DESIGN REPORT
ON
THE DETAIL DESIGN SURVEY
FOR
THE AGRICULTURAL COOPERATIVE PROMOTION PROJECT
IN
THAILAND

January 1986

Japan International Cooperation Agency

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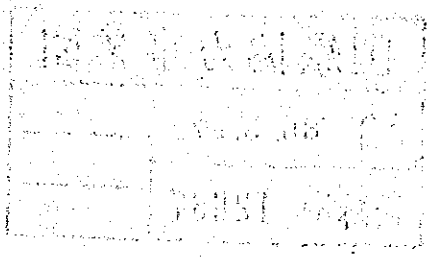


JAPAN INTERNATIONAL COOPERATION AGENCY

P R E F A C E

The Government of Kingdom of Thailand has made a request to the Government of Japan a technical cooperation, for the purpose of the promotion of the agricultural cooperative, as a key station for the acceleration of the reorganization planning of agricultural constitution, through introduction of experience and knowledge accumulated by the agricultural cooperative in Japan. The reorganization planning of agricultural construction, for the purpose of improvement of agricultural productivity and raitonalization of distribution, take its place as one of the important policy in the fifth national development plan.

In response to the request, the project in a five year has been started since the record of discussions for the project was signed on July 6, 1984 between both Governments of the Kindom of Thailand and Japan.

At present, the six Japanese experts are engaged in this project. In five model agricultural cooperative at Nakorn Ratchasima Province as the key station of this project, it is required to implement the irrigation water necessary for the agricultural management as the foundation of project activity.

The team was dispatched to the Kingdom of Thailand from October 16 to November 14, 1985 for the purpose of detail design survey of model infrastructures for the improvement of irrigation facilities such as weir and farm pond, in the farm lands of 2 model farmers groups, Chakarat area and Kong Samaki area, selected from the said 5 model farmers groups.

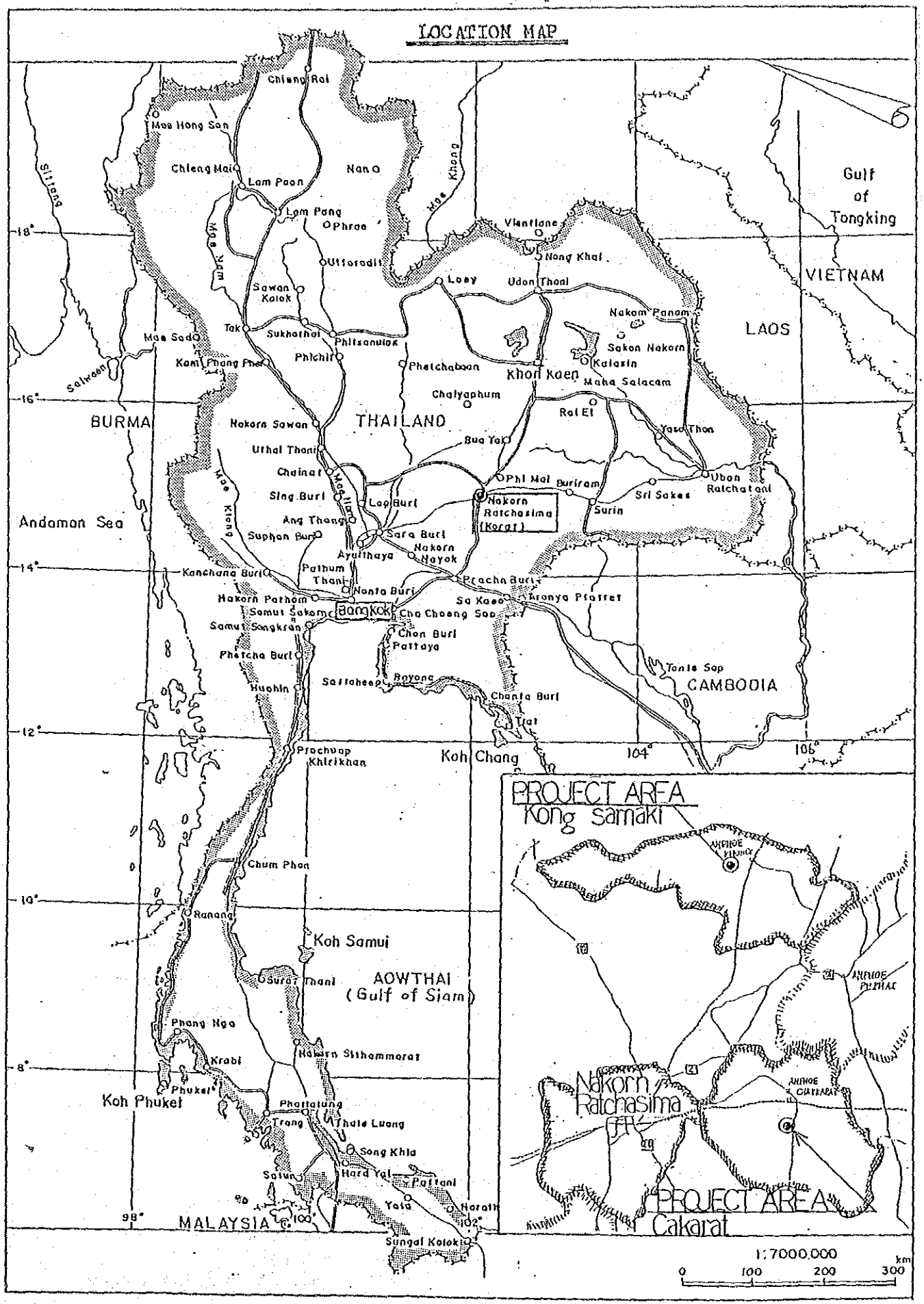
This reports presents the results of the field investigation and the subsequent study in Japan.

We hope that this report will serve as a guideline for the construction of the said irrigation facilities near future.

On behalf of the team members, I wish to take this opportunity to express my heartfelt gratitude to the all the authorities concerned for the valuable cooperation and assistance extended to the team throughout the survey period.

January, 1986

Takashi Tauchi
Director
Agricultural Development
Cooperation Department
Japan International Cooperation Agency


LOCATION MAP
Chiang Rai
Mae Hong Son
Chiang Mai
Lam Pang
Nan
Lam Phun
Phrae
Mae Khong
Vientiane
Nong Khai
Gulf of Tongking
VIETNAM
Uttaradit
Loey
Udon Thani
Sawan Kalok
Nakorn Panom
LAOS
Tak
Sukhothai
Phitsanulok
Sakon Nakorn
Mae Sod
Phichit
Phetchabun
Kalasin
Khon Kaen
Kamphaeng Phet
Maha Salacam
Chaiyaphum
Roi Et
BURMA
Nakorn Sawan
THAILAND
Yasothon
Uthai Thani
Bua Yai
Chainat
Phi Mai Buriram
Ubon Ratchatani
Sing Buri
Lop Buri
Nakorn Ratchasima (Korat)
Sri Sakes
Surin
Andaman Sea
Ang Thong
Suphan Buri
Sara Buri
Ayuthaya
Nakorn Nayok
Kanchana Buri
Pathum Thani
Nonta Buri
Prachin Buri
Nakorn Pathom
Bangkok
Sa Kaeo
Aranya Prathet
Samut Sakorn
Cha Choeng Sao
Samut Songkran
Chon Buri
Pattaya
Phetcha Buri
Rayong
Tonle Sap
CAMBODIA
Hua Hin
Sattahip
Chanta Buri
Trat
Prachuap Khirikhan
Koh Chang
104°
106°
PROJECT AREA
Kong Samaki
Chum Phon
Ranong
Koh Samui
Surat Thani
AOWTHAI
(Gulf of Siam)
Phang Nga
Nakorn Sithammarat
Krabi
Phuket
Koh Phuket
Phattalung
Trang
Thale Luang
Songkhla
Satun
Hard Yai
Pattani
Yala
Narathiwat
MALAYSIA
Sungai Kolok
Nakorn Ratchasima
PROJECT AREA
Cakarat
1:7000.000
km
0
100
200
300

MAIN WORKS OF THE PROJECT

Kong Samaki

1. Construction of Farm Pond

	W	x	D	x	H	Capacity	
Type A	25m	x	25m	x	5m	1,630 m^3	3 place
Type B	30m	x	30m	x	5m	2,630 m^3	5 place
Type C	40m	x	40m	x	5m	5,380 m^3	4 place
Total						39,600 m^3	12 place

Chakarat

2. Outlet Works — 1 place

3. Diversion Works — 1 place

4. Gates

Sluice gate	B x H : 1,500 x 1,500	4 set

CONTENTS

CHAPTER 1

FIELD INVESTIGATION

1-1. Topographical survey

Topographic map with scale 1/5,000 prepared by C.P.D. was utilized for the general purposes. Additional topographical survey was carried out according to the following specifications to meet with the requirements for the detail designs of infrastructures.

i) Kong Samaki area

1) Survey area : 270 ha
2) Closed traverse survey covering 270 ha
   Concrete pegs : 30 pegs
3) Leveling
   Setting of a base line and mesh lines of 50 m x 50 m.
   Leveling survey at intersection points.
   Number of points : 1,300
4) Temporary bench mark was set at No. 25 traverse peg and its elevation was settled at 185 m.
5) Drawings were made based on the above survey results and the C.P.D. map of 1/5,000 scale.

ii) Chakarat area

Survey area was selected according to the design requirement and it was devided into 5 blocks. Plane table survey was carried out at four blocks and cross sectional leveling survey at one block.

1) Survey area : 30 ha
2) Plane table survey
   Plane table is set at the travers peg (closed or open).
3) Cross sectional leveling survey
   Survey line was set along the irrigation canal with length about 850 m, and cross sectional interval at 25 m.

1-2. Topography and Geology

1-2-1. Topography

Kong Samaki and Chakarat areas belong to the Nakorn Ratchasima Prefecture and are located at south west of the Korat Plateau in the Northeast Thailand. Kong Samaki area is located at about 80 km of Nakorn Ratchasima City and extends about 1.5 km from east to west and about 2 km from south to north. The rain-fed paddy field stretches for all of the area. There are no rivers and no irrigation and drainage canals, and rainfall water flows from plot to plot.

Chakarat area is located at about 40 km east of the Nakorn Ratchasima City and also the paddy field area. The distance of this area from east to west is about 1.5 km. At the center of the area, the Chakarat River flows from south to north and eventually meet with the Mun River about 70 km away.

The levees, dams and weirs for irrigation are found at several points but they are all incomplete and small in scale, and have no systematic relations each other.

1-2-2. Geology

The Korat Plateau is composed of fine-graded sandstone and shale strata which are overlain in the valley depressions with alluvium and river terrace deposit.

The investigation of the soil profile was carried out through the excavation of two test pits in Kong Samaki area. The relevant soil is fine textured and poorly drained and suitable for rice cultivation.

1-3. Meteorology and Hydrology

1-3-1. Precipitation

Rainfall data was collected at near the project sites. Period of observation is shown at Fig. 9 and the data are summarized in Table .

Annual average rainfall ranges from 1,000 mm to 1,200 mm, and about 80 % of rainfall is concentrated druing wet season from season from May to October.

Based on the analysis on the rainfall records, the characteristics of rainfall are generally summarized as follows.

i) During the irrigation period from May to September, the months of May and September have generally greater amount of rainfall about 200 mm/month, and the months of July and August have comparatively small about 150 mm/month. (Fig. 10)

ii) Monthly fluctuation of rainfall is large in dry season.

1-3-2. Temperature and Humidity

Since June 1985, the cooperative offices at the both Kong Samaki and Chakarat areas have started meteorological observations on rainfall, temperature and humidity. Observation period is still too short for analysis.

The data from meteorological station at Nakorn Ratchasima were utilized for the calculation of evapotranspiration of crops. The Modified Penman method was adopted.

1-3-3. Streamflow

In the Chakarat area, streamflow observations are conducted at 2 gaging stations.

1. Chakarat cooperation office
   Location : Fig. 11
   Observation : June, 1985 - present
2. RID gaging station
   Location : Lat. N 15°10', Long. E 103°00'
   about 4 km downstream from the project area

Streamflow observations records are shown in Fig. 13 . At the gaging station of the Chakarat cooperation office, it was noticed that the stuff gage would be sometimes submerged during flood runoff. There are data lacking period every year in the observation records of RID gaging station.

As for the flood records, two floods were recorded in the RID observations with peak floods of 221.1 m^3/sec at October 16, 1983 and of 164.3 m^3/sec at September 10, 1982. Flood mark investigation was also conducted at 5 points along the river course in the project area. Based on the flood mark analysis, the maximum flood flow capacity of the present river was estimated at about 5.3 m^3/sec. (Fig. 11)

1-4. Soil Mechanics

1-4-1. Field tests

Location of the test pits excavation is shown at Fig. 15 . Depth and width of the both test pits are 2 m x 2 m x 2 m and additional drilling by hand-auger was also carried out from the bottom of the test pits. Soil profiles are shown at Fig. 16 and Fig. 17 . The results of the test pit investigation shows that : top soil is about 50 cm in depth containing grass routs and humus and below the top soil, the particle size of the gravel becomes larger by degrees of depth.

The ground water is observed at 1.6 m to 1.8 m from the ground surface but the obvious aquifer was not formed.

Studying the existing ponds in the both project area, slope of banking is 1 : 1 and it keeps steady. The fine sand on the bank surface was washed away by the precipitation and the gravels of 1 to 2 cm are exposed on the surface. Gally erosions of about 20 cm deep was in progress at interval of about 1 m. Consequently it is considered that the soil of these area is very weak against erosion and the slope protection should be required.

1-4-2. Soil test

The items of the soil tests are as follows.

1) Specific gravity test (ASTM D 854)
2) Liquid limit test (ASTM D 423)
3) Plastic limit test (ASTM D 424)
4) Grain size analysis (ASTM D 422)
5) Standard compaction test (ASTM D 698 method A)
6) Field density test

The soil sample was taken from the test pit at 1.5 m depth below the ground surface, which was considered the typical zone in this area.

The results of the tests are shown at P. 48- P.64 . Evaluating from "the coefficient of uniformity" and "the coefficient of curvature", the soil is well-graded and porosity is small. From the results of the liquid and plastic limit test, the soil is classified into cohesive sand (SC). (Table 13)

The compaction test shows as follows:

i) Wopt = 13.3 %, γd max = 1.82 g/cm^3
ii) Wopt = 15.5 %, γd max = 1.63 g/cm^3

Investigation the particle size analysis, consistency limits and compaction curve, the different two results of γdmax would be originated from the volume of the fine grained materials in the soil.

From the results of the field density test, field water content in this season shows at opeimum moisture ratio. But when the construction works will be carried out in dry season, the moisture content should be carefully checked.

1-5. Water quality

The locations of sampling for the water quality test are shown at Fig. 19.

Area	Point	Site	Soil of Water
Kong Samaki	A	existing farm pond	storage water
Kong Samaki	B	No. 1 test pit	grownd water
Kong Samaki	C	No. 2 test pit	grownd water
Kong Samaki	D	Kong Provincial Office	grownd water
Kong Samaki	E	Kong Hospital	grownd water
Chakarat	F.G.H.	Chakarat River	flowing water

According to "United State Department of Agriculture (USDA)", water samples are classified into four groups as shown in Fig. 20. with respect to sodium hazard depending on the sodium adsorption ration (S A R) value and the specific conductance. The SAR is defined as :

$$SAR = \frac{Na+}{\sqrt{(Ca^{++} + Mg^{++})/2}} \qquad (U\ S\ D\ A)$$

Where, the concentration of the ions is expressed in equivalents per million (epm).

The results of analysis of water samples are summarized below:

Site	Title of Sample	E.C. MMHOS/cm 25°	P H	SAR	Sodium Hazard	Salinity Hazard
Existing farm pond	A	0.11	6	0.85	S 1	C 1
No. 1 test pit	B	1.15	7	14.6	S 3	C 3
No. 2 test pit	C	1.20	6	16.2	S 3	C 3
Kong Provincial Office	D	3.20	6	31.5	S 4	C 4
Kong Hospital	E	3.30	6	22.4	S 4	C 4
Chakarat R.	F	0.06	6	0.53	S 1	-
Chakarat R.	G	0.06	6	0.58	S 1	-
Chakarat R.	H	0.06	6	0.63	S 1	-

From the above table it can be concluded that

i) The ground water is not adoptable for irrigation water resource

ii) If the ground water is diluted by the rain water, it may be adoptable for irrigation.

1-6. Irrigation and Drainage

a) Chakarat area

The irrigation water in this area is supplied from the Chakarat River which is originated from Dong Paya yen and flows down to north through the center of the area, then it meets with the Mun River at Pimai. The Chakarat River is meandering and the catchment area is composed of the alluvial soil and the paddy fields are extending at both sides of the river.

Several intake weirs are located along the Cakarat River. The intake facilities are the open diches or culverts combined with the weirs. The irrigation water flow down from the field to the field, so called plot to plot irrigation system.

The construction and protection of the river dike is imperfect. The dike is banked by the earth material near the site. Dike section is not sufficient and some part of it is as small as border dike of paddy field.

During rainy season, the flood water often flows over the dike and breaks it, and the piping has happened in some part of the dike sections.

From June to August, if the rainfall is small and the water level of the river is low, irrigation water is taken by several pumps but amount is insufficient consequently the yield of the crop is damaged considerably.

b) Kong Samaki area

The water resources of this area totally depends upon the rainfall. The irrigation of this area is plot to plot irrigation same as Chakarat.

Implementation of the farm pond with sufficient capacity is most urgently required to sustain the irrigation water.

CHAPTER 2 PLANNING AND DESIGN OF IRRIGATION FACILITIES

2-1. Kong Samaki Area

(1) General

In this area, rain-fed farming is practiced during wet season because of no water resource and no irrigation system.

The seasonal fluctuation of rainfall is large and not dependable every year. The largest constraint in this area for developemnt of agriculture is the shortage of dependable water for irrigation. It is, therefore urgently required to implement the water resources and to accelarte motivation of the farmers. In lines with the above purpose of this project, the construction of small scale farm pond is proposed through the following reasons.

1. The flat topography of this area does not meet with the construction of the storage dam.
2. The river is located too far and the construction of irrigation canal is not economical.
3. Ground water is evaluated to be not suitable for irrigation water, because it has high concentration of salt.

(2) Water requirement

a) Crop evapotranspiration

i) Potential evapotranspiration (ETo)

Potential evapotranspiration is calculated by the modified Penman method. The clamatic data at Nakorn Ratchasima was adopted for calculation. The form of the equation is as follows;

$$ETo = c\{WxRn + (1-W)xf(u)x(ea-ed)\}$$

where, ETo : potential evapotranspiration in mm/day
W : temperature-related weighting factor
Rn : net radiation in equivalent evaporation in mm/day
f(u) : wind-related function
(ea-ed) : difference between the saturation vapour pressure at mean air temperature and the mean actual vapour pressure of the air, both in mbar
c : adjustment factor to compensate for the effect of day and night weather conditions

The process of calculation is shown in Table 18.
As the result of calculation by modified Penman Method, the potential evapotranspiration was evaluated at 5.1 mm/day.

ii) Crop evapotranspiration (ET crop)
Crop evapotranspiration was calculated by the following formula;

$$ET\ crop = KC \times ETo$$

where, ET crop : crop evapotranpiration in mm/day
ETo : potential evapotranspiration in mm/day
KC : crop coefficient

Crop coefficient was evaluated at 1.05 in consideration of crop characteristics, time of planting or sawing, and stages of crop development. (See IRRIGATION AND DRAINAGE PAPER 24 FAO)

As the result of calculation, the crop evapotranspiration was evaluated at 5.4 mm/day.

b) Water requirement

The net water requirement was calculation by using the following formula;

$$Wn = ET\ crop - Re + (Ge + Wb)$$

where, Wn : net water requirement in mm/day
ET crop: crop evapotranspiration in mm/day
Re : effective rainfall in mm/day
Ge : groundwater contribution in mm/day
Wb : stored soil water in mm/day

The value of effective rainfall (Re) was neglected as a safety factor in consideration of the irregular distribution of rainfall. The value of "Ge" and "Wb" are too difficult to evaluate exactly, because these values are affected by method of field cultivation, control of irrigation water, and so on.

In consideration of the above, 2 mm/day was adopted as a percolation loss.

The value of net water requirement is calculated as follows;

$$Wn = 5.4 - 0.0 + 2.0$$
$$= 7.4$$
$$\fallingdotseq 8.0 \text{ mm/day}$$

The unit design irrigation requirement is calculated by the following formula;

$$Dw = 0.116 \times Wn \times \frac{100}{E}$$

where, Dw : unit design irrigation requirement in lit/sec/ha.
Wn : net water requirement in mm/day
E : irrigation efficieny in %

The value of irrigation efficiency was evaluated at 85%, then the value of the unit design irrigation requirement was concluded as follows;

$$Dn = 0.116 \times 8.0 \times 100/85$$
$$= 1.1 \text{ lit/sec/ha}$$

(3) Planning and design of the facilities

i) Water unitlization plan

In the beginning of wet season, May, rainfall amount is more than sufficient to satisfy the requirement of irrigation water for land preparation including nursery for paddy cultivation. But in June and July, as the rainfall becomes relatively small, the insufficiency of irrigation water occurrs.

Therefore, the small scale farm pond was proposed to store the surplus rainfall during early wet season, and to supply the irrigation water for the rest of the season.

It is also possible to use the reserved water for up-land irrigation after rice cultivation.

ii) Location of the small scale farm pond

The location of the pond was sellected to be at the boundary of each private benefit areas, considering the cooperative management of the farm pond by farmer themselves, in addition to the technical evaluations on the catchment area, benefit area and ground surface elevation.

iii) Storage volume of the farm pond

The storage volume of the small scale farm pond was determined to stores the irrigation water for 5 days.

v) Dimension of the small scale farm pond

The dimension was dicided in consideration of following factors.

1. Prevention of evaporation from the water surface of farm pond
2. Stability of the slope
3. Maintenance of farmpond
4. Active use of the ground water inflow from surrounding

The designed dimensions are as follows.

Type	Storage volume (cum)	size(m)	depth (m)	slope gradient	height of embankment(m)
A	1,630	25x25	1.5	1 : 1.5	1.5 (max)
B	2,630	30x30	1.5	1 : 1.5	
C	5,380	40x50	1.5	1 : 1.5	

2-2. Chakarat Area

(1) General

The Chakarat river flowing through the center of this area has been used as the water resources for irrigation. River water fluctuation is large. In July and August, the middle of wet season, the river flow becomes small and in the end of wet season, September, flood water overflows the paddy field. And of course, during dry season, there is no dependable water in the river for irrigation. There are several weirs and intake structures located along the river. These structures were deteriorated and their structure designs are not suitable to have proper functions.

Weirs have usually no functions for flood passage and for storage. It is therefore required to rehabilitate these existing weirs and intake structures. In this project, site A and B were selected as representative works with high priority for rehabilitation expected. Locations of site A and site B are shown in Fig. 27 .

1. Site A
   Intake weir at site A has no passage or spillway for flood. Left bank was damaged by overtopping and by pipng. Intake of river water is not functioned properly. Rehabilitation works required are to store the irrigation water at upstream of the weir, to keep intake water level and to have spillway function.
2. Site B
   Site B is the diversion point located at right bank irrigation canal. Structure is composed of culvert which is too small to divert the irrigation water. Rehabilitation works are proposed.

(2) Planning and design of irrigation facilities

Site A Outlet works

a) Location

This outlet work is planned as spillway of flood water to downstream and intake of irrigation water to the benefit area.

The location of the outlet work is selected at the right of the bank considering following conditions.

- Major part of catchment area is located at the right side of the bank
- The length of the outlet structure at the right side is shorter than it is located at left bank.

b) Design flood

Design flood (QA) is calculated as follows;

$$QA = QA' \times Fs$$

where, QA' : Maximum flood estimated from the existing flood sluice size

Fs : Safety factor

$QA' = 5.0\ (m^3/sec)$, see Fig. 11

$Fs = 1.5$

$QA = 5.0 \times 1.5 = 7.5 \fallingdotseq 8.0\ (m^3/sec)$

c) High water level

High water level is obtained at HWL 199.60 m from the elevation of the existing top bank at EL.199.80 m and free board at 0.2 m.

d) Flood overflow depth and overflow length

The relation between flood overflow depth and overflow length is obtained by the equation as follows;

$$Q = C\ B\ H^{3/2}$$

where, Q : Discharge (m /sec)

C : Overflow coefficient (C=1.7)

B : Overflow length(m)

H : Overflow depth (m)

$Q = 8.0\ (m^3/sec)$, $B = 3.0\ (m)$

$$H = \left(\frac{H}{C \times B}\right)^{2/3} = \left(\frac{8.0}{1.7 \times 3.0}\right)^{2/3} = 1.35 \fallingdotseq 1.5\ (m)$$

e) Design of diversion works

Full water level is determined as high as possible at high-water level, FWL. 199.60 m, in order to have the larger capacity of storage for the irrigation water. Sluice gate is designed for intake works, and two sluice gates are planned considering the overflow length of spillway. The size of a gate is as follows.

Gate width : 1.5 m
Gate height : 1.5 m

Setting the sluice gate, the full water level will be raised by 1.4 m (FWL. 199.60 m) from the existing full water level (FWL. 198.20). The increased capacity of storage will be as follows.

The capacity increase (m^3) = The increase height of the full water level (m) x the length of river (m) x the average width of river (m)
= 1.40 x 400 x 15
= 8,400 (m^3)

This capacity is equipvalent volume to supply irrigation water for 7 days to the downstream benefit area.

$$\text{The number of irrigable days} = \frac{\text{Capacity } (m^3)}{86.4 \times \text{Unit design water (1/sec/ha) requirement} \times \text{irrigation area(ha)}}$$

$$= \frac{8{,}400}{86.4 \times 1.09 \times 13.16}$$

$$= 6.7 \fallingdotseq 7.0 \text{ (days)}$$

Site B Design of diversion works

a) Design flood

Design flood (QB) is calculated as follows.

$$QB = QB' \times Fs$$

where, QB' : Maximum flood at the site B (m^3/sec)
Fs : Safety factor

QB' = 2.4 (m^3/sec), See Fig. 11 .

Fs = 1.5

QB= 2.4 x 1.5 = 3.6 ≒ 4.0 (m^3/sec)

b) High water level

High water level is determined at same elevation with the high water level at site A, HWL. 199.60 m.

c) Flood overflow depth and overflow length

The relation between flood overflow depth and overflow length is obtained by the equation as follows.

$$Q = C\ B\ H^{3/2}$$

where, Q : Discharge (m^3/sec)
C : Overflow coefficient (C=1.7)
B : Overflow length (m)
H : Overflow depth (m)

Q = 4.0 m^3/sec, B = 1.5 m

$$H = \left(\frac{Q}{C \times B}\right)^{2/3} = \left(\frac{4.0}{1.7 \times 1.5}\right)^{2/3} = 1.35 \fallingdotseq 1.5\ (m)$$

d) Design of outlet works

A sluice gate is designed as outlet works and the size of gate is as follows.

Gate width : 1.5 m , Gate height : 1.5 m

e) Design of diversion works

A sluice gate is adopted as diversion works and the size of gate is selected same as the gate of outlet works.

Gate width : 1.5 m , Gate height : 1.5 m

CHAPTER 3 CONSTRUCTION PLANNING

3-1. Basic assumptions

The following items should be considered prior to make a construction plan,

(1) Workable days

Mean workable day is decided as 21 days per month, considering the suspension days caused by rainfall, Sundays and national holidays.

(2) Conversion rate of earth volume

The conversion rate of earth volume for making the earth moving plan is dicided as 1 vs 1.

(3) Earth moving plan

In principle, the earth materials necessary for embankment are supplied by a excavated earth materials in the site. Earth moving plan is shown in Table .

(4) Application of manpower and construction machinery

Manpower is applied for the work, because the work scale is the comparatively small and the employment opportunity for local labour can be increased. The construction equipment is selected as follows.

Dump Truck (8 ton)	transportation
Bull Dozer (11 ton)	excavation or spreading
Back-Hoe Shovel (0.35 m^3)	excavation
Tractor Shovel (1.2 m^3)	loading
Vibration Roller 92 ton)	compaction
Portable Concrete Mixer	mixing of concrete

3-2. Construction planning

(1) Earth work

In Kong Samaki area, the construction of small scale farm pond is executed by the excavation method and the excavated materials therefrom is re-used for the embankment materials of up-land reclamation.

Taking account of the big amount of excavation and limited construction period in dry season, the plural construction equipments are required for the construction.

As to the construction of up-land reclamation, the surface soil treatment is planned for keeping the soil fertility and preventing from thrive enevenness. From the result of field investigation, the thickness of fertility soil is decided as 20 cm from ground surface. The excavated fertility soil is stocked near the job site at temporary, and continuously excavation and embankment of the lower soil from the fertility soil is executed.
After completion of these works, the stocked fertility soil is spreaded on the surface of the completed embankment. When the construction work is carried out in dry season, it is necessary to add water for getting the field density in accordance with the technical specification and preventing from the reduction of soil strength caused by water seepage.

In Chakarat area, the earth work by manpower is executed because of the following reasons.

i) The soil moving volume is not so much.
ii) The distance of moving soil is not so long.
iii) There are no access road for construction equipment.

(2) Concrete work

Concrete for lining canal, intake weir and so on is produced by portable concrete mixer of about 0.22 m^2 in capacity, and placed by manpower.

(3) Installation of gate

After completion of concrete works of intake weir, gate and acceraries are carefully installed.

3-3. Bill of Quantities

The bill of quantities of the construction works is shown in Table 21 .

CHAPTER 4 CONSTRUCTION COST ESTIMATION

Construction cost of the project is estimated by use bill of quantities taken from the detail designs, drawings, and reasonable unit costs. The construction cost is including tax, profit and overhead, and also including contingency for price escalation and physical measures of bill of quantities.

Cost for civil works is estimated taking account of various factors such as construction method, earth moving plan, workable days and so on.

Unit cost of each work item is estimated by use labour cost and material cost which are current market prices surveyed on the beginning of Nov.1985.

Construction cost is as shown in Table 22 and estimated unit cost of each work item is shown in Table 25, 26 and surveyed market prices of labour and material are shown in Table 23 and 24, respectively.

APPENDIX

TABLES

***** TABLES LIST *****

Table -1 Daily rainfall (Khong samaki)

------* RAINFALL 1977 YEAR UNIT : MM/DAY *---*---* PAGE-- 1

NAME OF STATION : KHONG

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
1	0.0	0.0	0.0	0.0	13.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	10.3	24.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	11.3	0.0	0.0	1.0	0.0	0.0
5	0.0	0.0	0.0	0.0	11.8	0.0	0.0	0.0	3.9	18.7	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	3.4	0.0	0.0	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.7	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	6.3	0.0	0.0
9	0.0	0.0	0.0	0.0	67.3	9.1	0.0	0.0	4.8	0.0	0.0	0.0
10	0.0	0.0	0.0	13.3	0.0	0.0	0.0	0.0	72.5	0.6	0.0	0.0
TOTAL	0.0	0.0	0.0	23.6	117.3	12.5	11.3	0.0	94.1	26.6	0.0	0.0
AVERAGE	0.0	0.0	0.0	2.4	11.7	1.3	1.1	0.0	9.4	2.7	0.0	0.0
11	0.0	0.0	0.0	0.0	14.5	45.5	0.0	0.0	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	24.3	7.5	24.7	0.0	0.0	13.7	0.0	0.0
13	0.0	0.0	0.0	0.0	8.5	14.0	0.0	0.0	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.2	0.7	0.0	0.0
15	0.0	0.0	0.0	0.0	0.0	0.0	27.5	0.0	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	42.0	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.5	31.6	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	30.4	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.5	4.4	0.0	0.0	0.0
TOTAL	0.0	0.0	0.0	0.0	47.3	67.0	52.2	67.0	78.6	14.4	0.0	0.0
AVERAGE	0.0	0.0	0.0	0.0	4.7	6.7	5.2	6.7	7.9	1.4	0.0	0.0
21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.3	16.6	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0	93.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0	0.0	0.0	17.0	0.0	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	3.8	0.0	0.0	10.5	0.0	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	14.5	0.0	0.0	0.0	0.0	0.0	7.9	0.0	2.3
26	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	20.9	0.0	0.0
27	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.2	17.7	13.5	0.0
28	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.5	0.0	0.0	0.0
29	0.0	--	0.0	0.0	23.4	41.0	0.0	7.2	18.6	1.8	0.0	0.0
30	0.0	--	0.0	0.0	0.0	0.0	0.0	17.2	0.0	0.0	0.0	0.0
31	0.0	--	0.0	--	0.0	--	0.0	0.0	--	0.0	--	0.0
TOTAL	0.0	0.0	0.0	18.3	117.0	41.4	10.5	52.7	63.9	48.3	13.5	2.3
AVERAGE	0.0	0.0	0.0	1.8	10.6	4.1	1.0	4.8	6.4	4.4	1.3	0.2
MONTHLY.TO	0.0	0.0	0.0	41.9	281.6	120.9	74.0	119.7	236.6	89.3	13.5	2.3
MONTHLY.AV	0.0	0.0	0.0	1.4	9.1	4.0	2.4	3.9	7.9	2.9	0.4	0.1

ANNUAL.TO 979.8 ANNUAL.AV 2.7

DAYLY RAINFALL 93.6 5/22

CONTINUOUS 2DAYS 93.6 5/22

------* RAINFALL 1978 YEAR UNIT : MM/DAY *---*---* PAGE-- 2

NAME OF STATION : KHONG

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
1	0.0	0.0	0.0	0.0	1.2	0.0	23.2	0.0	2.5	25.8	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	36.7	0.0	14.5	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	1.2	0.0	5.2	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	30.1	0.0	0.0	1.2	12.2	0.0
6	0.0	0.0	0.0	0.0	0.0	0.0	24.2	0.0	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0	9.2	0.0	2.1	0.0	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	0.0	24.5	0.0	14.5	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0	0.0	0.0	2.1	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	6.7	0.0	13.4	5.1	22.5	0.0	0.0	0.0
TOTAL	0.0	0.0	0.0	0.0	18.3	0.0	161.5	5.1	54.0	27.0	12.2	0.0
AVERAGE	0.0	0.0	0.0	0.0	1.8	0.0	16.1	0.5	5.4	2.7	1.2	0.0
11	0.0	0.0	0.0	0.0	0.0	15.5	6.1	26.7	2.1	0.0	0.0	0.0
12	0.0	0.0	0.0	24.2	33.2	0.0	1.2	0.0	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0	38.7	0.0	0.0	3.5	0.0	0.0	0.0	0.0
14	2.4	0.0	2.3	22.2	3.4	0.0	0.0	6.1	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	21.6	14.5	0.0	0.0	8.5	9.8	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	2.3	0.0	0.0	9.7	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.1	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0	24.2	14.4	0.0	5.2	26.3	0.0	0.0	0.0
19	0.0	0.0	1.2	18.2	0.0	12.2	0.0	0.0	15.2	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6	19.4	0.0	0.0	0.0
TOTAL	2.4	0.0	3.5	86.2	116.3	42.1	7.3	61.3	94.9	0.0	0.0	0.0
AVERAGE	0.2	0.0	0.3	8.6	11.6	4.2	0.7	6.1	9.5	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0	0.0	2.2	29.2	1.5	51.1	0.0	0.0	0.0
22	0.0	1.2	0.0	0.0	2.3	0.0	0.0	6.7	0.0	12.3	0.0	0.0
23	0.0	6.2	0.0	0.0	0.0	0.0	0.0	0.0	36.5	27.1	0.0	0.0
24	0.0	0.0	9.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	0.0	2.3	0.0	0.0	88.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27	0.0	0.0	1.2	0.0	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29	0.0	--	0.0	0.0	0.0	2.4	8.2	0.0	29.2	0.0	0.0	0.0
30	3.2	--	0.0	0.0	0.0	0.0	5.5	0.0	18.4	0.0	0.0	0.0
31	0.0	--	0.0	--	0.0	--	0.0	19.5	--	0.0	--	0.0
TOTAL	3.2	9.7	11.1	2.3	92.4	4.6	42.9	27.7	135.2	39.4	0.0	0.0
AVERAGE	0.3	1.2	1.0	0.2	8.4	0.5	3.9	2.5	13.5	3.6	0.0	0.0
MONTHLY.TO	5.6	9.7	14.6	88.5	227.0	46.7	211.7	94.1	284.1	66.4	12.2	0.0
MONTHLY.AV	0.2	0.3	0.5	2.9	7.3	1.6	6.8	3.0	9.5	2.1	0.4	0.0

ANNUAL.TO 1060.6 ANNUAL.AV 2.9

DAYLY RAINFALL	88.9	5/26
CONTINUOUS 2DAYS	90.1	5/26
CONTINUOUS 3DAYS	90.1	5/26

------* RAINFALL 1979 YEAR UNIT : MM/DAY *---*---* PAGE-- 3

NAME OF STATION : KHONG

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
1	0.0	0.0	0.0	0.0	0.0	4.3	2.4	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	6.2	0.0	0.0	0.0	20.1	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	1.4	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	9.2	22.3	0.0	5.4	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	8.4	0.0	10.1	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0	8.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0	3.1	15.1	0.0	6.5	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	8.3	0.0	3.1	0.0	39.5	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	0.0	0.0	0.0	8.3	27.2	54.6	2.4	61.5	20.1	0.0	0.0	0.0
AVERAGE	0.0	0.0	0.0	0.8	2.7	5.5	0.2	6.1	2.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0	19.8	37.5	35.2	0.0	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	5.6	0.0	4.2	0.0	0.0	3.1	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	2.6	0.0	0.0	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0	0.0	41.1	0.0	0.0	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	12.2	0.0	17.1	0.0	0.0	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0	69.2	0.0	0.0	0.0	35.6	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0	87.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	38.2	2.1	9.8	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	0.0	0.0	0.0	56.0	178.6	112.3	35.2	1.2	38.7	0.0	0.0	0.0
AVERAGE	0.0	0.0	0.0	5.6	17.9	11.2	3.5	0.1	3.9	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0	48.1	2.4	0.0	0.0	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0	12.2	0.0	0.0	0.0	25.6	0.0	0.0	0.0
23	0.0	0.0	0.0	25.3	16.4	0.0	0.0	0.0	77.5	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	27.1	0.0	0.0	0.0
25	0.0	0.0	0.0	19.1	0.0	0.0	25.2	15.6	35.5	0.0	0.0	0.0
26	0.0	0.0	0.0	12.3	0.0	0.0	32.3	27.2	4.2	0.0	0.0	0.0
27	0.0	0.0	0.0	6.7	0.0	0.0	2.4	3.4	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0	0.0	5.4	0.0	0.0	0.0	0.0	0.0	0.0
29	0.0	--	0.0	0.0	0.0	7.4	0.0	0.0	7.4	0.0	0.0	0.0
30	0.0	--	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31	0.0	--	0.0	--	0.0	--	0.0	0.0	--	0.0	--	0.0
TOTAL	0.0	0.0	0.0	63.4	76.7	15.2	59.9	46.2	177.3	0.0	0.0	0.0
AVERAGE	0.0	0.0	0.0	6.3	7.0	1.5	5.4	4.2	17.7	0.0	0.0	0.0
MONTHLY.TO	0.0	0.0	0.0	127.7	282.5	182.1	97.5	108.9	236.1	0.0	0.0	0.0
MONTHLY.AV	0.0	0.0	0.0	4.3	9.1	6.1	3.1	3.5	7.9	0.0	0.0	0.0

ANNUAL.TO 1034.8 ANNUAL.AV 2.8

DAYLY RAINFALL	87.5	5/19
CONTINUOUS 2DAYS	156.7	5/18
CONTINUOUS 3DAYS	158.8	5/18

NAME OF STATION : KHONG

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
1	0.0	0.0	0.0	3.9	0.0	0.0	0.0	4.2	0.0	12.1	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	4.1	0.0	0.0
3	0.0	0.0	0.0	0.0	1.5	0.0	0.0	0.0	4.1	5.6	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	13.2	13.4	0.0	5.4	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	2.5	4.1	18.6	4.1	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	3.4	0.0	0.0	3.5	40.2	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.1	0.0
8	0.0	0.0	0.0	0.0	20.1	0.0	0.0	51.4	4.2	0.0	0.0	0.0
9	0.0	0.0	0.0	3.1	0.0	0.0	0.0	43.2	10.3	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	42.2	0.0	10.1	10.2	0.0	0.0	0.0
TOTAL	0.0	0.0	0.0	7.0	21.6	58.8	15.9	113.0	57.5	66.1	11.1	0.0
AVERAGE	0.0	0.0	0.0	0.7	2.2	5.9	1.6	11.3	5.8	6.6	1.1	0.0
11	0.0	0.0	0.0	9.6	41.2	27.2	0.0	31.1	2.1	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0	13.1	0.0	0.0	7.5	1.7	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0	0.0	0.0	7.5	0.0	1.5	1.1	0.0	0.0
15	0.0	0.0	65.1	0.0	2.1	0.0	4.3	0.0	9.4	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	3.5	3.8	3.4	4.5	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0	0.0	14.0	0.0	47.2	7.5	1.2	0.0	0.0
18	0.0	0.0	0.0	0.0	0.0	13.1	0.0	72.5	0.0	3.1	0.0	0.0
19	0.0	0.0	0.0	0.0	0.0	8.4	8.4	3.2	19.1	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0	2.3	12.6	7.5	0.0	0.0	0.0	0.0	0.0
TOTAL	0.0	0.0	65.1	9.6	45.6	91.9	31.5	157.4	51.6	7.1	0.0	0.0
AVERAGE	0.0	0.0	6.5	1.0	4.6	9.2	3.1	15.7	5.2	0.7	0.0	0.0
21	0.0	0.0	0.0	9.7	20.7	43.3	2.1	0.0	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.4	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0	0.0	18.9	0.0	0.0	4.7	0.0	0.0	0.0
24	0.0	6.5	0.0	0.0	7.1	9.7	5.1	3.2	0.0	3.6	0.0	0.0
25	0.0	0.0	0.0	0.0	0.0	0.0	10.1	0.0	0.0	28.7	0.0	0.0
26	0.0	0.0	0.0	0.0	0.0	0.0	18.1	0.0	4.8	0.0	0.0	0.0
27	0.0	0.0	0.0	38.2	0.0	0.0	3.8	0.0	13.6	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0	0.0	2.3	0.0	0.0	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0	0.0	0.0	11.1	35.1	0.0	1.4	0.0	0.0
30	0.0	--	0.0	0.0	96.1	0.0	0.0	42.4	0.0	5.6	0.0	0.0
31	0.0	--	0.0	--	0.0	--	0.0	0.0	--	0.0	--	0.0
TOTAL	0.0	6.5	0.0	47.9	123.9	74.2	50.3	80.7	33.5	39.3	0.0	0.0
AVERAGE	0.0	0.7	0.0	4.8	11.3	7.4	4.6	7.3	3.3	3.6	0.0	0.0
MONTHLY.TO	0.0	6.5	65.1	64.5	191.1	224.9	97.7	351.1	142.6	112.5	11.1	0.0
MONTHLY.AV	0.0	0.2	2.1	2.1	6.2	7.5	3.2	11.3	4.8	3.6	0.4	0.0

ANNUAL.TO 1267.1 ANNUAL.AV 3.5

DAYLY RAINFALL	96.1	5/30
CONTINUOUS 2DAYS	119.7	8/17
CONTINUOUS 3DAYS	123.1	8/16

--------* RAINFALL 1981 YEAR UNIT : MM/DAY *----*----* PAGE-- 5

NAME OF STATION : KHONG

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	24.4	6.1	0.0	7.3	12.4	0.0	0.0	0.0	28.2	0.0
3	0.0	0.0	0.0	0.0	0.0	7.1	0.0	0.0	0.0	0.0	2.5	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.8	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.1	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	0.0	2.9	20.4	1.7	0.0	9.6	0.0
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.2	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0	2.1	0.0	0.0	0.0	0.0	12.1	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.7	1.8	0.0	0.0	0.0
TOTAL	0.0	0.0	24.4	6.1	2.1	14.4	15.3	55.0	25.7	12.1	40.3	0.0
AVERAGE	0.0	0.0	2.4	0.6	0.2	1.4	1.5	5.5	2.6	1.2	4.0	0.0
11	0.0	0.0	2.3	33.5	0.0	0.0	0.0	2.1	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0	1.2	0.0	0.0	0.0	4.2	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	6.5	0.0	0.0	0.0	0.0	2.6	0.0
14	0.0	0.0	0.0	0.0	5.7	3.6	3.7	0.0	4.1	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.3	21.2	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.1	0.0	0.0
17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	5.1	0.0
18	0.0	0.0	0.0	0.0	12.1	0.0	8.4	0.0	3.8	0.0	1.4	0.0
19	0.0	0.0	0.0	16.4	1.4	0.0	6.8	0.0	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	5.4	31.7	2.4	73.5	0.0	0.0	0.0	0.0	0.0
TOTAL	0.0	0.0	2.3	55.3	50.9	13.7	92.4	2.1	10.2	41.8	9.1	0.0
AVERAGE	0.0	0.0	0.2	5.5	5.1	1.4	9.2	0.2	1.0	4.2	0.9	0.0
21	0.0	0.0	0.0	12.2	5.2	0.0	13.1	0.0	11.5	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0	5.6	2.8	0.0	0.0	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0	31.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0	20.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	8.1	3.5	0.0	0.0	0.0	9.5	0.0	0.0	0.0
26	0.0	2.6	0.0	0.0	0.0	0.0	0.0	0.0	18.9	0.0	0.0	0.0
27	0.0	15.5	0.0	0.0	0.0	8.5	13.8	0.0	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0	0.0	0.0	6.1	0.0	24.3	0.0	0.0	0.0
29	0.0	--	0.0	46.6	0.0	0.0	0.0	0.0	7.8	0.0	0.0	0.0
30	0.0	--	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31	0.0	--	7.4	--	0.0	--	0.0	4.6	--	0.0	--	0.0
TOTAL	0.0	18.1	7.4	66.9	66.0	11.3	33.0	4.6	72.0	0.0	0.0	0.0
AVERAGE	0.0	2.3	0.7	6.7	6.0	1.1	3.0	0.4	7.2	0.0	0.0	0.0
MONTHLY.TO	0.0	18.1	34.1	128.3	119.0	39.4	140.7	61.7	107.9	53.9	49.4	0.0
MONTHLY.AV	0.0	0.6	1.1	4.3	3.8	1.3	4.5	2.0	3.6	1.7	1.6	0.0

ANNUAL.TO 752.5 ANNUAL.AV 2.1

DAYLY RAINFALL	73.5	7/20
CONTINUOUS 2DAYS	86.6	7/20
CONTINUOUS 3DAYS	93.4	7/19

NAME OF STATION : KHONG

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5
2	0.0	0.0	22.1	0.0	0.0	0.0	2.8	0.0	49.6	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	11.1	0.0	12.5	28.1	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.1	14.3	0.0	0.0	0.0
5	0.0	25.2	0.0	0.0	0.0	11.4	0.0	0.0	32.3	0.0	0.0	0.0
6	0.0	10.6	0.0	0.0	0.0	39.3	0.0	0.0	18.6	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0	3.1	7.7	0.0	3.2	54.8	0.0	0.0	0.0
8	0.0	0.0	0.0	14.1	0.0	0.0	0.0	3.8	28.2	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0	0.0	3.2	9.4	0.0	30.1	0.0	0.0	0.0
10	0.0	32.1	0.0	0.0	61.1	0.0	0.0	0.0	6.1	11.5	0.0	0.0
TOTAL	0.0	67.9	22.1	14.1	64.2	72.7	12.2	22.6	262.1	11.5	0.0	2.5
AVERAGE	0.0	6.8	2.2	1.4	6.4	7.3	1.2	2.3	26.2	1.1	0.0	0.3
11	0.0	0.0	0.0	0.0	0.0	0.0	4.2	32.1	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	2.8	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	3.5	0.0	0.0	0.0	0.0	0.0	0.0	32.1	0.0
15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.4	0.0
16	0.0	0.0	0.0	0.0	0.0	6.2	0.0	12.1	2.2	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0	8.6	0.0	0.0	0.0	5.4	0.0	0.0	0.0
18	0.0	0.0	0.0	30.2	5.1	0.0	13.7	0.0	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0	71.1	4.3	7.3	5.7	0.0	28.7	0.0	0.0
20	0.0	0.0	0.0	0.0	0.0	0.0	18.1	42.7	0.0	0.0	0.0	0.0
TOTAL	0.0	0.0	0.0	36.5	85.9	10.5	43.3	92.6	7.6	28.7	37.5	0.0
AVERAGE	0.0	0.0	0.0	3.6	8.6	1.0	4.3	9.3	0.8	2.9	3.8	0.0
21	0.0	0.0	0.0	14.8	0.0	0.0	14.5	2.1	0.0	4.5	0.0	0.0
22	0.0	0.0	0.0	0.0	9.2	0.0	0.0	0.0	0.0	4.6	0.0	0.0
23	0.0	0.0	0.0	0.0	2.1	0.0	0.0	43.4	0.0	1.2	0.0	0.0
24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.1	0.0	0.0	0.0	0.0
25	0.0	0.0	5.2	0.0	0.0	2.1	0.0	1.8	2.6	6.7	0.0	0.0
26	0.0	0.0	0.0	0.0	85.4	2.6	0.0	0.0	4.3	0.0	0.0	0.0
27	0.0	0.0	3.4	0.0	42.2	0.0	0.0	0.0	10.3	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	29.4	0.0	0.0	0.0
29	0.0	--	0.0	0.0	0.0	2.4	0.0	2.2	14.1	0.0	0.0	0.0
30	0.0	--	0.0	0.0	0.0	0.0	0.0	0.0	2.2	0.0	0.0	0.0
31	0.0	--	0.0	--	0.0	--	2.6	0.0	--	0.0	--	0.0
TOTAL	0.0	0.0	8.6	14.8	138.9	7.1	17.1	55.6	62.9	17.0	0.0	0.0
AVERAGE	0.0	0.0	0.8	1.5	12.6	0.7	1.6	5.1	6.3	1.5	0.0	0.0
MONTHLY.TO	0.0	67.9	30.7	65.4	289.0	90.3	72.6	170.8	332.6	57.2	37.5	2.5
MONTHLY.AV	0.0	2.4	1.0	2.2	9.3	3.0	2.3	5.5	11.1	1.8	1.3	0.1

ANNUAL.TO 1216.5 ANNUAL.AV 3.3

DAYLY RAINFALL	85.4	5/26
CONTINUOUS 2DAYS	127.6	5/26
CONTINUOUS 3DAYS	127.6	5/26

------* RAINFALL 1983 YEAR UNIT : MM/DAY *---*---* PAGE-- 7

NAME OF STATION : KHONG

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
1	0.0	0.0	0.0	0.0	0.0	25.4	0.0	1.5	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.4	10.9	0.0	0.0	0.0
3	3.8	0.0	0.0	0.0	2.6	0.0	0.0	29.1	15.4	1.8	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	39.3	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	59.3	1.5	0.0	24.6	17.6	4.7	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	15.9	14.9	5.2	2.6	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	3.2	36.4	14.6	20.8	2.1	0.0	0.0
8	0.0	0.0	0.0	0.0	1.8	0.0	0.0	2.1	0.0	6.8	36.1	0.0
9	0.0	0.0	0.0	0.0	0.0	8.5	0.0	3.6	0.0	2.6	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6	104.3	0.0	0.0
TOTAL	3.8	0.0	0.0	0.0	63.7	54.5	51.3	88.8	108.2	122.3	36.1	0.0
AVERAGE	0.4	0.0	0.0	0.0	6.4	5.4	5.1	8.9	10.8	12.2	3.6	0.0
11	0.0	0.0	0.0	0.0	0.0	22.5	0.0	0.0	29.4	13.1	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0	0.0	6.7	0.0	0.0	0.0	33.6	0.0
13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.8	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0	0.0	0.0	10.6	0.0	1.5	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.1	0.0	32.1	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	0.0	6.2	0.0	2.8	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0	36.9	0.0	0.0	0.0	0.0	4.8	0.0	0.0
18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.6	33.6	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	0.0	2.4	0.0	0.0	0.0	0.0	0.0	0.0	2.2	0.0	0.0	0.0
TOTAL	0.0	2.4	0.0	0.0	36.9	22.5	23.5	27.7	87.3	50.0	33.6	0.0
AVERAGE	0.0	0.2	0.0	0.0	3.7	2.3	2.3	2.8	8.7	5.0	3.4	0.0
21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.6	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0	0.0	21.7	13.9	0.0	0.0	1.2	0.0	0.0
23	0.0	1.1	0.0	0.0	0.0	65.1	33.1	0.0	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0	63.7	0.0	3.1	0.0	3.4	0.0	0.0	0.0
25	0.0	0.0	0.0	4.9	0.0	0.0	5.4	0.0	13.8	0.0	0.0	0.0
26	0.0	12.8	0.0	0.0	2.1	24.3	0.0	0.0	24.3	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0	7.4	6.1	0.0	0.0	4.1	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0	2.8	15.7	0.0	0.0	31.9	4.3	0.0	0.0
29	0.0	--	0.0	0.0	2.1	0.0	2.5	0.0	92.7	0.0	0.0	0.0
30	0.0	--	0.0	0.0	2.9	0.0	19.2	4.1	4.1	1.3	0.0	0.0
31	0.0	--	0.0	--	1.6	--	0.0	0.0	--	4.6	--	0.0
TOTAL	0.0	13.9	0.0	4.9	82.6	132.9	77.2	22.7	174.3	11.4	0.0	0.0
AVERAGE	0.0	1.7	0.0	0.5	7.5	13.3	7.0	2.1	17.4	1.0	0.0	0.0
MONTHLY.TO	3.8	16.3	0.0	4.9	183.2	209.9	152.0	139.2	369.8	183.7	69.7	0.0
MONTHLY.AV	0.1	0.6	0.0	0.2	5.9	7.0	4.9	4.5	12.3	5.9	2.3	0.0

ANNUAL.TO 1332.5 ANNUAL.AV 3.7

DAYLY RAINFALL	104.3	10/10
CONTINUOUS 2DAYS	124.6	9/28
CONTINUOUS 3DAYS	128.7	9/28

------* RAINFALL 1984 YEAR UNIT : MM/DAY *---*---* PAGE-- 8

NAME OF STATION : KHONG

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
1	0.0	0.0	0.0	23.5	0.0	0.0	0.0	0.0	27.1	8.1	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	2.4	0.0	0.0	2.1	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	52.5	10.6	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	5.2	11.2	4.7	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	32.9	0.0	0.0	5.3	1.2	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	22.3	20.4	0.0	1.5	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	2.5	0.0	0.0	0.0	5.6	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6	0.0	1.5	0.0	0.0
9	0.0	0.0	0.0	0.0	0.0	0.0	14.6	2.9	21.6	2.4	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	93.7	28.1	0.0	0.0	6.1	0.0	0.0
TOTAL	0.0	0.0	0.0	23.5	0.0	159.0	74.3	9.2	110.1	35.5	0.0	0.0
AVERAGE	0.0	0.0	0.0	2.3	0.0	15.9	7.4	0.9	11.0	3.5	0.0	0.0
11	0.0	0.0	0.0	0.0	0.0	8.4	12.6	0.0	0.0	0.0	1.2	0.0
12	0.0	0.0	0.0	5.6	37.2	0.0	7.9	0.0	0.0	2.4	0.0	0.0
13	0.0	0.0	0.0	0.0	6.5	0.0	0.0	1.5	0.0	12.2	0.0	0.0
14	0.0	0.0	0.0	4.2	1.6	0.0	0.0	20.3	0.0	8.3	0.0	0.0
15	0.0	0.0	0.0	0.0	0.0	0.0	34.8	0.0	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	0.0	12.9	0.0	0.0	14.8	0.0	0.0
17	0.0	3.2	0.0	0.0	5.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18	0.0	0.0	5.3	0.0	0.0	0.0	0.0	27.9	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0	0.0	15.1	0.0	59.5	3.1	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0	0.0	2.7	19.3	0.0	5.2	0.0	0.0	0.0
TOTAL	0.0	3.2	5.3	9.8	51.1	26.2	87.5	109.2	8.3	37.7	1.2	0.0
AVERAGE	0.0	0.3	0.5	1.0	5.1	2.6	8.8	10.9	0.8	3.8	0.1	0.0
21	0.0	0.0	0.0	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	0.0	0.0	7.4	11.8	0.0	0.0	0.0	0.0	15.7	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0	20.7	12.2	0.0	0.0	24.1	0.0	0.0	0.0
24	0.0	0.0	0.0	5.9	23.1	0.0	0.0	0.0	2.1	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0	56.4	0.0	0.0	0.0	12.6	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0	7.5	0.0	0.0	0.0	13.4	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.8	23.5	0.0	0.0	0.0
29	0.0	0.0	0.0	10.1	0.0	0.0	0.0	0.0	3.8	0.0	0.0	0.0
30	0.0	--	0.0	0.0	0.0	0.0	0.0	0.0	2.8	0.0	0.0	0.0
31	0.0	--	14.8	--	0.0	--	0.0	0.0	--	0.0	--	0.0
TOTAL	0.0	0.0	22.2	27.8	109.8	12.2	0.0	3.8	98.0	0.0	0.0	0.0
AVERAGE	0.0	0.0	2.0	2.8	10.0	1.2	0.0	0.3	9.8	0.0	0.0	0.0
MONTHLY.TO	0.0	3.2	27.5	61.1	160.9	197.4	161.8	122.2	216.4	73.2	1.2	0.0
MONTHLY.AV	0.0	0.1	0.9	2.0	5.2	6.6	5.2	3.9	7.2	2.4	0.0	0.0

ANNUAL.TO 1024.9 ANNUAL.AV 2.8

DAYLY RAINFALL	93.7	6/10
CONTINUOUS 2DAYS	102.1	6/10
CONTINUOUS 3DAYS	102.1	6/10

Table-2 Daily rainfall (Chakwal)

------* RAINFALL 1978 YEAR UNIT : MM/DAY *---*---* PAGE-- 1

NAME OF STATION : CHAKK

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
1	0.0	0.0	0.0	0.0	0.0	0.0	39.3	5.2	24.3	6.3	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	2.4	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	2.2	0.0	0.0	0.0	39.8	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	5.6	9.5	0.0	0.0	5.3	0.0
5	0.0	0.0	0.0	0.0	2.1	0.0	0.0	0.0	0.0	4.2	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.3	0.0	9.3	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.6	0.0	0.0	0.0
8	0.0	0.0	0.0	1.6	23.0	0.0	0.0	0.0	6.8	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0	0.0	0.0	6.4	3.2	8.2	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	3.2	28.7	39.5	0.0	0.0	0.0
TOTAL	0.0	0.0	0.0	3.8	25.1	0.0	56.9	90.7	95.4	19.8	5.3	0.0
AVERAGE	0.0	0.0	0.0	0.4	2.5	0.0	5.7	9.1	9.5	2.0	0.5	0.0
11	0.0	0.0	0.0	0.0	52.0	9.8	17.4	5.2	2.4	0.0	0.0	0.0
12	0.0	0.0	0.0	27.2	0.0	2.6	20.0	18.3	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	0.0	0.0	38.8	0.0	11.4	0.0	0.0	0.0	32.8	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0	2.3	0.0	42.6	0.0	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.6	22.8	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0	0.0	17.4	0.0	0.0	4.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.7	23.6	7.4	0.0	0.0
19	0.0	0.0	0.0	0.0	0.0	9.7	0.0	0.0	34.3	0.0	0.0	0.0
20	0.0	0.0	2.5	4.5	0.0	5.2	12.3	0.0	30.2	0.0	0.0	0.0
TOTAL	0.0	0.0	41.3	31.7	65.7	44.7	92.3	60.8	150.1	7.4	0.0	0.0
AVERAGE	0.0	0.0	4.1	3.2	6.6	4.5	9.2	6.1	15.0	0.7	0.0	0.0
21	0.0	0.0	0.0	0.0	0.0	3.4	9.3	0.0	14.8	0.0	0.0	0.0
22	0.0	1.0	22.0	0.0	9.5	11.4	0.0	0.0	0.0	32.1	0.0	0.0
23	0.0	0.0	0.0	0.0	0.0	6.7	0.0	0.0	20.8	3.4	0.0	0.0
24	0.0	0.0	0.0	0.0	11.0	0.0	0.0	24.8	0.0	7.2	0.0	0.0
25	0.0	0.0	0.0	0.0	8.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0	6.2	0.0	0.0	0.0	34.6	5.1	0.0	0.0
28	0.0	0.0	7.5	0.0	0.0	0.0	0.0	0.0	32.7	0.0	0.0	0.0
29	0.0	--	12.8	0.0	0.0	0.0	0.0	0.0	16.4	0.0	0.0	0.0
30	48.5	--	0.0	0.0	12.0	0.0	0.0	5.8	11.3	0.0	0.0	0.0
31	0.0	--	0.0	--	39.0	--	0.0	0.0	--	0.0	--	0.0
TOTAL	48.5	1.0	42.3	0.0	85.8	21.5	9.3	30.6	130.6	47.8	0.0	0.0
AVERAGE	4.4	0.1	3.8	0.0	7.8	2.1	0.8	2.8	13.1	4.3	0.0	0.0
MONTHLY.TO	48.5	1.0	83.6	35.5	176.6	66.2	158.5	182.1	376.1	75.0	5.3	0.0
MONTHLY.AV	1.6	0.0	2.7	1.2	5.7	2.2	5.1	5.9	12.5	2.4	0.2	0.0

ANNUAL.TO 1208.4 ANNUAL.AV 3.3

DAYLY RAINFALL	52.0	5/11
CONTINUOUS 2DAYS	67.3	9/27
CONTINUOUS 3DAYS	88.1	9/18

------* RAINFALL 1979 YEAR UNIT : MM/DAY *---*---* PAGE-- 2

NAME OF STATION : CHAKK

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
1	*	*	*	*	*	*	*	*	*	*	*	*
2	*	*	*	*	*	*	*	*	*	*	*	*
3	*	*	*	*	*	*	*	*	*	*	*	*
4	*	*	*	*	*	*	*	*	*	*	*	*
5	*	*	*	*	*	*	*	*	*	*	*	*
6	*	*	*	*	*	*	*	*	*	*	*	*
7	*	*	*	*	*	*	*	*	*	*	*	*
8	*	*	*	*	*	*	*	*	*	*	*	*
9	*	*	*	*	*	*	*	*	*	*	*	*
10	*	*	*	*	*	*	*	*	*	*	*	*
TOTAL	*	*	*	*	*	*	*	*	*	*	*	*
AVERAGE	*	*	*	*	*	*	*	*	*	*	*	*
11	*	*	*	*	*	*	*	*	*	*	*	*
12	*	*	*	*	*	*	*	*	*	*	*	*
13	*	*	*	*	*	*	*	*	*	*	*	*
14	*	*	*	*	*	*	*	*	*	*	*	*
15	*	*	*	*	*	*	*	*	*	*	*	*
16	*	*	*	*	*	*	*	*	*	*	*	*
17	*	*	*	*	*	*	*	*	*	*	*	*
18	*	*	*	*	*	*	*	*	*	*	*	*
19	*	*	*	*	*	*	*	*	*	*	*	*
20	*	*	*	*	*	*	*	*	*	*	*	*
TOTAL	*	*	*	*	*	*	*	*	*	*	*	*
AVERAGE	*	*	*	*	*	*	*	*	*	*	*	*
21	*	*	*	*	*	*	*	*	*	*	*	*
22	*	*	*	*	*	*	*	*	*	*	*	*
23	*	*	*	*	*	*	*	*	*	*	*	*
24	*	*	*	*	*	*	*	*	*	*	*	*
25	*	*	*	*	*	*	*	*	*	*	*	*
26	*	*	*	*	*	*	*	*	*	*	*	*
27	*	*	*	*	*	*	*	*	*	*	*	*
28	*	*	*	*	*	*	*	*	*	*	*	*
29	*	--	*	*	*	*	*	*	*	*	*	*
30	*	--	*	*	*	*	*	*	*	*	*	*
31	*	--	*	--	*	--	*	*	--	*	--	*
TOTAL	*	*	*	*	*	*	*	*	*	*	*	*
AVERAGE	*	*	*	*	*	*	*	*	*	*	*	*
MONTHLY.TO	*	*	*	*	*	*	*	*	*	*	*	*
MONTHLY.AV	*	*	*	*	*	*	*	*	*	*	*	*

ANNUAL.TO * ANNUAL.AV *

DAYLY RAINFALL *

CONTINUOUS 2DAYS *

CONTINUOUS 3DAYS *

------* RAINFALL 1980 YEAR UNIT : MM/DAY *---*---* PAGE-- 3

NAME OF STATION : CHAKK

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.2	0.0	22.4	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.6	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	27.8	28.3	0.0	0.0
4	0.0	0.0	0.0	0.0	8.5	0.0	95.8	0.0	0.0	5.4	0.0	0.0
5	0.0	0.0	8.5	0.0	0.0	47.2	0.0	8.4	6.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	0.0	9.8	0.0	0.0	21.8	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.4	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.6	0.0
9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.1	35.5	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	27.4	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	0.0	0.0	8.5	0.0	8.5	74.6	105.6	53.7	69.3	108.9	23.6	0.0
AVERAGE	0.0	0.0	0.8	0.0	0.8	7.5	10.6	5.4	6.9	10.9	2.4	0.0
11	0.0	0.0	0.0	0.0	7.4	29.1	0.0	0.0	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	55.6	0.0	0.0	0.0	27.4	0.0	0.0	0.0
13	0.0	0.0	37.1	0.0	0.0	0.0	0.0	0.0	0.0	64.5	0.0	0.0
14	0.0	0.0	0.0	0.0	0.0	11.5	0.0	39.7	38.5	19.8	0.0	0.0
15	0.0	0.0	27.8	0.0	3.3	6.4	0.0	0.0	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	0.0	11.0	0.0	0.0	16.5	0.0	0.0
17	0.0	0.0	0.0	0.0	15.8	18.6	13.4	0.0	68.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.3	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0	0.0	8.7	0.0	34.5	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0	15.0	5.6	45.8	0.0	0.0	0.0	0.0	0.0
TOTAL	0.0	0.0	64.9	0.0	97.1	79.9	70.2	83.5	133.9	100.8	0.0	0.0
AVERAGE	0.0	0.0	6.5	0.0	9.7	8.0	7.0	8.3	13.4	10.1	0.0	0.0
21	0.0	0.0	0.0	0.0	8.3	0.0	15.2	0.0	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0	0.0	14.5	0.0	0.0	27.5	13.0	0.0	0.0
23	0.0	19.2	0.0	0.0	6.4	9.5	0.0	13.0	15.5	10.0	0.0	0.0
24	0.0	6.7	0.0	0.0	0.0	23.5	0.0	0.0	16.8	81.0	0.0	0.0
25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.1	0.0	0.0
26	0.0	0.0	0.0	0.0	2.5	0.0	0.0	5.3	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0	4.6	0.0	26.7	0.0	29.0	0.0	0.0	0.0
28	0.0	0.0	0.0	35.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0	0.0	0.0	0.0	67.8	0.0	0.0	0.0	0.0
30	0.0	--	0.0	0.0	12.0	0.0	0.0	0.0	22.7	0.0	0.0	0.0
31	0.0	--	0.0	--	0.0	--	0.0	11.5	--	0.0	--	0.0
TOTAL	0.0	25.9	0.0	35.5	33.8	47.5	41.9	97.6	111.5	110.1	0.0	0.0
AVERAGE	0.0	2.9	0.0	3.5	3.1	4.8	3.8	8.9	11.1	10.0	0.0	0.0
MONTHLY.TO	0.0	25.9	73.4	35.5	139.4	202.0	217.7	234.8	314.7	319.8	23.6	0.0
MONTHLY.AV	0.0	0.9	2.4	1.2	4.5	6.7	7.0	7.6	10.5	10.3	0.8	0.0

ANNUAL.TO 1586.8 ANNUAL.AV 4.3

DAYLY RAINFALL	95.8	7/ 4
CONTINUOUS 2DAYS	95.8	7/ 4
CONTINUOUS 3DAYS	105.6	7/ 4

NAME OF STATION : CHAKK

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
1	0.0	0.0	0.0	0.0	8.5	0.0	0.0	0.0	17.0	0.0	12.6	0.0
2	0.0	0.0	19.7	0.0	0.0	0.0	23.4	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	11.6	0.0	0.0	0.0	0.0	0.0	5.3	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.4	0.0	10.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	47.0	10.6	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	35.0	0.0	0.0	31.1	0.0
7	0.0	0.0	0.0	0.0	65.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	0.0	23.8	0.0	12.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	8.5	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.3	0.0	0.0	0.0	0.0
TOTAL	0.0	0.0	19.7	0.0	85.5	0.0	94.2	56.3	29.0	18.5	49.0	0.0
AVERAGE	0.0	0.0	2.0	0.0	8.5	0.0	9.4	5.6	2.9	1.8	4.9	0.0
11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	0.0	0.0	22.0	0.0	0.0	0.0	0.0	0.0	0.0	6.8	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	14.5	0.0	0.0	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0	6.3	5.3	26.4	0.0	0.0	0.0	11.0	0.0
15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	55.6	0.0	0.0
16	0.0	0.0	0.0	0.0	8.5	0.0	0.0	0.0	3.5	5.8	21.0	0.0
17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.0	0.0	0.0
18	0.0	0.0	0.0	0.0	0.0	0.0	39.5	0.0	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0	0.0	21.5	3.5	0.0	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0	0.0	0.0	8.0	0.0	0.0	0.0	0.0	0.0
TOTAL	0.0	0.0	22.0	0.0	14.8	41.3	77.4	0.0	9.5	85.2	32.0	0.0
AVERAGE	0.0	0.0	2.2	0.0	1.5	4.1	7.7	0.0	0.9	8.5	3.2	0.0
21	0.0	0.0	0.0	13.0	0.0	0.0	3.4	0.0	20.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0	0.0	0.0	36.0	0.0	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.5	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	0.0	13.5	0.0	0.0	33.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	0.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	12.0	0.0	0.0	0.0
27	0.0	3.3	0.0	0.0	0.0	0.0	0.0	4.5	6.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.6	0.0	0.0	0.0
29	0.0	--	0.0	8.2	0.0	0.0	0.0	0.0	0.0	5.4	0.0	0.0
30	0.0	--	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31	0.0	--	0.0	--	0.0	--	12.5	14.6	--	0.0	--	0.0
TOTAL	0.0	21.8	0.0	21.2	33.3	0.0	51.9	19.1	65.1	5.4	0.0	0.0
AVERAGE	0.0	2.7	0.0	2.1	3.0	0.0	4.7	1.7	6.5	0.5	0.0	0.0
MONTHLY.TO	0.0	21.8	41.7	21.2	133.6	41.3	223.5	75.4	103.6	109.1	81.0	0.0
MONTHLY.AV	0.0	0.8	1.3	0.7	4.3	1.4	7.2	2.4	3.5	3.5	2.7	0.0

ANNUAL.TO 852.2 ANNUAL.AV 2.3

DAYLY RAINFALL	65.4	5/ 7
CONTINUOUS 2DAYS	65.4	5/ 7
CONTINUOUS 3DAYS	78.4	10/15

------* RAINFALL 1982 YEAR UNIT : MM/DAY *---*---* PAGE-- 5

NAME OF STATION : CHAKK

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	6.3	11.3	0.0	0.0
3	0.0	0.0	18.5	0.0	0.0	0.0	9.8	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	32.5	51.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.3	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	13.4	0.0	0.0	9.0	29.9	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	81.3	0.0	0.0	0.0
8	0.0	0.0	0.0	39.7	0.0	38.8	17.7	0.0	13.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0	0.0	9.0	0.0	0.0	60.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.3	46.3	0.0	0.0
TOTAL	0.0	0.0	18.5	39.7	0.0	67.2	27.5	32.5	335.2	87.5	0.0	0.0
AVERAGE	0.0	0.0	1.8	4.0	0.0	6.7	2.7	3.3	33.5	8.7	0.0	0.0
11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0	13.3	0.0	0.0	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	20.0	18.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0	0.0	0.0	28.4	0.0	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	1.0	0.0	0.0	0.0	42.6	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0	0.0	0.0	36.6	0.0	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	54.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0	0.0	0.0	27.9	45.5	0.0	0.0	0.0	0.0
TOTAL	0.0	0.0	0.0	75.4	18.0	13.3	92.9	88.1	0.0	0.0	0.0	0.0
AVERAGE	0.0	0.0	0.0	7.5	1.8	1.3	9.3	8.8	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0	0.0	0.0	8.2	0.0	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0	63.2	0.0	0.0	0.0	0.0	14.3	0.0	0.0
23	0.0	0.0	0.0	1.5	0.0	0.0	0.0	71.0	18.7	8.0	0.0	0.0
24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	5.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	0.0	0.0	14.5	0.0	9.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27	0.0	0.0	55.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	38.2	0.0	0.0	0.0
29	0.0	--	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30	0.0	--	14.6	0.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31	0.0	--	0.0	--	0.0	--	0.0	0.0	--	0.0	--	0.0
TOTAL	0.0	0.0	84.1	7.0	75.5	0.0	8.2	71.0	56.9	22.3	0.0	0.0
AVERAGE	0.0	0.0	7.6	0.7	6.9	0.0	0.7	6.5	5.7	2.0	0.0	0.0
MONTHLY.TO	0.0	0.0	102.6	122.1	93.5	80.5	128.6	191.6	392.1	109.8	0.0	0.0
MONTHLY.AV	0.0	0.0	3.3	4.1	3.0	2.7	4.1	6.2	13.1	3.5	0.0	0.0

ANNUAL.TO 1220.8 ANNUAL.AV 3.3

DAYLY RAINFALL 100.3 9/10

CONTINUOUS 2DAYS 160.3 9/ 9

NAME OF STATION : CHAKK

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
1	0.0	0.0	0.0	0.0	0.0	2.8	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	39.8	0.0	0.0	0.0	0.0
3	11.6	0.0	0.0	0.0	48.0	0.0	0.0	49.8	0.0	5.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	41.4	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	0.0	40.0	19.8	26.7	6.0	0.0	0.0
8	0.0	0.0	0.0	0.0	14.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0	0.0	30.8	0.0	30.5	0.0	0.0	15.7	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.8	110.0	20.0	0.0
TOTAL	11.6	0.0	0.0	0.0	62.0	33.6	40.0	181.3	36.5	121.0	35.7	0.0
AVERAGE	1.2	0.0	0.0	0.0	6.2	3.4	4.0	18.1	3.6	12.1	3.6	0.0
11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.6	25.0	0.0
12	0.0	0.0	0.0	0.0	0.0	7.4	0.0	0.0	0.0	38.0	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.4	7.8	0.0	0.0
14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.8	4.3	0.0	0.0
15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.0	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	0.0	27.5	0.0	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	31.8	0.0	8.8	0.0	0.0
18	0.0	0.0	0.0	0.0	0.0	7.0	0.0	41.2	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0	12.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	0.0	0.0	0.0	0.0	12.2	14.4	27.5	73.0	8.2	82.5	25.0	0.0
AVERAGE	0.0	0.0	0.0	0.0	1.2	1.4	2.8	7.3	0.8	8.3	2.5	0.0
21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.2	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0	0.0	0.0	8.8	0.0	0.0	10.7	0.0	0.0
24	0.0	0.0	0.0	0.0	18.5	0.0	0.0	0.0	13.5	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0	7.0	0.0	37.5	17.8	0.0	0.0	0.0	0.0
26	0.0	36.6	0.0	0.0	6.3	29.2	0.0	0.0	10.5	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.6	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29	0.0	--	0.0	0.0	22.5	0.0	0.0	0.0	30.5	0.0	0.0	0.0
30	0.0	--	0.0	9.6	0.0	0.0	40.5	0.0	19.6	10.2	0.0	0.0
31	0.0	--	0.0	--	0.0	--	0.0	16.8	--	15.5	--	0.0
TOTAL	0.0	36.6	0.0	9.6	54.3	29.2	86.8	53.4	74.1	36.4	0.0	0.0
AVERAGE	0.0	4.6	0.0	1.0	4.9	2.9	7.9	4.9	7.4	3.3	0.0	0.0
MONTHLY.TO	11.6	36.6	0.0	9.6	128.5	77.2	154.3	307.7	118.8	239.9	60.7	0.0
MONTHLY.AV	0.4	1.3	0.0	0.3	4.1	2.6	5.0	9.9	4.0	7.7	2.0	0.0

ANNUAL.TO 1144.9 ANNUAL.AV 3.1

DAYLY RAINFALL	110.0	10/10
CONTINUOUS 2DAYS	115.6	10/10
CONTINUOUS 3DAYS	153.6	10/10

------* RAINFALL 1984 YEAR UNIT : MM/DAY *---*---* PAGE-- 7

NAME OF STATION : CHAKK

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
1	0.0	0.0	0.0	0.0	0.0	0.0	14.5	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	5.4	0.0	15.8	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	31.8	0.0	16.2	0.0
4	0.0	0.0	0.0	0.0	0.0	8.5	0.0	0.0	0.0	12.3	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	12.7	0.0	0.0	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	0.0	32.4	0.0	23.5	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	0.0	9.6	0.0	0.0	18.2	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	0.0	11.4	6.5	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	3.2	14.7	9.3	0.0	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	7.0	28.8	0.0	9.7	0.0	0.0	0.0	0.0
TOTAL	0.0	0.0	0.0	8.6	21.7	75.1	67.9	16.2	55.3	30.5	16.2	0.0
AVERAGE	0.0	0.0	0.0	0.9	2.2	7.5	6.8	1.6	5.5	3.0	1.6	0.0
11	0.0	0.0	0.0	0.0	9.4	74.0	16.8	0.0	18.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	18.3	0.0	8.6	0.0	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.6	0.0	0.0
14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	32.4	21.2	9.5	0.0	0.0
15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.1	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	0.0	7.4	0.0	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	2.6	0.0	0.0	0.0	15.0	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0	5.8	0.0	5.3	30.8	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	35.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	0.0	0.0	0.0	37.6	33.5	74.0	38.1	82.3	39.2	27.1	0.0	0.0
AVERAGE	0.0	0.0	0.0	3.8	3.3	7.4	3.8	8.2	3.9	2.7	0.0	0.0
21	0.0	0.0	0.0	0.0	0.0	0.0	2.5	0.0	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0	0.0	0.0	11.8	0.0	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	32.3	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	30.4	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	39.3	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0	51.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	32.4	0.0	0.0	0.0
30	0.0	--	0.0	0.0	0.0	0.0	0.0	0.0	4.5	0.0	0.0	0.0
31	0.0	--	0.0	--	59.7	--	0.0	0.0	--	0.0	--	0.0
TOTAL	0.0	0.0	0.0	0.0	111.4	0.0	14.3	0.0	156.9	0.0	0.0	0.0
AVERAGE	0.0	0.0	0.0	0.0	10.1	0.0	1.3	0.0	15.7	0.0	0.0	0.0
MONTHLY.TO	0.0	0.0	0.0	46.2	166.6	149.1	120.3	98.5	251.4	57.6	16.2	0.0
MONTHLY.AV	0.0	0.0	0.0	1.5	5.4	5.0	3.9	3.2	8.4	1.9	0.5	0.0

ANNUAL.TO 905.9 ANNUAL.AV 2.5

DAYLY RAINFALL 74.0 6/11

CONTINUOUS 2DAYS 102.8 6/10

CONTINUOUS 3DAYS 112.1 6/8

--------* RAINFALL 1985 YEAR UNIT : MM/DAY *----*----* PAGE-- 8

NAME OF STATION : CHAKK

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
1	0.0	0.0	0.0	0.0	0.0	0.0	32.2	0.0	0.0	0.0	*	*
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	54.6	0.0	*	*
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*	*
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.5	0.0	*	*
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.8	0.0	0.0	*	*
6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*	*
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*	*
8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.3	0.0	*	*
9	0.0	0.0	0.0	0.0	28.0	0.0	0.0	0.0	0.0	0.0	*	*
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.3	0.0	6.3	*	*
TOTAL	0.0	0.0	0.0	0.0	28.0	0.0	32.2	20.1	95.4	6.3	*	*
AVERAGE	0.0	0.0	0.0	0.0	2.8	0.0	3.2	2.0	9.5	0.6	*	*
11	0.0	0.0	0.0	0.0	2.0	0.0	10.5	0.0	0.0	0.0	*	*
12	0.0	0.0	0.0	0.0	6.2	0.0	39.0	0.0	21.7	16.3	*	*
13	0.0	0.0	0.0	0.0	14.9	53.5	0.0	0.0	0.0	0.0	*	*
14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.5	51.9	0.0	*	*
15	0.0	0.0	0.0	0.0	0.0	2.5	0.0	0.0	0.0	0.0	*	*
16	0.0	0.0	0.0	13.5	17.8	0.0	0.0	0.0	153.9	13.5	*	*
17	0.0	0.0	0.0	91.8	0.0	0.0	9.8	0.0	0.0	34.2	*	*
18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*	*
19	0.0	0.0	0.0	7.0	0.0	0.0	3.5	0.0	0.0	15.3	*	*
20	0.0	0.0	0.0	0.0	0.0	7.4	0.0	0.0	0.0	0.0	*	*
TOTAL	0.0	0.0	0.0	112.3	40.9	63.4	62.8	6.5	227.5	79.3	*	*
AVERAGE	0.0	0.0	0.0	11.2	4.1	6.3	6.3	0.6	22.7	7.9	*	*
21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*	*
22	0.0	0.0	0.0	27.2	22.2	0.0	0.0	0.0	0.0	58.0	*	*
23	0.0	0.0	18.4	0.0	0.0	0.0	48.0	0.0	0.0	0.0	*	*
24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*	*
25	17.0	17.0	3.4	22.5	0.0	0.0	0.0	0.0	0.0	0.0	*	*
26	0.0	2.6	0.0	8.4	0.0	0.0	0.0	0.0	0.0	17.9	*	*
27	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.4	14.9	0.0	*	*
28	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*	*
29	0.0	--	0.0	0.0	0.0	0.0	0.0	2.6	0.0	0.0	*	*
30	0.0	--	0.0	79.2	0.0	0.0	0.0	0.0	0.0	10.7	*	*
31	0.0	--	0.0	--	0.0	--	0.0	0.0	--	0.0	--	*
TOTAL	17.0	19.6	21.8	137.3	22.2	0.0	48.0	21.0	14.9	86.6	*	*
AVERAGE	1.5	2.4	2.0	13.7	2.0	0.0	4.4	1.9	1.5	7.9	*	*
MONTHLY.TO	17.0	19.6	21.8	249.6	91.1	63.4	143.0	47.6	337.8	172.2	*	*
MONTHLY.AV	0.5	0.7	0.7	8.3	2.9	2.1	4.6	1.5	11.3	5.6	*	*

ANNUAL.TO 1163.1 ANNUAL.AV 3.8

DAYLY RAINFALL	153.9	9/16
CONTINUOUS 2DAYS	153.9	9/16
CONTINUOUS 3DAYS	205.8	9/14

Table -3 Daily rainfall (Chakerat office)

------* RAINFALL 1980 YEAR UNIT : MM/DAY *---*---* PAGE-- 1

NAME OF STATION : OFFICE

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
1	0.0	0.0	0.0	0.0	0.0	0.0	57.5	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	23.0	0.0	0.0	0.0	27.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.5	27.0	14.0	60.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	55.5	0.0	0.0	30.0	42.0	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.5	49.0	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	0.0	11.7	0.0	4.2	14.0	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.1	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0	0.0	9.0	10.5	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	30.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	0.0	0.0	0.0	0.0	0.0	118.0	106.7	64.1	115.7	132.0	0.0	0.0
AVERAGE	0.0	0.0	0.0	0.0	0.0	11.8	10.7	6.4	11.6	13.2	0.0	0.0
11	0.0	0.0	0.0	0.0	16.0	0.0	36.2	0.0	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.3	5.2	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	60.0	0.0	0.0
14	0.0	0.0	0.0	0.0	0.0	55.0	0.0	0.0	0.1	8.2	0.0	0.0
15	0.0	0.0	0.0	0.0	16.5	60.0	24.0	0.0	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0	0.0	17.5	0.0	0.0	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0	0.0	21.5	0.0	0.0	0.0	27.0	0.0	0.0
20	0.0	0.0	0.0	0.0	48.1	0.0	0.0	21.0	0.0	0.0	0.0	0.0
TOTAL	0.0	0.0	0.0	0.0	130.6	154.0	60.2	21.0	6.4	100.4	0.0	0.0
AVERAGE	0.0	0.0	0.0	0.0	13.1	15.4	6.0	2.1	0.6	10.0	0.0	0.0
21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.5	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0	0.0	27.5	41.0	0.0	28.1	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0	0.0	55.0	3.0	0.0	0.0	0.0	0.0	0.0
24	0.0	13.0	0.0	0.0	0.0	63.1	0.0	0.0	0.0	0.0	0.0	0.0
25	0.0	40.0	0.0	0.0	0.0	0.0	50.0	11.0	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	32.1	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0	24.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	37.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0	0.0	0.0	0.0	60.0	42.1	0.0	0.0	0.0
30	0.0	--	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31	0.0	--	0.0	--	0.0	--	0.0	0.0	--	0.0	--	0.0
TOTAL	0.0	53.0	0.0	37.5	24.0	145.6	94.0	71.0	152.8	0.0	0.0	0.0
AVERAGE	0.0	5.9	0.0	3.8	2.2	14.6	8.5	6.5	15.3	0.0	0.0	0.0
MONTHLY.TO	0.0	53.0	0.0	37.5	154.6	417.6	260.9	156.1	274.9	232.4	0.0	0.0
MONTHLY.AV	0.0	1.8	0.0	1.3	5.0	13.9	8.4	5.0	9.2	7.5	0.0	0.0

ANNUAL.TO 1587.0 ANNUAL.AV 4.3

DAYLY RAINFALL	63.1	6/24
CONTINUOUS 2DAYS	118.1	6/23
CONTINUOUS 3DAYS	145.6	6/22

------* RAINFALL 1981 YEAR UNIT : MM/DAY *---*---* PAGE-- 2

NAME OF STATION : OFFICE

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
1	*	*	*	*	*	*	0.0	0.0	70.0	0.0	0.0	*
2	*	*	*	*	*	*	22.0	0.0	0.0	0.0	0.0	*
3	*	*	*	*	*	*	0.0	0.0	0.0	0.0	0.0	*
4	*	*	*	*	*	*	0.0	4.4	0.0	40.0	0.0	*
5	*	*	*	*	*	*	47.0	10.4	0.0	0.0	0.0	*
6	*	*	*	*	*	*	0.0	0.0	0.0	20.0	0.0	*
7	*	*	*	*	*	*	0.0	0.0	0.0	0.0	0.0	*
8	*	*	*	*	*	*	0.0	0.0	70.0	20.0	20.0	*
9	*	*	*	*	*	*	0.0	4.0	0.0	0.0	0.0	*
10	*	*	*	*	*	*	0.0	2.3	0.0	0.0	0.0	*
TOTAL	*	*	*	*	*	*	69.0	21.1	140.0	80.0	20.0	*
AVERAGE	*	*	*	*	*	*	6.9	2.1	14.0	8.0	2.0	*
11	*	*	*	*	*	*	0.0	0.0	0.0	0.0	0.0	*
12	*	*	*	*	*	*	0.0	0.0	0.0	0.0	0.0	*
13	*	*	*	*	*	*	0.0	0.0	0.0	0.0	0.0	*
14	*	*	*	*	*	*	0.0	0.0	40.0	0.0	0.0	*
15	*	*	*	*	*	*	0.0	0.0	30.0	56.0	0.0	*
16	*	*	*	*	*	*	0.0	0.0	0.0	40.0	0.0	*
17	*	*	*	*	*	*	0.0	0.0	0.0	20.0	0.0	*
18	*	*	*	*	*	*	0.0	0.0	0.0	0.0	0.0	*
19	*	*	*	*	*	*	0.0	0.0	50.0	0.0	0.0	*
20	*	*	*	*	*	*	0.0	0.0	0.0	0.0	0.0	*
TOTAL	*	*	*	*	*	*	0.0	0.0	120.0	116.0	0.0	*
AVERAGE	*	*	*	*	*	*	0.0	0.0	12.0	11.6	0.0	*
21	*	*	*	*	*	*	0.0	0.0	0.0	0.0	0.0	*
22	*	*	*	*	*	*	0.0	32.0	0.0	0.0	0.0	*
23	*	*	*	*	*	*	0.0	0.0	0.0	0.0	0.0	*
24	*	*	*	*	*	*	0.0	0.0	0.0	0.0	0.0	*
25	*	*	*	*	*	*	0.0	0.0	0.0	0.0	0.0	*
26	*	*	*	*	*	*	0.0	0.0	0.0	0.0	0.0	*
27	*	*	*	*	*	*	0.0	0.0	0.0	20.0	0.0	*
28	*	*	*	*	*	*	0.0	0.0	0.0	20.0	0.0	*
29	*	--	*	*	*	*	0.0	0.0	0.0	0.0	0.0	*
30	*	--	*	*	*	*	0.0	0.0	0.0	0.0	0.0	*
31	*	--	*	--	*	--	0.0	0.0	--	0.0	--	*
TOTAL	*	*	*	*	*	*	0.0	32.0	0.0	40.0	0.0	*
AVERAGE	*	*	*	*	*	*	0.0	2.9	0.0	3.6	0.0	*
MONTHLY.TO	*	*	*	*	*	*	69.0	53.1	260.0	236.0	20.0	*
MONTHLY.AV	*	*	*	*	*	*	2.2	1.7	8.7	7.6	0.7	*

ANNUAL.TO 638.1 ANNUAL.AV 4.2

DAYLY RAINFALL	70.0	9/ 8
CONTINUOUS 2DAYS	96.0	10/15
CONTINUOUS 3DAYS	116.0	10/15

NAME OF STATION : OFFICE

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*	*	*	*	*
2	0.0	0.0	0.0	0.0	0.0	0.0	22.0	*	*	*	*	*
3	0.0	0.0	50.0	0.0	0.0	0.0	0.0	*	*	*	*	*
4	0.0	0.0	0.0	40.0	0.0	50.0	0.0	*	*	*	*	*
5	0.0	0.0	0.0	0.0	0.0	0.0	47.0	*	*	*	*	*
6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*	*	*	*	*
7	0.0	0.0	0.0	0.0	0.0	50.0	0.0	*	*	*	*	*
8	0.0	0.0	0.0	50.0	0.0	70.0	0.0	*	*	*	*	*
9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*	*	*	*	*
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*	*	*	*	*
TOTAL	0.0	0.0	50.0	90.0	0.0	170.0	69.0	*	*	*	*	*
AVERAGE	0.0	0.0	5.0	9.0	0.0	17.0	6.9	*	*	*	*	*
11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*	*	*	*	*
12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*	*	*	*	*
13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*	*	*	*	*
14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*	*	*	*	*
15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*	*	*	*	*
16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*	*	*	*	*
17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*	*	*	*	*
18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*	*	*	*	*
19	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*	*	*	*	*
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*	*	*	*	*
TOTAL	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*	*	*	*	*
AVERAGE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*	*	*	*	*
21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*	*	*	*	*
22	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*	*	*	*	*
23	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*	*	*	*	*
24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*	*	*	*	*
25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*	*	*	*	*
26	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*	*	*	*	*
27	0.0	0.0	0.0	0.0	50.0	0.0	0.0	*	*	*	*	*
28	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*	*	*	*	*
29	0.0	--	0.0	0.0	0.0	0.0	0.0	*	*	*	*	*
30	0.0	--	0.0	0.0	20.0	0.0	0.0	*	*	*	*	*
31	0.0	--	0.0	--	0.0	--	0.0	*	--	*	--	*
TOTAL	0.0	0.0	0.0	0.0	70.0	0.0	0.0	*	*	*	*	*
AVERAGE	0.0	0.0	0.0	0.0	6.4	0.0	0.0	*	*	*	*	*
MONTHLY.TO	0.0	0.0	50.0	90.0	70.0	170.0	69.0	*	*	*	*	*
MONTHLY.AV	0.0	0.0	1.6	3.0	2.3	5.7	2.2	*	*	*	*	*

ANNUAL.TO 449.0 ANNUAL.AV 2.1

DAYLY RAINFALL	70.0	6/ 8
CONTINUOUS 2DAYS	120.0	6/ 7
CONTINUOUS 3DAYS	120.0	6/ 7

NAME OF STATION : OFFICE

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.1	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.9	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	18.0	0.0	0.0	45.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.0	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	7.0	0.0	51.1	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	0.0	37.0	0.0	27.6	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.2	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0	0.0	51.0	10.0	22.6	5.0	0.0	57.8	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	2.1	119.6	10.3	0.0
TOTAL	0.0	0.0	0.0	0.0	18.0	58.0	47.7	168.8	37.8	119.6	68.1	0.0
AVERAGE	0.0	0.0	0.0	0.0	1.8	5.8	4.8	16.9	3.8	12.0	6.8	0.0
11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.9	5.6	0.0
12	0.0	0.0	0.0	0.0	0.0	0.0	6.2	0.0	0.0	31.5	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.3	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	3.7	0.0	0.0
15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	0.0	28.3	0.0	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	35.6	0.0	7.3	0.0	0.0
18	0.0	0.0	0.0	0.0	0.8	20.0	0.3	29.7	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	0.0	0.0	0.0	0.0	0.8	20.0	34.8	65.8	5.3	49.4	5.6	0.0
AVERAGE	0.0	0.0	0.0	0.0	0.1	2.0	3.5	6.6	0.5	4.9	0.6	0.0
21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.2	0.0	0.0	0.0	7.1	0.0	10.5	0.0	0.0
23	0.0	0.0	0.0	0.3	0.0	5.2	0.0	0.0	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0	20.7	0.0	21.0	0.0	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0	0.0	0.0	53.0	9.4	23.9	0.0	0.0	0.0
26	0.0	42.0	0.0	0.0	0.0	7.0	0.0	4.3	13.5	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0	0.0	0.2	0.0	8.1	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.1	0.0	0.0	0.0
29	0.0	--	0.0	0.0	10.9	0.0	0.3	0.0	52.1	0.0	0.0	0.0
30	0.0	--	0.0	0.0	0.0	0.0	43.0	21.4	0.0	11.3	0.0	0.0
31	0.0	--	0.0	--	7.5	--	0.4	4.3	--	7.5	--	0.0
TOTAL	0.0	42.0	0.0	0.5	39.1	12.4	117.7	54.6	95.6	29.3	0.0	0.0
AVERAGE	0.0	5.3	0.0	0.0	3.6	1.2	10.7	5.0	9.6	2.7	0.0	0.0
MONTHLY.TO	0.0	42.0	0.0	0.5	57.9	90.4	200.2	289.2	138.7	198.3	73.7	0.0
MONTHLY.AV	0.0	1.5	0.0	0.0	1.9	3.0	6.5	9.3	4.6	6.4	2.5	0.0

ANNUAL.TO 1090.9 ANNUAL.AV 3.0

DAYLY RAINFALL	119.6	10/10
CONTINUOUS 2DAYS	126.5	10/10
CONTINUOUS 3DAYS	158.0	10/10

-------- RAINFALL 1984 YEAR UNIT : MM/DAY *---*---* PAGE-- 5

NAME OF STATION : OFFICE

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
1	0.0	0.0	0.0	0.0	0.0	11.3	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	9.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	10.5	0.0	0.0	55.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	15.6	8.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	7.2	11.2	0.0	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	0.0	25.0	10.0	28.0	0.0	0.0	0.0
7	0.0	0.0	10.2	0.0	0.0	17.5	4.0	0.0	0.0	33.0	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	0.0	20.0	1.0	6.5	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0	10.0	31.4	0.0	4.5	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	11.3	25.0	13.7	5.8	0.0	0.0	0.0	0.0
TOTAL	0.0	0.0	10.2	0.0	21.3	127.5	81.9	21.3	89.5	33.0	0.0	0.0
AVERAGE	0.0	0.0	1.0	0.0	2.1	12.7	8.2	2.1	8.9	3.3	0.0	0.0
11	0.0	0.0	0.0	0.0	13.0	129.2	0.0	0.0	26.2	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	9.7	0.0	5.0	0.0	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0	15.4	0.0	0.0	0.0	0.0	20.1	0.0	0.0
14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	10.9	10.2	0.0	0.0
15	0.0	0.0	0.0	0.0	0.0	0.0	3.1	4.3	0.0	10.4	0.0	0.0
16	0.0	0.0	3.2	0.0	7.5	0.0	21.3	0.0	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0	1.8	0.0	4.1	0.0	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0	0.0	0.0	0.0	44.4	9.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	0.0	0.0	3.2	0.0	49.7	129.2	33.5	95.7	46.1	40.7	0.0	0.0
AVERAGE	0.0	0.0	0.3	0.0	5.0	12.9	3.4	9.6	4.6	4.1	0.0	0.0
21	0.0	0.0	0.0	0.0	0.0	0.7	11.0	0.0	11.5	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0	0.0	0.0	12.5	0.0	40.1	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.0	0.0	0.0	0.0
24	0.0	0.0	0.0	23.2	0.0	0.0	0.0	0.0	6.5	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0	15.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0	15.6	4.2	0.0	0.0	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0	8.4	0.0	2.1	0.0	10.0	0.0	0.0	0.0
29	0.0	0.0	8.1	3.2	0.0	8.0	0.0	0.0	9.0	0.0	0.0	0.0
30	0.0	--	0.0	7.1	0.0	7.2	0.0	0.0	12.1	0.0	0.0	0.0
31	0.0	--	1.2	--	62.7	--	0.0	0.0	--	0.0	--	0.0
TOTAL	0.0	0.0	9.3	33.5	101.8	20.1	25.6	0.0	105.2	0.0	0.0	0.0
AVERAGE	0.0	0.0	0.8	3.3	9.3	2.0	2.3	0.0	10.5	0.0	0.0	0.0
MONTHLY.TO	0.0	0.0	22.7	33.5	172.8	276.8	141.0	117.0	240.8	73.7	0.0	0.0
MONTHLY.AV	0.0	0.0	0.7	1.1	5.6	9.2	4.5	3.8	8.0	2.4	0.0	0.0

ANNUAL.TO 1078.3 ANNUAL.AV 2.9

DAYLY RAINFALL	129.2	6/11
CONTINUOUS 2DAYS	154.2	6/10
CONTINUOUS 3DAYS	185.6	6/9

------* RAINFALL 1985 YEAR UNIT : MM/DAY *---*---* PAGE-- 6

NAME OF STATION : OFFICE

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEP.	OCT.	NOV.	DEC.
1	0.0	0.0	0.0	0.0	10.2	0.0	20.3	0.0	0.0	0.0	*	*
2	0.0	0.0	0.0	0.0	3.1	0.0	0.0	0.0	26.0	0.0	*	*
3	0.0	0.0	0.0	0.0	2.2	0.0	0.0	0.0	0.0	0.0	*	*
4	0.0	0.0	0.0	0.0	0.0	4.3	0.0	0.0	26.0	0.0	*	*
5	0.0	0.0	0.0	0.0	0.0	0.0	5.0	0.0	1.6	0.0	*	*
6	0.0	0.0	0.0	0.0	6.7	0.0	0.0	0.0	0.0	0.0	*	*
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*	*
8	0.0	0.0	0.0	0.0	12.5	0.0	0.0	0.0	0.0	0.0	*	*
9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*	*
10	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	*	*
TOTAL	0.0	0.0	0.0	0.0	34.7	7.3	25.3	0.0	53.6	0.0	*	*
AVERAGE	0.0	0.0	0.0	0.0	3.5	0.7	2.5	0.0	5.4	0.0	*	*
11	0.0	0.0	0.0	0.0	6.1	0.0	0.0	0.0	0.0	0.0	*	*
12	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	50.0	11.2	*	*
13	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.7	0.0	*	*
14	0.0	0.0	0.0	0.0	0.1	0.0	15.4	0.0	20.3	6.3	*	*
15	0.0	0.0	0.0	20.3	0.0	20.0	7.0	0.0	20.5	0.0	*	*
16	0.0	0.0	0.0	5.2	9.7	8.0	0.0	0.0	137.3	20.9	*	*
17	0.0	0.0	0.0	93.8	0.0	0.0	8.7	0.0	0.0	40.9	*	*
18	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*	*
19	0.0	0.0	0.0	0.0	0.0	0.0	0.0	26.0	8.6	0.0	*	*
20	0.0	0.0	0.0	0.0	0.0	11.5	0.0	0.0	0.0	30.9	*	*
TOTAL	0.0	0.0	0.0	119.3	16.9	39.5	31.1	26.0	237.4	110.2	*	*
AVERAGE	0.0	0.0	0.0	11.9	1.7	3.9	3.1	2.6	23.7	11.0	*	*
21	0.0	0.0	0.0	16.2	36.4	0.0	0.0	0.0	0.0	30.6	*	*
22	0.0	0.0	0.0	0.0	0.0	0.0	36.7	0.0	0.0	0.0	*	*
23	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	5.1	*	*
24	0.0	0.0	30.5	0.0	0.0	0.0	0.0	0.0	20.1	0.0	*	*
25	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*	*
26	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*	*
27	0.0	10.0	0.0	0.0	0.0	0.0	0.0	7.3	0.0	0.0	*	*
28	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	*	*
29	0.0	--	0.0	4.3	2.3	0.0	0.0	0.0	0.0	0.0	*	*
30	0.0	--	0.0	71.3	3.0	0.0	0.0	0.0	0.0	0.0	*	*
31	0.0	--	0.0	--	0.0	--	0.0	0.0	--	0.0	--	*
TOTAL	0.0	10.0	34.5	91.8	41.7	0.5	36.7	7.3	20.1	35.7	*	*
AVERAGE	0.0	1.3	3.1	9.2	3.8	0.0	3.3	0.7	2.0	3.2	*	*
MONTHLY.TO	0.0	10.0	34.5	211.1	93.3	47.3	93.1	33.3	311.1	145.9	*	*
MONTHLY.AV	0.0	0.4	1.1	7.0	3.0	1.6	3.0	1.1	10.4	4.7	*	*

ANNUAL.TO 979.6 ANNUAL.AV 3.2

DAYLY RAINFALL	137.3	9/16
CONTINUOUS 2DAYS	157.8	9/15
CONTINUOUS 3DAYS	178.1	9/14

Table-4 Monthly Rainfall (mm/month)

station : khong samaki

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1977	0.0	0.0	0.0	41.9	281.6	120.9	74.0	119.7	236.6	89.3	13.5	2.3	979.8
1978	5.6	9.7	14.6	88.0	227.0	46.7	211.7	94.1	284.1	66.4	12.2	0.0	1060.1
1979	0.0	0.0	0.0	127.7	282.5	182.1	97.5	108.9	236.1	0.0	0.0	0.0	1037.8
1980	0.0	6.5	6.5.1	64.5	191.1	224.9	97.7	351.1	142.6	112.5	11.1	0.0	1267.1
1981	0.0	18.1	34.1	128.3	119.0	39.4	140.7	61.7	107.9	53.9	49.4	0.0	752.5
1982	0.0	67.9	30.7	65.4	289.0	90.3	92.6	170.8	332.6	57.2	37.5	2.5	1126.5
1983	3.8	16.3	0.0	4.9	183.2	209.9	152.0	139.2	369.8	183.7	69.7	0.0	1332.5
1984	0.0	3.2	27.5	61.1	160.9	197.4	161.8	122.2	216.4	73.2	1.2	0.0	1024.9
Mean	1.1	15.2	21.5	72.7	216.8	139.0	126.0	146.0	240.8	79.5	24.3	0.6	1072.2
*Error	±0.8	±7.9	±8.0	±14.7	±22.5	±26.3	±17.3	±31.4	±31.3	±18.8	±8.9	±0.4	-
A	73	52	37	20	10	19	14	22	13	24	37	67	-
B	0.1	1.4	2.0	6.7	20.0	12.8	11.6	13.5	22.2	7.3	2.2	0.1	-

*Error show "mean square error"

A = Error/Mean , B : Mean Monthly Rainfall/Mean Total Rainfall

Table 5 Monthly Rainfall (mm/month)

station : Chakarat (office)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1980	0.0	53.0	0.0	37.5	154.6	417.6	260.9	156.1	274.9	232.4	0.0	0.0	1587.0
1981	—	—	—	—	—	—	69.0	53.1	260.0	236.0	20.0	—	—
1982	0.0	0.0	50.0	90.0	70.0	170.0	69.0	—	—	—	—	—	—
1983	0.0	42.0	0.0	0.5	57.9	90.4	200.2	289.2	158.7	198.3	73.7	0.0	1090.9
1984	0.0	0.0	22.7	35.5	172.8	276.8	141.0	117.0	240.8	73.7	0.0	0.0	1078.3
1985	0.0	10.0	34.5	211.1	93.3	47.3	93.1	33.3	311.1	—	—	—	—
Mean	0.0	21.0	21.4	74.5	109.7	200.4	138.9	129.7	245.1	185.1	23.4	0.0	1252.1
*Error	—	±11.1	± 9.8	±37.0	±22.9	±66.9	±31.9	±45.5	±29.0	±38.1	±17.4	—	—
A	—	52	46	50	21	33	23	35	12	21	74	—	—
B	—	1.8	1.9	6.5	9.5	17.4	12.1	11.3	21.3	16.1	2.0	—	—

*Error show "mean square error"

A : Error/Mean , B : Mean Monthly Rainfall/Mean Total Rainfall

Table 6 Monthly Rainfall (mm/month)

station : Chakarat

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1978	48.5	1.0	83.6	35.5	176.6	66.2	158.3	182.2	376.1	75.0	5.3	0.0	1208.3
1980	0.0	25.9	0.0	35.5	174.9	201.0	217.7	235.8	313.0	319.8	23.6	0.0	1547.2
1981	0.0	21.8	22.0	40.9	133.6	41.3	223.5	75.4	103.6	109.1	81.0	0.0	852.2
1982	0.0	0.0	102.6	115.1	95.5	80.5	128.6	191.6	392.1	109.8	0.0	0.0	1213.8
1983	16.0	36.6	0.0	9.6	128.5	340.2	154.3	307.7	118.8	239.9	60.7	0.0	1412.3
1984	0.0	0.0	0.0	46.2	166.6	129.1	120.3	98.5	251.4	57.6	16.2	0.0	885.9
1985	17.0	19.6	21.8	249.6	91.1	63.4	143.8	41.1	337.9	172.2	—	—	—
Mean	11.6	15.0	32.9	76.1	137.8	131.7	163.8	161.8	157.1	154.8	31.1	0.0	1186.6
*Error	± 6.8	± 5.6	±16.1	± 51.4	±15.8	±40.2	±15.5	±35.9	±64.3	±36.1	±13.3	—	—
A	59	37	49	41	10	31	9	22	41	23	43	—	—
B	1.1	1.4	3.1	7.1	12.8	12.3	15.3	15.1	14.6	14.4	2.9	—	—

Error show "mean square error"

A : Error/Mean B : Mean Monthly Rainfall/Mean Total Rainfall

Table - 7 CLIMATOLOGICAL DATA FOR THE PERIOD 1951 - 1980 (Nakhon Ratchasima)

Station	NAKHON RATCHASIMA	Elevation of station above MSL.	187 meters
Index Station	48 431	Height of barometer above MSL.	188 meters
Latitude	14° 58' N.	Height of thermometer above ground	1.25 meters
Longitude	102° 05' E.	Height of wind vane above ground	11.30 meters
		Height of raingauge	1.00 meters

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Pressure (+ 1000 or 900 mb.)													
Mean	13.93	11.85	10.11	08.61	07.09	06.16	06.22	06.24	07.71	10.81	13.11	14.39	09.69
Ext. Max.	28.58	24.58	23.88	21.46	15.78	13.86	14.86	13.36	15.26	19.70	22.98	25.66	28.58
Ext. Min.	03.01	01.78	00.86	98.95	99.34	97.28	97.38	97.26	98.98	01.74	03.68	03.58	97.26
Mean daily range	5.82	6.15	5.94	5.43	4.80	4.32	4.25	4.45	4.65	4.79	4.87	5.34	5.07
Temperature (°C.)													
Mean	22.9	25.7	28.1	29.0	28.4	28.1	27.6	27.3	26.5	25.9	24.2	22.5	26.4
Mean Max.	31.0	33.5	35.9	36.5	35.0	34.1	33.4	32.9	31.9	30.8	29.8	29.6	32.9
Mean Min.	16.2	19.3	22.0	23.5	24.0	23.9	23.6	23.4	23.1	22.3	19.5	16.6	21.5
Ext. Max.	37.8	40.6	42.5	42.7	41.4	40.1	40.0	38.1	38.0	35.3	35.3	35.8	42.7
Ext. Min.	4.9	10.6	11.6	15.7	20.7	21.2	21.1	20.5	19.7	16.2	9.1	6.2	4.9
Relative Humidity (%)													
Mean	67.0	65.0	65.0	68.0	76.0	76.0	77.0	78.0	83.0	81.0	76.0	69.0	73.0
Mean Max.	88.6	86.4	86.1	87.2	91.3	91.1	91.4	92.2	95.1	94.2	92.0	90.4	90.5
Mean Min.	43.0	40.9	40.4	43.9	53.4	55.2	56.5	58.6	64.0	63.0	56.2	48.6	52.0
Ext. Min.	22.0	14.0	12.0	19.0	23.0	23.0	35.0	35.0	39.0	31.0	27.0	20.0	12.0
Dew Point (°C.)													
Mean	15.8	17.8	19.2	21.8	23.2	23.1	22.0	22.8	23.2	22.2	19.3	16.6	20.6
Evaporation (mm.)													
Mean - Pan	146.4	152.0	193.0	194.4	182.9	173.4	168.9	159.8	152.2	137.2	134.8	140.5	1915.5
Cloudiness (0 - 8)													
Mean	2.9	3.4	3.8	4.5	5.6	6.3	6.5	6.8	6.5	5.1	3.9	3.2	4.9
Sunshine Duration (hr.)													
Mean	283.0	244.7	248.4	245.3	244.5	207.4	194.7	185.8	166.1	225.0	256.6	277.1	2780.6
Visibility (km.)													
0700 L.S.T.	3.7	3.4	3.6	5.1	8.0	9.6	9.6	9.5	7.7	6.4	5.1	4.1	6.3
Mean	7.5	6.3	6.2	7.6	9.8	10.6	10.6	10.3	9.5	9.7	9.2	8.3	8.8
Wind (Knots)													
Prevailing wind	NE	NE	NE	SW	SW	SW	W	W	W	NE	NE	NE	-
Mean wind speed	2.5	2.6	2.5	2.9	2.8	3.7	3.8	3.6	2.4	2.7	3.2	2.9	-
Max. wind speed	28 ENE	37 E	45 SSW	53 S	46 SE	58 SW	41 W	35 SE	33 S, WSW	54 SE	44 NE,E	40 NE	58 SW
Rainfall (mm.)													
Mean	3.5	22.9	55.2	70.0	157.6	116.2	131.0	126.9	263.3	157.7	30.0	3.1	1137.4
Mean rainy days	1.2	2.9	6.1	7.9	15.9	15.0	15.6	16.5	19.5	12.1	3.8	0.9	117.4
Greatest in 24 hr.	17.1	59.7	97.3	91.8	134.5	114.8	104.1	72.3	143.7	136.0	108.6	20.6	143.7
Day/Year	26/54	23/65	10/74	4/73	13/52	27/69	10/75	27/64	12/68	25/76	9/55	3/70	12/68
Number of days with													
Haze	27.5	26.9	29.1	22.1	6.5	0.9	0.6	1.1	2.3	9.9	17.3	24.2	168.4
Fog	3.2	3.1	2.6	2.9	1.3	0.3	0.3	0.2	1.0	2.5	2.3	2.4	22.0
Hail	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Thunderstorm	0.4	2.0	7.5	13.4	16.9	8.5	8.2	7.5	11.3	7.0	0.6	0.0	83.3
Squall	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2

Remark : 1. Evaporation 1962 - 1980
2. Sunshine Duration 1957 - 1980

original by "CLIMATOLOGICAL DATA OF THAILAND 30 YEARS PERIOD METOLOGICAL DEPARTMENT MINISTRY OF COMMUNICATIONS

การทดสอบหาความถ่วงจำเพาะของดิน

ดินตัวอย่าง ตัวอย่างที่ ๑ (1)

แหล่งที่เก็บ อ.คง จ.นครราชสีมา

ทดสอบเมื่อ ๓๐ ตุลาคม ๒๕๓๘

ลำดับที่	Determination การทดสอบ	สัญญลักษณ์	หน่วย	ครั้งที่ ๑	ครั้งที่ ๒
1	น.น. ขวด + น้ำ + ดิน Weight of pycnometer + Water + soil	W_1	กรัม	992.70	919.50
2	อุณหภูมิ Temperature	T	°C	27	28.5
3	น.น. ขวด + น้ำ Weight of pycnometer + Water	W_2	กรัม	665.80	662.10
4	น.น. ดินแห้ง Weight of dry soil	W_s	กรัม	417.70	417.70
5	ถ.พ. ของน้ำที่อุณหภูมิ T Specific gravity of water at temparature °C	G_T	-	.9965	.9961
6	ถ.พ. ของดิน Specific gravity	G_s	-	2.588	2.596

หมายเหตุ $G_s = \frac{G_T \cdot W_s}{W_s - W_1 + W_2}$

ผู้ทดสอบ .....

วิศวกร .....

หัวหน้างานวิเคราะห์วิจัย .....

.../.../...

งานวิเคราะห์วิจัย
ฝ่ายสำรวจและออกแบบ
ศูนย์ ฯ รพช. นครราชสีมา

ได้ตรวจสอบรายละเอียดครบถ้วนถูกต้องแล้ว
ลงชื่อ ..... หัวหน้าฝ่ายฯ

Table-8-1 Specific gravity of Test pit 1

การทดสอบความถ่วงจำเพาะของดิน

ดินตัวอย่าง ตัวอย่างที่ ๒ (2)

แหล่งที่เก็บ อ.คง จ.นครราชสีมา

ทดสอบเมื่อ ๓๐ ตค. ๒๘

ลำดับที่	การทดสอบ	สัญญลักษณ์	หน่วย	ครั้งที่ ๑	ครั้งที่ ๒
1	นน.ขวด + น้ำ + ดิน	W_1	กรัม	921.50	918.50
2	อุณหภูมิ	T	°C	27	28.5
3	นน.ขวด + น้ำ	W_2	กรัม	665.80	662.10
4	นน.ดินแห้ง	W_s	กรัม	415.00	415.00
5	ถพ.ของน้ำที่อุณหภูมิ T	G_T	-	.9965	.9965
6	ถพ.ของดิน	G_s	-	2.596	2.606

หมายเหตุ $G_s = \dfrac{G_T \cdot W_s}{W_s - W_1 + W_2}$

ผู้ทดสอบ .....

วิศวกร .....

หัวหน้างานวิเคราะห์วิจัย .....

๔/๑๑/๒๘

ได้ข้าระเงินค่าทดสอบถูกต้องครบถ้วนแล้ว

ตรวจ.....หัวหน้าฝ่ายฯ

งานวิเคราะห์วิจัย

ฝ่ายสำรวจและออกแบบ

ศูนย์ ฯ รพช.นครราชสีมา

Table - 8-2 Specific gravity of Test pit 2

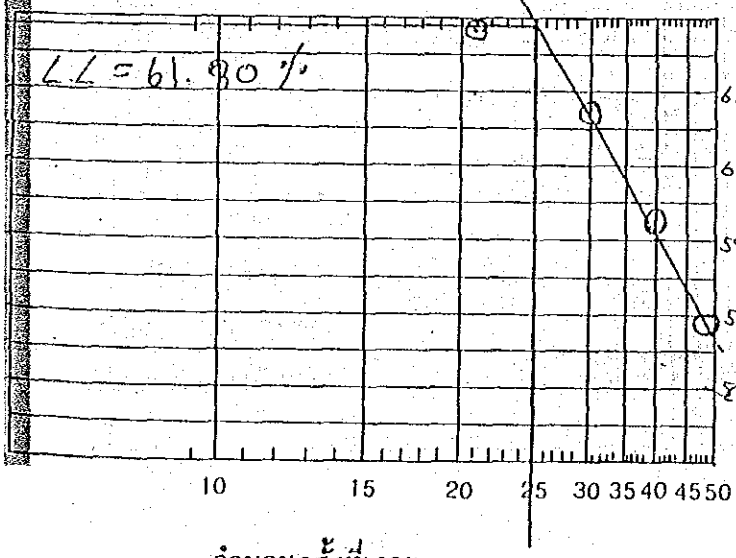
Table-9-1 การทดสอบ ATTERBERG LIMITS

ตัวอย่างที่หลุมหลุมที่ 1 โครงการ [illegible]

ชนิดของวัสดุ ดิน วันที่ทดสอบ 30 ก.ค. 28

PLASTIC LIMIT (P.L)					
ทดสอบครั้งที่ Determination	1	2	3	4	5
หมายเลขภาชนะ Number of container	93	A6	105		
น.น. ดินชื้น + ภาชนะ Wet soil + container กรัม	37.76	37.00	36.A5		
น.น. ดินแห้ง + ภาชนะ Dry soil + container กรัม	35.A6	3A.88	3A.A8		
น.น. น้ำ Weight of Water กรัม	2.30	2.12	1.97		
น.น. ภาชนะ Weight of container กรัม	2A.3A	2A.73	2A.58		
น.น. ดินแห้ง Weight of dry soil กรัม	11.12	10.15	9.90		
เปอร์เซนต์ความชื้น (P.L) Water content %	20.68	20.89	19.90		
เปอร์เซนต์ความชื้นเฉลี่ย Average of water content %	—	20.A9	—		

LIQUID LIMIT (L.L)					
หมายเลขภาชนะ Number of container	A66	A60	A83	A142	
น.น. ดินชื้น + ภาชนะ Wet soil + container กรัม	53.13	52.25	50.30	53.8A	
น.น. ดินแห้ง + ภาชนะ Dry soil + container กรัม	A2.22	A2.00	A0.89	A3.15	
น.น. น้ำ Weight of water กรัม	10.91	10.25	9.A1	10.69	
น.น. ภาชนะ Weight of container กรัม	2A.58	25.11	25.02	2A.68	
น.น. ดินแห้ง Weight of dry soil กรัม	17.6A	16.89	15.87	18.A7	
เปอร์เซนต์ความชื้น Water content %	61.85	60.69	59.29	57.88	
จำนวนที่เคาะ	21	30	A0	A9	



LL = 61.80 %

PL = 20.49 %

PI = A1.31 %

(N. Seng) ผู้ทดสอบ

วิศวกร/หัวหน้าช่างผู้ควบคุม

หัวหน้างานวิเคราะห์

4 / ม.ค. / 28

ได้ชำระเงินค่าทดสอบวัสดุครบถ้วนถูกต้องแล้ว

ลงชื่อ ..... หัวหน้าฝ่ายฯ

แบบฟอร์ม วส. 12

ฝ่ายสำรวจและออกแบบ

ศูนย์ปฏิบัติการ รพช. นครราชสีมา

Table - 9-2 การทดสอบ ATTERBERG LIMITS

ตัวอย่างที่ หลุมขุดเจาะที่ 2 โครงการ ก่อสร้างหอพักนักศึกษา ม.สงขลานครินทร์

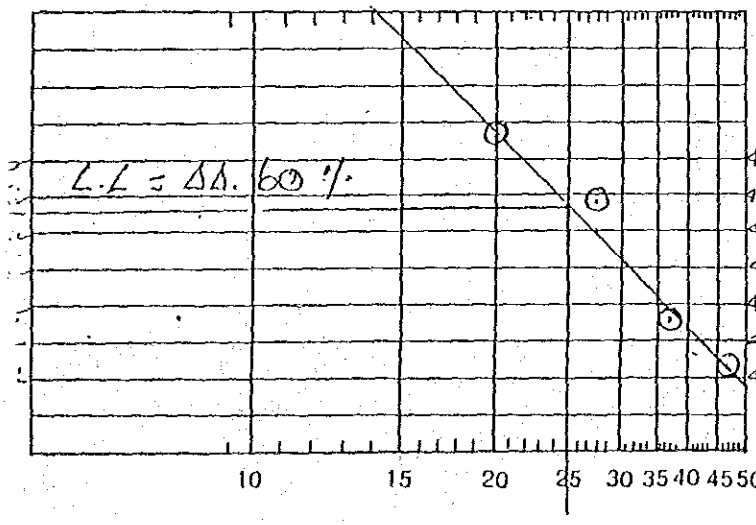
ชนิดของวัสดุ ดิน วันที่ทดสอบ 30 ก.ค. 28

PLASTIC LIMIT (P.L)

ทดสอบครั้งที่		1	2	3	4	5
หมายเลขภาชนะ		A16	111	AY5		
น.น. ดินชื้น + ภาชนะ	กรัม	36.26	36.80	35.68		
น.น. ดินแห้ง + ภาชนะ	กรัม	34.15	34.60	33.60		
น.น. น้ำ	กรัม	2.11	2.20	2.08		
น.น. ภาชนะ	กรัม	24.21	24.78	24.32		
น.น. ดินแห้ง	กรัม	9.94	9.82	9.28		
เปอร์เซนต์ความชื้น (P.L)	%	21.23	22.40	22.41		
เปอร์เซนต์ความชื้นเฉลี่ย	%	-	22.01	-		

LIQUID LIMIT (L.L)

หมายเลขภาชนะ		91	087	A2	123	
น.น. ดินชื้น + ภาชนะ	กรัม	53.20	51.20	52.41	51.82	
น.น. ดินแห้ง + ภาชนะ	กรัม	44.00	43.00	44.28	43.95	
น.น. น้ำ	กรัม	9.20	8.20	8.13	7.87	
น.น. ภาชนะ	กรัม	24.33	24.74	24.73	24.41	
น.น. ดินแห้ง	กรัม	19.67	18.26	19.55	19.54	
เปอร์เซนต์ความชื้น	%	46.77	44.91	41.57	40.28	
จำนวนที่เคาะ		20	28	38	44	



LL = 44.60 %

PL = 22.01 %

PI = 22.59 %

ผู้ทดสอบ

วิศวกร/นายช่างผู้ควบคุม

หัวหน้างานวิเคราะห์

จำนวนครั้งที่เคาะ

ได้ชำระเงินค่าทดสอบโดยครบถ้วนถูกต้องแล้ว
ลงชื่อ ..... หัวหน้าฝ่ายฯ

แบบฟอร์ม วส. 12
ฝ่ายสำรวจและออกแบบ
ศูนย์ปฏิบัติการ รพช. นครราชสีมา

SOIL MECHANICS LABORATORY

COMPACTION TEST

Soil sample _____ Test No. 1

Date. 30th OCTOBER 1985

Tested by MR. SUTHER TANOMGITNORUK

Location KONG., RACHASRIMA. Type Test Dry preparation and repetitive method

Boring No. 2. Mold : volume 956.43 cm^3

Sample No. _____ : weight 2029.20 gm.

Specific gravity. G_s = 2.60 RAMMER: WEIGHT 5.5 lbs

NUMBER OF LAYER : 3

DENSITY NUMBER OF TAMPING PER EACH LAYER 25.

Determination No.		1	2	3	4	5	6
Weight mold + compacted soil	g	3905.00	3835.00	3969	4002	3915	3895
Weight mold	g	2029.20	2029.20	2029.20	2029.20	2029.20	2029.20
Weight compacted soil	g	1697.80	1807.80	1941.80	1979.80	1887.80	1869.80
Wet density	g/cc	1.754	1.890	2.030	2.070	1.974	1.932
Dry density, γ_d	g/cc	1.653	1.738	1.812	1.793	1.623	1.560
Void ratio e		0.57	0.50	0.43	0.45	0.60	0.67
Porosity n	%	36	33	30	31	38	40
WATER CONTENT							
Determination No.							
Container No.		NO_3-1	NO_3-2	NO_2-1	NO_4-1	NO_1-2	NO_4-2
Weight container + wet soil	g	85.64	81.25	77.01	68.09	94.10	130.00
Weight container + dry soil	g	81.45	75.99	66.80	55.30	80.00	109.00
Weight water, Ww	g	4.19	5.26	6.21	6.79	14.10	23.00
Weight container	g	12.59	15.68.	15.25	11.35	14.20	10.55
Weight dry soil, Ws	g	68.86	60.31	51.55	43.95	65.30	96.45
Water content, w	%	6.088	8.722	12.047	15.449	21.593	23.849

REMARKS:-

$$e = \frac{\gamma_w}{\gamma_d} G_s - 1 \quad , \quad \gamma_d = \frac{\gamma_w}{\frac{1}{G_s} + \frac{w}{S_r}}$$

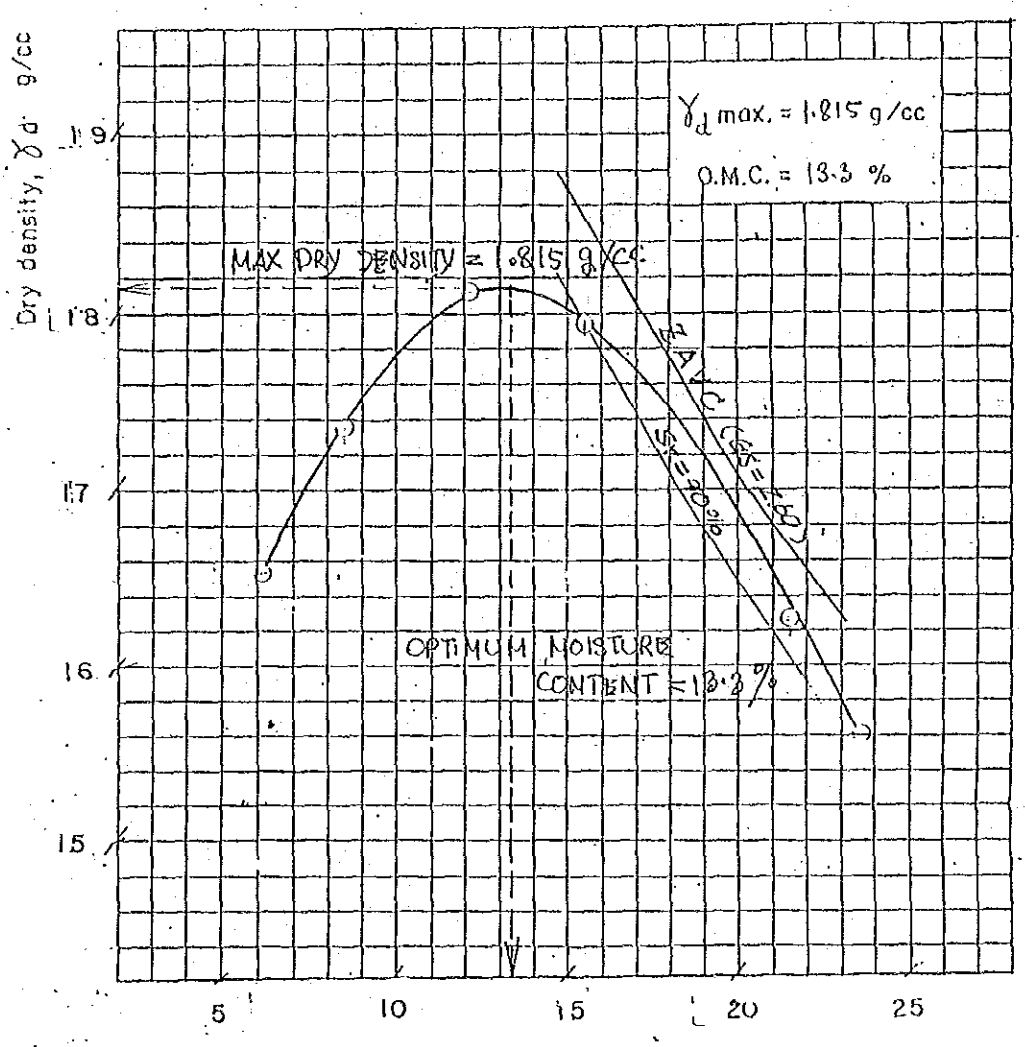
$$n = \frac{e}{1+e} \times 100 \quad (\%)$$

Table - 10-1 Compaction Test

Location KONG. 2 RACHASRIMA. Date 30th OCTOBER 1985

Boring No. 2. Test No. 1.

Type Test STANDARD COMPACTION Tested by MR. SUTHEP TANOMGITNURUK.



– continue –

SOIL MECHANICS LABORATORY

DEPARTMENT OF COOPERATIVE PROMOTION, ENGINEERING DIVISION

COMPACTION TEST

Soil sample _____ Test No. 1.

Date. 1ST NOVEMBER 1985

Tested by MR. SUTHEP TANONGITANURUK.

Location _____ Type Test Dry preparation and repetitive method

Boring No. 1. Mold : volume 956.42 cm³

Sample No. _____ : weight 2028.29 gm.

Specific gravity. G_s = 2.59 Rammer : weight 5.5 lbs.

NUMBER OF LAYER : 3

DENSITY NUMBER OF TAMPING PER EACH LAYER : 25

Determination No.		1	2	3	4	5	6
Weight mold + compacted soil	g	3722.00	3826.00	3865	3968	3631	
Weight mold	g	2027.29	2029.29	2027.29	2029.29	2029.29	
Weight compacted soil W	g	1694.71	1798.71	1837.71	1740.71	1603.71	
Wet density γ_t	g/cc	1.772	1.881	1.922	1.820	1.677	
Dry density, γ_d	g/cc	1.593	1.634	1.603	1.470	1.306	
Void ratio e		0.63	0.59	0.62	0.76	0.98	
Porosity n		39	37	38	43	49	
WATER CONTENT							
Determination No.							
Container No.		NO_3-2	NO_4-1	NO_2-1	NO_1-2	NO_4-2	
Weight container + wet soil	g	65.31	79.61	67.92	66.00	60.00	
Weight container + dry soil	g	60.30	70.61	59.00	56.09	49.00	
Weight water, Ww	g	5.01	9.00	8.92	9.91	11.00	
Weight container	g	15.69	11.01	14.20	14.45	10.30	
Weight dry soil, Ws	g	44.61	59.60	44.80	41.64	38.70	
Water content, w	%	11.23	15.10	19.91	23.80	28.42	

REMARKS :-

$$e = \frac{\gamma_w}{\gamma_d} G_s - 1 \quad , \quad \gamma_d = \frac{\gamma_w}{\frac{1}{G_s} + \frac{w}{S_r}}$$

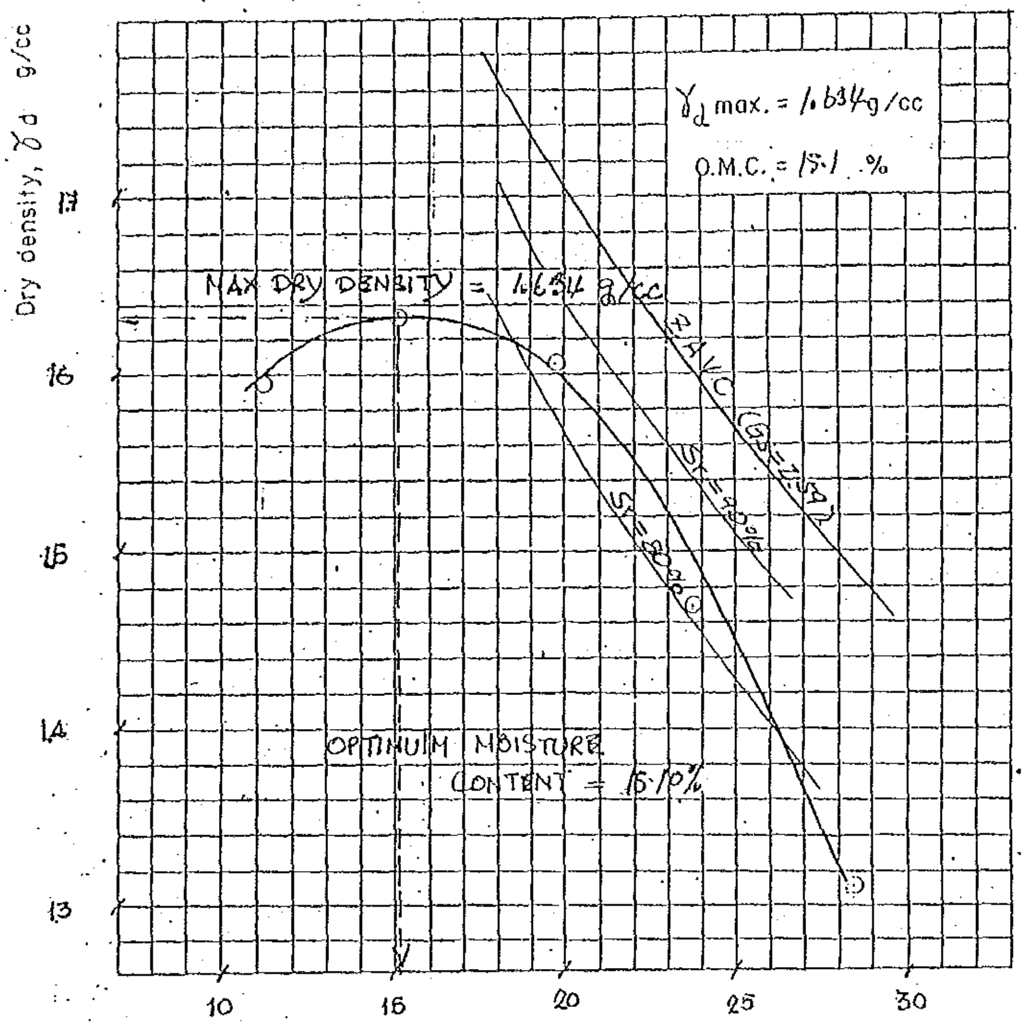
$$n = \frac{e}{1+e} \times 100\ (\%)$$

Table - 10-2 Compaction Test

Location ______ Date. 1st NOVEMBER 1985.

Boring No. 1 Test No. 1.

Type Test STANDARD COMPACTION. Tested by ~~MR. SUTHEP TANCHGITNAVRUK.~~



- continue -

Table -11-1 SIEVE ANALYSIS

Soil sample : _____

_____

_____

Location : KONG. RACHASRIMA.

Boring No. 1.

Sample No _____

Soil sample weight. _____

Container No. _____

Wt. Container + Dry soil in g 1294.88 gm

Wt. Container in g 294.88 gm

Wt. Dry soil Ws, in g. 1000.00 gm

Specific Gravity, Gs, _____

Test No. 1.

_____

Date 31. OCTOBER 1985

_____

Tested by MR. SUTHEP TANOMGITNURUK.
นาย สุเทพ ทนงกิจนุรักษ์

_____

Sieve No.	Sieve opening in mm.	Wt. sieve in g.	Wt. sieve + soil in g.	Wt. soil returned in g	Percent Retained	Cumulative Percent Retained	Percent Finer
3/4"	19.00 m.m	502.45	502.45	—	—	—	100.00
3/8"	9.50 m.m	449.70	493.90	16.20	1.42	1.42	98.58
4	4.75 m.m	466.20	677.40	211.20	21.16	22.58	77.42
8	2.36	423.90	723.20	299.30	29.99	52.57	47.43
10	2.00	418.05	472.20	54.15	5.43	58.00	42.00
16	1.18	412.20	528.80	116.60	11.68	69.68	30.32
30	0.60	352.00	435.20	83.20	8.34	78.02	21.98
40	0.425	347.75	377.20	29.45	2.95	80.97	19.03
50	0.30	320.00	344.50	24.50	2.45	83.42	16.58
100	0.150	309.85	372.49	63.14	6.33	89.75	10.25
200	0.075	302.50	356.00	53.50	5.36	95.11	4.89
PAN.	—	294.88	343.70	48.82	4.89	100.00	0.00
				Σ 998.06			

ERROR = 1.94 gm

Boring No. 1. Date 31 OCTOBER 1985 Test No. 1.

Location : KONG. RACHASRIMA. Tested by MR SUTHEP TANOMGITNURUK.

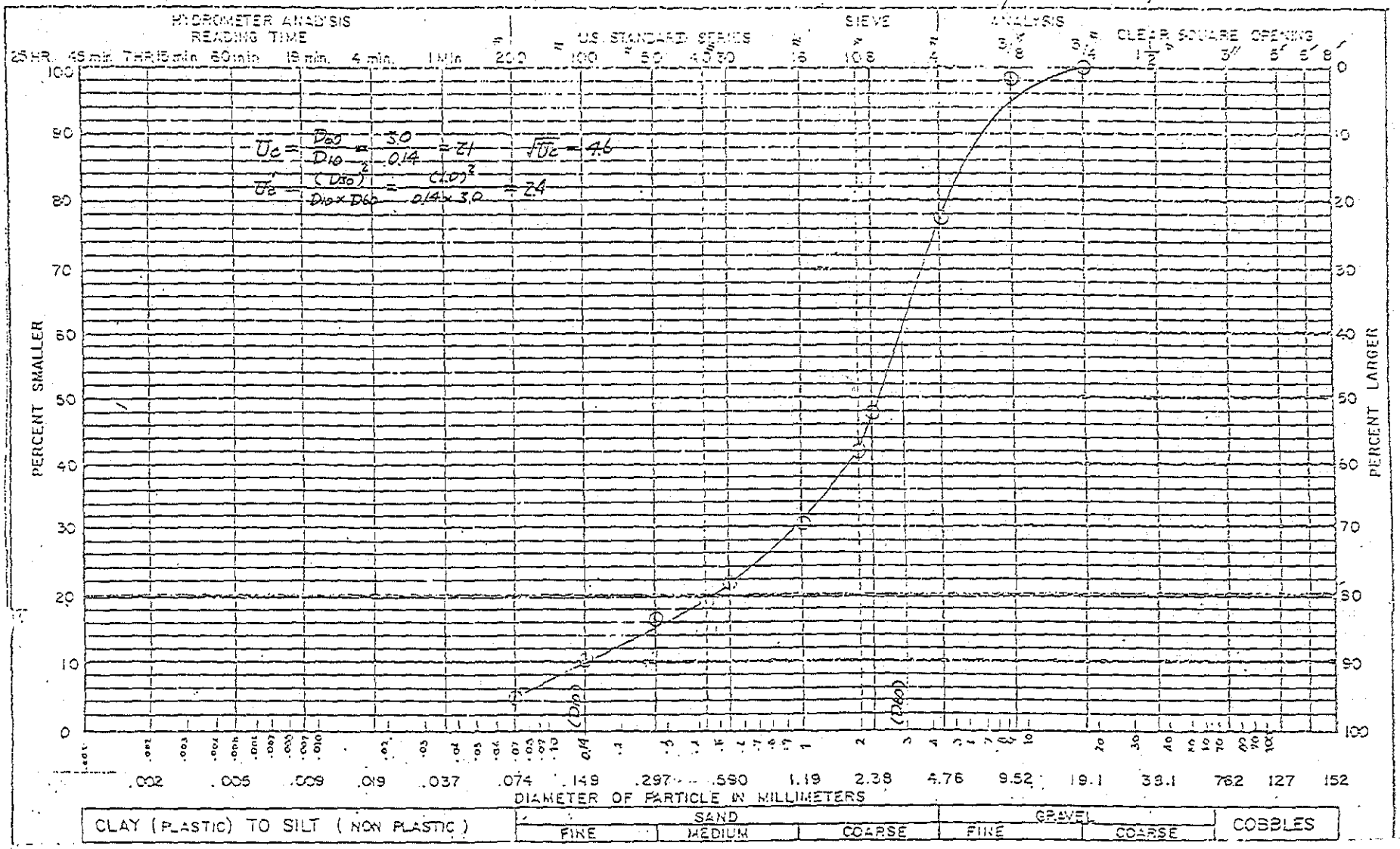


Table-11-2 SIEVE ANALYSIS

Soil sample : _____

_____

_____

Location : KONG., RACHASRIMA.

Boring No. 1.

Sample No _____

Soil sample weight. _____

Container No. _____

Wt. Container + Dry soil in g 1294.75 gm

Wt. Container in g 294.75 gm.

Wt. Dry soil Ws, in g. 1000 gm.

Specific Gravity, Gs, _____

Test No. 2.

_____

Date 1ST NOVEMBER 1985.

_____

Tested by MR. SUTHEP TANOMGITNURUK. MR. SOMN. DHAMMAYASNO.

_____

Sieve No.	Sieve opening in mm.	Wt. sieve in g.	Wt. sieve + soil in g.	Wt. soil returned in g	Percent Retained	Cumulative Percent Retained	Percent Finer
3/4"	19.00 m.m	507.45	—	—	—	—	100.00
3/8"	9.50 m.m	479.60	486.09	6.49	0.65	0.65	99.35
4	4.75	466.80	676.20	210.40	21.07	21.72	78.28
8.	2.36	423.80	699.69	275.89	27.63	49.35	50.65
10	2.00	418.00	471.88	53.88	5.40	54.75	45.25
16.	1.18	412.50	521.58	109.08	10.92	65.67	34.33
30	0.60	351.85	441.30	89.45	8.96	74.63	25.37
40	0.425	347.80	382.35	34.55	3.46	78.09	21.91
50	0.300	320.00	347.70	27.70	2.77	80.86	19.14
100	0.150	309.50	387.40	77.90	7.80	88.66	11.34
200	0.075	302.90	358.45	55.55	5.56	94.22	5.78
PAN.	—	294.75	352.50	57.75	5.78	100.00	0.00

Σ 998.64 gm

ERROR 1.36 gm

Boring No. 1. Date 1st. NOVEMBER 1985 Test No. 2.

Location : KONG., RACHASRINA. Tested by NR SUTHEP. TANOMGITJURUK.

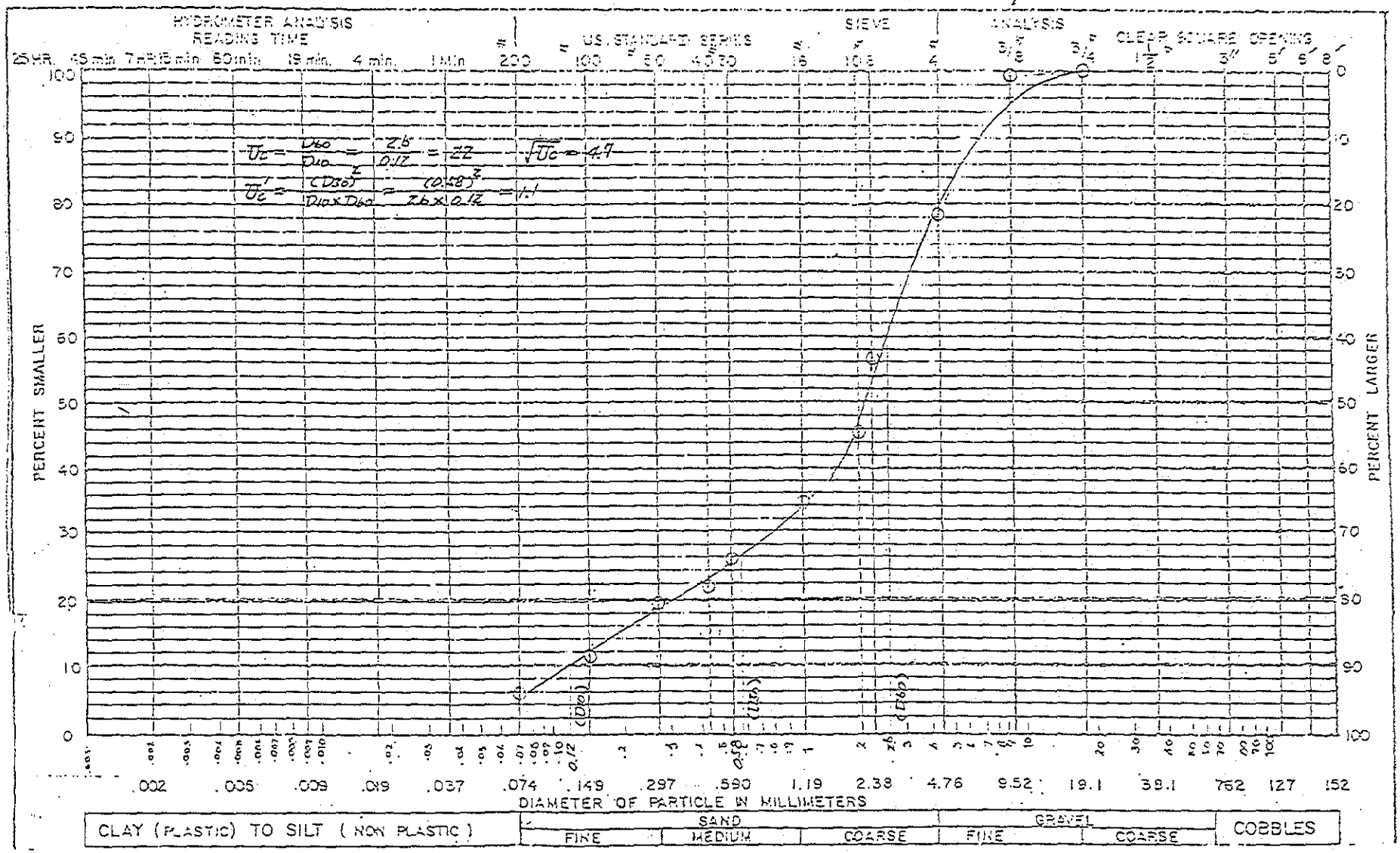


Table -11-3 SIEVE ANALYSIS

Soil sample : ______

Location : KONG. RACHASRIMA.

Boring No. 2.

Sample No 2.

Soil sample weight. ______

Container No. ______

Wt. Container + Dry soil in g 1294.70 gm

Wt. Container in g 294.70 gm

Wt. Dry soil Ws, in g. 1000 gm.

Specific Gravity, Gs, ______

Test No. 1.

Date 29th OCTOBER 1985

Tested by MR. SUTHEP. TANONGITNGRUK
[illegible]

Sieve No.	Sieve opening in mm.	Wt. sieve in g.	Wt. sieve + soil in g.	Wt. soil returned in g	Percent Retained	Cumulative Percent Retained	Percent Finer
3/4"	19.00 m.m	506.80	506.80	—	—	—	100.00
3/8"	9.50	479.30	565.35	86.05	8.61	8.61	91.39.
4	4.75	466.15	763.20	297.05	29.72	38.33	67.00
8	2.36	423.70	684.52	260.82	26.10	64.43	35.57
10	2.00	414.90	466.70	48.80	4.88	69.31	30.69
16	1.18	412.20	511.89	99.69	9.98	79.29	20.71
30	0.60	351.40	420.15	68.75	6.88	86.17	13.83
40	0.425	347.60	370.82	23.22	2.32	88.49	11.51
50.	0.30	319.90	336.30	16.40	1.64	90.13	9.87
100.	0.15	309.20	348.35	39.15	3.92	94.05	5.95
200	0.075	302.70	330.70	28.00	2.80	96.85	3.15
PAN.	—	294.70	326.18	31.48	3.15	100.00	0.00

Σ 999.41

ERROR 0.59 gm

Boring No. 2 Date 29th OCTOBER 1985 Tested by MR SUTHEP TANOMGITNUKUK

Test No. 1 Location : KONG , RACHASRIMA

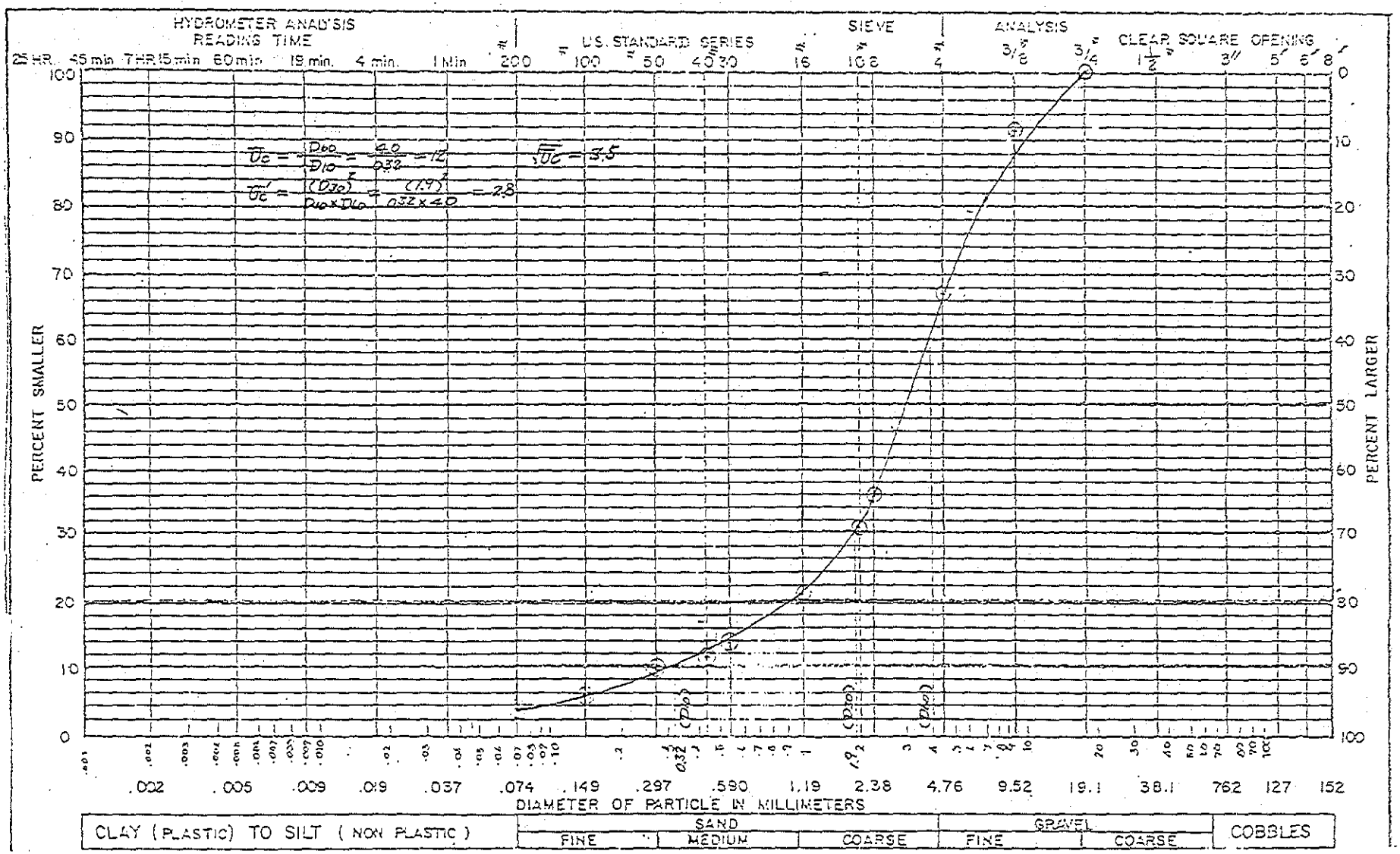


Table - 11-4 SIEVE ANALYSIS

Soil sample : _____

Location : KONG., RACHASRIMA.

Boring No. 2

Sample No 2

Soil sample weight. _____

Container No. _____

Wt. Container + Dry soil in g 294.70 gm

Wt. Container in g 294.70 gm.

Wt. Dry soil Ws, in g. _____

Specific Gravity, Gs, _____

Test No. 2.

Date _____

Tested by MR. SUTHEP TANOMCHITNURUK.
นาย สุทธิพ์ ทนมชิตนุรักษ์
28.01.28.

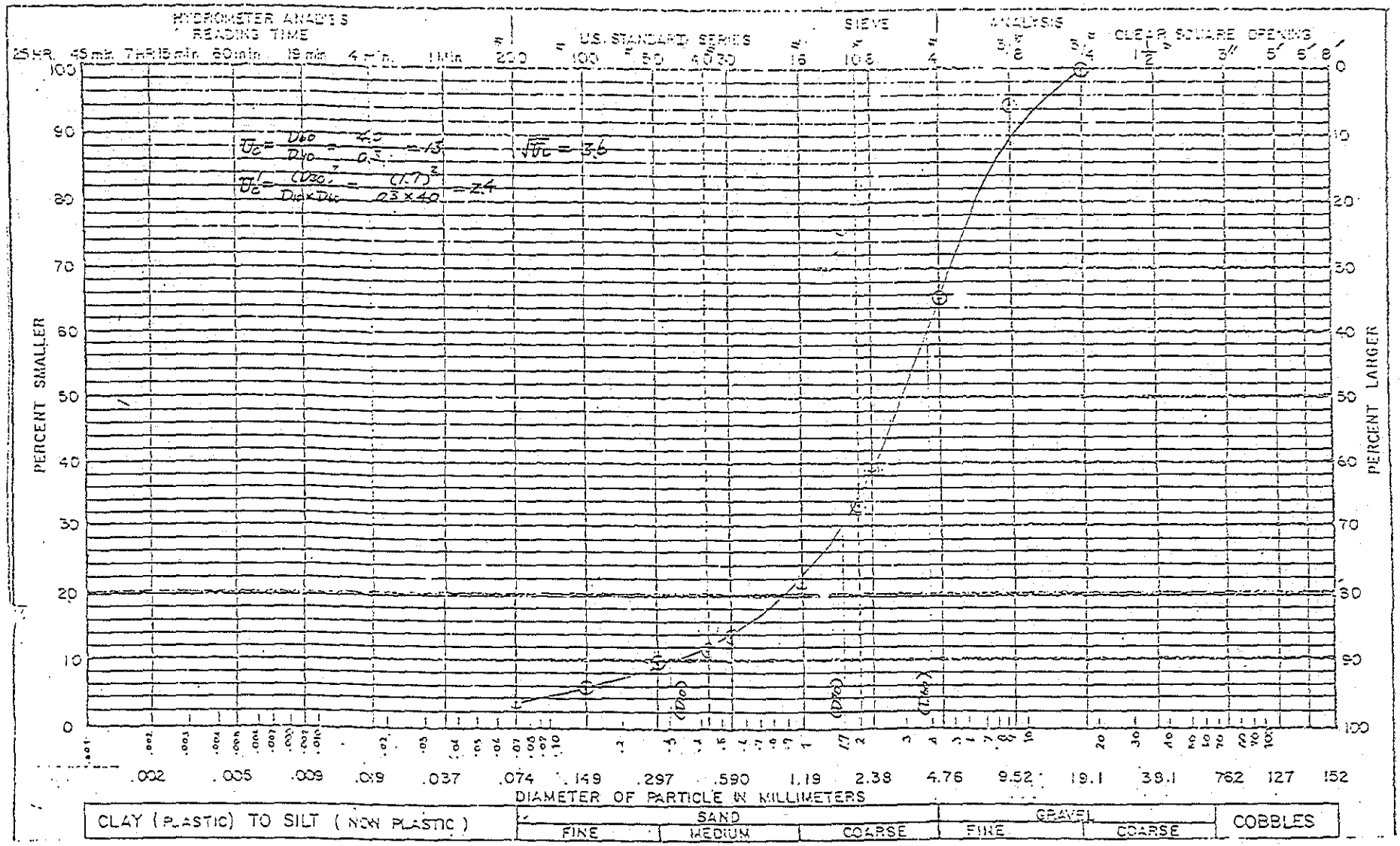
Sieve No.	Sieve opening in mm.	Wt. sieve in g.	Wt. sieve + soil in g.	Wt. soil returned in g	Percent Retained	Cumulative Percent Retained	Percent Finer
3/4"	19.00 m.m	507.10	—	—	—	—	100.00
3/8"	9.50	429.49	535.00	55.51	5.56	5.56	94.44
4	4.75	466.10	757.57	291.47	29.20	34.76	65.24
8	2.36	423.72	687.36	263.64	26.42	61.18	38.82
10	2.00	418.00	474.70	56.70	5.68	66.86	33.14
16	1.18	412.20	527.40	115.20	11.54	78.40	21.60
30	0.60	352.20	429.51	77.31	7.75	86.15	13.85
40	0.425	347.82	371.81	23.99	2.40	88.55	11.45
50	0.30	320.20	337.00	16.80	1.68	90.23	9.77
100	0.15	309.82	348.05	38.23	3.83	94.06	5.94
200	0.075	302.60	330.80	28.20	2.83	96.89	3.11
PAN.	—	294.20	325.75	31.05	3.11	100.00	0.00

Σ 998.10 gm

ERROR 1.9 gm

Boring No. 2. Date 28th. October. 1985 Test No. 2.

Location : KONG, RACHASRINA. Tested by MR.SUTHEP TANOMGITNURUK.



Determination		Test pit 1		Test pit 2	
		NO.1	NO.2	NO.3	NO.4
Specimen	Weight m ; kg	1.580	1.500	3.010	2.930
	Volume V ; cm^3	816.2	703.7	1,436.5	1,447.3
Wet density $\rho t, m/V$ (g/cm^3)		1.936	2.132	2.095	2.024
Water contents (%)		14.67	17.20	15.99	15.09
Dry density ρd $\rho t/(1+w/100)$ (g/cm^3)		1.688	1.819	1.806	1.759
Specific gravity Gs		2.592	2.592	2.601	2.601
Void ratio e ($Gs \cdot \rho w/\rho d - 1$)		0.536	0.425	0.440	0.479
Degree of saturation Sr $Gs \cdot w/e$ (%)		70.94	100.00	94.52	81.94

Table 12-1 Field density test.

SOIL MECHANICS LABORATORY

DEPARTMENT OF COOPERATIVE PROMOTION, ENGINEERING DIVISION

WATER CONTENT OF SOIL

Soil sample ______________________ Test No. ______________________

Date. 28 October. 1985.

Tested by MR. SUTHEP. TANONGITNURUK. [illegible]

Location KONG. RACHASRINA.

Boring No. ______________________

Sample No. NO1, NO2, NO3 - NO4.

Specific gravity, G_s ______________________

WATER CONTENT		NO1		NO2		NO3	
Determination No.		1	2	1	2	1	2
Container No.		A-1	A-2	B-1	B-2	C-1	C-2
Weight container + wet soil	g	68.40	100.27	85.90	100.00	99.00	102.39
Weight container + dry soil	g	61.05	89.40	75.40	87.90	87.00	90.59
Weight water, Ww	g	7.35	10.87	10.50	12.10	12.00	11.80
Weight container	g	11.30	14.75	15.30	16.40	12.80	15.99
Weight dry soil, Ws	g	49.75	74.65	60.10	71.50	74.20	74.60
Water content, W	%	14.77	14.56	17.47	16.92	16.17	15.81

WATER CONTENT		NO4					
Determination No.		1	2				
Container No.		D-1	D-2				
Weight container + wet soil	g	116.90	97.20				
Weight container + dry soil	g	103.40	85.60				
Weight water, Ww	g	13.50	11.60				
Weight container	g	11.40	10.80				
Weight dry soil, Ws	g	92.00	74.80				
Water content, W	%	14.67	15.50				

REMARKS:– NO.1, NO.2 : Test pit 1

$$\bar{w} = \frac{1}{4}(14.77+14.56+17.47+16.92) = 15.9 \ (\%)$$

NO.3, NO.4 : Test pit 2

$$\bar{w} = \frac{1}{4}(16.17+15.81+14.67+15.50) = 15.5 \ (\%)$$

Table 12-2 Water content of soil

Table 13 Suitability or soil for banking and foundation

Symbol	Suitability for banking	Compaction	Dry density (t/m^3)	Permeability cm/sec.	Suitability for foundation	Adjustment for permeability
GW	Very good used for pervious zone of bank or dam	Good by tractor, rubber tired roller, steel wheel roller	2.00 ∿ 2.16	$> 10^{-2}$	Good	Cut off wall required
GP	Good used for pervious zone of bank or dam	Good by tractor, rubber tired roller, steel wheel roller	1.84 ∿ 2.00	$> 10^{-2}$	Good	Cut off wall required
GM	Fair not so suitable as impervious zone, but used for impervious core or blanket	Good by close management, by rubber tired roller, sheeps food roller etc.	1.92 ∿ 2.16	10^{-3} ∿ 10^{-6}	Good	Toe trench required ∿ needless
GC	Barely fair used for impervious core	Fair by rubber tired roller, sheeps foot roller	1.84 ∿ 2.08	10^{-6} ∿ 10^{-8}	Good	Needless
SW	Very good used for pervious zone with slope protection	Good by tractor	1.76 ∿ 2.08	$> 10^{-3}$	Good	Upstream blanket, toe drain or drain well required
SP	Fair used for gentle slope banking	Good by tractor	1.60 ∿ 1.92	$> 10^{-3}$	Good-poor according their density	Upstream blanket, toe drain or drain well required
SM	Barely fair not so suitable for impervious zone, used for impervious core or bank	Good careful operation required. by rubber tired roller, sheeps foot roller	1.72 ∿ 2.00	10^{-3} ∿ 10^{-6}	Good-poor according their density	Upstream blanket, toe drain or drain well required
SC	Barely fair used for impervious core of flood protection bank	Fair by sheeps foot roller, rubber tired roller	1.68 ∿ 2.00	10^{-6} 10^{-9}	Good-poor	Needless
ML	Poor used on proper adjustment	Good - poor careful operation is important. by rubber tired roller, sheeps foot roller	1.52 ∿ 1.92	10^{-3} ∿ 10^{-6}	Very poor in danger of liquefaction	Toe drain ∿ needless
CL	Barely fair used for impervious core or blanket	Fair - good by sheeps foot roller, rubber tired roller	1.52 ∿ 1.92	10^{-6} ∿ 10^{-8}	Good-poor	Needless
OL	Unsuitable for banking materials	Fair - poor by sheeps foot roller	1.28 ∿ 1.60	10^{-4} ∿ 10^{-6}	Fair-poor in danger large settlement	Needless
MH	Poor used for core in hydraulic fill but unsuitable for roll fill	Poor - unsuitable by sheeps foot roller	1.12 ∿ 1.52	10^{-4} ∿ 10^{-6}	Poor	Needless
CH	Fair for gentle slope, used for thin core, blanket	Fair - poor by sheeps foot roller	1.20 ∿ 1.68	10^{-6} ∿ 10^{-8}	Fair-poor	Needless
OH	Unsuitable for banking materials	Poor - unsuitable by sheeps foot roller	1.04 ∿ 1.60	10^{-6} ∿ 10^{-8}	Very poor	Needless
Pt	Can't use for construction materials	Practically impossible	-	-	Can't use for foundation	-

Table 14

Damage caused by salt on rice growth

Salt concentration and rice growth

Chlorine (ppm)	Height of rice (cm)	Tillering (number)	Weight ratio of unhulled rice (%)	Weight ratio of unhulled rice (%)	Weight of straw (g)
0	80.9	21.0	53.5	100	59.3
100	82.6	19.5	52.0	97	59.0
300	81.4	19.5	47.0	87	59.0
500	78.1	21.5	47.5	88	55.0
1,000	79.9	20.5	46.5	86	56.0
2,000	77.5	22.0	36.0	67	49.0
3,000	wither	-	-	-	-
5,000	wither	-	-	-	-

Table 15

Temporary salt injury in each growing period

Concentration of NaCl (ppm)	Nursery period		Yield ratio (%)		
	Germination ratio (%)	Height after 30 days (cm)	in transplanting time	After setting	in booting period
0	100	13.0	100	100	100
1,000	100	13.0	54	109	112
2,500	100	13.0	34	79	100
5,000	100	12.0	0	9	106
7,500	80	9.5	0	0	67
10,000	50	8.0	0	0	57
15,000	0	-	0	0	27

ITEMS	A	B	C	D
1.PH Value	6	7	6	6
2.Electrical Conductivity	110	1,150	1,200	3,200
3.Total Hardness (as $CaCO_3$)	45	23	235	278
4.Mg^{++} ion	10.8	5.4	56.4	24
5.Ca^{++} ion	0	0	0	71.8
6.Na^{+} ion	2	24	86	218
7.SAR	0.85	14.6	16.2	31.5

ITEMS	E	F	G	H
1.PH Value	6	6	6	6
2.Electrical Conductivity	3,300	60	60	60
3.Total Hardness (as $CaCO_3$)	580	30	25	20
4.Mg^{++} ion	96	7.2	6	4.8
5.Ca^{++} ion	74.5	0	0	0
6.Na^{+} ion	206	1	1	2
7.SAR	22.4	0.53	0.58	0.63

Table 16 Report of water analysis

Table -17-1

REPORT OF WATER ANALYSIS BY PHYSICAL AND CHEMICAL EXAMINATIONS

Sampling date	October 24,1985
Sampling place	Existing Reservoir
Sample name	A

ANALYSIS RESULT (S)

Item \ Sample name		A
1. Appearance		Little White Mud
2. Colour		0
3. Odour		-
4. Turbidity		40
5. PH value		6
6. Electrical conductivity at 20°C, micromhos/cm		110
7. Total solids	(ppm)	213
8. Suspended solids	(ppm)	167
9. Dissolved solids	(ppm)	46
10. Total hardness	(ppm as $CaCo_3$)	45
11. Temporary hardness	(ppm as $CaCo_3$)	45
12. Permanent hardness	(ppm as $CaCo_3$)	0
13. M—Alkalinity	(ppm as $CaCo_3$)	62
14. P—Alkalinity	(ppm as $CaCo_3$)	0
15. Residual—Alkalinity	(ppm as $CaCo_3$)	0
16. Chlorides Ion	(ppm as Cl^-)	2
17. Sulfates Ion	(ppm as SO_4^{-2})	
18. Phosphates Ion	(ppm as PO_4^{-3})	
19. Nitrates Ion	(ppm as NO_3^-)	Detection
20. Nitrites Ion	(ppm as NO_2^-)	Detection
21. Ammonium Ion	(ppm as NH_4^+)	None
22. Silica	(ppm as Slo_2)	
23. Total Iron	(ppm)	3.5
24. Total Manganese	(ppm)	
25. Residual Chlorine	(ppm)	0
26. COD-Mn		4

REMARKS.

LABORATORY MANAGER

Table -17-2

REPORT OF WATER ANALYSIS BY PHYSICAL AND CHEMICAL EXAMINATIONS

Sampling date	October, 1985
Sampling place	NO.1 TEST PIT
Sample name	B

ANALYSIS RESULT (S)

Item \ Sample name		B
1. Appearance		Little White Mud
2. Colour		01
3. Odour		-
4. Turbidity		91
5. PH value		7
6. Electrical conductivity at 20°C, micromhos/cm		1,150
7. Total solids	(ppm)	1,685
8. Suspended solids	(ppm)	71
9. Dissolved solids	(ppm)	1,614
10. Total hardness	(ppm as $CaCo_3$)	23
11. Temporary hardness	(ppm as $CaCo_3$)	23
12. Permanent hardness	(ppm as $CaCo_3$)	0
13. M-Alkalinity	(ppm as $CuCo_3$)	1,300
14. P-Alkalinity	(ppm as $CuCo_3$)	0
15. Residual-Alkalinity	(ppm as $CaCo_3$)	0
16. Chlorides Ion	(ppm as Cl^-)	52
17. Sulfates Ion	(ppm as SO_4^{-2})	
18. Phosphates Ion	(ppm as PO_4^{-3})	
19. Nitrates Ion	(ppm as NO_3^-)	None
20. Nitrites Ion	(ppm as NO_2^-)	Detection
21. Ammonium Ion	(ppm as NH_4^+)	None
22. Silica	(ppm as Slo_2)	
23. Total Iron	(ppm)	25
24. Total Manganese	(ppm)	
25. Residual Chlorine	(ppm)	0
26. COD-Mn		3

REMARKS.

LABORATORY MANAGER

Table -17-3

REPORT OF WATER ANALYSIS BY PHYSICAL AND CHEMICAL EXAMINATIONS

Sampling date	October, 1985
Sampling place	NO. 2 TEST PIT
Sample name	C

ANALYSIS RESULT (8)

Item \ Sample name		C
1. Appearance		Little White Mud
2. Colour		0'
3. Odour		-
4. Turbidity		17'
5. PH value		6
6. Electrical conductivity at 20°C, micromhos/cm		1,200
7. Total solids	(ppm)	781
8. Suspended solids	(ppm)	135
9. Dissolved solids	(ppm)	646
10. Total hardness	(ppm as $CaCo_3$)	235
11. Temporary hardness	(ppm as $CaCo_3$)	235
12. Permanent hardness	(ppm as $CaCo_3$)	0
13. M-Alkalinity	(ppm as $CuCo_3$)	296
14. P-Alkalinity	(ppm as $CuCo_3$)	0
15. Residual-Alkalinity	(ppm as $CaCo_3$)	0
16. Chlorides Ion	(ppm as Cl^-)	162
17. Sulfates Ion	(ppm as SO_4^{-2})	
18. Phosphates Ion	(ppm as PO_4^{-3})	
19. Nitrates Ion	(ppm as NO_3^-)	None
20. Nitrites Ion	(ppm as NO_2^-)	None
21. Ammonium Ion	(ppm as NH_4^+)	None
22. Silica	(ppm as Sio_2)	
23. Total Iron	(ppm)	1
24. Total Manganese	(ppm)	
25. Residual Chlorine	(ppm)	0
26. COD-Mn		2

REMARKS.

LABORATORY MANAGER

REPORT OF WATER ANALYSIS

Table -17-4 BY PHYSICAL AND CHEMICAL EXAMINATIONS

Sampling date	October 24, 1985
Sampling place	District public office
Sample name	D

ANALYSIS RESULT (S)

Item \ Sample name	D
1. Appearance	Little Brown Mud
2. Colour	0'
3. Odour	-
4. Turbidity	30'
5. PH value	6
6. Electrical conductivity at 20°C, micrombos/cm	3,200
7. Total solids (ppm)	1,708
8. Suspended solids (ppm)	211
9. Dissolved solids (ppm)	1,497
10. Total hardness (ppm as $CaCo_3$)	278
11. Temporary hardness (ppm as $CaCo_3$)	278
12. Permanent hardness (ppm as $CaCo_3$)	0
13. M-Alkalinity (ppm as $CaCo_3$)	532
14. P-Alkalinity (ppm as $CaCo_3$)	0
15. Residual-Alkalinity (ppm as $CaCo_3$)	0
16. Chlorides Ion (ppm as Cl^-)	661
17. Sulfates Ion (ppm as SO_4^{-2})	
18. Phosphates Ion (ppm as PO_4^{-3})	
19. Nitrates Ion (ppm as NO_3^-)	None
20. Nitrites Ion (ppm as NO_2^-)	None
21. Ammonium Ion (ppm as NH_4^+)	None
22. Silica (ppm as Slo_2)	
23. Total Iron (ppm)	10.5
24. Total Munganese (ppm)	
25. Residual Chlorine (ppm)	0
26. COD-Mn	3

REMARKS.

LABORATORY MANAGER

REPORT OF WATER ANALYSIS
Table -17-5 BY PHYSICAL AND CHEMICAL EXAMINATIONS

Sampling date	October 24, 1985
Sampling place	Deep Well of Un Samaki Hospital
Sample name	E

ANALYSIS RESULT (S)

Item \ Sample name		E
1. Appearance		Little White Mud
2. Colour		0'
3. Odour		-
4. Turbidity		3'
5. PH value		6
6. Electrical conductivity at 20°C, micromhos/cm		3,300
7. Total solids	(ppm)	2,072
8. Suspended solids	(ppm)	14
9. Dissolved solids	(ppm)	2,058
10. Total hardness	(ppm as $CaCo_3$)	580
11. Temporary hardness	(ppm as $CaCo_3$)	580
12. Permanent hardness	(ppm as $CaCo_3$)	0
13. M—Alkalinity	(ppm as $CaCo_3$)	374
14. P—Alkalinity	(ppm as $CaCo_3$)	0
15. Residual—Alkalinity	(ppm as $CaCo_3$)	0
16. Chlorides Ion	(ppm as Cl^-)	911
17. Sulfates Ion	(ppm as SO_4^{-2})	
18. Phosphates Ion	(ppm as PO_4^{-3})	
19. Nitrates Ion	(ppm as NO_3^-)	None
20. Nitrites Ion	(ppm as NO_2^-)	None
21. Ammonium Ion	(ppm as NH_4^+)	None
22. Silica	(ppm as Sio_2)	
23. Total Iron	(ppm)	1.25
24. Total Manganese	(ppm)	
25. Residual Chlorine	(ppm)	0
26. COD-Mn		

REMARKS.

LABORATORY MANAGER

Table -17-6

REPORT OF WATER ANALYSIS BY PHYSICAL AND CHEMICAL EXAMINATIONS

Sampling date	October 30, 1985
Sampling place	Chakaya River Point A
Sample name	F

ANALYSIS RESULT (S)

Item \ Sample name		F
1. Appearance		Little Brown Mud
2. Colour		0'
3. Odour		-
4. Turbidity		13'
5. PH value		6
6. Electrical conductivity at 20°C, micromhos/cm		60
7. Total solids	(ppm)	140
8. Suspended solids	(ppm)	69
9. Dissolved solids	(ppm)	71
10. Total hardness	(ppm as $CaCo_3$)	30
11. Temporary hardness	(ppm as $CaCo_3$)	30
12. Permanent hardness	(ppm as $CaCo_3$)	0
13. M-Alkalinity	(ppm as $CaCo_3$)	34
14. P-Alkalinity	(ppm as $CaCo_3$)	0
15. Residual-Alkalinity	(ppm as $CaCo_3$)	0
16. Chlorides Ion	(ppm as Cl^-)	4
17. Sulfates Ion	(ppm as SO_4^{-2})	
18. Phosphates Ion	(ppm as PO_4^{-3})	
19. Nitrates Ion	(ppm as NO_3^-)	None
20. Nitrites Ion	(ppm as NO_2^-)	None
21. Ammonium Ion	(ppm as NH_4^+)	None
22. Silica	(ppm as Slo_2)	
23. Total Iron	(ppm)	1.25
24. Total Manganese	(ppm)	
25. Residual Chlorine	(ppm)	0
26. COD-Mn		

REMARKS.

LABORATORY MANAGER

REPORT OF WATER ANALYSIS

Table -17-7 BY PHYSICAL AND CHEMICAL EXAMINATIONS

Sampling date	October 29,1985
Sampling place	Chakara River Point B
Sample name	G

ANALYSIS RESULT (S)

Item \ Sample name		G
1. Appearance		Little Brown Mud
2. Colour		0'
3. Odour		-
4. Turbidity		9'
5. PH value		6
6. Electrical conductivity at 20°C, micrombos/cm		60
7. Total solids	(ppm)	115
8. Suspended solids	(ppm)	57
9. Dissolved solids	(ppm)	58
10. Total hardness	(ppm as $CaCo_3$)	25
11. Temporary hardness	(ppm as $CaCo_3$)	25
12. Permanent hardness	(ppm as $CaCo_3$)	0
13. M—Alkalinity	(ppm as $CaCo_3$)	30
14. P—Alkalinity	(ppm as $CaCo_3$)	0
15. Residual—Alkalinity	(ppm as $CaCo_3$)	0
16. Chlorides Ion	(ppm as Cl^-)	4
17. Sulfates Ion	(ppm as SO_4^{-2})	
18. Phosphates Ion	(ppm as PO_4^{-3})	
19. Nitrates Ion	(ppm as NO_3^-)	None
20. Nitrites Ion	(ppm as NO_2^-)	None
21. Ammonium Ion	(ppm as NH_4^+)	None
22. Silica	(ppm as Slo_2)	
23. Total Iron	(ppm)	5
24. Total Manganese	(ppm)	
25. Residual Chlorine	(ppm)	
26. COD-Mn		3

REMARKS.

LABORATORY MANAGER

Table -17-8

REPORT OF WATER ANALYSIS BY PHYSICAL AND CHEMICAL EXAMINATIONS

Sampling date	October 30, 1985
Sampling place	Chakara River under the Bridge
Sample name	II

ANALYSIS RESULT (S)

Item \ Sample name		II
1. Appearance		Little Brown Mud
2. Colour		0'
3. Odour		-
4. Turbidity		11'
5. PH value		6
6. Electrical conductivity at 20°C, micromhos/cm		60
7. Total solids	(ppm)	136
8. Suspended solids	(ppm)	58
9. Dissolved solids	(ppm)	78
10. Total hardness	(ppm as $CaCo_3$)	20
11. Temporary hardness	(ppm as $CaCo_3$)	20
12. Permanent hardness	(ppm as $CaCo_3$)	0
13. M-Alkalinity	(ppm as $CaCo_3$)	32
14. P-Alkalinity	(ppm as $CaCo_3$)	0
15. Residual-Alkalinity	(ppm as $CaCo_3$)	0
16. Chlorides Ion	(ppm as Cl^-)	4
17. Sulfates Ion	(ppm as SO_4^{-2})	
18. Phosphates Ion	(ppm as PO_4^{-3})	
19. Nitrates Ion	(ppm as NO_3^-)	None
20. Nitrites Ion	(ppm as NO_2^-)	None
21. Ammonium Ion	(ppm as NH_4^+)	None
22. Silica	(ppm as Sio_2)	
23. Total Iron	(ppm)	1.25
24. Total Manganese	(ppm)	
25. Residual Chlorine	(ppm)	0
26. COD-Mn		3

REMARKS.

LABORATORY MANAGER

Table 18 CALCULATION OF EVAPOTRANSPIRATION

(1) Modified Penman Method ($ETo = C \{ W \cdot Rn + (1-W) \cdot f(u) \cdot (ea-ed) \}$)

		Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Remarks
I. METEOROLOGICAL DATA														
Air Temperature (°c)		22.9	25.7	28.1	29.0	28.4	28.1	27.6	27.3	26.5	25.9	24.2	22.5	
Relative Humidity (%)		67.0	65.0	65.0	68.0	76.0	76.0	77.0	78.0	83.0	81.0	76.0	69.0	
Wind Velocity (m/s)		1.0	1.0	1.0	1.2	1.1	1.5	1.6	1.5	1.0	1.1	1.3	1.2	
Sun Shine Duration (n/N)		0.81	0.75	0.67	0.65	0.62	0.53	0.49	0.48	0.45	0.62	0.76	0.80	
II. CALCULATION														
ea (mbar)		27.9	33.0	38.0	40.1	38.7	38.0	37.0	36.3	34.7	33.4	30.2	27.3	
ed=eaxRHmean/100		18.7	21.5	24.7	27.3	29.4	28.9	28.5	28.3	28.8	27.1	23.0	18.8	
(ea-ed)		9.2	11.5	13.3	12.8	9.3	9.1	8.5	8.0	5.9	6.3	7.2	8.5	
u		86.4	86.4	86.4	103.4	95.0	129.6	138.2	129.6	86.4	95.0	112.3	103.7	
f(u)=0.27(1+u/100)		0.50	0.50	0.50	0.55	0.53	0.62	0.64	0.62	0.50	0.53	0.57	0.55	
(1-W)		0.28	0.25	0.23	0.23	0.23	0.23	0.23	0.24	0.25	0.25	0.27	0.29	
W		0.72	0.75	0.77	0.77	0.77	0.77	0.77	0.76	0.75	0.75	0.73	0.71	
Ra		12.2	13.5	14.8	15.7	15.9	15.8	15.8	15.7	15.1	14.0	12.6	11.8	
Rs=(0.25+0.50n/N)Ra		2.0	8.4	8.7	9.0	8.9	8.1	7.8	7.7	7.2	7.8	7.9	7.7	
Rns= (1-α)Rs		6.0	6.3	6.5	6.8	6.7	6.1	5.9	5.8	5.4	5.9	5.9	5.8	
Rnl=f(T)·f(ed)·F(n/N)	f(T)	15.2	15.8	16.3	16.5	16.4	16.3	16.2	16.2	16.0	15.9	15.5	15.1	
	f(ed)	0.13	0.12	0.11	0.11	0.11	0.11	0.11	0.11	0.12	0.12	0.12	0.13	
	f(n/N)	0.83	0.78	0.70	0.69	0.66	0.58	0.59	0.53	0.51	0.66	0.78	0.82	
Rnl		1.6	1.5	1.3	1.3	1.2	1.0	1.0	0.9	1.0	1.3	1.5	1.6	
Rn=Rns-Rnl		4.4	4.8	5.2	5.5	5.5	5.1	4.9	4.9	4.4	4.6	4.4	4.2	
C		1.05	1.06	1.07	1.06	1.07	1.04	1.02	1.03	1.04	1.04	1.04	1.04	
ETo=C{W·Rn+(1-W)·f(u)·(ea-ed)}		4.7	5.3	5.9	6.2	5.7	5.4	5.1	5.1	4.2	4.5	4.5	4.5	

W : temperature-related weighting factor

Rn : net radiation in equivalent evaporation in mm/day

F(u) : wind-related function

(ea-ed) : difference between in saturation vapour pressure at mean air temperature and the mean actual vapour pressure of the air, both in mbar

C : adjustment factor to compensate for the effect of day and night weather conditions

– continue –

Temperature °C	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
ea mbar	6.1	6.6	7.1	7.6	8.1	8.7	9.3	10.0	10.7	11.5	12.3	13.1	14.0	15.0	16.1	17.0	18.2	19.4	20.6	22.0

Temperature °C	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
ea mbar	23.4	24.9	26.4	28.1	29.8	31.7	33.6	35.7	37.8	40.1	42.4	44.9	47.6	50.3	53.2	56.2	59.4	62.8	66.3	69.9

1/ Also actual vapour pressure (ed) can be obtained from this table using available Tdewpoint data.
(Example: Tdewpoint is 18°C; ed is 20.6 mbar)

Saturation Vapour Pressure (ea) in mbar as Function of Mean Air Temperature (T) in °C 1/

Temperature °C		2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40
W at altitude	m																				
	0	0.43	.46	.49	.52	.55	.58	.61	.64	.66	.69	.71	.73	.75	.77	.78	.80	.82	.83	.84	.85
	500	.44	.48	.51	.54	.57	.60	.62	.65	.67	.70	.72	.74	.76	.78	.79	.81	.82	.84	.85	.86
	1 000	.46	.49	.52	.55	.58	.61	.64	.66	.69	.71	.73	.75	.77	.79	.80	.82	.83	.85	.86	.87
	2 000	.49	.52	.55	.58	.61	.64	.66	.69	.71	.73	.75	.77	.79	.81	.82	.84	.85	.86	.87	.88
	3 000	.52	.55	.58	.61	.64	.66	.69	.71	.73	.75	.77	.79	.81	.82	.84	.85	.86	.87	.88	.89
	4 000	.54	.58	.61	.64	.66	.69	.71	.73	.75	.77	.79	.81	.82	.84	.85	.86	.87	.89	.90	.90

Values of Weighting Factor (W) for the Effect of Radiation on ETo at Different Temperatures and Altitudes

- continue -

$T°C$	0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36
$f(T) = \sigma Tk^4$	11.0	11.4	11.7	12.0	12.4	12.7	13.1	13.5	13.8	14.2	14.6	15.0	15.4	15.9	16.3	16.7	17.2	17.7	18.1

Effect of Temperature f(T) on Longwave Radiation (Rnl)

ed mbar	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40
$f(ed) = 0.34 - 0.044\sqrt{ed}$	0.23	.22	.20	.19	.18	.16	.15	.14	.13	.12	.12	.11	.10	.09	.08	.08	.07	.06

Effect of Vapour Pressure f(ed) on Longwave Radiation (Rnl)

n/N	0	.05	.1	.15	.2	.25	.3	.35	.4	.45	.5	.55	.6	.65	.7	.75	.8	.85	.9	.95	1.0
$f(n/N) = 0.1 + 0.9\ n/N$	0.10	.15	.19	.24	.28	.33	.37	.42	.46	.51	.55	.60	.64	.69	.73	.78	.82	.87	.91	.96	1.0

Effect of the Ratio Actual and Maximum Bright Sunshine Hours f(n/N) on Longwave Radiation (Rnl)

– continue –

	RHmax = 30%				RHmax = 60%				RHmax = 90%			
Rs mm/day	3	6	9	12	3	6	9	12	3	6	9	12
Uday m/sec	Uday/Unight = 4.0											
0	.86	.90	1.00	1.00	.96	.98	1.05	1.05	1.02	1.06	1.10	1.10
3	.79	.84	.92	.97	.92	1.00	1.11	1.19	.99	1.10	1.27	1.32
6	.68	.77	.87	.93	.85	.96	1.11	1.19	.94	1.10	1.26	1.33
9	.55	.65	.78	.90	.76	.88	1.02	1.14	.88	1.01	1.16	1.27
	Uday/Unight = 3.0											
0	.86	.90	1.00	1.00	.96	.98	1.05	1.05	1.02	1.06	1.10	1.10
3	.76	.81	.88	.94	.87	.96	1.06	1.12	.94	1.04	1.18	1.28
6	.61	.68	.81	.88	.77	.88	1.02	1.10	.86	1.01	1.15	1.22
9	.46	.56	.72	.82	.67	.79	.88	1.05	.78	.92	1.06	1.18
	Uday/Unight = 2.0											
0	.86	.90	1.00	1.00	.96	.98	1.05	1.05	1.02	1.06	1.10	1.10
3	.69	.76	.85	.92	.83	.91	.99	1.05	.89	.98	1.10	1.14
6	.53	.61	.74	.84	.70	.80	.94	1.02	.79	.92	1.05	1.12
9	.37	.48	.65	.76	.59	.70	.84	.95	.71	.81	.96	1.06
	Uday/Unight = 1.0											
0	.86	.90	1.00	1.00	.96	.98	1.05	1.05	1.02	1.06	1.10	1.10
3	.64	.71	.82	.89	.78	.86	.94	.99	.85	.92	1.01	1.05
6	.43	.53	.68	.79	.62	.70	.84	.93	.72	.82	.95	1.00
9	.27	.41	.59	.70	.50	.60	.75	.87	.62	.72	.87	.96

Adjustment Factor (c) in Presented Penman Equation

- continue -

	month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
CLIMATOLOGICAL DATA OF THAILAND [1951~1980]	Pan Evaporation mm/month	146.4	152.0	193.0	194.4	182.9	173.4	168.9	159.8	132.2	137.2	134.8	140.5
	Pan Evaporation mm/day	4.7	5.4	6.2	6.5	5.9	5.8	5.4	5.2	4.4	4.4	4.5	4.5
	*1 ETo mm/day	4.0	4.6	5.3	5.5	5.0	4.9	4.6	4.4	3.7	3.8	3.8	3.9
ESTIMATED POTENTIAL EVAPOTRANSPIRATION IN THE NORTHEAST [1965~1970]	Pan Evaporation x0.6 mm/month	91.0	92.0	116.0	116.0	104.0	108.0	109.0	100.0	81.0	84.0	81.0	85.0
	Pan Evaporation mm/month	151.7	153.3	193.3	193.3	173.3	180.0	173.3	166.7	135.0	140.0	135.0	141.7
	Pan Evaporation mm/day	4.9	5.5	6.2	6.4	5.6	6.0	5.6	5.4	4.5	4.5	4.5	4.6
	*2 ETo mm/day	4.2	4.7	5.3	5.5	4.8	5.1	4.8	4.6	3.8	3.8	3.8	3.9
RAINFALL AND EVAPORATION ANALYSES OF THAILAND [17 years]	Pan Evaporation mm/month	146.0	153.0	191.0	192.0	185.0	179.0	167.0	159.0	135.0	135.0	131.0	143.0
	Pan Evaporation mm/day	4.7	5.5	6.2	6.4	6.0	6.0	5.4	5.1	4.5	4.4	4.4	4.6
	*3 ETo mm/day	4.0	4.6	5.2	5.4	5.1	5.1	4.6	4.4	3.8	3.7	3.7	3.9
ETo calculated by Penman method mm/day		4.7	5.3	5.9	6.2	5.7	5.4	5.1	5.1	4.2	4.5	4.5	4.5

(Pan evaporation data was observed in Nkhon Rachasima)

*1, *2, *3 ETo (Reference crop evapotranspiration) = Kp · Epan

where Epan = pan evaporation in mm/day and represents the mean daily value of the period considered

Kp = pan coefficient

= 0.85 (see FAO IRRIGATION AND DRAINAGE PAPER 24 Table 18 ; case A, RHmean high, Wind Light, Windward side distance of green crop 1000 m)

Table 19 Comparison of ETo Penman method - Pan evaporation method

(see fig 27)

Farm Pond No.	Area of paddy field	Total Area of paddy field	Volume of Irrigation	Volume of existing Farm-pond	Volume of planning Farm-pond	Total Volume of Farm-pond	The number of days for Irrigation possible
	ha	ha	cum/day	cum	cum	cum	days
	① 5.04						
	② 4.91			Ⓐ 1.000	Type C		
P1	③ 7.06	17.01	1,601	Ⓑ 2.280	5 380	8 660	5.4
					Type B		
P2	④ 6.20	6.20	584	Ⓒ 122	2 630	2 752	4.7
					Type A		
P3	⑤ 4.16	4.16	392		1 630	1 630	4.2
	⑥ 2.08				Type C		
P4	⑦ 7.31	9.39	884	Ⓓ 90	5 380	5 470	6.2
					Type B		
P5	⑧ 7.20	7.20	678		2 630	2 630	3.9
	⑨ 3.26						
	⑩ 5.02				Type C		
P6	⑪ 4.00	12.28	1,156		5 380	5 380	4.7
	⑫ 4.30				Type B		
P7	⑬ 3.86	8.16	768	Ⓔ 1.036	2 630	3 666	4.8
					Type B		
P8	⑭ 5.57	5.57	524		2 630	2 630	5.0
	⑮ 4.00						
	⑯ 5.57				Type C		
P9	⑰ 3.64	13.21	1,243		5 380	5 380	4.3
	⑱ 3.77				Type B		
P10	⑲ 4.00	7.77	731		2 630	2 630	3.6
					Type A		
P11	⑳ 4.07	4.07	383		1 630	1 630	4.3
					Type A		
P12	㉑ 4.49	4.49	423		1 630	1 630	3.9
Total		99.51	9,367	4,528	39 560	44 088	(mean) 4.7

Table 20 Calculation of Farm Pond potential

Table-21-1 BILL OF QUANTITIES (kong samaki)

	Item	unit	Quantities
1. Construction of Farm pond			
Type A (3 place)			
	Excavation (top soil) 480 x 3	cum	1,440
	Excavation 300 x 3	cum	900
	Excavation 1,200 x 3	cum	3,600
	Spreading 1,200 x 3	cum	3,600
	Spreading (top soil) 480 x 3	cum	1,440
	Compaction 1,980 x 3	cum	5,940
	Smoothing face 1,165 x 3	sq m	3,495
Type B (5 place)	Excavation (top soil) 720 x 5	cum	3,600
	Excavation 545 x 5	cum	2,725
	Excavation 1,900 x 5	cum	9,500
	Spreading 1,900 x 5	cum	9,500
	Spreading (top soil) 720 x 5	cum	3,600
	Compaction 3,165 x 5	cum	15,825
	Smoothing face 1,460 x 5	sq m	7,300
Type C (4 place)	Excavation (top soil) 1,125 x 4	cum	4,500
	Excavation 1,055 x 4	cum	4,220
	Excavation 4,000 x 4	cum	16,000
	Spreading 4,000 x 4	cum	16,000
	Spreading (top soil) 1,125 x 4	cum	4,500

	Item		unit	Quantities
	Compaction	6,180×4	cum	24,720
	Smoothing face	2,416×4	sqm	9,664
2. Inlet works				
Type A (6 place)	Excavation	24×6	cum	144
	Smoothing face	30×6	sqm	180
	Concrete	(4.7+0.4)×6	cum	30.6
	Wooden form	3.4×6	sqm	20.4
	Slope protection	36×6	sqm	216
Type B (10 place)	Excavation	30×10	cum	300
	Smoothing face	38×10	sqm	380
	Concrete	(5.2+0.4)×10	cum	56
	Wooden form	3.4×10	sqm	34
	Slope protection	36×10	sqm	360
Type C (11 place)	Excavation	64×11	cum	704
	Smoothing face	69×11	sqm	759
	Concrete	(7.2+0.4)×11	cum	83.6
	Wooden form	3.4×11	sqm	37.4
	Slope protection	36×11	sqm	396

Table-21-2 BILL OF QUANTITIES (Chakarat)

	Item	unit	Quantities
1. Outlet works			
	Excavation 110+50+190+610	cum	960
	Embankment 340+100	cum	440
	Slope protection 240+350	sqm	590
	Concrete	cum	59.7
	Wooden form	sqm	30.1
2. Diversion works			
	Excavation 180+200+90+140	cum	610
	Embankment 200+160	cum	360
	Slope protection 480+120	sqm	600
	Concrete	cum	89.5
	Wooden form	sqm	90.5

Table 22 Project Cost

Item	Quantity	Equipment Cost (฿)	Construction Cost (฿)	Remarks
I. Construction Cost				
A. Direct cost				
Kong Samaki				
1. Construction of farm pond	39,600 m^3		1,706,000	
2. Appertenant structure	1 set		452,000	
Sub-Total			2,158,000	(1)
Chakarat				
3. Outlet works	1 set		139,000	
4. Division works	1 set		173,000	
5. Appertenant structure	1 set	1,000,000	50,000	Gate setting
Sub-Total			362,000	(2)
B. Indirect cost			504,000	(3)={(1)+(2)}x 20%
C. Physical contingency			211,000	{(1)+(2)+(3)}x7%
Sub-Total			715,000	
Total			3,235,000	(4)
II. Others			305,000	(4)x9.4%(±)
Grand Total		1,000,000 ฿	3,540,000 ฿	