11-A1 Dalcheon

The dam site is located on the Dal River approximately 9 km upstream from its confluence with the South Han River and about 6.5 km southwest of Chungju City.

The basement here is comprised of gneiss and schist and the dam site is situated where a granite mass has intruded both rocks.

The left bank forms a ridge consisting of granite. The edge of the ridge becomes a steep cliff which drops to the river. The top of the ridge is weathered for 3 to 5 m. The right bank is a gentle slope reaching to the river and since talus is only deposited thinly, there will be no problem. The river gradient in this vicinity is approximately 1/600 and there is a thick gravel layer deposited at the river bed.

Although there is no problem geologically inside the reservoir, the number of objects requiring compensation is very large. Farmers here are prosperous compared with those in upper reaches of the South Han River and there are many fertile paddies and fields, so that it is considered compensation for submerged areas will be a big problem.

This site is being contemplated from the necessity for flood control and water supply.

The road from Chungju City to the dam site is in comparatively good condition, though partial repairs will be necessary.

Since there are sand and gravel which are suitable as concrete aggregates upstream of the dam site, it is thought a concrete gravity-type dam would be suitable.

11-A1 Dalcheon

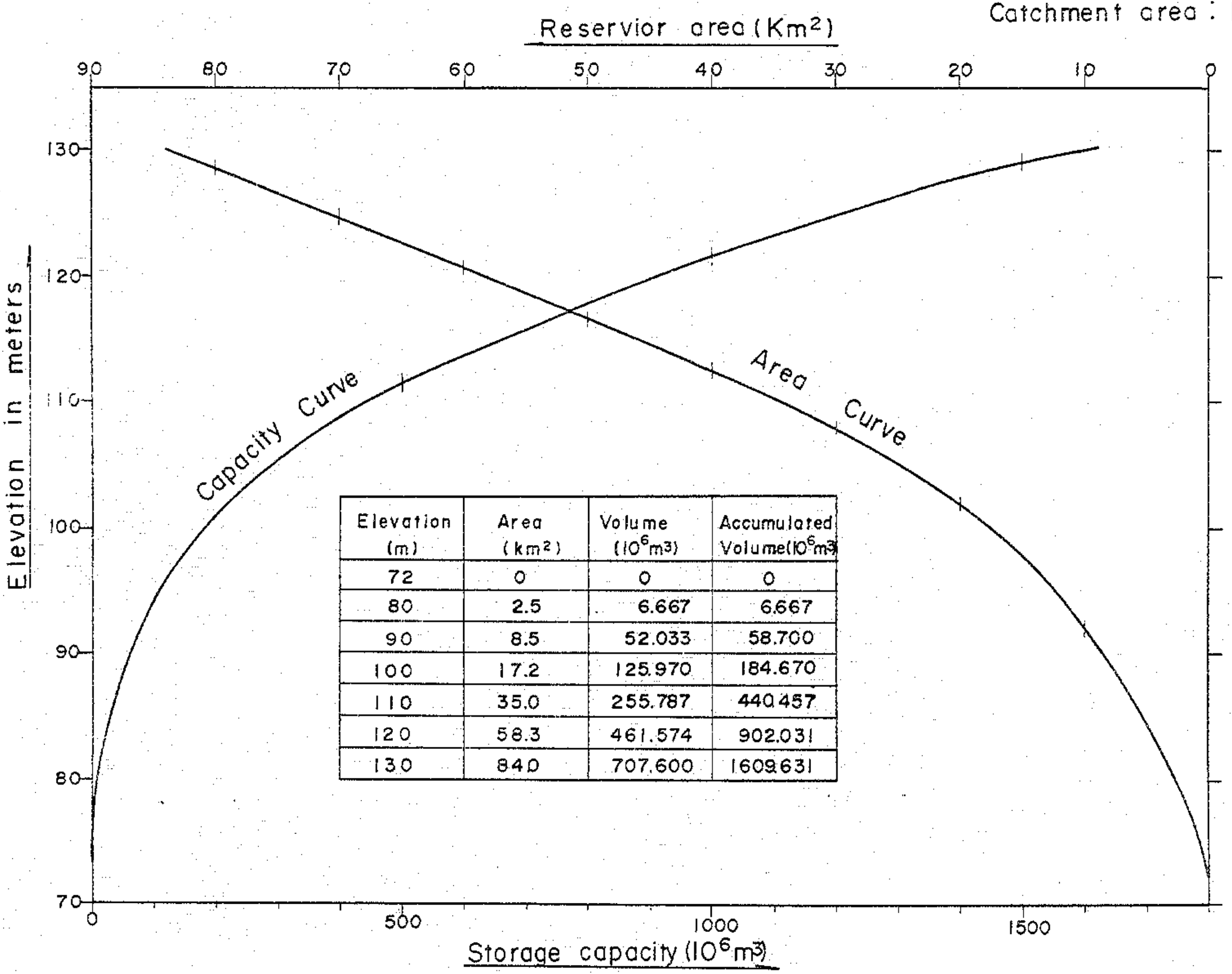
Location of dam Chungcheongbug-do Jungweon-gun

Name of river		Dal R., South Han R.
Basin		
Catchment area	km^2	1,348
Annual precipitation	mm	1,220
Annual mean discharge	m^3/s	33.43
Reservoir		
F.W.L.	EL.m	119.8
N.H.W.L.	"	115.8
L.W.L.	"	102.9
Gross storage capacity (N.H.W.L)	$10^6\mathrm{m}^3$	710
Effective capacity	"	421.7
Dead capacity	"	
Reservoir area (N.H.W.L)	km^2	48.5
Firm discharge	$\mathrm{m}^3/\mathrm{sec}$	14.39
Flood control capacity	$10^6\mathrm{m}^3$	185.4
Dam		
Type		Concrete-Gravity
Dam height	m	56.8
Crest length	"	313
Volume of dam	$10^3\mathrm{m}^3$	300
Spillway design flood	m^3/s	6,980
Geology		Granite
Power station		
Type		Dam
Max.discharge	$\mathrm{m}^3/\mathrm{sec}$	71.52
Rated head (effective)	m	37.3
Installed capacity	kW	23,100
Annual energy output	10^3kWh	66,700

Construction cost	10^6Won	
Compensation	"	18,044
Dam	"	11,872
Sub total	"	29,916
Power facilities	"	9,934
Total	"	39,850
Annual cost of dam and power station	10^6Won	3,565
Power & energy benefit	10^6Won	1,493
kW benefit	"	787
kWh benefit	"	706
B/C of power		0.42
(B-C) of power	10^6Won	-2,072
Increase of annual available discharge	$10^6\mathrm{m}^3$	403.5
Benefit of water supply	10^6Won	3,454 (107)
Benefit of flood control	"	1,868 (5,054)
Total benefit		6,815
Total B/C		(1.42) 1.91
B-C	10^6Won	(1,489) 3,250

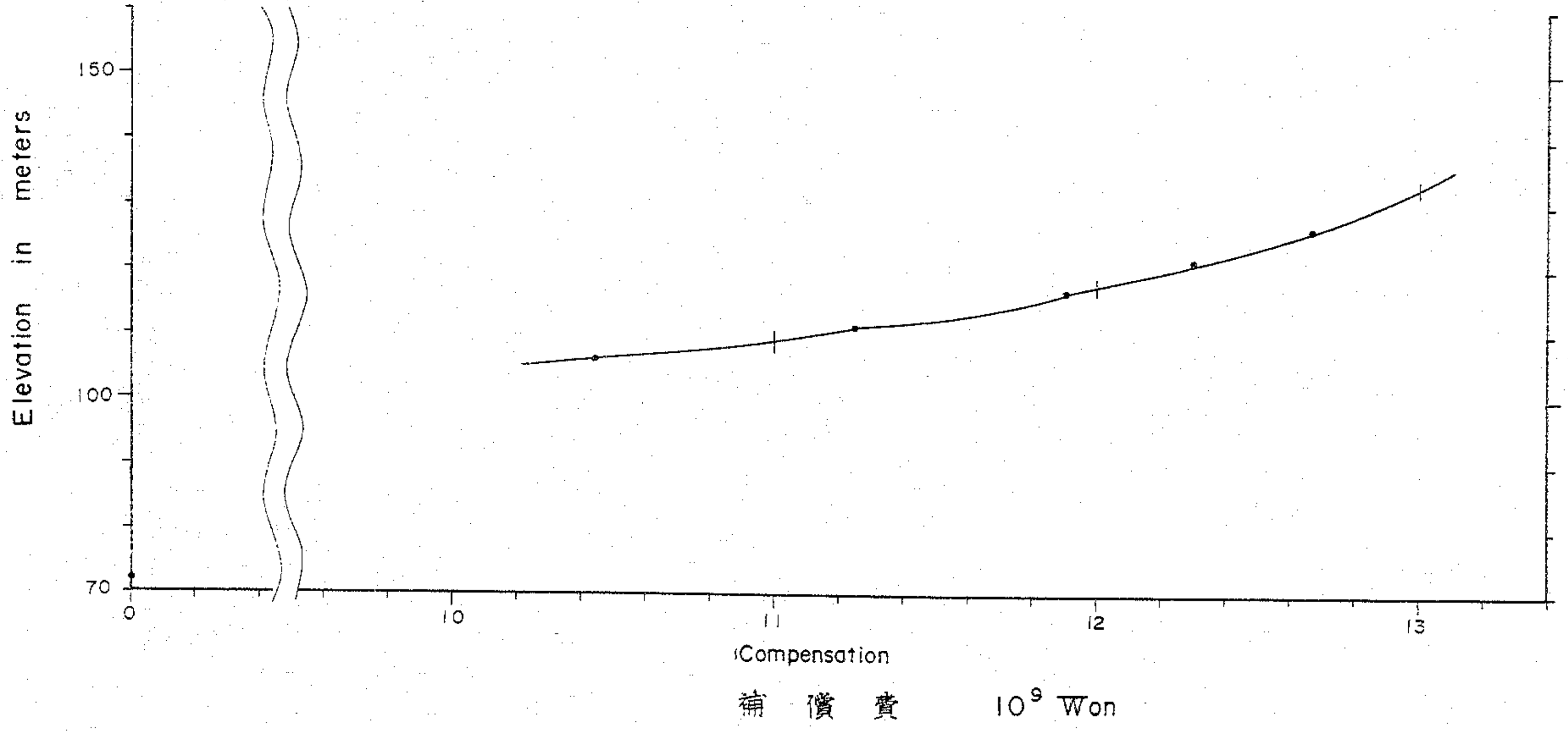
11-A1 達川 Dalcheon

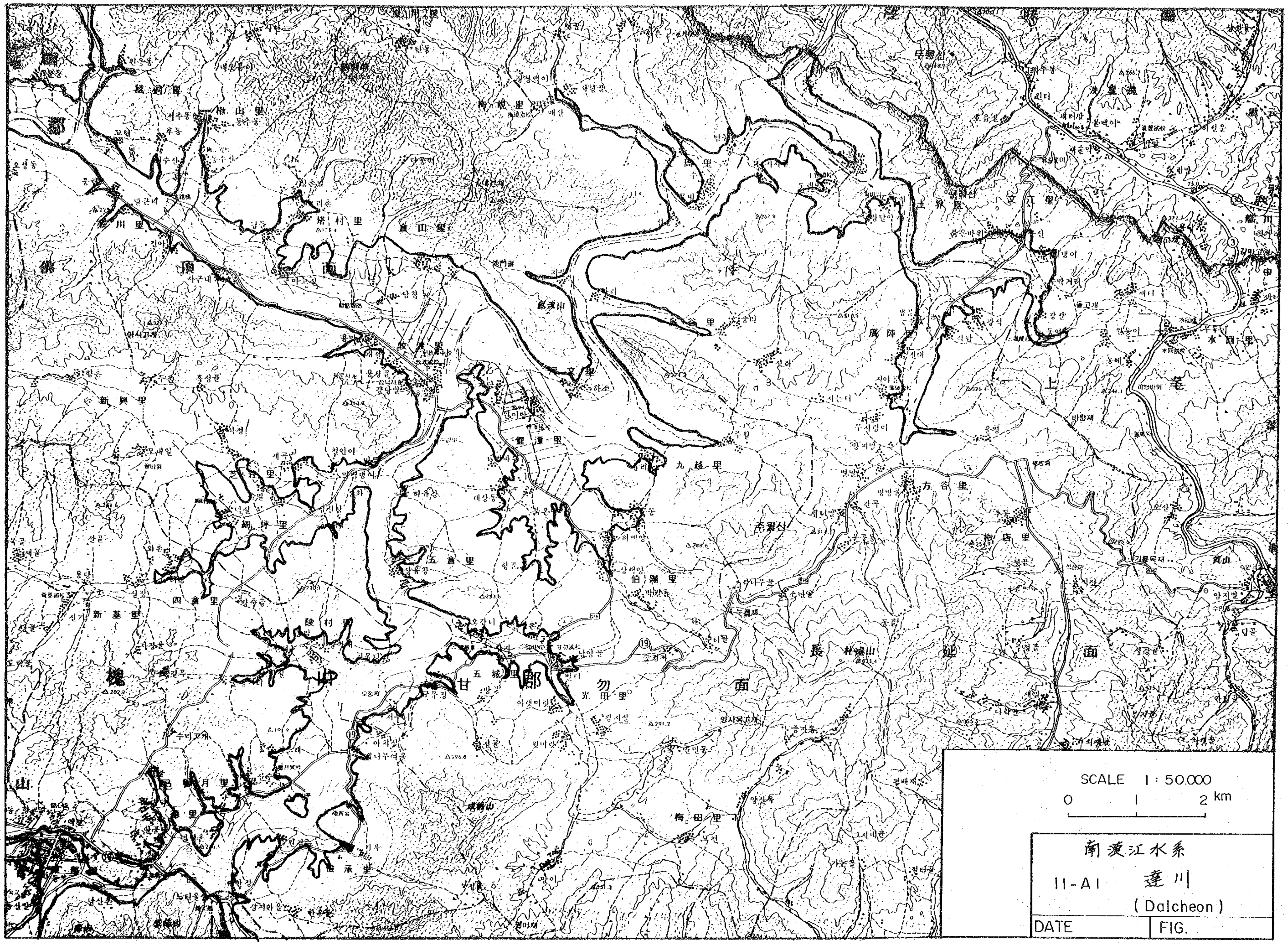
Catchment area : 1,348 Km²



Elevation (m)	Area (km²)	Volume (10^6m^3)	Accumulated Volume(10^6m^3)
72	0	0	0
80	2.5	6.667	6.667
90	8.5	52.033	58.700
100	17.2	125.970	184.670
110	35.0	255.787	440.457
120	58.3	461.574	902.031
130	84.0	707.600	1609.631

11－A1　達　川　Dalcheon




九越里
方谷里
伯鷄里
五倉里
四倉里
陵村里
新基里
新興里
五城里
光田里
梅田里
長
延
面
甘
勿
面
SCALE 1 : 50.000
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1
2 km

南漢江水系

11-A1 達川

(Dalcheon)

DATE FIG.

12-A3 Ganhyeon

The Ganhyeon Dam site is located approximately 25 km upstream along the Tam River which flows into the South Han River from the north and approximately 7 km northwest of Weonju City.

The river gradient in this vicinity is approximately 1/800 and relatively gentle, and the river flows southwest meandering widely until it merges to the South Han River.

Outcrops of quartz porphyry are seen at both banks of the dam site, and the river bed and both abutments are also quartz porphyry which is hard and dense so that the bedrock is good and there is no problem with the geology.

A saddle exists at the left bank with granite exposed at the reservoir side up to elevation of about 120 m, downstream from which a gentle slope consisting of weathered granite and talus deposits is developed. It is thought leakage from the reservoir will not be a problem at the planned high water level of 111.40 m.

Since there are many houses, paddies and fields in the vicinity of the end of the reservoir, detailed topographical surveys should be made hereafter including this vicinity and the number of objects of compensation investigated.

At the left bank downstream from the dam site and beyond 500 to 600 m upstream there are large quantities of sand and gravel on the river bed so that this site is favored with natural concrete materials of good quality.

12-A2 Ganhyeon

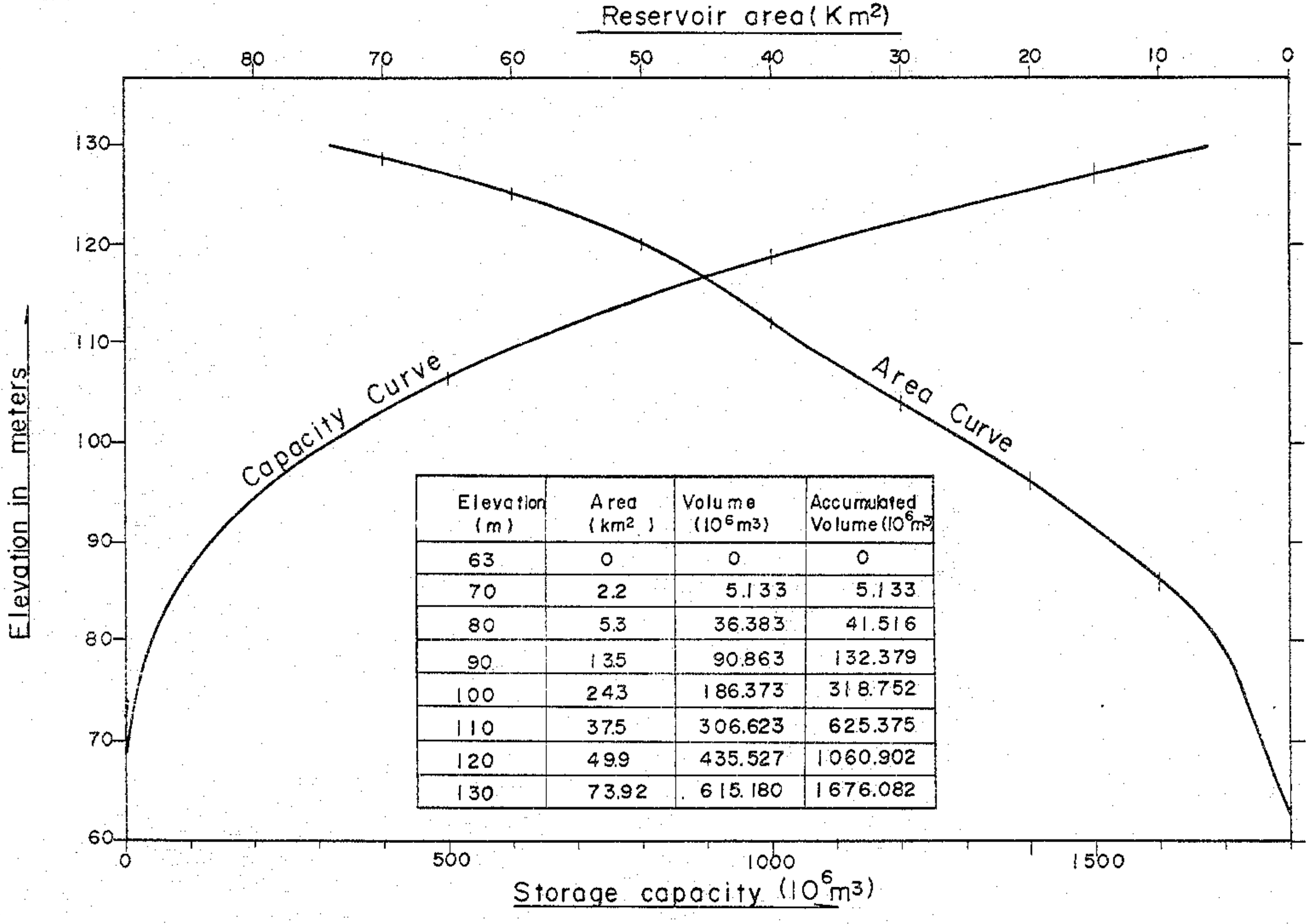
Location of dam Gangweon-do Weonseong-gun

Name of river		Tam R., South Han. R.
Basin		
Catchment area	km^2	1,180
Annual precipitation	mm	1,420
Annual mean discharge	m^3/s	33.87
Reservoir		
F.W.L.	EL.m	115.3
N.H.W.L.	"	111.4
L.W.L.	"	99.6
Gross storage capacity (N.H.W.L)	10^6m^3	673
Effective capacity	"	374
Dead capacity	"	299
Reservoir area (N.H.W.L)	km^2	39
Firm discharge	m^3/sec	14.45
Flood control capacity	10^6m^3	162.3
Dam		
Type		Concrete-Gravity
Dam height	m	48.4
Crest length	"	264
Volume of dam	10^3m^3	192
Spillway design flood	m^3/s	7,670
Geology		Quartz porphyry
Power station		
Type		Dam
Max.discharge	m^3/sec	70.98
Rated head (effective)	m	34.7
Installed capacity	kW	21,300
Annual energy output	10^3kWh	63,600

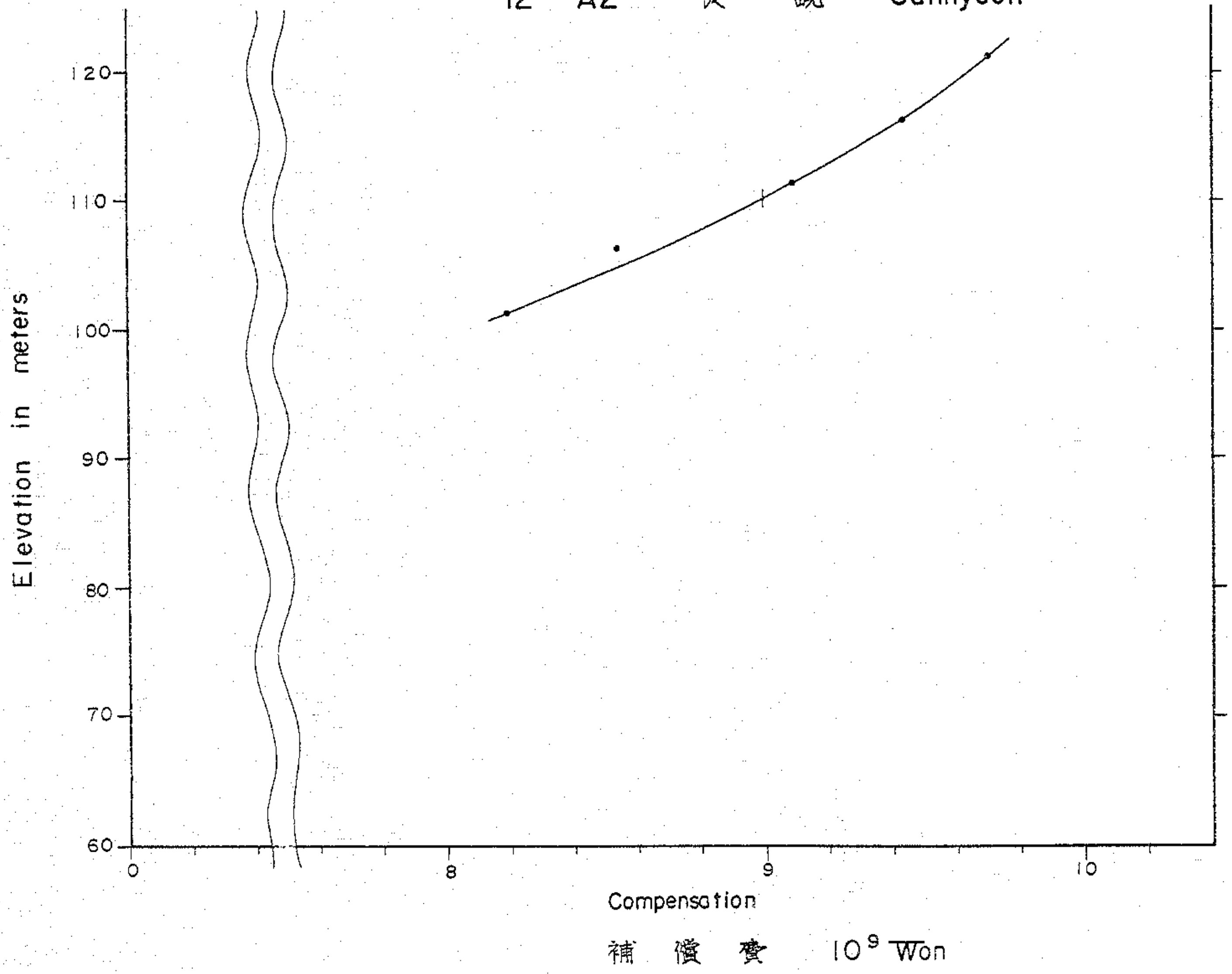
Construction cost	10^6Won	
Compensation	"	13,817
Dam	"	6,636
Sub total	"	20,453
Power facilities	"	12,343
Total	"	32,796
Annual cost of dam and power station	10^6Won	3,022
Power & energy benefit	10^6Won	1,401
kW benefit	"	727
kWh benefit	"	674
B/C of power		0.46
(B-C) of power	10^6Won	-1,621
Increase of annual available discharge	10^6m^3	405.7
Benefit of water supply	10^6Won	3,473 (34)
Benefit of flood control	"	1,260 (4,908)
Total benefit	"	6,134
Total B/C		(1.62) 2.03
B-C	10^6Won	(1,886) 3,112

12 - A2 艮 峴 Ganhyeon

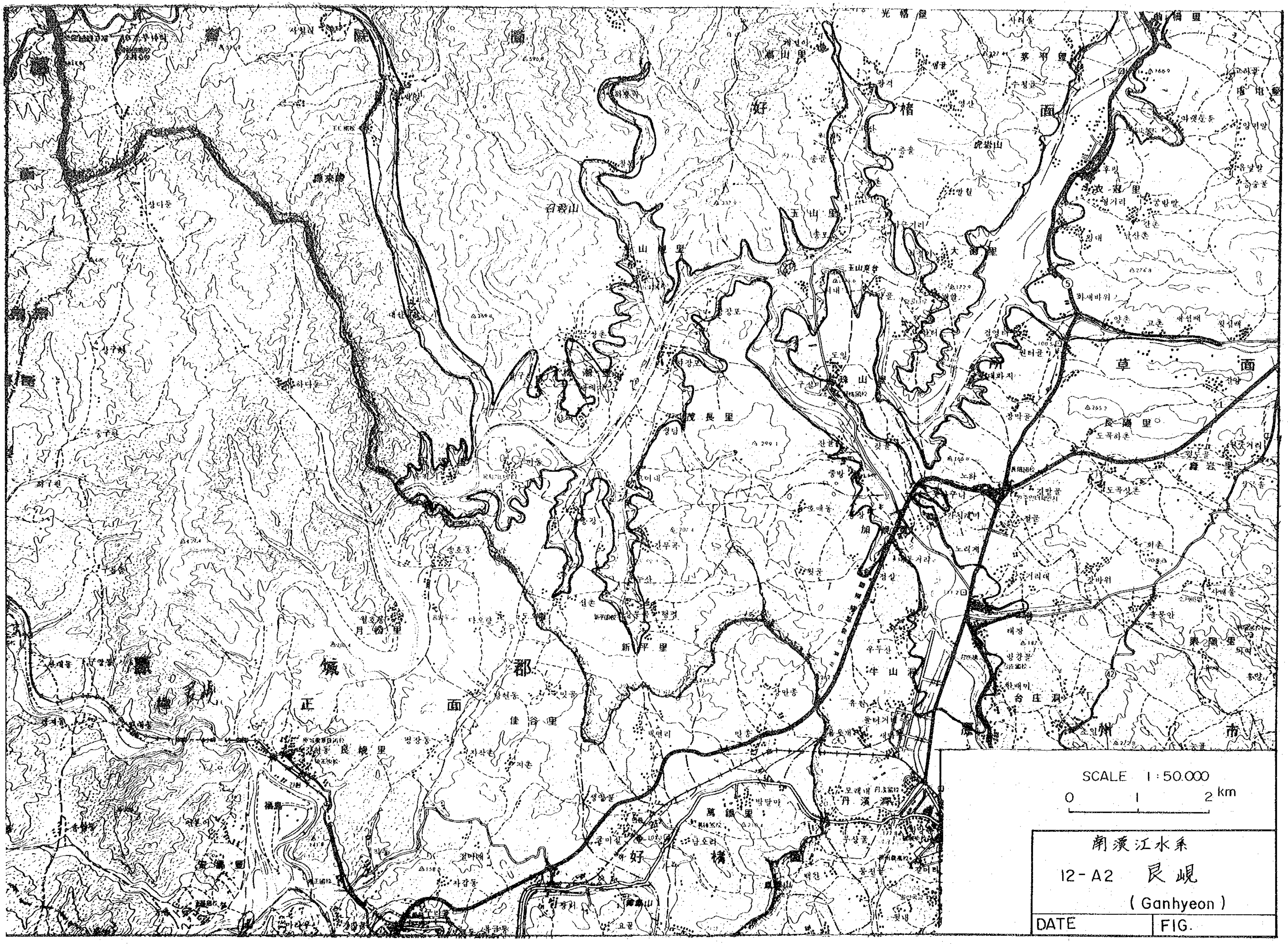
Catchment area : 1,180 Km²



Elevation (m)	Area (km²)	Volume ($10^6 m^3$)	Accumulated Volume ($10^6 m^3$)
63	0	0	0
70	2.2	5.133	5.133
80	5.3	36.383	41.516
90	13.5	90.863	132.379
100	24.3	186.373	318.752
110	37.5	306.623	625.375
120	49.9	435.527	1060.902
130	73.92	615.180	1676.082



12 — A2 艮 峴 Ganhyeon


光格里
好楮面
玉山里
新平里
月松里
艮峴里
佳谷里
正面
草面
原州市
丹溪洞
萬鍾里
牛山洞

SCALE 1:50.000

0 1 2 km

南漢江水系

12-A2 艮峴

(Ganhyeon)

DATE	FIG.

13-35 Bonghawa

The project site is located approximately 408 km up the Nakdong River and about 20 km upstream from the end of the Andong Dam backwater.

The river gradient in this vicinity is around 1/480 and relatively gentle.

The bed rock of the originally proposed dam site consists of sedimentary rocks - alternations of sandstone and conglomerate. The left bank is steeply sloped and outcrops can be seen, while at the river bed the gravel layer is thin and thought to be 1 - 2 m. Although it is thought there will be no special problem as a dam foundation, slight loosening of the bedrock can be seen at the right abutment and there is a possibility that deep excavation will be required.

An alternative site approximately 3 km downstream from the original one can be considered. The downstream alternative site has talus at the left bank and the deposit is estimated to be about 5 to 6 m in thickness, while topographically, the site is wider compared with the upstream original site. The geology is the same as that of the upstream site, but there are fewer cracks and both the left and right banks will be sound if the talus is removed.

A rough comparison study was made for the original and downstream sites. Based on this study, the development scheme at the upstream site will be economically advantageous, but a need remains for further investigations for comparison of the two proposals.

13-35 Bonghwa

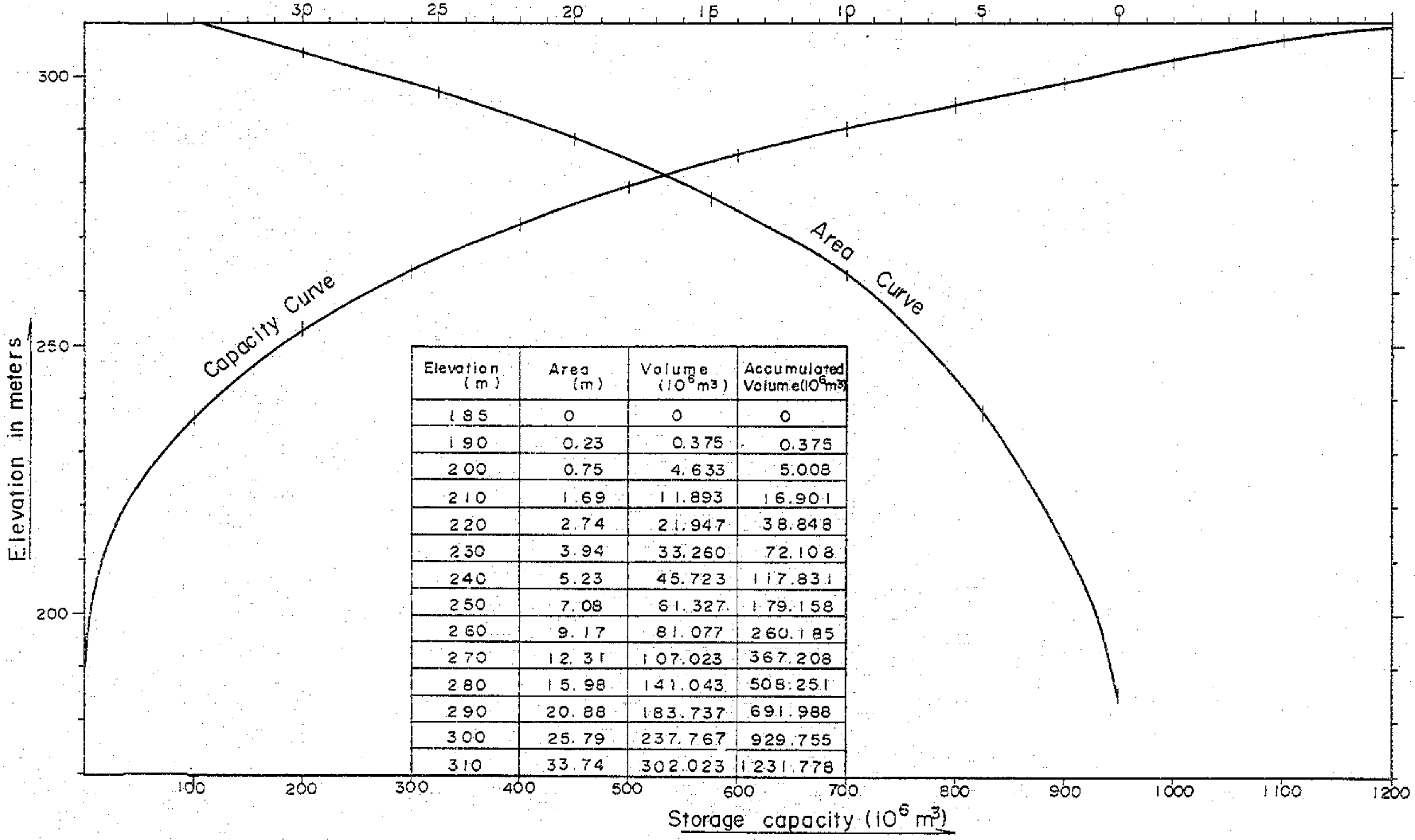
Location of dam Gyeongsangbug-do Bonghwa-gun

Name of river	Nakdong R.	
Basin		
Catchment area	km^2	1,105
Annual precipitation	mm	1,020
Annual mean discharge	m^3/s	20.77
Reservoir		
F.W.L.	EL.m	305.8
N.H.W.L.	"	303.8
L.W.L.	"	269.6
Gross storage capacity (N.H.W.L)	10^{6}m^3	1,015
Effective capacity	"	655.1
Dead capacity	"	359.9
Reservoir area (N.H.W.L)	km^2	29.3
Firm discharge	m^3/sec	17.74
Flood control capacity	10^{6}m^3	53.4
Dam		
Type		Rock-Fill
Dam height	m	128.8
Crest length	"	302
Volume of dam	10^{3}m^3	5,920
Spillway design flood	m^3/s	6,360
Geology		Sand stone, conglomerate
Power station		
Type		Dam
Max. discharge	m^3/sec	86.62
Rated head(effective)	m	100.4
Installed capacity	kw	75,200
Annual energey output	10^{3}kwh	149,400

Construction cost	10^{6}Won	
Compensation	"	5,473
Dam	"	22,242
Sub total	"	27,715
Power facilities	"	12,297
Total	"	40,012
Annual cost of dam and power station	10^{6}Won	3,690
Power & energy benefit	10^{6}Won	4,123
KW benefit	"	2,568
KWh benefit	"	1,555
B/C of power		1.12
(B-C) of power	10^{6}Won	433
Increase of annual available discharge	10^{6}m^3	139.3
Benefit of water supply	10^{6}Won	908
Benefit of flood control	"	35
Total benefit	"	5,066
Total B/C		1.37
B-C	10^{6}Won	1,376

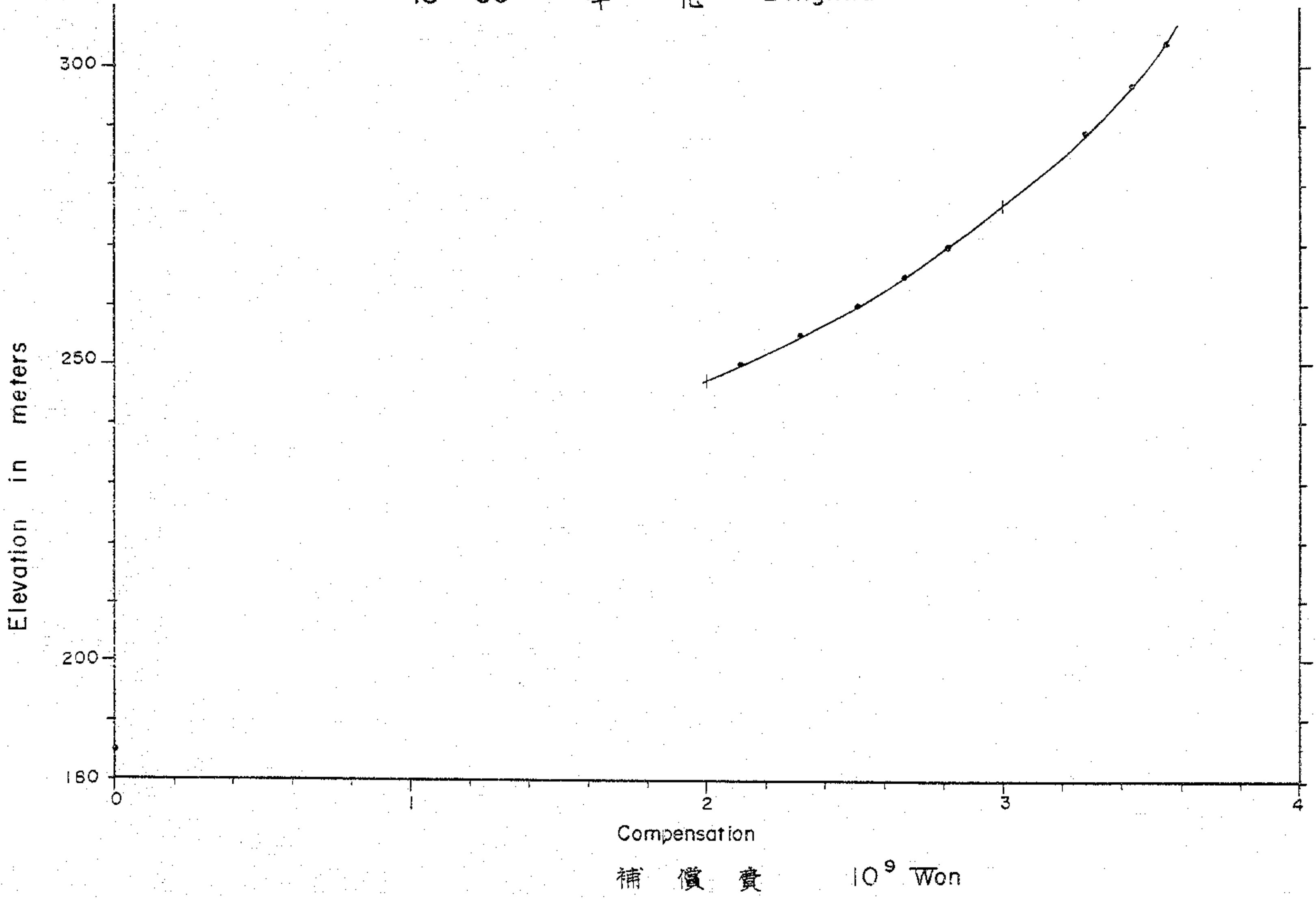
13-35 奉化（原案） Bonghwa

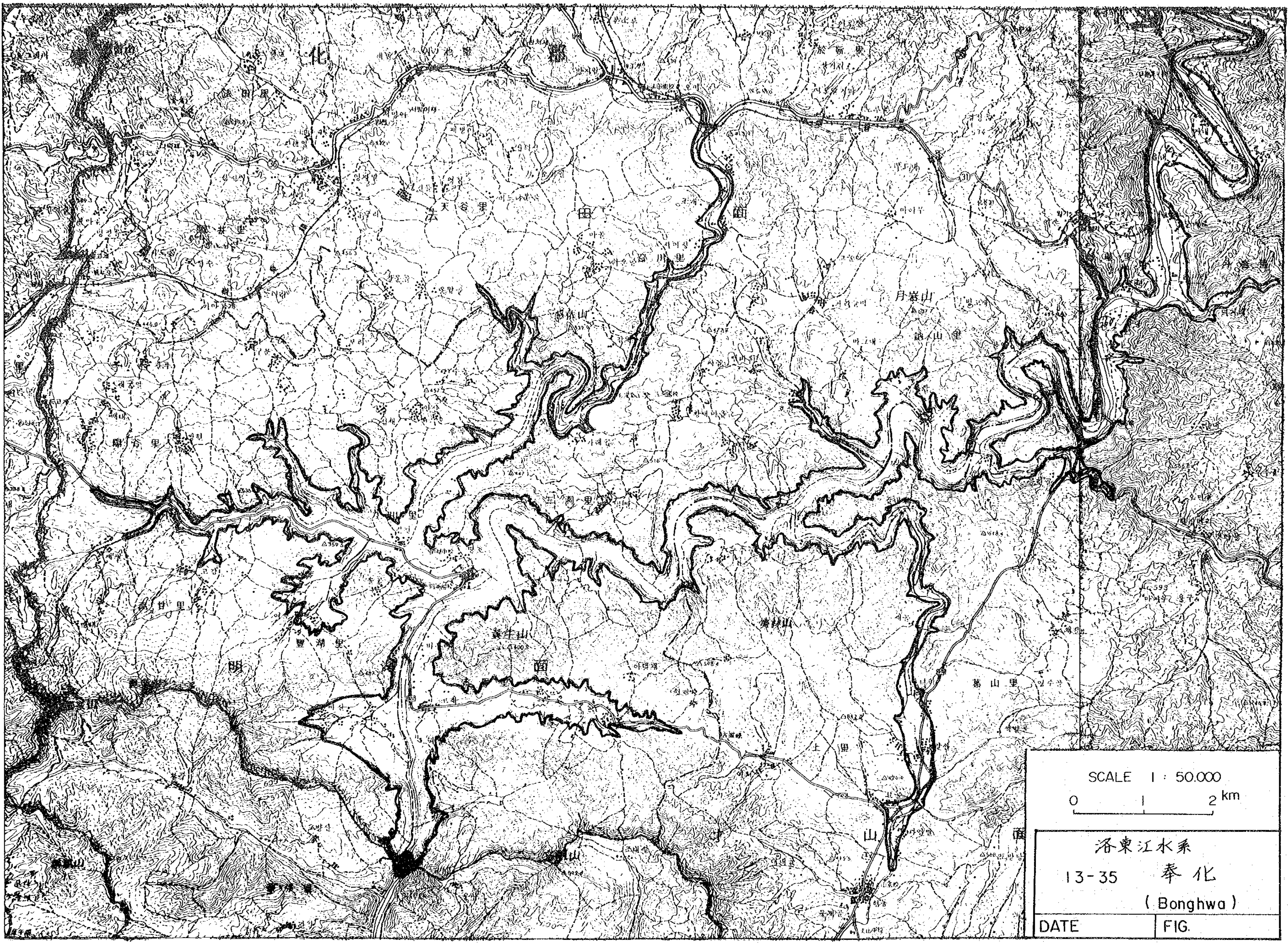
Catchment area : 1, 105 Km²



Elevation (m)	Area (m)	Volume ($10^6 m^3$)	Accumulated Volume($10^6 m^3$)
185	0	0	0
190	0.23	0.375	0.375
200	0.75	4.633	5.008
210	1.69	11.893	16.901
220	2.74	21.947	38.848
230	3.94	33.260	72.108
240	5.23	45.723	117.831
250	7.08	61.327	179.158
260	9.17	81.077	260.185
270	12.31	107.023	367.208
280	15.98	141.043	508.251
290	20.88	183.737	691.988
300	25.79	237.767	929.755
310	33.74	302.023	1231.778

13 - 35 奉化 Bonghwa




化
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洛東江水系

13-35 奉化

(Bonghwa)

DATE FIG.

14-43 Imha

The dam site is located on the Panbyeon River approximately 25 km upstream from the conjunction with the Nagdong River mainstream and about 15 km east of Andong City.

The river gradient in this vicinity is gentle at about 1/570, and the river flows northwest meandering widely until it merges to the Nagdong River.

The dam site has a stable topography at both left and right banks where outcrops of gneiss are seen, while there are almost no deposits of sand and gravel at the river bed so that it is a favorable condition for a dam.

The right bank immediately upstream of the dam site is gullied and thin ridges exist at 3 places, but there is exposed rock along gully surfaces so that special problems are not posed.

It is thought materials for the dam can be obtained upstream of the dam.

Since it is presumed there will be a fairly large number of objects requiring compensation in the reservoir area, detailed investigations should be made and further examinations carried out with regard to the height of the dam.

14-43 Imha

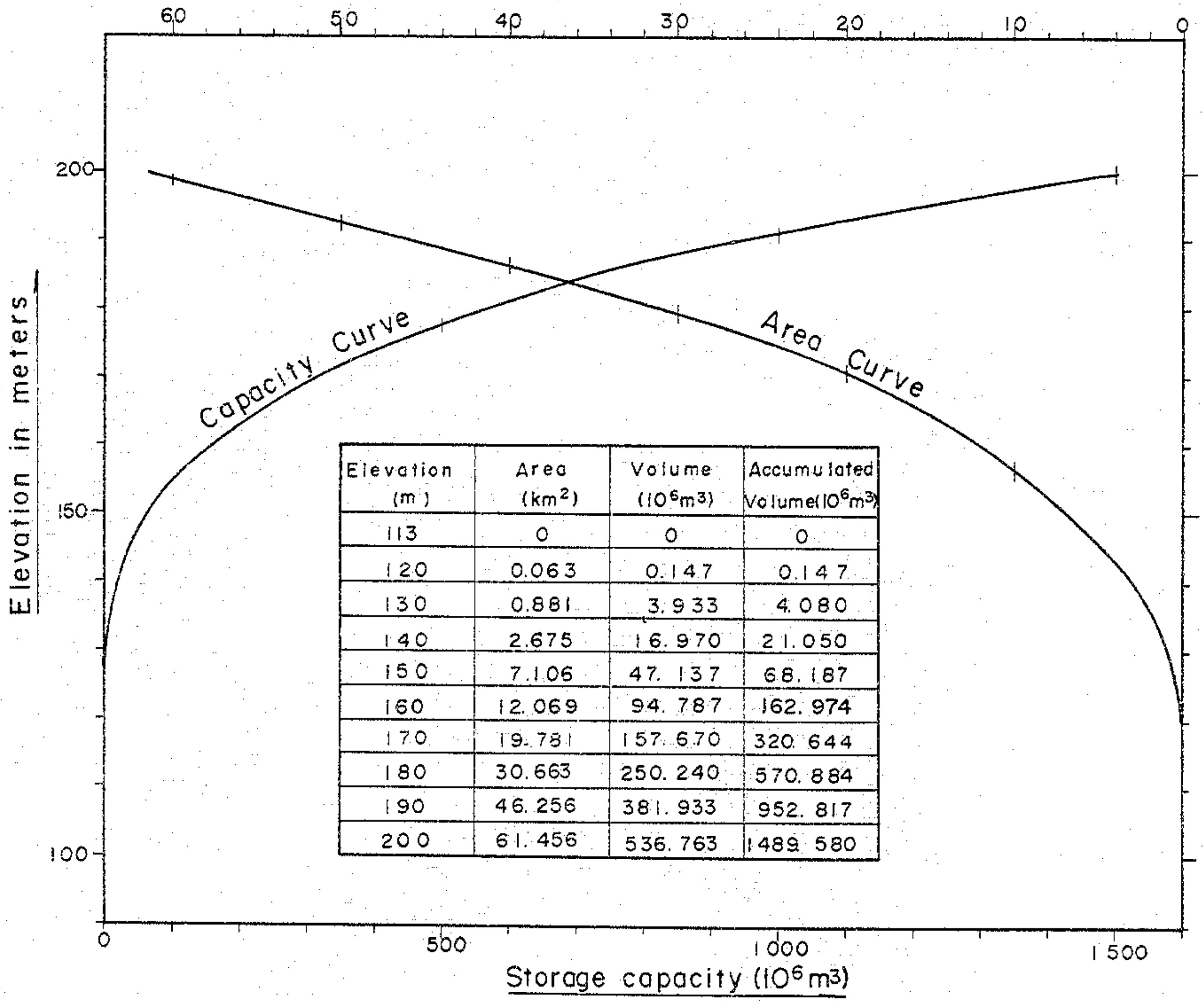
Location of dam Gyeongsangbug-do Andong-gun

Name of river		Panbyeon R., Nakdong R.
Basin		
Catchment area	km^2	1,230
Annual precipitation	mm	1,040
Annual mean discharge	m^3/s	23.12
Reservoir		
F.W.L.	EL.m	193.5
N.H.W.L.	"	192
L.W.L.	"	169.8
Gross storage capacity (N.H.W.L)	10^6m^3	1,055
Effective capacity	"	729.2
Dead capacity	"	325.8
Reservoir area (N.H.W.L)	km^2	48.8
Firm discharge	m^3/sec	19.6
Flood control capacity	10^6m^3	84.9
Dam		
Type		Rock-Fill
Dam height	m	83
Crest length	"	376
Volume of dam	10^3m^3	3,020
Spillway design flood	m^3/s	6,700
Geology		Gneiss
Power station		
Type		Dam
Max. discharge	m^3/sec	96.34
Rated head(effective)	m	65
Installed capacity	kW	54,200
Annual energy output	10^3kWh	107,100

Construction cost	10^6Won	
Compensation	"	19,739
Dam	"	12,889
Sub total	"	32,628
Power facilities	"	12,753
Total	"	45,381
Annual cost of dam and power station	10^6Won	4,093
Power & energy benefit	10^6Won	2,865
kW benefit	"	1,851
kWh benefit	"	1,014
B/C of power		0.70
(B-C) of power	10^6Won	-1,228
Increase of annual available discharge	10^6m^3	590.9
Benefit of water supply	10^6Won	3,853 (61)
Benefit of flood control	"	1,915
Total benefit	"	(6,779) 8,633
Total B/C	"	(1.66) 2.11
B-C	10^6Won	(2,686) 4,540

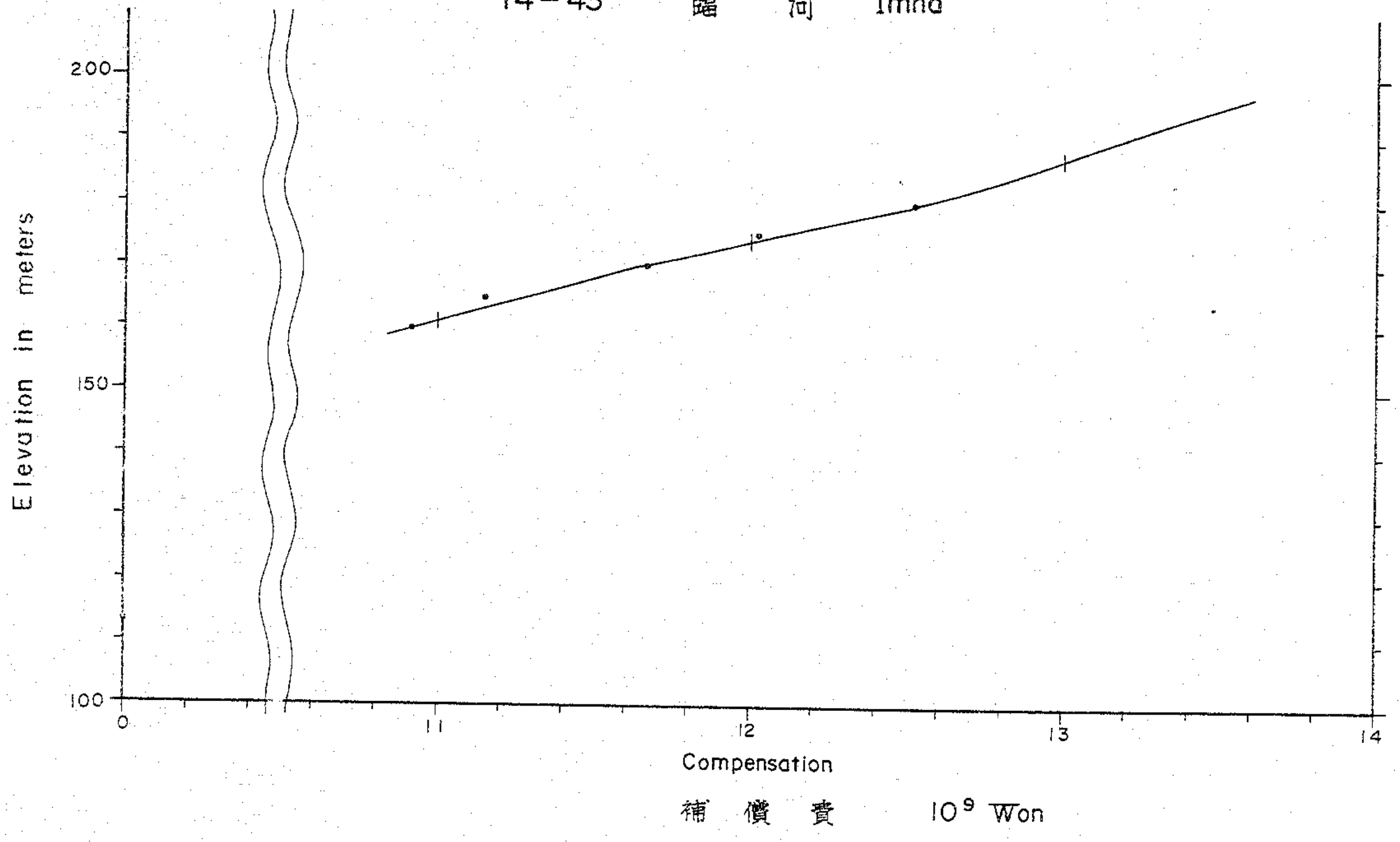
14 -43 臨 河 Imha

Catchment area : 1,230 Km²



Elevation (m)	Area (km²)	Volume ($10^6 m^3$)	Accumulated Volume($10^6 m^3$)
113	0	0	0
120	0.063	0.147	0.147
130	0.881	3.933	4.080
140	2.675	16.970	21.050
150	7.106	47.137	68.187
160	12.069	94.787	162.974
170	19.781	157.670	320.644
180	30.663	250.240	570.884
190	46.256	381.933	952.817
200	61.456	536.763	1489.580

14－43　臨　河　Imha


200
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Elevation in meters
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Compensation
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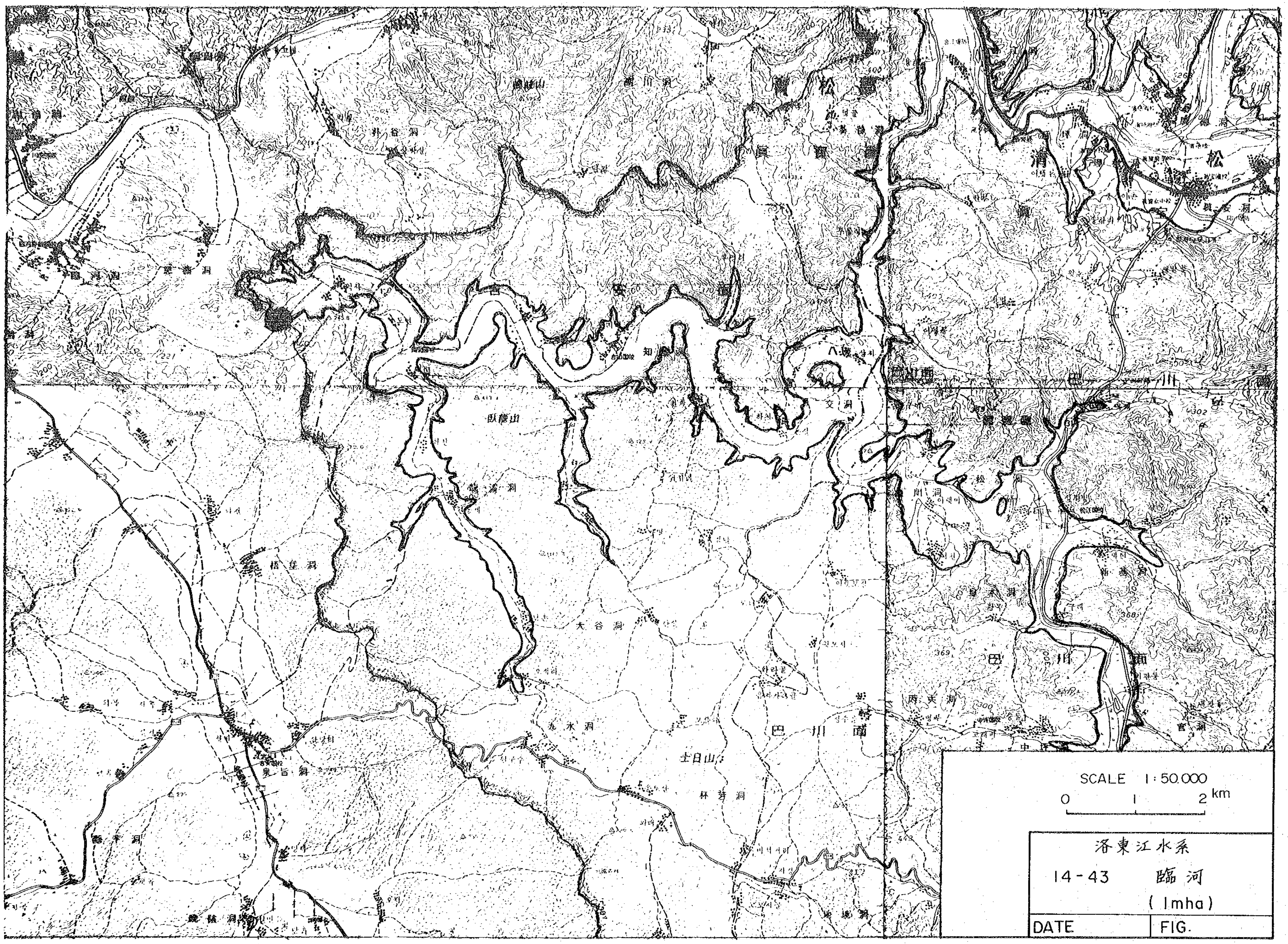
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洛東江水系

14-43 臨河

(1mha)

DATE

FIG.

15-36 Chibo

The project site is at the upstream part of the Nakdong River mainstream and is located approximately 60 km west of Andong City.

This site is immediately below Pung Ji Bridge approximately 5 km downstream from the site originally proposed and is considered to be superior to the original site as the water storage efficiency of the dam would be far better, and therefore, selected as an alternative site in this present study.

There is a site which had been investigated many years ago about 5 km downstream from this one, but there is a portion of low elevation at the left bank which would require construction of a long subdam and so no economic comparison can be made.

Although the high water level of the dam will be restricted by the elevation of Andong City, it was tentatively planned at 87.7 m. The river gradient in the vicinity of the dam site is gentle at around 1/2,000, and there are wide distributions of thickly deposited sand and gravel layers both upstream and downstream reaches of the dam, and the river meanders in large sweeps.

The basal rock is granitic gneiss, and while the right bank has outcrops and is sound, the left bank shows considerable weathering of schistous gneiss.

Meanwhile, with respect to the geology of the originally proposed site, although the existence of fault cannot be confirmed, since there are dislocations of ground strata, it is possible for small scale fault to exist at the river bed.

It is thought necessary for further geological survey for dam site and topographical survey for the reservoir, and detailed investigations for compensation necessary for study of the dam height.

15-36 Chibo

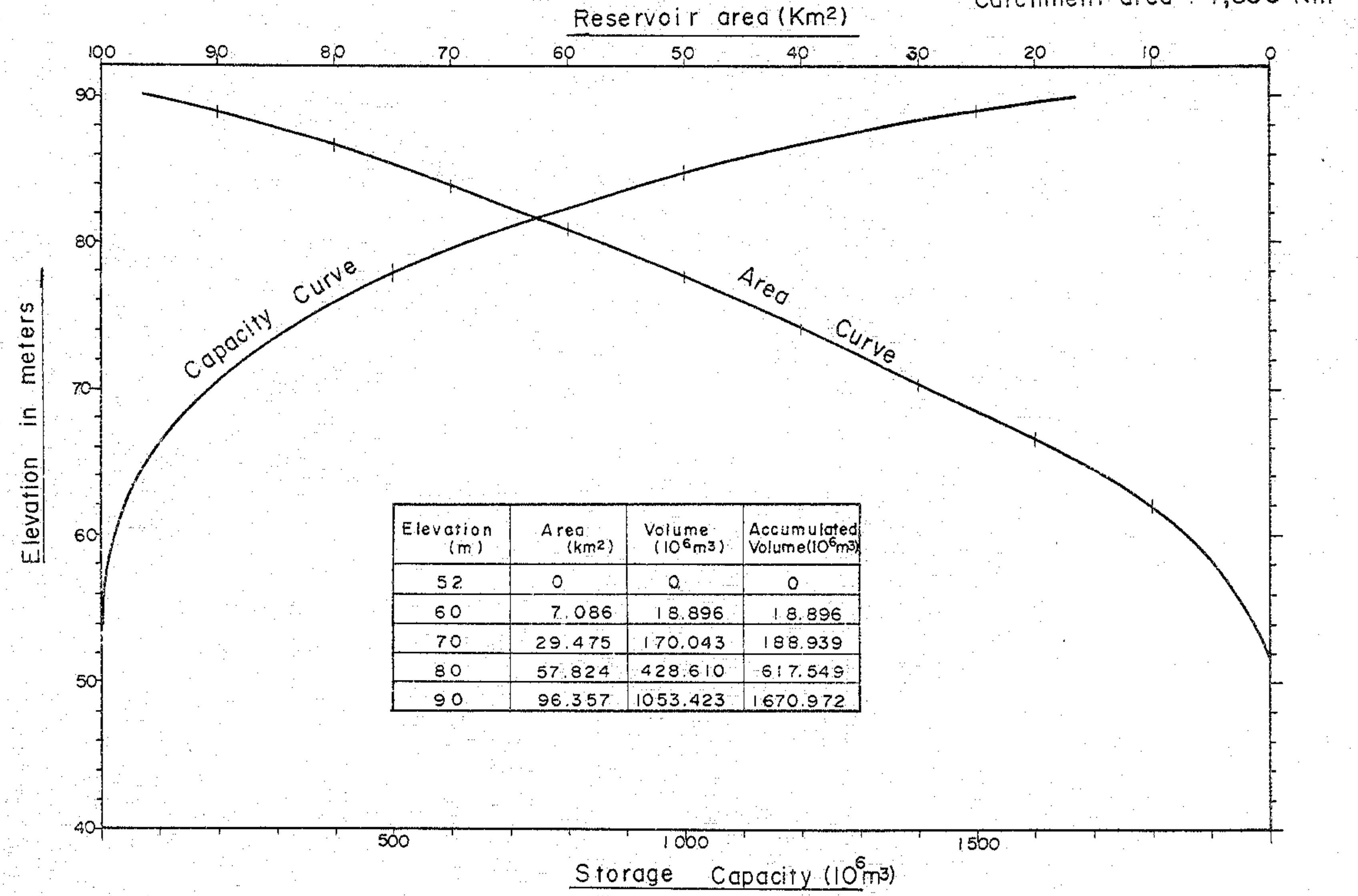
Location of dam left bank : Gyeongsangbug-do Euiseong-gun
right bank: Gyeongsangbug-do Yecheon-gun

Name of river		Nakdong R.
Basin		
Catchment area	km^2	4,550
Annual precipitation	mm	1,040
Annual mean discharge	m^3/s	77.34
Reservoir		
F.W.L.	EL.m	91.0
N.H.W.L.	"	87.7
L.W.L.	"	77.6
Gross storage capacity (N.H.W.L)	10^{6}m^3	900
Effective capacity	"	776
Dead capacity	"	124
Reservoir area (N.H.W.L)	km^2	73.3
Firm discharge	m^3/sec	58.68
Flood control capacity	10^{6}m^3	314
Dam		
Type		Concrete-Gravity
Dam height	m	48.7
Crest length	"	579
Volume of dam	10^{3}m^3	476.5
Spillway design flood	m^3/s	11,780
Geology		Granitic gneiss Schistous gneiss
Power station		
Type		Dam
Max. discharge	m^3/sec	285.41
Rated head(effective)	m	29.6
Installed capacity	kW	73,100
Annual energy output	10^{3}kwh	164,800

Construction cost	10^{6}Won	
Compensation	"	50,230
Dam	"	15,026
Sub total	"	65,256
Power facilities	"	27,352
Total	"	92,608
Annual cost of dam and power station	10^{6}Won	8,329
Power & energy benefit	10^{6}Won	4,059
KW benefit	"	2,498
kWh benefit	"	1,561
B/C of power		0.49
(B-C) of power	10^{6}Won	-4,270
Increase of annual available discharge	10^{6}m^3	965.7
Benefit of water supply	10^{6}Won	6,296 (141)
Benefit of flood control	"	4,527
Total benefit	"	(10,496) 14,882
Total B/C		(1.26) 1.79
B-C	10^{6}Won	(2,167) 6,553

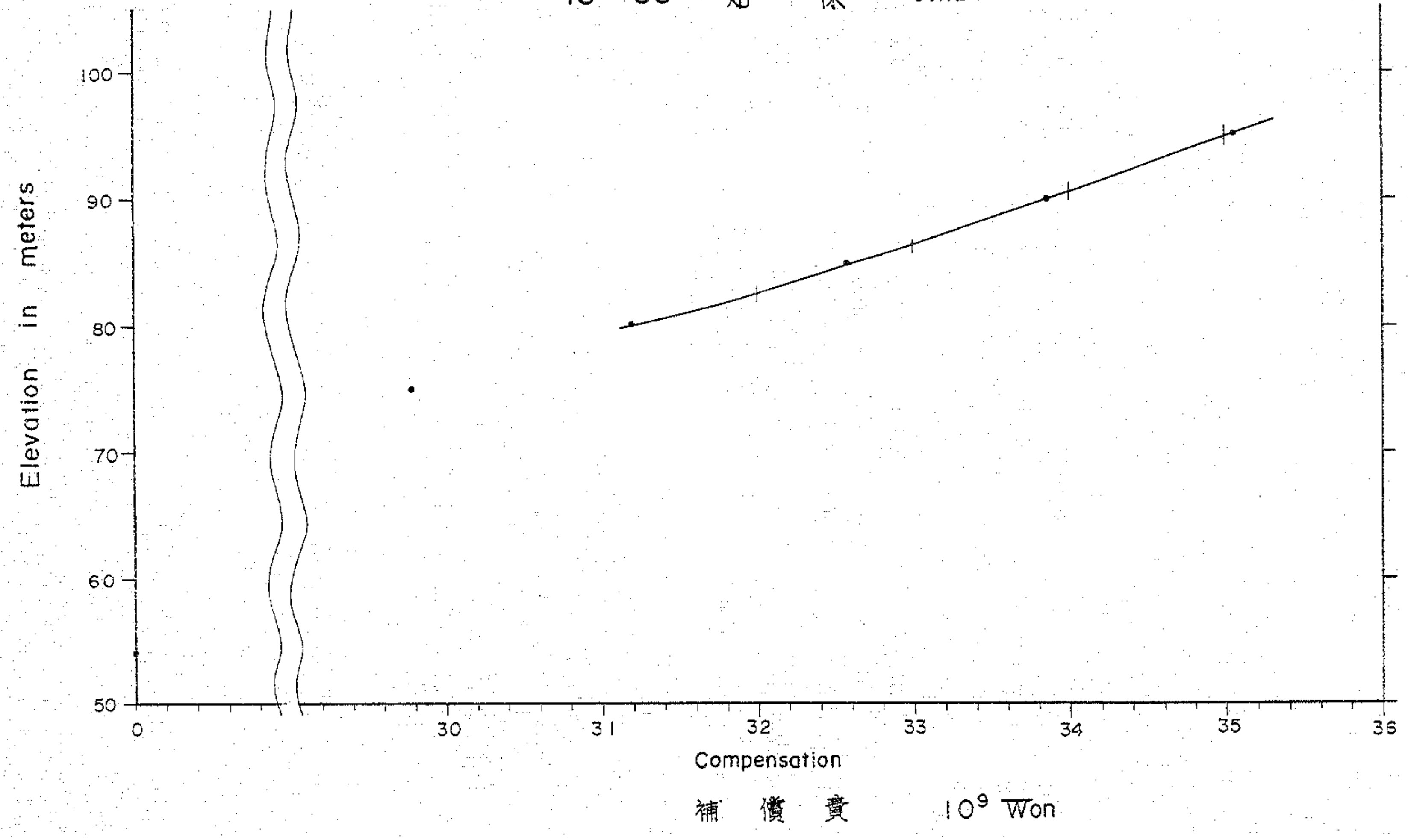
15 - 36 知 保（下流案） Chibo

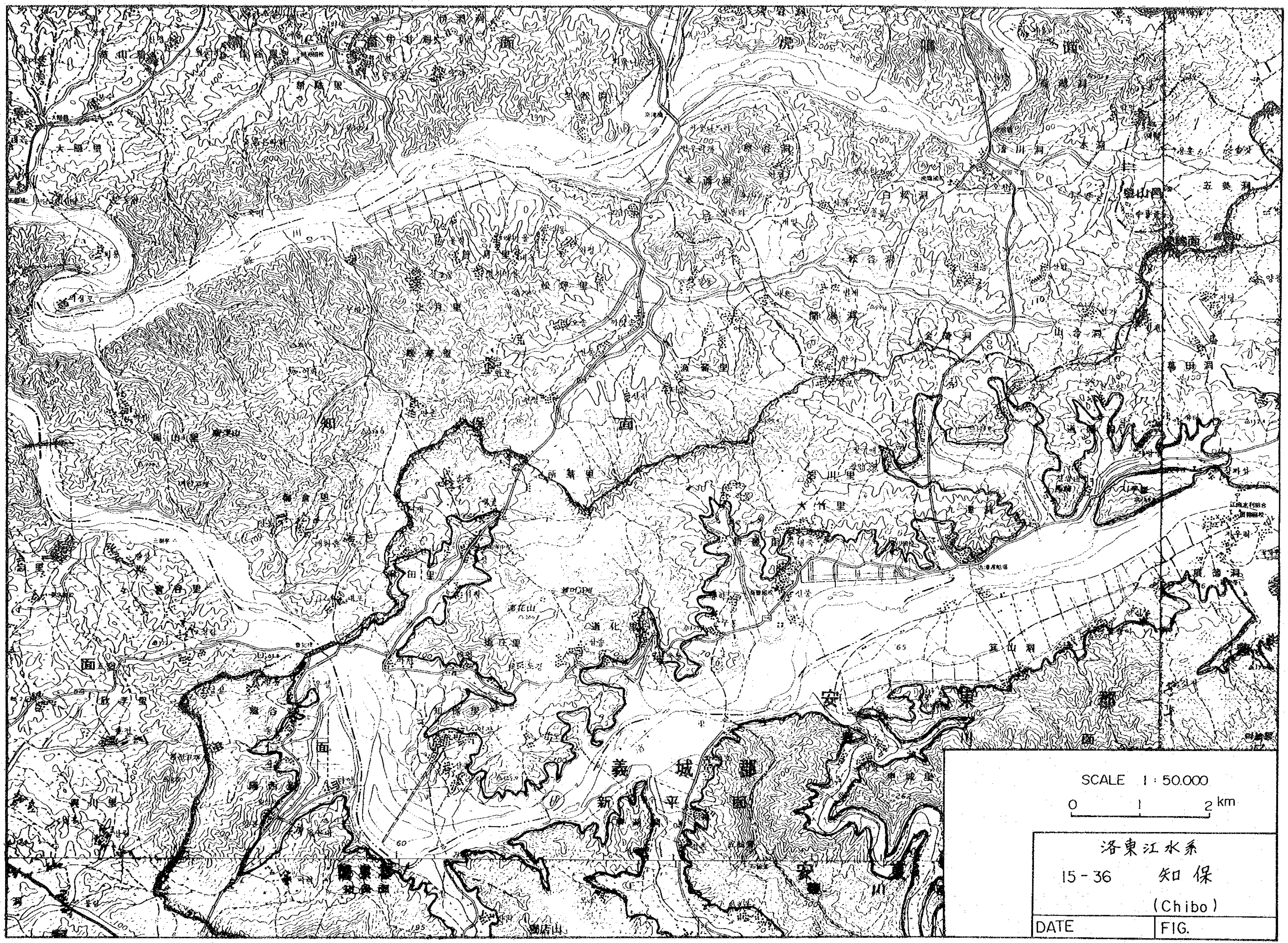
Catchment area : 4,550 Km²



Elevation (m)	Area (km²)	Volume (10^6m^3)	Accumulated Volume(10^6m^3)
52	0	0	0
60	7.086	18.896	18.896
70	29.475	170.043	188.939
80	57.824	428.610	617.549
90	96.357	1053.423	1670.972

15—36 知 保 Chibo

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SCALE 1 : 50.000
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2 km

洛東江水系

15 - 36 知 保

(Chibo)

DATE

FIG.

16-51 Hamyang

The projected Hamyang site is at the upstream part of the Nam River located approximately 190 km above the point where the Nam River merges to the Nakdong River mainstream.

Since the river gradient at the originally proposed dam site is approximately 1/60 and very steep so that efficiency of water storage would be poor and total storage capacity small, a scheme was formulated where a dam would be provided at the Sininweal site about 6.5 km upstream from the original site and head would be utilized by a tunnel through the leftbank.

The sininweal site is stable topographically compared with the originally proposed dam site. Both banks consist of diorite (black) and there are outcrops at the river bed and deposits are thin so that the geology is suitable for a dam foundation.

On the other hand, faults are developed at the downstream side of the original site, and accordingly, there are small scale faults cutting across the river.

There is a large number of objects requiring compensation in the area scheduled for reservoir and it will be necessary for further topographical surveys and investigations to be carried out regarding property compensation. Compensation costs have been estimated and listed up in this study referring to figures at other sites.

16-51 Hamyang

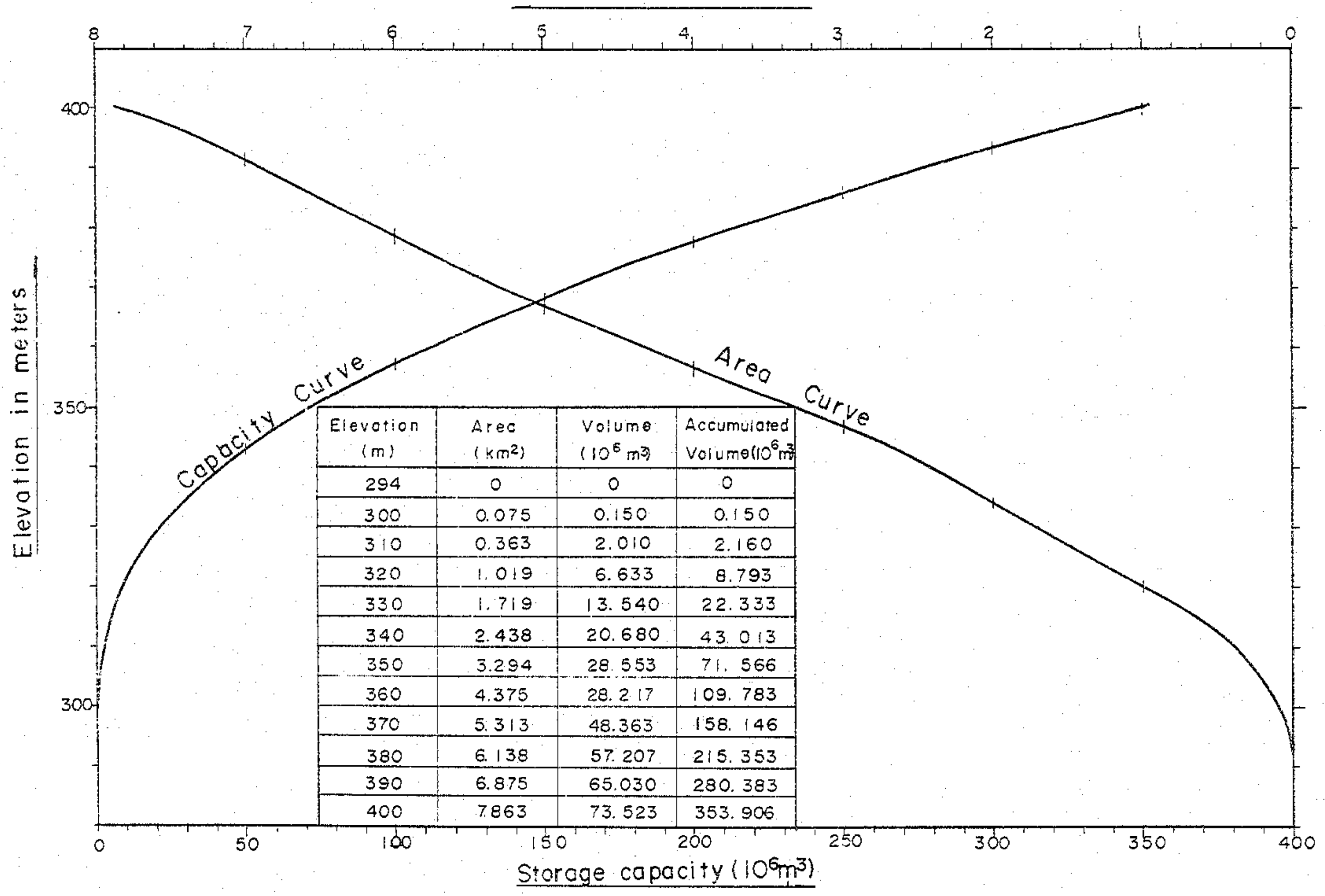
Location of dam Gyeongsangnam-do Hamyang-gun

Name of river		Nam R.
Basin		
Catchment area	km^2	264
Annual precipitation	mm	1,400
Annual mean discharge	m^3/s	7.97
Reservoir		
F.W.L.	EL.m	382.5
N.H.W.L.	"	380.5
L.W.L.	"	328.2
Gross storage capacity (N.H.W.L)	10^6m^3	218
Effective capacity	"	201.1
Dead capacity	"	16.9
Reservoir area (N.H.W.L)	km^2	6.1
Firm discharge	m^3/sec	6.83
Flood control capacity	10^6m^3	13.0
Dam		
Type		Rock-Fill
Dam height	m	95.5
Crest length	"	402
Volume of dam	10^3m^3	3,780
Spillway design flood	m^3/s	3,290
Geology		Diorite
Power station		
Type		Dam & conduit
Max. discharge	m^3/sec	33.03
Rated head(effective)	m	190.7
Installed capacity	kW	54.500
Annual energy output	10^3kWh	109,800

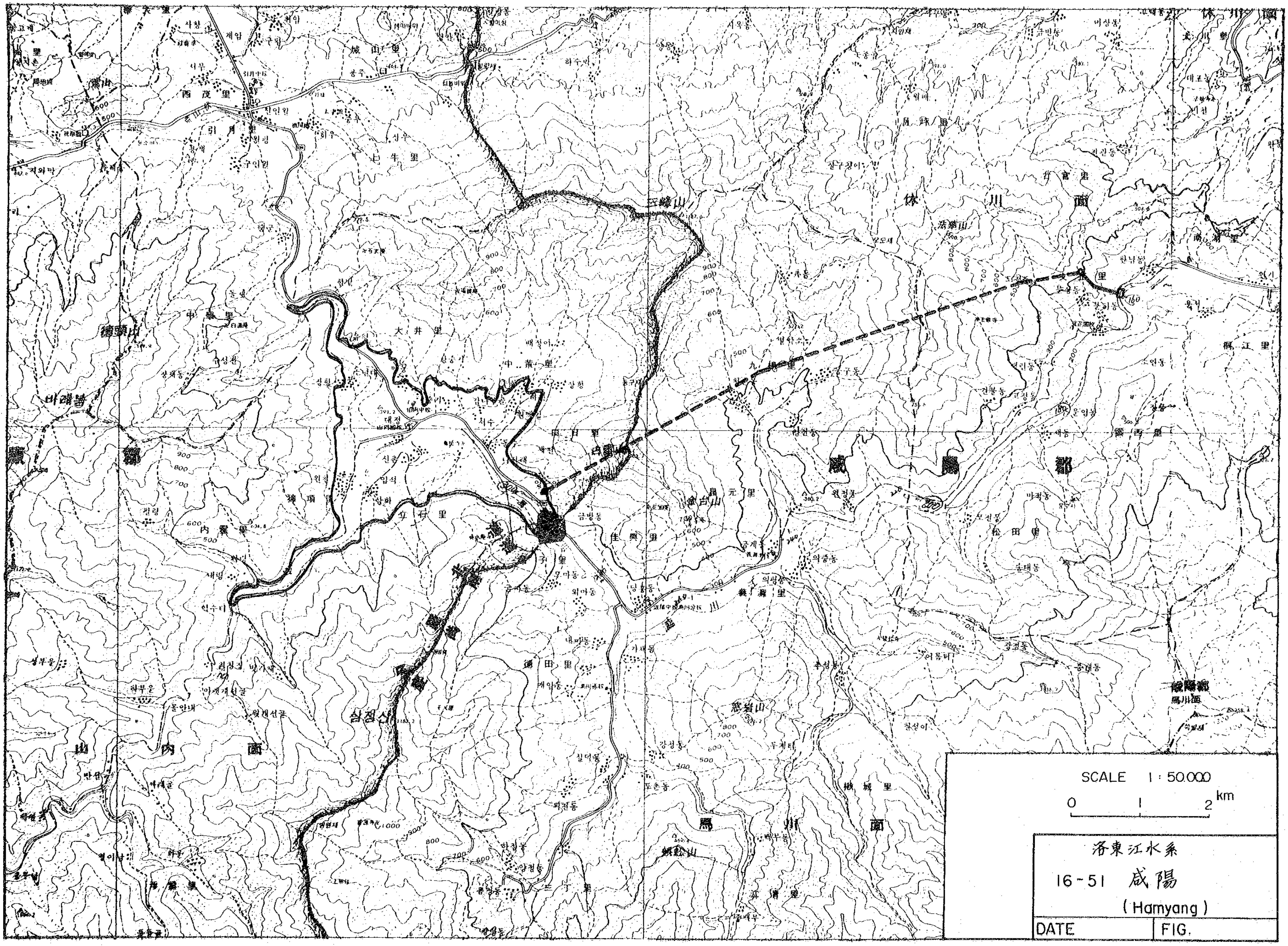
Construction cost	10^6Won	
Compensation	"	6,822
Dam	"	13,720
Sub total	"	20,542
Power facilities	"	15,061
Total	"	35,603
Annual cost of dam and power station	10^6Won	3,356
Power & energy benefit	10^6Won	2,979
kW benefit	"	1,907
kWh benefit	"	1,072
B/C of power		0.89
(B-C) of power	10^6Won	-377
Increase of annual available discharge	10^6m^3	184.4
Benefit of water supply	10^6Won	1,202
Benefit of flood control	"	36
Total benefit	"	4,217
Total B/C		1.26
B-C	10^6Won	861

16 −51 咸 陽 (新 引 月) Hamyang (Sininweol)

Catchment area : 264 Km²



Elevation (m)	Area (km²)	Volume (10⁶ m³)	Accumulated Volume(10⁶m³)
294	0	0	0
300	0.075	0.150	0.150
310	0.363	2.010	2.160
320	1.019	6.633	8.793
330	1.719	13.540	22.333
340	2.438	20.680	43.013
350	3.294	28.553	71.566
360	4.375	28.217	109.783
370	5.313	48.363	158.146
380	6.138	57.207	215.353
390	6.875	65.030	280.383
400	7.863	73.523	353.906


SCALE 1 : 50,000
0
1
2 km
咸陽郡
休川面
馬川面
山内面
五峰山
九 里
元 里

洛東江水系

16-51 咸陽

(Hamyang)

DATE

FIG.

17-53 Dogsan

The project site is located at a point on the Dog River approximately 43 km upstream from this river's conjunction with the Nam River. The river gradient in the vicinity is about 1/120 and there is wide meandering at the downstream part.

The center ofthe dam previously selected is lined on a collapsed slope and is underirable as a location of dam. Consequently, an examination was made shifting the dam axis approcimately 200 m upstream from the originally proposed site.

Although a weathered layer 2 to 3 m thick can be seen at the surface of the left bank of the new site, the slope itself is stable. There is a weir at the river bed and the thickness of sand and gravel layer is estimated at 2 to 3 m.

The right bank side is covered with 1 to 2 m of talus, but there are occasional outcrops of fresh gneiss and there will be no special problem in dam construction.

The project in this case was formulated as a power generation scheme involving a tunnel shortcutting meanders of the river.

Since there is a very large number of objects requiring compensation within the area scheduled for reservoir, it will be necessary for further detailed investigations of compensation objects upon preparation of topographical maps.

17-53 Dogsan

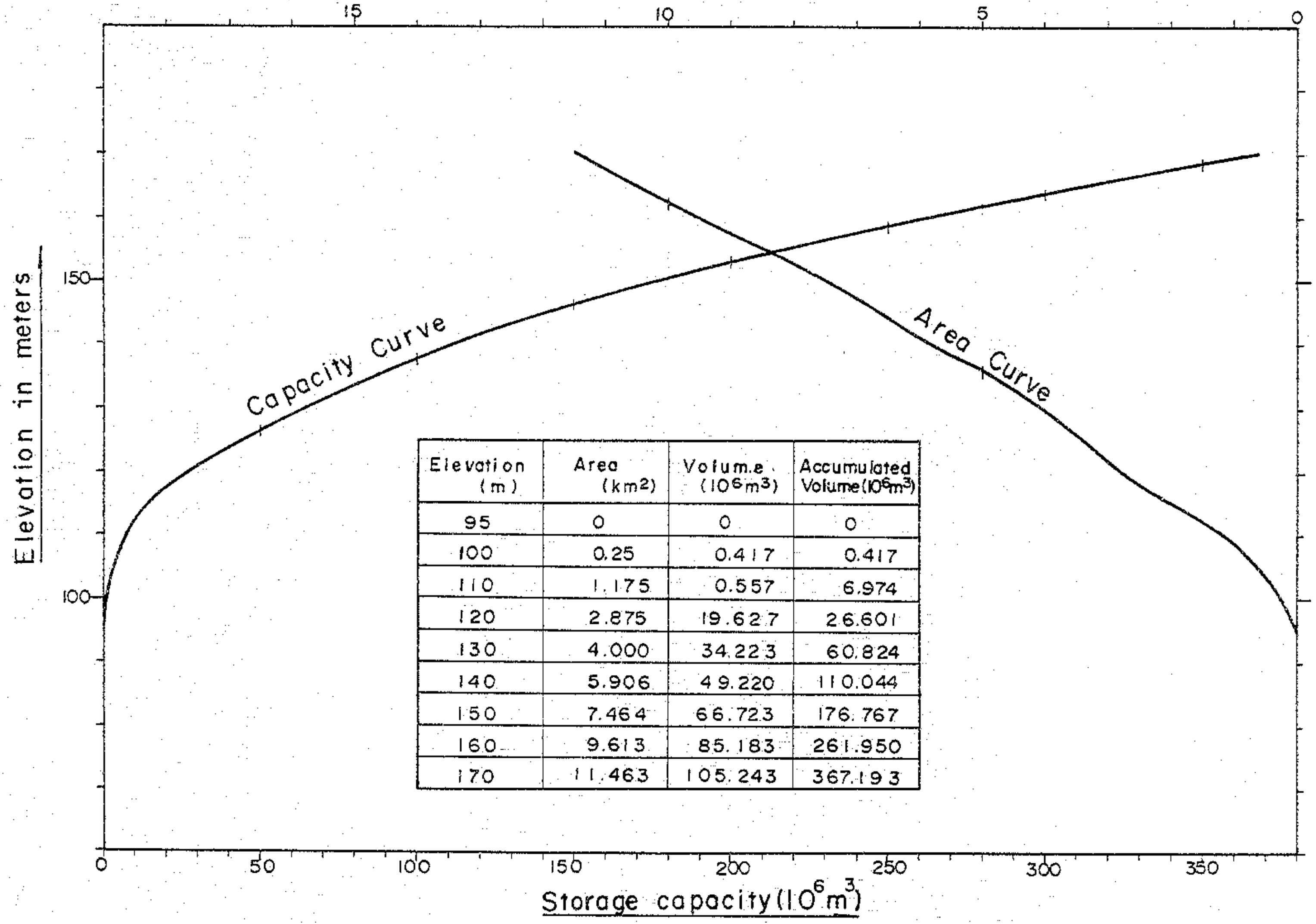
Location of dam Gyeongsangnam-do Sancheong-gun

Name of river	Nam R.	
Basin		
Catchment area	km^2	231
Annual precipitation	mm	1,550
Annual mean discharge	m^3/s	7.32
Reservoir		
F.W.L.	EL.m	160.4
N.H.W.L.	"	158.4
L.W.L.	"	130.4
Gross storage capacity (N.H.W.L)	10^{6}m^3	244
Effective capacity	"	184.7
Dead capacity	"	59.3
Reservoir area (N.H.W.L)	km^2	9.2
Firm discharge	m^3/sec	6.26
Flood control capacity	10^{6}m^3	17.0
Dam		
Type		Rock-Fill
Dam height	m	77.4
Crest length	"	371
Volume of dam	10^{3}m^3	2,880
Spillway design flood	m^3/s	3,280
Geology		Gneiss
Power station		
Type		Dam & conduit
Max. discharge	m^3/sec	30.31
Rated head(effective)	m	78.6
Installed capacity	kW	20,600
Annual energy output	10^{3}kWh	45,200

Construction cost	10^{6}Won	
Compensation	"	8,220
Dam	"	10,473
Sub total	"	18,693
Power facilities	"	7,239
Total	"	25,932
Annual cost of dam and power station	10^{6}Won	2,353
Power & energy benefit	10^{6}Won	1,157
kW benefit	"	699
kWh benefit	"	458
B/C of power		0.49
(B-C) of power	10^{6}Won	-1,196
Increase of annual available discharge	10^{6}m^3	169.0
Benefit of water supply	10^{6}Won	1,102
Benefit of flood control	"	57
Total benefit	"	2,316
Total B/C		0.98
B-C	10^{6}Won	-37

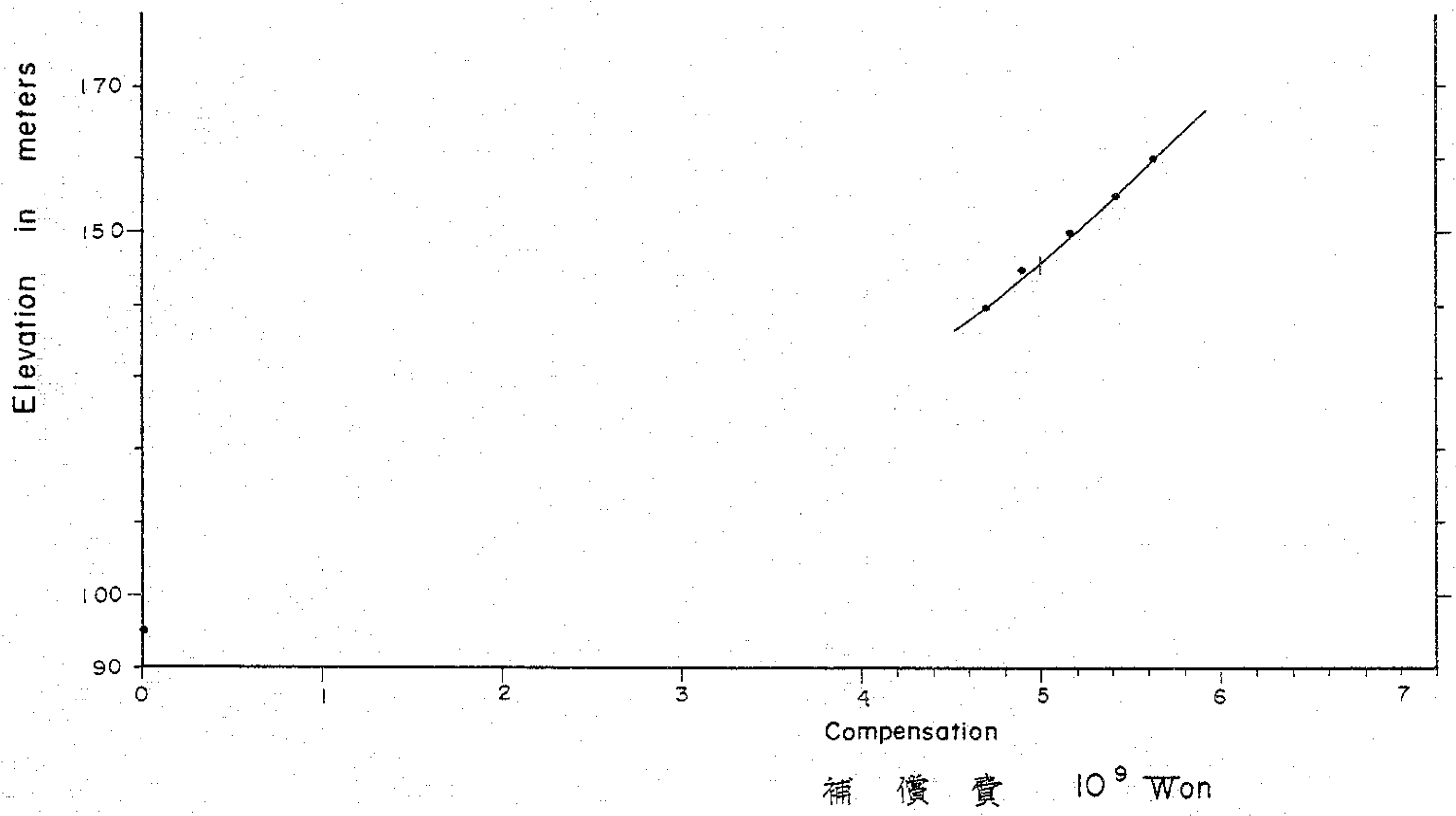
17 — 53 徳山 Dogsan

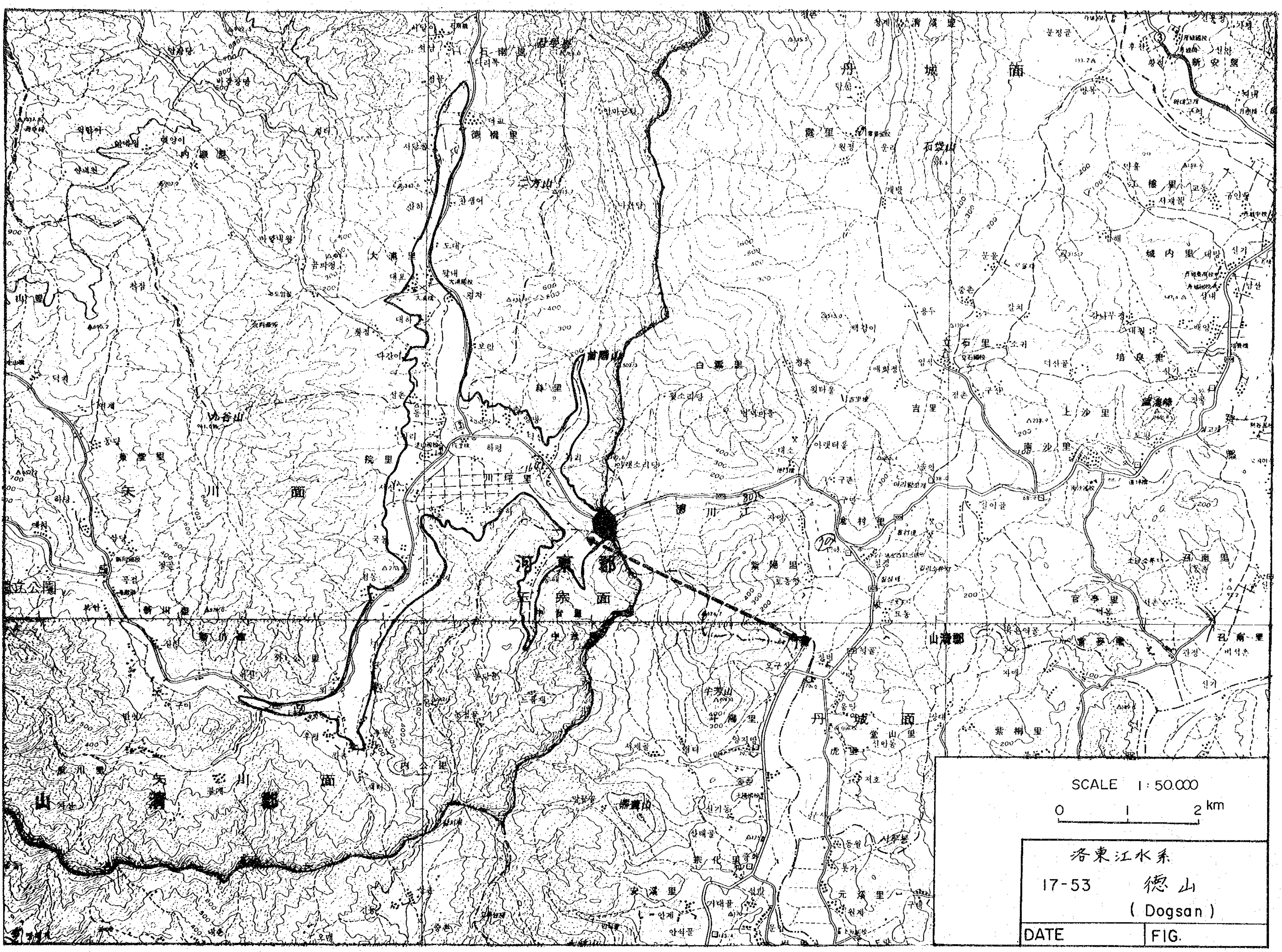
Catchment area :231 Km^2



Elevation (m)	Area (km2)	Volume ($10^6 m^3$)	Accumulated Volume ($10^6 m^3$)
95	0	0	0
100	0.25	0.417	0.417
110	1.175	0.557	6.974
120	2.875	19.627	26.601
130	4.000	34.223	60.824
140	5.906	49.220	110.044
150	7.464	66.723	176.767
160	9.613	85.183	261.950
170	11.463	105.243	367.193

17 – 53 德 山 Dogsan




丹城面
矢川面
山淸郡
川坪里
白雲里
立石里
吉里
上沙里
南沙里
城內里
培良里
丹城面

SCALE 1 : 50.000
0 1 2 km

洛東江水系
17-53 德山
(Dogsan)

DATE
FIG.

18-62 Yongdam

The project site is located at the upper reaches of the Geum River, approximately 180 km upstream from Daecheong Dam now under construction.

The river gradient in the vicinity is relatively gentle, about 1/500. The project sites of Sutong and Myeongcheon are located downstream of this site and each will be developed as a dam-type scheme.

For the Yongdam Development Project, there is an upstream alternative site approximately 6 km upstream of the original one straddling National Highway No. 19 which runs from Daejeon through Yongdong to Namweon, where investigations including boring have been made in the past.

The right bank at the original dam site is steep with a slope of about 40°, while the left bank is slightly more gentle. The river-bed width is around 200 m and there is a deposit of sand and gravel albeit thin. The geology consists of granitic gneiss and the top soil is not thick.

Regarding the upstream site, there are wide terrace and talus deposits at the right-bank from the end of which is a cliff of about 70°, above which there is a flat terrain. Weathering at this part is severe and is thought to be about 40 m in depth.

Outcrops are seen at the left bank, the slope of which is about 50°, and talus on the top of the slope is scarce. Judging from the results of past boring thickness of the gravel layer at the river bed is thought to be 2 to 3 m.

Geologically, the problems will be whether the saddle at the right bank and the weathered rock underlying the talus will be adequate for the dam foundation.

Topographically, there is a possibility that a tectonic line runs north-south at the river bed or the bottom portion of the terrace. (The existence of a brecciated zone has been confirmed in past boring investigations.)

Based on geological comparisons, although the condition of the tectonic line is not clear, the downstream original site is more stable.

Songpung Village (ginseng production area) will be submerged in the case of the original plan to increase compensation costs. Detailed investigations regarding property compensation along with topographical surveys inside the reservoir area are required.

18-62 Yongdam

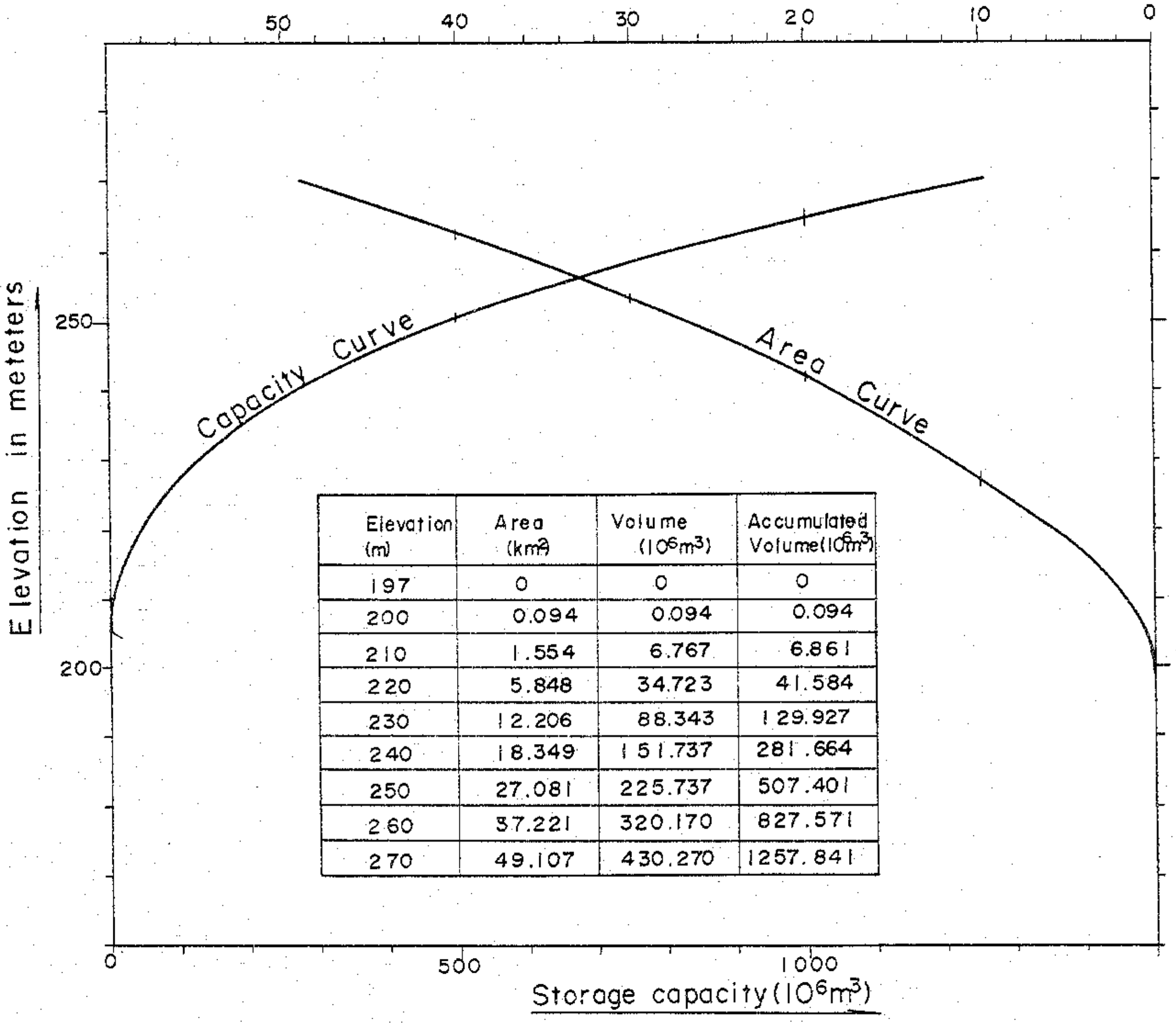
Location of dam Jeonlabug-do Jinan-gun

Name of river	Geum R.	
Basin		
Catchment area	km^2	949
Annual precipitation	mm	1,340
Annual mean discharge	m^3/s	24.29
Reservoir		
F.W.L.	EL.m	271.7
N.H.W.L.	"	269.7
L.W.L.	"	248.8
Gross storage capacity (N.H.W.L)	10^{6}m^3	1,220
Effective capacity	"	766.1
Dead capacity	"	453.9
Reservoir area (N.H.W.L)	km^2	48.8
Firm discharge	m^3/sec	20.77
Flood control capacity	10^{6}m^3	86.1
Dam		
Type		Rock-Fill
Dam height	m	79.7
Crest length	"	465
Volume of dam	10^{3}m^3	3,460
Spillway design flood	m^3/s	5,920
Geology		Granitic gneiss
Power station		
Type		Dam
Max. discharge	m^3/sec	101.53
Rated head(effective)	m	61.3
Installed capacity	kW	53,800
Annual energy output	10^{3}kWh	106,500

Construction cost	10^{6}Won	
Compensation	"	24,452
Dam	"	13,488
Sub total	"	37,940
Power facilities	"	14,833
Total	"	52,773
Annual cost of dam and power station	10^{6}Won	4,751
Power & energy benefit	10^{6}Won	2,945
kW benefit	"	1,838
kWh benefit	"	1,107
B/C of power		0.62
(B-C) of power	10^{6}Won	-1,806
Increase of annual available discharge	10^{6}m^3	495.9
Benefit of water supply	10^{6}Won	2,901
Benefit of flood control	"	48
Total benefit	"	5,894
Total B/C		1.24
B-C	10^{6}Won	1,143

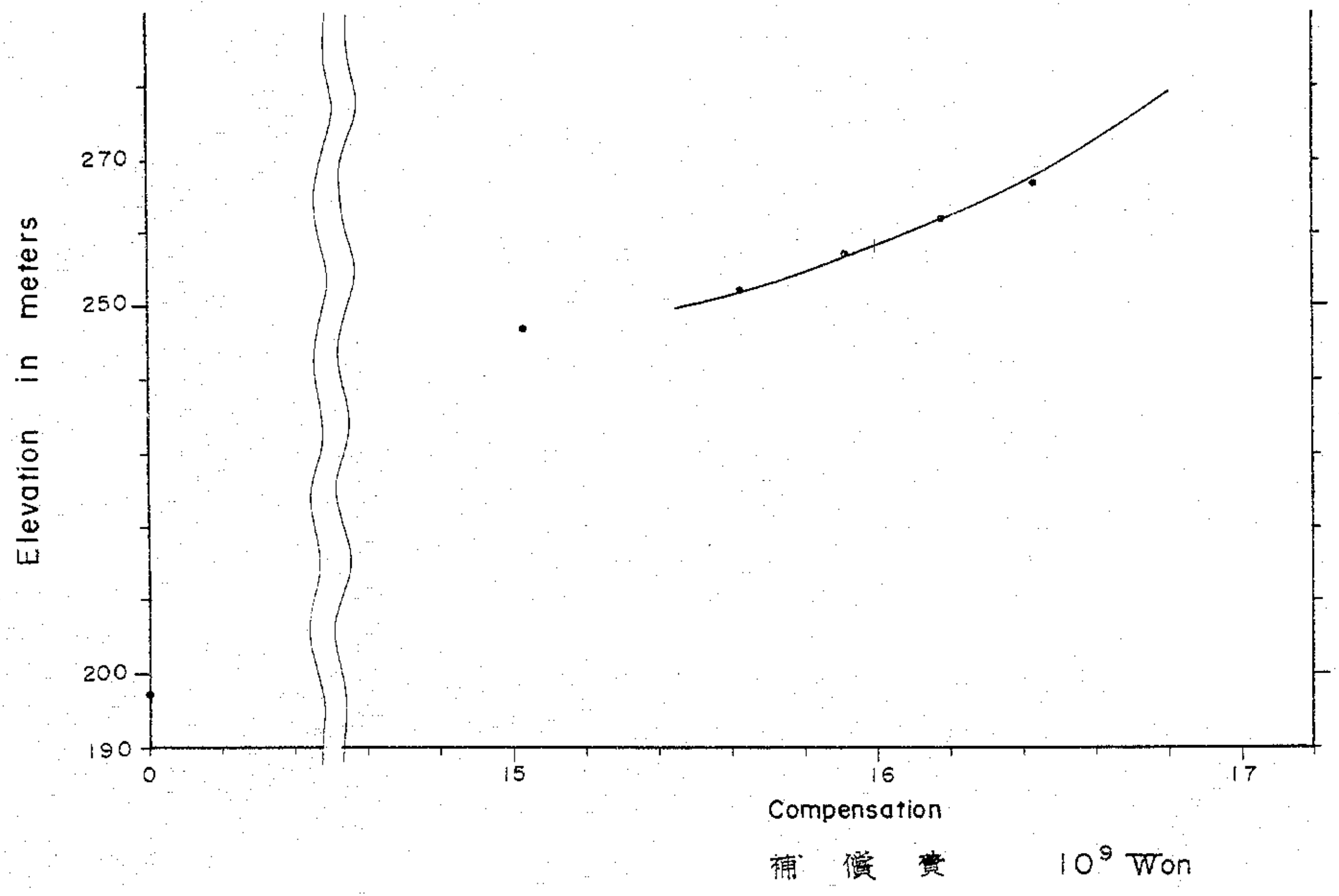
18 - 62 竜 潭 Yangdam

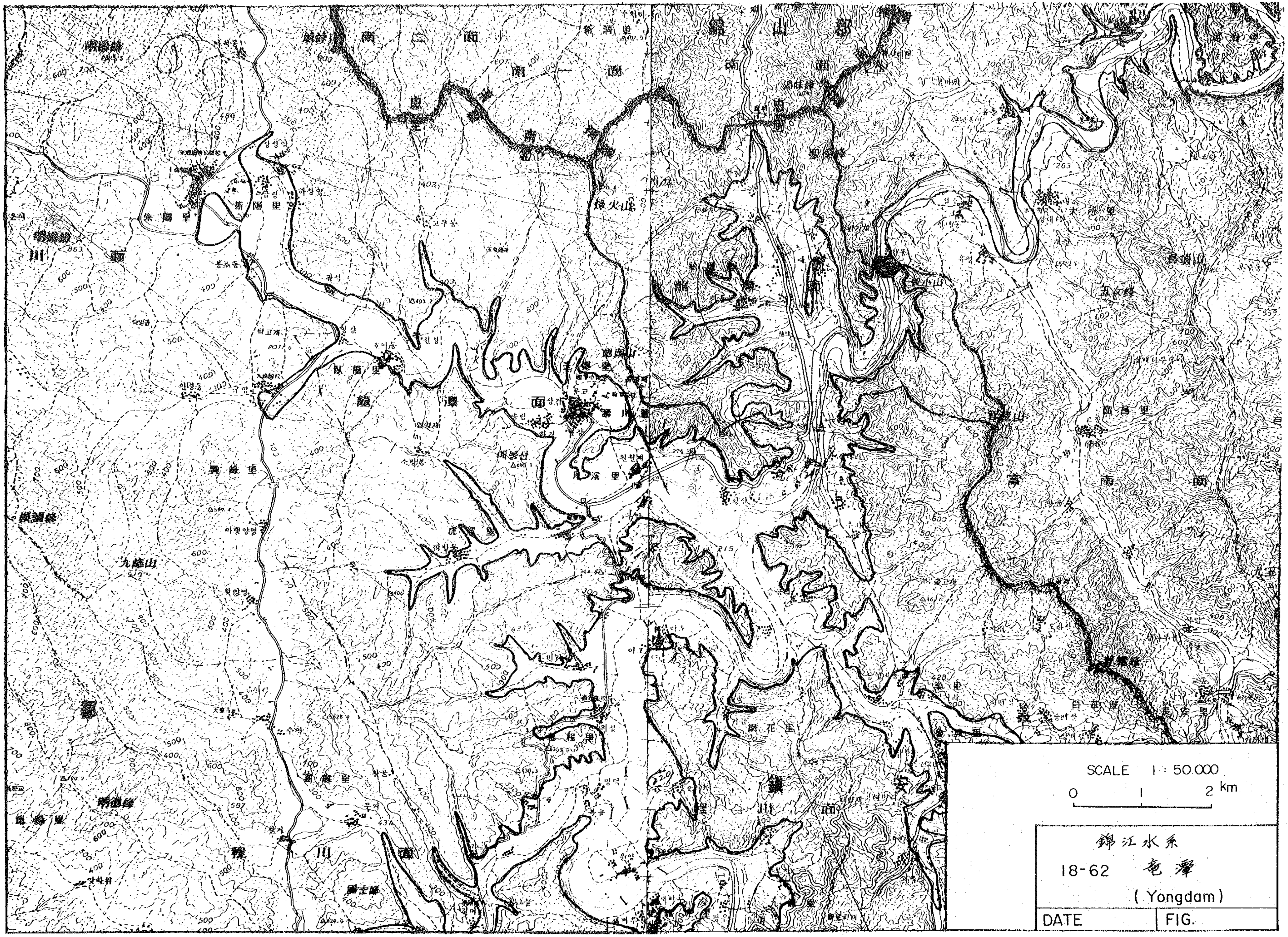
Catchment area : 949 Km^2



Elevation (m)	Area (km^2)	Volume (10^6m^3)	Accumulated Volume(10^6m^3)
197	0	0	0
200	0.094	0.094	0.094
210	1.554	6.767	6.861
220	5.848	34.723	41.584
230	12.206	88.343	129.927
240	18.349	151.737	281.664
250	27.081	225.737	507.401
260	37.221	320.170	827.571
270	49.107	430.270	1257.841

18 − 62 龍 潭 Yongdom




錦山郡
南二面
南面
烽火山
新陽里
龍潭面
月溪里
九峰山
富南面
SCALE 1 : 50.000
0
1
2 km

錦江水系

18-62 竜潭

(Yongdam)

DATE FIG.

19-63 Sutong

The project site is situated on the Geum River mainstream approximately 33 km downstream from the Yongdam Dam site, the river flowing from the Yongdam site in the northeast direction while meandering widely. The gradient of the river is gentle at aroung 1/500.

The dam site is located approximately 1 km upstream from Sutong village. Both left and right banks form cliffs of 35° to 70°. The left bank is a steep cliff from the river bed up to about 60 m, above which is a gentle ridge. The right bank has rhyolite exposed over its entire surface and there are no deposites.

According to "Report on Basic Survey of Sutong Site, 1962, Construction Authority of Korea" prepared by the Korean Government in 1962, the deposits at the river bed are around 2 m in thickness with dikes of quartz porphyry at the river bed, and investigations for existence of fractured zones will be required.

Muju town is located at the end of the reservoir and it will be necessary for further detailed topographical surveys and compensation studies to be carried out.

19-63 Sutong

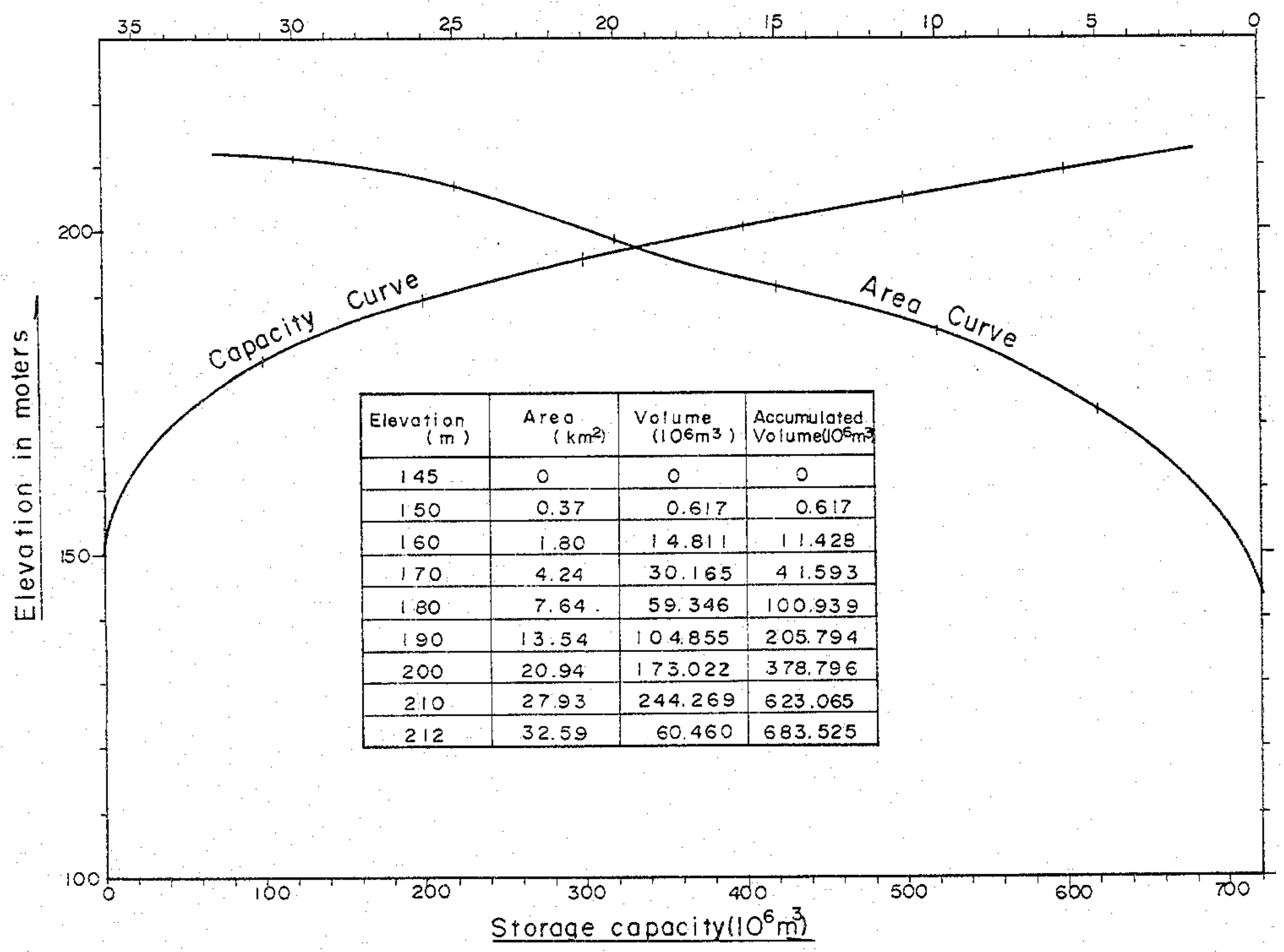
Location of dam Chungcheongnam-do Geumsan-gun

Name of river		Geum R.
Basin		
Catchment area	km^2	1,526
Annual precipitation	mm	1,310
Annual mean discharge	m^3/s	37.23
Reservoir		
F.W.L.	EL.m	202
N.H.W.L.	"	200
L.W.L.	"	185
Gross storage capacity (N.H.W.L)	10^6m^3	379
Effective capacity	"	232.3
Dead capacity	"	146.7
Reservoir area (N.H.W.L)	km^2	20.9
Firm discharge	m^3/sec	18.73
Flood control capacity	10^6m^3	48.9
Dam		
Type		Rock-Fill
Dam height	m	62
Crest length	"	246
Volume of dam	10^3m^3	1,580
Spillway design flood	m^3/s	7,390
Geology		Phyolite
Power station		Dam
Type		
Max. discharge	m^3/sec	90.69
Rated head(effective)	m	44
Installed capacity	kW	34,500
Annual energy output	10^3kWh	105,400

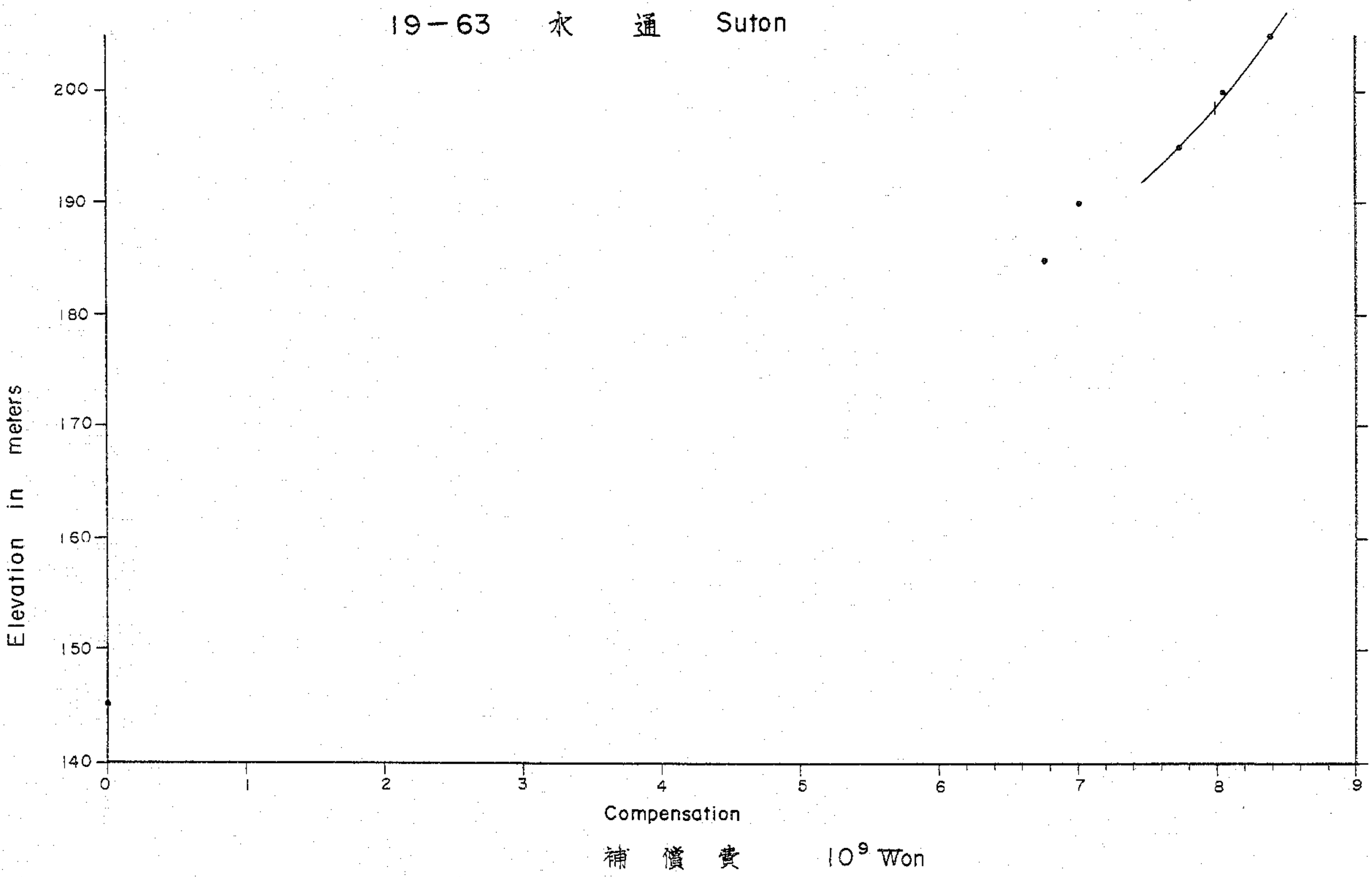
Construction cost	10^6Won	
Compensation	"	11,858
Dam	"	8,484
Sub total	"	20,342
Power facilities	"	11,935
Total	"	32,277
Annual cost of dam and power station	10^6Won	2,979
Power & energy benefit	10^6Won	2,211
kW benefit	"	1,178
kWh benefit	"	1,033
B/C of power		0.74
(B-C) of power	10^6Won	-768
Increase of annual available discharge	10^6m^3	307.0
Benefit of water supply	10^6Won	1,796
Benefit of flood control	"	28
Total benefit	"	4,035
Total B/C		1.35
B-C	10^6Won	1,056

19-63 水 通 Suton

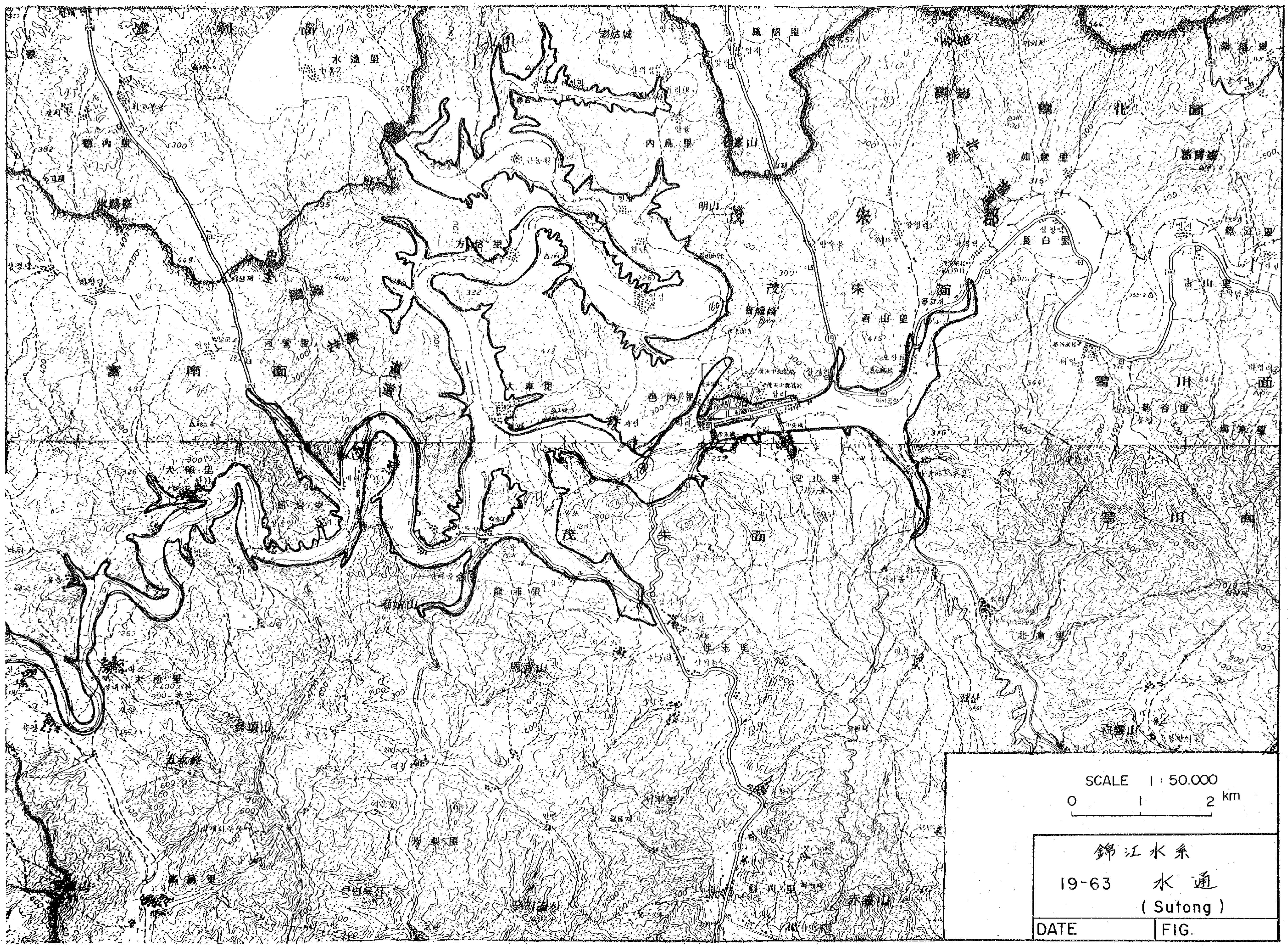
Catchment area : 1,526 Km^2



Elevation (m)	Area (km^2)	Volume ($10^6 m^3$)	Accumulated Volume($10^6 m^3$)
145	0	0	0
150	0.37	0.617	0.617
160	1.80	14.811	11.428
170	4.24	30.165	41.593
180	7.64	59.346	100.939
190	13.54	104.855	205.794
200	20.94	173.022	378.796
210	27.93	244.269	623.065
212	32.59	60.460	683.525



19－63 水通 Suton


SCALE 1 : 50.000
0
1
2 km

錦江水系

19-63 水通

(Sutong)

DATE

FIG.

20-64 Myeongcheon

The project site is located on the Geum River mainstream approximately 43 km downstream from the Sutong site and approximately 4 km upstream from the Yanggan village on the National Highway No. 4.

The river gradient is gentle at around 1/500.

The left and right banks at the dam site are sloped at 30° to 40°. Outcrops of granite continuing along the entire surface on the right-bank can be seen on the road along the river. At the left bank the granite changes to dikes of quartz porphyry. However, neither of the banks poses a problem as a dam foundation.

Bedrocks with cracks 1 to 3 m in depth are found upstream and downstream of the dam center at the right bank. The width of the river bed is approximately 140 m, the entire surface being covered by gravel with no outcrops to be seen.

There are many distributions of sand and gravel layers along the river both upstream and downstream from the dam site but it appears that sand is comparatively abundant with little gravel content.

Paddy fields of the Yansang village exist in the area to be submerged in the reservoir and it is thought necessary for detailed investigations of property compensation to be carried out hereafter similarly as for other sites.

20-64 Myeongcheon

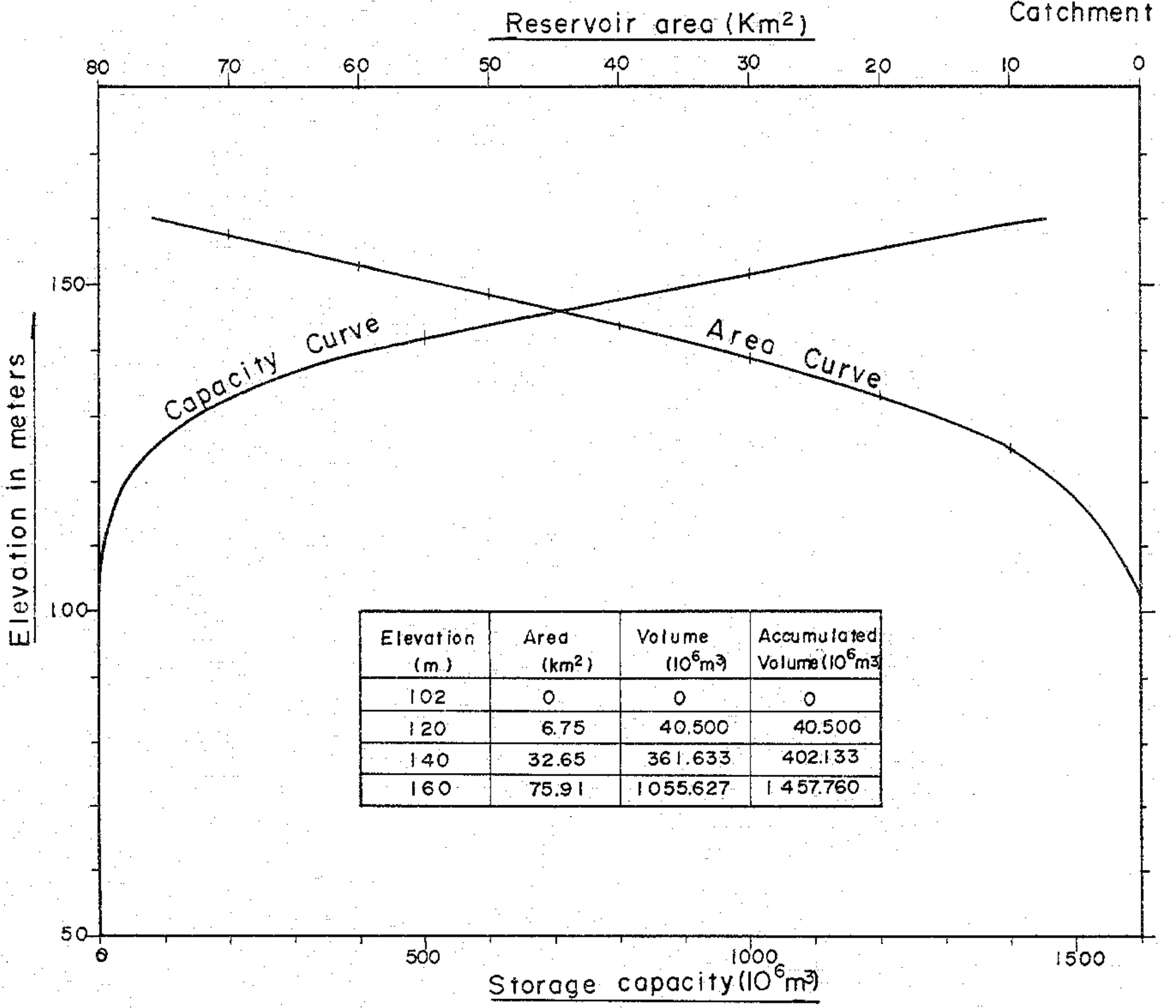
Location of dam Chungcheongbug-do Yeongdong-gun

Name of river	Geum R.	
Basin		
Catchment area	km^2	2,003
Annual precipitation	mm	1,260
Annual mean discharge	m^3/s	47.67
Reservoir		
F.W.L.	EL.m	152
N.H.W.L.	"	150
L.W.L.	"	136.5
Gross storage capacity (N.H.W.L)	$10^6 m^3$	910
Effective capacity	"	507
Dead capacity	"	403
Reservoir area (N.H.W.L)	km^2	53.5
Firm discharge	m^3/sec	28.42
Flood control capacity	$10^6 m^3$	105.6
Dam		
Type		Rock-Fill
Dam height	m	61
Crest length	"	314
Volume of dam	$10^3 m^3$	1,800
Spillway design flood	m^3/s	8,350
Geology		Granite & quartz porphyry
Power station		
Type		Dam
Max. discharge	m^3/zec	138.59
Rated head(effective)	m	40
Installed capacity	kW	47,400
Annual energy output	10^3kWh	130,100

Construction cost	10^6Won	
Compensation	"	30,462
Dam	"	9,417
Sub total	"	39,879
Power facilities	"	16,887
Total	"	56,766
Annual cost of dam and power station	10^6Won	5,110
Power & energy benefit	10^6Won	2,950
kW benefit	"	1,618
kWh benefit	"	1,332
B/C of power		0.58
(B-C) of power	10^6Won	-2,160
Increase of annual available discharge	$10^6 m^3$	670
Benefit of water supply	10^6Won	3,920
Benefit of flood control	"	46
Total benefit	"	6,916
Total B/C	10^6Won	1.35
B-C	10^6Won	1,806

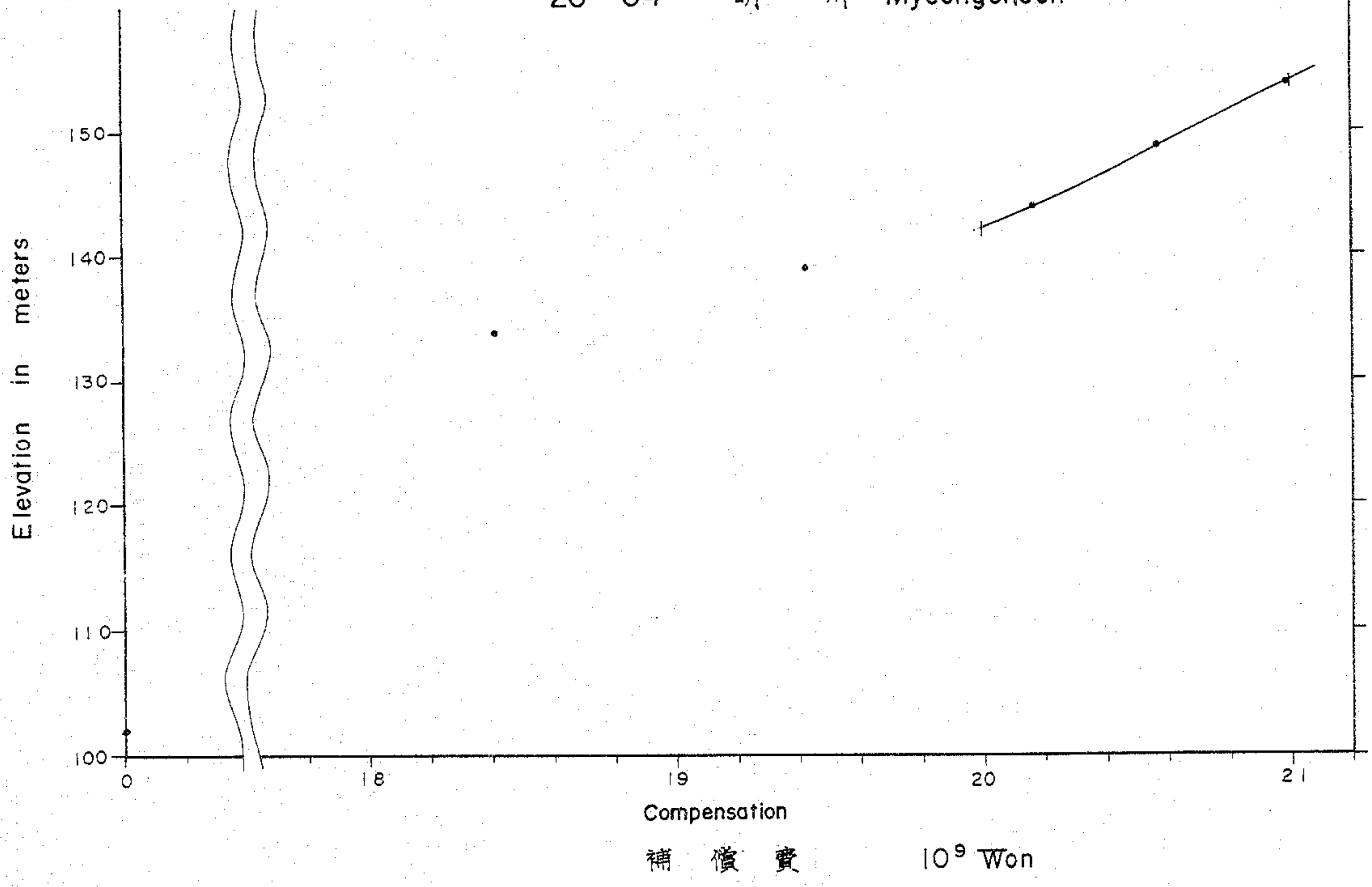
20 − 64 明 川 Myeongcheon

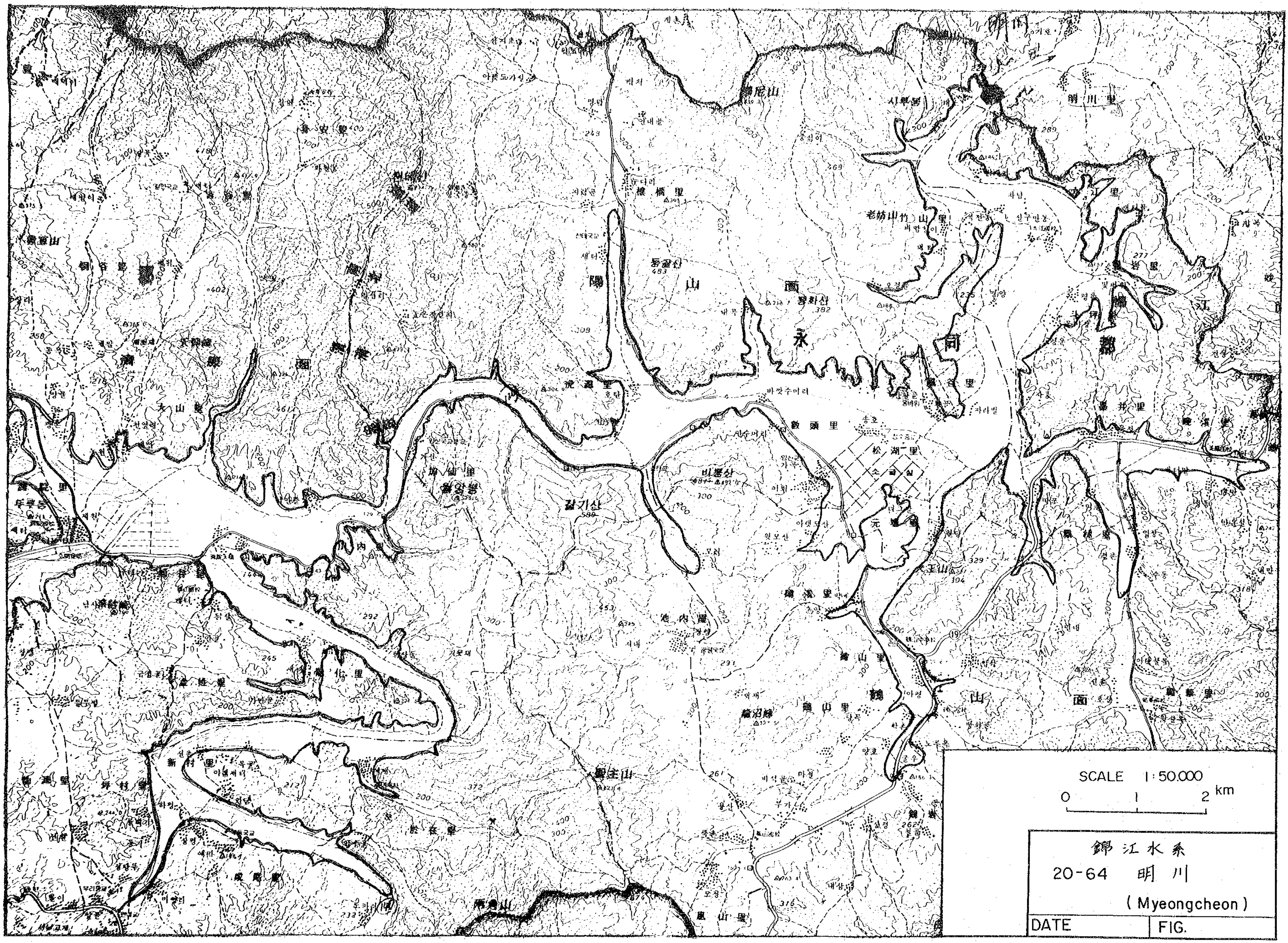
Catchment area : 2,003 Km²



Elevation (m.)	Area (km²)	Volume (10^6m^3)	Accumulated Volume (10^6m^3)
102	0	0	0
120	6.75	40.500	40.500
140	32.65	361.633	402.133
160	75.91	1055.627	1 457.760

20 - 64 明 川 Myeongcheon




明川里
陽 山 面
永 同 郡
鶴 山 面
數頭里
松湖里
池內里
新村里
갈기산
589
19

SCALE 1:50.000

0 1 2 km

錦江水系

20-64 明川

(Myeongcheon)

DATE FIG.

21-69 Simcheon

The project site is located on the Song River, a tributary of the Geum River, approximately 13 km upstream from the confluence of the two rivers and about 4 km along a local road branching north from National Highway No. 4. An irrigation weir of height about 1 m is situated at the dam site.

The river gradient in this vicinity is approximately 1/850. The river flows west from about 10 km upstream of the dam site meandering widely to north and south.

The left bank at the dam site is a steep slope of around 40^{o} to 50^{o}, while the right bank is a slope of about 30^{o}.

The bed rock consists of schist at both banks, and although it is thought there will be no problem as a dam foundation, immediately upstream of the right abutment a thin topsoil and cracking of bedrock can be seen so that it would be advisable to shift the dam axis downstream about 10 m.

The Seoul-Pusan Highway runs in the area proposed for the reservoir, and there are many other objects requiring compensation, then this site may not be considered advantageous from the standpoint of economics.

21-69 Simcheon

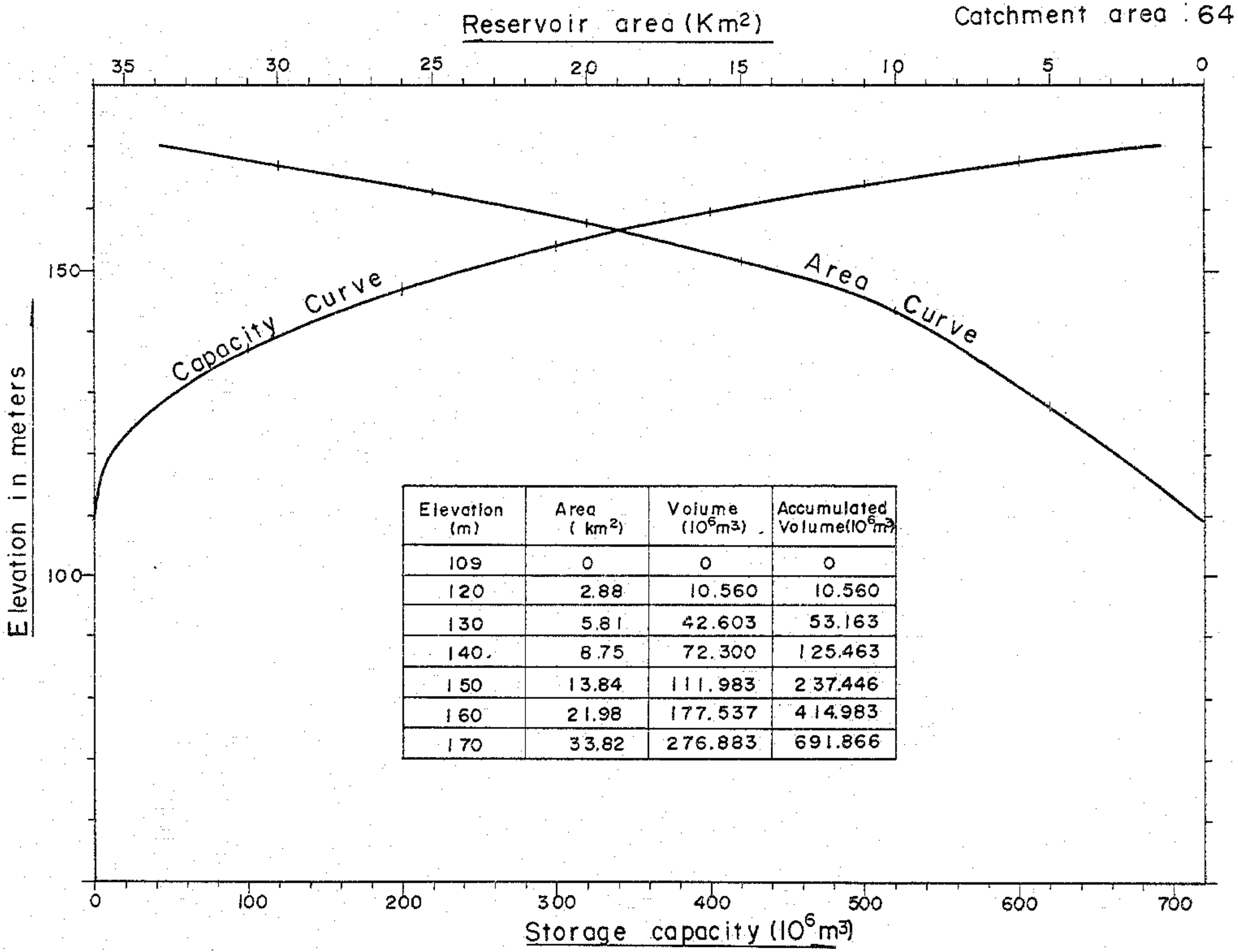
Location of dam Chungcheongbug-do Yeongdong-gun

Name of river		Song R., Geum R.
Basin		
Catchment area	km^2	640.3
Annual precipitation	mm	1,160
Annual mean discharge	m^3/s	14.66
Reservoir		
F.W.L.	EL.m	172.7
N.H.W.L.	"	170.7
L.W.L.	"	151
Gross storage capacity (N.H.W.L)	10^6m^3	715
Effective capacity	"	462.4
Dead capacity	"	252.6
Reservoir area (N.H.W.L)	km^2	34.7
Firlm discharge	m^3/sec	12.42
Flood control capacity	10^6m^3	55.4
Dam		
Type		Rock-Fill
Dam height	m	76.7
Crest length	"	327
Volume of dam	10^3m^3	2,810
Spillway design flood	m^3/s	4,870
Geology		Schist
Power station		
Type		Dam
Max. discharge	m^3/sec	61.25
Rated head(effective)	m	57.8
Installed capacity	kW	30,600
Annual energy output	10^3kWh	60,200

Construction cost	10^6Won	
Compensation	"	26,043
Dam	"	11,407
Sub total	"	37,450
Power facilities	"	9,621
Total	"	47,071
Annual cost of dam and power station	10^6Won	4,145
Power & energy benefit	10^6Won	1,645
kW benefit	"	1,045
kWh benefit	"	600
B/C of power		0.40
(B-C) of power	10^6Won	-2,500
Increase of annual available discharge	10^6m^3	295.3
Benefit of water supply	10^6Won	1,728
Benefit of flood control	"	74
Total benefit	"	3,447
Total B/C		0.83
B-C	10^6Won	-698

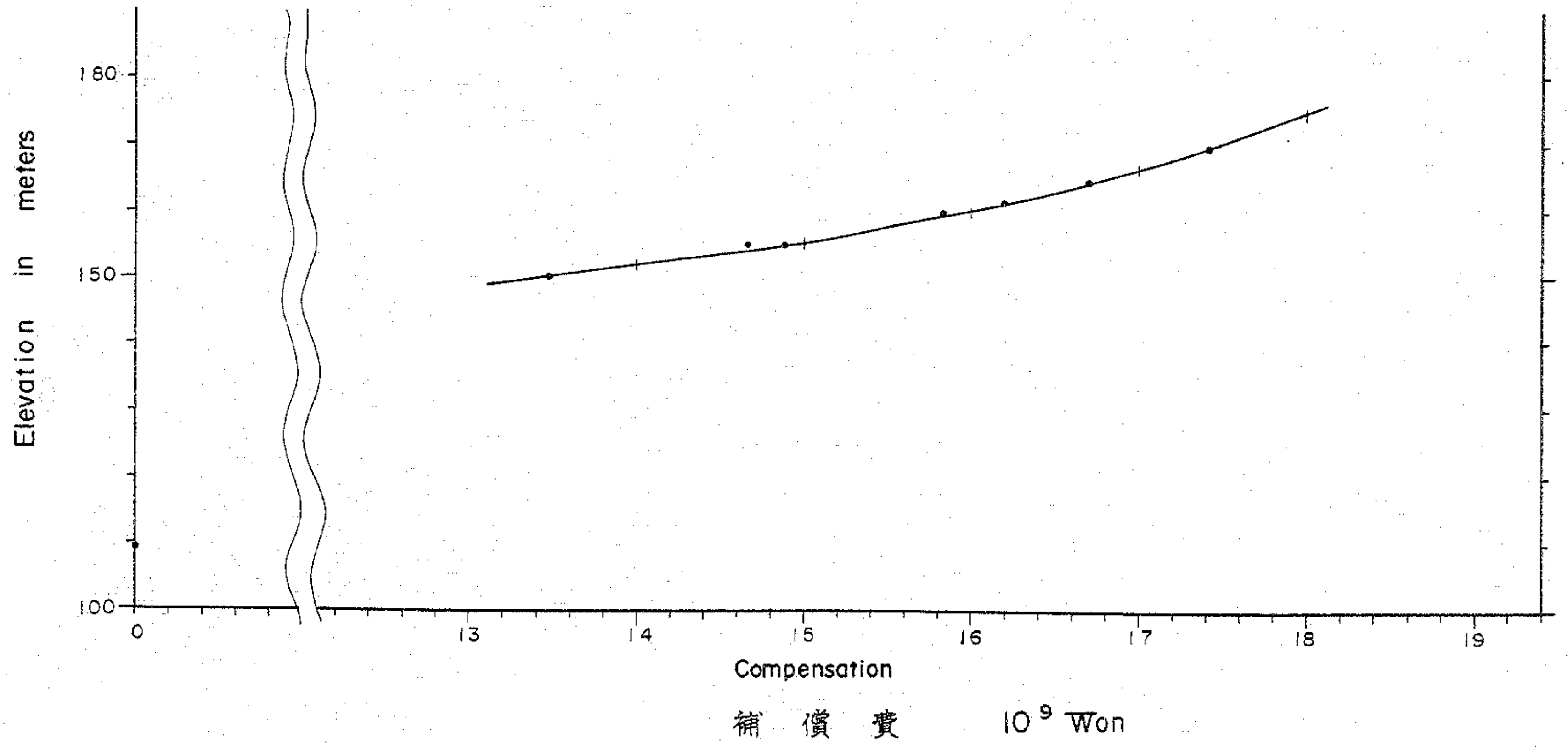
21-69 深川 Simcheon

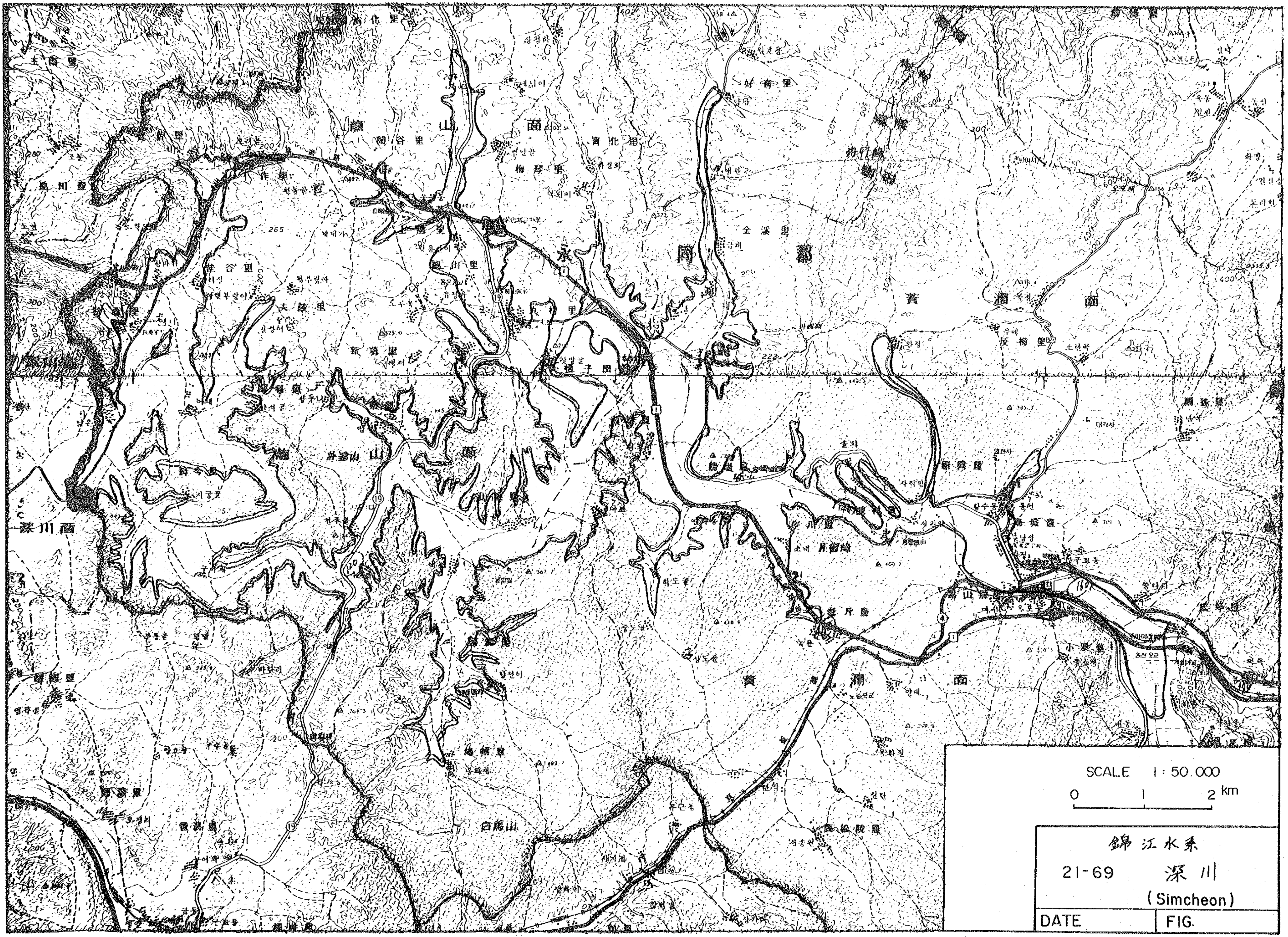
Catchment area : 640.3 Km²



Elevation (m)	Area (km²)	Volume (10⁶m³)	Accumulated Volume(10⁶m³)
109	0	0	0
120	2.88	10.560	10.560
130	5.81	42.603	53.163
140.	8.75	72.300	125.463
150	13.84	111.983	237.446
160	21.98	177.537	414.983
170	33.82	276.883	691.866

21 - 69 深 川 Simcheon




深川面
白馬山
SCALE 1:50.000
0 1 2 km

錦江水系

21-69 深川

(Simcheon)

DATE FIG.

22-27 Jeokseong

The project site is located at the upstream part of the Seumjin River approximately 111 km upstream from the mouth of the river. The existing Seumjingang Dam is located approximately 27 km further upstream.

The river gradient in the vicinity of the dam site is gentle at around 1/800, and the development scheme will be one of dam type.

The Jeokseong Dam site has a remaining catchment area of 241 km^2 because of water diversion from the upstream Seumjingang Dam, and annual inflow will be small.

There are two places of low elevation at the top of a gully approximately 400 m upstream of the dam site. The geology of this vicinity is considerably weathered into decomposed granite. The depth of weathering is thought to be more than 5 m.

The geology of the dam site is comprised of granite with outcrops at both left and right banks and at the river bed, and although there is no problem as a dam foundation, there is a cover of about 5 m of talus at the right bank. It is thought that the cover will become thinner if the dam axis were to be moved 30 to 50 m upstream.

22-77 Jeokseong

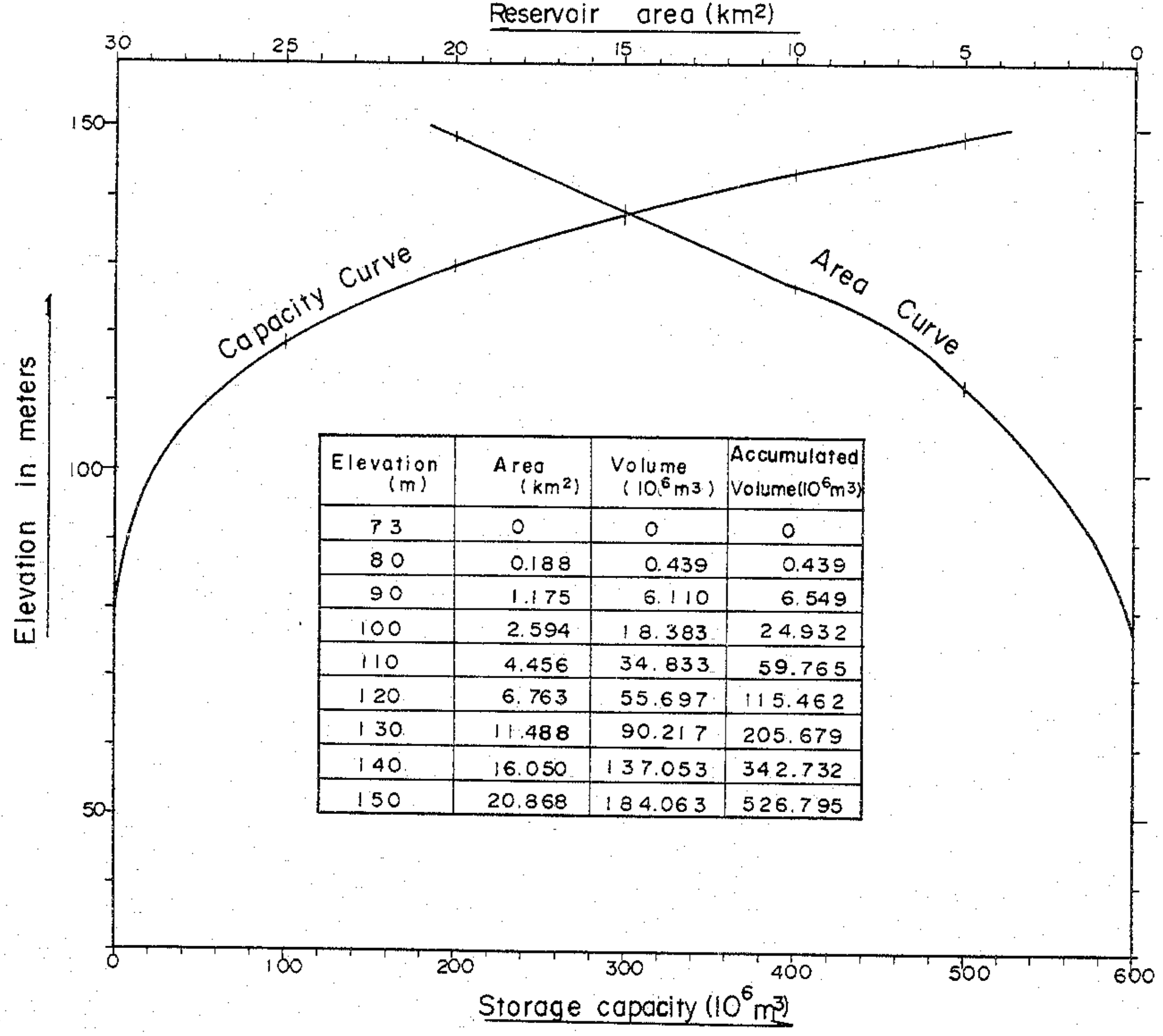
Location of dam Jeonlabug-do Sunchang-gun

Name of river	Seumjin R.	
Basin		
Catchment area	km^2	1,004
Annual precipitation	mm	1,390
Annual mean discharge	m^3/s	5.93
Reservoir		
F.W.L.	EL.m	135
N.H.W.L.	"	133
L.W.L.	"	116.2
Gross storage capacity (N.H.W.L)	10^{6}m^3	240
Effective capacity	"	149.6
Dead capacity	"	90.4
Reservoir area (N.H.W.L)	km^2	13.7
Firm discharge	m^3/sec	5.01
Flood control capacity	10^{6}m^3	27.0
Dam		
Type		Rock-Fill
Dam height	m	66
Crest length	"	389
Volume of dam	10^3/m^3	2,320
Spillway design flood	m^3/s	6,580
Geology		Granitic gneiss
Power station		
Type		Dam
Max. discharge	m^3/sec	24.45
Rated head(effective)	m	49.2
Installed capacity	kW	10,400
Annual energy output	10^{3}kWh	21,000

Construction cost	10^{6}Won	
Compensation	"	9,221
Dam	"	10,317
Sub total	"	19,538
Power facilities	"	4,654
Total	"	24,192
Annual cost of dam and power station	10^{6}Won	2,146
Power & energy benefit	10^{6}Won	554
kW benefit	"	355
kWh benefit	"	199
B/C of power		0.26
(B-C) of power	10^{6}Won	-1,592
Increase of annual available discharge	10^{6}m^3	134.4
Benefit of water supply	10^{6}Won	1,214
Benefit of flood control	"	55
Total benefit	"	1,823
Total B/C		0.85
B-C	10^{6}Won	-323

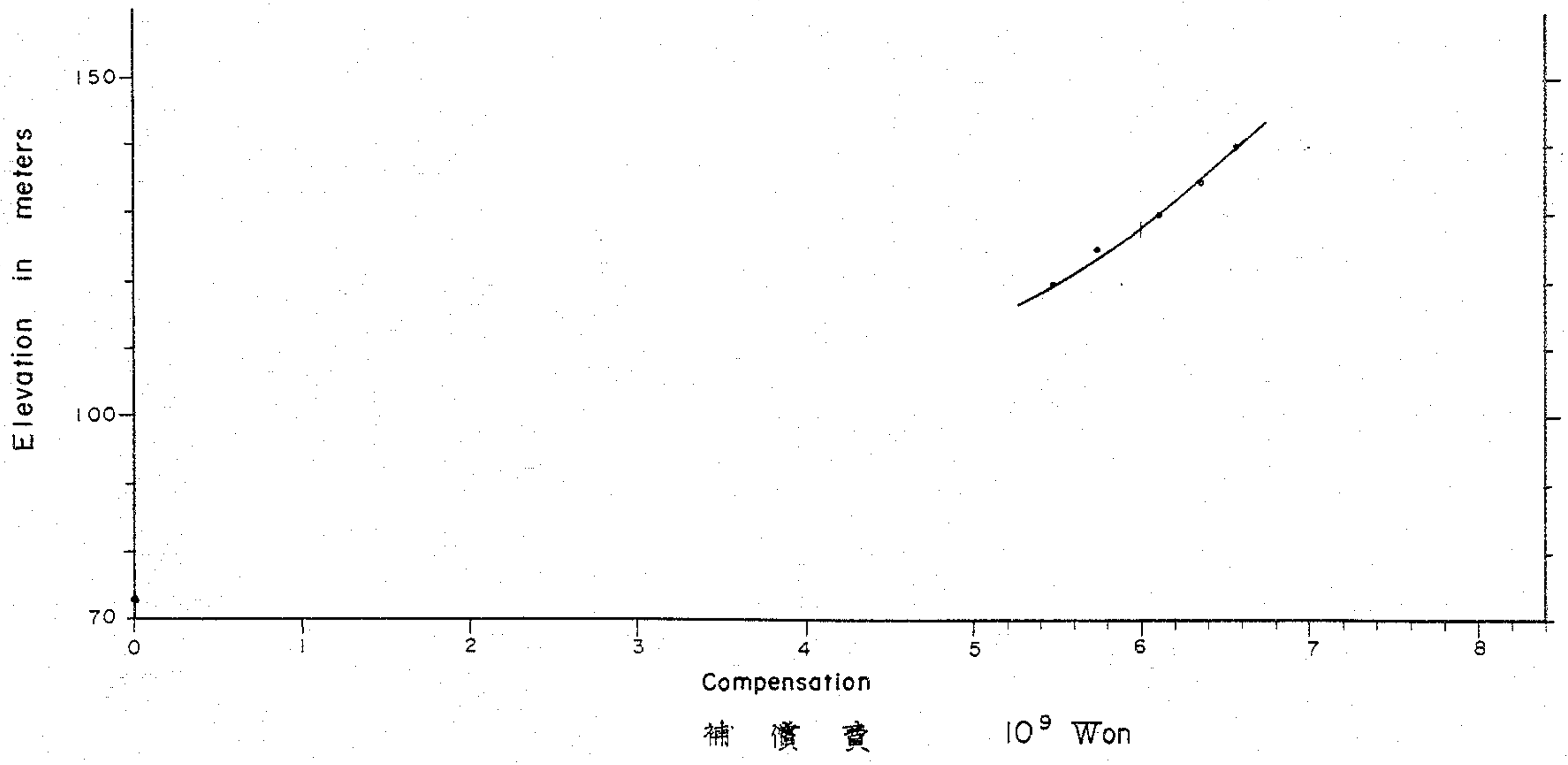
22-77 赤 城 Jeokseong

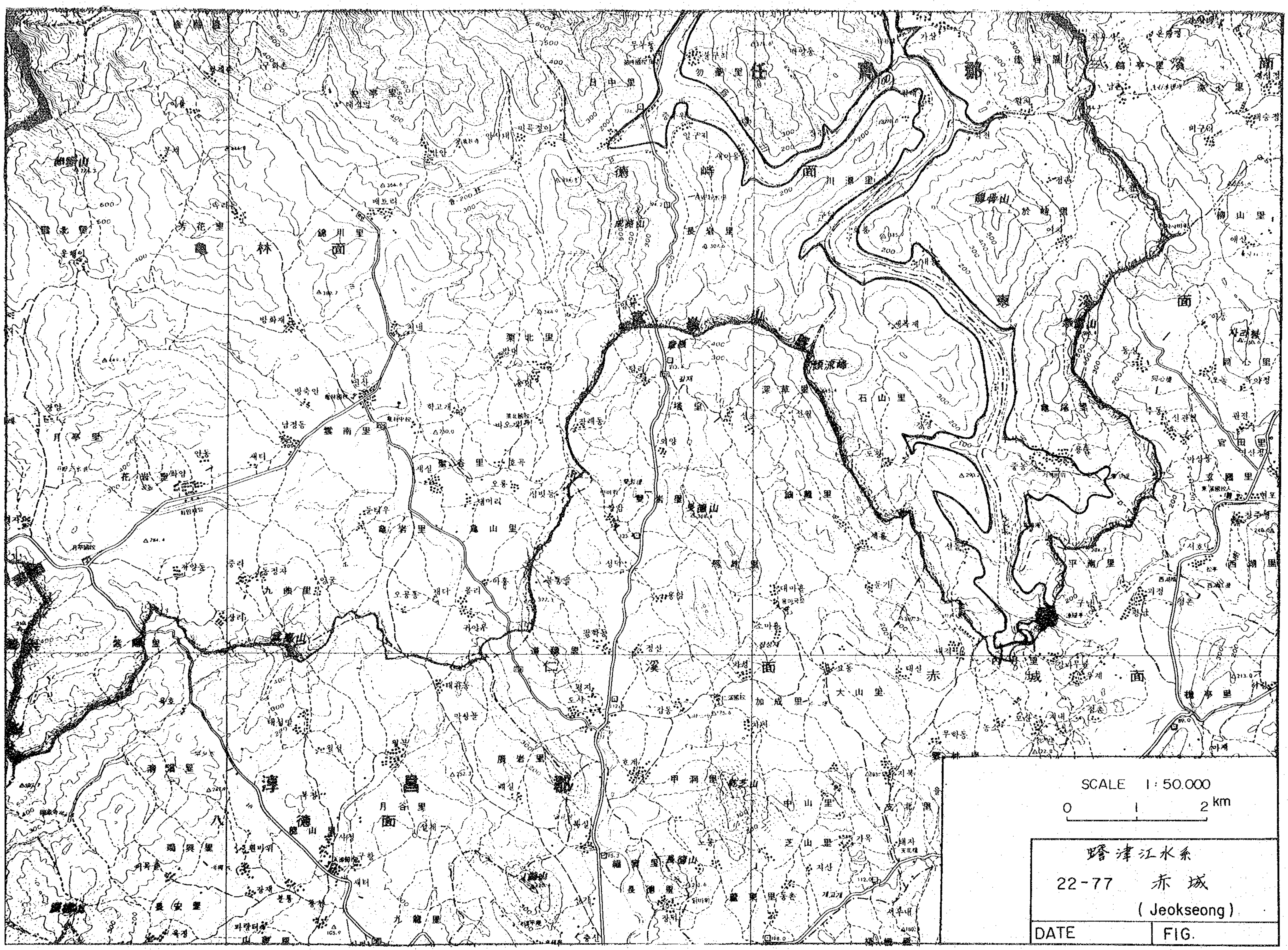
Catchment area (Residual basin of the Sumjin dam) :
241 Km²



Elevation (m)	Area (km²)	Volume (10^6 m3)	Accumulated Volume(10^6 m3)
73	0	0	0
80	0.188	0.439	0.439
90	1.175	6.110	6.549
100	2.594	18.383	24.932
110	4.456	34.833	59.765
120	6.763	55.697	115.462
130	11.488	90.217	205.679
140	16.050	137.053	342.732
150	20.868	184.063	526.795

22 - 77 赤 城 Jeokseong




SCALE 1:50.000
0
1
2 km

蟾津江水系

22-77 赤 城

(Jeokseong)

DATE

FIG.

23-82 Juam

The project site is located at the lower reaches of the Boseong River, a tributary of the Seomjin, and is about 25 km upstream from the junction of the two rivers. The river gradient in the vicinity of the site is gentle at approximately 1/1,200.

The objects of investigation in this study were the Juam site and the No. 2 Boseonggang Dam site as an alternative. Both are being considered for dam construction to secure agricultural and industrial water which would be required in connection with the reclamation project on the southwest coast presently being contemplated.

There is also a proposal for water diversion to the south coast from this site, but there is No. 1 Boseonggang Dam existing about 70 km upstream from this project site from where almost all inflow from 275 km^2 catchment area is being diverted.

In this study, the dam scales were examined for the Juam and No. 2 Boseonggang sites without considering water diversions. For Juam Dam, the vicinity of the site in the original proposal is suitable, but since the left bank consists of a thin ridge and talus deposits are estimated to be thick, it will be advisable for the dam axis to be shifted about 50 m downstream from the site ogiginally selected.

The left bank at the downstream side has granite exposed up to mid-height and there is little overburden. Small-scale faults are expected to exist at parts of low elevation and it is thought necessary for these to be clarified through further investigations. The coverage is thin at the right bank and outcrops are also seen so that there will be no problem.

There is a large number of objects requiring compensation in the area scheduled for reservoir and it will be necessary for further detailed investigations to be made regarding property compensation.

23-82 Juam

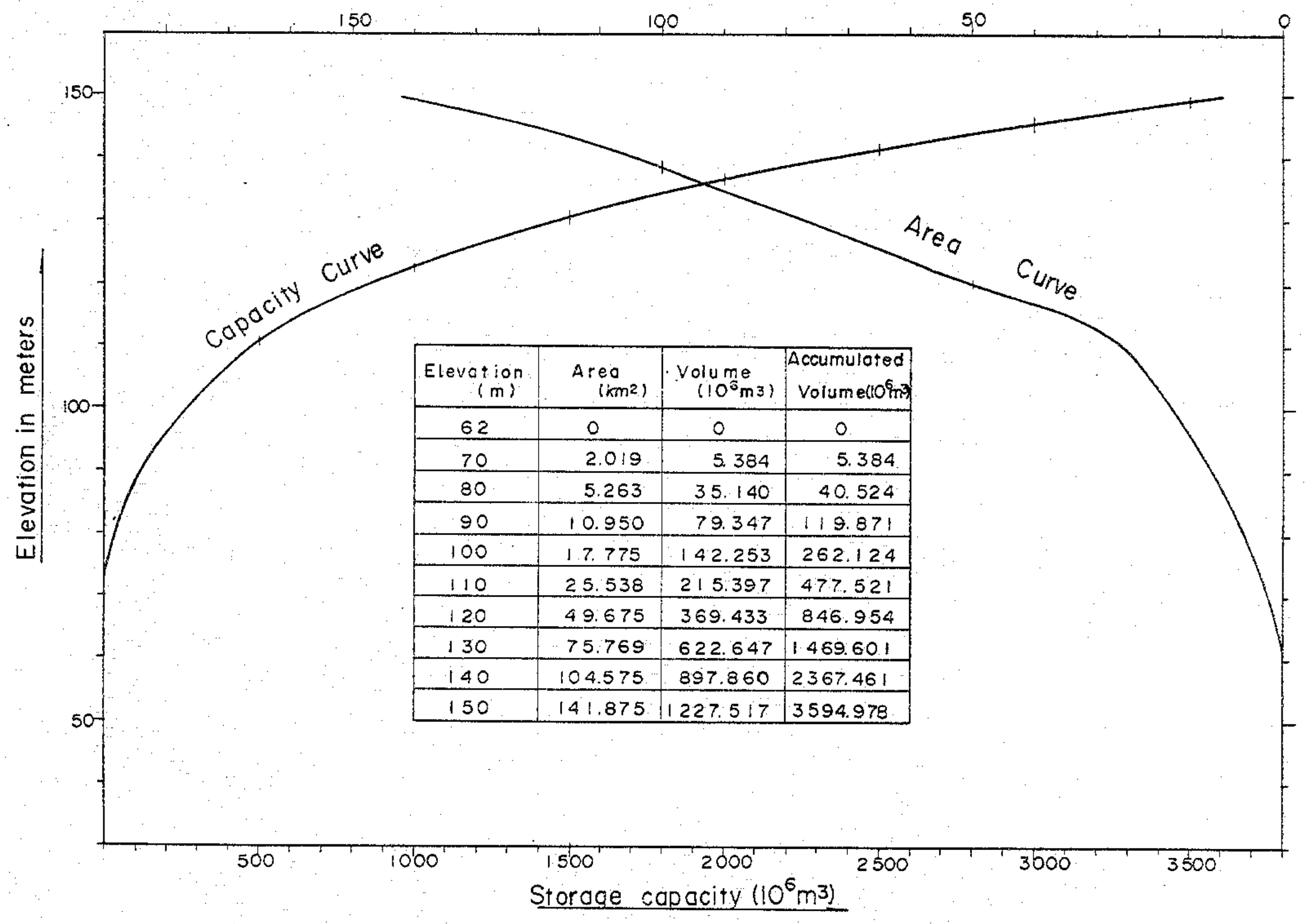
Location of dam Jeonlanam-do Seungju-gun

Name of river		Boseong R.
Basin		
Catchment area	km^2	1,010
Annual precipitation	mm	1,410
Annual mean discharge	m^3/s	22.49
Reservoir		
F.W.L.	EL.m	126.5
N.H.W.L.	"	124.5
L.W.L.	"	106
Gross storage capacity (N.H.W.L)	10^6m^3	1,100
Effective capacity	"	709.3
Dead capacity	"	390.7
Reservoir area (N.H.W.L)	km^2	61.3
Film discharge	m^3/sec	19.79
Food control capacity	10^6m^3	124.5
Dam		
Type		Rock-Fill
Dam height	m	76.5
Crest length	"	424
Volume of dam	10^3m^3	3,070
Spillway design flood	m^3/s	6,590
Geology		Granitic gneiss
Power station		
Type		Dam
Max. discharge	m^3/sec	97.34
Rated head(effective)	m	54
Installed capacity	kW	45,500
Annual energy output	10^3kWh	86,400

Construction cost	10^6Won	
Compensation	"	47,284
Dam	"	12,904
Sub total	"	60,188
Power facilities	"	13,541
Total	"	73,729
Annual cost of dam and power station	10^6Won	6,430
Power & energy benefit	10^6Won	2,372
kW benefit	"	1,553
kWh benefit	"	819
B/C of power		0.37
(B-C) of power	10^6Won	-4,058
Increase of annual available discharge	10^6m^3	534.4
Benefit of water supply	10^6Won	4,826
Benefit of flood control	"	131
Total benefit	"	7,329
Total B/C		1.14
B-C	10^6Won	899

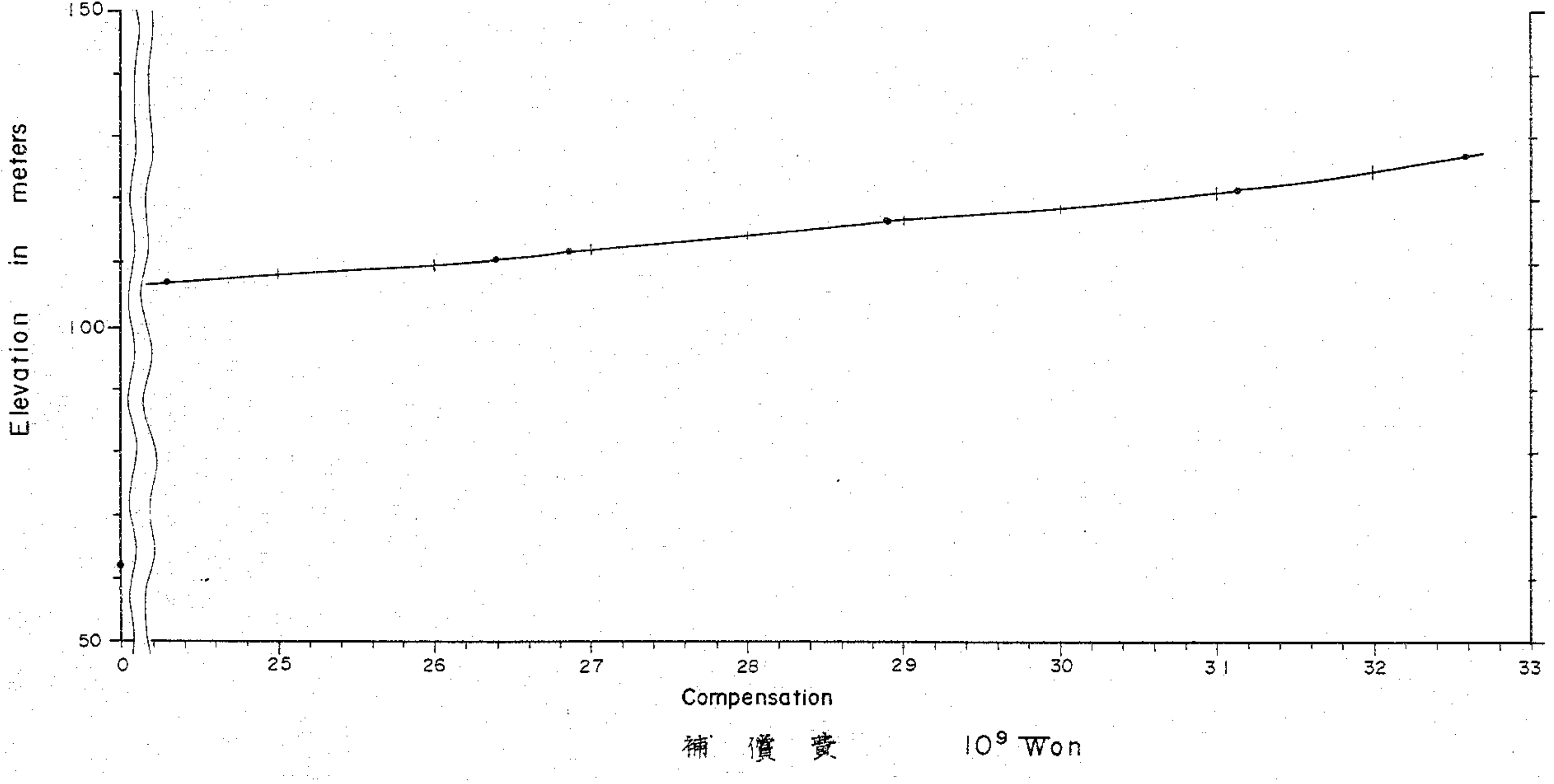
23-82 住 岩 Juam

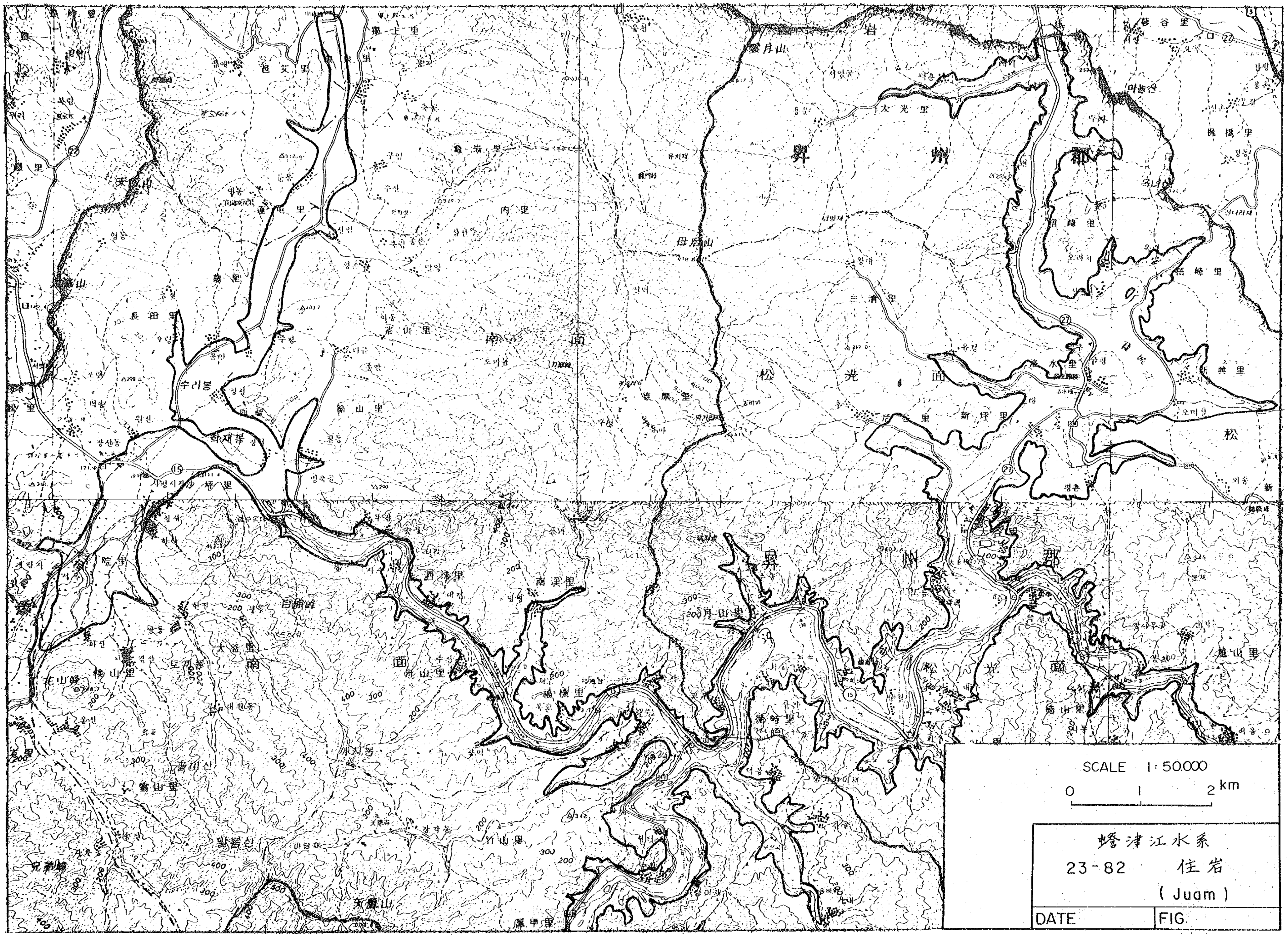
Catchment area (Residual basin of the Bosung Dam) : 735 Km²



Elevation (m)	Area (km2)	Volume (10⁶m3)	Accumulated Volume(10⁶m3)
62	0	0	0
70	2.019	5.384	5.384
80	5.263	35.140	40.524
90	10.950	79.347	119.871
100	17.775	142.253	262.124
110	25.538	215.397	477.521
120	49.675	369.433	846.954
130	75.769	622.647	1469.601
140	104.575	897.860	2367.461
150	141.875	1227.517	3594.978

23 - 82 住 岩 Juam


Elevation in meters
150
100
50
0
25
26
27
28
29
30
31
32
33
Compensation
補 償 費
10⁹ Won


SCALE 1:50.000
0
1
2 km
昇
州
松
光
面
母后山
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15
22
27
300
200
DATE
FIG.

蟾津江水系

23-82 住岩

(Juam)

24-A4 No. 2 Boseonggang

This site was planned as an alternative of the Juam site. The site originally selected is severely weathered at the left bank along the national highway, with deeply weathered portions (decomposed granite) running along the river. Further, there are faults running underneath and at the river bed, then the site is unsuitable for a dam site.

An alternative site was selected upstream of this site. This alternative site is located approximately 10 km downstream from No. 1 Boseonggang Dam, with its geology comprised of gneiss. The geology of the left-bank is good and there is no fear of faulting at the river bed. The bedrock at the righ-bank is slightly loosened at places, but there is no problem as a dam foundation.

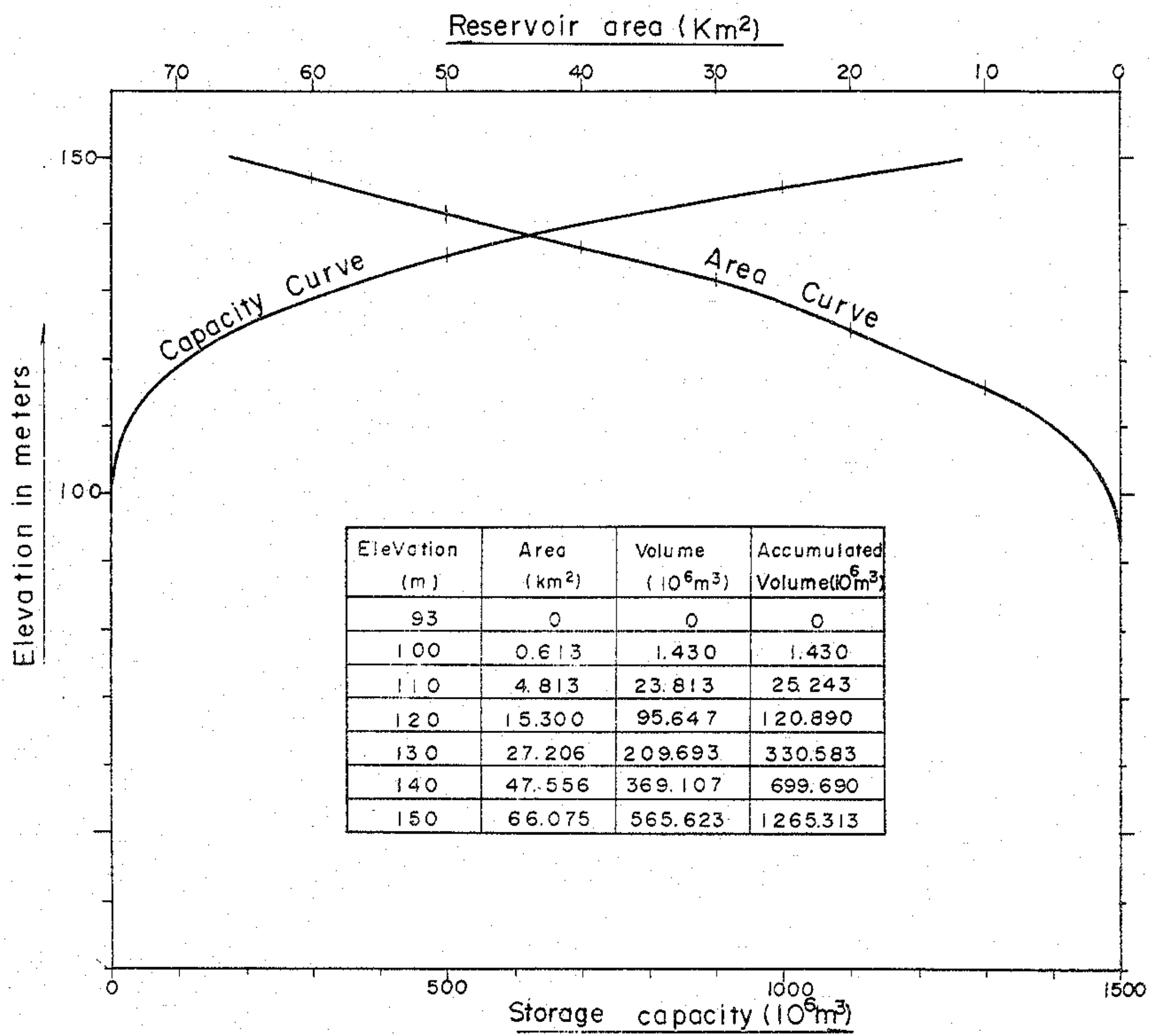
24-A4 Boseonggang

Location of dam Jeonlanam-do Boseong-gun

Name of river	Boseong R.	
Basin		
Catchment area	km^2	457
Annual precipitation	mm	1,410
Annual mean discharge	m^3/s	5.57
Reservoir		
F.W.L.	EL.m	121
N.H.W.L.	"	119
L.W.L.	"	112.1
Gross storage capacity (N.H.W.L)	10^{6}m^3	100.5
Effective capacity	"	70.2
Dead capacity	"	30.3
Reservoir area (N.H.W.L)	km^2	13.6
Firm discharge	m^3/sec	3.68
Flood control capacity	10^{6}m^3	30.5
Dam		
Type		Rock-Fill
Dam height	m	25
Crest length	"	239
Volume of dam	10^{3}m^3	270
Spillway design flood	m^3/s	4,430
Geology		Gneiss
Power station		
Type		Dam
Max. discharge	m^3/sec	18.3
Rated head(effective)	m	20
Installed capacity	kW	3,170
Annual energy output	10^{3}kWh	7,900

Construction cost	10^{6}Won	
Compensation	"	7,950
Dam	"	2,533
Sub total	"	10,483
Power facilities	"	3,161
Total	"	13,644
Annual cost of dam and power station	10^{6}Won	1,207
Power & energy benefit	10^{6}Won	183
kW benefit	"	108
kWh benefit	"	75
B/C of power		0.15
(B-C) of power	10^{6}Won	-1,024
Increase of annual available discharge	10^{6}m^3	94.0
Benefit of water supply	10^{6}Won	849
Benefit of flood control	"	47
Total benefit	"	1,079
Total B/C		0.89
B-C	10^{6}Won	-128

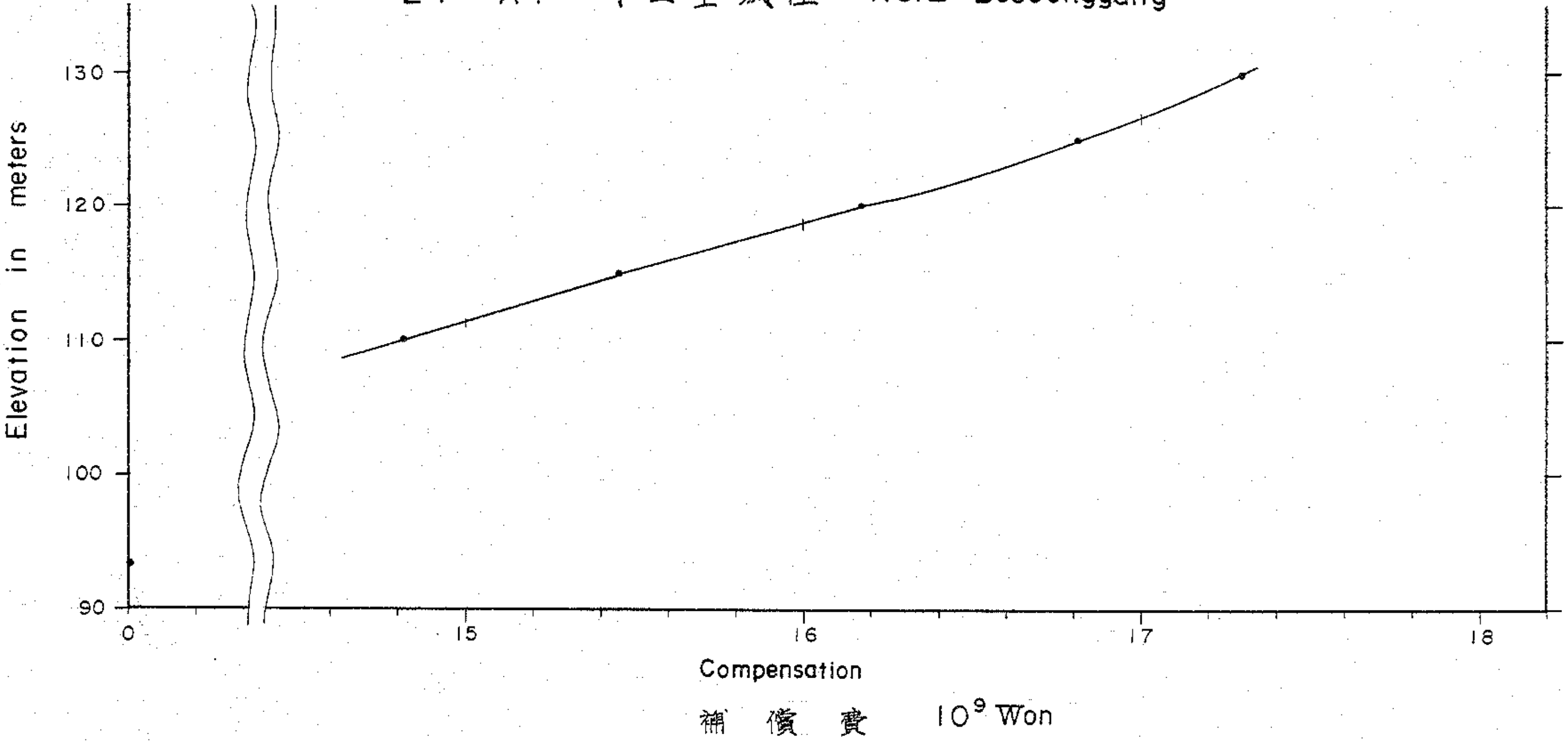
24-A4 第二宝城江 (代案地点) NO.2 Boseonggang

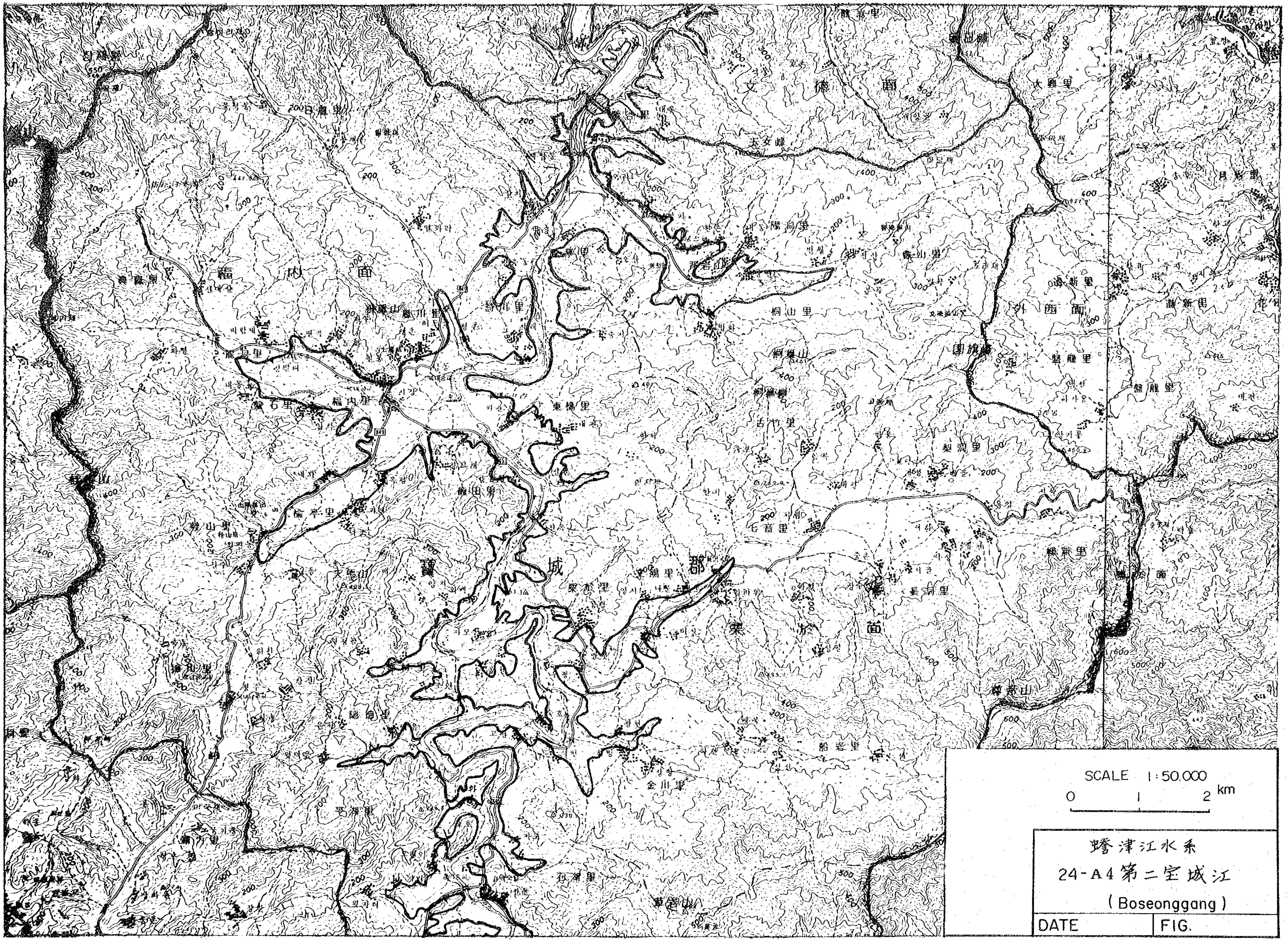


Elevation (m)	Area (km²)	Volume (10^6m^3)	Accumulated Volume(10^6m^3)
93	0	0	0
100	0.613	1.430	1.430
110	4.813	23.813	25.243
120	15.300	95.647	120.890
130	27.206	209.693	330.583
140	47.556	369.107	699.690
150	66.075	565.623	1265.313

Catchment area (Residual basin of the Bosung Dam) :
182 Km²

24 - A4 才二宝城江 NO.2 Boseonggang




文德面
福內面
寶城郡
栗於面
外西面
玉女峰
SCALE 1:50.000
0
1
2 km

蟾津江水系
24-A4 第二宝城江
(Boseonggang)

DATE
FIG.