transmission line is approximately 165 km, as shown in the attached drawing "General Map of Num Gam Basin", and will naturally result in a large voltage drop. Therefore, it will be necessary to install static condensers in order to maintain the voltage drop within 10%, to increase transmission capacity and to maintain a prescribed voltage at the consumer end. As a result of studies it was concluded that on the assumed load of Nakhon Phanon and Mukudahan, shown in the table below, about 500 KVA of static condensers would be needed.

Sub-station	Assumed load in KVA
Sakol Nakhon	1,700
Nakae	100
Nakhon Phanon	1,000
That Phanon	400
Mukudahan	600
Nam Pung Bridge site	1,000

Assuming that no static condensers will be installed and loads will be 100% power factor consisting mostly of lighting demand, the voltage drop at Nakhon Phanon, which is at the end of the line, is estimated to be about 15% of the assumed load.

D. Cost estimates

Field studies that the Team has conducted were principally investigations to formulate a development plan and to design necessary structures. Therefore, it must be pointed out that adequate studies which are necessary to estimate project costs have not been made. Cost estimates which are presented herewith were made from various data obtained in Tokyo, as well as, from assumptions. Consequently, cost estimates with a higher degree

of reliability may be prepared as a result of discussions with the Government of Thailand and the supplementary field investigations that the Team proposes to conduct.

Estimated Costs of Nam Pung Generation and Transmission Scheme

	Item	Quantity	Cost in US$	Remarks
a)	Dam	744,000 m^3	2,646,000	
b)	Waterway			
	Intake		92,000	
	Headrace	572 m	384,000	
	Surge tank		50,000	Simple surge tank
	Penstock	400 m	132,000	
	Powerhouse		184,000	Inclusive of switchyard and sub-station
	Tailrace		44,000	
	Generation equipment	3 units	556,000	
	Transmission line	35 km	178,000	To Sakol Nakorn
	Distribution sub-station	6,600 KVA	217,000	
	Sub-total		1,837,000	
c)	General administrative expenses		1,497,000	
Total costs			5,980,000	

Direct costs of generation and transmission plants which are the total costs less the cost of the dam and general administrative expenses are estimated to be $1,837,000 or 12.2 cents per KWH. If 43.5% of general administrative expenses and 28% of the cost of the dam are allocated to power, the total cost of power will be $3,183,000. Assuming interest costs at 6% per annum, power could be delivered to Sakol Nakorn at 2.0 cents per KWH.

If power is to be delivered to Nakorn Phanom, That Phanom and Mukudahan, additional costs of approximately $1,165,000 would be entailed to construct transmission lines and sub-stations. Then the total cost would be $7,145,000.

NAM PUNG PROJECT

LIST OF FIGURES

NAME	NO. OF FIGURE
GEOLOGY AND LOCATION OF EXPLORATION (DAM)	201
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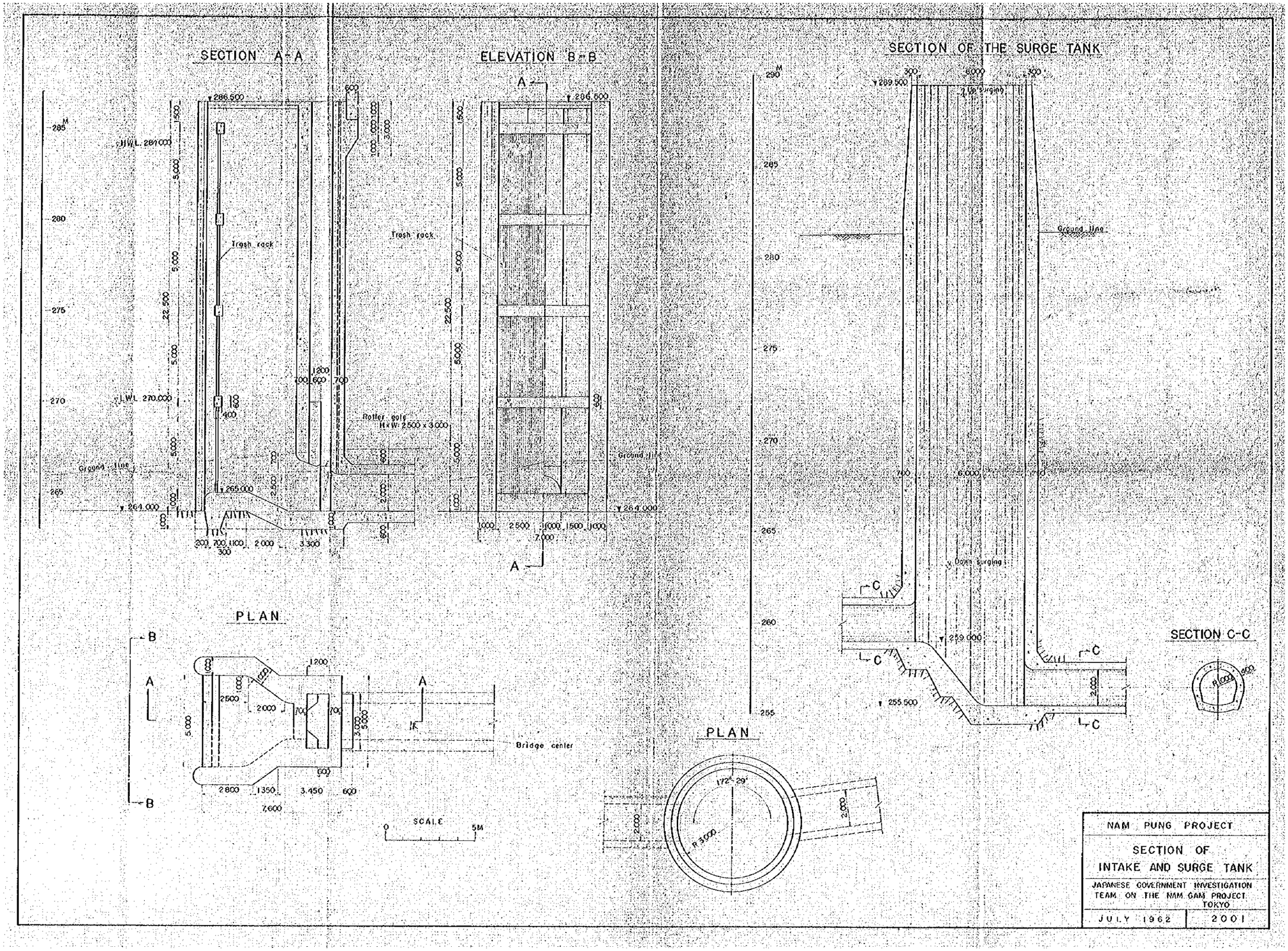
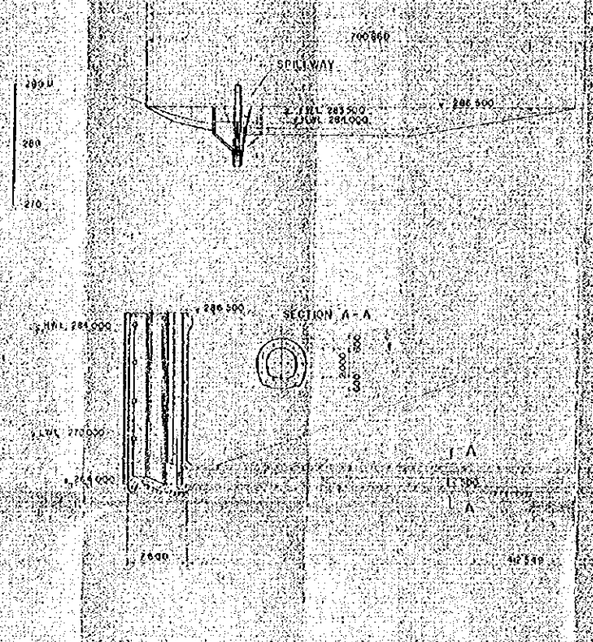
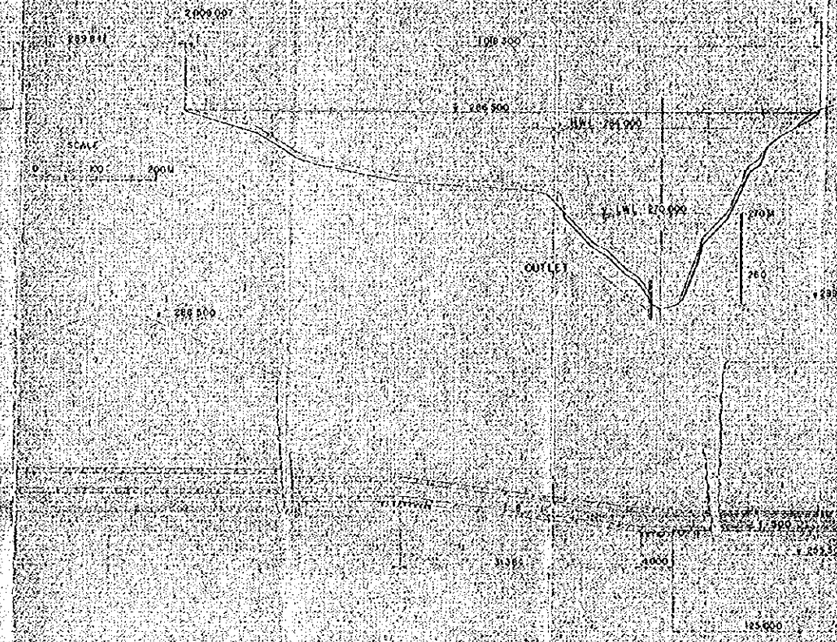
GEOLOGIC SECTION (DAM)	204
PLAN OF RESERVOIR	601
GENERAL PLAN	402
TYPICAL SECTION AND UPSTREAM ELEVATION OF DAM	1102
PLAN AND SECTION OF SPILLWAY	1601
SECTION OF SPILLWAY	1602
LONGITUDINAL SECTION	501
SECTION OF INTAKE AND SURGE TANK	2001
SECTIONAL PROFILE OF POWERPLANT	2401
PLAN OF POWERPLANT AND SWITCH YARD	3001

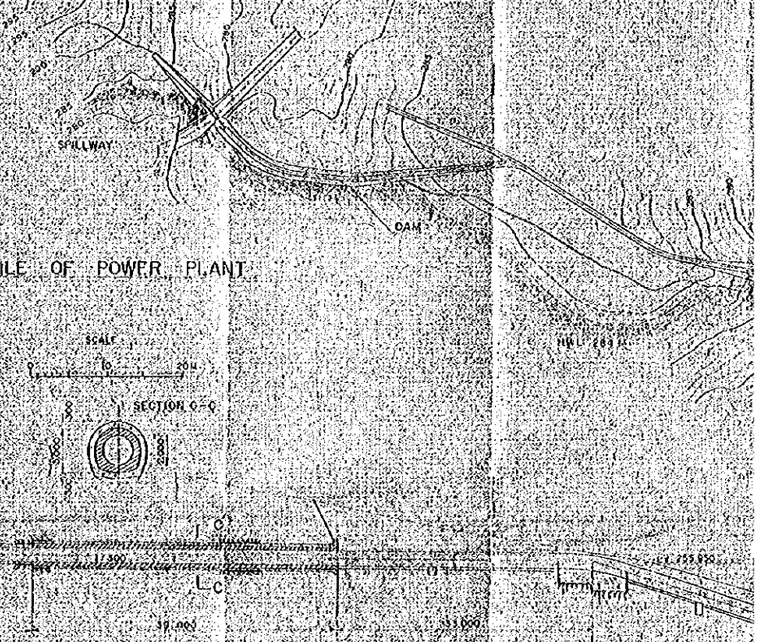

SECTION A-A
ELEVATION B-B
SECTION OF THE SURGE TANK
PLAN
PLAN
SECTION C-C
H.W.L. 281.000
L.W.L. 270.000
Trash rack
Roller gate
H x W 2500 x 3000
Ground line
Bridge center
Down surging
SCALE
NAM PUNG PROJECT
SECTION OF
INTAKE AND SURGE TANK
JAPANESE GOVERNMENT INVESTIGATION
TEAM ON THE NAM GAM PROJECT
TOKYO
JULY 1962
2001

UPSTREAM ELEVATION

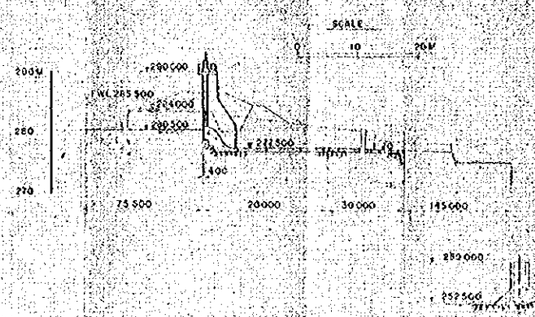




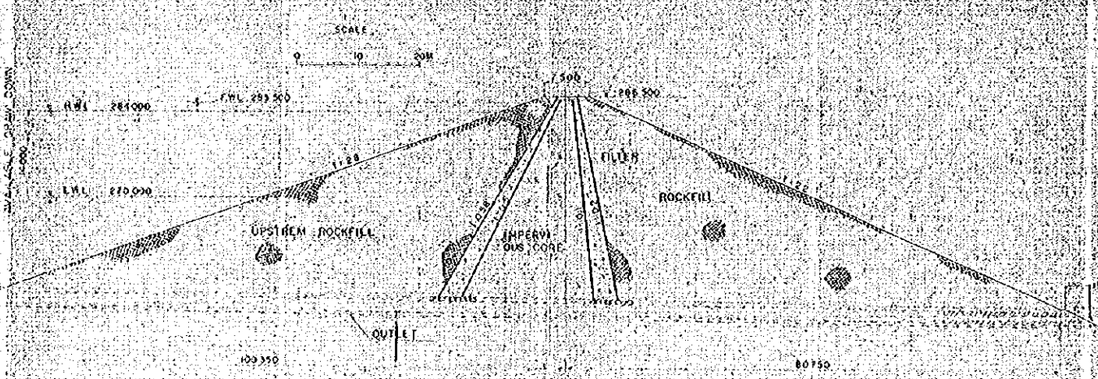
SECTIONAL PROFILE OF POWER PLANT



SECTIONAL PROFIL OF SPILLWAY



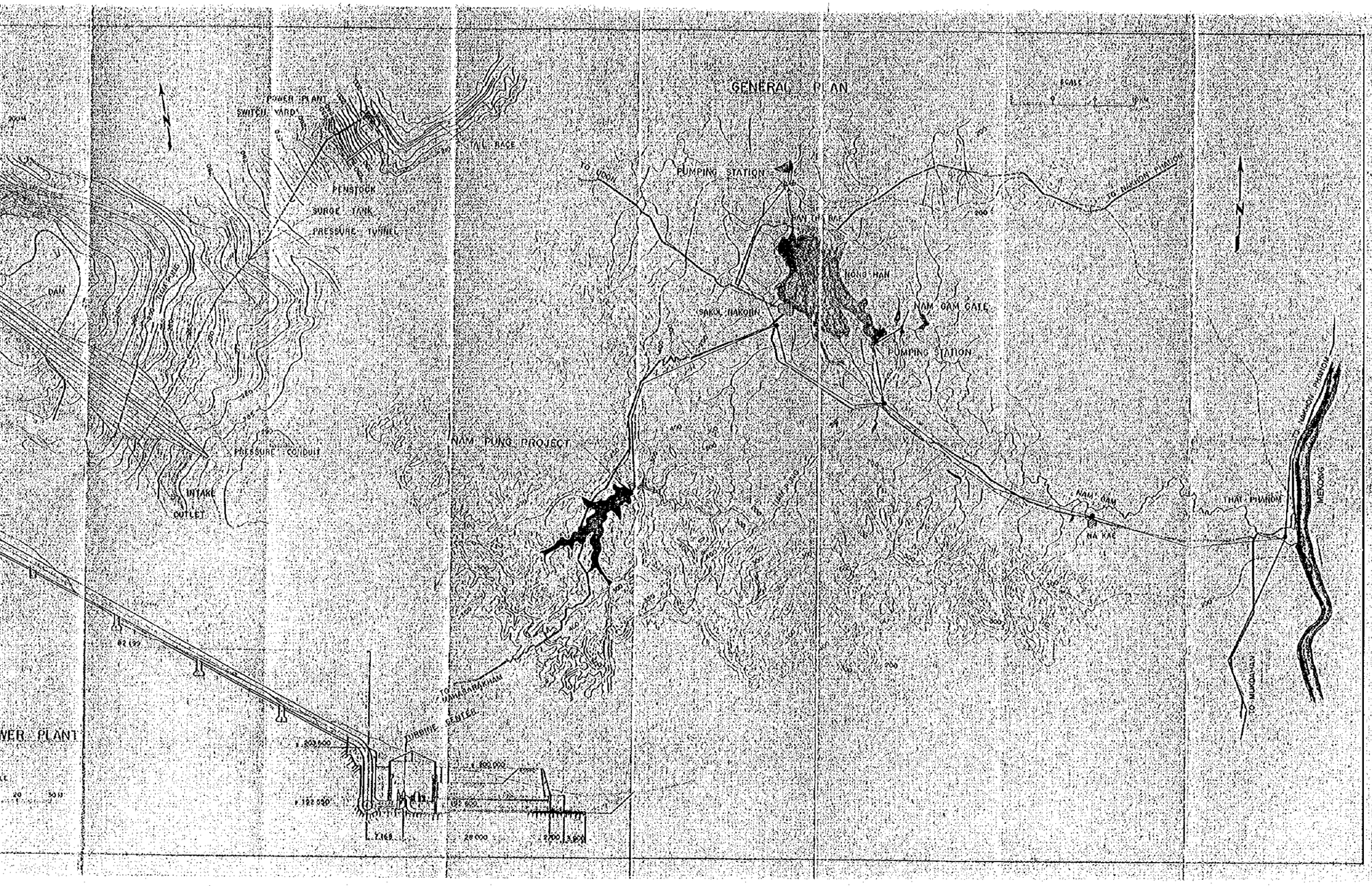
TYPICAL SECTION OF DAM



NAM PUNG PROJECT

JUNE 1962

JAPANESE GOVERMENT - INVESTIGATION TEAM
ON THE NAM GAM PROJECT TOKYO



OUTLINE OF PROJECT

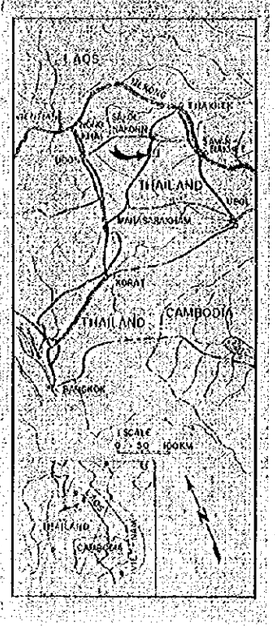
DRAINAGE AREA	298 KM²
FLOOD FLOW	
DISCHARGE IN FLOW	1 900M³/S
DESIGN OUT FLOW	1 300M³/S
RESERVOIR	
HIGH WATER LEVEL	209 M
AVAILABLE DRAWDOWN	18 M
RESERVOIR AREA	20 KM²
GROSS STORAGE	133 / 10⁶M³
EFFECTIVE STORAGE	122 / 10⁶M³
ANNUAL INFLOW	1 GM³
USABLE WATER	
AT H.W.L.	80 M³/S
AT L.W.L.	86 M³/S
FIRM	2.75M³/S
AT FIRM PEAK LOAD	5.6M³/S
EFFECTIVE HEAD	
AT H.W.L.	86.5M
AT L.W.L.	71.5M
GENERATION	
MAX. CAPACITY	84000 KW
FIRM	1.750 KW
AT FIRM PEAK LOAD	3000 KW
OUT PUT	1500000 KWH

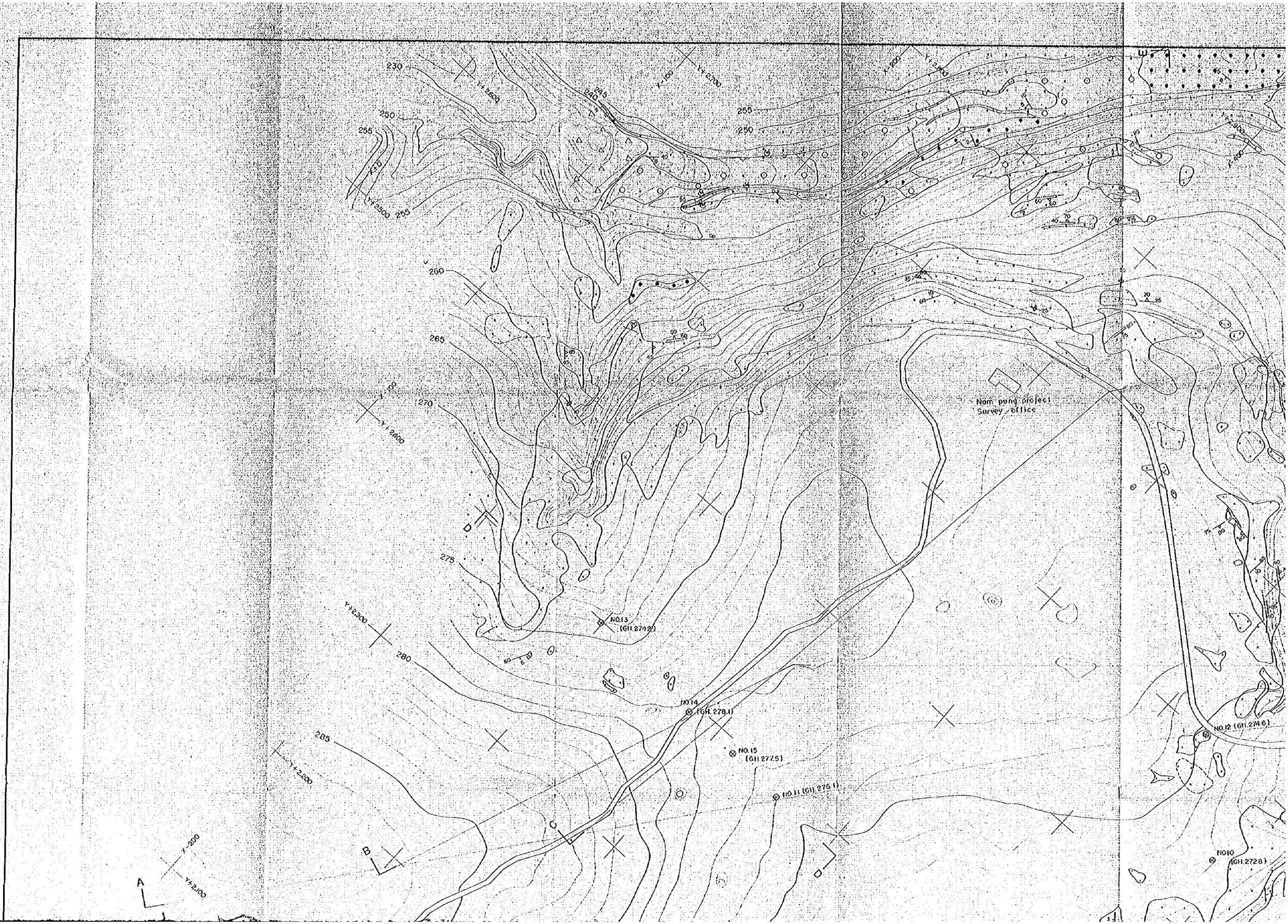
OUTLINE OF MAIN STRUCTURE

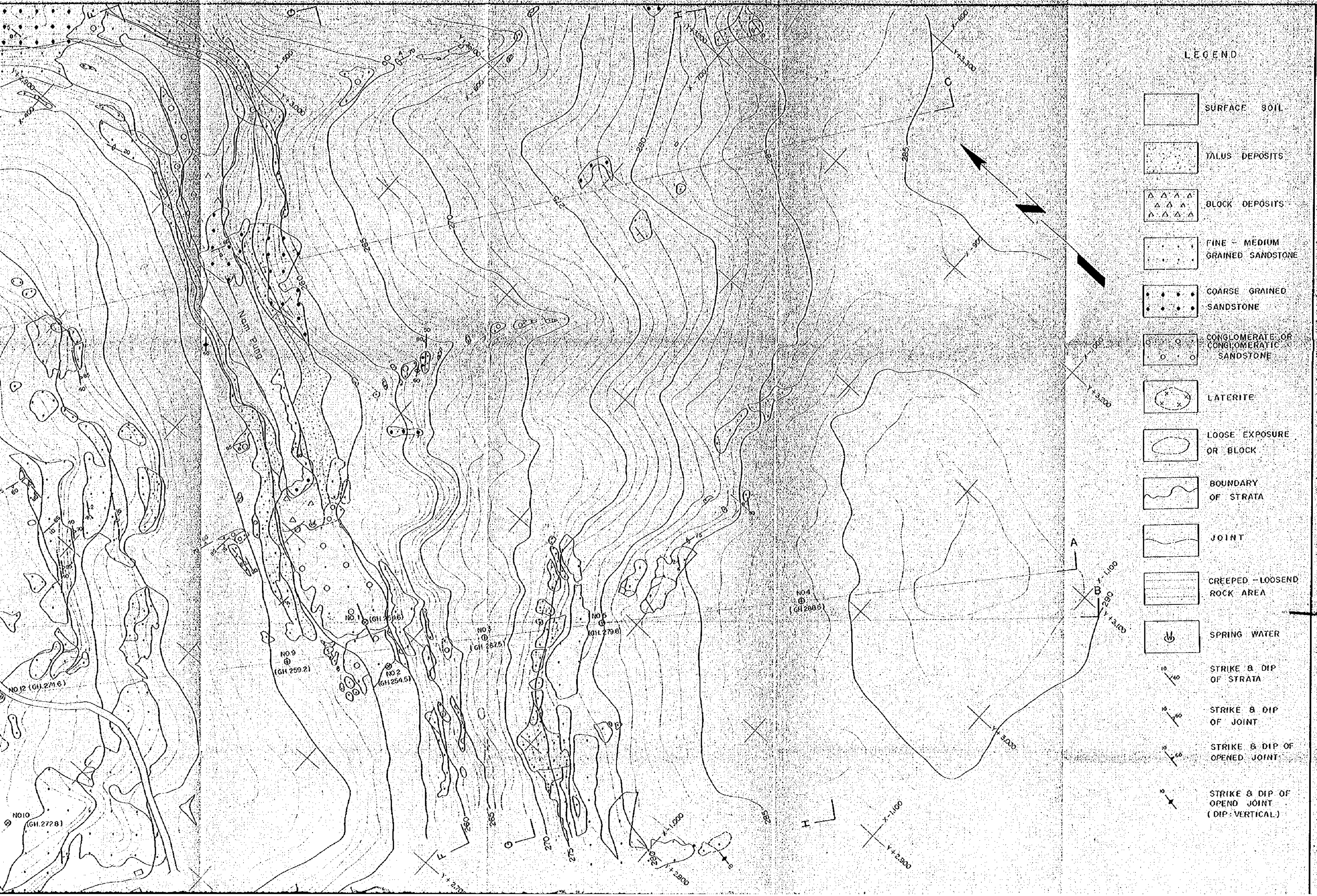
DAM	
TYPE : CENTER CORE ROCK FILL DAM	
HEIGHT	32 M
CREST LENGTH	1.173 M
VOLUME	741 000 M³
SPILLWAY	
TYPE : OVERFLOW TYPE SHUTTER GATE	
CAPACITY	500 M³/S
GATE	2
RIVER OUTLET	
TYPE : PRESSURE CONDUIT OUTLET	
LENGTH	190 M
GATE	2
INTAKE	
VERTICAL TYPE	
HEIGHT	22.5M
GATE 2.5M W. 3.0M H.	
CONDUIT	
INNER DIAMETER	2 M
LENGTH	450 M
TUNNEL	
INNER DIAMETER	7 M
LENGTH	1.173 M
SURGE TANK	
SIMPLE SURGE TANK	
INNER DIAMETER	6 M
HEIGHT	24 M
PENSTOCK	
UPPER SIDE ; TUNNEL	
LENGTH	242 M
INNER DIAMETER	6 M
LOWER SIDE ; PENSTOCK	
LENGTH	73 M
INNER DIAMETER 2.0 - 1.5 - 0.8 M	
POWER PLANT	
WIDTH 9 M. LENGTH	17.2M
TAIL RACE	
TUNNEL	
LENGTH	168M

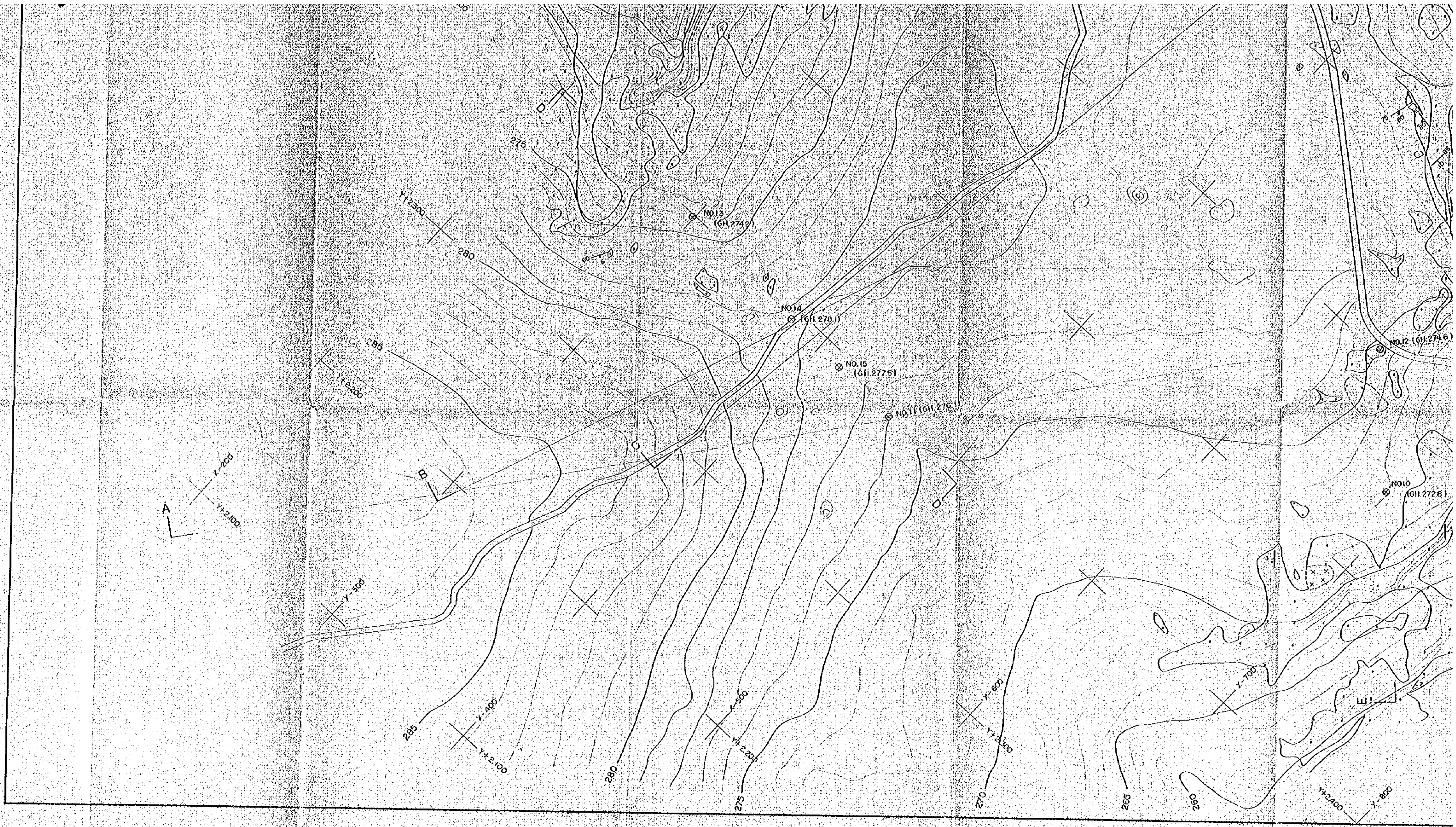
MAIN EQUIPMENT

TURBINE	
HORIZONTAL SHAFT FRANCIS	
NUMBER OF UNIT	3
MAX. CAPACITY	1.650 KW
SPEED	750 R.P.M
GENERATOR	
TYPE ; HORIZONTAL SHAFT, 3 - PHASE SYNCHRONOUS GENERATOR	
NUMBER OF UNIT	3
FREQUENCY	50 CYCLE
CAPACITY	2 000 KVA
VOLTAGE	3.3 KV
SPEED	750 R.P.M
TRANSFORMER	
TYPE ; 3 - PHASE OIL IMMERSED - SELF COOLED TYPE WITH DIAPHRAM SEALED	
CAPACITY	2 200 KVA
NUMBER OF UNIT	3
VOLTAGE	
PRIMARY VOLTAGE	3.3 KV
SECONDARY VOLTAGE	33.0 KV

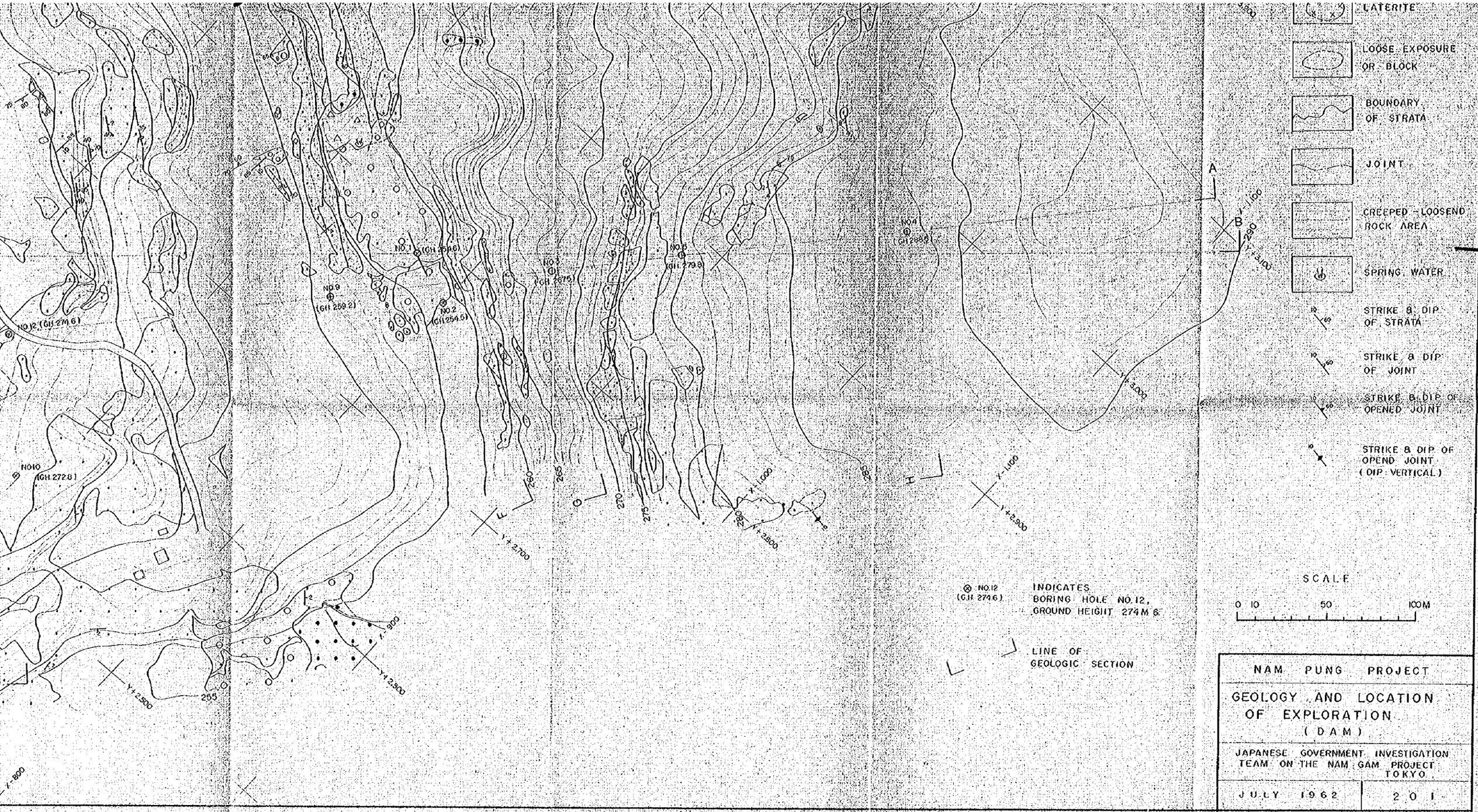



Nam pung project
Survey office
NO.13 (611.279.2)
NO.14 (611.278.1)
NO.15 (611.277.5)
NO.11 (611.276.1)
NO.12 (611.274.6)
NO.10 (611.272.8)
A
B
C
D


LEGEND
SURFACE SOIL
TALUS DEPOSITS
BLOCK DEPOSITS
FINE - MEDIUM GRAINED SANDSTONE
COARSE GRAINED SANDSTONE
CONGLOMERATE OR CONGLOMERATIC SANDSTONE
LATERITE
LOOSE EXPOSURE OR BLOCK
BOUNDARY OF STRATA
JOINT
CREEPED - LOOSEND ROCK AREA
SPRING WATER
STRIKE & DIP OF STRATA
STRIKE & DIP OF JOINT
STRIKE & DIP OF OPENED JOINT
STRIKE & DIP OF OPEND JOINT (DIP: VERTICAL)
Nam Pung
NO.1 (GH.251.6)
NO.2 (GH.254.5)
NO.3 (GH.267.5)
NO.4 (GH.288.5)
NO.5 (GH.279.8)
NO.9 (GH.259.2)
NO.10 (GH.272.8)
NO.12 (GH.271.6)
A
B
C
F
G
H
260
265
270
275
280
285
290



NO.13 (GH.274.2)
NO.14 (GH.278.1)
NO.15 (GH.277.5)
NO.11 (GH.278.1)
NO.12 (GH.274.6)
NO.10 (GH.272.8)
Y+2,300
Y+2,200
Y+2,100
Y+2,400
X-200
X-300
X-400
X-500
X-600
X-700
X-800
285
280
275
270
265
260
A
B
C
D

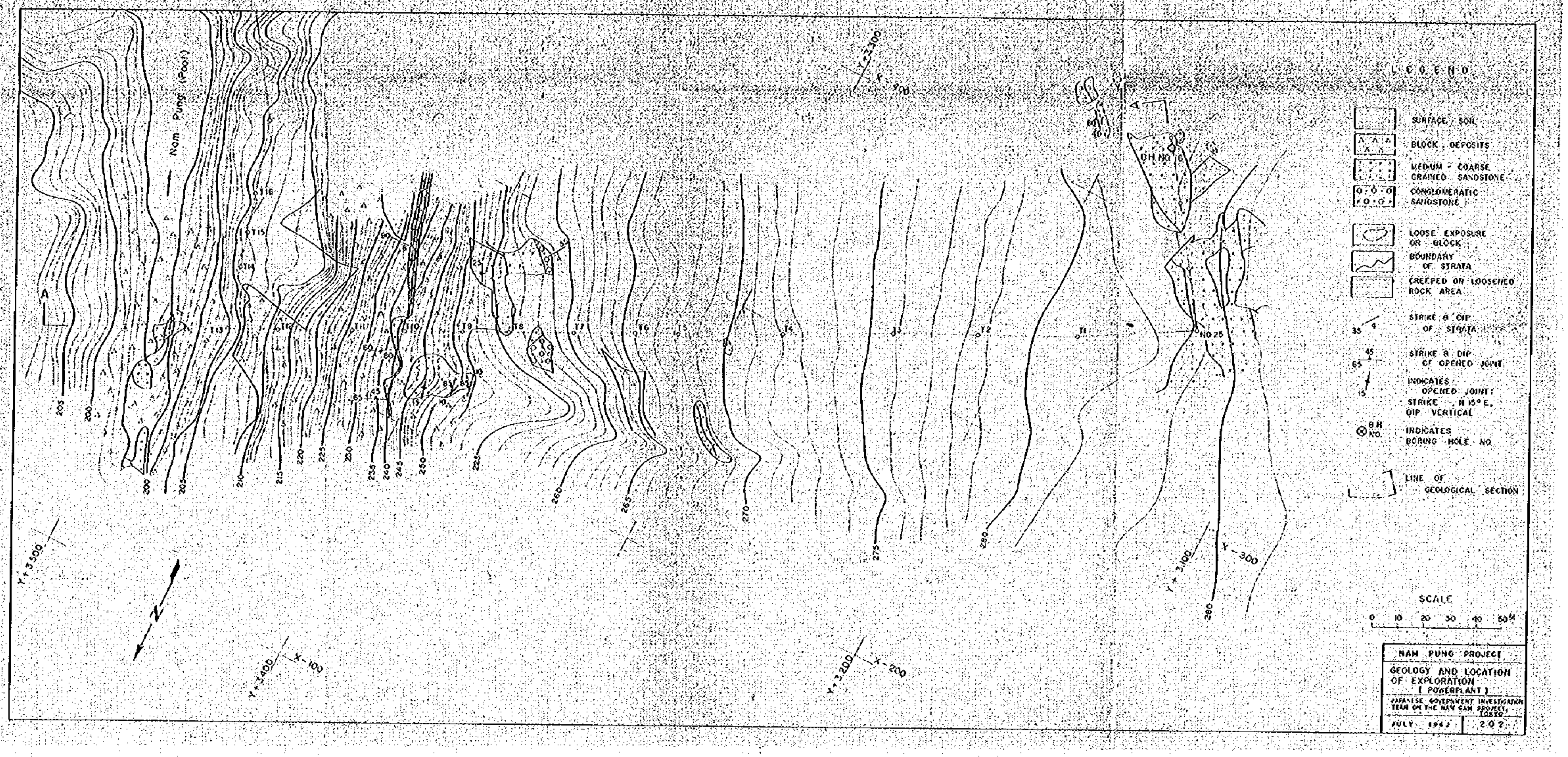


NAM PUNG PROJECT

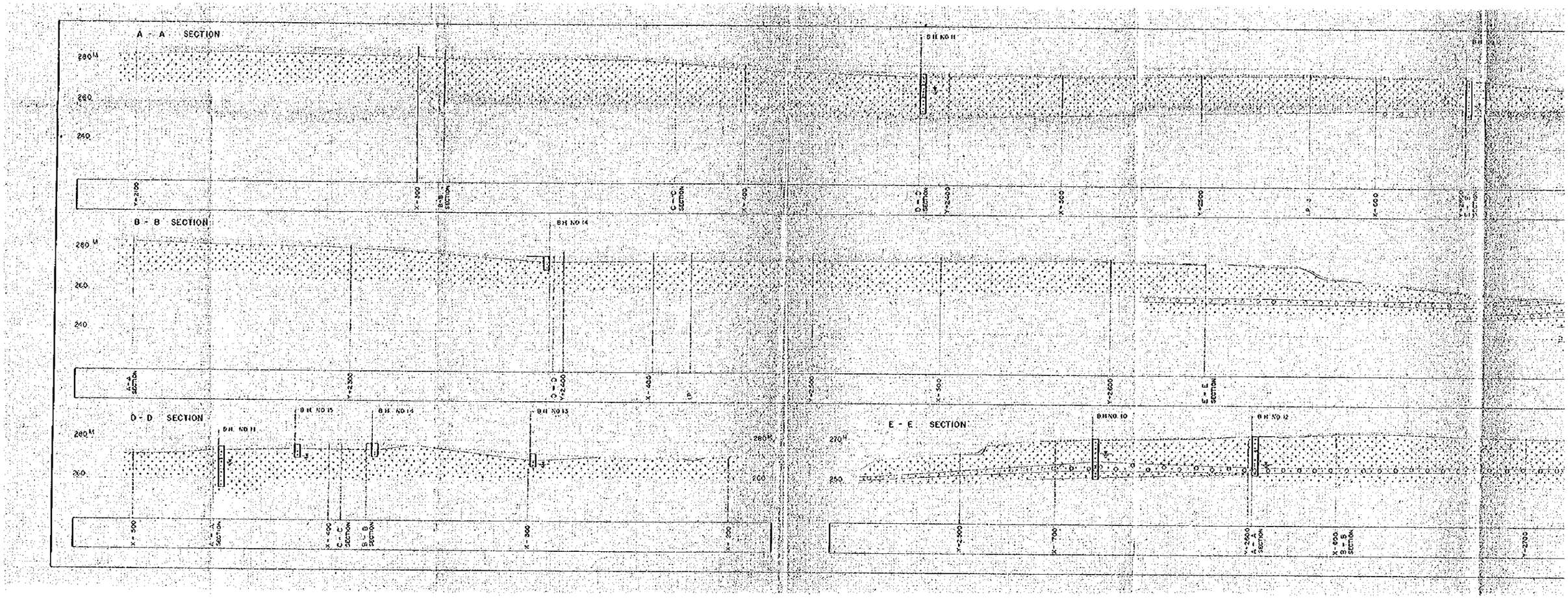
GEOLOGY AND LOCATION OF EXPLORATION (DAM)

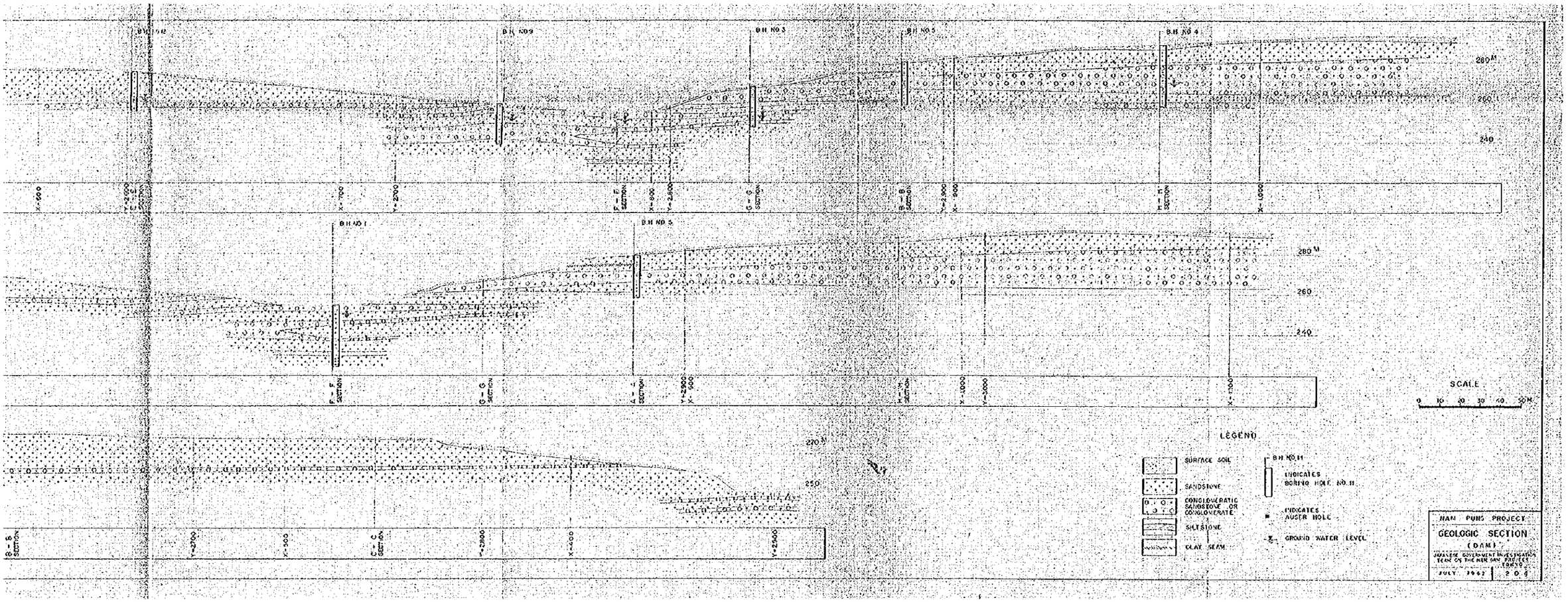
JAPANESE GOVERNMENT INVESTIGATION TEAM ON THE NAM GAM PROJECT TOKYO

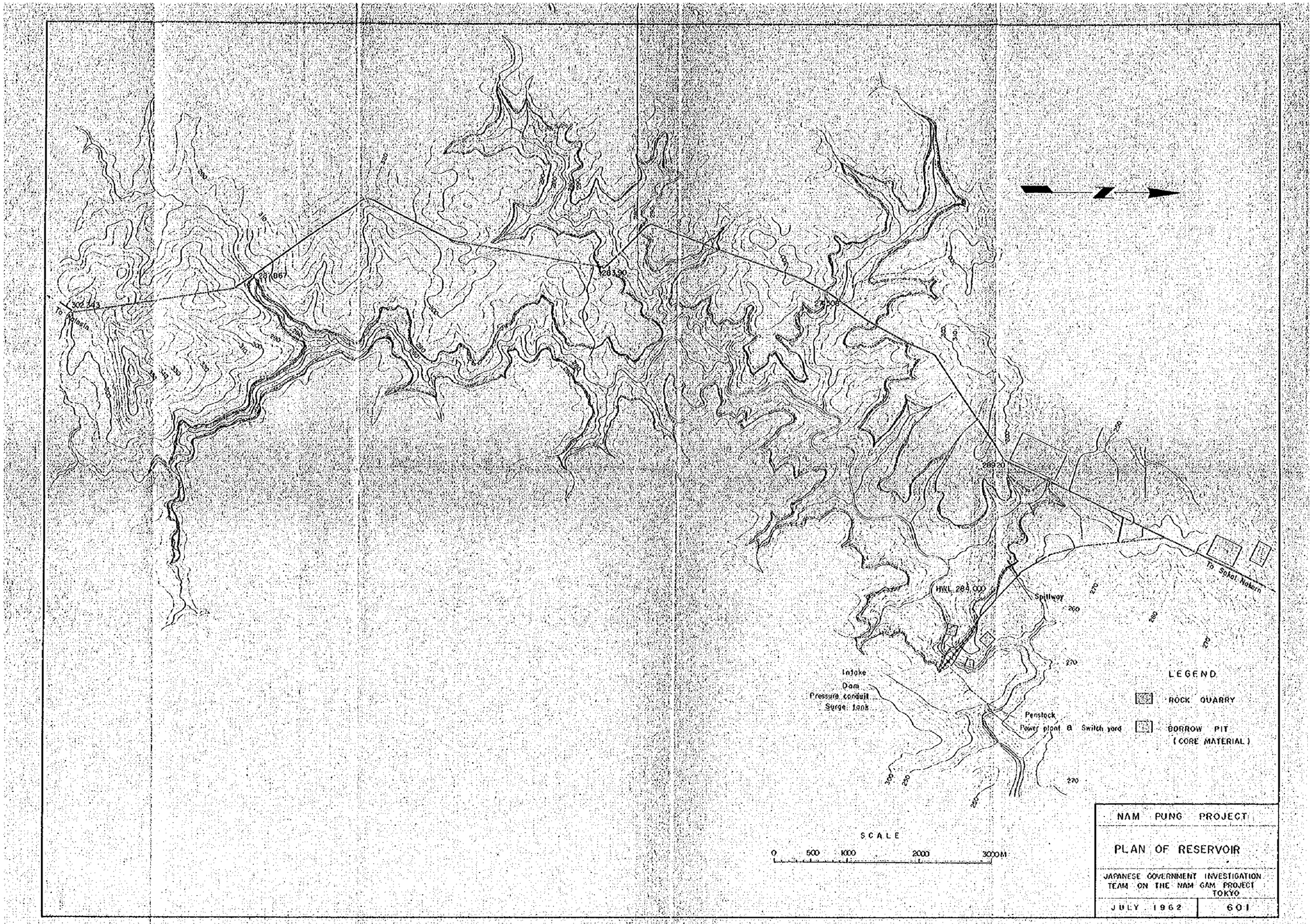
JULY 1962 | 201

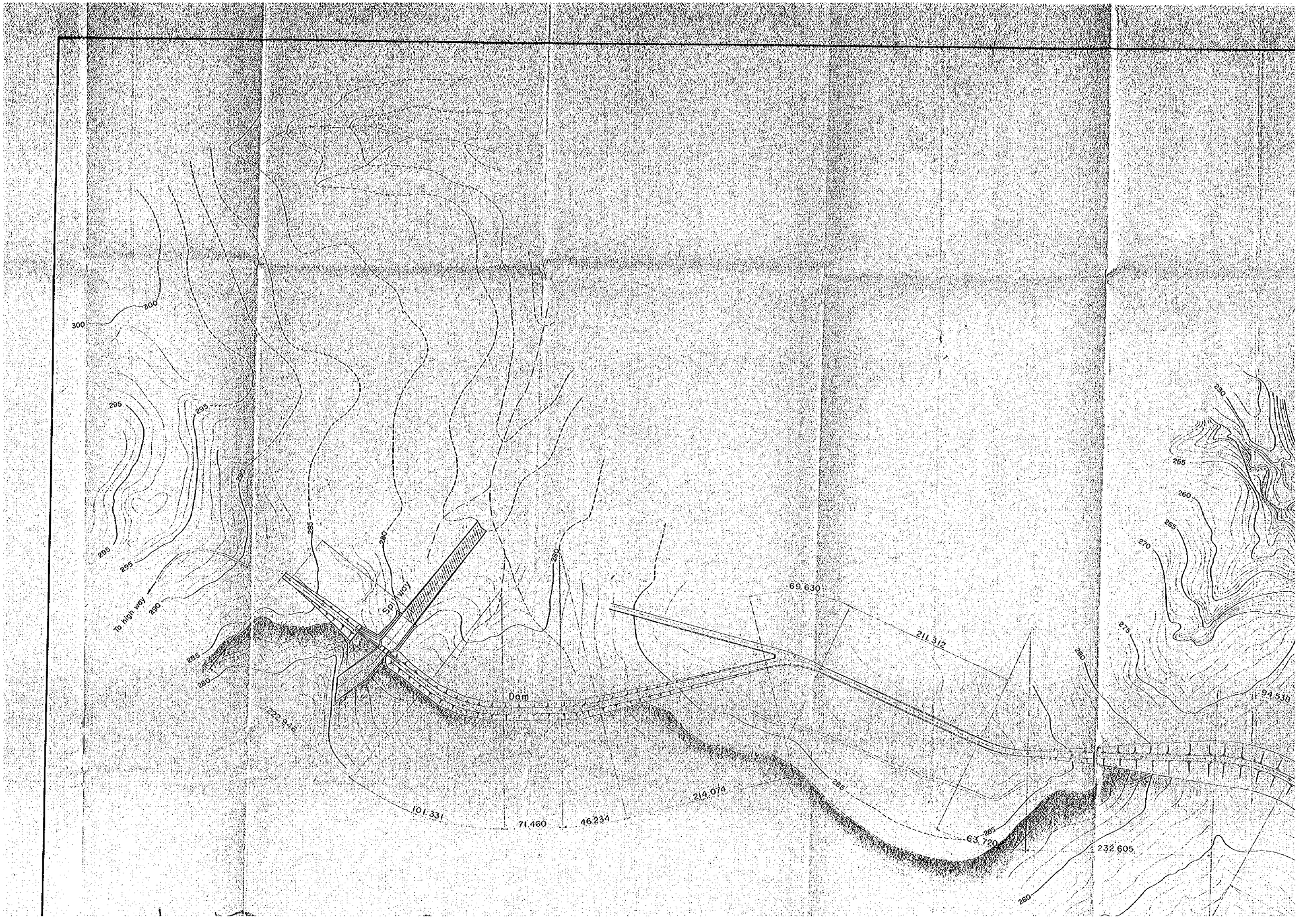


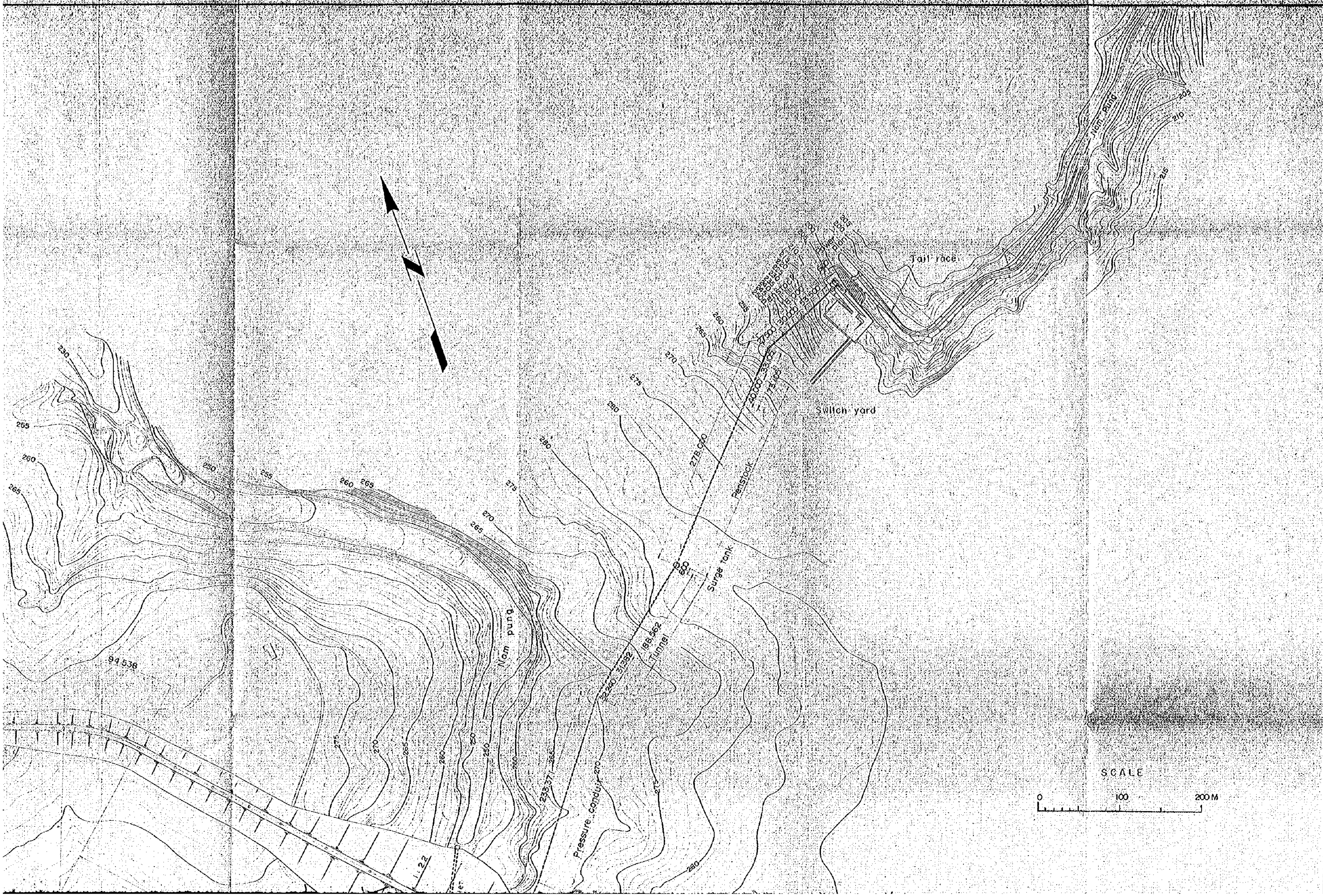
Nam Pung (Pool)
LEGEND
SURFACE SOIL
BLOCK DEPOSITS
MEDIUM - COARSE GRAINED SANDSTONE
CONGLOMERATIC SANDSTONE
LOOSE EXPOSURE OR BLOCK
BOUNDARY OF STRATA
CREEPED OR LOOSENED ROCK AREA
STRIKE & DIP OF STRATA
STRIKE & DIP OF OPENED JOINT
INDICATES OPENED JOINT: STRIKE N 15° E, DIP VERTICAL
INDICATES BORING HOLE NO
LINE OF GEOLOGICAL SECTION
SCALE
0 10 20 30 40 50M
NAM PUNG PROJECT
GEOLOGY AND LOCATION OF EXPLORATION (POWERPLANT)
JULY
202


A - A SECTION
B - B SECTION
C - C SECTION
D - D SECTION
E - E SECTION
BH NO 11
BH NO 12
BH NO 13
BH NO 14
BH NO 15
BH NO 10
280 M
260
240
270 M
250
200


B.H NO.2
B.H NO.3
B.H NO.5
B.H NO.4
B.H NO.1
B.H NO.6
280 M
260
240
220 M
250
SCALE
0 10 20 30 40 50 M
LEGEND
SURFACE SOIL
SANDSTONE
CONGLOMERATIC SANDSTONE OR CONGLOMERATE
SILTSTONE
CLAY SEAM
B.H NO.II
INDICATES BORING HOLE NO.II
INDICATES AUGER HOLE
GROUND WATER LEVEL
HAN PURS PROJECT
GEOLOGIC SECTION
(DAM)
JULY 1962

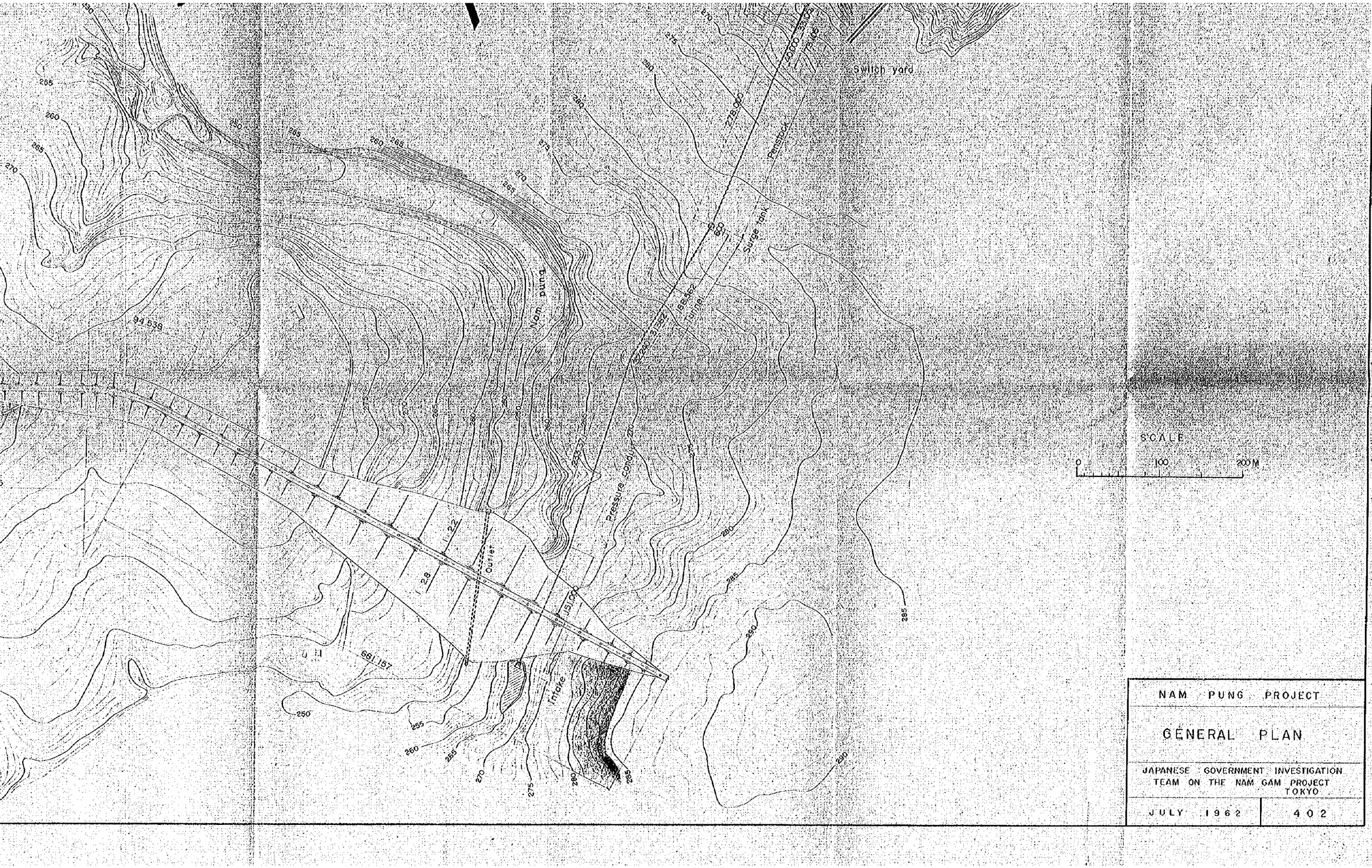

To Pakxan
To Sokot Nakorn
HWL 284.000
Spillway
Intake
Dam
Pressure conduit
Surge tank
Penstock
Power plant & Switch yard
LEGEND
ROCK QUARRY
BORROW PIT
(CORE MATERIAL)
SCALE
0 500 1000 2000 3000M
NAM PUNG PROJECT
PLAN OF RESERVOIR
JAPANESE GOVERNMENT INVESTIGATION TEAM ON THE NAM GAM PROJECT TOKYO
JULY 1962
601


300
295
295
295
290
285
280
285
280
290
To high way
Spillway
Dam
69.630
211.312
94.530
222.946
101.331
71.460
46.234
214.074
63.720
232.605
230
255
260
265
270
275
280
285



Nam Pung
Tail race
Power plant
Switch yard
Penstock
Surge tank
Tunnel
Pressure conduit
278.000
188.562
94.536
SCALE
0
100
200 M


295
295
295
295
290
285
280
250
To high-way
Spillway
Dam
69 630
211 312
94 538
214 074
101 337
71 460
49 234
63 720
232 605
255
260
265
270
275
280
285



NAM PUNG PROJECT

GENERAL PLAN

JAPANESE GOVERNMENT INVESTIGATION TEAM ON THE NAM GAM PROJECT TOKYO

JULY 1962

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