	-	-
5	14.24	64.15	35.26	43.13	-	-
6	5.00	18.37	4.36	19.01	5.56	7.93
7	0.50	6.45	4.36	2.59	6.21	8.86
8	0.50	19.42	17.97	1.95	6.85	9.77
9	0.50	19.42	17.97	1.95	7.49	10.68
10	0.50	19.87	4.86	15.51	8.14	11.61
11	0.50	19.87	4.86	15.51	8.73	12.45
12	0.50	7.95	4.86	3.59	9.27	13.22
13	2.41	7.95	4.86	5.50	9.81	13.99
14	4.33	7.95	4.86	7.42	10.35	14.76
15	4.33	18.94	14.79	8.48	10.89	15.53
16	4.33	28.91	14.79	18.45	11.43	16.30
17	2.41	18.80	5.22	15.99	11.97	17.07
18	0.60	9.17	.	4.55	12.52	17.86
19	.	.	.	4.55	13.06	18.63
20	.	.	.	.	13.60	19.40
21	.	.	.	.	14.14	20.17
22	.	.	.	.	14.68	20.94
23	.	.	.	.	14.90	21.25
24	ditto	ditto	ditto	ditto	.	.
25	.	.	.	.	.	.
26	.	.	.	.	.	.
27	.	.	.	.	.	.
28	.	.	.	.	.	.
29	.	.	.	.	.	.
30	0.60	.	5.22	4.55	.	.
31	0.94	.	5.56	4.55	.	.
32	1.63	9.17	5.91	4.89	.	.
33	1.98	9.17	6.05	5.10	.	.
34	1.98	45.91	27.12	20.77	.	.
35	1.63	55.55	26.64	30.54	.	.
36	0.94	18.81	5.22	14.53	ditto	ditto
37	0.60	9.17	5.22	4.55	.	.
38	0.65	17.98	15.69	2.89	.	.
39	0.65	17.98	15.69	2.89	.	.
40	0.65	18.81	5.22	14.19	.	.
41	0.65	18.81	5.22	14.19	.	.
42	0.60	9.17	5.22	4.55	.	.
43	0.74	9.17	5.22	4.69	.	.
44	0.88	9.17	5.22	4.83	.	.
45	0.88	16.31	12.86	4.33	.	.
46	0.88	24.09	12.86	12.11	.	.
47	0.74	0.74	5.22	12.47	.	.
48	0.60	0.60	5.22	4.55	14.90	21.25
49	0.60	0.60	5.22	4.55	14.90	21.25
50	0.60	0.60	5.22	4.55	14.90	21.25
T.P.W.	67.83	199.85	143.57	125.20	87.78	125.19

Additional Table Q 49 Continued (7)

Juam (V) : Diversion Route C						
Year in Order	M&I Alternative Cost		Project Associ- ated Cost	(1)+(2)-(3) (\$ 10 ⁶)	Net Water Supply (m ³ /s)	M&I Benefit (\$ 10 ⁶)
	Dam (\$ 10 ⁶)	Associ- ated (\$ 10 ⁶)	(\$ 10 ⁶)			
	(1)	(2)	(3)	(4)	(5)	(6)
1	4.75	-	-	4.75	-	-
2	14.24	-	-	14.24	-	-
3	18.98	-	5.50	13.48	-	-
4	18.98	51.81	53.40	17.39	-	-
5	14.24	64.18	47.90	30.52	-	-
6	5.00	18.40	4.94	18.46	5.56	6.75
7	0.50	6.45	4.94	2.01	6.21	7.54
8	0.50	19.42	26.14	-6.22	6.85	8.31
9	0.50	19.42	26.14	-6.22	7.49	9.09
10	0.50	19.90	5.84	14.56	8.14	9.88
11	0.50	19.90	5.84	14.56	8.73	10.59
12	0.50	7.95	5.84	2.61	9.27	11.25
13	3.33	7.95	5.84	5.44	9.81	11.90
14	6.16	7.95	5.84	8.27	10.35	12.56
15	6.16	21.97	27.04	1.09	10.89	13.22
16	6.16	34.34	27.04	13.46	11.43	13.87
17	3.33	21.44	6.74	18.03	11.97	14.53
18	0.65	9.49	6.74	3.40	12.52	15.19
19	.	9.49	6.74	3.40	13.06	15.85
20	.	9.49	6.74	3.40	13.60	16.50
21	.	9.49	6.74	3.40	14.14	17.16
22	.	13.29	7.89	6.05	14.68	17.81
23	.	13.29	7.89	6.05	15.23	18.48
24	ditto	9.69	6.79	3.55	15.77	19.14
25	.	.	.	.	16.10	19.54
26	.	.	.	.	.	.
27	.	.	.	ditto	.	.
28	.	ditto	ditto	.	.	.
29	.	.	.	.	.	.
30	0.65	.	.	3.55	.	.
31	0.99	.	.	3.89	.	.
32	1.68	9.69	6.79	4.58	.	.
33	2.03	9.69	7.05	4.67	.	.
34	2.03	46.43	40.46	8.00	.	.
35	1.68	56.07	40.46	17.29	.	.
36	0.99	19.33	6.79	13.53	.	.
37	0.65	9.69	6.79	3.55	ditto	ditto
38	0.65	18.50	23.50	-4.35	.	.
39	0.65	18.50	23.50	-4.35	.	.
40	0.65	19.33	6.79	13.19	.	.
41	0.65	19.33	6.79	13.19	.	.
42	0.65	9.69	6.79	3.55	.	.
43	0.85	9.69	6.79	3.75	.	.
44	1.06	9.69	6.79	3.96	.	.
45	1.06	18.80	23.50	-3.64	.	.
46	1.06	28.44	23.50	6.00	.	.
47	0.85	19.33	6.79	13.39	.	.
48	0.65	9.69	6.79	3.55	16.10	19.54
49	0.65	9.69	6.79	3.55	16.10	19.54
50	0.65	9.69	6.79	3.55	16.10	19.54
T.P.W.	70.38	206.51	168.28	109.24	90.02	109.25

Revised Table Q 50 UNIT VALUE OF M&I WATER

Dam Scheme	Net M&I Supply Capacity (m ³ /s)	Unit Value (mill/m ³)
Bamscongol (C)	9.8	19.3
Hongcheon (C)	17.7	12.5
Hongcheon (V)	90.9	14.0
Dalcheon (V)	79.8	12.7
Ganhyeon (V)	78.2	12.6
Imha (C)	11.3	20.1
Imha (V)	15.8	18.7
Juam: Main Stream (C)	9.65	47.3
Juam: Main Stream (V)	18.6	52.5
Juam: Diversion		
Route A	16.1	51.5
Route B	14.9	45.2
Route C	16.1	38.5

Remarks : C : Constant draft operation

V : Variable draft operation

Revised Table Q 51 Continued (3)

Unit: \$ 10⁶

Year in Order		Year	Economic Benefit				Economic Cost			Total
Year	Order		M&I water supply	Irrigation	Power	Flood control	Production foregone	Dam O & M	Power facilities O & M	
2003.6	1		-	-	-	-	-	-	10.17	10.17
	2		-	-	-	-	-	-	20.33	20.33
	3		-	-	-	-	-	-	20.33	20.33
	4		-	-	-	-	-	-	20.33	20.33
	5		-	-	-	-	-	-	10.17	10.17
2008.6	6		2.36	-	0.66	0.32	-1.87	-	1.47	0.35
	7		4.72	0.15	0.66	0.32	-1.87	-	3.98	0.35
	8		7.08	0.31	0.66	0.32	-1.87	-	6.50	0.35
	9		9.44	0.46	-	-	-	-	9.01	-
	10		11.80	0.61	-	-	-	-	11.52	-
2013.6	11		14.16	0.76	-	-	-	-	14.03	-
	12		16.52	0.92	-	-	-	-	16.55	-
	13		18.88	1.07	-	-	-	-	19.06	-
	14		21.24	1.22	-	-	-	-	21.57	-
	15		23.60	1.38	-	-	-	-	24.09	-
2018.6	16		25.96	1.53	-	-	-	-	26.60	-
	17		28.32	1.68	-	-	-	-	29.11	-
	18		30.68	1.84	-	-	-	-	31.63	-
	19		33.05	1.99	-	-	-	-	34.15	-
	20		35.40	2.14	-	-	-	-	36.65	-
2023.6	21		37.76	2.30	-	-	-	-	39.17	-
	22		38.71	2.45	-	-	-	-	40.27	-
	23		38.71	2.60	-	-	-	-	40.42	-
	24		38.71	2.66	-	-	-	-	40.48	-
	25		-	-	-	-	-	-	-	-
	26		-	-	-	-	-	-	-	-
	27		-	-	-	-	-	-	-	-
	28		-	-	-	-	-	-	-	-
	29		-	-	-	-	-	-	-	-
2033.6	30		-	-	-	-	-	-	-	-
	31		-	-	-	-	-	-	1.09	0.35
	32		-	-	-	-	-	-	2.17	1.44
	33		-	-	-	-	-	-	2.17	2.52
	34		-	-	-	-	-	-	2.17	2.52
	35		-	-	-	-	-	-	2.17	2.52
2038.6	36		ditto	ditto	ditto	ditto	ditto	ditto	1.09	1.44
	37		-	-	-	-	-	-	-	0.35
	38		-	-	-	-	-	-	-	0.35
	39		-	-	-	-	-	-	-	0.35
2048.6	46		-	-	-	-	-	-	-	ditto
	47		-	-	-	-	-	-	-	ditto
	48		38.71	2.66	0.66	0.32	-1.87	-	40.48	0.35
	49		38.71	2.66	0.66	0.32	-1.87	-	40.48	0.35
2052.6	50		38.71	2.66	0.66	0.32	-1.87	-	40.48	0.35

Revised Table Q 51 Continued (4)

Unit: \$ 10⁶

Dalcheon

Year	Year in Order	Economic Benefit				Economic Cost			Total
		M&I water supply	Irrigation	Power	Flood control	Production foregone	Dam O & M	Power facilities		Power O & M
2003.6	1	-	-	-	-	-	7.07	-	7.07
	2	-	-	-	-	-	14.16	-	14.16
	3	-	-	-	-	-	14.16	-	14.16
	4	-	-	-	-	-	14.16	-	14.16
	5	-	-	-	-	-	7.07	-	7.07
2008.6	6	2.13	-	0.14	0.71	-3.62	-	0.24	0.24
	7	4.25	0.15	0.14	0.71	-3.62	-	0.24	0.24
	8	6.38	0.31	0.14	0.71	-3.62	-	0.24	0.24
	9	8.51	0.46	-	-	-	-	-	-
	10	10.63	0.61	-	-	-	-	-	-
2013.6	11	12.76	0.77	-	-	-	-	-	-
	12	14.89	0.92	-	-	-	-	-	-
	13	17.01	1.07	-	-	-	-	-	-
	14	19.14	1.22	-	-	-	-	-	-
2018.6	15	21.27	1.38	-	-	-	-	0.24	0.24
	16	23.40	1.53	-	-	-	-	0.24	0.24
	17	25.52	1.68	-	-	-	-	0.24	0.24
	18	27.65	1.84	-	-	-	-	0.24	0.24
	19	29.78	1.99	-	-	-	-	0.24	0.24
2023.6	20	30.63	2.14	-	-	-	-	0.24	0.24
	21	30.63	2.30	-	-	-	-	0.24	0.24
	22	30.63	2.36	-	-	-	-	0.24	0.24
	23	-	-	-	-	-	-	-	-
	24	-	-	-	-	-	-	-	-
	25	-	-	-	-	-	-	-	-
	26	-	-	-	-	-	-	-	-
	27	-	-	-	-	-	-	-	-
	28	-	-	-	-	-	-	-	-
	29	-	-	-	-	-	-	-	-
	30	-	-	-	-	-	-	-	-
2033.6	31	-	-	-	-	-	-	-	-
	32	ditto	ditto	ditto	ditto	ditto	1.14	-	1.14
	33	-	-	-	-	-	2.28	-	2.28
	34	-	-	-	-	-	2.28	-	2.28
2038.6	35	-	-	-	-	-	1.14	-	1.14
	36	-	-	-	-	-	-	-	-
	37	-	-	-	-	-	-	-	-
	38	-	-	-	-	-	-	-	-
	39	-	-	-	-	-	-	-	-
2048.6	46	-	-	-	-	-	-	-	-
	47	-	-	-	-	-	-	-	-
	48	30.63	2.36	0.14	0.71	-3.62	-	0.24	0.24
	49	30.63	2.36	0.14	0.71	-3.62	-	0.24	0.24
2052.6	50	30.63	2.36	0.14	0.71	-3.62	-	0.24	0.24

Revised Table Q 51 Continued (5)

Unit: \$ 10⁶

Year	Year in Order	Economic Benefit				Economic Cost			Total
		M&I water supply	Irrigation	Power	Flood control	Production foregone	Dam O & M	Power facilities		Dam O & M
2003.6	1	-	-	-	-	-	-	-	4.33
	2	-	-	-	-	-	-	-	8.65
	3	-	-	-	-	-	-	-	8.65
	4	-	-	-	-	-	-	-	8.65
	5	-	-	-	-	-	-	-	4.33
2008.6	6	2.12	-	0.14	0.90	-2.80	-	0.13	0.36
	7	4.24	-	0.14	0.90	-2.80	-	0.13	2.63
	8	6.36	0.31	0.14	0.90	-2.80	-	0.13	4.91
	9	8.48	0.46	-	-	-	-	-	7.18
	10	10.59	0.61	-	-	-	-	-	9.44
	11	12.71	0.77	-	-	-	-	-	11.72
2013.6	12	14.83	0.92	-	-	-	-	-	13.99
	13	16.95	1.07	-	-	-	-	-	16.26
	14	19.07	1.22	-	-	-	-	-	18.53
	15	21.19	1.38	-	-	-	-	-	20.81
2018.6	16	23.31	1.53	-	-	-	-	ditto	23.08
	17	25.43	1.68	-	-	-	-	-	25.35
	18	27.54	1.84	-	-	-	-	-	27.62
	19	29.67	1.99	-	-	-	-	-	29.90
	20	29.88	2.14	-	-	-	-	-	30.26
2023.6	21	29.88	2.30	-	-	-	-	-	30.42
	22	29.88	2.31	-	-	-	-	-	30.43
	23	-	-	-	-	-	-	-	-
	24	-	-	-	-	-	-	-	-
	25	-	-	-	-	-	-	-	-
	26	-	-	-	-	-	-	-	-
	27	-	-	-	-	-	-	-	-
	28	-	-	-	-	-	-	-	-
	29	-	-	-	-	-	-	-	-
2033.6	30	ditto	ditto	ditto	ditto	ditto	ditto	ditto	ditto
	31	-	-	-	-	-	-	-	1.04
	32	-	-	-	-	-	-	-	2.09
	33	-	-	-	-	-	-	-	2.09
	34	-	-	-	-	-	-	-	2.09
	35	-	-	-	-	-	-	-	1.04
2038.6	36	-	-	-	-	-	-	-	-
	37	-	-	-	-	-	-	-	-
	38	-	-	-	-	-	-	-	-
2046.6	46	-	-	-	-	-	-	-	-
	47	-	-	-	-	-	-	-	-
	48	29.88	2.31	0.14	0.90	-2.80	-	0.13	30.43
	49	29.88	2.31	0.14	0.90	-2.80	-	0.13	30.43
2052.6	50	29.88	2.31	0.14	0.90	-2.80	-	0.13	30.43

Revised Table Q 51 Continued (8)

Unit: \$ 10⁶

Juan (V): Main Stream

Year	Year in Order	M&I water supply	Economic Benefit			Production foregone	Total	Economic Cost			Total
			Irrigation	Power	Flood control			Dam O & M	Power facilities	Power O & M	
1981.0	1	-	-	-	-	-	-	9.50	-	-	9.50
	2	-	-	-	-	-	-	19.00	-	-	19.00
	3	-	-	-	-	-	-	19.00	-	-	19.00
	4	-	-	-	-	-	-	19.00	-	-	19.00
	5	-	-	-	-	-	-	9.50	-	-	9.50
1986.0	6	9.20	-	0.14	-1.57	7.77	-	-	0.24	-	0.24
	7	10.28	0.52	0.14	-1.57	9.37	-	-	0.24	-	0.24
	8	11.34	0.57	0.14	-1.57	10.48	-	-	0.24	-	0.24
	9	12.40	0.62	0.14	-1.57	11.59	-	-	-	-	-
	10	13.47	0.68	-	-	13.41	-	-	-	-	-
	11	14.45	0.73	-	-	13.75	-	-	-	-	-
	12	15.34	0.79	-	-	14.70	-	-	-	-	-
	13	16.24	0.84	-	-	15.65	-	-	-	-	-
	14	17.13	0.90	-	-	16.60	-	-	-	-	-
	15	18.02	0.96	-	-	17.55	-	-	-	-	-
1996.0	16	18.92	1.02	-	-	18.51	-	-	-	-	-
	17	19.81	1.08	-	-	19.46	-	-	-	-	-
	18	20.72	1.13	-	-	20.42	-	-	-	-	-
	19	21.61	1.18	-	-	21.36	-	-	-	-	-
	20	22.51	1.24	-	-	22.32	-	-	-	-	-
2001.0	21	23.40	1.29	-	-	23.26	-	-	-	-	-
	22	24.29	1.35	-	-	24.21	-	-	-	-	-
	23	25.21	1.40	-	-	25.18	-	-	ditto	-	ditto
	24	26.10	1.46	-	-	26.13	-	-	-	-	-
	25	26.99	1.51	-	-	27.07	-	-	-	-	-
2006.0	26	27.89	1.56	-	-	28.02	-	-	-	-	-
	27	28.78	1.62	-	-	28.97	-	-	-	-	-
	28	29.69	1.67	-	-	29.93	-	-	-	-	-
	29	30.58	1.73	-	-	30.88	-	-	-	-	-
	30	30.78	1.76	-	-	31.11	-	-	-	-	-
2011.0	31	30.78	1.76	-	-	31.11	-	1.09	-	-	1.33
	32	30.78	1.76	-	-	31.11	-	2.18	-	-	2.42
	33	-	-	-	-	-	-	2.18	-	-	2.42
	34	-	-	-	-	-	-	2.18	-	-	2.42
	35	-	-	-	-	-	-	1.33	-	-	1.67
2016.0	36	-	-	-	-	-	-	1.09	-	-	1.33
	37	-	-	-	-	-	-	-	-	-	-
	38	-	-	-	-	-	-	-	-	-	-
	39	-	-	-	-	-	-	-	-	-	-
	40	-	-	-	-	-	-	-	-	-	-
	41	-	-	-	-	-	-	-	-	-	-
	42	-	-	-	-	-	-	-	-	-	-
	43	-	-	-	-	-	-	-	-	-	-
	44	-	-	-	-	-	-	-	-	-	-
	45	-	-	-	-	-	-	-	-	-	-
2026.0	46	-	-	-	-	-	-	-	-	-	-
	47	-	-	-	-	-	-	-	-	-	-
	48	30.78	1.76	0.14	-1.57	31.11	-	-	0.24	-	0.24
	49	30.78	1.76	0.14	-1.57	31.11	-	-	0.24	-	0.24
2030.0	50	30.78	1.76	0.14	-1.57	31.11	-	-	0.24	-	0.24

Additional Table Q 51 Continued (10)

Unit: \$ 10⁶

Juan (V): Diversion Route A (M&I Benefit 10% Discount)

Year	Year in Order	Economic Benefit				Economic Cost					
		M&I water supply	Irrigation	Power	Flood control	Production foregone	Total	Dam O & M	Dam facilities	Power O & M	Total
1981.0	1	-	-	-	-	-	-	-	-	-	10.92
	2	-	-	-	-	-	-	-	-	-	21.85
	3	-	-	-	-	-	-	-	-	-	21.85
	4	-	-	-	-	-	-	-	-	-	21.85
	5	-	-	-	-	-	-	-	-	-	10.92
1986.0	6	10.84	-	-	0.21	-1.88	9.17	-	-	0.29	0.29
	7	12.10	0.52	-	0.21	-1.88	10.95	-	-	0.29	0.29
	8	13.35	0.57	-	0.21	-1.88	12.25	-	-	0.29	0.29
	9	14.60	0.62	-	-	-	13.55	-	-	-	-
	10	15.86	0.68	-	-	-	14.87	-	-	-	-
1991.0	11	17.01	0.73	-	-	-	16.07	-	-	-	-
	12	18.07	0.79	-	-	-	17.19	-	-	-	-
	13	19.12	0.84	-	-	-	18.29	-	-	-	-
	14	20.17	0.90	-	-	-	19.40	-	-	-	-
	15	21.22	0.96	-	-	-	20.51	-	-	-	-
1996.0	16	22.28	1.02	-	-	-	21.63	-	-	-	-
	17	23.33	1.08	-	-	-	22.74	-	-	-	-
	18	24.40	1.13	-	-	-	23.86	-	-	-	-
	19	25.45	1.18	-	-	-	24.96	-	-	-	-
	20	26.51	1.24	-	-	-	26.08	-	-	-	-
2001.0	21	27.56	1.29	-	-	-	27.18	-	-	-	-
	22	28.61	1.35	-	-	-	28.29	-	-	-	-
	23	29.68	1.40	-	-	-	29.41	-	-	-	-
	24	30.74	1.46	-	-	-	30.53	-	-	-	-
	25	31.38	1.51	-	-	-	31.22	-	-	-	-
2006.0	26	31.38	1.56	-	-	-	31.27	-	-	-	-
	27	31.38	1.57	-	-	-	31.28	-	-	-	-
	28	-	1.57	-	-	-	31.28	-	-	-	-
	29	-	1.57	-	-	-	31.28	-	-	-	-
2011.0	30	-	-	-	-	-	-	-	-	-	0.29
	31	-	-	-	-	-	-	1.09	-	-	1.38
	32	-	-	-	-	-	-	2.18	-	-	2.47
	33	-	-	-	-	-	-	2.18	-	-	2.47
	34	-	-	-	-	-	-	2.18	-	-	2.47
	35	-	-	-	-	-	-	1.09	-	-	1.38
2016.0	36	-	-	-	-	-	-	-	-	-	0.29
	48	31.38	1.57	-	0.21	-1.88	31.28	-	-	-	ditto
	49	31.38	1.57	-	0.21	-1.88	31.28	-	-	-	0.29
2030.0	50	31.38	1.57	-	0.21	-1.88	31.28	-	-	-	0.29

Additional Table Q 51 Continued (11)

Unit: \$ 10⁶

Juam (V): Diversion Route B

Year	Year in Order	Main water supply	Economic Benefit			Production foregone	Total	Economic Cost			
			Irrigation	Power	Flood control			Dam O & M	Dam facilities	Power O & M	Total
1981.0	1	-	-	-	-	-	-	9.99	-	-	9.99
	2	-	-	-	-	-	-	19.98	-	-	19.98
	3	-	-	-	-	-	-	19.98	-	-	19.98
	4	-	-	-	-	-	-	19.98	-	-	19.98
	5	-	-	-	-	-	-	9.99	-	-	9.99
1986.0	6	7.93	-	0.16	-	-1.67	6.42	-	0.26	-	0.26
	7	8.86	0.52	0.16	-	-1.67	7.87	-	0.26	-	0.26
	8	9.77	0.57	0.16	-	-1.67	9.83	-	0.26	-	0.26
	9	10.68	0.62	-	-	-	9.79	-	-	-	-
	10	11.61	0.68	-	-	-	10.78	-	-	-	-
1991.0	11	12.45	0.73	-	-	-	11.67	-	-	-	-
	12	13.22	0.79	-	-	-	12.50	-	-	-	-
	13	13.99	0.84	-	-	-	13.32	-	-	-	-
	14	14.76	0.90	-	-	-	14.15	-	-	-	-
	15	15.53	0.96	-	-	-	14.98	-	-	-	-
1996.0	16	16.30	1.02	-	-	-	15.81	-	-	-	-
	17	17.07	1.08	-	-	-	16.64	-	-	-	-
	18	17.86	1.13	-	-	-	17.48	-	-	-	-
	19	18.63	1.18	-	-	-	18.30	-	ditto	-	ditto
	20	19.40	1.24	-	-	-	19.13	-	-	-	-
2001.0	21	20.17	1.29	-	-	-	19.95	-	-	-	-
	22	20.94	1.35	-	-	-	20.78	-	-	-	-
	23	21.25	1.40	-	-	-	21.14	-	-	-	-
	24	21.25	1.45	-	-	-	21.19	-	-	-	-
	25	21.25	1.45	-	-	-	21.19	-	-	-	-
2006.0	26	21.25	1.45	-	-	-	21.19	-	-	-	-
	27	-	-	-	-	-	-	-	-	-	-
	28	-	-	-	-	-	-	-	-	-	-
	29	-	-	-	-	-	-	-	-	-	-
	30	-	-	-	-	-	-	-	-	-	-
2011.0	31	ditto	ditto	-	-	-	ditto	1.09	-	-	0.26
	32	-	-	-	-	-	-	2.18	-	-	1.35
	33	-	-	-	-	-	-	2.18	-	-	2.44
	34	-	-	-	-	-	-	2.18	-	-	2.44
	35	-	-	-	-	-	-	2.18	-	-	2.44
2016.0	36	-	-	-	-	-	-	1.09	-	-	1.35
	37	-	-	-	-	-	-	-	-	-	0.26
	38	-	-	-	-	-	-	-	-	-	ditto
	39	-	-	-	-	-	-	-	-	-	-
	40	-	-	-	-	-	-	-	-	-	-
	41	-	-	-	-	-	-	-	-	-	-
	42	-	-	-	-	-	-	-	-	-	-
	43	-	-	-	-	-	-	-	-	-	-
	44	-	-	-	-	-	-	-	-	-	-
	45	-	-	-	-	-	-	-	-	-	-
	46	-	-	-	-	-	-	-	-	-	-
	47	-	-	-	-	-	-	-	-	-	-
2030.0	48	21.25	1.45	0.16	-	-1.67	21.19	-	0.26	-	0.26
	49	21.25	1.45	0.16	-	-1.67	21.19	-	0.26	-	0.26
	50	21.25	1.45	0.16	-	-1.67	21.19	-	0.26	-	0.26

Additional Table Q 51 Continued (12)

Unit: \$ 106

Juam (V): Diversion Route C

Year	Year in Order	M&I water supply	Economic Benefit			Production foregone	Total	Economic Cost			
			Irrigation	Power	Flood control			Dam O & M	Power facilities	Power O & M	Total
1981.0	1	-	-	-	-	-	10.92	-	-	-	10.92
	2	-	-	-	-	-	21.85	-	-	-	21.85
	3	-	-	-	-	-	21.85	-	-	-	21.85
	4	-	-	-	-	-	21.85	-	-	-	21.85
	5	-	-	-	-	-	10.92	-	-	-	10.92
1986.0	6	6.75	-	0.21	-1.88	5.08	-	0.29	-	-	0.29
	7	7.54	0.52	0.21	-1.88	6.39	-	0.29	-	-	0.29
	8	8.31	0.57	0.21	-1.88	7.21	-	0.29	-	-	0.29
	9	9.09	0.62	-	-	8.04	-	-	-	-	-
	10	9.88	0.68	-	-	8.89	-	-	-	-	-
1991.0	11	10.59	0.73	-	-	9.65	-	-	-	-	-
	12	11.25	0.79	-	-	10.37	-	-	-	-	-
	13	11.90	0.84	-	-	11.07	-	-	-	-	-
	14	12.56	0.90	-	-	11.79	-	-	-	-	-
	15	13.22	0.96	-	-	12.51	-	-	-	-	-
1996.0	16	13.87	1.02	-	-	13.22	-	-	-	-	-
	17	14.53	1.08	-	-	13.94	-	-	-	-	-
	18	15.19	1.13	-	-	14.65	-	-	-	-	-
	19	15.85	1.18	-	-	15.36	-	-	-	-	-
	20	16.50	1.24	-	-	16.07	-	-	-	-	-
2001.0	21	17.10	1.29	-	-	16.72	-	-	-	-	-
	22	17.81	1.35	-	-	17.49	-	-	-	-	-
	23	18.48	1.40	-	-	18.21	-	-	-	-	-
	24	19.14	1.46	-	-	18.93	-	-	-	-	-
	25	19.54	1.51	-	-	19.38	-	-	-	-	-
2006.0	26	19.54	1.56	-	-	19.44	-	-	-	-	-
	27	19.54	1.57	-	-	19.44	-	-	-	-	-
	28	-	1.57	-	-	19.44	-	-	-	-	-
	29	-	-	-	-	-	-	-	-	-	0.29
	30	-	-	-	-	-	-	-	-	-	1.38
2011.0	31	-	-	-	-	-	-	-	-	-	2.47
	32	-	-	-	-	-	-	-	-	-	2.47
	33	-	-	-	-	-	-	-	-	-	2.47
	34	-	-	-	-	-	-	-	-	-	1.38
	35	-	-	-	-	-	-	-	-	-	0.29
2016.0	36	-	-	-	-	-	-	-	-	-	ditto
	48	19.54	1.57	0.21	-1.88	19.44	-	0.29	-	-	0.29
	49	19.54	1.57	0.21	-1.88	19.44	-	0.29	-	-	0.29
2030.0	50	19.54	1.57	0.21	-1.88	19.44	-	0.29	-	-	0.29

Additional Table Q 51 Continued (13)

Unit: \$ 10⁶

Juan (C): Main Stream

Year	Year in Order	M&I water supply	Economic Benefit			Production foregone	Total	Economic Cost			Total
			Irrigation	Power	Flood control			Dam O & M	Power facilities	O & M	
1981.0	1	-	-	-	-	-	10.92	-	-	-	11.72
	2	-	-	-	-	-	21.85	-	-	-	23.46
	3	-	-	-	-	-	21.85	-	-	-	23.46
	4	-	-	-	-	-	21.85	-	-	-	23.46
	5	-	-	-	-	-	10.92	-	-	-	11.72
1986.0	6	8.30	-	0.21	-1.88	8.34	-	0.29	-	0.16	0.45
	7	9.27	0.52	0.21	-1.88	9.83	-	0.29	-	0.16	0.45
	8	10.22	0.57	0.21	-1.88	10.83	-	0.29	-	0.10	0.45
	9	11.18	0.62	0.21	-1.88	11.84	-	-	-	-	-
	10	12.15	0.68	-	-	12.87	-	-	-	-	-
1991.0	11	13.03	0.73	-	-	13.80	-	-	-	-	-
	12	13.84	0.79	-	-	14.67	-	-	-	-	-
	13	14.40	0.84	-	-	15.28	-	-	-	-	-
	14	14.40	0.85	-	-	15.29	-	-	-	-	-
1996.0	15	14.40	-	-	-	15.29	-	-	-	-	-
	16	-	-	-	-	15.29	-	-	-	-	-
	17	-	-	-	-	-	-	-	-	-	-
	18	-	-	-	-	-	-	-	-	-	-
	19	-	-	-	-	-	-	-	-	-	-
	20	-	-	-	-	-	-	-	-	-	-
		ditto	ditto	ditto	ditto	ditto	-	ditto	-	ditto	ditto
2011.0	30	-	-	-	-	-	-	-	-	-	-
	31	-	-	-	-	-	-	-	-	-	-
	32	-	-	-	-	-	1.09	-	0.66	-	0.45
	33	-	-	-	-	-	2.18	-	1.32	-	2.20
	34	-	-	-	-	-	2.18	-	1.32	-	3.95
	35	-	-	-	-	-	2.18	-	1.32	-	3.95
2016.0	36	-	-	-	-	-	1.09	-	0.66	-	2.20
		-	-	-	-	-	-	-	-	-	0.45
	46	-	-	-	-	-	-	-	-	-	-
	47	-	-	-	-	-	-	-	-	-	ditto
	48	14.40	0.85	0.21	-1.88	15.29	-	0.29	-	0.16	0.45
	49	14.40	0.85	0.21	-1.88	15.29	-	0.29	-	0.16	0.45
2030.0	50	14.40	0.85	0.21	-1.88	15.29	-	0.29	-	0.16	0.45

Additional Table Q 51 Continued (14)

Unit: \$ 10⁶

Juam (SV): Main Stream

Year	Year in Order	M&I water supply	Economic Benefit			Production foregone	Total	Economic Cost			Total
			Irrigation	Power	Flood control			Dam O & M	Dam O & M facilities	Power O & M	
1981.0	1	-	-	-	-	-	-	10.92	-	-	11.71
	2	-	-	-	-	-	-	21.85	-	-	23.44
	3	-	-	-	-	-	-	21.85	-	-	23.44
	4	-	-	-	-	-	-	21.85	-	-	23.44
	5	-	-	-	-	-	-	21.85	-	-	23.44
1986.0	6	9.02	-	0.21	-	-1.88	9.00	-	0.29	-	0.45
	7	10.07	0.52	0.21	-	-1.88	10.57	-	0.29	-	0.45
	8	11.11	0.57	0.21	-	-1.88	11.66	-	0.29	-	0.45
	9	12.15	0.62	-	-	-	12.75	-	-	-	-
	10	13.20	0.68	-	-	-	13.86	-	-	-	-
	11	14.16	0.73	-	-	-	14.87	-	-	-	-
1991.0	12	15.04	0.79	-	-	-	15.81	-	-	-	-
	13	15.91	0.84	-	-	-	16.73	-	-	-	-
	14	16.79	0.90	-	-	-	17.67	-	-	-	-
	15	17.67	0.96	-	-	-	18.61	-	-	-	-
1996.0	16	18.54	1.02	-	-	-	19.54	-	-	-	-
	17	19.42	1.08	-	-	-	20.48	-	-	-	-
	18	20.31	1.13	-	-	-	21.42	-	-	-	-
	19	21.19	1.18	-	-	-	22.35	-	-	-	-
	20	22.06	1.24	-	-	-	23.28	-	-	-	-
2001.0	21	22.94	1.29	-	-	-	24.27	-	-	-	-
	22	23.81	1.35	-	-	-	25.14	-	-	-	-
	23	24.71	1.40	-	-	-	26.09	-	-	-	-
	24	25.58	1.46	-	-	-	27.02	-	-	-	-
	25	26.28	1.51	-	-	-	27.77	-	-	-	-
2006.0	26	26.28	1.56	-	-	-	27.82	-	-	-	-
	27	26.28	1.56	-	-	-	27.82	-	-	-	-
	28	-	1.56	-	-	-	27.82	-	-	-	-
	29	-	-	-	-	-	-	-	-	-	-
	30	-	-	-	-	-	-	-	-	-	-
2011.0	31	-	-	-	-	-	-	1.09	-	-	0.45
	32	-	-	-	-	-	-	2.18	-	-	3.93
	33	-	-	-	-	-	-	2.18	-	-	3.93
	34	-	-	-	-	-	-	2.18	-	-	3.93
	35	ditto	ditto	-	-	-	ditto	1.09	-	-	2.27
2016.0	36	-	-	-	-	-	-	-	-	-	0.45
	37	-	-	-	-	-	-	-	-	-	0.45
	38	-	-	-	-	-	-	-	-	-	0.45
2026.0	45	-	-	-	-	-	-	-	-	-	ditto
	47	26.28	1.56	0.21	-	-1.88	27.82	-	0.29	-	0.45
	48	26.28	1.56	0.21	-	-1.88	27.82	-	0.29	-	0.45
2030.0	49	26.28	1.56	0.21	-	-1.88	27.82	-	0.29	-	0.45
	50	26.28	1.56	0.21	-	-1.88	27.82	-	0.29	-	0.45

Additional Table Q 51 Continued (16)

Unit: \$ 10⁶

Inha (C): (Assuming Alternative Facilities Cost Streams as M&I and Power Benefit Streams)

Year	Year in Order	M&I water supply	Economic Benefit			Production foregone	Total	Economic Cost			Total
			Irrigation	Power	Flood control			Dam O & M	Power facilities	Power O & M	
1985.1	1	5.89	-	-	-	5.89	10.79	3.24	-	-	14.03
	2	11.79	-	-	-	11.79	21.58	6.48	-	-	28.06
	3	11.79	6.79	-	-	18.58	21.58	6.48	-	-	28.06
	4	11.79	9.05	-	-	20.84	21.58	6.48	-	-	28.06
	5	5.89	6.79	-	-	12.68	10.79	3.24	-	-	14.03
1990.1	6	0.79	2.63	1.78	-1.05	4.15	-	-	0.33	0.60	0.93
	7	0.79	2.63	1.78	-1.05	4.56	-	-	0.33	0.60	0.93
	8	0.79	2.63	1.78	-1.05	4.96	-	-	0.33	0.60	0.93
	9	.	1.19	.	.	5.34	-	-	.	.	.
	10	.	1.57	.	.	5.72	-	-	.	.	.
1995.1	11	.	1.95	.	.	6.10	-	-	.	.	.
	12	.	2.33	.	.	6.48	-	-	.	.	.
	13	.	2.71	.	.	6.86	-	-	.	.	.
	14	.	3.09	.	.	7.24	-	-	.	.	.
	15	ditto	3.20	.	.	7.35	-	-	.	.	.
2000.1	16	.	3.20	.	.	7.35	-	-	.	.	.
	17	.	3.20	.	.	7.35	-	-	.	.	.
	.	.	.	.	.	ditto	-	-	.	.	.
	.	.	.	.	.	ditto	-	-	.	.	.
	.	.	.	.	.	ditto	-	-	.	.	.
2015.1	30	0.79	.	.	.	7.35	0.94	2.35	-	-	0.93
	31	1.77	.	.	.	8.33	0.94	2.35	-	-	4.22
	32	2.75	.	.	.	9.31	1.88	4.70	-	-	7.51
	33	2.75	.	.	.	9.31	1.88	4.70	-	-	7.51
	34	2.75	ditto	ditto	ditto	9.31	1.88	4.70	ditto	ditto	7.51
	35	1.77	.	.	.	8.33	0.94	2.35	-	-	4.22
2020.1	36	0.79	.	.	.	7.35	-	-	-	-	0.93
	37	.	.	.	.	ditto	-	-	-	-	0.93
	.	ditto	.	.	.	ditto	-	-	-	-	.
	-	-	-	-	.
2030.1	46	.	.	.	.	.	-	-	-	-	.
	47	.	.	.	.	.	-	-	-	-	.
	48	0.79	3.20	1.78	-1.05	7.35	-	-	0.33	0.60	0.93
	49	0.79	3.20	1.78	-1.05	7.35	-	-	0.33	0.60	0.93
2034.1	50	0.79	3.20	1.78	-1.05	7.35	-	-	0.33	0.60	0.93

Additional Table Q 51 Continued (17)

Unit: \$ 10⁶

Juam (C): Main Stream (Assuming Alternative Facilities Cost Streams as M&I and Power Benefit Streams)

Year	Order	Year in	Economic Benefit			Economic Cost			Total				
			M&I water supply	Irrigation	Power	Flood control	Production foregone	Dam O & M		Power facilities	Power C & M		
1981.0	1	1	4.75	-	-	-	-	4.75	10.92	-	0.80	-	11.72
	2	2	12.13	-	-	-	-	12.13	21.85	-	1.61	-	23.46
	3	3	14.77	-	0.97	-	-	15.74	21.85	-	1.61	-	23.46
	4	4	39.50	-	1.30	-	-	40.80	21.85	-	1.61	-	23.46
	5	5	47.13	-	0.97	-	-	48.10	10.92	-	0.80	-	11.72
1986.0	6	6	14.99	-	1.39	0.21	-	14.71	-	0.29	-	0.16	0.45
	7	7	0.54	0.52	1.39	0.21	-	0.78	-	0.29	-	0.16	0.45
	8	8	0.59	0.57	1.39	0.21	-	0.88	-	0.29	-	0.16	0.45
	9	9	0.59	0.62	-	-	-	0.93	-	-	-	-	-
	10	10	1.77	0.68	-	-	-	2.17	-	-	-	-	-
1991.0	11	11	1.77	0.73	-	-	-	2.22	-	-	-	-	-
	12	12	0.42	0.79	-	-	-	0.93	-	-	-	-	-
	13	13	0.42	0.84	-	-	-	0.98	-	-	-	-	-
	14	14	0.42	0.85	-	-	-	0.99	-	-	-	-	-
	15	15	-	0.85	-	-	-	0.99	-	-	-	-	-
1996.0	16	16	-	0.85	-	-	-	0.99	-	-	-	-	-
	17	17	-	-	-	-	-	-	-	-	-	-	-
	18	18	-	-	-	-	-	-	-	-	-	-	-
	19	19	-	-	-	-	-	-	-	-	-	-	-
	20	20	-	-	-	-	-	-	-	-	-	-	-
2001.0	21	21	ditto	ditto	ditto	ditto	ditto	ditto	-	ditto	-	-	-
	22	22	ditto	ditto	ditto	ditto	ditto	ditto	-	ditto	-	-	-
	23	23	ditto	ditto	ditto	ditto	ditto	ditto	-	ditto	-	-	-
	24	24	ditto	ditto	ditto	ditto	ditto	ditto	-	ditto	-	-	-
	25	25	ditto	ditto	ditto	ditto	ditto	ditto	-	ditto	-	-	-
2006.0	26	26	ditto	ditto	ditto	ditto	ditto	ditto	-	ditto	-	-	-
	27	27	ditto	ditto	ditto	ditto	ditto	ditto	-	ditto	-	-	-
	28	28	ditto	ditto	ditto	ditto	ditto	ditto	-	ditto	-	-	-
	29	29	ditto	ditto	ditto	ditto	ditto	ditto	-	ditto	-	-	-
	30	30	0.42	-	-	-	-	0.99	-	-	-	-	0.45
2011.0	31	31	0.76	-	-	-	-	1.33	1.09	-	0.66	-	2.20
	32	32	1.30	-	1.39	-	-	1.87	2.18	-	1.32	-	3.95
	33	33	1.49	-	2.26	-	-	2.93	2.18	-	1.32	-	3.95
	34	34	20.77	-	2.56	-	-	22.51	2.18	-	1.32	-	3.95
	35	35	30.06	-	2.26	-	-	31.50	1.09	-	0.66	-	2.20
2016.0	36	36	10.25	-	1.39	-	-	10.82	-	-	-	-	0.45
	37	37	0.42	-	-	-	-	1.02	-	-	-	-	-
	38	38	0.42	-	-	-	-	1.02	-	-	-	-	-
	39	39	0.42	-	-	-	-	1.02	-	-	-	-	-
	40	40	1.51	-	-	-	-	2.11	-	-	-	-	-
2021.0	41	41	1.51	-	-	-	-	2.11	-	-	-	-	-
	42	42	0.42	-	-	-	-	1.02	-	-	-	-	-
	43	43	-	-	-	-	-	-	-	-	-	-	-
	44	44	-	-	-	-	-	-	-	-	-	-	-
	45	45	ditto	ditto	ditto	ditto	ditto	ditto	-	ditto	-	-	-
2026.0	46	46	-	-	-	-	-	-	-	-	-	-	-
	47	47	-	-	-	-	-	-	-	-	-	-	-
	48	48	0.42	0.85	1.39	0.21	-	1.02	-	0.29	-	0.16	0.45
	49	49	0.42	0.85	1.39	0.21	-	1.02	-	0.29	-	0.16	0.45
2030.0	50	50	0.42	0.85	1.39	0.21	-	1.02	-	0.29	-	0.16	0.45

Additional Table Q 51 Continued (18)

Unit: \$ 10⁶

Juam (V): Diversion (Route A): (Assuming Alternative Facilities Cost Streams as M&I and Power Benefit Streams)

Year	Year in Order	M&I water supply	Economic Benefit				Economic Cost				
			Irrigation	Power	Flood control	Production foregone	Total	Dam O & M	Dam O & M facilities	Power O & M	Total
1991.0	1	4.75	-	-	-	-	4.75	10.92	-	-	10.92
	2	14.24	-	-	-	-	14.24	21.85	-	-	21.85
	3	14.56	-	-	-	-	14.56	21.85	-	-	21.85
	4	29.87	-	-	-	-	29.87	21.85	-	-	21.85
	5	41.91	-	-	-	-	41.91	10.92	-	-	10.92
1996.0	6	19.26	-	-	-	-	17.59	-	0.29	-	0.29
	7	2.81	0.52	0.21	-1.88	-	1.66	-	0.29	-	0.29
	8	-2.89	0.57	0.21	-1.88	-	-3.99	-	0.29	-	0.29
	9	-2.89	0.62	0.21	-1.88	-	-3.94	-	-	-	-
	10	15.78	0.68	-	-	-	14.79	-	-	-	-
1991.0	11	15.78	0.73	-	-	-	14.84	-	-	-	-
	12	3.83	0.79	-	-	-	2.95	-	-	-	-
	13	6.66	0.84	-	-	-	5.83	-	-	-	-
	14	9.49	0.90	-	-	-	8.72	-	-	-	-
	15	7.57	0.96	-	-	-	6.86	-	-	-	-
1996.0	16	19.94	1.02	-	-	-	19.29	-	-	-	-
	17	19.67	1.08	-	-	-	19.08	-	-	-	-
	18	5.04	1.13	-	-	-	4.50	-	-	-	-
	19	5.04	1.18	-	-	-	4.55	-	ditto	-	ditto
	20	5.04	1.24	-	-	-	4.61	-	-	-	-
2001.0	21	5.04	1.29	-	-	-	4.66	-	-	-	-
	22	7.98	1.35	-	-	-	7.66	-	-	-	-
	23	7.98	1.40	-	-	-	7.71	-	-	-	-
	24	5.21	1.46	-	-	-	5.00	-	-	-	-
	25	5.21	1.51	-	-	-	5.05	-	-	-	-
2006.0	26	5.21	1.56	-	-	-	5.10	-	-	-	-
	27	5.21	1.57	-	-	-	5.11	-	-	-	-
	28	5.21	1.57	-	-	-	5.11	-	-	-	-
	29	5.21	1.57	-	-	-	5.11	-	-	-	-
	30	5.21	-	-	-	-	5.11	-	-	-	0.29
2011.0	31	5.55	-	-	-	-	5.45	1.09	-	-	1.38
	32	6.24	-	-	-	-	6.14	2.18	-	-	2.47
	33	6.51	-	-	-	-	6.41	2.18	-	-	2.47
	34	17.83	-	-	-	-	17.73	2.18	-	-	2.47
	35	27.20	-	-	-	-	27.10	1.09	-	-	1.38
2016.0	36	15.19	-	-	-	-	15.09	-	-	-	0.29
	37	5.21	-	-	-	-	5.11	-	-	-	-
	38	1.44	-	-	-	-	1.34	-	-	-	-
	39	1.44	-	-	-	-	1.34	-	-	-	-
	40	14.85	-	-	-	-	14.75	-	-	-	-
2021.0	41	14.85	-	-	-	-	14.75	-	-	-	-
	42	5.21	ditto	-	-	-	5.11	-	-	-	ditto
	43	5.41	-	-	-	-	5.31	-	-	-	-
	44	5.62	-	-	-	-	5.52	-	-	-	-
	45	14.73	-	-	-	-	14.63	-	-	-	-
2026.0	46	24.37	-	-	-	-	24.27	-	-	-	-
	47	15.05	-	-	-	-	14.95	-	-	-	-
	48	5.21	1.57	0.21	-1.88	-	5.11	-	0.29	-	0.29
	49	5.21	1.57	0.21	-1.88	-	5.11	-	0.29	-	0.29
2030.0	50	5.21	1.57	0.21	-1.88	-	5.11	-	0.29	-	0.29

Additional Table Q 51 Continued (19)

Unit: \$ 10⁶

Juan (V): Diversion (Route C): (Assuming Alternative Facilities Cost Streams as M&I and Power Benefit Streams)

Year	Year in Order	M&I water supply	Irrigation	Economic Benefit		Production forgone	Total	Dam O & M		Economic Cost		Total
				Flood control	Power			Dam O & M	Power facilities			
1981.0	1	4.75	-	-	-	-	4.75	10.92	-	-	-	10.92
	2	14.24	-	-	-	-	14.24	21.85	-	-	-	21.85
	3	13.48	-	-	-	-	13.48	21.85	-	-	-	21.85
	4	17.39	-	-	-	-	17.39	21.85	-	-	-	21.85
	5	30.52	-	-	-	-	30.52	10.92	-	-	-	10.92
1986.0	6	18.46	-	-	-1.88	-	16.79	-	0.29	-	-	0.29
	7	2.01	0.52	0.21	-1.88	-	0.86	-	0.29	-	-	0.29
	8	-6.22	0.57	0.21	-1.88	-	-7.32	-	0.29	-	-	0.29
	9	-6.22	0.62	-	-	-	-7.27	-	-	-	-	-
1991.0	10	14.56	0.68	-	-	-	13.57	-	-	-	-	-
	11	14.56	0.73	-	-	-	13.62	-	-	-	-	-
	12	2.61	0.79	-	-	-	1.73	-	-	-	-	-
	13	5.44	0.84	-	-	-	4.61	-	-	-	-	-
	14	8.27	0.90	-	-	-	7.50	-	-	-	-	-
	15	1.09	0.96	-	-	-	0.38	-	-	-	-	-
	16	13.46	1.02	-	-	-	12.81	-	-	-	-	-
1996.0	17	18.03	1.08	-	-	-	17.44	-	-	-	-	-
	18	3.40	1.13	-	-	-	2.86	-	-	-	-	-
	19	3.40	1.18	-	-	-	2.91	-	ditto	-	-	ditto
	20	3.40	1.24	-	-	-	2.97	-	-	-	-	-
	21	3.40	1.29	-	-	-	3.02	-	-	-	-	-
2001.0	22	3.40	1.35	-	-	-	5.73	-	-	-	-	-
	23	6.05	1.40	-	-	-	5.78	-	-	-	-	-
	24	6.05	1.46	-	-	-	3.34	-	-	-	-	-
	25	3.55	1.51	-	-	-	3.39	-	-	-	-	-
	26	3.55	1.56	-	-	-	3.45	-	-	-	-	-
	27	3.55	1.57	-	-	-	3.45	-	-	-	-	-
	28	3.55	1.57	-	-	-	3.45	-	-	-	-	-
	29	3.55	1.57	-	-	-	3.45	-	-	-	-	-
	30	3.55	1.57	-	-	-	3.45	-	-	-	-	-
	31	3.89	-	-	-	-	3.79	-	1.09	-	-	0.29
2011.0	32	4.58	-	-	-	-	4.48	-	2.18	-	-	1.38
	33	4.67	-	-	-	-	4.57	-	2.18	-	-	2.47
	34	8.00	-	-	-	-	7.90	-	2.18	-	-	2.47
	35	17.29	-	-	-	-	17.19	-	1.09	-	-	1.38
	36	13.53	-	-	-	-	13.43	-	-	-	-	0.29
	37	3.55	-	-	-	-	3.45	-	-	-	-	-
	38	-4.35	-	-	-	-	-4.45	-	-	-	-	-
2016.0	39	-4.35	-	-	-	-	-4.45	-	-	-	-	-
	40	13.19	-	-	-	-	13.09	-	-	-	-	-
	41	13.19	-	-	-	-	13.09	-	-	-	-	-
	42	3.55	ditto	-	-	-	3.45	-	-	-	-	ditto
	43	3.75	-	-	-	-	3.65	-	-	-	-	-
2021.0	44	3.96	-	-	-	-	3.86	-	-	-	-	-
	45	-3.64	-	-	-	-	-3.74	-	-	-	-	-
	46	6.00	-	-	-	-	5.90	-	-	-	-	-
	47	13.39	-	-	-	-	13.29	-	-	-	-	-
	48	3.55	1.57	0.21	-1.88	-	3.45	-	0.29	-	-	0.29
2026.0	49	3.55	1.57	0.21	-1.88	-	3.45	-	0.29	-	-	0.29
	50	3.55	1.57	0.21	-1.88	-	3.45	-	0.29	-	-	0.29

Revised Table Q 52 ESTIMATED VALUES OF EIRR

(Unit : %)

	A	B	C	D	E	F	G
	Normal	Benefit 10% Down	Cost 20% Up	Benefit 1-Year Delay	Energy Value Doubled	B+C	B+C+D
Bamseonggol (C)	8.5	7.6	7.0	7.8	11.1	6.1	5.7
Hongcheon (C)	8.8	7.9	7.3	8.1	11.5	6.4	6.0
Imha (C)	8.8	8.0	7.4	8.2	10.1	6.6	6.2
Juam (C)							
Main Stream	10.8	9.8	9.3	10.0	11.6	8.4	7.9
Hongcheon (V)	14.8	14.0	13.4	12.7	15.1	12.7	11.9
Dalcheon (V)	15.3	14.5	14.0	13.2	15.4	13.2	12.4
Ganhyeon (V)	20.3	19.3	18.6	18.8	20.4	17.7	16.4
Imha (V)	9.8	9.1	8.6	9.2	-	7.9	7.5
Juam (V)							
Main Stream	14.5	13.5	12.9	13.3	-	12.0	11.2
Juam (V)							
Diversión							
Route A	12.8	11.8	11.3	11.8	-	10.5	9.9
Route B	12.5	11.6	11.0	11.5	-	10.1	9.5
Route C	10.3	9.5	9.1	9.7	-	8.4	7.9
Juam (SV)							
Main Stream	12.9	12.1	11.5	12.0	13.7	10.7	10.0

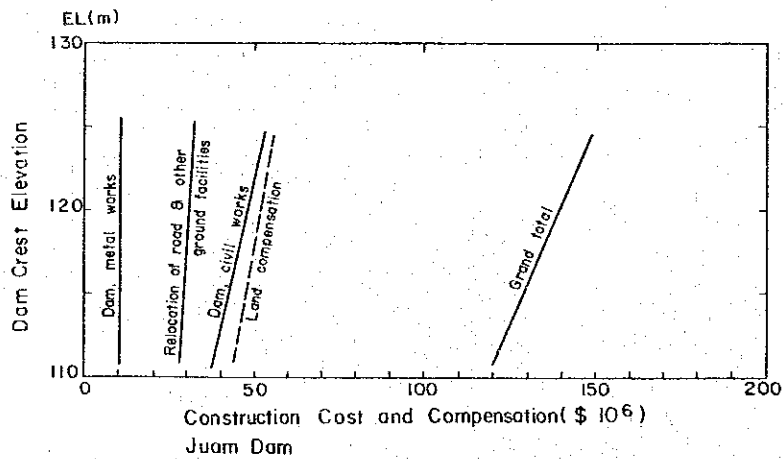
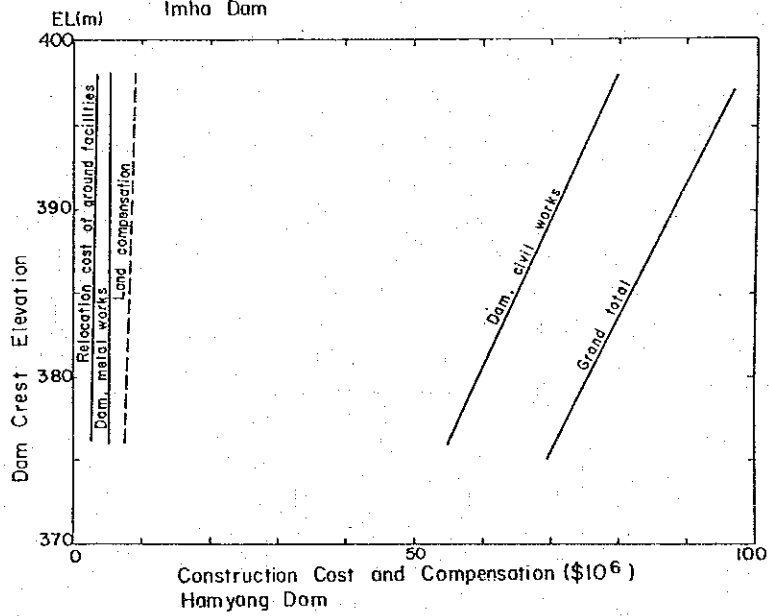
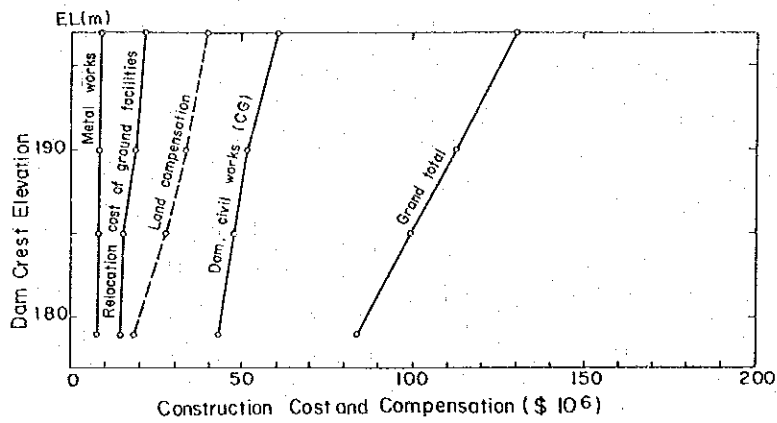
Assuming Alternative Facilities Cost Streams
as M&I and Power Benefit Stream

Hongcheon (C)	9.6	7.9	6.7	8.2	14.3	5.3	4.7
Imha (C)	9.5	7.5	6.4	8.0	12.6	4.9	4.4
Juam (C)							
Main Stream	39.3	26.7	20.0	19.6	42.0	10.8	7.2
Juam (V)							
Diversión							
Route A	40.0	30.0	24.2	22.6	-	18.5	13.5
Route C	18.8	13.7	11.1	13.1	-	8.5	7.1

M&I Benefit 10% Discount

Juam (V)							
Diversión							
Route A	14.5	13.6	12.9	13.4	-	12.0	11.2

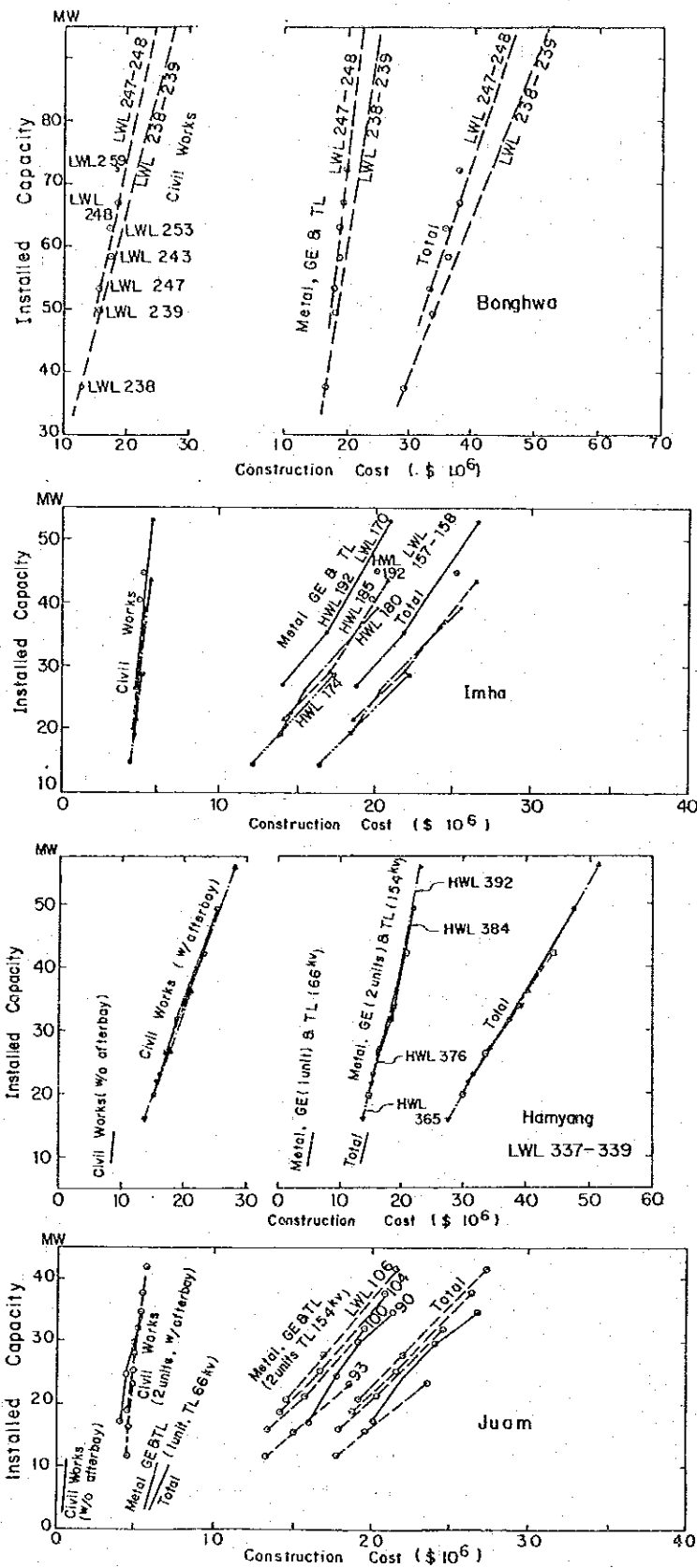
Remarks : C : Constant draft operation
V : Variable draft operation
SV: Semi-variable draft operation



Revised

Fig. P2 Continued (3)

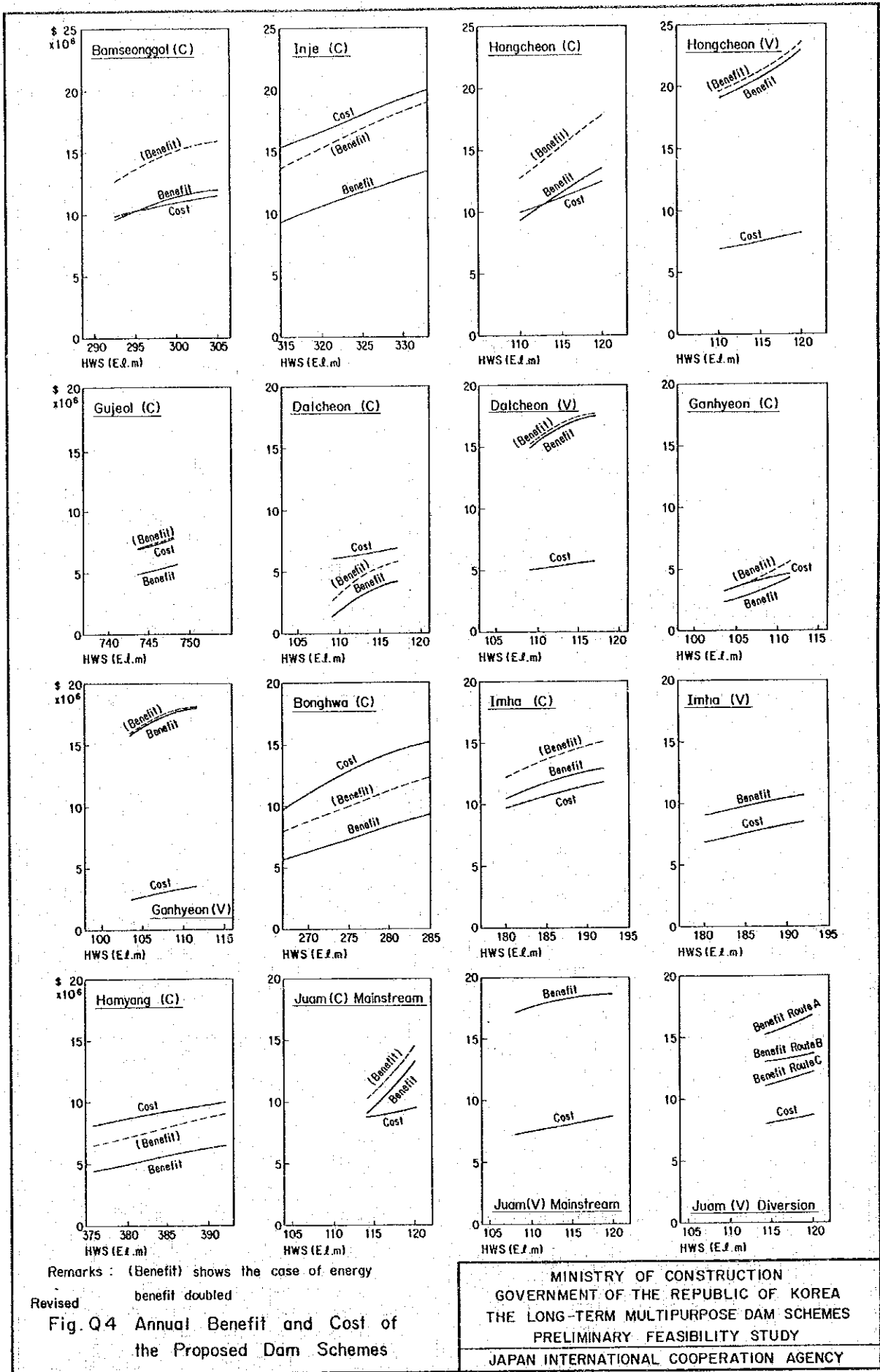
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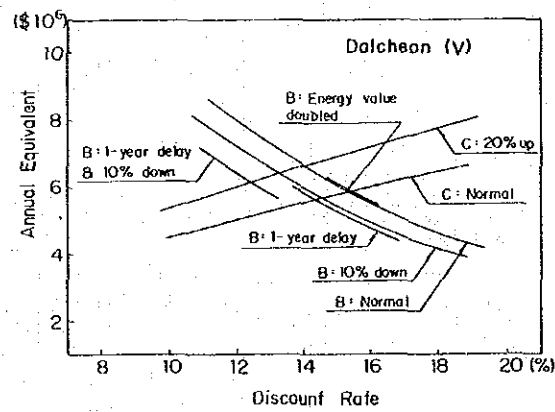
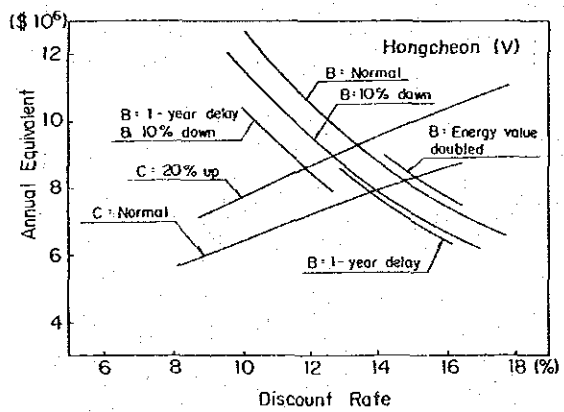
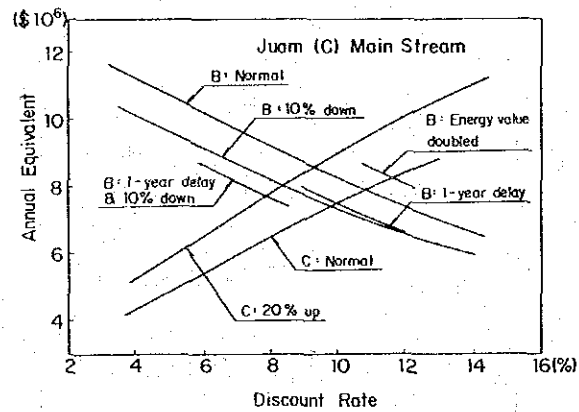
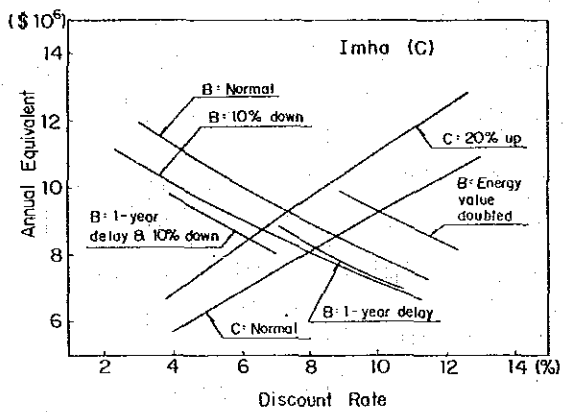
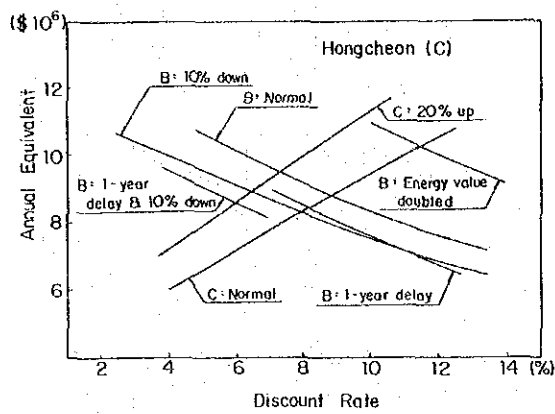
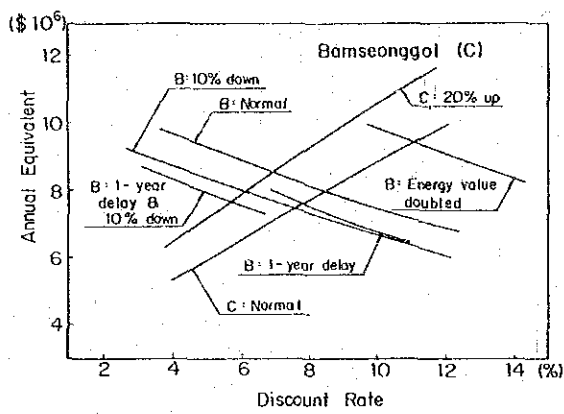


Revised

Fig P 3 Continued (3)

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 PRELIMINARY FEASIBILITY STUDY
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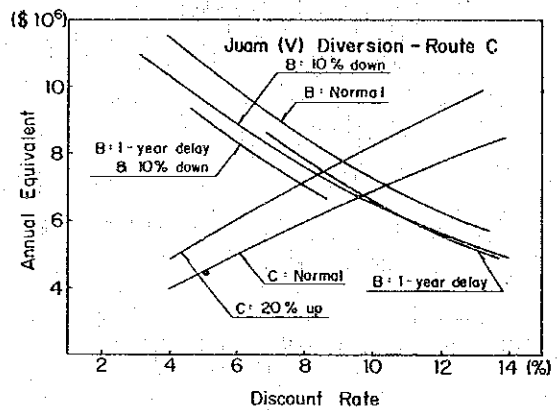
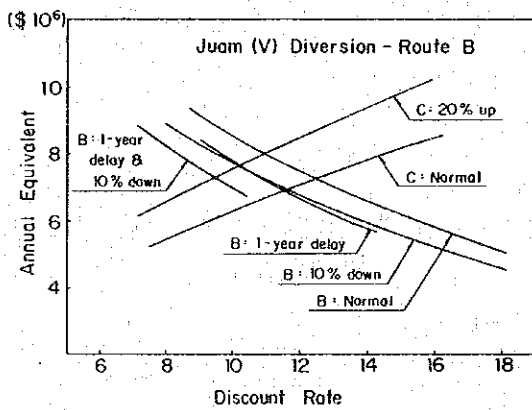
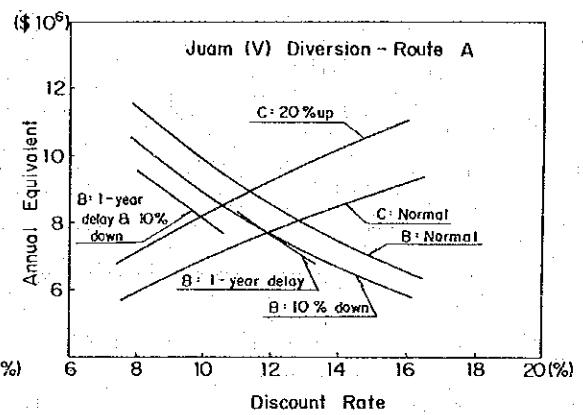
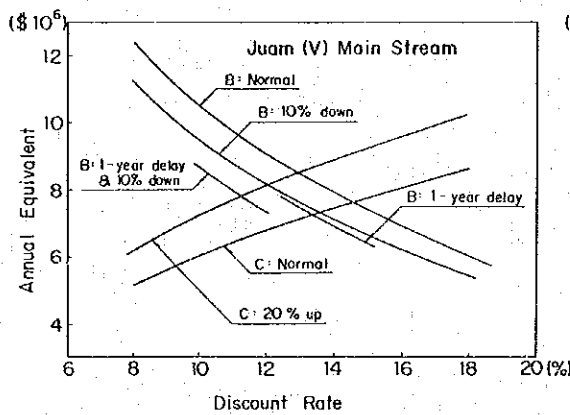
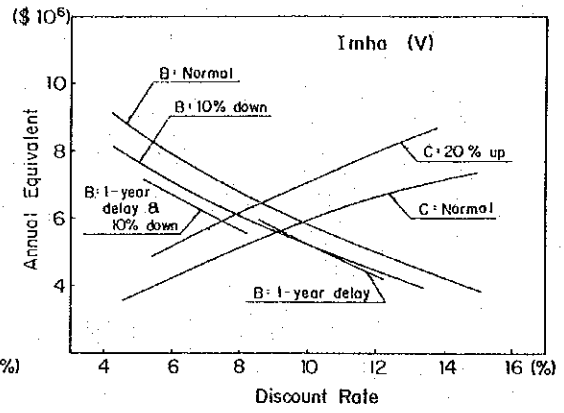
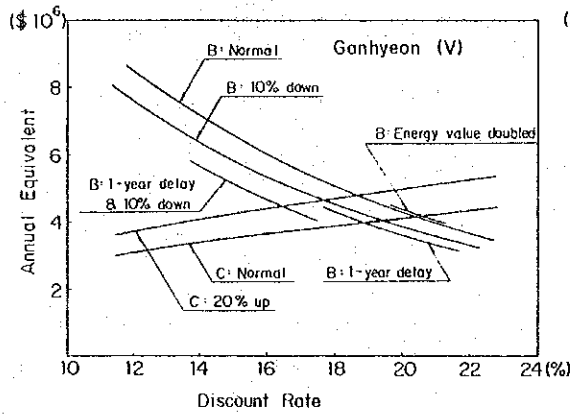




Remarks B: Benefit
C: Cost

Revised Fig. Q5 Results of Cash Flow Analysis

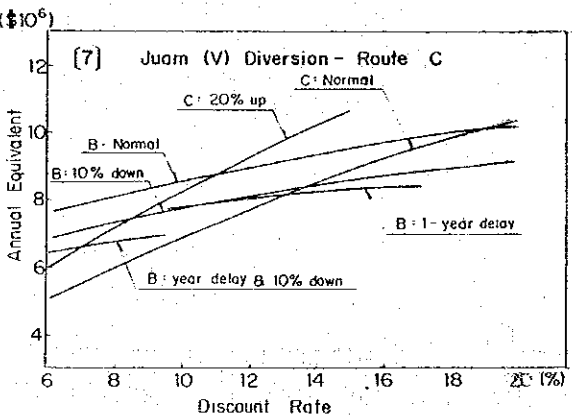
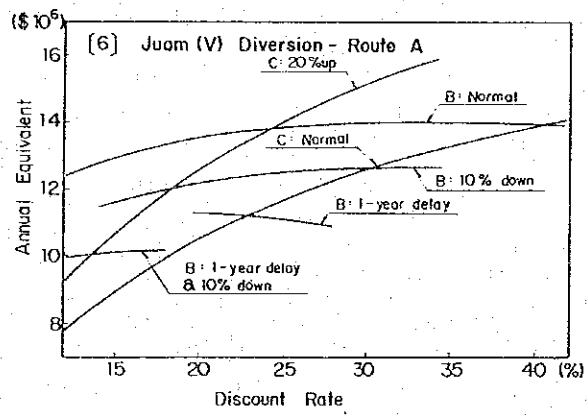
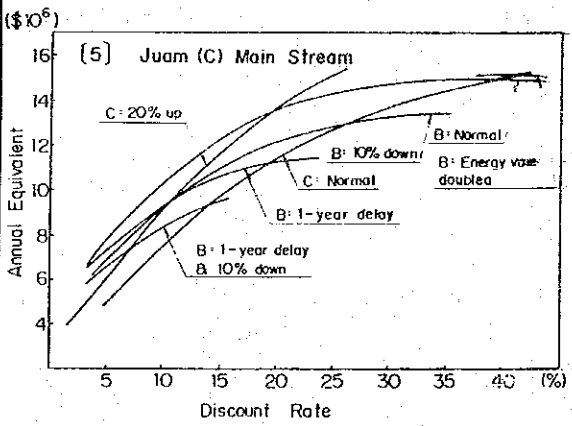
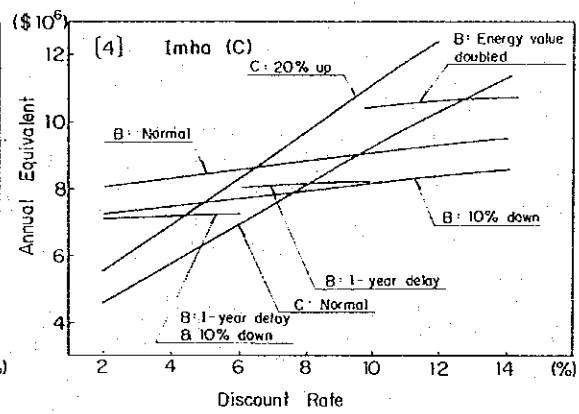
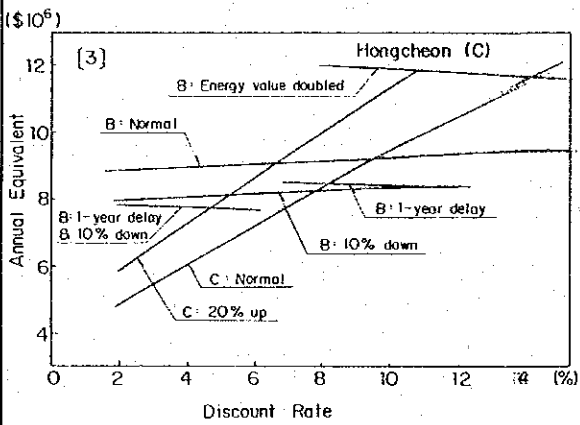
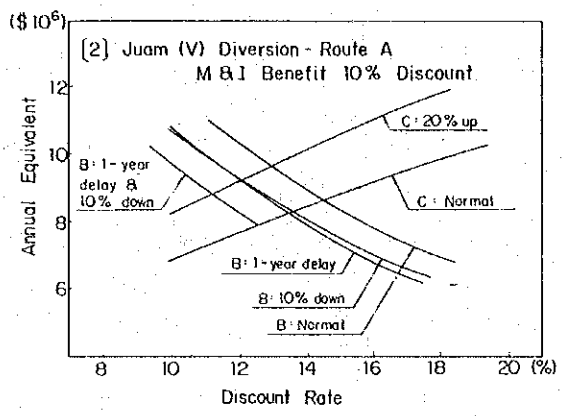
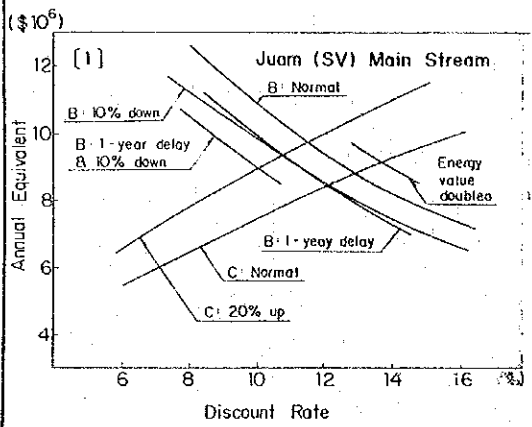
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Remarks : B : Benefit
C : Cost

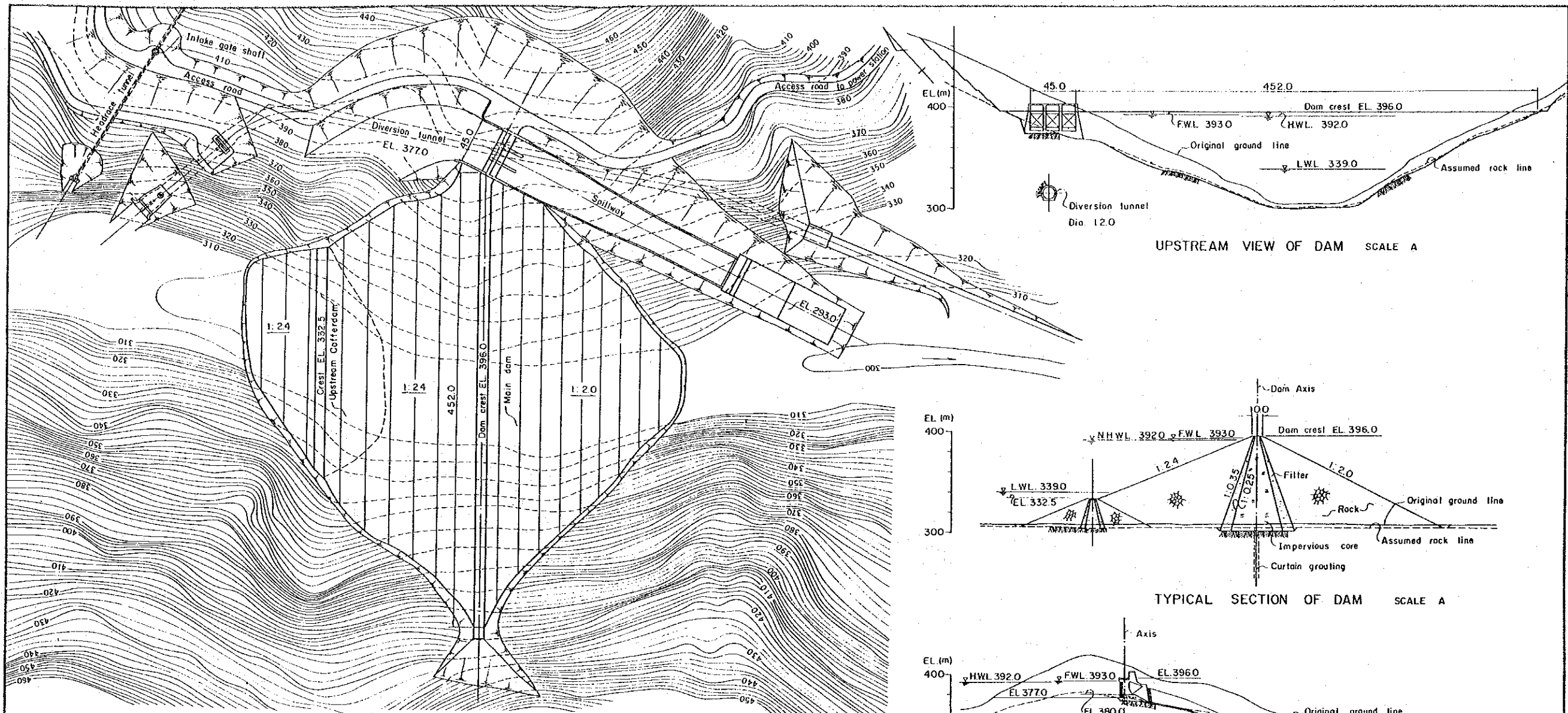
Revised Fig Q5 Continued (2)

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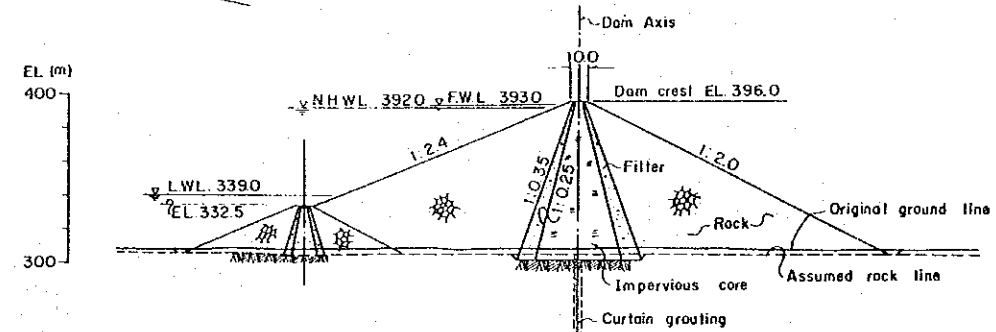
Remarks
 [1] An example of semi-variable draft operation — Juam Dam Main Stream Plan.
 [2] Assuming EIRR of alternative facilities to be 10%.
 [3]~[7] Assuming the M&I and agricultural water supply benefits to be identical with the cost streams of pertaining alternative facilities.

Fig. Q6 Results of Cash Flow Analysis Under Various Assumptions

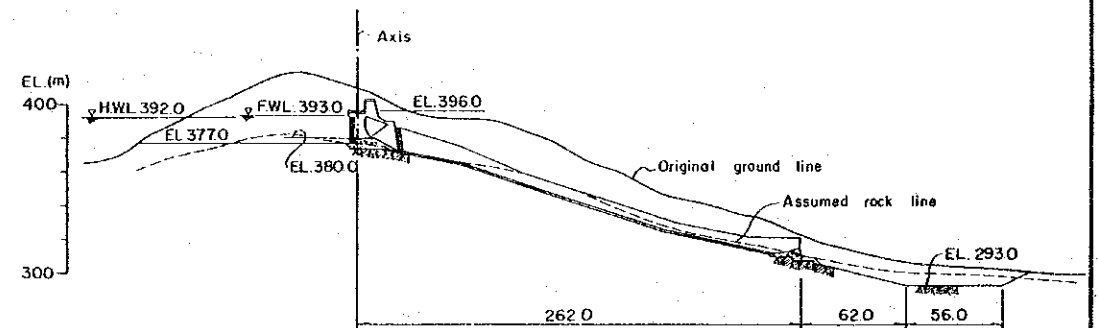


PLAN SCALE A

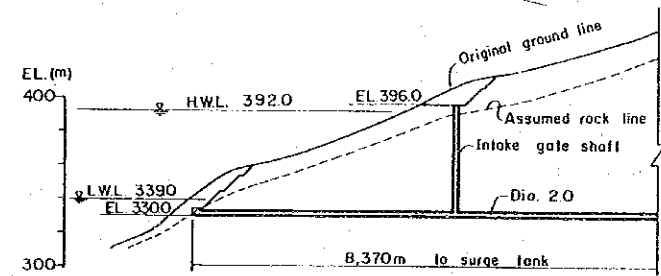
UPSTREAM VIEW OF DAM SCALE A



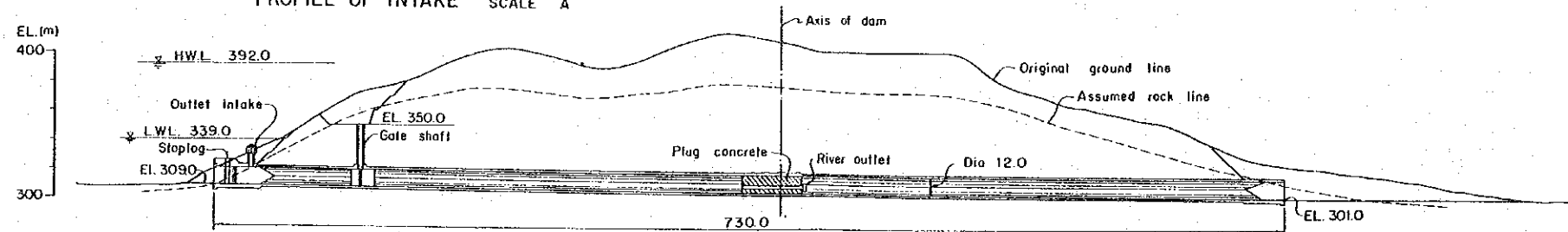
TYPICAL SECTION OF DAM SCALE A



PROFILE OF SPILLWAY SCALE A



PROFILE OF INTAKE SCALE A

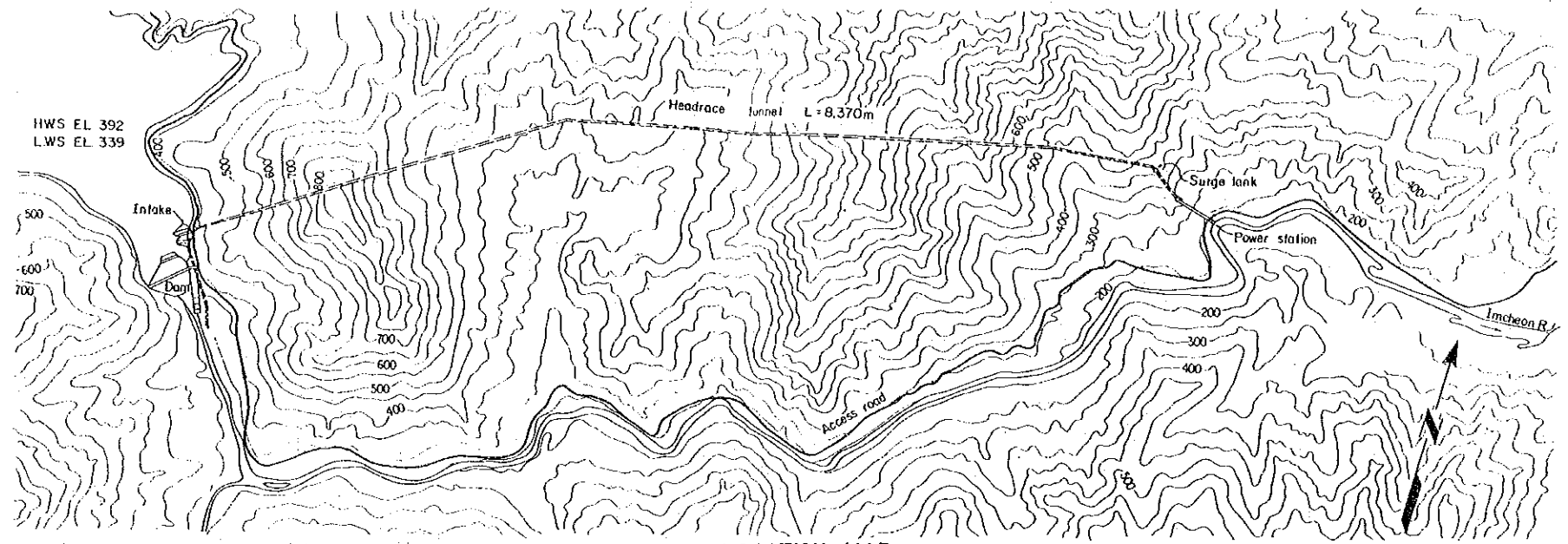


PROFILE OF DIVERSION TUNNEL SCALE A

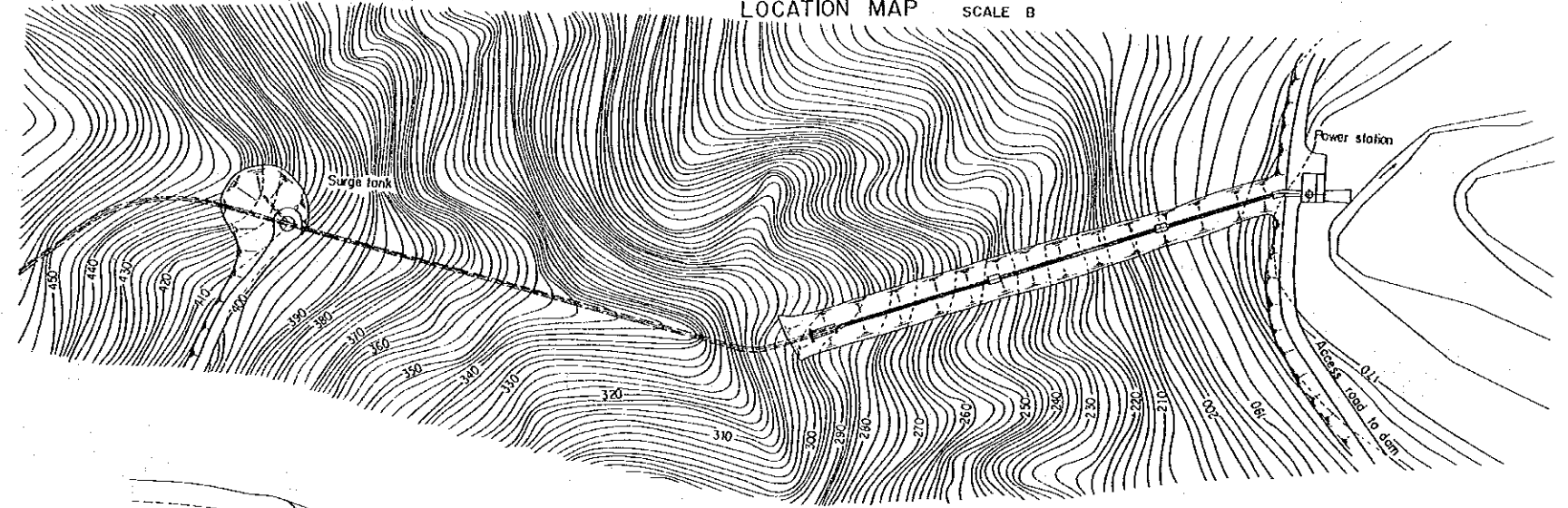
SCALE A 0 100 200m

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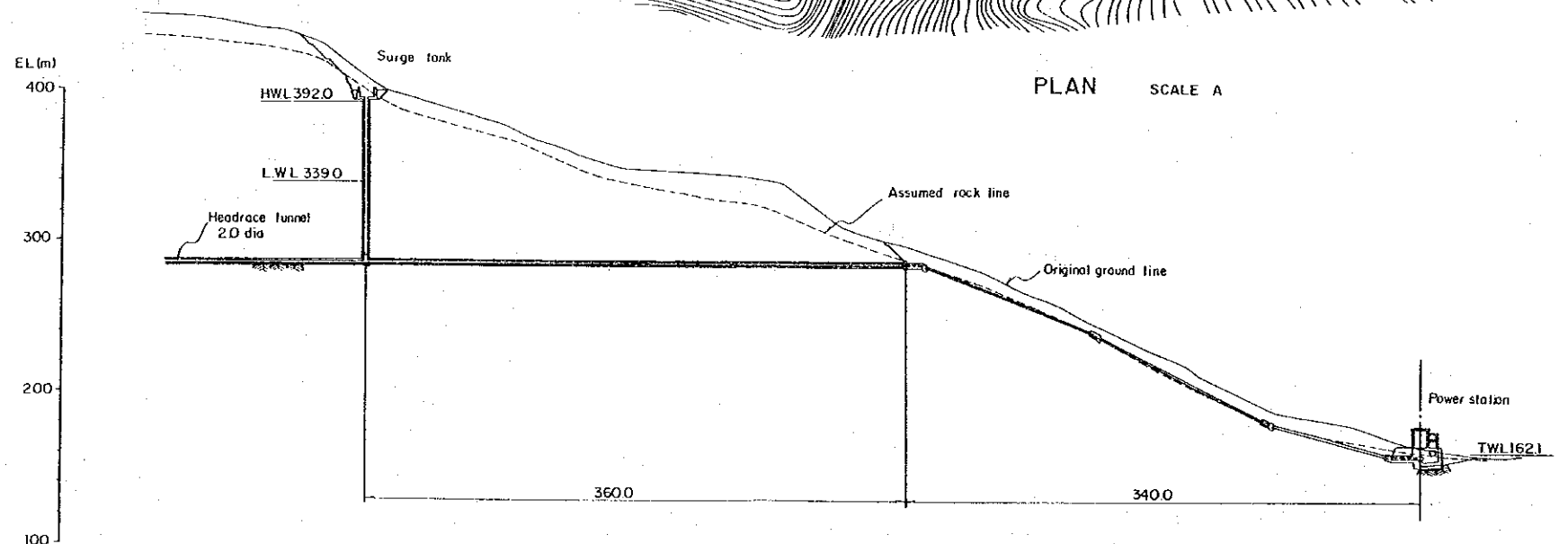
MINISTRY OF CONSTRUCTION GOVERNMENT OF THE REPUBLIC OF KOREA THE LONG-TERM MULTIPURPOSE DAM SCHEMES PRELIMINARY FEASIBILITY STUDY	
SAMPLE DESIGN HAMYANG DAM	
DRAWING NO.	116
JAPAN INTERNATIONAL COOPERATION AGENCY	



LOCATION MAP SCALE B

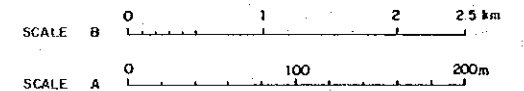


PLAN SCALE A



PROFILE OF PENSTOCK AND POWER STATION SCALE A

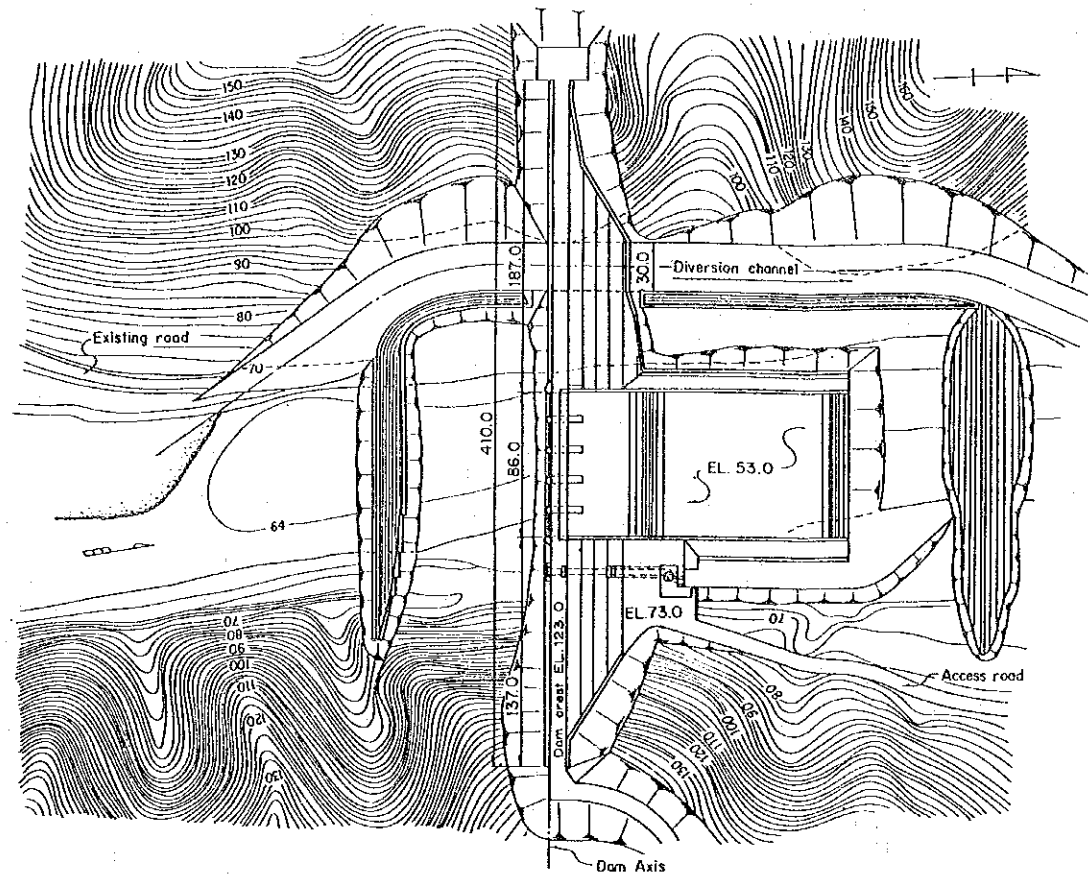
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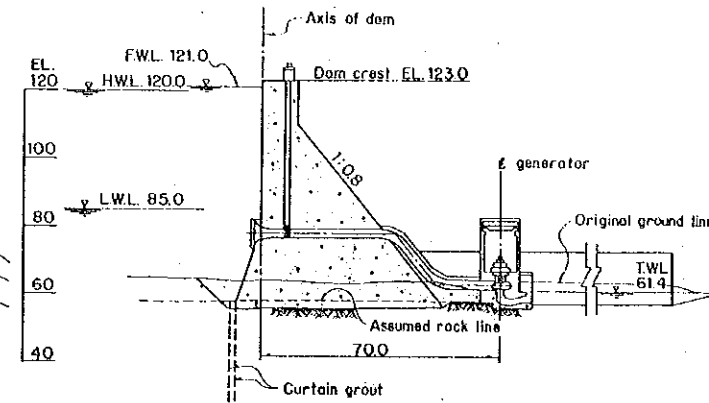
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GOVERNMENT OF THE REPUBLIC OF KOREA
THE LONG-TERM MULTIPURPOSE DAM SCHEMES
PRELIMINARY FEASIBILITY STUDY

SAMPLE DESIGN
HAMYANG
WATERWAY AND POWER STATION

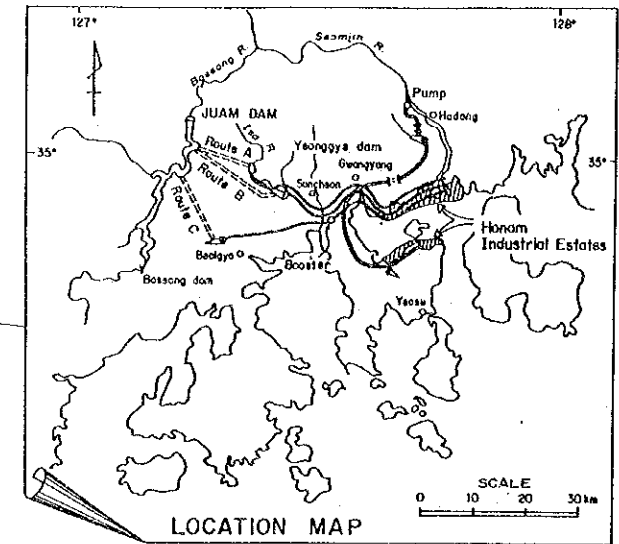
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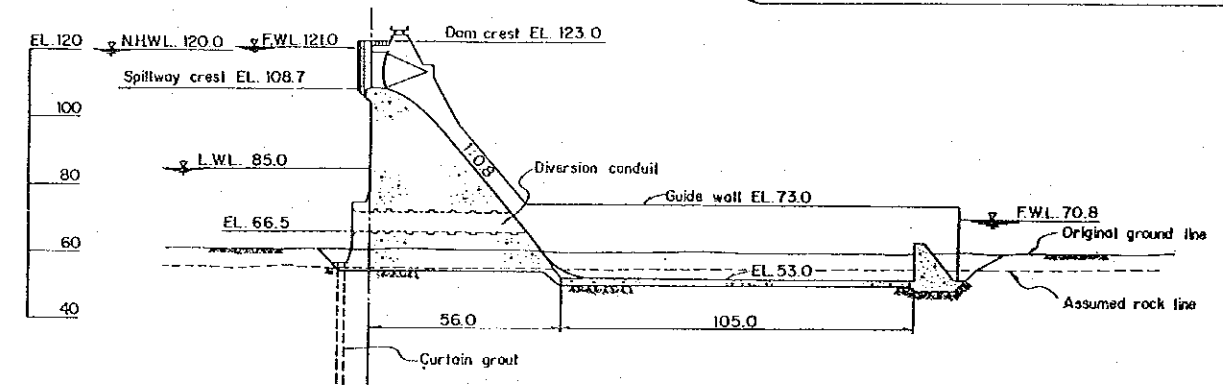
PLAN SCALE A



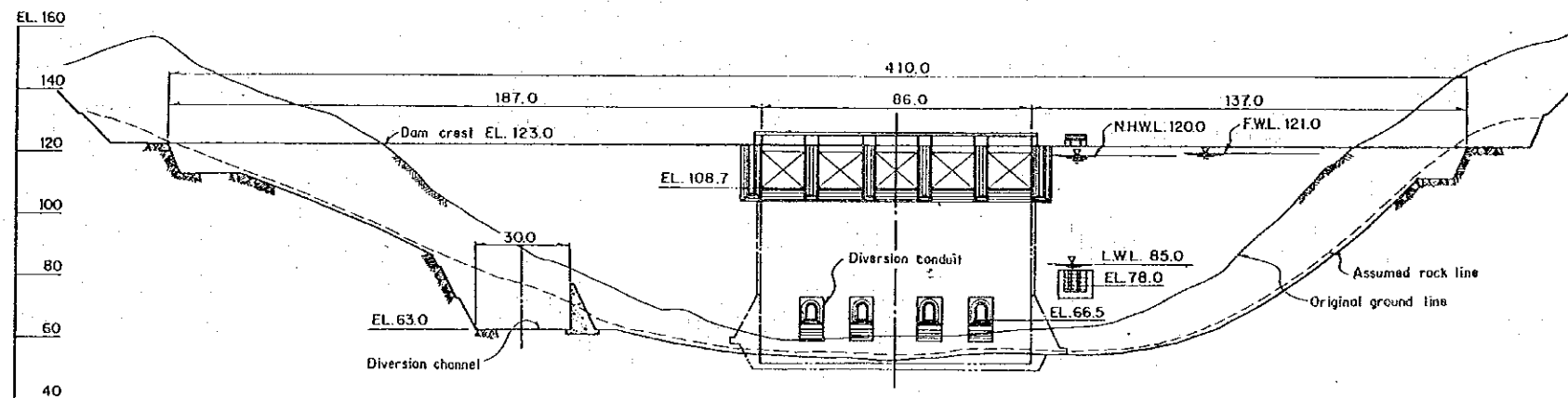
PROFILE OF INTAKE AND POWER HOUSE SCALE B



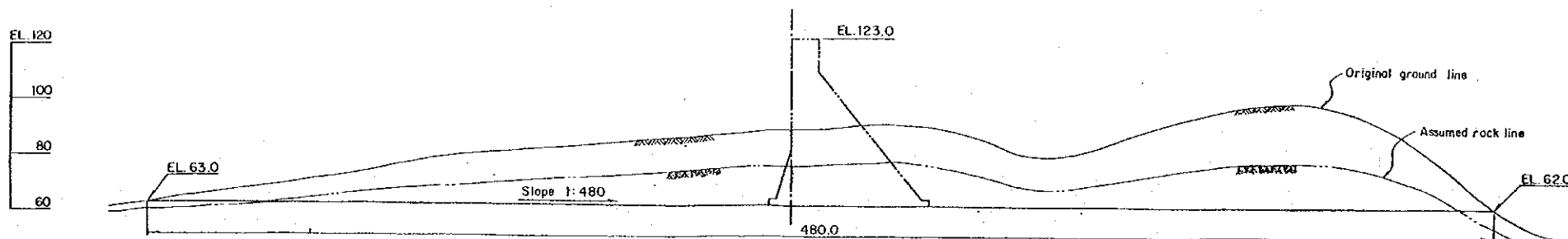
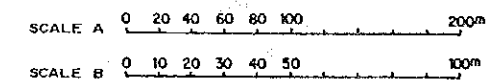
LOCATION MAP



PROFILE OF SPILLWAY SCALE B



UPSTREAM VIEW OF DAM SCALE B



PROFILE OF DIVERSION CHANNEL SCALE B

MINISTRY OF CONSTRUCTION GOVERNMENT OF THE REPUBLIC OF KOREA THE LONG-TERM MULTIPURPOSE DAM SCHEMES PRELIMINARY FEASIBILITY STUDY	
PRE - FEASIBILITY DESIGN JUAM (MAIN STREAM PLAN) DAM AND POWER STATION (HWL 120)	
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