SOUTH EAST JOHOR PROJECT TANJONG PENGGERANG AND JOHOR TENGAH REGIONAL MASTER PLAN

FOR

THE GOVERNMENT OF MALAYSIA

AND

THE STATE OF JOHOR

PROGRESS REPORT

No. 7

OCTOBER 1970

• HUNTING TECHNICAL SERVICES — LAND USE AND AGRICULTURAL CONSULTANTS •

BINNIE AND PARTNERS
CONSULTING ENGINEERS

•

OVERSEAS DEVELOPMENT GROUP
UNIVERSITY OF EAST ANGLIA
SOCIO ECONOMIC STUDIES

•

SHANKLAND COX OVERSEAS
PLANNING CONSULTANTS

SOUTH EAST JOHOR PROJECT TANJONG PENGGERANG AND
JOHOR TENGAH REGIONAL MASTER PLAN STUDY
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GOVERNMENT OF MALAYSIA & THE STATE OF JOHOR

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CONTENTS

PROJECT MANAGEMENT

1. STAFF: additional to Report No.6

Post No.	Name	Destination	Chargeable Dates
5	R.D. Law	Soil Surveyor I	to 30.9.1970
10	L.E. Palmer	Irrigation Agronomist	to 25.10.1970
24	M. Holmstrom	Social Dev. Specialist	to 24.9.1970
	Mrs. E. Edwards	"	to 30.9.1970
25	H. Maddick	Inter-Government Organisation Specialist	24.10.1970-
29	R.J. Spooner	Resident Principal	18.9.1970-
30	D.T. Sinker	Resident Economist	9-16.10.1970 21-29.10.70
31	D. Francis	Forestry Specialist	24.10.70-

SPECIAL INDIVIDUAL CONSULTANTS

4-8	P.A. Durgnat	Utilisation Specialist	29.8.1970-
	H. Piper	Groundwater Specialist	6-7.10.1970
	M. Watkins	Engineering Geologist	21.10.1970

SPECIALIST CONSULTING FIRM

A. Proudlove	Planning Specialist	2-10.9.1970
D. Grove	Planning Specialist	22.9.70- 2.10.70
J. Kirke	Resident Traffic & Civil Engineer	22.9.1970-

COUNTERPART SPECIALISTS

Inche Zainuddin bin Mohamed has replaced Inche Ishak bin Ariffin of the Department of the Town and Country Planning.

Visiting Principals to the Project during the period under review included Mr. Robertson of Hunting Technical Services, Mr. Hardy of Binnie and Partners and Mr. Shankland of Shankland Cox. Other visitors included Mr. King of the Ministry of Overseas Development, London, Mr. Turner of the British High Commission and a nine-man World Bank Agricultural Sector Team headed by Dr. Owen Price.

2. ADMINISTRATION & FINANCE

a) Housing and Offices: Satisfactory

b) Transport : Satisfactory

c) Staff : Satisfactory

d) Funds: The thirteenth deposit of local funds has been received. Approval of Sterling payment to 30.9.70 has been given.

e) Accounts : The twelfth and thirteenth Statements of Dollar Costs were submitted on the due dates with supporting analysis of expenditure ranking for Aid Reimbursement.

f) The Johore Port Study was financed initially from project funds and expenditure incurred on the Gunong Sumalayang Limestone exploration has also been met from project funds.

3. SCHEDULE OF WORK

The programme of work is as indicated in the progress chart at cover i.e. drafting the project report for submission on the 31st January, 1971. Virtually the efforts of the whole team have been directed towards preparing initial drafts of material to be included in the Draft Project Report. Brief papers identifying possible technical assistance studies have been provided to EPU in respect of livestock Development, Timber Milling, Infrastructural Equipment, Town & Country Planning Services and Tourism.

4. SURVEY, MAPS & REPORTS

All the one inch series compilations have now been received and work is well advanced on fair drawing and mask preparation.

The draft project report is now under preparation and first draft writing is well in hand.

SECTION A : NATURAL RESOURCES STUDIES

1. SOIL SURVEY

Soil and Land Use Potential Mapping

The 1.63.360 soil map for the Tanjong Penggerang Area was reduced to 1:250,000 scale. Land Use Potential maps for this area were compiled. Reduction of the last mentioned map to the scale of 1:250,000 has also been carried out.

Soil Survey

No field work was carried out during the period under review.

2. AGRICULTURE & LIVESTOCK

Crop Husbandry

The report on coconuts by one of our specialists was received in the middle of October. Two projects have since been evaluated, one based on commercial scale production of selected local seedlings, the other on slower development with hybrid nuts (West African semi-talls X Malaysian Yellow Dwarfs).

The Irrigation Agronomist completed his assignment at the end of October. During the past six weeks, in addition to completing his report on climate, he made an appraisal of prospects for cacao development in the project area, and reappraised the annual cropping proposals. In connection with these we have been offered a number of sorghum varieties, both grain and fodder type, from Africa and U.S.A. These will be given to the State Agricultural Officer for preliminary field experiments.

Livestock Husbandry

A scheme for building up the dairy industry in the project area has been evaluated, and also a scheme for the introduction of a small pedigree tropical beef herd, to provide quality meat for special markets and breeding bulls for use on cull dairy stock, thus building-up a cross-bred beef industry for the general local market.

Fisheries

The possibility of developing sea-fishing activities in the project area was raised at the last Steering Committee and a report is attached at Appendix A.

General

Good progress has been made with the report to be submitted at the end of January. First drafts of most of the agricultural material have been completed.

3. FOREST UTILIZATION

Forest Officers and timber industrialists in Johor provided data on forest outturn, forest resources, and forest products processing.

Federal Forest Dept. H.Q. and Cantrans, in K.L. and Pahang, provided data and observations on forest organization, timber exports, and modern logging under Malayan conditions. Federal Forest Research provided (information insights into) quick growing tree plantations. Chipping of forest waste for export was encouragingly viewed by a major chip exporter (Japan).

A review of the effects of current royalty and premium rates on forest extraction and products also began.

The inventory results were analysed by species and tonnages. Major forest roads leading to and within the project area were selected and a plan prepared in conjunction with the Physical Planners.

A general note on Johore Forestry and the implications arising from accelerated forest working prior to agricultural development was prepared and circulated to E.P.U., the State Forest Officer, and to the UNDP/FAO Forest Industries Project with whom close relations are maintained.

Basic data for reporting were codified:- industry sectors, inputs and outputs; markets:- local and export; Produce:- by species, by grades, by prices.

The inventory analysis was completed based on new computer data and carried through to give five alternative outturns from the project area at two volume levels.

4. MINING AND GEOLOGY

The draft section of our Final Report dealing with mining and geology is now being edited in London prior to printing.

The report covering the Gunong Sumalayang Limestone area has been received and forwarded to Government. The results of the exploration indicate estimates of reserves of 30 million tons of limestone. Core samples from two bores are currently being analysed by the Department of Geological Survey and on completion will be submitted as a complementary appendix to the Report.

Apart from its use in agriculture we are currently looking into the possibility of using limestone as a soil stablizing agent in connection with the road construction programme. At the same time possibilities for cement and ornamental stone should not be overlooked.

5. WATER RESOURCES

Hydrological analysis and water sampling have continued satisfactory. Discussions have been held with the D.I.D. regarding the taking over of the project hydrological network by the end of February 1971.*

Studies have continued on the economic comparision of alternative sources for existing water supply areas and for project developments. Work has been done on the regulation of the Johore river involving alternative dam sites and a tidal

* It is understood that D.I.D. have requested budgetory provision through E.P.U. for the continued maintenance of the network.

barrage to repel saline intrusion. Possible dam sites on the Ulu Linggui, Lebam and Selujut have been visited by an engineering geologist.

An interim report on "Flood Mitigation at Kota Tinggi" is included in Appendix B.

SECTION B : INFRASTRUCTURAL URBAN & INDUSTRIAL DEVELOPMENT STUDIES

1. WORK UNDERTAKEN

Surveys of Central Area Property Owners and Shoppers in Kota Tinggi have taken place to provide background information with regard to an alternative siting of the Town Centre.

An Origin and Destination Traffic Survey was held on two days in FLDA Kulai, to provide essential information on the trip generating characteristics of settlers in land development schemes.

Results from this latter survey are being used in conjunction with other data to provide estimates of traffic loadings that may be expected in the project regions, and the roads serving them at various stages of development to 1990. These will give criteria for road design, and vehicle fleet requirements.

Work has continued on first draft sections for the Draft Project Report and a background paper on Tourism has been started. Current studies have revealed that a shortage of equipment and trained management at State level in J.K.R. is likely to provide a serious constraint to implementation of the Master Plan during the S.M.P. period 1971-75. Existing priorities are believed to absorb all State capacity.

2. TOURISM

Market estimates so far, suggest that Tourism in Johor could become a major new industry. There are strong indications that the industry could have a major job creation and income earning function in the development of the project regions. Successful development of Tourism could provide as many as 25-30,000 jobs by 1990.

3. LANDS

It is now thought desirable to draw attention to the possibility of land speculation in and near the Project area. It is suggested that existing legislation is examined to ascertain whether or not the public interest is adequately protected in this regard.

The following might require gazettement or extension of existing notices:

1. The Project areas inclusive
2. Lands either side of existing communication routes.
3. Proposed new communication routes.
4. Existing and proposed routes for public utilities i.e. pipelines, cables.
5. Zoning of urban areas for expansion including the Port Area/Kluang/Kota Tinggi.
6. Terminals e.g. ferries, outfalls, intakes.
7. Watersheds, forest and other reserves above 500 feet or on 20^{o} slopes or over which extend outside the project area e.g. G. Blumut and lands to the east of the project areas.

SECTION C : SOCIO-ECONOMIC ASPECTS & INDUSTRIAL INFRA-STRUCTURE

The final reports of the Socio-economic Studies are now under discussion.

The advisor on organizations has arrived and evaluation of the alternative types of organization has commenced.

Work on evaluation of enterprises and combination of enterprises and organizations for alternative strategies to be presented in the draft report continues.

APPENDIX A

JOHOR EAST COAST MARINE FISHERIES

PRESENT SITUATION

The fisheries based off the east coast of Johor are the least productive of all the West Malaysian East Coast. This is due in part to natural paucity of the fish fauna and partly because the seabed is composed of very soft sediments and these are unsuitable for trawling at present. New techniques are being developed using floating trawls which will exploit these grounds rather more. There are no deep sea fisheries based off the East Coast, all the present catches come from inshore fishing in water less than 45 fathoms and usually no more than five miles off the coast. The pelagic (surface feeding) fisheries provide the greater part of the fish crop. It is well known that these pelagic fisheries are depleated and several, once abundant, species are now very scarce or very small in size.

The Fisheries department has over the years actively encouraged the intensification of the inshore fisheries and production has increased. During this time the prices of fish remained at a high stable level indicating the good demand for fish. The prices for fish are artificially maintained at high levels by the middle men. In the southern half of West Malaysia the same kinds of fish do not become available on both coasts at the same time and certain desirable species may only be available from one coast. Should the catches of one species be particularly good in one place then the bulk of this catch will not be retailed in the home district but packed in ice and sent off to a market where this species is scarce. In the home market supplies are restricted so that a glut is avoided thereby maintaining high prices.

Singapore is an excellent market for fish at present. Much of the fish sold in the Johor Bahru market is infact reimported from Singapore. Malaysian waters supply almost all Singapore's requirement. However, much of this fish is caught by other than Malaysian fishermen trawling in Malaysian waters and who sell directly at Jurong wharf. There are highly skilled fishemen and operate steel hulled 100 ton boats, the fishermen are armed. This is likely to be a growing problem as the fishing grounds to the north west become increasingly over-fished and the Malaysian fishing grounds become better known.

DEVELOPMENT POTENTIAL AND CONSTRAINTS ON FUTURE DEVELOPMENT

International teams have completed surveys of the fisheries resources up to 15 miles off the east coast. These surveys indicate excellent prospects for demersal trawling for both fish and prawns, although in detail the surveys are probably inadequate.

The main constraint at present is the lack of suitable harbour facilities for boats over 20 tons. Mersing, Endau and Kuala Sedili can only be entered at high tide which seriously limits fishing effort. This limit on the size of trawlers which can operate from these harhours also limits the fishing season. These small boats cannot operate far from shore during the monsoon period and restrict their efforts to inshore trawling for prawns.

Another constraint on the operation of bigger and more expensive boats is the attitude of the local fishermen who like only to go out when the need for cash arises. At present fishermen from Trengganu, who are prepared to work the boats as often as possible come down to work the trawlers.

Approximately 30% of any trawler catch is trash fish but this can be very much higher. Because the facilities for handling large quantities of trash fish do not exist, these catches are often dumped in the sea. At Endau there are a number of small scale fish meal plants but inadequate to handle the quantities of fish available and thereby make it worthwhile for the fishermen.

At the moment the government does not make credit available to develop fisheries. The private sector are inhibited by the lack of infrastructure facilities and suitable personnel to invest large sums of money in new boats and equipment.

POSSIBLE DEVELOPMENT

A Japanese team have identified a small deep water harbour site not far from Mersing, but attention is drawn to the potential of the proposed port at Johor Bahru as a highly suitable base for large trawlers. It would have the advantage of being close to the markets but with a slight disadvantage of being relatively far from the fishing grounds which tend to be off the coast of north Johor rather than the southern coast. It will require landing places for unloading, sorting, packing andauctioning of the fish. Preferably nearby should be an ice factory, a shipyard, a fuel depot, a freshwater supply and fish processing plant.

The Fisheries Department are hoping that the government will increase the funds available for credit to develop marine fisheries. Co-operative management of boats and gear is now officially discouraged by the department, new loans will be made to family groups.

A large capacity fish meal plant will be required after suitable ports are constructed and large trawlers become increasingly common. This plant will handle the relatively large quantities of trash fish, which are at present dumped but could provide the basis for a profitable industry. There is a very ready market for quality fish meal from the livestock feedstuff manufactures who import their fish protein from abroad.

Regarding smallboats fishing off the Penggerang coast the porposed tourist resort could provide a daily market and encouragement should be given to small enterprises if and when such developments take place. Also should the trawling industry develop the small fishermen should be provided with training in more sophisticated techniques and eventually be given a stake in the industry.

APPENDIX B

FLOOD MITIGATION AT KOTA TINGGI

1. Introduction

During the North East Monsoon period many parts of the State of Johor may be subject to extensive flooding. Large areas of the urban centres of Kluang and Kota Tinggi, both partly within the Project Area, were flooded in December 1969 during the monsoon period. Kluang is situated on the S. Mengkibol with an upstream catchment area of 30 sq. miles and Kota Tinggi is situated on the S. Johore with an upstream catchment area of over 600 sq. miles.

It is understood that the D.I.D. have in hand a flood mitigation scheme for Kluang and flooding at Kluang will not be considered further in this report.

2. Terms of Reference

The Terms of Reference call for recommendations for the prevention or mitigation of flooding due to changes in river regime consequent upon proposed developments . It appears, at this stage of investigations, that, for storm conditions identical to those that produced the 1969 flood, the Johore River may eventually run at levels up to 2.0 feet higher at Kota Tinggi, due to the change in river regime.

3. Frequency of Flooding

The incidence of flooding and stage heights during the period 1942-69 inclusive are shown in Table 1. The south river bank level is about 11.00 M.S.L. and the north bank level about 3 feet lower i.e. 8.00 M.S.L. It is seen that the river

overflowed both banks 7 times over the 28 year period i.e. approximately once in 4 years. From interviews with local inhabitants it is understood that the north bank is overtopped to small depths almost every year.

The frequency of flooding will tend to rise as a result of jungle clearance and associated development in the catchment and for this study we have assumed a frequency of once in 3 years.

4 The December 1969 Flood

Heavy rainfall occurred on 9th and 10th December over most of the State of Johore and the raingauge at Mawai Estate, about 3 miles north east of Kota Tinggi recorded a fall of 17 inches over 24 hours. The river overtopped the banks early morning 10th December and the flood stages increased to a maximum level of 14.23 MSL over the next 2 days. The flood had receded sufficiently by 15th December to allow road traffic to pass through the town. The area flooded is shown in Plan 1.

5. Flood Damage and Losses

We have been unable to trace or evaluate flood damage and losses prior to 1969 but the following extracts on flood damage are from the 1952 and 1964 Flood Reports produced by the D.I.D.

January 1952 Report:

"The inhabitants of Kota Tinggi Town after their experience of the 1951 Flood, moved out of the low lying areas early, so apart from the inconvenience and the dirt, there was little damage. In other areas only loss of crops was reported."

March 1964 Report:

"Apart from the inconvenience and the silt, the flood caused practically no damage. In the low lying farming areas the small food crops were destroyed."

It should be noted that both these floods had a lower maximum flood stage than the 1969 flood and that in fact the river in 1964 did not overflow its banks (See Table 1).

We have contacted the Chairman of the Kota Tinggi Chinese Chambers of Commerce, the District Officer of Kota Tinggi and other Government Departments to ascertain the damage and losses caused by the 1969 flood.

The results of our investigations (Table 2) shows damages and losses of M$118,000 in Kota Tinggi. Of this total about M$83,000 was borne by the private sector and $35,000 by the public sector in the form of subsidies. In addition damages and losses were incurred on present agricultural developments in the flood plain of the S. Johore upstream of Kota Tinggi. Between Kota Tinggi and the site of a possible flood storage reservoir (see section 6.1), located about 16 miles upstream, the damages and losses have been estimated at M$16,000 (See Table 3).

As damage and losses caused by previous floods are not available it has not been possible to determine a stage/damage curve. Assuming that the flood loss and damage would not vary much with the stages listed in Table 1 and taking a frequency of flooding of once in 3 years the annual flood loss and damage would be about M$40,000 in Kota Tinggi and about M$5,000 in the flood plain upstream to the reservoir site. Of the total of M$40,000 about M$28,000 would be borne by the private sector and M$12,000 by the public sector.

The very low figures of $40,000 and $5,000 are probably due to the fact that the inhabitants of Kota Tinggi are well prepared for floods and that the flood plain mostly acts as storage volume giving low velocities capable of little physical damage.

6. Flood Mitigation Measures

6.1 Reservoir Storage

To be effective reservoirs storage must be located so that it commands at least 50% of the catchment draining to the area required to be protected. From a study of the 1 inch and 1 in 25000 maps the only promising site to fulfil this condition is located on the S. Johore about ¾ miles downstream of the confluence of the S. Linggui and S. Sayong (1" sheet 130, reference 935, 189). The flood level of the S. Johore at this point has not been established but probably lies between 35-45 M.S.L. We have assumed a reservoir conservation level of 60 M.SL.L. and a dam crest of 70 M.S.L. and have estimated the capital cost of the dam at M$ 10.7 million.*

The reservoir would have other benefits, notably it would be capable of regulating the flows in the S. Johore to meet possible future abstraction for water supplies, so it would be unfair to charge the whole cost of the dam against flood control. The future provision of regulating storage in the S. Johore catchment, and the amount of such storage, depends on factors and decisions outside our control. If a decision is made to provide regulation for the probable maximum demands likely

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* Subject to further refinement in light of engineering geologists visit.

to be placed on the river over the next 30 years then the most economic adequate storage can be obtained by constructing a dam on the S. Linggiu (1" sheet 125, reference 924, 307) at an estimated capital cost of M$ 7.4 million.* The proportion of the capital cost of the dam on the S. Johore attributal to flood control can therefore be taken as M$ 3.3 million. To this must be added the value of the inundated land. The area of the inundated land would be about 15 sq. miles of which about 2500 acres, including 1000 acres in the FLDA Kulai Complex, is developed. At a M$1000 per acre the capital cost to replace 2500 acres of developed land is M$ 2.5 million. This gives an approximate total cost of M$ 5.8 million.

Reservoirs located in the headwaters of the tributaries of the S. Johore for regulation of low flows would have very little effect on flood stages at Kota Tinggi. For example the reservoir located on the S. Linggui described above would only command 13% of the catchment draining to Kota Tinggi and consequently there would only be a slight reduction in flood peaks in some instances and no reduction in cases where the flooding originated elsewhere in the catchment area.

6.2 Barrage Storage

Although at low flows the tide has about a 6 foot range at Kota Tinggi, this effect is dampened out as the river flow increases. Figure 1 shows the hourly variation in flood level at Kota Tinggi from 1 p.m. 12th December to 1 p.m. 14th December during the 1969 flood and it is seen that the flood level was only marginally affected by the tide, to the extent

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* Subject to further refinement in light of engineering geologists visit.

of a few inches. Therefore it can be concluded that flooding at Kota Tinggi is caused solely by high river flows and that tides have virtually no effect. Consequently a tidal barrage on the Johore estuary downstream of Kota Tinggi would not mitigate the flooding.

6.3 Relief Channel

Due to topography it is not practical to provide a flood relief channel from upstream of Kota Tinggi into a neighbouring catchment.

In our opinion the benefits to be derived from providing a relief channel in the present flood plain from say Kg. Kelantan to Tg. Putus would be marginal and could not be evaluated until detailed investigations preferably including model tests were carried out.

Regarding costs there would be at least 1 million cubic yards of excavation involved, an additional large bridge would have to be constructed on the main road and a significant part of the town would have to be relocated involving land acquisition costs.

The approximate cost of the excavation of the channel and the new bridge can be taken as M$ 3.4 million. To this must be added the cost of some form of control headworks, M$ 3 million, relocation of roads (1 mile at $100,000) and acquisition of about 40 acres of the town (including property) estimated at M$ 0.4 million making a very approximate total cost of M$ 6.9 million.

6.4 River Channel Improvements

Widening the river through the town would have much the same effect as a relief channel in the flood plain. Costs would be at least as high as for the relief channel.

In view of the small slope of the river bed any regrading or deepening of the river bed would only have marginal benefits and could not be considered as a realistic solution to the flooding. It appears at present that the effects of sediment deposition on the river bed level at Kota Tinggi and in fact down past Nam Heng Estate is small, but dredging may be necessary in the future if the sediment load in the S. Johore, increases.

6.4 Bunding

The flood stage in 1969 was just over 14 M.S.L. Allowing 2 feet for an increase in stage due to change in river regime the minimum crest level of bunds would be 18 M.S.L.

We have made a preliminary survey of parts of Kota Tinggi and the minimum layout of bunds we would consider reasonable is shown in Plan 2. More detailed investigation, including model tests would be required to determine the correct alignment and height of bunds.

On the south bank of the river the bunds would be generally 7 feet high. West of the bridge the bund would extend from the bridge abutment to the International club and then turn at approximately right angles into high ground about 600 feet away. East of the bridge the bund would extend as far as the west bank of S. Tembeyoh and then would be turned back along the west bank of the S. Tembeyoh until it meets high ground near the airstrip after crossing the main Kota Tinggi - Johor Baharu road.

Bunding of the S. Johore east of S. Tembeyoh would be possible but would be expensive. Bund dimensions would increase due to lower ground levels. The area is lightly populated and the only major enterprise is a large sawmill situated directly on the banks of the S. Johore. To protect

the sawmill by bunds would require relocation of a large part of the sawmill. The inclusion of the catchment area of the S. Tembeyoh behind the bund would present a major drainage problem and it would probably be necessary to divert the S. Tembeyoh over a distance of about 1 mile to Tg. Putus.

On the north bank of the river the bunds would be generally 10 feet high. West of the bridge the bund would extend to the east bank of the S. Kemang and then turn at approximately right angles into high ground about 3000 feet away. Bunding of the S. Johore west of the S. Kemang would be possible but would be expensive. The extended bund would only be required to protect Kg. Kelantan which flooded to depths of 10-12 feet in 1969. Bund dimensions would increase in this area due to lower ground levels and a large part of Kg. Kelantan would have to be relocated to make way for the bunds. Also the inclusion of the catchment area of the S. Kemang behind the bund would present a major drainage problem and there is no practical way of diverting this tributary. East of the bridge the bund would extend for a distance of about 600 feet and then turn northwards behind the built up area until meeting the Kota Tinggi - Mersing road and then north east along the south side of this road until meeting the S. Bang crossing. It would then cross the road and run along the west bank of the S. Bang until reaching high ground. Instead of terminating the bund running north east at the S. Bang crossing it would be possible to extend this to the S. Permandi crossing. However the bunded area would then include the catchment area of the S. Bang and as the additional protected area is lightly populated this extension does not appear desirable.

The bunded area south of the river is about 150 acres and north of the river about 300 acres and each would require a pumping station to remove internal water when the S. Johore was in flood. The drainage system in each area would require careful study to prevent local flooding and the size of the pumping stations would depend on a detailed study of the allowable ponding behind the bunds. All property roads etc. within 100-150 feet (depending on local circumstances) of the river bank would have to be relocated to allow the construction of the bunds.

We have estimated the cost of the bunding at M$ 1.4 million. To this must be added the cost of the pumping stations which (based on 50 cusec and 100 cusec pumps for the south and north bunded areas respectively) we have estimated at M$ 1.2 million, requisition of about 65 acres of the town (including property) estimated at $0.6 million and relocation of roads (1½ miles at $100,000) making a very approximate total cost of M$ 3.35 million.

It should be noted that there is a certain danger relying on bunds to protect an urban area. They give full protection up to a certain flood stage and at higher stages are overtopped.

People in bunded protected areas feel secure and invest in development if there are no high flows for a long time. Any break in the bund due to overtopping or weakness at high flow might conceivably cause more total damage than would be the case with no bunds.

7. Comparison of Annual Costs and Benefits

Flood control planning requires a comparison of the annual cost and benefits, both tangible and intangible, of control measures for each alternative scheme. The tangible benefits are the avoidance of damange and expenditure on relief

work when flooding is controlled; the intangible benefits are the avoidance of the dislocation and discomfort of a flooded town.

Total annual costs (including operating costs), annual benefits to private and public sectors and net additional finance required from public sector for each scheme considered are shown in Table 4. Annual benefits are based on our estimate of tangible damages and losses incurred in the 1969 flood (M$118,000 in Kota Tinggi and M$16000 in upstream flood plain to reservoir site) and assuming a frequency of flooding of equal severity once in every 3 years.

8. Conclusion

The net additional finance required anually from the public sector for each scheme considered is:

Scheme	Additional Annual Finance (M$)
Storage on S. Johore	571,000
Relief Channel	681,000
Bunds	355,000

Subsidies of the order indicated above represent a very heavy investment indeed for the sake of avoiding periodic inconvenience and distress to the people involved. Before adopting subsidies on this scale consideration should be given to a policy of restricting development on the low ground and of encouraging relocation of existing low lying dwellings on higher ground.

TABLE 1

Recent Historical Floods at Kota Tinggi

Date	Stage (MSL)	Remarks
1942	Not known	Stage described as high by local inhabitants
1948	15.23	About 1 foot higher than 1969
Jan. 1951	16.20 *	Level mentioned in 1952 DID Report 12.90
Jan 1952	12.00 *	DID Report available. Level given in report 11.00
Dec. 1954	12.60 *	
Mar. 1964	6.00	DID Report available. River did not overflow banks at Kota Tinggi
Dec. 1967 } Jan. 1968 }	14.40 *	Double peaked flood
Dec. 1969	14.23	J.K.R. level 13.75

* Levels shown on flood maps provided by D.I.D.

TABLE 2

Damages and Losses Caused by 1969 Flood at Kota Tinggi

	M$	M$
A. Private Sector		
1. Physical Damage		
Personal		
Damage to houses, furniture, clothing etc.	13,250	
Business		
Damage to property and loss of stock	70,000	83,250
2. Commercial Loss		
See note below		Nil
Total (1)		83,250
B. Public Sector		
1. Physical Damage		
Damage to Government buildings etc.		11,160
2. Relief Costs		
Food, grants, beds, boats etc.	13,610	
Vaccines etc. (approx.)	10,000	23,610
Total (2)		34,770
Total (1) + (2)		118,020

NOTE:

In an interview the Chairman of the Kota Tinggi Chinese Chamber of Commerce stated that the commercial

losses to business due to the 1969 flood were negligible. Most businesses affected were in the distribution sector and sales lost due to floods were made up in the following weeks. Transport of goods from the East coast to the south must also have been affected but there is no data on this. It should be noted that the flooding at Kota Tinggi was not the only cause of disruption as certain stretches of the road from the east coast to the south were impassable due to flooding from catchments other than the Johore river. Commercial losses have therefore been taken as nil.

TABLE 3

Damages and Losses Caused by 1969 Floods in River Valley Between Possible dam site and Kota Tinggi

	M$	M$
1. 17 acres of small holders crops destroyed	5,000	
2. 1500 acres of rubber trees under water for 5/6 days(approximately)	11,000	16,000

TABLE 4

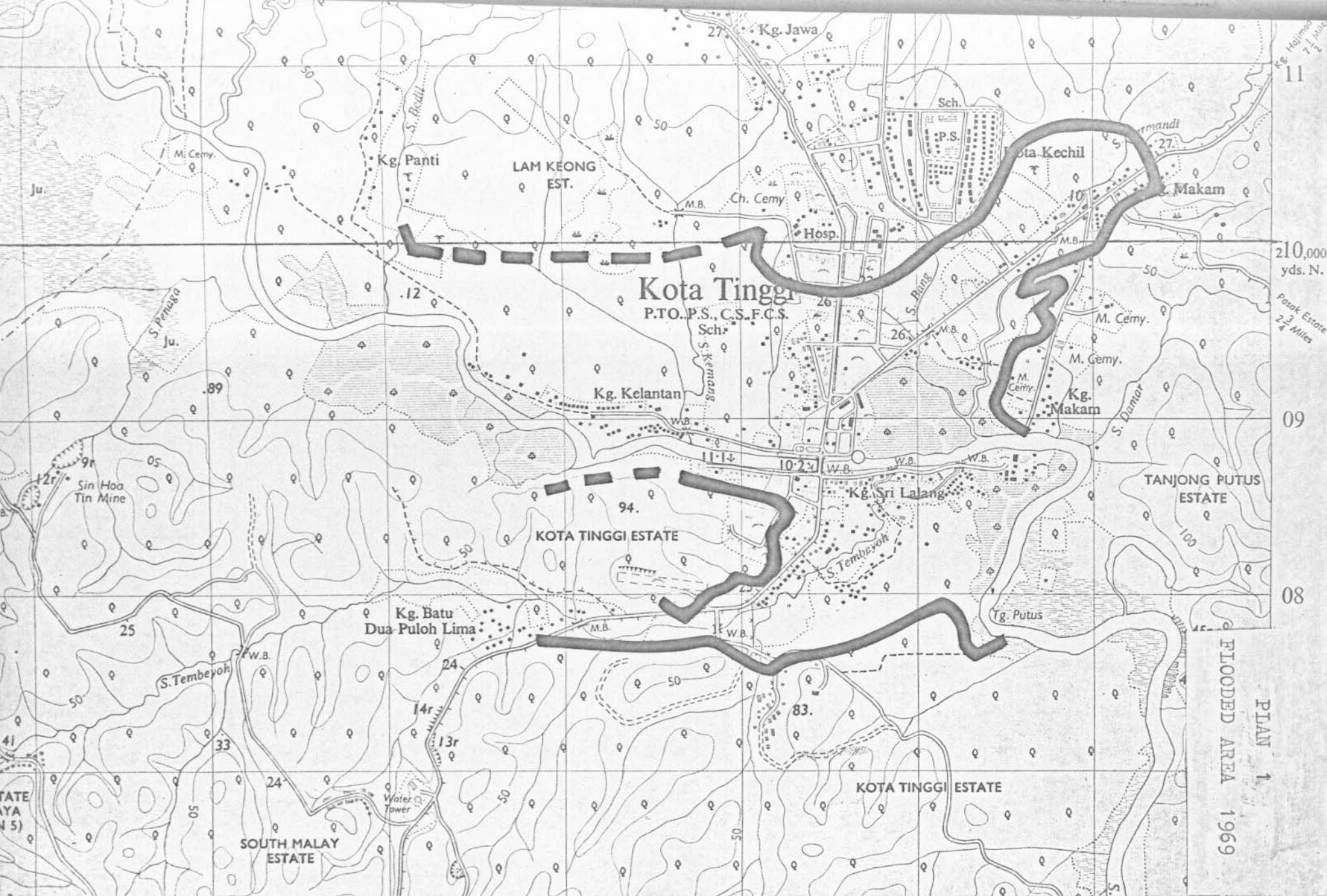
FLOOD MITIGATION MEASURES - ANNUAL COSTS, BENEFITS AND ADDITIONAL PUBLIC SECTOR FINANCE

Scheme	Capital Cost of Flood Mitigation Measures M$ million	Annual Cost of Capital Cost at 10% M$	Operating Cost M$	Total Annual Cost M$	Annual Benefits		Net Additional Finance required from public sectors (Annual) ((5 less 7) M $
					Private Sector M$	Public Sector M$	
1	2	3	4	5	6	7	8
Storage on S. Johore	a) dam 3.3 + b) Developed 2.5 Area flooded	580,000	0.1% of (a)=0.003 3,000	583,000	33,000	12,000	571,000
Relief Channel	a) Channel 2.40 b) Bridge 1.00 c) Control Works 3.00 d) Roads 0.10 e) Land acquisition 0.40 6.90	690,000	0.5% of (a)+(b)+(c)+(d) =.003 3,000	693,000	28,000	12,000	681,000
Bund	a) Bunds 1.40 b) Pumping Stations 1.20 c) Roads 0.15 d) Land acquisition 0.60 - 3.35	335,000	0.5% of (a)+(c)= .008 2% of (b)= .024 32,000	367,000	28,000	12,000	355,000

+) Capital cost of dam on S. Johor $ 10.7 million

Capital cost of alternative regulating reservoir (estimated max.) $ 7.4 million

Net Cost attribution to flood control (estimated min.) $ 3.3 million


PLAN 1
FLOODED AREA 1969
Kota Tinggi
P.T.O., P.S., C.S., F.C.S.
Kg. Jawa
Kg. Panti
LAM KEONG EST.
Kg. Kelantan
Kg. Sri Lalang
Kg. Batu Dua Puloh Lima
Kg. Makam
Kota Kechil
Makam
Hosp.
Sch.
P.S.
Ch. Cemy.
M. Cemy.
M.B.
W.B.
S. Penuga
S. Kemang
S. Rong
S. Damar
S. Tembeyoh
Sin Hoa Tin Mine
KOTA TINGGI ESTATE
TANJONG PUTUS ESTATE
SOUTH MALAY ESTATE
Tg. Putus
Water Tower
Pasak Estate
2 3/4 Miles
10,000 yds. N.
11
10
09
08
27
26
25
24
33
83.
94.
89
12
11·1
10·2

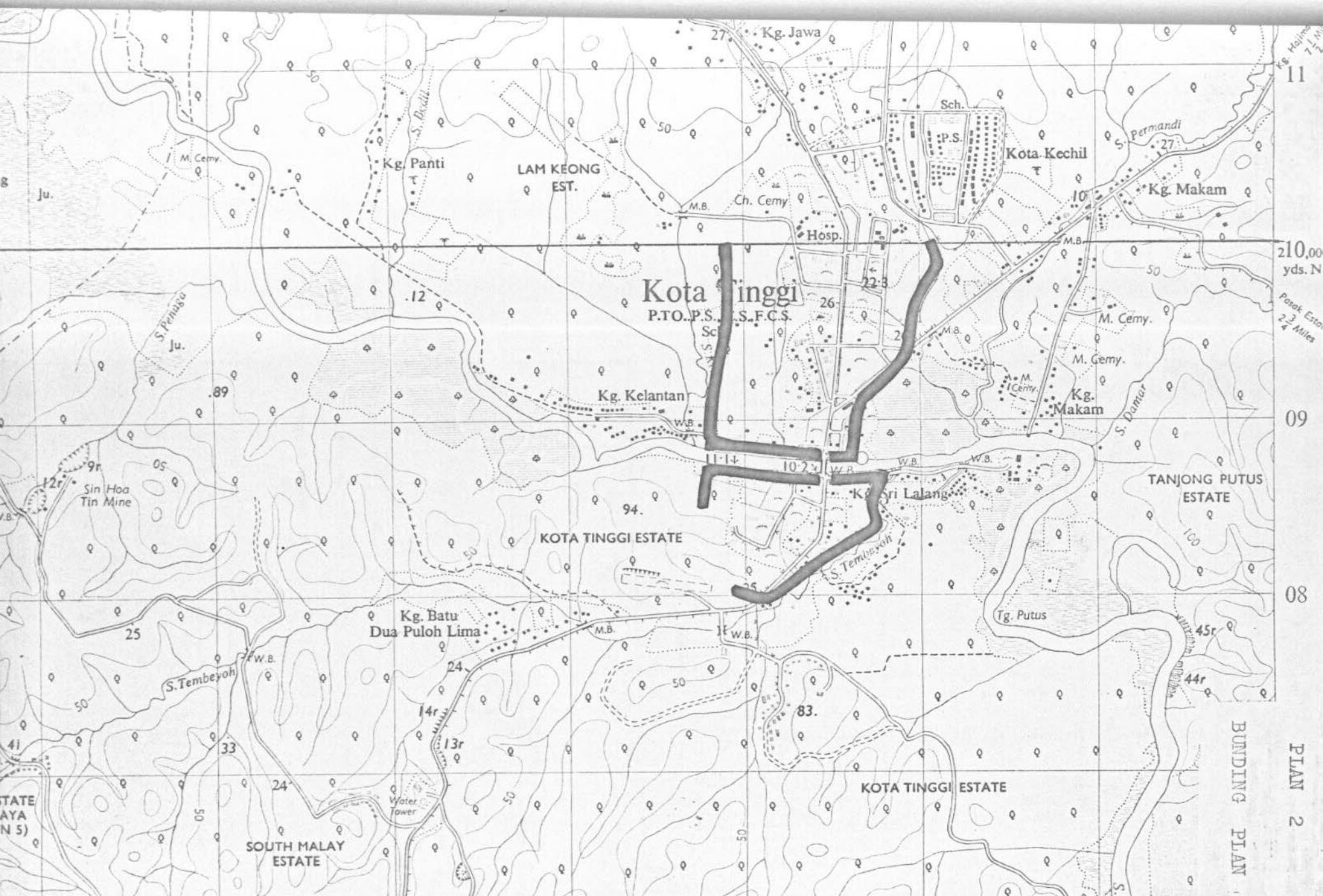
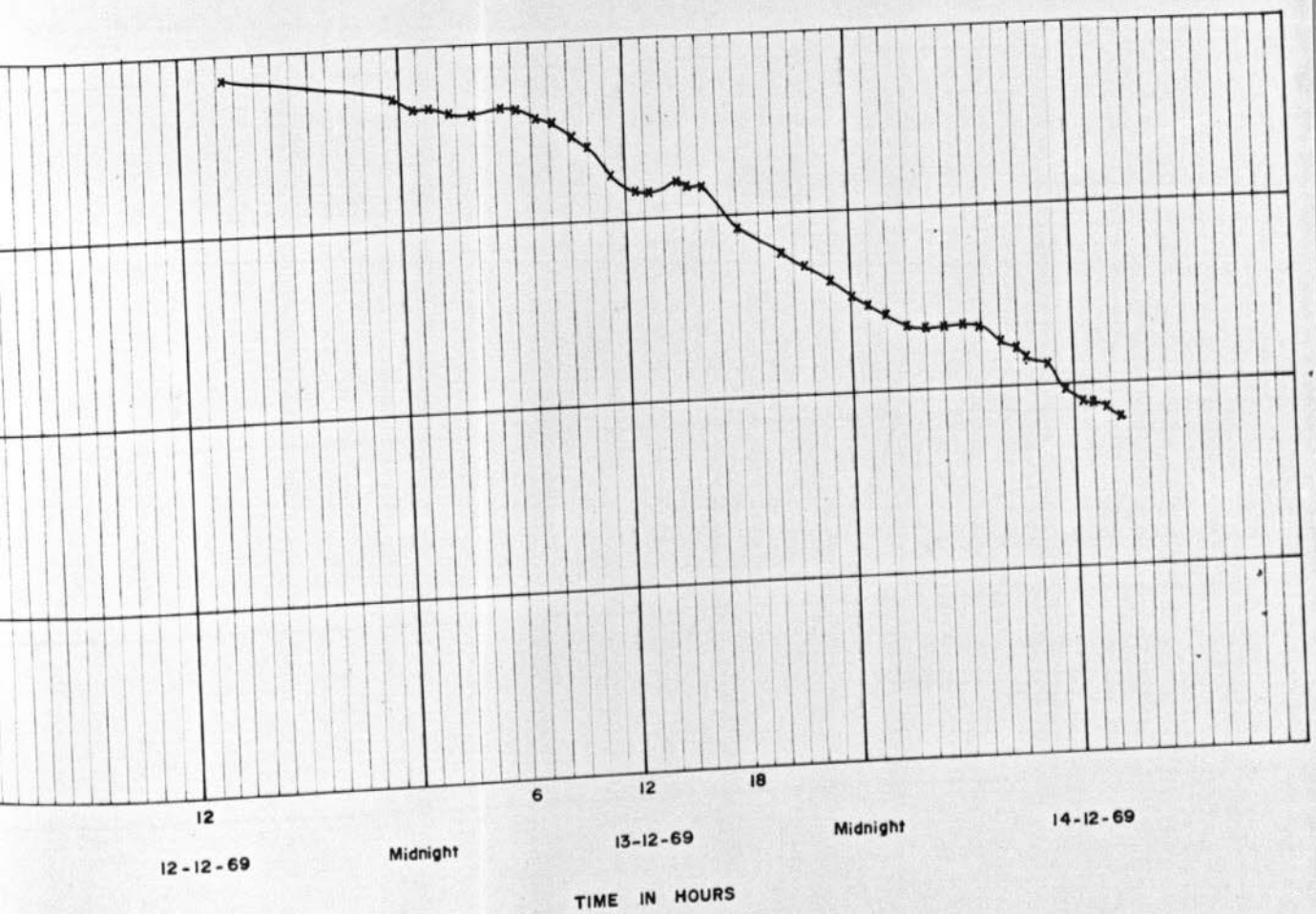

Kg. Jawa
Kg. Panti
LAM KEONG EST.
Kota Kechil
Kg. Makam
Kota Tinggi
P.T.O. P.S. S.F.C.S.
Hosp.
Kg. Kelantan
Kg. Sri Lalang
Sin Hoa Tin Mine
KOTA TINGGI ESTATE
TANJONG PUTUS ESTATE
Kg. Batu Dua Puloh Lima
Tg. Putus
SOUTH MALAY ESTATE
Water Tower
S. Tembeyoh
S. Permandi
S. Penusu
S. Damar
M. Cemy.
Ch. Cemy
M.B.
W.B.
Sch.
P.S.
Ju.
11
10
09
08
210,000 yds. N
PLAN 2
BUNDING PLAN

FIGURE 1

FLOOD LEVEL IN KOTA TINGGI TOWN
DECEMBER 1969 FLOOD



PLAN OF OPERATION & MONTHLY PROGRESS CHART

SOUTH EAST JOHOR PROJECT