(7)

PEOPLE'S REPUBLIC OF BANGLADESH

Ministry of Irrigation, Water Development and Flood Control

Bangladesh Water Development Board

CYCLONE PROTECTION PROJECT II - FAP 7
FEASIBILITY AND DESIGN STUDIES

FINAL PROJECT PREPARATION REPORT
VOLUME 3 - ANNEX XII - POLDER DATA

May 1992

Joint Venture of
KAMPSAX INTERNATIONAL A/S,
BCEOM
DANISH HYDRAULIC INSTITUTE
in association with
DEVELOPMENT DESIGN CONSULTANTS LTD

Financed by European Community - Project No. ALA/87/05

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REPORT VOLUMES

The present Report Volume is part of the

CYCLONE PROTECTION PROJECT II - FAP 7
FEASIBILITY AND DESIGN STUDIES
BWDB COMPONENT
FINAL PROJECT PREPARATION REPORT

Consisting of the following Volumes :

Volume 1	-	Main Report
Volume 2	-	Annexes I - XI, XIII
Volume 3	-	Annex XII - Polder Data
Appendix A	-	Hydraulic Studies
Appendix B	-	Field Surveys and Soil Investigations
Appendix C	-	Embankment Design
Appendix D	-	Agriculture
Appendix E	-	Socio-Económics
Appendix F	-	Operation & Maintenance
Appendix G	-	Cyclone Early Warning System
Appendix H	-	Afforestation
Appendix I	-	Feasibility Study on Patenga Project
Appendix J	-	Fisheries

INTRODUCTION

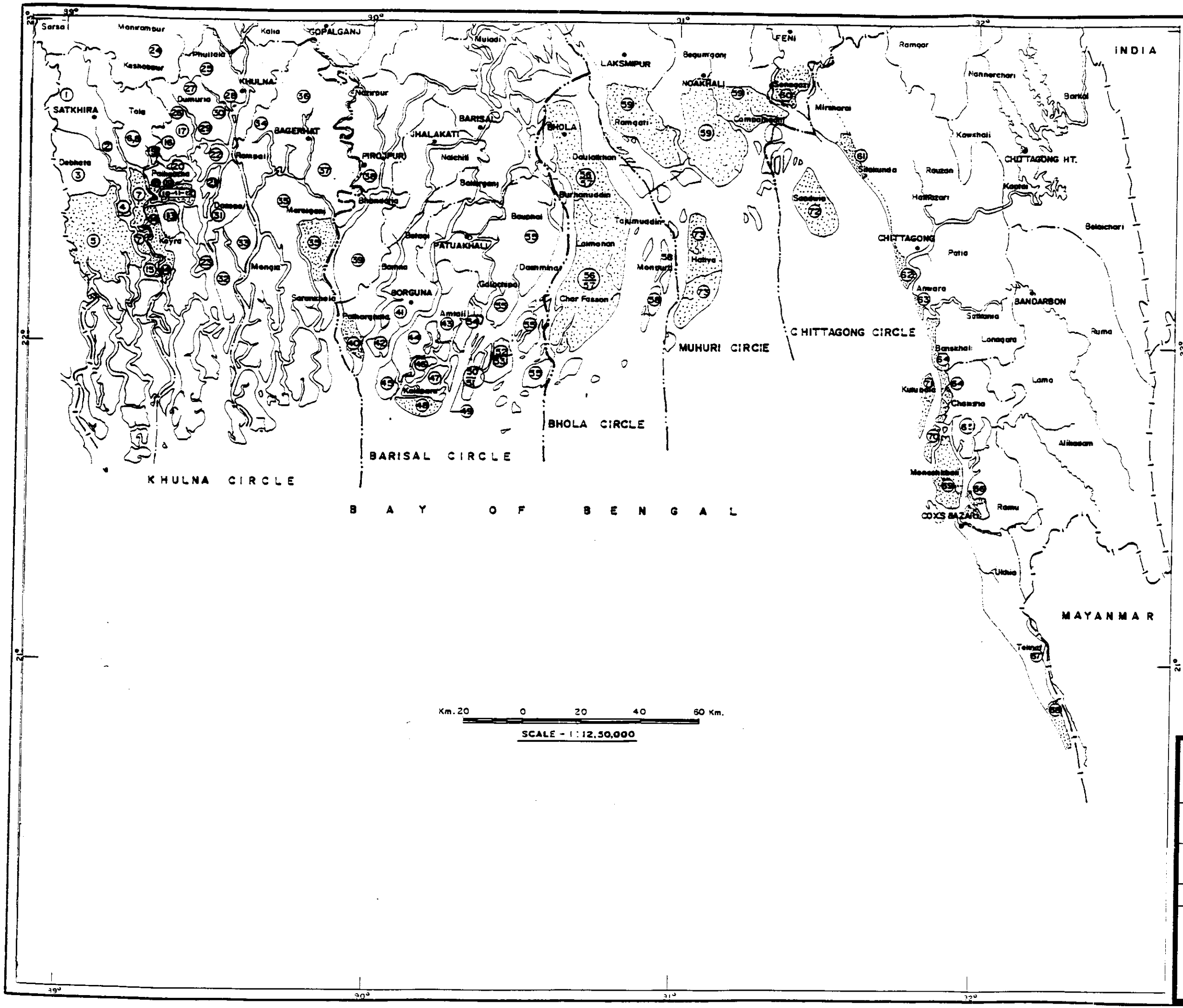
This volume presents basic data and information on a total number of 29 polders, which were selected for detailed field reconnaissance and further studies on the basis of a careful screening of polders within the overall study area.

Engineering and afforestation condition surveys were made in each polder resulting in a description of the present conditions of embankments and hydraulic structures, the extent and performance of existing afforestation, the nature and causes of damages and recommended remedial measures for repair and prevention of damages.

Data on polder areas, land use, major cyclone damage, etc. were collected. All the collected data and information are presented separately for each polder together with relevant polder maps.

The polder maps show existing embankments and hydraulic structures as well as proposed resectioning of embankments, new embankments, structures and protective works. They also shown the net protected areas used in the calculation of agricultural benefits.

The polders are presented circle wise.



LEGEND

- International Boundary ...
- District Boundary ...
- BWDB Circle Boundary ...
- Rivers ...
- Polder Number ... (55)
- Polders in Mid Term Program ...

PEOPLE'S REPUBLIC OF BANGLADESH
MINISTRY OF IRRIGATION, WATER DEVELOPMENT AND FLOOD CONTROL
BANGLADESH WATER DEVELOPMENT BOARD

CYCLONE PROTECTION PROJECT II

MID TERM PROGRAMME BASE MAP

Design:	Recomm.	Appr.:	DATE:01-02-92

KAMPSAX INTERNATIONAL A/S, BCEOM and DANISH HYDRAULIC INSTITUTE in association with DEVELOPMENT DESIGN CONSULTANTS LTD.
23, New Eskaton Road, Dhaka-1000. Tel. 405477, Fax 880 02 832951

SCALE : 1:1 250 000

DRAWING NO. :

Polder no. 5

Project Type:	Flood Control, Drainage and salinity exclusion (FCD).
Location:	District: Satkhira Upazila : Shyamnagar O&M division: Satkhira I Circle: Khulna
Status:	Polder complete
Area(ha):	Gross protected 55,400 Net cultivable 48,700 Net benefitted 4,000
Land elevation:	1.0-1.5 m PWD
Tidal range: (m PWD)	Kobadak Forest Office Gauge Station: Return Period 2.33 Year 20 Year HWL 2.359 3.140 LWL (-)1.436 (-)2.415
Land usage:	Paddy cropping & shrimp cultivation
Embankment length and type:	155 km interior Crest level 4.6 m along Kalindi river and 4.3m along Kholpetua river
Constructed:	1965-70 under CEP phase I
Major Cyclone Damage:	By 1965, 1970 and 1988
Major Flood Damages:	By 1987-88 floods
Repair/rehabilitation:	1988-90 under ADB funded part of Flood Rehabilitation Project, FDR
O & M:	Practically no routine or periodic maintenance been carried out since the construction of the embankment.
Remarks:	Some conflicts of interests between shrimp cultivators and paddy croppers.

Damaged embankments and embankments exposed to damage.

The embankment chainage 92.2 to 114.8 km along the 0.8-1.2 km wide lower reach of Kholpetua river is exposed to frequent local wind generated waves causing extensive erosion of the river side slopes. Part of the embankment along the outer bends of the river is further exposed to some river erosion.

The same applies but to lesser extent for the embankment chainage 32 to 46 km along the Kalindi River.

Damages on structure.

Drainage sluices 9 & 10 are severely damaged by waves and flood.

Afforestation.

There is no afforestation or plantation on the foreshore or on the embankment along Kolpetua River and only scattered patches of grass turfing on the river side slope.

Along the Kalindi river there are some pathes of natural mangrove on the foreshore providing effective protection against wave attack and Babla trees are found on short length of the embankment. The embankment slopes, except the lower part on the river side, is covered with grass turfing (durba grass) in fair condition.

Recommended remedial measures.

Embankment chainage 32 to 46 km and 92.2 to 114.8 km:
Resectioning to provide flatter and well compacted river side slope with durba grass turfing.

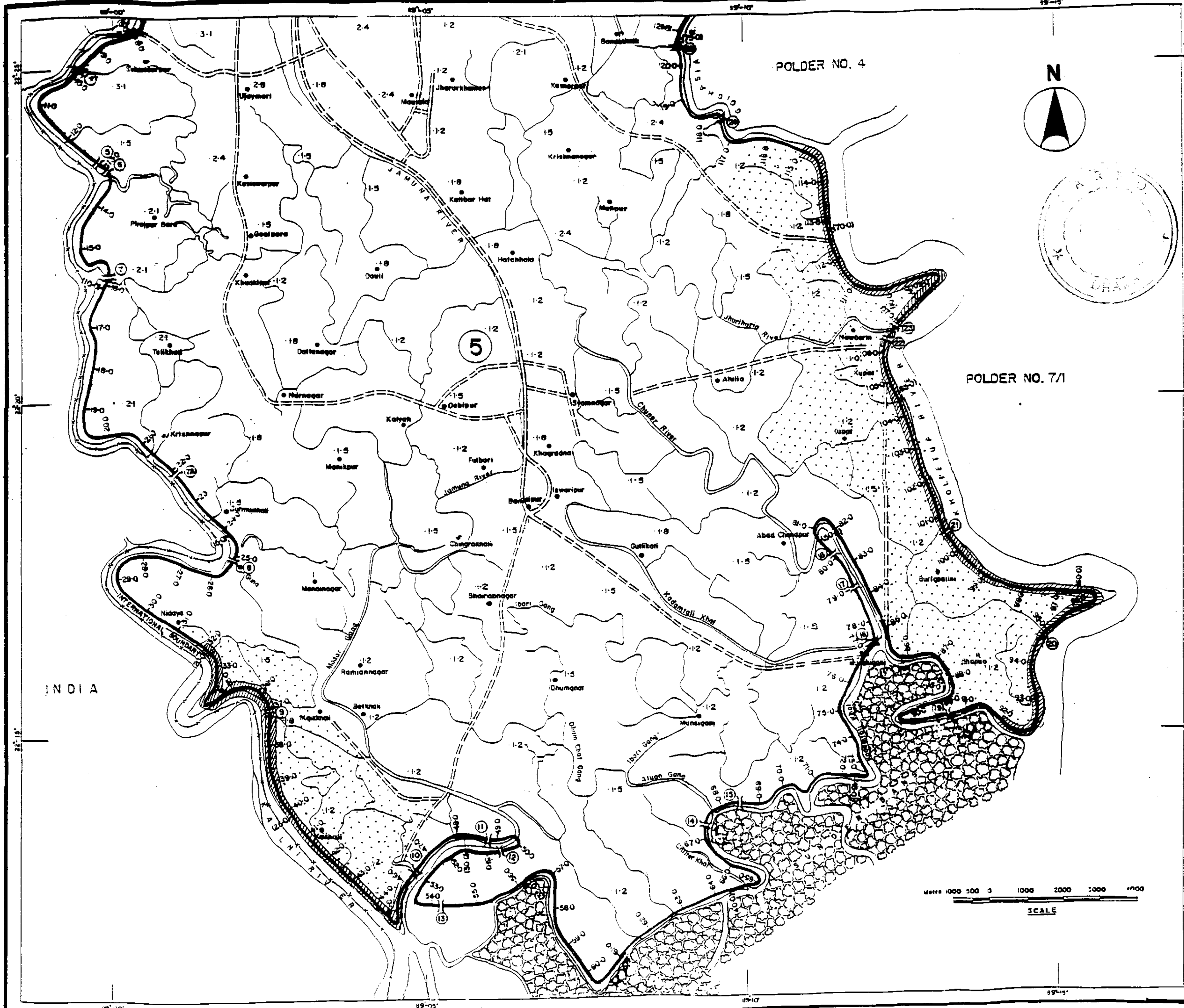
River training works with porcupine along outer bends of Kolpetua river exposed to erosion. To be carried out as part of required regular and periodic maintenance.

Repairing drainage sluices No 9 and 10 conforming flatter river side slope of embankment.

Mangrove afforestation on foreshore area and in borrow pits.

Babla tree plantation on embankment slopes.

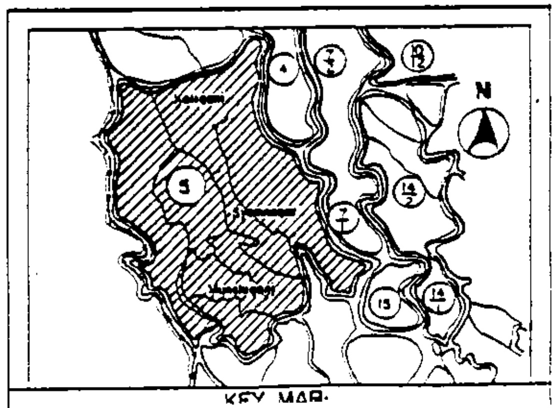
POLDER NO. 5



LEGEND

- River & Khal
- Roads
- Shore Line 1965
- Shore Line 19
- Limit of Protected Area
- Spot Heights in Metre (PWD) — 0 3·4 / 8
- Embankments Ch. Km. 8·0/ Mile(5·0) — (5·0)
- New/Retired Embankment
- Resectioning Embankment
- Protective Works
- Original CEP Embankment
- Porcupine
- Existing Sluice — DS, SS
- Proposed Sluice — DS, SS
- Sluice to be Repaired — DS, SS
- Net Protected Area

Note:
This programme is not recommended for implementation under CPP-II.



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MINISTRY OF IRRIGATION, WATER DEVELOPMENT AND FLOOD CONTROL
BANGLADESH WATER DEVELOPMENT BOARD

CYCLONE PROTECTION PROJECT II

MID TERM PROGRAMME-PHASE 2 PROPOSED WORKS	POLDER 5
Design: / Recomm. / Appr.:	DATE:01-02-92
KAMPSAX INTERNATIONAL A/S, BCEOM and DANISH HYDRAULIC INSTITUTE in association with DEVELOPMENT DESIGN CONSULTANTS LTD. 23, New Eskaton Road, Dhaka-1000, Tel. 405477, Fax 880 02 832951	SCALE : 1:100 000 DRAWING NO. :

Polder no. 7/1 & 7/2

Project Type:	Flood Control, Drainage and salinity exclusion (FCD).
Location:	District: Satkhira Upazila: Shamnagar (7/1) & Assasuni (7/2) O&M division: Satkhira I Circle: Khulna
Status:	Polder complete
Area(ha):	Gross protected 3,900 (7/1) + 10,900 (7/2) Net cultivable 2850 (7/1) + 7,740 (7/2) Net benefitted 3,900 (7/1) + 1,300 (7/2)
Land elevation:	1.0-1.5 m PWD
Tidal range (m PWD):	Kobadak Forest Office Gauge Station:

Return Period	2.33 Year	20 Year
HWL	2.359	3.140
LWL	(-)1.436	(-)2.415

Land usage:	Paddy cropping & shrimp cultivation
Embankment length and type:	33.6 km (7/2) +57.9 km (7/2) interior Crest level 4.3 m.
Constructed:	1965-70 under CEP phase I
Major Cyclone Damage:	By 1965, 1970 & 1988
Major Flood Damages:	By 1987-88 floods
Repair/rehabilitation:	1988-90 under ADB funded part of Flood Rehabilitation Project, FDR
O & M:	Practically no routine or periodic maintenance have been carried out since the construction of the embankment.
Remarks:	Some conflicts of interests between shrimp cultivators and paddy croppers.

Damaged embankments and embankments exposed to damage.

The embankment of polder 7/1 and 7/2 along the 0.8-1.2 km wide lower reaches of Kholpetua and kobadak river is exposed to local wind generated waves causing extensive erosion of the river side slopes. Part of the embankment along the outer bends of rivers is further exposed to some river erosion.

Damages on structure.

None.

Afforestation.

There is no afforestation or plantation on the foreshore or on the embankment along Kolpetua and Kobadak river and only scattered patches of grass turfing on the river side slope.

Recommended remedial measures.

Embankment chainage 0 to 18.5 km and 19 to 31 km of polder 7/1 and embankment chainage 0 to 6 km and 46 to 58.4 km of polder 7/2:

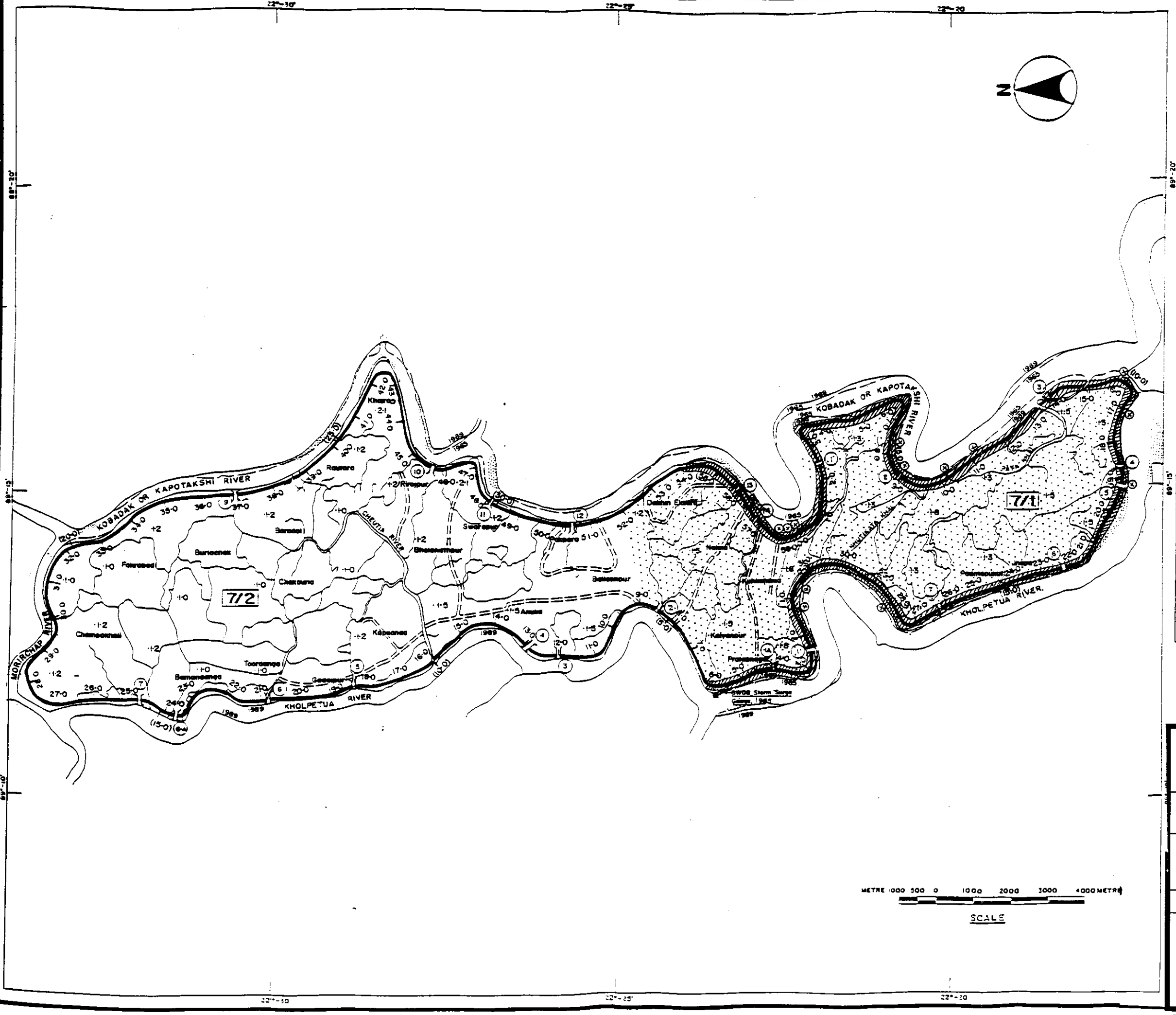
Resectioning to provide flatter and well compacted river side slope with durba grass turfing.

River training works with porcupine along outer bends of Kolpetua and Kobadak river exposed to erosion. To be carried out as part of required regular and periodic maintenance.

Mangrove afforestation on foreshore area and in borrow pits.

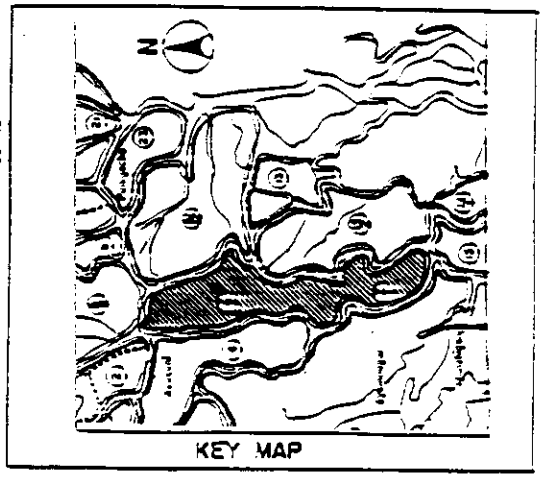
Babla tree plantation on embankment slopes.

POLDER NO. 7/1 & 7/2



LEGEND

- River & Khal
- Roads
- Shore Line 1965
- Shore Line 19
- Limit of Protected Area
- Spot Heights in Metre (PWD) 3·4
- Embankments Ch. Km. 8·0/Mile(5·0) (5·0)
- New/Retired Embankment
- Resectioning Embankment
- Protective Works
- Original CEP Embankment
- Porcupine. (⊗.= 400m.)
- Existing Sluice DS SS
- Proposed Sluice DS SS
- Sluice to be Repaired DS SS
- Net Protected Area



Note:
This programme is not recommended for implementation under CPP-II.

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BANGLADESH WATER DEVELOPMENT BOARD

CYCLONE PROTECTION PROJECT II

MID TERM PROGRAMME-PHASE 2 PROPOSED WORKS			POLDER 7/1, 7/2
Design:	Recomm.	Appr.:	DATE:01-02-92

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SCALE : 1:100 000

DRAWING NO. :

Polder no. 10-11-12

Project Type:	Flood Control, Drainage and salinity exclusion (FCD).
Location:	District: Khulna Upazila: Paikgacha O&M division: Khulna-II Circle: Khulna
Status:	Polder complete
Area(ha):	Gross protected 16,000 Net cultivable 13,900 Net benefitted 3,300
Land elevation:	1.0-1.2 m PWD
Tidal range: (m PWD)	Shibsa River

Return Period	2.33 Year	20 Year
HWL	2.426	3.19
LWL	(-)1.071	(-)2.18

Land usage:	Paddy cropping & winter cropping
Embankment length and type:	69 km Interior Crest level 4.3 m along Shibsa River
Constructed:	1965-70 CEP phase I
Major Cyclone Damages:	By 1965, 1970 & 1988
Major Flood Damages:	By 1987-88 floods
Repair/rehabilitation:	1988-90 under ADB funded part of Flood Rehabilitation Project, (FDR) & FFW since 1976.
O & M:	Practically no routine or periodic maintenance have been carried out since the construction of the embankment.
Remarks :	Drainage sluice No 5 is damaged and under capacity to drain out efficiently the upland flow of the river.

Damaged embankments and embankments exposed to damage.

The embankment chainage 16.0 to 23.5 km along 0.8-1.2 km wide lower reach of Shibsa river is exposed to frequent local wind generated waves causing extensive erosion of the river side slopes.

Damages on structure.

Drainage sluice no 5 is overload by the upland flow of Ghoshkhali river and is in severely damaged condition.

Afforestation.

Some scattered mangrove trees are growing on the foreland and in some area the whole embankment is almost empty.

Recommended remedial measures.

Embankment chainage 16 to 23.5 km:

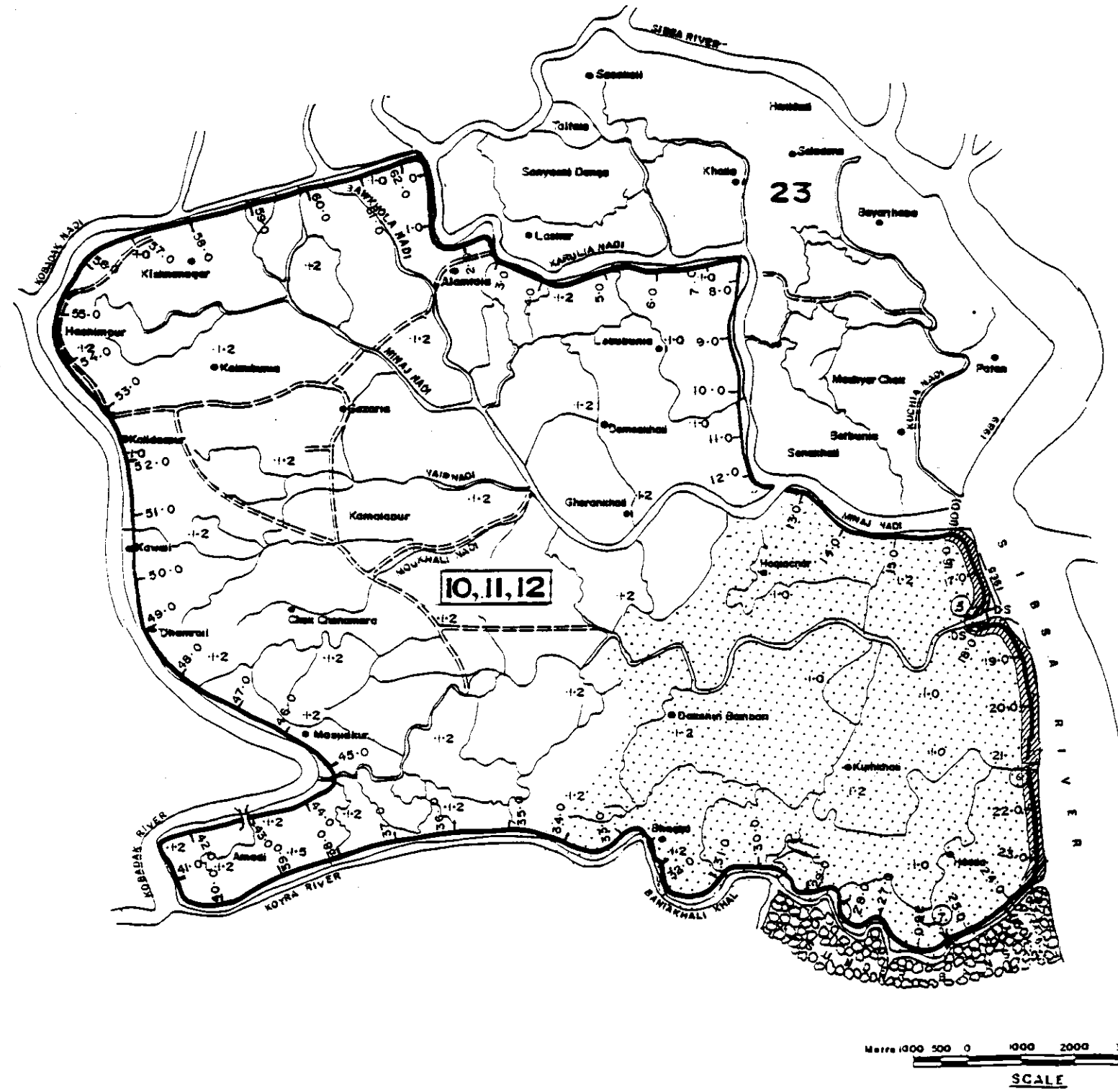
Resectioning to provide flatter and well compacted river side slope with durba grass turfing.

Major repair/replacement of drainage sluice no 5 to provide safety of the structure and to carry full discharge of Ghoshkhali river controlling upland flooding.

Mangrove afforestation on foreshore area and in borrow pits.

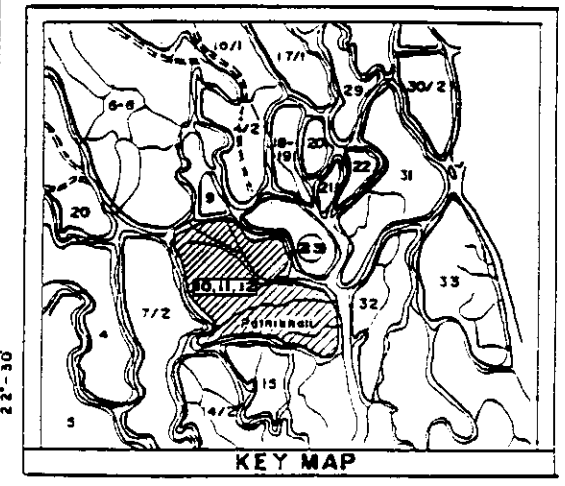
Babla tree plantation on embankment slopes.

POLDER NO. 10,11,12



LEGEND

- River & Khal
- Roads
- Shore Line 1965
- Shore Line 19
- Limit of Protected Area
- Spot Heights in Metre (PWD)
- Embankments Ch. Km. 6·0/Mile(5·0)
- New/Retired Embankment
- Resectioning Embankment
- Protective Works
- Original CEP Embankment
- Porcupine
- Existing Sluice (DS, SS)
- Proposed Sluice (DS, SS)
- Sluice to be Repaired (DS, SS)
- Net Protected Area



Note:
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PEOPLE'S REPUBLIC OF BANGLADESH
MINISTRY OF IRRIGATION, WATER DEVELOPMENT AND FLOOD CONTROL
BANGLADESH WATER DEVELOPMENT BOARD

CYCLONE PROTECTION PROJECT II

MID TERM PROGRAMME-PHASE 2 PROPOSED WORKS	POLDER 10-11-12
Design: Recomm. Appr.:	DATE:01-02-92
KAMPSAX INTERNATIONAL A/S, BCEOM and DANISH HYDRAULIC INSTITUTE in association with DEVELOPMENT DESIGN CONSULTANTS LTD. 23, New Eskaton Road, Dhaka-1000. Tel. 405477, Fax 880 02 832951	SCALE : 1:100 000
	DRAWING NO. :

Polder no. 14/1 & 14/2

Project Type:	Flood Control, Drainage and salinity exclusion (FCD).
Location:	District: Satkhira Upazila: Koyra O&M division: Satkhira-II Circle: Khulna
Status:	Polder complete
Area(ha):	Gross protected 2,550 (14/1) + 11,000(14/2) Net cultivable 2010 (14/1) + 8,800 (14/2) Net benefitted 2,500 (14/1) + 2,300 (14/2)
Land elevation:	1.2-1.5 m PWD
Tidal range: (m PWD)	Kobadak Forest Station Gauge Station Return Period 2.33 Year 20 Year HWL 2.359 3.140 LWL (-)1.436 (-)2.415
Land usage:	Paddy cropping & shrimp cultivation
Embankment length and type:	26.5 (14/1) + 64.0 (14/2) Interior Crest level 4.3 m
Constructed:	1965-70 under CEP phase I
Major Cyclone Damage:	By 1965, 1970 & 1988
Major Flood Damages:	By 1987-88 floods
Repair/rehabilitation:	1988-90 under ADB funded part of flood Rehabilitation Project, (FDR)
O & M:	Practically no routine or periodic maintenance have been carried out since the construction of the embankment.
Remarks:	Some conflicts of interest between shrimp cultivators and paddy croppers.

Damaged embankments and embankments exposed to damage.

The embankment of polder 14/1 and 14/2 along the 0.8 to 1.2 km wide lower reach of kobadak river is exposed to local wind generated waves causing extensive erosion of the river side slopes. Part of the embankment along the outer bends of the river is further exposed to some river erosion.

Damages on structure.

None.

Afforestation.

There is no afforestation or plantation on the foreshore or on the embankment along Kobadak river and only scattered patches of grass turfing on the river side slope.

Recommended remedial measures.

Embankment chainage 0 to 11.5 km of polder 14/1 and embankment chaniage 0 to 10 km of polder 14/2:
Resectioning to provide flatter and well compacted river side slope with durba grass turfing.

River training works with porcupine along outer bends of Kobadak river exposed to erosion. To be carried out as part of required regular and beriodic maintenance.

Mangrove afforestation on foreshore area and in borrow pits.

Babla tree plantation on embankment slopes.

Polder no. 15

Project Type:	Flood Control, Drainage and salinity exclusion (FCD).
Location:	District: Satkhira Upazila: Shyamnagar O&M division: Satkhira-I Circle: Khulna
Status:	Polder complete
Area(ha):	Gross protected 3,320 Net cultivable 3,050 Net benefitted 3,300
Land elevation:	1.2-1.5 m PWD
Tidal range: (m PWD)	Kobadak Forest Gauge Station:

Return Period	2.33 Year	20 Year
HWL	2.359	3.140
LWL	(-)1.436	(-)2.415

Land usage:	Paddy cropping & shrimp cultivation
Embankment length and type:	22 km Interior Crest level 4.3 m
Constructed:	1965-70 under CEP phase I
Major Cyclone Damage:	By 1965, 1970 & 1988
Major Flood Damages:	By 1987-88 floods
Repair/rehabilitation:	1988-90 under ADB funded part of flood Rehabilitation Project, FDR.
O & M:	Practically no routine or periodic maintenance have been carried out since the construction of the embankment.
Remarks:	Some conflicts of interest between shrimp cultivators and paddy croppers.

Damaged embankments and embankments exposed to damage.

The embankment chainage 0 to 7 km and 20.8 to 26.8 km along 0.8 to 12 km wide lower reach of kholpetua river and embankment chainage 7 to 20.5 km along similar wide lower reach of Kobadak river are exposed to frequent local wind generated waves causing extensive erosion of the river side slopes. Part of the embankment along the outer bends of the river is further exposed to some river erosion.

Damages on structure.

None.

Afforestation.

There is no afforestation or plantation on the foreshore or on the embankment along Kobadak river and only scattered cluster of mangrove plantation on small foreland of Kholpatua in the southern part of the polder.

Recommended remedial measures.

Embankment chainage 0 to 20.5 km and 20.8 to 26.8 km:
Resectioning to provide flatter and well compacted river side slope with durba grass turfing.

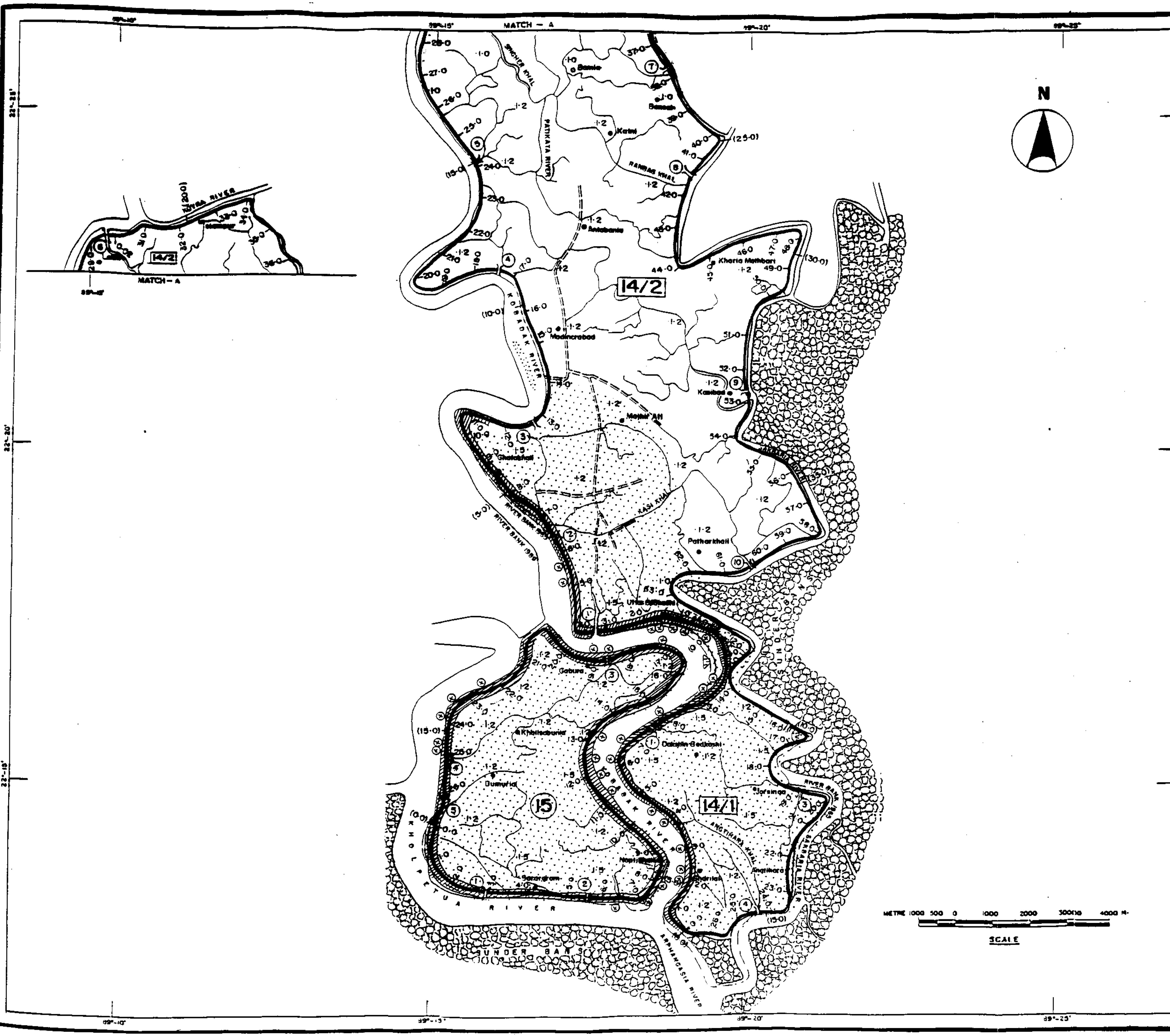
River training works with porcupine along outer bends of Kobadak river exposed to erosion. To be carried out as part of required regular and periodic maintenance.

Mangrove afforestation on foreshore area and in borrow pits.

Babla tree plantation on embankment slopes.

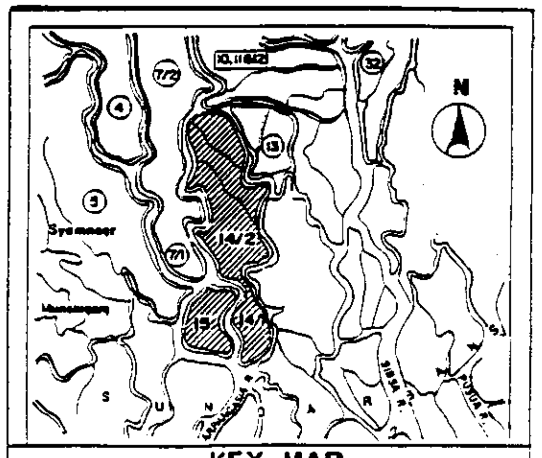
20

POLDER NO.14/1,14/2&15



LEGEND

- River & Khal
- Roads
- Shore Line 1965
- Shore Line 19
- Limit of Protected Area
- Spot Heights in Metre (PWD) — 3·4
- Embankments Ch. Km. 8·0/Mile(5·0)
- New/Retired Embankment
- Resectioning Embankment
- Protective Works
- Original CEP Embankment
- Porcupine. (⊗ = 400m.)
- Existing Sluice — DS, SS
- Proposed Sluice — DS, SS
- Sluice to be Repaired — DS, SS
- Net Protected Area



KEY MAP

Note:
This programme is not recommended for implementation under CPP-II.

PEOPLE'S REPUBLIC OF BANGLADESH
MINISTRY OF IRRIGATION, WATER DEVELOPMENT AND FLOOD CONTROL
BANGLADESH WATER DEVELOPMENT BOARD

CYCLONE PROTECTION PROJECT II

MID TERM PROGRAMME-PHASE 2 PROPOSED WORKS			POLDER 14/1,14/2, 15
Design:	Recomm.	Appr.:	DATE:01-02-92
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			DRAWING NO. :

Polder no. 35/1

Project Type:	Flood Control, Drainage and salinity exclusion (FCD).
Location:	District: Bagerhat Upazila: Sarankhola O&M division: Bagerhat Circle: Khulna
Status:	Polder not complete
Area(ha):	Gross protected 13,600 Net cultivable 8,980 Net benefitted 4,220
Land elevation:	1.2-1.8 m PWD
Tidal range: (m PWD)	Rayanda Guage Station:

Return Period	2.33 Year	20 Year
HWL	3.237	3.61
LWL	0.197	(-)1.633

Land usage:	Paddy cropping & shrimp cultivation.
Embankment length and type:	94 km Interior Crest level 4.9 m
Constructed:	June, 1967 under CEP phase I
Major Cyclone Damage:	By 1961, 1965 & 1970 & 1988
Major Flood Damages:	By 1987-88 floods
Repair/rehabilitation:	1988-90 under ADB funded part of flood Rehabilitation Project, FDR.
O & M:	Practically no routine or periodic maintenance have been carried out since the construction of the embankment.
Remarks:	Some conflicts of interest between shrimp cultivators and paddy croppers.

Damaged embankments and embankments exposed to damage.

Embankment chainage 1.6 to 19.5 km and along 1.4-2.0 km wide Baleswar river is exposed to prequent wind driven sea waves causing extensive erosion of the river side slopes. Embankment and revetment work of chainage 1.6 to 4.1 is further exposed to some river erosion. Three-forth part of revetment work from chainage 6.3 to 8.1 km is damaged by the severe action of waves.

Damages on structure.

None but drainage sluice 2 and 3 are insufficient to carry excess flood water.

Afforestation.

Some scattered patches of mangrove on the foreland successfully protecting the embankment and its revetment work. In the slope of embankment where no protective work was taken, a few plantation was found.

Recommended remedial measures.

Embankment chainage 1.6 to 4.1 km:
Resectioning and reconstructing to provide flatter and well compacted river side slope with new revetment work in addition to porcupine protective work against river erosion.

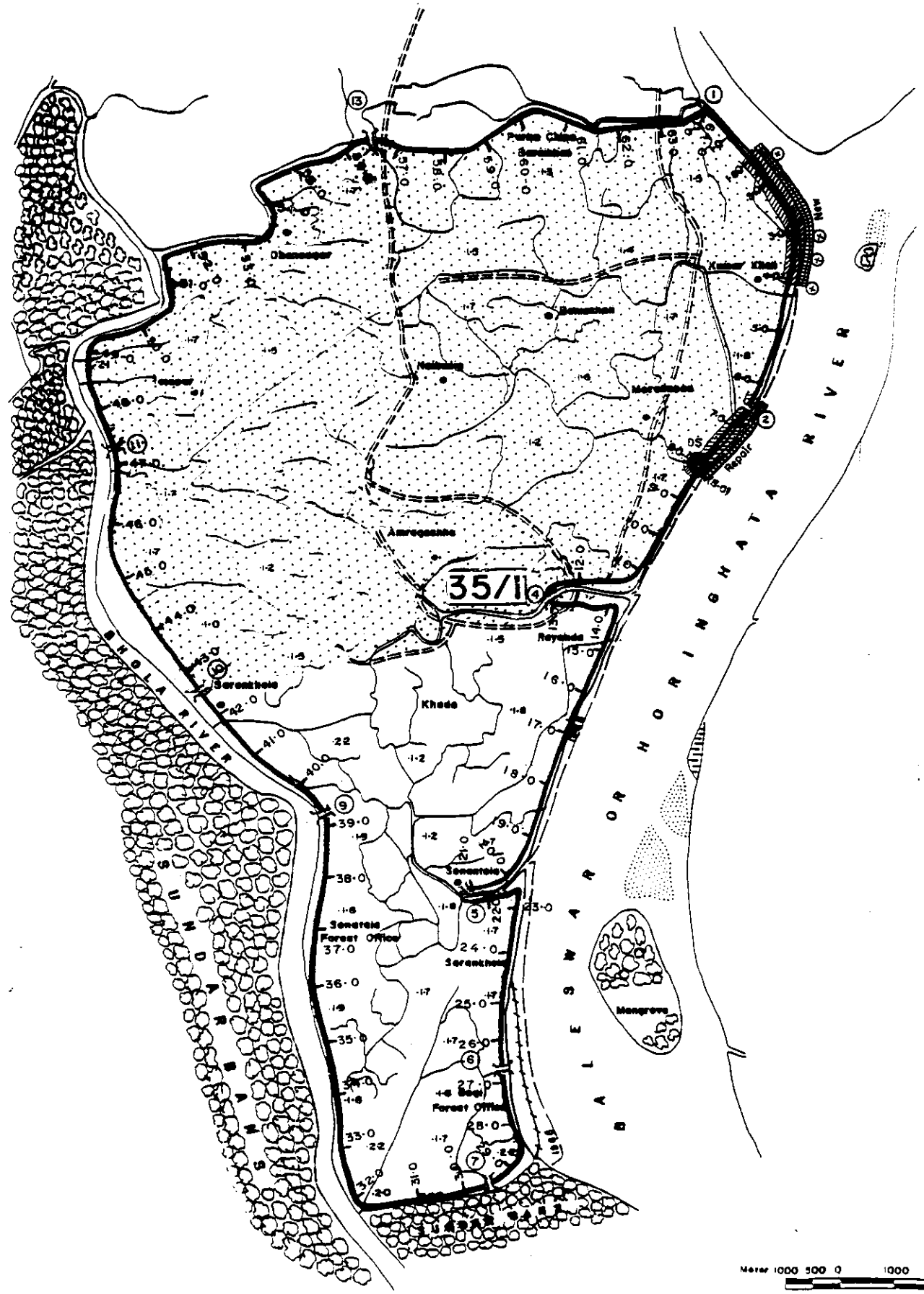
Embankment chainage 6.3 to 8.1 km:
Resectioning to provide flatter and well compacted river side slope with repair of revetment work.

Constructing new drainage sluice at chaniage 8.2 km to provide exit of excess rain & flood water protecting drainage sluices 2 and 3.

Mangrove afforestation on foreshore area and in borrow pits.

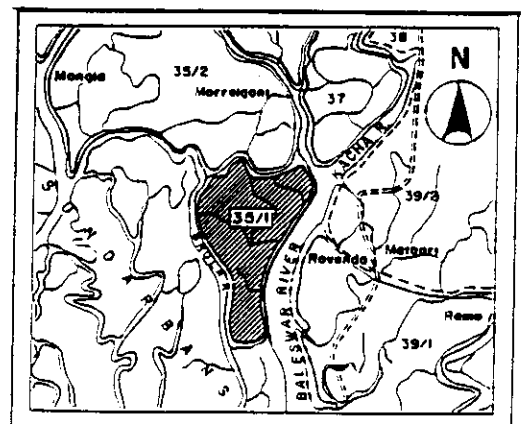
Babla tree plantation on the country side slope of embankment where revetment work exists and in both side of embankment where no revetment work is present.

POLDER NO. 35/1



LEGEND

- River & Khal
- Roads
- Shore Line 1985
- Shore Line 19
- Limit of Protected Area
- Spot Heights in Metre (PWD) 3·4
- Embankments Ch. Km. 8·0/ Mile(5·0) (5·0)
- New / Retired Embankment
- Resectioning Embankment
- Protective Works
- Original CEP Embankment
- Porcupine. (Ⓟ =400 m.)
- Existing Sluice DS SS
- Proposed Sluice DS SS
- Sluice to be Repaired DS SS
- Net Protected Area



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MINISTRY OF IRRIGATION, WATER DEVELOPMENT AND FLOOD CONTROL
BANGLADESH WATER DEVELOPMENT BOARD

CYCLONE PROTECTION PROJECT II

MID TERM PROGRAMME-PHASE 2 PROPOSED WORKS			POLDER 35/1
Design:	Recomm.	Appr.:	DATE:01-02-92
KAMPSAX INTERNATIONAL A/S, BCEOM and DANISH HYDRAULIC INSTITUTE in association with DEVELOPMENT DESIGN CONSULTANTS LTD. 23, New Eskaton Road, Dhaka-1000. Tel. 405477. Fax 880 02 832951			SCALE : 1:100 000
			DRAWING NO. :

Polder no. 40/2

Project Type:	Flood Control, Drainage and salinity exclusion (FCD).
Location:	District: Barguna Upazila: Patharghata O&M division: Barguna Circle: Barisal
Status:	Polder complete
Area(ha):	Gross protected 4,400 Net cultivable 2,380 Net benefitted 2,400
Land elevation:	1.5-1.8 m PWD
Tidal range: (m PWD)	Patharghata Gauge Station:

Return Period	2.33 Year	20 Year
HWL	2.474	3.080
LWL	(-)1.115	(-)1.785

Land usage:	Paddy cropping & shrimp cultivation.
Embankment length and type:	13km sea, 1.7km Interior & 20.6km Marginal. Crest level 5.2 m.
Constructed:	June, 1966 under CEP phase I
Major Cyclone Damage:	By 1961, 1965, 1970 & 1988
Major Flood Damages:	By 1987-88 floods
Repair/rehabilitation:	1988-90 under ADB funded part of flood Rehabilitation Project, FDR.
O & M:	Practically no routine or periodic maintenance have been carried out since the construction of the embankment.
Remarks:	Communication system yet to develope to cope with the cyclone and flood damages.

Damaged embankments and embankments exposed to damage.

The embankment chainage 10 to 23 km along 3-6 km wide lower reach of Baleswar river is exposed to frequent attack of sea waves causing extensive erosion of the river side slopes. Part the same applies but to lesser extent for the embankment chainage 0 to 3 km along Bishkhali river.

Damages on structure.

None

Afforestation.

A few scattered plantation on the slope of embankment and some scattered patches of mangrove afforestation is on the foreland. Gulpata plantation in the borrow pits is seen to grow very well and acting as good protective work for embankment.

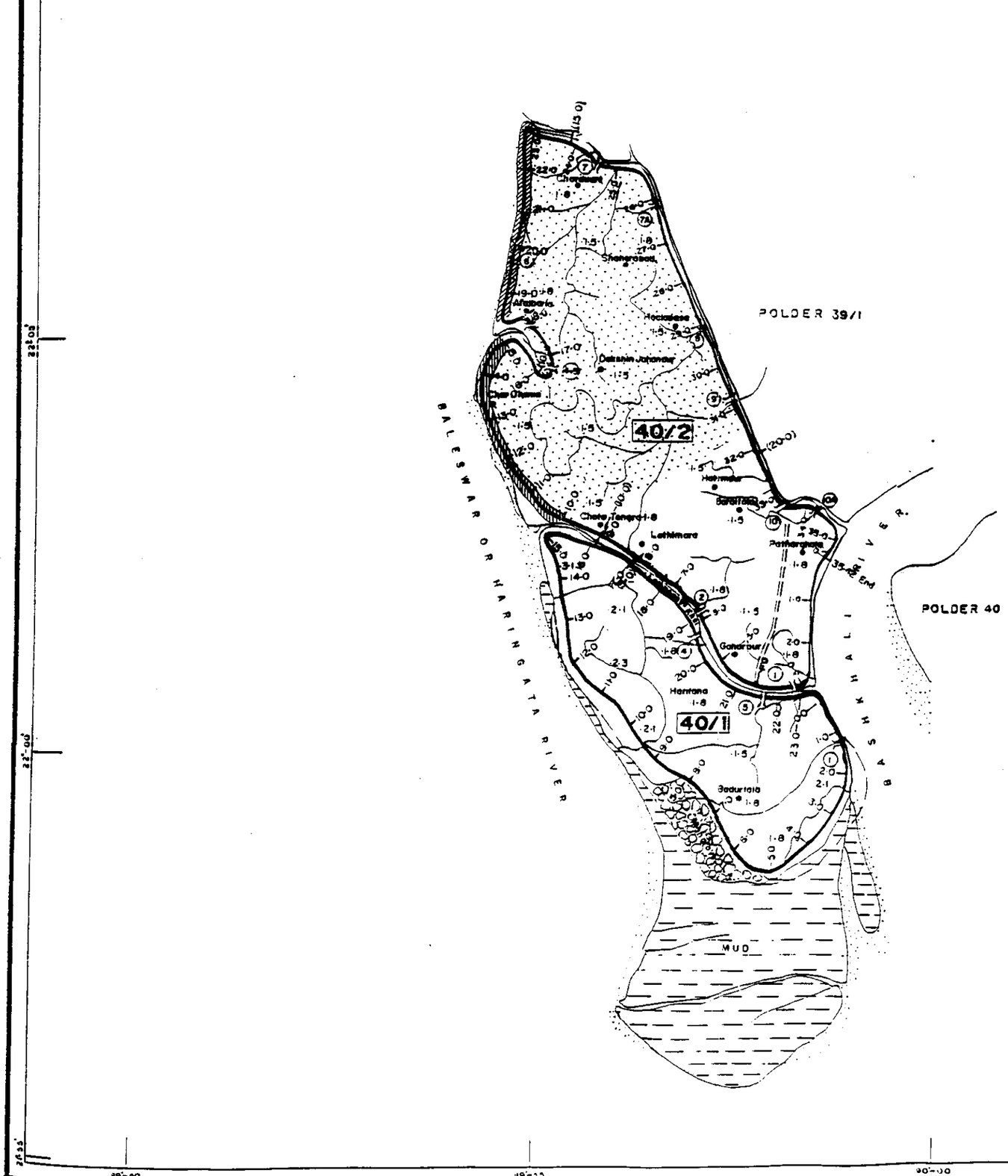
Recommended remedial measures.

Embankment chainage 10 to 15 km & 18.5 to 23 km:
Resectioning to provide flatter and well compacted river side slope with durba grass turfing.

Mangrove afforestation on foreshore area and Gulpata afforestation in the borrow pits.

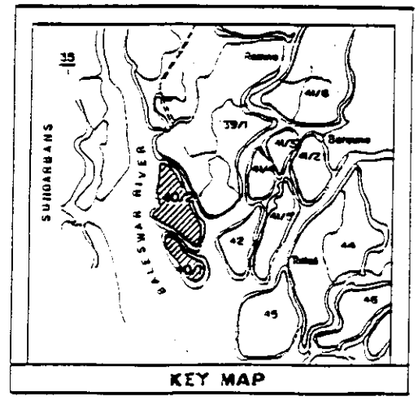
Babla tree plantation on embankment slopes.

POLDER NO. 23 40/2



LEGEND

- River & Khal
- Roads
- Shore Line 1965
- Shore Line 19
- Limit of Protected Area
- Spot Heights in Metre (PWD). 3·4
- Embankments Ch. Km. 8·0/Mile(5·0) 8·0
- New/Retired Embankment (5·0)
- Resectioning Embankment
- Protective Works
- Original CEP Embankment
- Porcupine
- Existing Sluice OS SS
- Proposed Sluice OS SS
- Sluice to be Regaired OS SS
- Net Protected Area



PEOPLE'S REPUBLIC OF BANGLADESH
MINISTRY OF IRRIGATION, WATER DEVELOPMENT AND FLOOD CONTROL
BANGLADESH WATER DEVELOPMENT BOARD

CYCLONE PROTECTION PROJECT II

MID TERM PROGRAMME-PHASE 2 PROPOSED WORKS			POLDER 40/2
Design:	Recomm.	Appr.:	DATE:01-02-92

KAMPSAX INTERNATIONAL A/S, 8CEDM and DANISH HYDRAULIC INSTITUTE in association with DEVELOPMENT DESIGN CONSULTANTS LTD.
23, New Eskaton Road, Dhaka-1000. Tel. 405477, Fax 880 02 832951

SCALE : 1:100 000

DRAWING NO. :

Polder no. 48

Project Type:	Flood Control, Drainage and salinity exclusion (FCD).
Location:	District: Patuakhali Upazila: Kalapara O&M division: Patuakhali Circle: Barisal
Status:	Polder complete
Area(ha):	Gross protected 5,400 Net cultivable 3,715 Net benefitted 3,715
Land elevation:	1.5-1.8 m PWD
Tidal range (m PWD):	Khepupara Gauge Station:

Return Period	2.33 Year	20 Year
HWL	2.20	2.75
LWL	(-)0.11	(-)0.64

Land usage:	Paddy cropping & shrimp cultivation
Embankment length and type:	20 km sea, and 18 km Interior. Crest level 6.1 m.
Constructed:	June, 1967 under CEP phase I
Major Cyclone Damage:	By 1961, 1965, 1970 & 1988
Major Flood Damages:	By 1987-88 floods
Repair/rehabilitation:	1988-90 under ADB funded Part of flood Rehabilitation Project, FDR.
O & M:	Practically no routine or periodic maintenance have been carried out since the construction of the embankment.
Remarks:	For want of clay soil, this sea facing embankment sandy core under 0.3 m top claylayer is exposed to wind blows and damages.

Damaged embankments and embankments exposed to damage.

The embankment chainage 26 to 35 km along the sea coast is exposed to the attack of sea waves. The exposed part of sandy core is under frequent action of some wind erosion and gradually lowered down.

Damages on structure.

None.

Afforestation.

A large well grown mangrove afforestation in the east part of the coast successfully protecting the embankment. Some scattered plantation on the slope of embankment exists.

Recommended remedial measures.

Embankment chainage 26 to 35 km:

Resectioning to provide flatter and well compacted river side slope with thick layer of clay over sandy core material and with durba grass turfing.

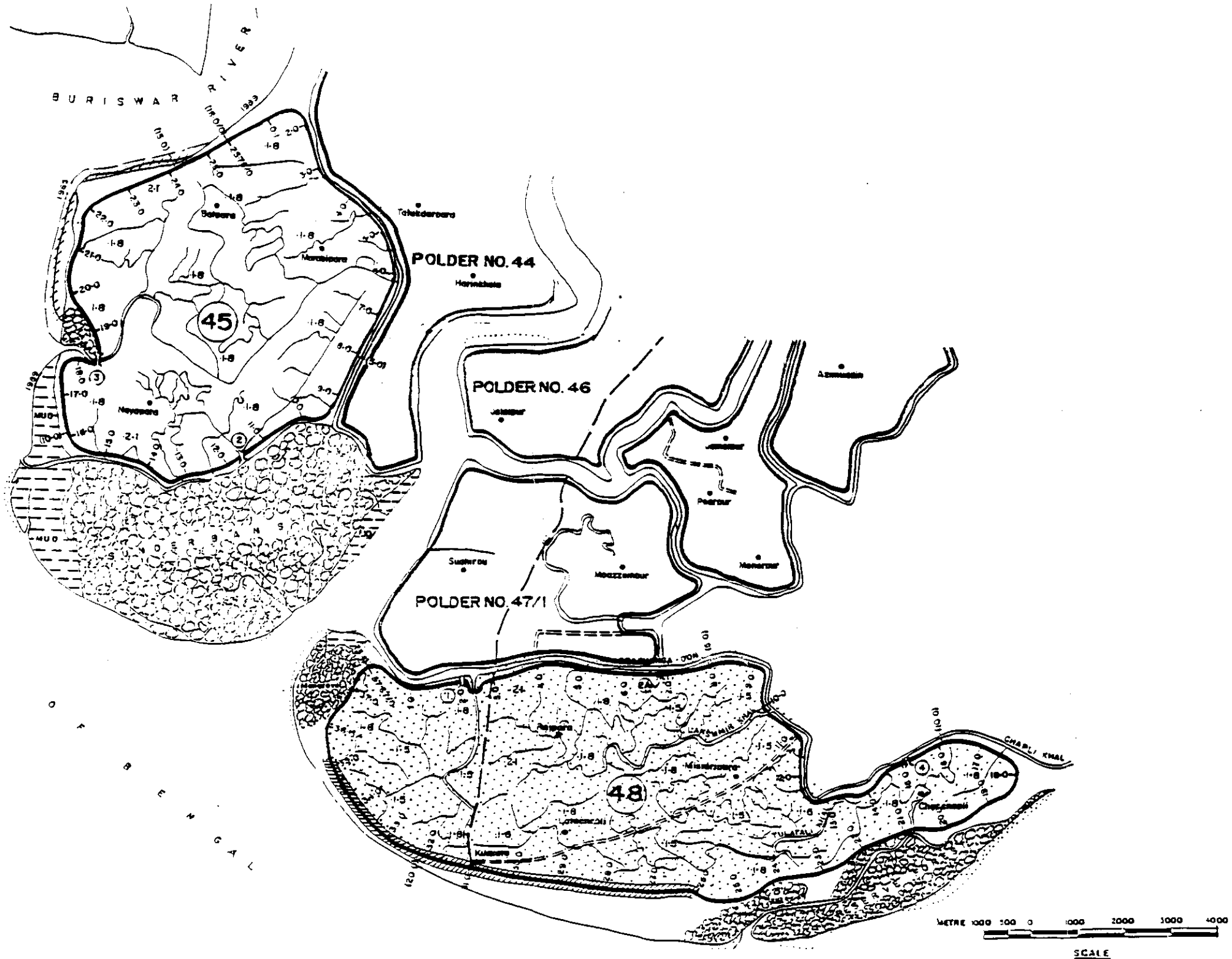
Mangrove afforestation on long foreshore area and in borrow pits.

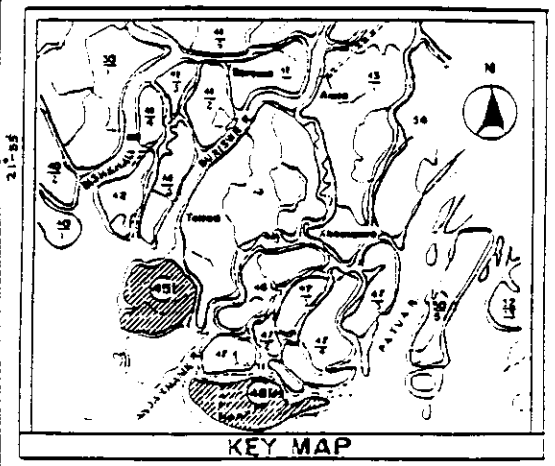
Babla tree plantation on embankment slopes.

POLDER NO. 48

LEGEND

- River & Khal
- Roads...
- Shore Line 1965
- Shore Line 19
- Limit of Protected Area
- Spot Heights in Metre (PWD)... 3·4
- Embankments Ch. Km. 8-0/Mile(5-0) (5-0)
- New/Retired Embankment
- Resectioning Embankment
- Protective Works
- Original CEP Embankment
- Porcupine
- Existing Sluice ... DS SS
- Proposed Sluice ... DS SS
- Sluice to be Repaired... DS SS
- Net Protected Area ...





KEY MAP

PEOPLE'S REPUBLIC OF BANGLADESH
MINISTRY OF IRRIGATION, WATER DEVELOPMENT AND FLOOD CONTROL
BANGLADESH WATER DEVELOPMENT BOARD

CYCLONE PROTECTION PROJECT II

MID TERM PROGRAMME-PHASE 2 PROPOSED WORKS	POLDER 48
Design: Recomm. Appr.:	DATE:01-02-92
	SCALE : 1:100 000
	DRAWING NO. :

KAMPSAX INTERNATIONAL A/S, BCEOM and DANISH HYDRAULIC INSTITUTE in association with DEVELOPMENT DESIGN CONSULTANTS LTD.
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Fax 880 02 832951

Polder no. 56/57

Project Type:	Flood Control, Drainage and salinity exclusion (FCD).
Location:	District: Bhola Upazila: Charfason & Lalmohan O&M division: Bhola Circle: Bhola
Status:	Polder complete
Area(ha):	Gross protected 110,000 Net cultivable 78,100 Net benefitted 7,000
Land elevation:	1.5-1.8 m PWD
Tidal range: (m PWD)	Tajumuddin Gauge Station: Return Period 2.33 Year 20 Year HWL 3.208 4.160 LWL (-)1.507 (-)1.974
Land usage:	Paddy cropping & shrimp cultivation
Embankment length and type:	230 km sea, and 20 km Interior Crest level 5.8 m upto 76 km along Shahbajpur river and for the rest 5.5 m from 76 km to 126 km along the Bay of Bengal.
Constructed:	1965-1970 under CEP part I
Major Cyclone Damage:	By 1961, 1965, 1970 & 1985
Major Flood Damages:	None
Repair/rehabilitation:	Food for work (FFW) since 1975 and flood damage Rehabilitation since 1986.
O & M:	Practically no routine or periodic maintenance have been carried out since the construction of the embankment.
Remarks:	In many places the embankment sides are settled by landless people. Paddy cultivation goes on foreland instead of any plantation

Damaged embankments and embankments exposed to damage.

The embankment chainage 63.7 to 126 km is exposed to the wave attack of the Bay of Bengal causing extensive erosion of the sea side slope and, in some part, the full section of embankment.

Damages on structure.

The drainage sluice no 4A has been fully damaged by the waves and surges of cyclone.

Afforestation.

Almost all foreland embankment slope is without any plantation. Wide and long borrow pits are without any afforestation. In some part of embankment berm, Hogla pata are plants giving good protection to the embankment.

Recommended remedial measures.

Embankment chainage 63.7 to 67.5 km and 80.5 to 126 km:
Resectioning to provide raised crest, flatter and well compacted sea side slope with durba grass turfing.

Embankment chainage 67.5 to 80.5 km:
Constructing retired embankment with raised crest and flatter slope by well compacted earth and durba grass turfing over the slopes.

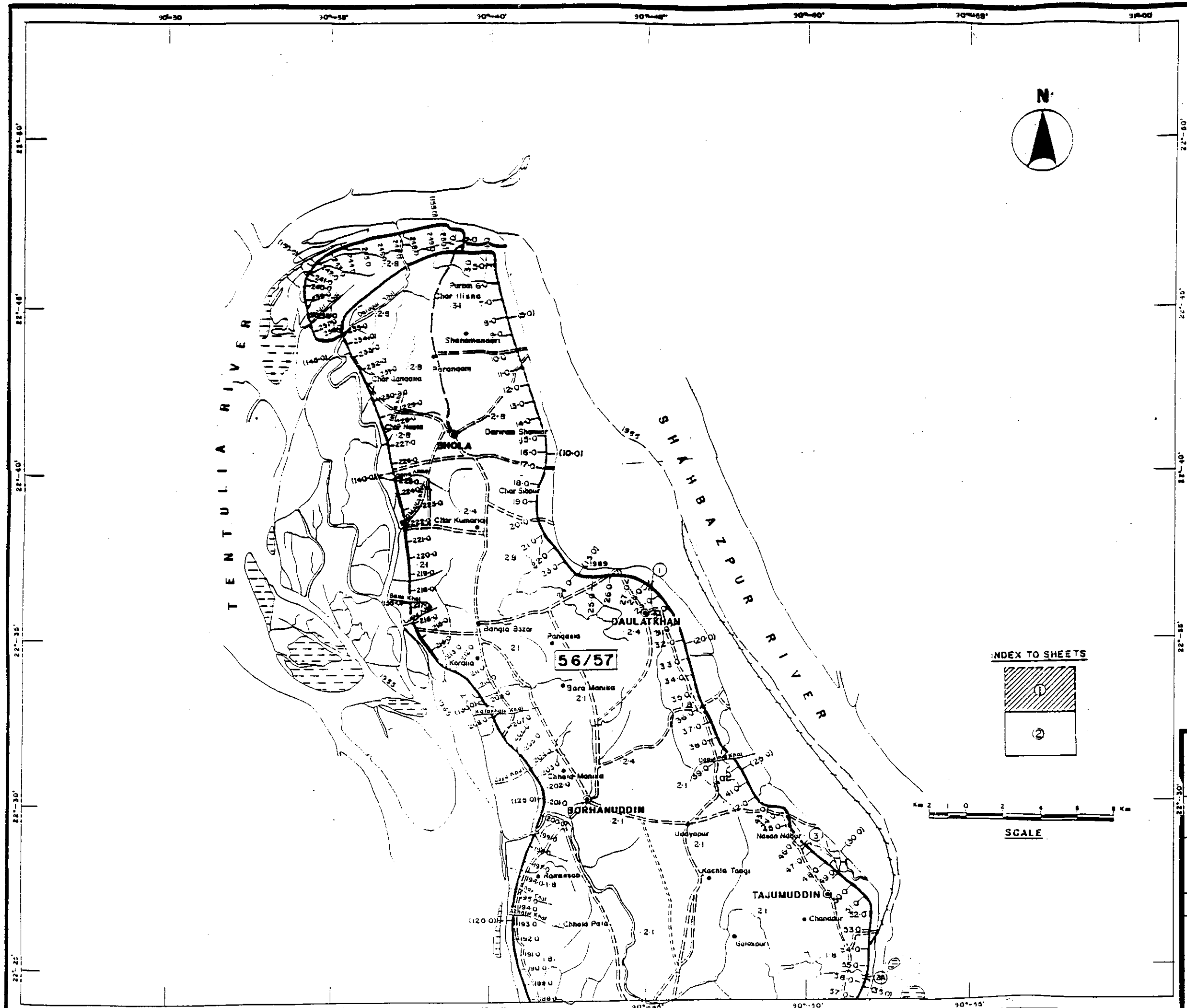
Construction of a new structure at chainage 67.5 km across khal as a replacement of sluice 4A.

Mangrove afforestation on long foreshore area and in borrow pits and Hogla pata plantation on the berm and, upto river.

Babla tree plantation on embankment slopes.

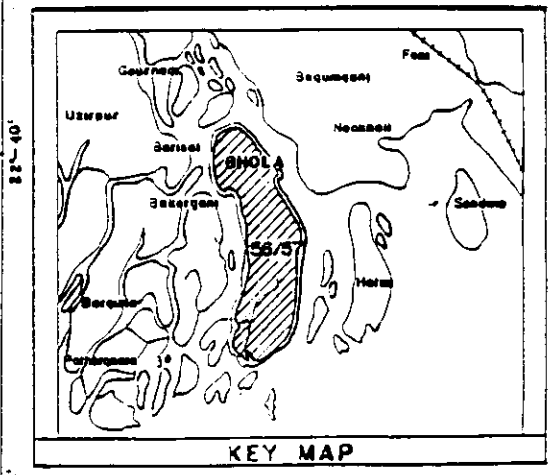
POLDER NO. 56/57

SHEET 1 OF 2 (2)



LEGEND

- River & Khal
- Roads...
- Shore Line 1965
- Shore Line 19
- Limit of Protected Area
- Spot Heights in Metre (P.W.D)... 3·4
- Embankments Ch. Km. & O/ Mile (5-0)
- New / Retired Embankment (5-0)
- Resectioning Embankment...
- Protective Works
- Original CEP Embankment
- Porcupine
- Existing Sluice ... DS SS
- Proposed Sluice DS SS
- Sluice to be Repaired... DS SS
- Net Protected Area ...



PEOPLE'S REPUBLIC OF BANGLADESH
MINISTRY OF IRRIGATION, WATER DEVELOPMENT AND FLOOD CONTROL
BANGLADESH WATER DEVELOPMENT BOARD

CYCLONE PROTECTION PROJECT II

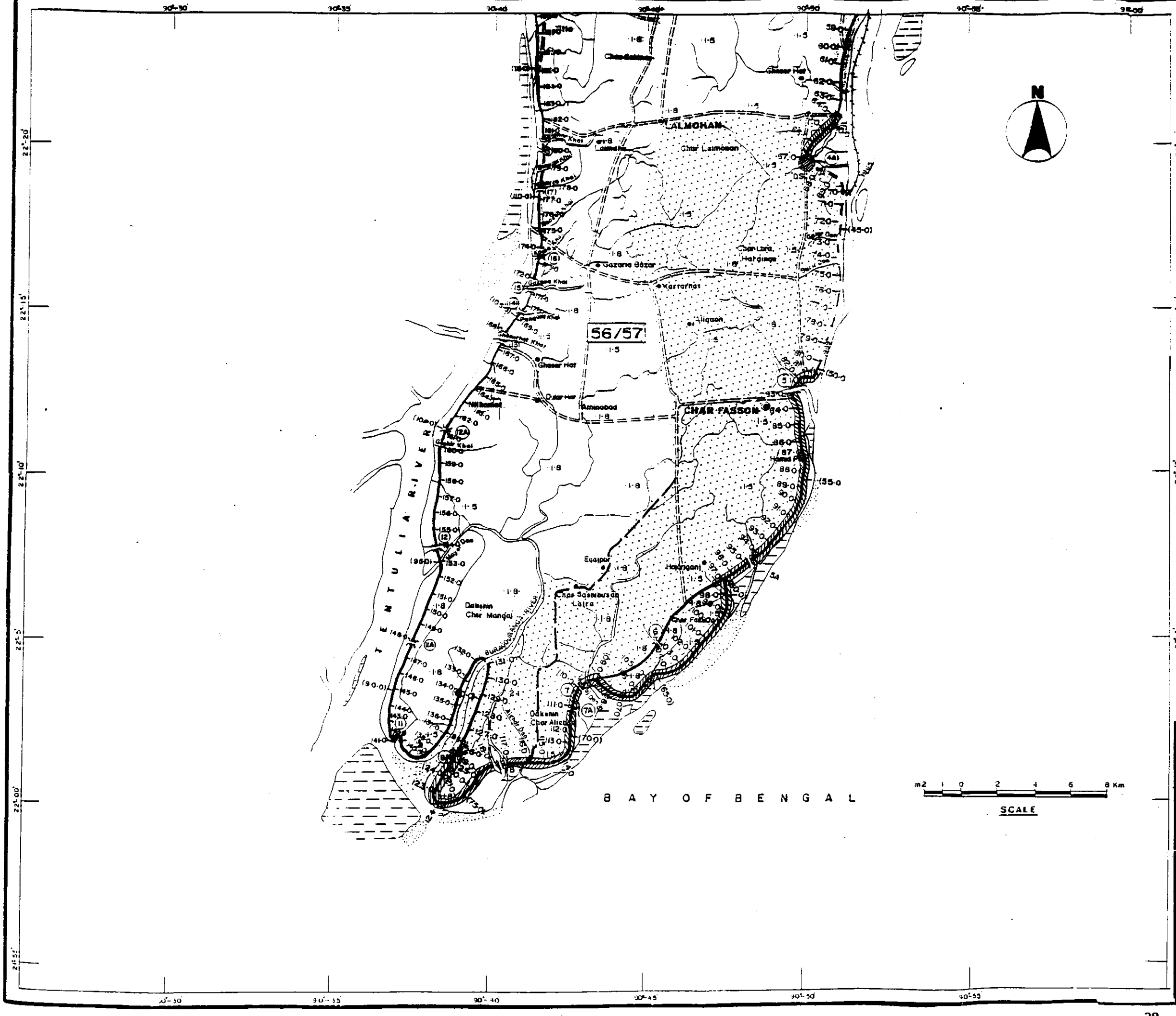
MID TERM PROGRAMME-PHASE 2 PROPOSED WORKS			POLDER 56/57
Design:	Recomm.	Appr.:	DATE:01-02-92

KAMPSAX INTERNATIONAL A/S, BCEOM and DANISH HYDRAULIC INSTITUTE in association with DEVELOPMENT DESIGN CONSULTANTS LTD.
23, New Eskaton Road, Dhaka-1000. Tel. 405477, Fax 880 02 832951

SCALE : 1:200 000

DRAWING NO. :

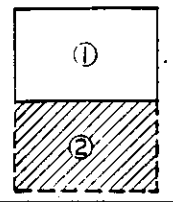
POLDER NO. 56/57
SHEET 2 OF 2



LEGEND

- River & Khal
- Reeds
- Shore Line 1965
- Shore Line 19
- Limit of Protected Area
- Spot Heights in Metre (PWD) 3·4
- Embankments Ch. Km. 8·0/ Mile(5·0) 8·0 (5·0)
- New/Retired Embankment
- Resectioning Embankment
- Protective Works
- Original CEP Embankment
- Porcupine
- Existing Sluice DS SS
- Proposed Sluice DS SS
- Sluice to be Recoired DS SS
- Net Protected Area

INDEX TO SHEETS



PEOPLE'S REPUBLIC OF BANGLADESH
MINISTRY OF IRRIGATION, WATER DEVELOPMENT AND FLOOD CONTROL
BANGLADESH WATER DEVELOPMENT BOARD

CYCLONE PROTECTION PROJECT II

MID TERM PROGRAMME-PHASE 2 PROPOSED WORKS			POLDER 56/57
Design:	Recomm.	Appr.:	DATE:01-02-92
KAMPSAX INTERNATIONAL A/S, BCEOM and DANISH HYDRAULIC INSTITUTE in association with DEVELOPMENT DESIGN CONSULTANTS LTD. 23, New Eskaton Road, Dhaka-1000. Tel. 405477, Fax 880 02 832951			SCALE : 1:200 000
			DRAWING NO. :

Polder no. 59/2

Project Type:	Flood Control, Drainage and salinity exclusion (FCD).
Location:	District: Laxmipur Upazila: Ramgati O&M division: Laxmipur Circle: Muhuri
Status:	Polder complete except some sluices.
Area(ha):	Gross protected 25,000 Net cultivable 22,700 Net benefitted 4,160
Land elevation:	3.0 - 3.5 m PWD
Tidal range (m PWD):	Daulatkhan Gauge Station:

Return Period	2.33 Year	20 Year
HWL	3.801	4.445
LEL	(-)0.620	(-)1.417

Land usage:	Paddy cropping & Winter cropping
Embankment length and type:	57.5 km Interior. Crest 7.0 m along Baggar Dona Khal and Shahbajpur River.
Constructed:	1968-70 under CEP Phase I
Major Cyclone Damage:	By 1961, 1970 and 1985.
Major Flood Damages:	By 1987-88 floods
Repair/rehabilitation:	1988-90 under ADB funded part of flood Rehabilitation Project, FDR and FFW since 1976.
O & M:	Practically no routine or periodic maintenance, have been carried out since the construction of the embankment.
Remarks:	Good Road system with cyclone shelters is needed.

Damaged embankments and embankments exposed to damage.

The embankment chainage 120.0 - 140.0 km is exposed to waves of Bay of Bengal and estuary of mighty river Shahbajpur and the sea side slope is regularly attacked and damaged by waves.

Damages on structure.

Structures are partially damaged of pitching work. There are two existing openings kept for construction of new drainage sluices, at chainage 120.8 km & 131.6 km and two lecations are identified for new surface sluices at Chainage 128.7 km and 130.4 km.

Afforestation.

There is no afforestation or plantation on the foreshore but scattered plantation on embankment slope in a few locations. In some part of embankment slope, grass turfing is present.

Recommended remedial measures.

Embankment chainage 121 to 135 km.

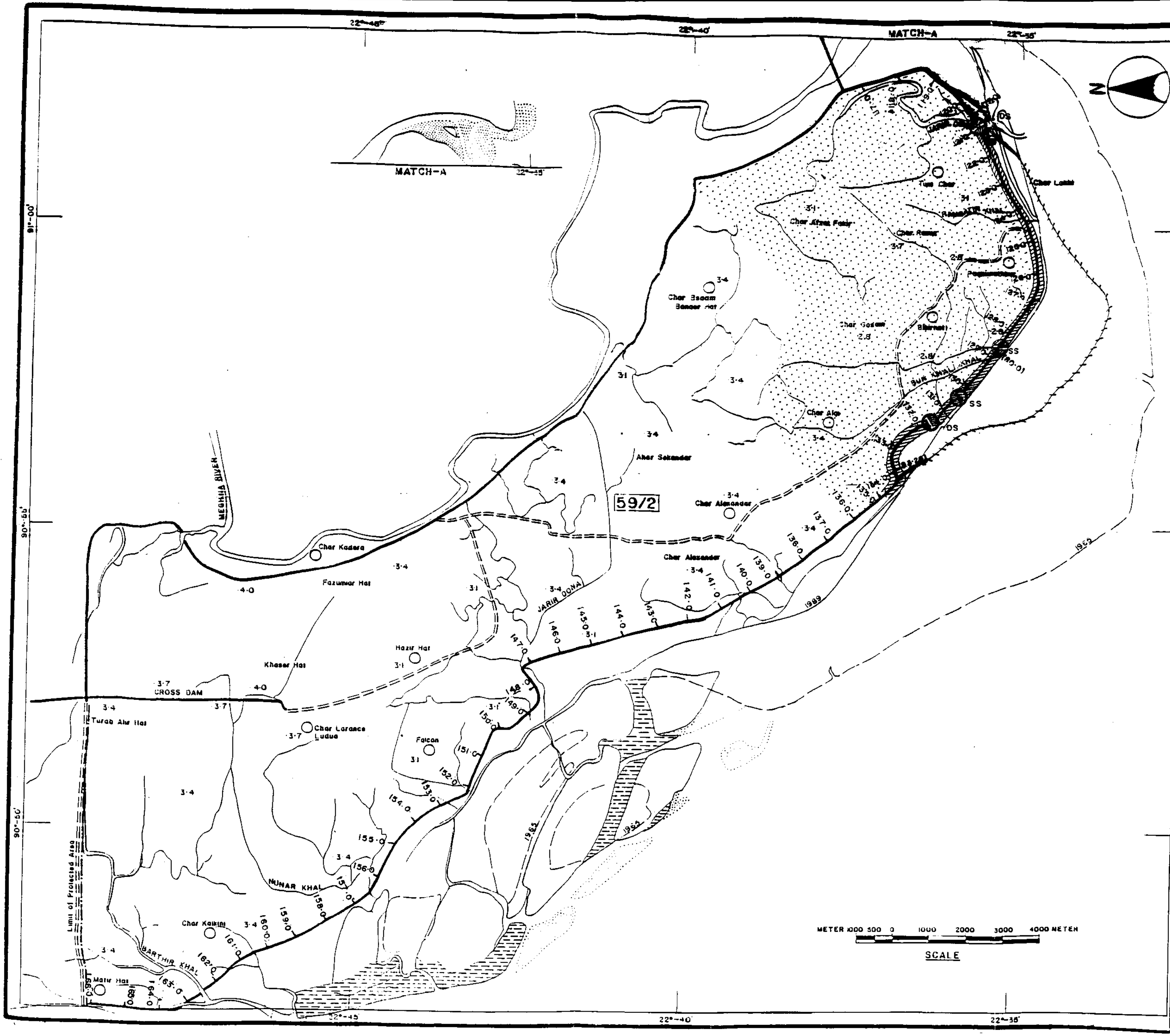
Resectioning to provide flatter and well compacted river side slope with durba grass turfing.

Constructing four new sluices to close and complete the polder.

Mangrove afforestation on foreshore area and in borrow pits.

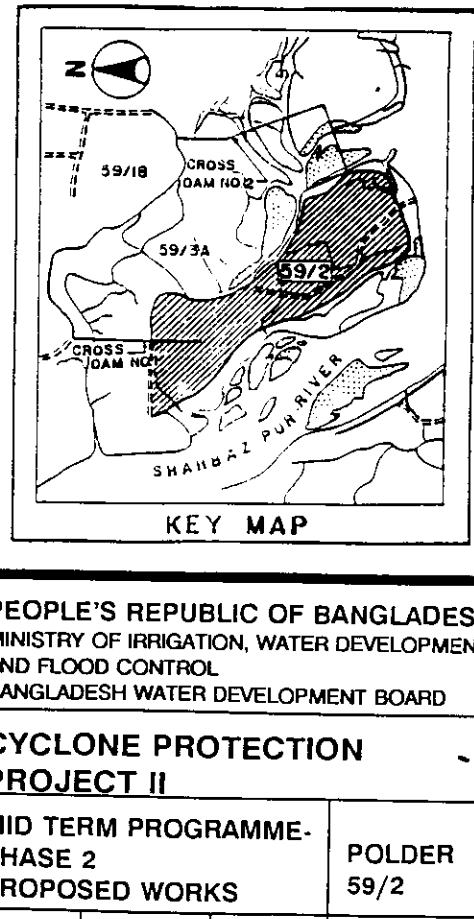
Babla tree plantation on embankment slopes.

POLDER NO. 59/2



LEGEND

River & Khal
Roads
Shore Line 1965
Shore Line 19
Limit of Protected Area
Spot Heights in Metre (PWD)
Embankments Ch. Km. 8-0/Mile(5-0)
New/Retired Embankment
Resectioning Embankment
Protective Works
Original CEP Embankment
Porcupine
Existing Sluice
Proposed Sluice
Sluice to be Repaired
Net Protected Area



KEY MAP

PEOPLE'S REPUBLIC OF BANGLADESH
MINISTRY OF IRRIGATION, WATER DEVELOPMENT AND FLOOD CONTROL
BANGLADESH WATER DEVELOPMENT BOARD

CYCLONE PROTECTION PROJECT II

MID TERM PROGRAMME-PHASE 2 PROPOSED WORKS	POLDER 59/2
Design: Recomm. Appr.:	DATE:01-02-92
KAMPSAX INTERNATIONAL A/S, BCEOM and DANISH HYDRAULIC INSTITUTE in association with DEVELOPMENT DESIGN CONSULTANTS LTD. 23, New Eskaton Road, Dhaka-1000, Tel. 405477, Fax 880 02 832951	SCALE: 1:100 000 DRAWING NO.:

Polder no. 59/3B

Project Type:	Flood Control, Drainage and salinity exclusion (FCD).
Location:	District: Noakhali Upazila: Sudharam O&M division: Noakhali Circle: Muhuri
Status:	Polder not complete
Area(ha):	Gross protected 31,000 Net cultivable 27,300 Net benefitted 11,050
Land elevation:	3.1-4.0 m PWD
Tidal range (m PWD):	Hatia & Companigonj (extrapolated) 6.Stat: Return Period 2.33 Year 20 Year HWL 4.895 6.063 LWL (-)0.195 (-)1.409
Land usage:	Paddy cropping and winter cropping.
Embankment length and type:	51 km sea & 18.5 km Interior. Crest level 7.0 m along Noakhali Khal and 7.6 along Hatia river.
Constructed:	1965-70 under CEP phase I
Major Cyclone Damage:	By 1961, 1970, 1985 & 1991
Major Flood Damages:	By 1987-88 floods
Repair/rehabili-tation:	1988-90 under ADB funded part of flood Rehabilitation Project, (FDR) & FFW since 1976.
O & M:	Practically no routine or periodic maintenance have been carried out since the construction of the embankment.
Remarks:	The constructed drainage sluices suffer severe siltation problem in the sea side apron. Surface sluices are much more common.

Damaged embankments and embankments exposed to damage.

The embankment chainage 19.5 to 42 km along 1.0 km wide Noakhali Khal and chainage 60.8 to 69.8 km along Hatia river, both creating large foreshore in the Bay of Bengal are exposed to severe attack of sea waves in monsoon.

Damages on structure.

None but several khals and rivers are open.

Afforestation.

In many parts of embankment and foreland is well planted and successfully taken care by the local people and foreland carry mangrove afforestation and gives good protection to the respective portion of embankment.

Recommended remedial measures.

Embankment chainage 19.5 to 42 km and 60.8 to 69.8 km:

Resectioning to provide flatter and well compacted river side slope with durba grass turfing.

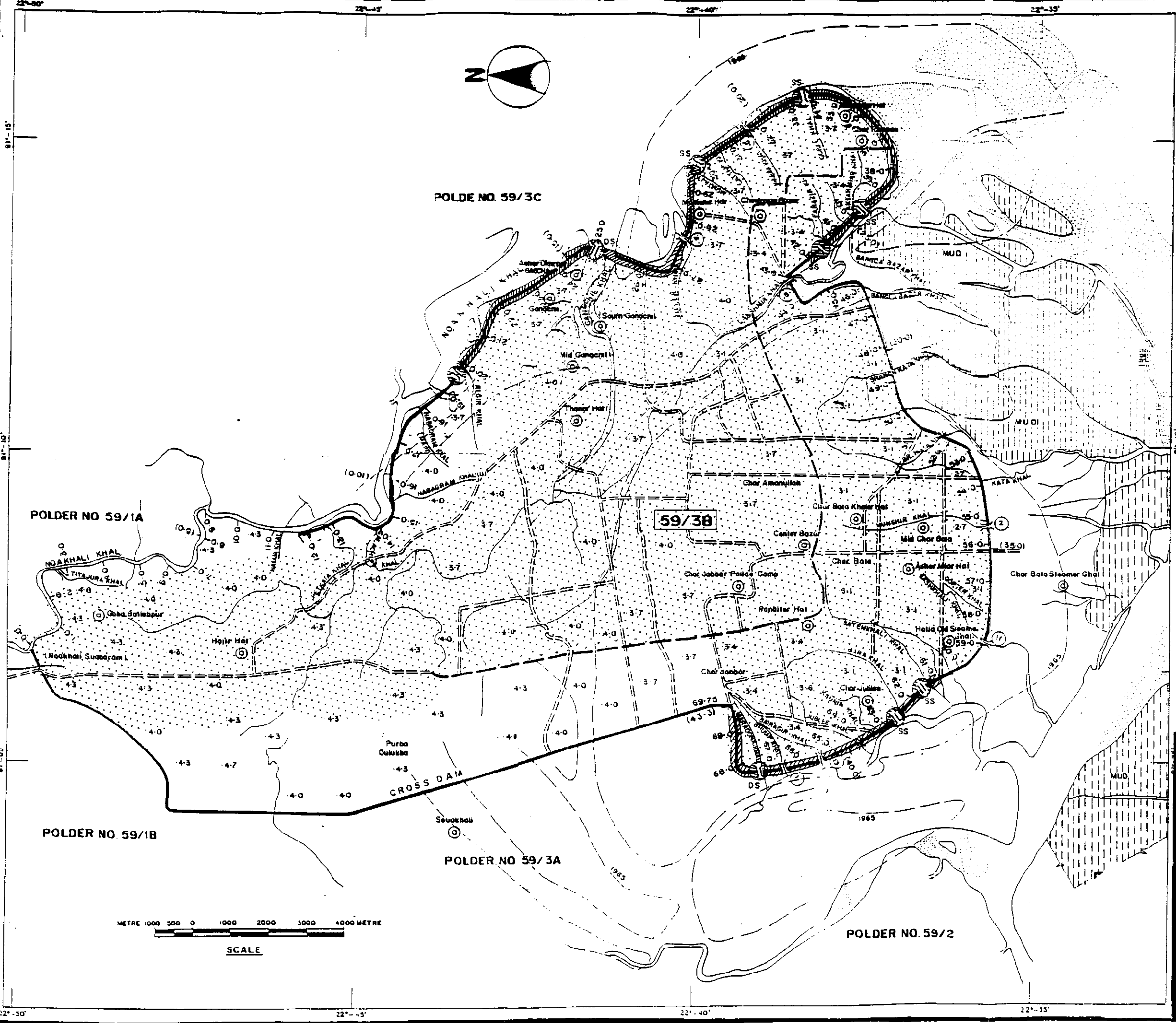
Providing closure of 0.5 km long on Ganchill Khal providing 12-vent sluice on Ganchil Khal and 13 vent sluice on Meradona Khal. Six new surface sluices to close all the khals completing the polder.

Mangrove afforestation on the large newly acreted foreshore area and in borrow pits.

Babla tree plantation on embankment slopes.

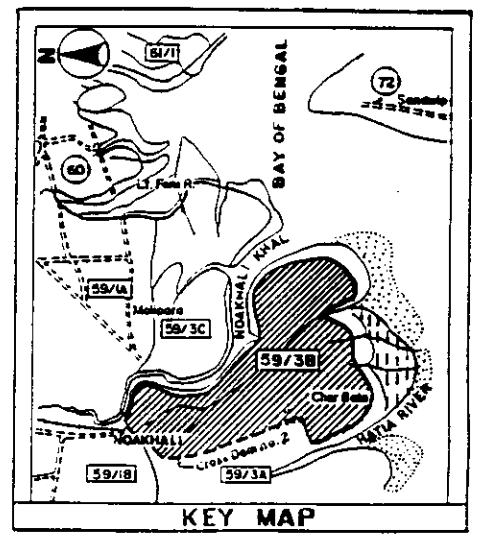
POLDER NO. 59/3B

(97)



LEGEND

- River & Khal
- Roads
- Shore Line 1965
- Shore Line 19
- Limit of Protected Area
- Spot Heights in Metre (PWD) 3·4
- Embankments Ch. Km. 8·0/Mile(5·0) (5·0)
- New/Retired Embankment
- Resectioning Embankment
- Protective Works
- Original CEP Embankment
- Porcupine
- Existing Sluice DS SS
- Proposed Sluice DS SS
- Sluice to be Repaired DS SS
- Net Protected Area



KEY MAP

PEOPLE'S REPUBLIC OF BANGLADESH
MINISTRY OF IRRIGATION, WATER DEVELOPMENT AND FLOOD CONTROL
BANGLADESH WATER DEVELOPMENT BOARD

CYCLONE PROTECTION PROJECT II

MID TERM PROGRAMME-PHASE 2 PROPOSED WORKS	POLDER 59/3B
Design: Recomm. Appr.:	DATE:01-02-92
KAMPSAX INTERNATIONAL A/S, BCEOM and DANISH HYDRAULIC INSTITUTE in association with DEVELOPMENT DESIGN CONSULTANTS LTD. 23, New Eskaton Road, Dhaka-1000, Tel. 405477, Fax 880 02 832951	SCALE : 1:100 000
	DRAWING NO. :

Polder no. 59/3C

Project Type :	Flood Control, Drainage and salinity exclusion (FCD).
Location:	District: Noakhali Upazila: Companigonj O&M division: Noakhali Circle: Muhuri
Status:	Polder not complete
Area(ha):	Gross protected 13,600 Net cultivable 10,400 Net benefitted 9,945
Land elevation:	4.0 - 4.3 m PWD.
Tidal range (m PWD):	Companigonj Gauge Station:

Return Period	2.33 Year	20 Year
HWL	5.528	6.944
LWL	0.586	(-)0.522

Land usage:	Paddy cropping and winter cropping.
Embankment length and type:	32 Km Sea & 11.3 Km Interior Crest level 7.0 m along Little Feni River sea, Bamni River and Noakhali River.
Constructed:	1968-70 under CEP Phase I.
Major Cyclone Damage:	By 1961,1970 & 1985.
Major Flood Damages:	By 1987-88 flood.
Repair/rehabili-tation:	1988-90 under ADB funded part of Flood Rehabilitation Project, FDR and FFW since 1976.
O & M:	Practically no routine or periodic maintenance have been carried out since construction of the embankment.
Remarks:	The constructed sluices suffer severe siltation problem in the sea side apron.

Damaged embankments and embankments exposed to damage.

The embankment chainage 0.0 to 4.0 km along the lower reach of Little Feni River and chainage from 20.0 to 28.0 along Noakhali river is exposed to frequent sea wave attack in addition to the extensive erosion of the river side slopes.

Damages on structures.

There are Guster Khal, Char Balua Khal and char Elahi Khal open to the rivers and Bamni River is open to sea.

There is no structure in major damaged condition.

Afforestation.

There is no afforestation or plantation on the foreshore or on the embankment along Little Feni River or Noakhali River. There is a small foreshore afforestation by the side of Bamni River.

Recommended remedial measures.

Set back embankment of 7 km:
New embankment to guide Bamni river upto proposed multivent sluices with well compacted river side flat slope and durba grass turfing.

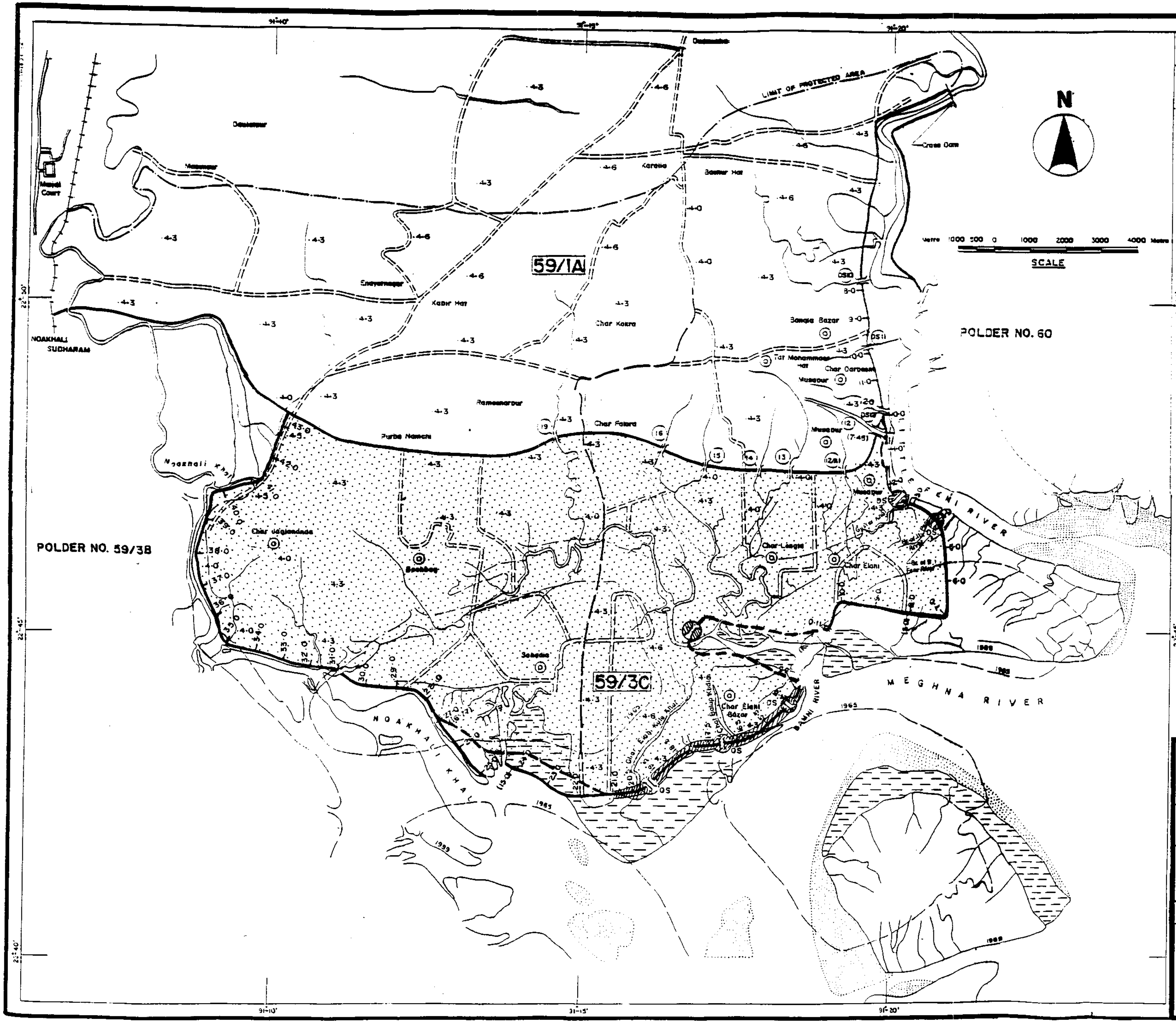
Embankment chainage 21 to 27 km:
Retired embankment with well compacted river side flat slope and durba grass turfing and river training work with porcupine along outer bend of Noakhali Khal.

Embankment chainage 21 to 27 km :
Resectioning to provide flatter and well compacted river side slope with durba grass turfing.

One multivent drainage sluice one Bamni River and three other sluices at the out fall of guster Khal, char Balua Khal and Char Elahi are to be constructed new to complete the polder.

Mangrove afforestation on foreshore area and in borrow pits.

Babla, Coconut, Shil Koroi plantation on embankment slopes.

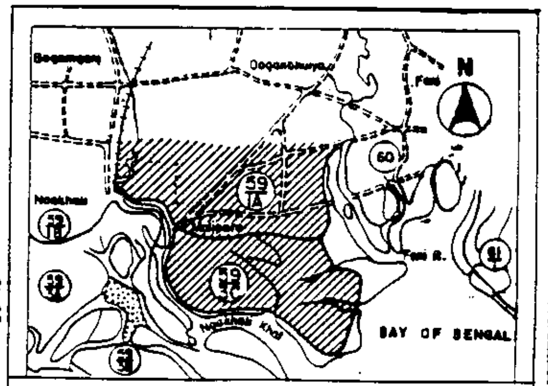


POLDER NO. 59/3C

82

LEGEND

- River & Khal
- Roads
- Shore Line 1965
- Shore Line 19
- Limit of Protected Area
- Spot Heights in Metre (PWD) 3·4
- Embankments Ch. Km. 8·0/Mile(5·0)
- New/Retired Embankment
- Resectioning Embankment
- Protective Works
- Original CEP Embankment
- Porcupine
- Existing Sluice DS SS
- Proposed Sluice DS SS
- Sluice to be Repaired DS SS
- Net Protected Area



PEOPLE'S REPUBLIC OF BANGLADESH
MINISTRY OF IRRIGATION, WATER DEVELOPMENT AND FLOOD CONTROL
BANGLADESH WATER DEVELOPMENT BOARD

CYCLONE PROTECTION PROJECT II

MID TERM PROGRAMME-PHASE 2 PROPOSED WORKS			POLDER 59/3C
Design:	Recomm.	Appr.:	DATE:01-02-92
KAMPSAX INTERNATIONAL A/S, BCEOM and DANISH HYDRAULIC INSTITUTE in association with DEVELOPMENT DESIGN CONSULTANTS LTD. 23, New Eskaton Road, Dhaka-1000. Tel. 405477, Fax 880 02 832951			SCALE : 1:100 000
			DRAWING NO. :

Polder no. 60

Project Type:	Flood control, Drainage, Irrigation and salinity exclusion (FCDI).
Location:	District: Feni Upazila: Sonagazi O&M division: Noakhali Circle: Muhuri
Status:	Polder complete.
Area(ha):	Gross protected 10,000 Net cultivable 6,900 Net benefitted 4,875
Land elevation:	3.8 - 4.5 m PWD.
Tidal range (m PWD):	Companijong:

Return Period	2.33 Year	20 Year
HWL	5.528	6.944
LWL	0.586	(-)0.522

Land usage:	Paddy cropping and Winter cropping.
Embankment length and type:	26.5 km Interior & 12.3 Marginal Crest level 7.0 m along Little Feni River and 6.5 m along Feni River.
Constructed:	1965-70 under CEP Phase I.
Major Cyclone Damage:	By 1961, 1970 & 1985.
Major Flood Damage:	By 1987-88 Flood.
Repair/rehabili-tation:	1988-90 under ADB funded part of flood Rehabilitation Project, FDR and FFW since 1976.
O & M:	Practically no routine or Periodic maintenance have been carried out since construction of the embankment.
Remarks:	Sonagazi Regulator has severe Problem of lifting gates during pre-monsoon operation, due to heavy siltation in sea side apron.

Damaged embankments and embankments exposed to damage.

The embankment chainage 15 to 17.3 km and 25 to 27 km along confluence of Little Feni River and Feni River is exposed to frequent wave attack in monsoon causing extensive erosion of river side slope.

Damages on structure.

No major damage of structures.
Siltation in the out fall channel of drainage sluices, specially, Sonagazi Regulator suffers gate lifting problem in pre-monsoon flood.

Afforestation.

There is no afforestation or plantation on the foreshore developed in the confluence of Little Feni River and Feni River. There are scattered plantation on the slope of embankment in some reaches.

Recommended remedial measures.

Embankment chainage 15 to 17.3 km and 25 to 30.7 km :

Resectioning to provide flatter and well compacted river side slope with durba grass turfing.

Repair of three sluices.

Mangrove afforestation on foreshore area and in borrow pits.

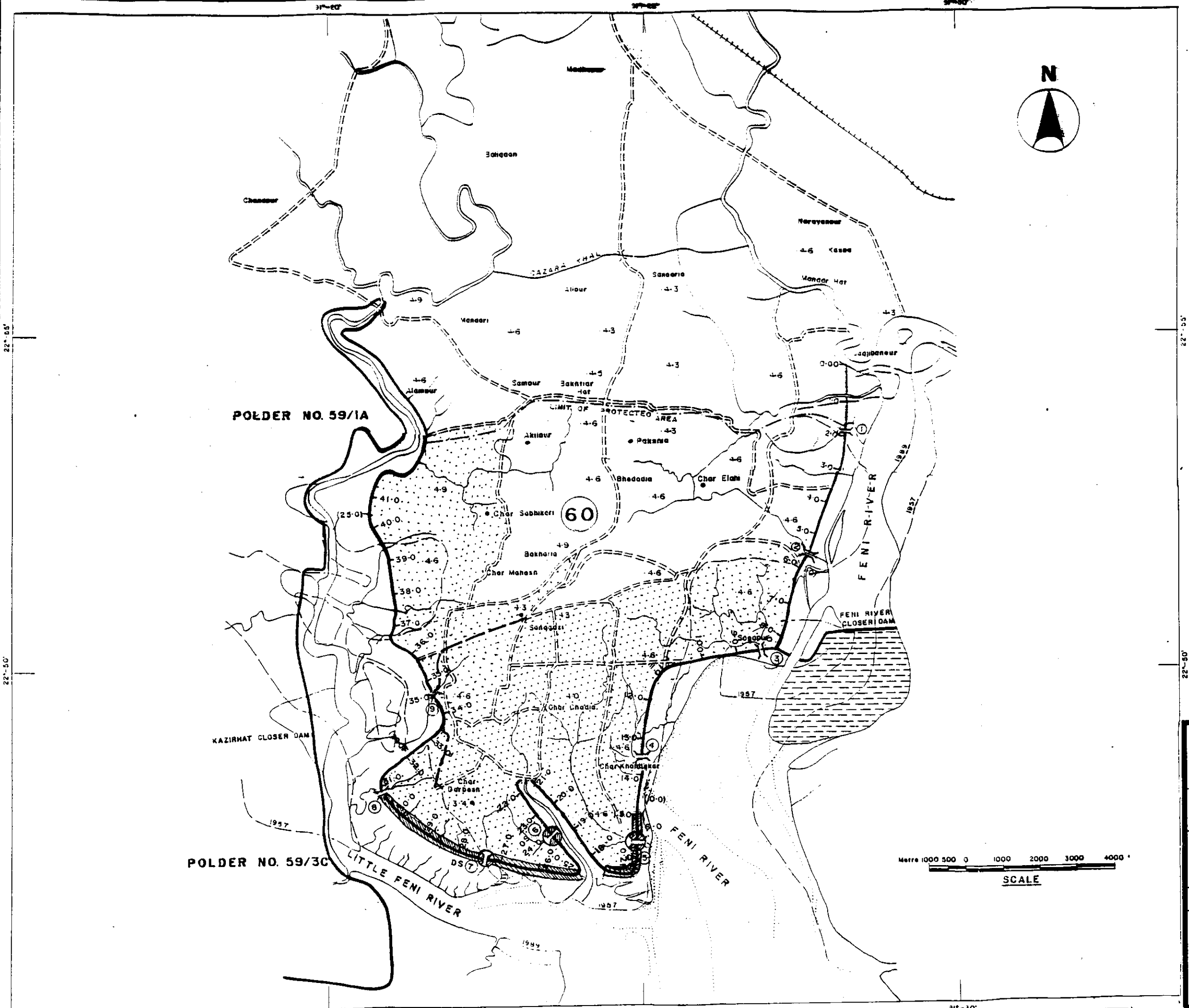
Babla, Khair, Shisam and Shil Koroi plantation on embankment slopes.

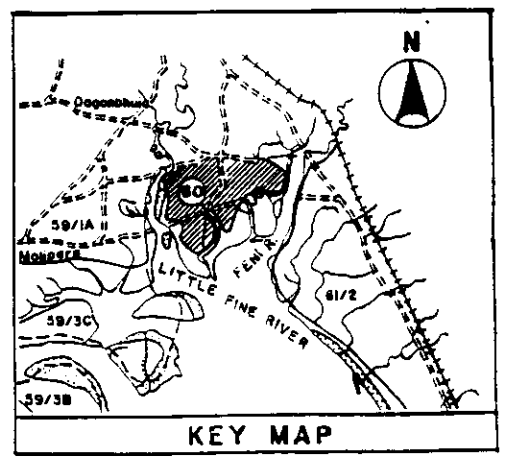
POLDER NO. 60

60

LEGEND

- River & Khal
- Roads...
- Shore Line 1965
- Shore Line 19
- Limit of Protected Area
- Spot Heights in Metre (PWD) — 3·4
- Embankments Ch. Km. 8·0/ Mile(5·0) — (5·0)
- New / Retired Embankment
- Resectioning Embankment
- Protective Works
- Original CEP Embankment
- Porcupine
- Existing Sluice — DS SS
- Proposed Sluice — DS SS
- Sluice to be Repaired — DS SS
- Net Protected Area





KEY MAP

PEOPLE'S REPUBLIC OF BANGLADESH
MINISTRY OF IRRIGATION, WATER DEVELOPMENT AND FLOOD CONTROL
BANGLADESH WATER DEVELOPMENT BOARD

CYCLONE PROTECTION PROJECT II

MID TERM PROGRAMME-PHASE 2 PROPOSED WORKS	POLDER 60
Design: / Recomm. / Appr.:	DATE:01-02-92
KAMPSAX INTERNATIONAL A/S, BCEOM and DANISH HYDRAULIC INSTITUTE in association with DEVELOPMENT DESIGN CONSULTANTS LTD. 23, New Eskaton Road, Dhaka-1000. Tel. 405477, Fax 880 02 832951	SCALE : 1:100 000
	DRAWING NO. :

Polder no. 61/1

Project Type:	Flood Control, Drainage and salinity exclusion (FCD).
Location:	District: Chittagong Upazila: Sitakunda O&M division: Chittagong II Circle: Chittagong
Status:	Polder not complete.
Area(ha):	Gross protected 6,600 Net cultivable 5,280 Net benefitted 600
Land elevation:	3.4-4.0 m PWD.
Tidal range: (m PWD)	Patenga Gauge Station:

Return Period	2.33 Year	20 Year
HWL	2.33	4.102
LWL	(-)0.705	(-)1.81

Land usage:	Paddy cropping and winter cropping.
Embankment length and type:	24 km sea & 3.4 km Marginal Crest level 6.7m of sea, and 5.8m of marginal embankment.
Constructed:	1965-70 under CEP phase I.
Major Cyclone Damage:	By 1960, 1963, & 1991.
Major Flood Damages:	None.
Repair/rehabilitation:	Emergency repair by FFW since 1975, IDA funded FDR since 1986 & ECRR in 1991.
O & M:	Practically no routine or periodic maintenance have been carried out since construction of the embankment.
Remarks:	Afforestation is needed on the foreshore bear area.

Damaged embankments and embankments exposed to damage.

The embankment chainage 1 to 2.6 km and 0.5E to 5.0E km along the 7-10 km wide lower reach of Sandwip channel is exposed to frequent attack of sea waves in monsoon causing extensive erosion of the sea side slope.

Damages on structure.

The drainage sluice no 16 has been severely damaged by waves & cyclonic surges. At chainage 3.55 E & 3.80E km, embankment is kept open for construction of two surface sluices.

Afforestation.

There are small groups of mangrove afforestation on the long foreshore along the coast. The embankment is will guarded by babla tree, date tree and other tree plantation in most of the reaches.

Recommended remedial measures.

Embankment chainage 1 to 2.6 km & 0.5E to 2.1E km:
Resectioning to provide flatter and well compacted sea side slope with durba grass turfing.

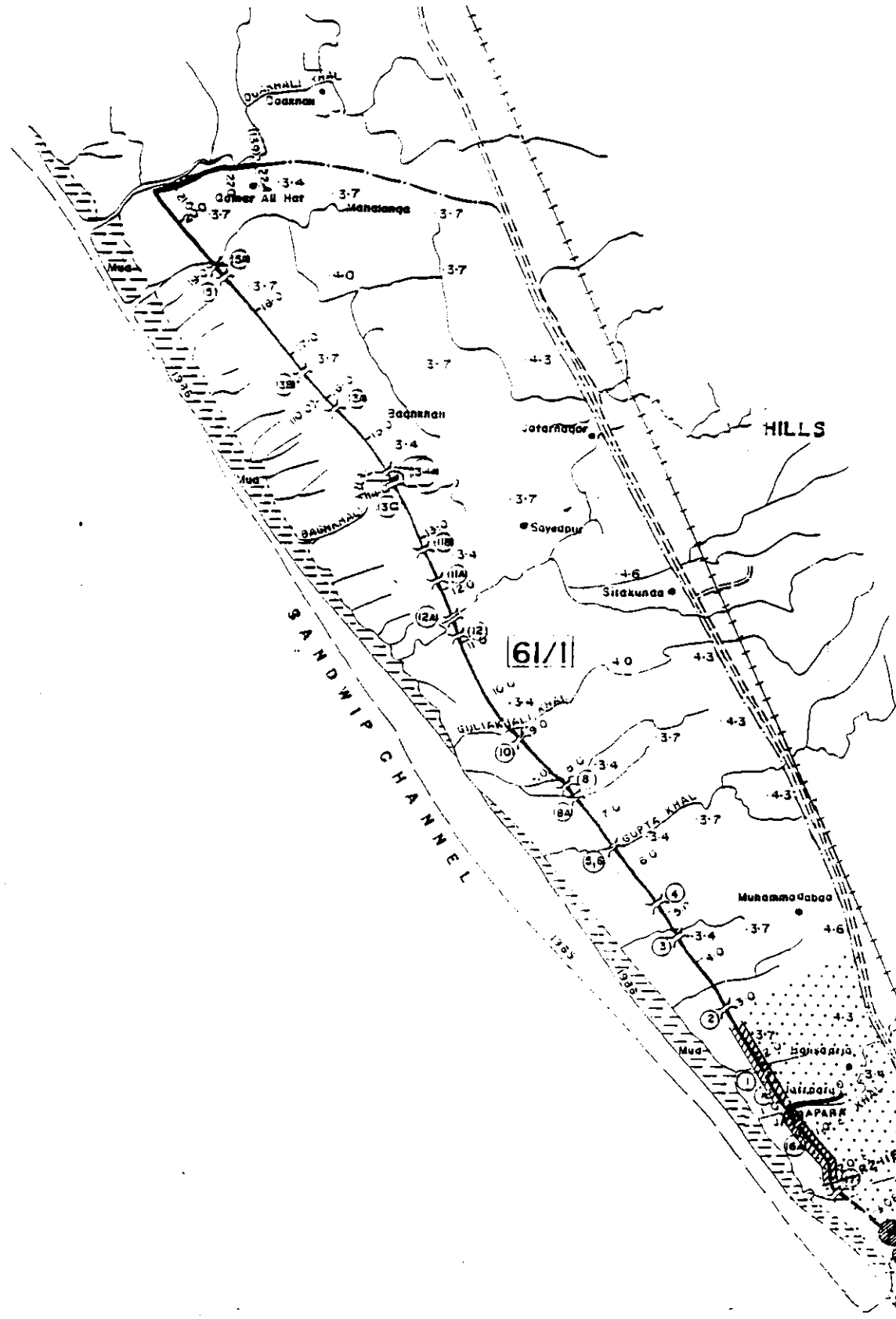
Embankment chainage 2.1E to 5.0E km:
Providing retirement with flatter and well compacted sea side slope and durba grass turfing.

Repairing damaged sluice no 16 and constructing two new surface sluices at ch. 3.55E & 3.80E km to release flush flood immediately.

Mangrove afforestation on the bear foreshore & borrow pits.

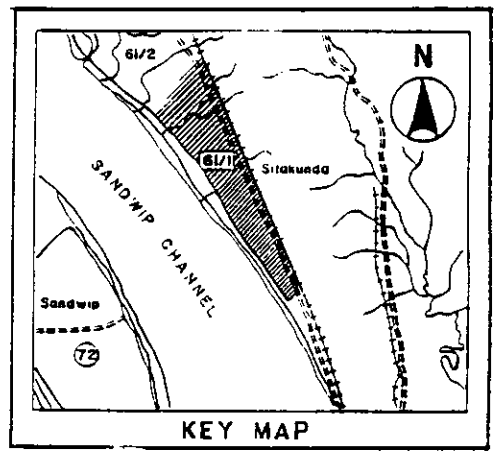
Babla tree plantation on embankment slopes.

POLDER NO. 61/1



LEGEND

- River & Khal
- Roads
- Shore Line 1965
- Shore Line 19
- Limit of Protected Area
- Spot Heights in Metre (PWD) — 3·4
- Embankments Ch. Km. 8·0/Mile(5·0) — (5·0)
- New/Retired Embankment
- Resectioning Embankment
- Protective Works
- Original CEP Embankment
- Porcupine
- Existing Sluice — DS, SS
- Proposed Sluice — DS, SS
- Sluice to be Repaired — DS, SS
- Net Protected Area



KEY MAP

PEOPLE'S REPUBLIC OF BANGLADESH
MINISTRY OF IRRIGATION, WATER DEVELOPMENT AND FLOOD CONTROL
BANGLADESH WATER DEVELOPMENT BOARD

CYCLONE PROTECTION PROJECT II

MID TERM PROGRAMME-PHASE 1
PROPOSED WORKS

POLDER 61/1

Design:	Recomm.	Appr.:	DATE:01-02-92

KAMPSAX INTERNATIONAL A/S, BCEOM and DANISH HYDRAULIC INSTITUTE in association with DEVELOPMENT DESIGN CONSULTANTS LTD.
23, New Eskaton Road, Dhaka-1000. Tel. 405477. Fax 880 02 832951

SCALE : 1:100 000

DRAWING NO. :

Polder no. 62

Project Type:	Flood Control, Drainage and salinity exclusion (FCD).
Location:	District: Chittagong Upazila: Chittagong Port P.S. O&M division: Chittagong I Circle: Chittagong
Status:	Polder not complete.
Area(ha):	Gross protected 2,550 Net cultivable 1,420
Land elevation:	3-3.5 m PWD.
Tidal range (m PWD):	Patenga Gauge Station:

Return Period	2.33 Year	20 Year
HWL	3.652	4.102
LWL	(-)0.705	(-)1.81

Land usage:	Paddy cropping, commercial & industrial infrastructures.
Embankment length and type:	18.5 km sea Crest level 6.7 m.
Constructed:	1965-70 under CEP phase I.
Major Cyclone Damage:	By 1960, 1965, 1970 & 1991.
Major Flood Damages:	None.
Repair/rehabilitation:	Emergency repair by FFW since 1975, IDA funded FDR since 1986 & ECRR in 1991.
O & M:	Practically no routine or periodic maintenance have been carried out since construction of the embankment.
Remarks:	Full afforestation of the foreshore is needed with protective work in the southern part of the embankment.

Damaged embankments and embankments exposed to damage.

The embankment chainage 0 to 1.3 km along esturine bank of Karnafuly river and chainage 1.98 to 22.2 km along the coast of the Bay of Bengal are exposed to the attack of sea waves causing sever damage to river side slope and extensive erosion of the sea side slope.

Damages on structure.

The cyclonic surge and waves have damages all sea facing surface and drainage sluices and it is needed to reconstruct or replace them.

Afforestation.

In some part of the foreshore, there is good mangrove afforestation but renders less effect due to the discontinuation of the afforestation. On embankment slope parallel to the existing mangrove afforestation, there are well grown babla and other plantation present.

Recommended remedial measures.

Embankment chainage 0 to 1.3 km & 5.5 to 18.7 km:
Resectioning to provide higher crest level with flatter and well compacted sea side slope with durba grass turfing.

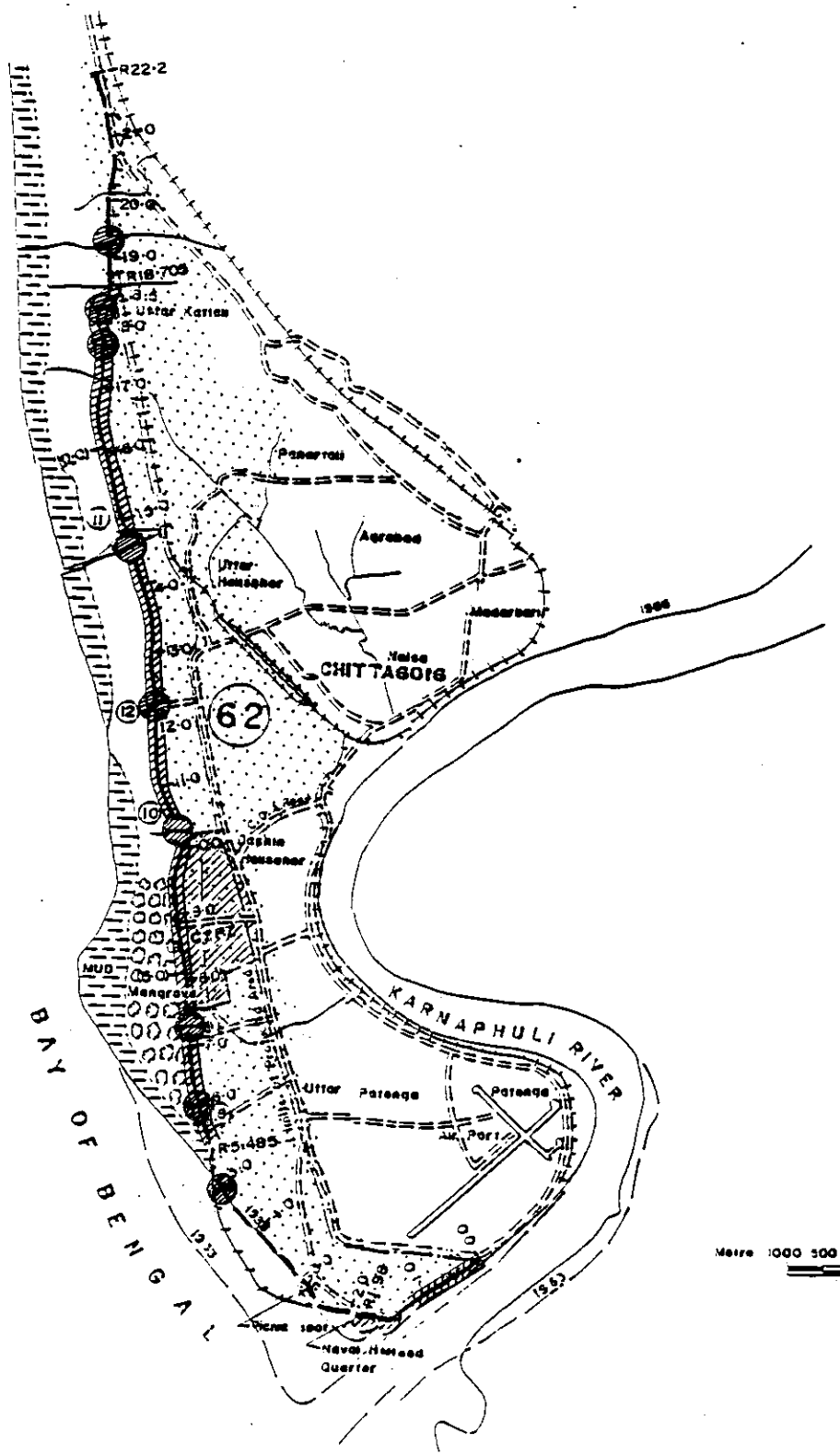
Embankment chainage 2 to 5.5 km and 18.7 to 22.2. km:
Providing retirement of embankment with higher crest level, flatter and well compacted sea side slope and durba grass turfing and new embankment from 18.7 to 22.2 km to link with Dhaka-Chittagong Highway.

Reconstructing 4 drainage and 5 surface sluices matching with new higher crest level and flatter sea side slope.

Mangrove afforestation in the fellow foreshore area.

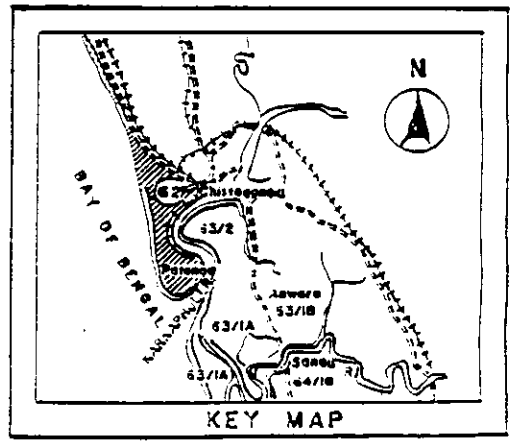
Babla tree plantation on embankment slopes.

POLDER NO. 62



LEGEND

- River & Khal
- Roads
- Shore Line 1965
- Shore Line 19
- Limit of Protected Area
- Spot Heights in Metrs (P.W.D) 3·4
- Embankments Ch. Km. 8·0/Mile(5·0) 8·0 (5·0)
- New/Retired Embankment
- Resectioning Embankment
- Protective Works
- Original CEP Embankment
- Porcupine
- Existing Sluice DS SS
- Proposed Sluice DS SS
- Sluice to be Repaired DS SS
- Net Protected Area



PEOPLE'S REPUBLIC OF BANGLADESH
MINISTRY OF IRRIGATION, WATER DEVELOPMENT AND FLOOD CONTROL
BANGLADESH WATER DEVELOPMENT BOARD

CYCLONE PROTECTION PROJECT II

MID TERM PROGRAMME-PHASE 1 PROPOSED WORKS			POLDER 62
Design:	Recomm.	Appr.:	DATE:01-02-92
KAMPSAX INTERNATIONAL A/S, BCEOM and DANISH HYDRAULIC INSTITUTE in association with DEVELOPMENT DESIGN CONSULTANTS LTD. 23, New Eskaton Road, Dhaka-1000. Tel. 405477, Fax 880 02 832951			SCALE : 1:100 000
			DRAWING NO. :

Polder no. 63/1A

Project Type:	Flood Control, Drainage and salinity exclusion (FCD).
Location:	District: Chittagong Upazila: Anowara O&M division: Chittagong II Circle: Chittagong
Status:	Polder complete.
Area(ha):	Gross protected 5,450 Net cultivable 3,100 Net benefitted 1,250
Land elevation:	2.1-2.4 m PWD.
Tidal range: (m PWD)	Banigram Gauge Station:

Return Period	2.33 Year	20 Year
HWL	3.543	4.96
LWL	(-)1.00	(-)1.996

Land usage:	Paddy cropping,winter cropping and (minor) shrimp cultivation.
Embankment length and type:	34 km sea and 14.3 km Marginal Crest level 6.3 m of sea, and 5.6 of Marginal embankment.
Constructed:	1965-70 under CEP phase I.
Major Cyclone Damage:	By 1960, 1965 & 1991.
Major Flood Damages:	None.
Repair/rehabilitation:	Emergency repair by FFW since 1975 IDA funded FDR since 1986 & ECRR in 1991.
O & M:	Practically no routine or periodic maintenance have been carried out since construction of the embankment.
Remarks:	Afforestation on available foreshore is needed. Retirement is difficult due to thick homestead close to embankment.

Damaged embankments and embankments exposed to damage.

The embankment chainage 28.5 to 32 km along the turbulent hilly Sangu river in estuarine reach is exposed to frequent wave attack in association with eroding current and chaniage 32 to 43 km along the sea coast is directly exposed to wave attack in association with several cyclonic surges occur time to time.

Damages on structure.

The drainage sluice no 15 at chainage 32.4 is severely damage by waves and surges.

Afforestation.

There is newly grown mangrove afforestation in the estuarine foreshore of Sangu river but no afforestation on the beach like foreshore along the sea coast. Other than on short length of the embankment no plantation is present on the slope of the embankment.

Recommended remedial measures.

Embankment chainage 34 to 37 km and 38.3 to 42 km:
Providing retirement of embankment with flatter and well compacted sea side slope and durba grass turfing

Embankment Chainage 28.5 to 34 km, 37 to 38.3 km and 42 to 43 km:
Resectioning to provide flatter and well compacted river side slope with protective measure from 28.5 to 32 km against erosion and, sea side slope with durba grass turfing.

Repairing drainage sluice no 15 matching with the mew protective work and embankment slope.

Mangrove or casuarina afforestation on foreshore area.

Babla tree plantation on embankment slopes.

Polder no. 64/1A

Project Type:	Flood Control, Drainage and salinity exclusion (FCD).
Location:	District: Chittagong Upazila: Banskhali O&M Division: Chittagong II Circle: Chitagong
Status:	Polder complete.
Area(ha):	Gross protected 12,700 Net cultivable 10,800 Net benefitted 4,300
Land elevation:	1.8-2.4 m PWD.
Tidal range: (m PWD)	Banigram Gauge Station: Return Period 2.33 Year 20 Year HWL 3.543 4.96 LWL (-)1.00 (-)1.996
Land usage:	Paddy cropping & (minor) shrimp cultivation.
Embankment length and type:	2.4 km sea and 34.6 km Interior Crest level 6.1 m of sea and 5.5 m of Interior embankment.
Constructed:	1965-70 under CEP phase I.
Major Cyclone Damage:	By 1960, 1965 & 1991.
Major Flood Damages:	None.
Repair/rehabilitation:	Emergency repair by FFW since 1975, IDA funded FDR since 1986 & ECRR in 1991.
O & M:	Practically no routine or periodic maintenance have been carried out since construction of the embankment.
Remarks:	Irrigation scheme may be successful by Jalkadal Khal as reservoir.

Damaged embankments and embankments exposed to damage.

The embankment chainage 81 to 86 km along the lower reach of Jalkadal Khal is exposed to frequent wind high tide generated waves causing extensive erosion of the river side slope. The embankment chainage 86 to 107.8 km along the sea coast is exposed to the severe attack of waves and frequent surges of this cyclone prone zone.

Damages on structure.

Severe damages to the drainage sluice no 28 and 29 caused by waves and cyclonic surges.

Afforestation.

No remarkable plantation on the embankment except a short length of 0.3 km around ch. 86 km. Along the estuarine foreshore of Jalkadal Khal and along sea coast from chainage 93 to 98 km, there are some paths of mangrove afforestation on the foreshore providing a good protection against wave attack.

Recommended remedial measures.

Embankment chainage 81 to 83.3 km and 90.1 to 100.4 km:
Resectioning to provide flatter and well compacted river and sea side slope with durba grass turfing.

Embankment chainage 83.3 to 90.1 km and 100.4 to 107.8 km:
Providing retirement of embankment of higher crest level and flatter and well compacted river and sea side slope with durba grass turfing.

Repairing drainage sluice no 28 and reconstructing the drainage sluice no 29 with new design, crest and slope.

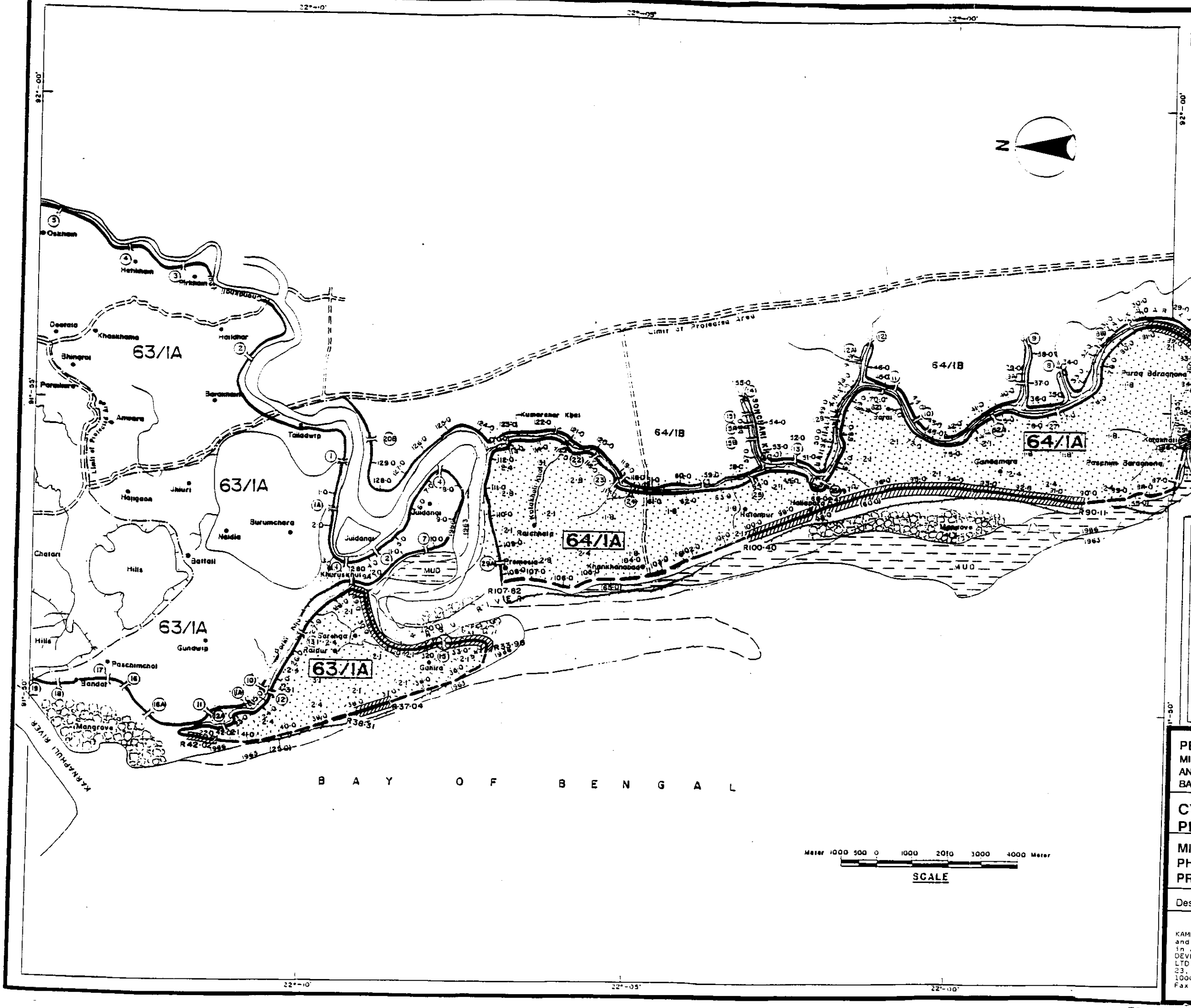
Mangrove afforestation on foreshore area and in borrow pits.

Babla tree plantation on embankment slopes.

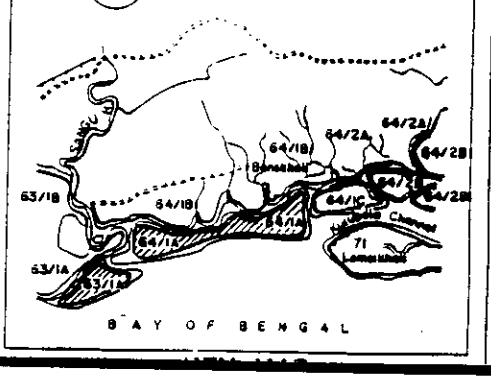
POLDER NO. 63/1A, 64/1A

LEGEND

- River & Khal
- Roads
- Shore Line 1965
- Shore Line 19
- Limit of Protected Area
- Spot Heights in Metre (PWD) 3·4
- Embankments Ch. Km. 8·0/Mile(5·0) (5·0)
- New/Retired Embankment
- Resectioning Embankment
- Protective Works
- Original CEP Embankment
- Porcupine
- Existing Sluice DS SS
- Proposed Sluice DS SS
- Sluice to be Repaired DS SS
- Net Protected Area



KEY MAP



PEOPLE'S REPUBLIC OF BANGLADESH
MINISTRY OF IRRIGATION, WATER DEVELOPMENT AND FLOOD CONTROL
BANGLADESH WATER DEVELOPMENT BOARD

CYCLONE PROTECTION PROJECT II

MID TERM PROGRAMME-PHASE 1 PROPOSED WORKS			POLDER 63/1A, 64/1A
Design:	Recomm.	Appr.:	DATE:01-02-92
KAMPSAX INTERNATIONAL A/S, BCEOM and DANISH HYDRAULIC INSTITUTE in association with DEVELOPMENT DESIGN CONSULTANTS LTD. 23, New Eskaton Road, Dhaka-1000, Tel. 405477, Fax 880 02 832951			SCALE : 1:100 000
			DRAWING NO. :

Polder no. 64/1C

Project Type:	Flood Control, Drainage and salinity exclusion (FCD).
Location:	District: Chittagong Upazila: Banskhali O&M division: Chittagong II Circle: Chittagong
Status:	Polder complete.
Area(ha):	Gross protected 3,000 Net cultivable 2,550 Net benefitted 1,200
Land elevation:	1.8-2.1 m PWD.
Tidal range: (m PWD)	Lemsikhali Gauge Station:

Return Period	2.33 Year	20 Year
HWL	3.802	4.780
LWL	(-)1.285	(-)2.260

Land usage:	Paddy cropping & salt Production.
Embankment length and type:	9.5 km sea and 13 km Interior Crest level 6.1 m of sea and 5.5 m of Interior embankment.
Constructed:	1965-70 under CEP phase I.
Major Cyclone Damages:	By 1960, 1965 & 1991.
Major Flood Damages:	None.
Repair/rehabilitation:	Emergency repair by FFW since 1975, IDA funded FDR since 1986 & ECRR in 1991.
O & M:	Practically no routine or periodic maintenance have been carried out since construction of the embankment.
Remarks:	Communication system needs further development with a bridge on Jalkadal Khal.

Damaged embankments and embankments exposed to damage.

The embankment chainage 11 to 21 km along 2 km wide Kutubdia channel is exposed to regular wave action causing extensive erosion of the channel side slope.

Damages on structure.

None.

Afforestation.

In the lower end of Jalkadal Khal meeting Kutubdia channel, there is a group of mangrove afforestation of the foreshore further developed naturally providing effective protection against wave attack. No plantation is found on the embankment.

Recommended remedial measures.

Embankment chainage 11 to 21 km:
Resectioning to provide flatter and well compacted channel side slope with durba grass turfing.

Mangrove afforestation on foreshore area and in borrow pits.

Babla tree plantation on embankment slopes.

Polder no. 64/2B

Project Type:	Flood Control, Drainage and salinity exclusion (FCD).
Location:	District: Cox's Bazar Upazila: Chakaria O&M division: Cox's Bazar Circle: Chittagong
Status:	Polder complete.
Area(ha):	Gross protected 7,000 Net cultivable 4,270 Net benefitted 3,250
Land elevation:	1.2-1.8 m PWD.
Tidal range: (m PWD)	Lemsikhali Guage Station:

Return Period	2.33 Year	20 Year
HWL	3.802	4.780
LWL	(-)1.285	(-)2.260

Land usage:	Paddy cropping, shrimp cultivation and salt production.
Embankment length and type:	14.2 km sea and 64.7 km Interior & 15.3 km Marginal. Crest level 6.1 m.
Constructed:	1965-70 under CEP phase I.
Major Cyclone Damage:	By 1960, 1965, 1970 & 1991.
Major Flood Damages:	None.
Repair/rehabilitation :	Emergency repair by FFW since 1975, IDA funded FDR since 1986 & ECRR in 1991.
O & M:	Practically no routine or periodic maintenance have been carried out since construction of the embankment.
Remarks:	Re-afforestation need to supplement the ineffective and destroyed mangrove plantation.

Damaged embankments and embankments exposed to damage.

The embankment chainage 10.8 to 14.2 km, chainage 104 to 107 km and chainage 116.8 to 126.8 km respectively of Rajakhali, Ujantia and Mognama along 4 km wide (widest part of) Kutubdia channel is exposed to frequent attract of waves causing extensive erosion of the channel side slopes.

Damages on structure.

None.

Afforestation.

Along the channel, there are some patches of scattered and in-effective mangrove afforestation on the foreshore providing no protection to the embankment due to bear and open long stems of the plantations. There are a few babla plantation in some lengths of the embankment.

Recommended remedial measures.

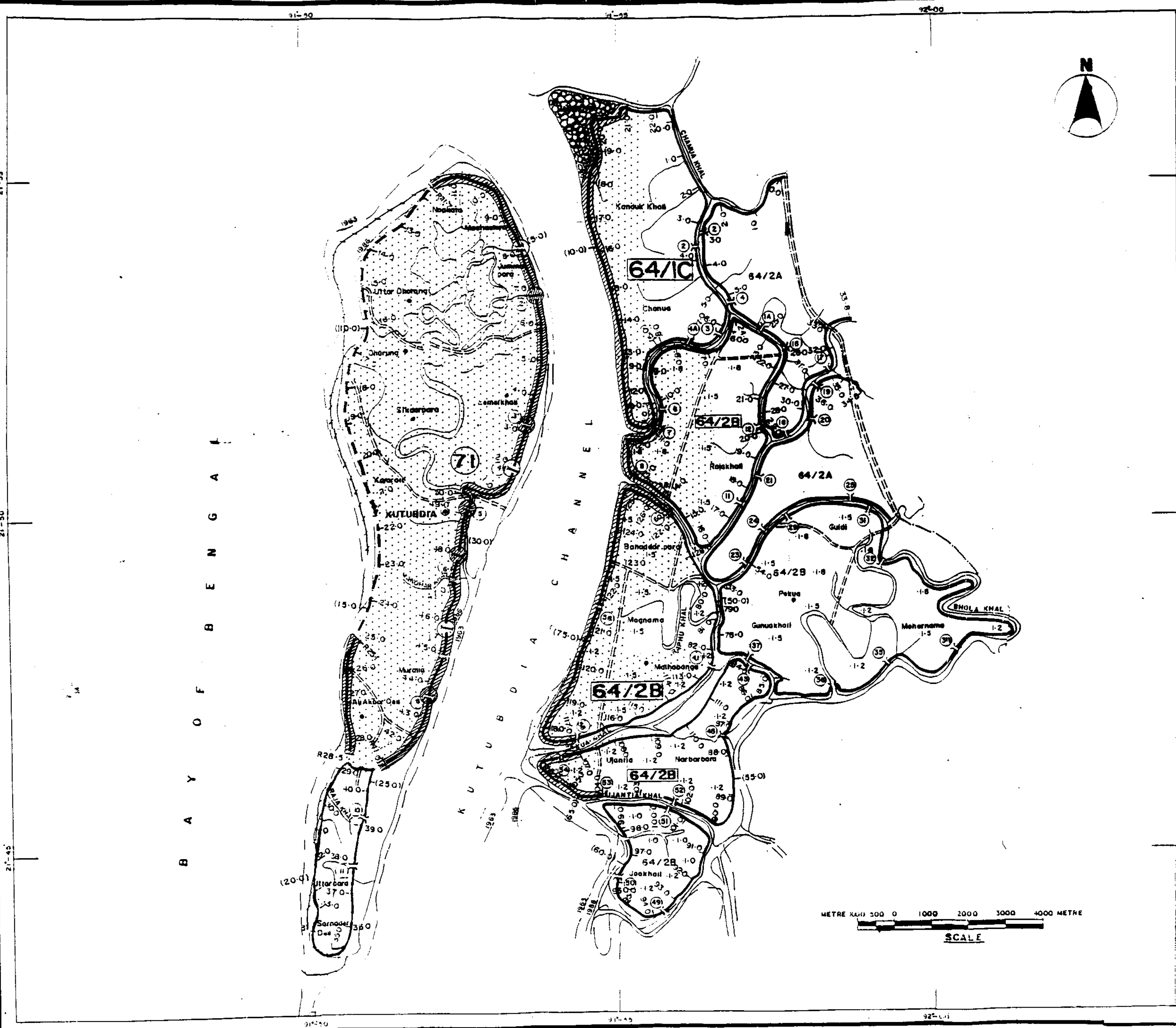
Embankment chainage 10.8 to 14.2 km, 104 to 107 km and 116.8 to 126.8 km:

Resectioning to provide flatter and well compacted river side slope with durba grass turfing.

Mangrove afforestation on foreshore area and in borrow pits.

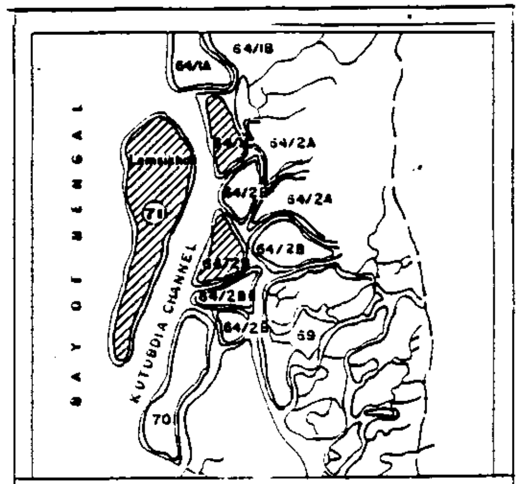
Babla tree plantation on embankment slopes.

POLDER NO. 64/2B, 64/1C & 71



LEGEND

- River & Khal
- Roads...
- Shore Line 1965 ..
- Shore Line 19
- Limit of Protected Area
- Spot Heights in Metre (PWO).. 3·4
- Embankments Ch. Km. 8-0/Mile(5-0)
- New/Retired Embankment
- Resectioning Embankment...
- Protective Works
- Original CEP Embankment
- Porcupine .
- Existing Sluice ... DS SS
- Proposed Sluice DS SS
- Sluice to be Repaired... DS SS
- Net Protected Area ....



KEY MAP

PEOPLE'S REPUBLIC OF BANGLADESH MINISTRY OF IRRIGATION, WATER DEVELOPMENT AND FLOOD CONTROL BANGLADESH WATER DEVELOPMENT BOARD	
CYCLONE PROTECTION PROJECT II	
MID TERM PROGRAMME-PHASE 1 PROPOSED WORKS	POLDER 71 64/2B, 64/1C
Design: / Recomm. / Appr.:	DATE:01-02-92
KAMPSAX INTERNATIONAL A/S, BCEOM and DANISH HYDRAULIC INSTITUTE in association with DEVELOPMENT DESIGN CONSULTANTS LTD. 23, New Eskaton Road, Dhaka-1000, Tel. 405477, Fax 880 02 832951	SCALE : 1:100 000 DRAWING NO. :

Polder no. 66/1

Project Type:	Flood Control, Drainage and salinity exclusion (FCD).
Location:	District: Cox's Bazar Upazila: Cox's Bazar O & M division: Cox's Bazar Circle: Chittagong
Status:	Polder complete.
Area(ha):	Gross protected 2500 Net cultivable 1450 Net benefitted 660
Land elevation:	1.5-1.8 m PWD.
Tidal range (m PWD):	Shaflapur Gauge Station: Return Period 2.33 Year 20 Year HWL 3.704 4.616 LWL (-)1.451 (-)2.216
Land usage:	Paddy cropping, fish catching and drying.
Embankment length and type:	5.6 km sea & 13.7 km Marginal Crest level 4.9 m along Moheshkhali Channel & 4.2 m along Zoaria Khal.
Constructed:	June, 1968 Complete
Major Cyclone Damage:	By 1970, 1985, and 1991
Major Flood Damages:	None
Repair/rehabilitation:	Food For Work (FFW) Since 1975 and Flood Damage Rehabilitation Since 1986.
O & M:	Practically no routine or periodic maintenance have been carried out since construction of the embankment.
Remarks:	Foreshore afforestation is disturbed by frequent anchorage of fishing boats.

Damaged embankments and embankments exposed to damage.

The embankment chainage 0 to 5 km is exposed to waves of two km wide Moheskhali Channel which is directly linked with Bay of Bengal and channel side slope is regularly attacked and damaged by waves.

Damages on structure.

One surface sluice at chainage 1.28 km is severely damaged.

Afforestation.

There were attempts to grow mangrove afforestation in the foreshore and few plantation on the slope of embankment.

Recommended remedial measures.

Embankment chainage 0 to 5 km :
Resectioning to provide flatter and well compacted channel side slope with durba turfing.

Major repairing of one surface sluice at chainage 1.28 km.

Mangrove afforestation in foreshore and borrow pits.

Babla tree plantation on embankment slopes.

Polder no. 66/3

Project Type:	Flood Control, Drainage and salinity exclusion (FCD).
Location:	District: Cox's Bazar Upazila: Cox's Bazar O&M division: Cox's Bazar Circle: Chittagong
Status:	Polder complete.
Area(ha):	Gross protected 3,000 Net cultivable 1,890 Net benefitted 900
Land elevation:	1.2-1.8 m PWD.
Tidal range: (m PWD)	Shaflapur Gauge Station:

Return Period	2.33 Year	20 Year
HWL	3.704	4.616
LWL	(-)1.451	(-)2.216

Land usage:	Paddy cropping, shrimp cultivation and (minor) salt production.
Embankment length and type:	6.5km sea, 8.5km Interior & 4.8 km Marginal Crest level 4.9 m of sea and 4.3 m of Interior embankment.
Constructed:	1965-70 under CEP phase I
Major Cyclone Damage:	By 1963, 1965, 1970 & 1991
Major Flood Damages:	None
Repair/rehabilitation:	Emergency repair by FFW since 1975, IDA funded FDR since 1986 & ECRR in 1991.
O&M:	Practically no routine or periodic maintenance have been carried out since construction of the embankment.
Remarks:	The polder is successfully cultivating land for paddy and for shrimp.

Damaged embankments and embankments exposed to damage.

The embankment chainage 44.3 to 49.3 km along outfall of Bharuakhali Khal and Moheskhali channel is exposed to waves associated with some river flow causing extensive erosion of the river and channel side slopes.

Damages on structure.

Drainage sluice no 6 is exposed to Moheskhali channel and severely damaged by waves and surges.

Afforestation.

Some good mangrove afforestation present in some section of the embankment protecting to embankment slope very efficiently. A few plantation on the embankment.

Recommended remedial measures.

Embankment chainage 44.3 to 45.9 km:
Providing retirement of embankment with higher crest level and flatter and well compacted river side slope and durba turfing excluding existing rivetment work.

Embankment chainage 45.9 to 49.3 km:
Resectioning to provide higher crest level and flatter and well compacted channel side slope with durba grass turfing in addition to the existing protective work.

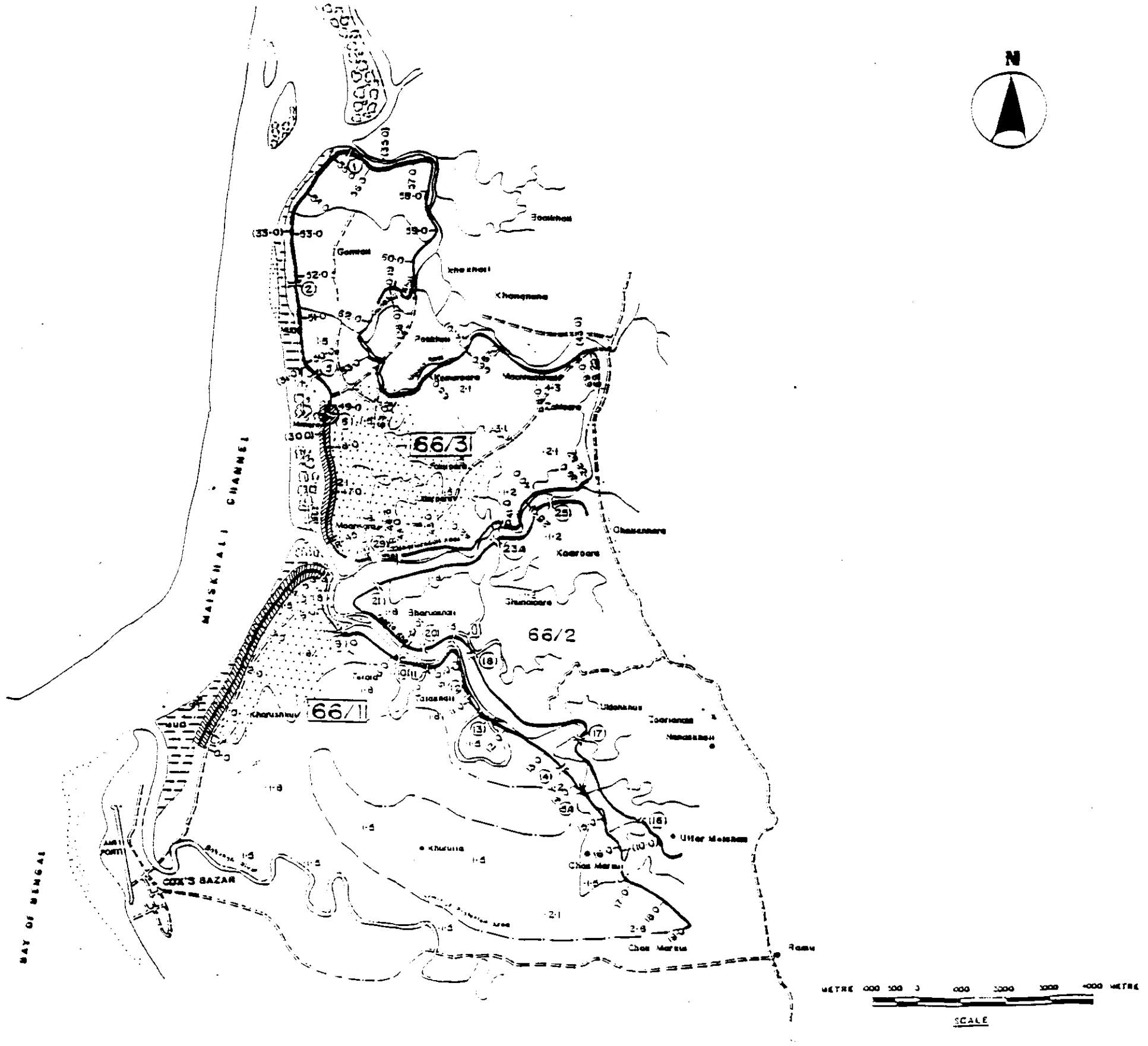
Reconstructing drainage sluice no 6 matching with the higher crest level and flatter channel side slope of the embankment.

Mangrove afforestation on foreshore area and in borrow pits.

Babla tree plantation on embankment slopes.

POLDER NO.66/1&66/3

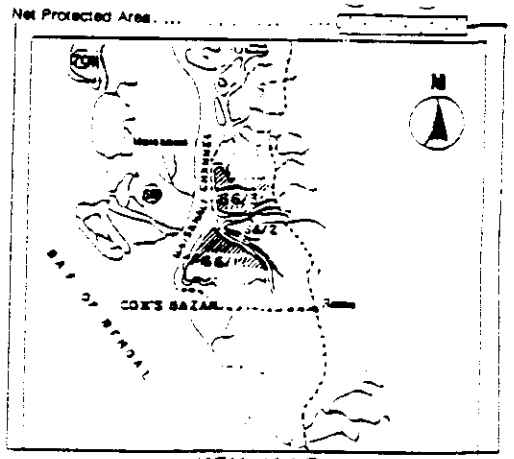
44



N

LEGEND

- River & Khal
- Roads
- Shore Line 1965
- Shore Line 19
- Limit of Protected Area
- Spot Heights in Metre (PWD)
- Embankments Ch. Km. 8-0/Mile(5-0)
- New/Retired Embankment
- Resectioning Embankment
- Protective Works
- Original CEP Embankment
- Porcupine
- Existing Sluice
- Proposed Sluice
- Sluice to be Repaired
- Net Protected Area



KEY MAP

PEOPLE'S REPUBLIC OF BANGLADESH
MINISTRY OF IRRIGATION, WATER DEVELOPMENT AND FLOOD CONTROL
BANGLADESH WATER DEVELOPMENT BOARD

CYCLONE PROTECTION PROJECT II

MID TERM PROGRAMME-PHASE 1 & 2 PROPOSED WORKS			POLDER 66/1,66/3
Design:	Recomm.	Appr.:	DATE:01-02-92

KAMPSAX INTERNATIONAL A/S, BCEOM and DANISH HYDRAULIC INSTITUTE in association with DEVELOPMENT DESIGN CONSULTANTS LTD.
23 New Eskaton Road, Dhaka-1000. Tel: 405477.
Tlx 880 02 332951

SCALE : 1:100 000

DRAWING NO. :

Polder no. 68

Project Type:	Flood Control, Drainage, Irrigation (Gravity flow) and salinity exclusion (FCDI).
Location:	District: Cox's Bazar Upazila: Teknaf O&M division: Cox's Bazar Circle: Chittagong
Status:	Polder not complete
Area(ha):	Gross protected 2,900 Net cultivable 2,088 Net benefitted 1,500
Land elevation:	1.0 - 1.8 m PWD.
Tidal range (m PWD):	Teknaf Gauge Station: Return Period 2.33 Year 20 Year HWL 1.840 2.255 LWL (-)0.31 (-)1.10
Land usage:	Paddy cropping, winter cropping & shrim culture.
Embankment length and type:	5.5 km Interior and rest 17.3 km Sea embankment. Crest level 3.4 m to 4.9 m along Naf river and 5.2 m along sea.
Constructed:	1968-70 under CEP Phase I.
Major Cyclone Damage:	By 1965, 1970 and 1991.
Major Flood Damages:	Flash flood by 1985-86 and 1988-89.
Repair/rehabilitation:	Emergency repair after cyclones by FFW since 1976 & FDR in 1988-90.
O & M:	Practically no routine or periodic maintenance have been carried out since the construction of the embankment.
Remarks:	Local people repaired severe damages of embankment on emergency basis. Some grown up mangrove afforestation is withered by shrimp cultivators.

Damaged embankments and embankments exposed to damage.

The embankment chainage 9.4 to 16.4 km along the wide lower reach of Naf River is exposed to frequent wind generated waves and chainage 16.4 to 28.4 km along the Bay of Bengal coast is under direct attack of sea waves causing extensive erosion of river and sea sides slopes.

Damages on structure.

On sluice at 12.2 km was severe damaged by cyclonic waves in 1970 and it was reconstructed nearby but the capacity is insufficient. Now a new structure is required to drain out the inundation of cropping field.

Afforestation.

There are several good mangrove afforestation in forelands of Naf River and foreshore of the Bay of Bengal. Some afforestations in foreland of interior part of Naf River have been withered by shrim-culturists.

Recommended remedial measures.

Embankment chainage 9.4 km and 16.4 km and 18.7 km to 23.8 km:
Resectioning to provide flatter and well compacted river side slope with durba grass turfing.

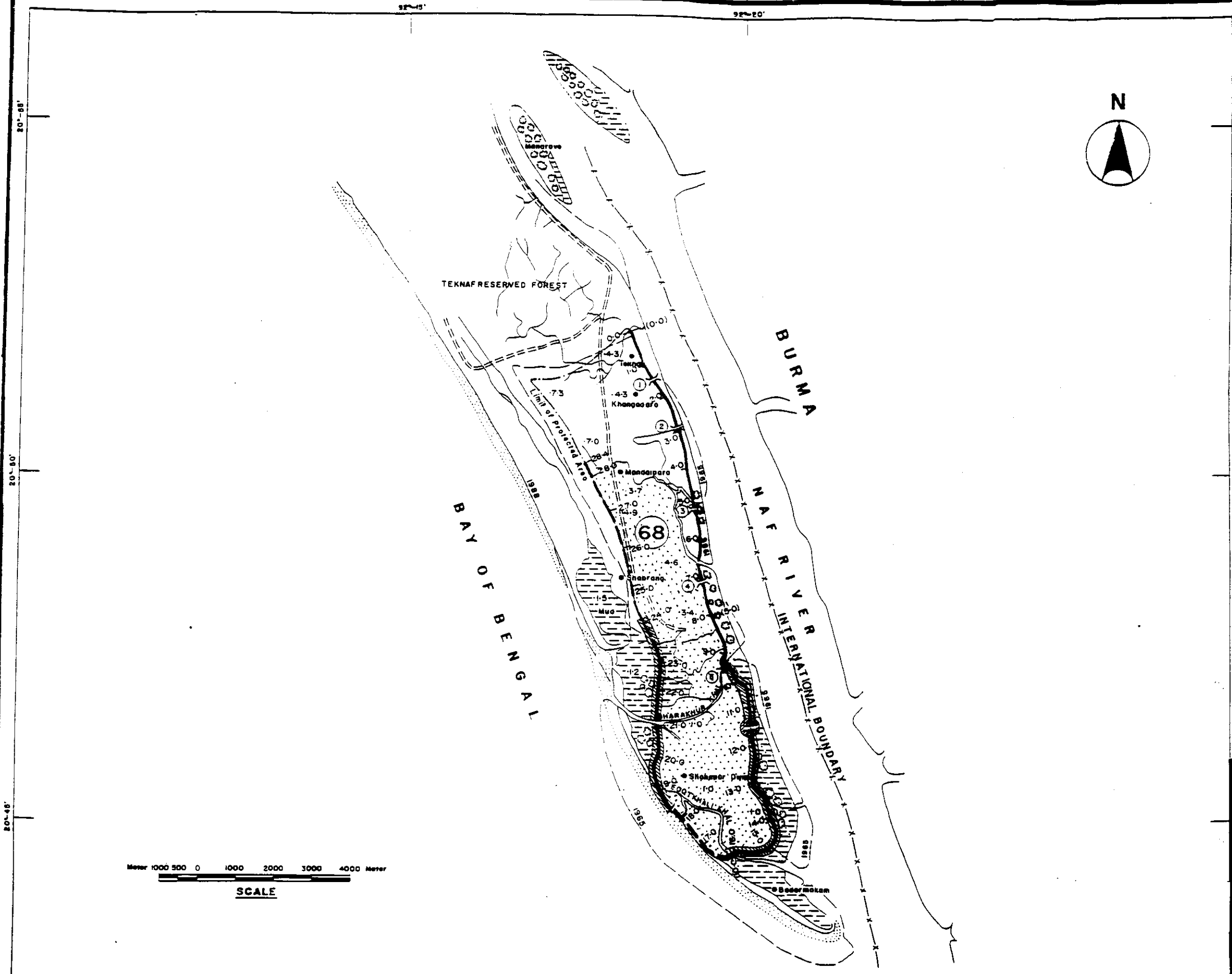
Embankment chainage 16.4 - 18.7 km and 23.8 to 28.4 km:
Constructing new embankment to retire and to protect new land of acretion respectively providing flatter and well compacted sea side slope with durba grass turfing.

Construction of a new sluice at 12.2 km.

Mangrove afforestation on foreshore of the Bay of Bengal and borrow pits.

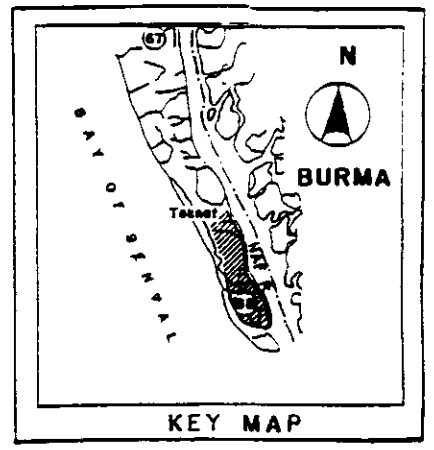
Babla, Shil Koroi, Rain tree plantation on embankment slopes.

POLDER NO. 68



LEGEND

- River & Khal
- Roads
- Shore Line 1965
- Shore Line 19
- Limit of Protected Area
- Spot Heights in Metre (PWD) 3·4
- Embankments Ch. Km. 8·0/Mile(5·0) (5·0)
- New/Retired Embankment
- Resectioning Embankment
- Protective Works
- Original CEP Embankment
- Porcupine
- Existing Sluice DS SS
- Proposed Sluice DS SS
- Sluice to be Repaired DS SS
- Net Protected Area



PEOPLE'S REPUBLIC OF BANGLADESH
MINISTRY OF IRRIGATION, WATER DEVELOPMENT AND FLOOD CONTROL
BANGLADESH WATER DEVELOPMENT BOARD

CYCLONE PROTECTION PROJECT II

MID TERM PROGRAMME-PHASE 2 PROPOSED WORKS			POLDER 68
Design:	Recomm.	Appr.:	DATE:01-02-92

KAMPSAX INTERNATIONAL A/S, BCEOM and DANISH HYDRAULIC INSTITUTE in association with DEVELOPMENT DESIGN CONSULTANTS LTD.
23, New Eskaton Road, Dhaka-1000, Tel. 405477, Fax 880 02 832951

SCALE : 1:100 000

DRAWING NO. :

Polder no. 69

Project Type:	Flood Control, Drainage and salinity exclusion (FCD).
Location:	District: Cox's Bazar Upazila: Moheshkhali O&M division: Cox's Bazar Circle: Chittagong
Status:	Polder not complete.
Area(ha):	Gross protected 2,850 Net cultivable 1,940 Net benefitted 1,400
Land elevation:	1.0-1.2 m PWD.
Tidal range (m PWD):	Shaflapur Gauge Station: Return Period 2.33 Year 20 Year HWL 3.704 4.616 LWL (-)1.451 (-)2.216
Land usage:	Paddy cropping, salt production and (minor) shrimp cultivation.
Embankment length and type:	10.5 km sea and 2.4 km Interior Crest level 5.5 m of sea & 4.9 m of interior embankment.
Constructed:	1965-70 under CEP. phase I.
Major Cyclone Damage:	By 1963, 1965, 1970 and 1991.
Major Flood Damages:	None.
Repair/rehabilitation:	Emergency repair by FFW since 1975, IDA funded FDR since 1986 & ECRR in 1991.
O & M:	Practically no routine or periodic maintenance have been carried out since construction of the embankment.
Remarks:	In 1988, it was planned to incorporate west and North-West part of the island under the project by 19 km of embankment, but only 6 km of embankment was constructed.

Damaged embankments and embankments exposed to damage.

The embankment chainage 0 to 12.9 km along 4 km wide Moheskhali channel is exposed to frequent wave attack causing severe erosion of the river side slopes.

Damages on structure.

All drainage sluices 1 through 4 have been damaged by the waves and cyclonic surges.

Afforestation.

Some well establish mangrove afforestation are present along some portion of embankment. Plants like Keya bushes found on slope of embankment.

Recommended remedial measures.

Embankment chainage 0 to 12.9 km:
Resectioning to provide higher crest level and flatter and well compacted channel side slope with durba grass turfing.

Reconstructing drainage sluice no 1, 2, 3, and 4 to provide higher crest level and flatter channel side slopes.

Mangrove afforestation on foreshore area in between the existing groups of afforestation, and in borrow pits.

Babla tree plantation on embankment slopes.

Polder no. 70

Project Type:	Flood Control, Drainage and salinity exclusion (FCD).
Location:	District: Cox's Bazar Upazila: Moheskhali O&M division: Cox's Bazar Circle: Chittagong
Status:	Polder not complete
Area(ha):	Gross protected 2,900 Net cultivable 1940 Net benefitted 650 (agricultural)
Land elevation:	1.2 - 1.8 m PWD
Tidal range (m PWD):	Lemsikhali Gauge Station Kutubdia Channel Return Period 2.33 Year 20 Year HWL 3.802 4.780 LWL (-)1.285 (-)2.260
Land usage:	Salt production, Shrimp culture and paddy cropping.
Embankment length and type:	16.5 km Sea and rest 17.5 km Interior Crest level 4.0 m along Kutubdia and Moheskhali Channels.
Constructed:	June, 1966 under CEP Phase-I.
Major Cyclone Damage:	1965,1970 and 1991 cyclonic surge.
Major Flood Damages:	None.
Repair/rehabilitation :	Emergency repair by FFW since 1975, cyclone damage repairing (CDR) and IDA Founded FDR since 1986.
O & M:	Practically no routine or periodic maintenance have been carried out since the construction of the embankment.
Remarks:	Polder is more suitable for salt production and shrimp culture.

Damaged Embankments and Embankments Exposed to Damage.

The embankment chainage 0 - 16.5 km along Kutubdia channel and 16.5 to 34 km along Moheskhali channel is exposed to wave attack causing extensive erosion of the channel side slopes.

Damages on Structure.

None.

Afforestation.

There is a few patches of mangrove afforestation on some part of the foreland of Moheskhali channel and some plantation on embankment slopes in the reach 6.5 to 8.5 km.

Recommended remedial Measures.

Embankment chainage 0 to 16.5 km:
Resectioning to provide higher crest level 6.3 m and 5.7 m respectively and flatter and well compacted channel side slope 1:7 and 1:3 respectively with durba grass turfing.

Embankment Chainage 7.0 (cross wise) to 26.0 km:

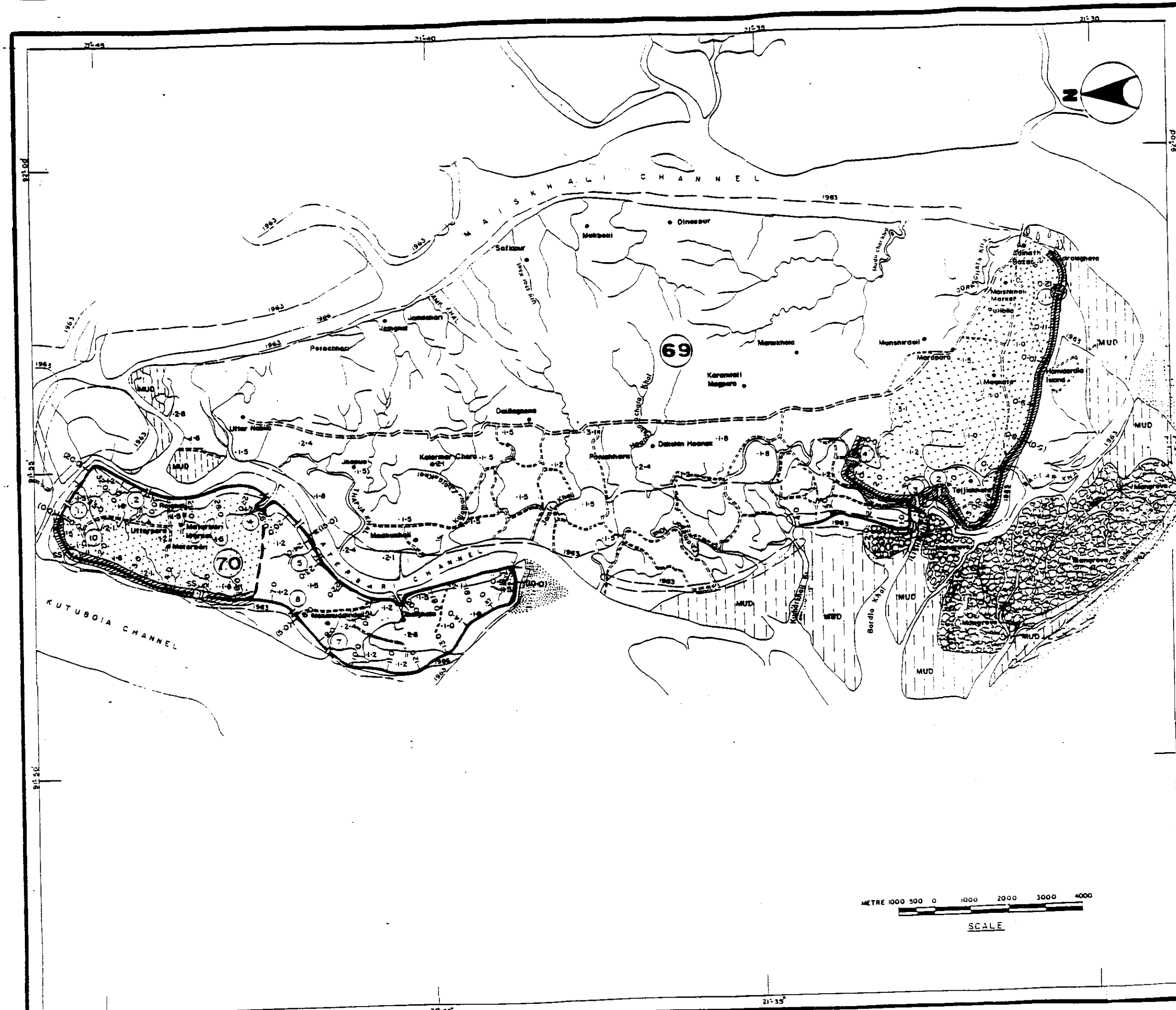
Constructing new embankment for making partition between paddy cropping area and Salt-Shrim cultivation area with side slop 1:3 in both sides of embankment with proper durba grass turfing.

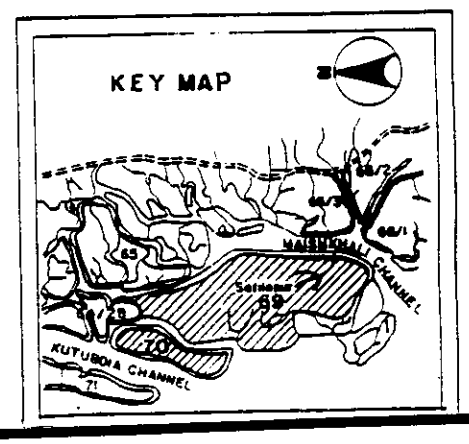
Mangrove afforestation on foreshore area and in borrow pits.

Babla tree plantation on embankment slopes.

POLDER NO. 69 & 70

98





LEGEND

- River & Khal
- Roads
- Shore Line 1965
- Shore Line 19
- Limit of Protected Area
- Spot Heights in Metre (P.W.D.)
- Embankments Ch. Km. 8-0/Mile(5-0)
- New / Retired Embankment
- Reasectioning Embankment
- Protective Works
- Original CEP Embankment
- Porcupine
- Existing Sluice (DS, SS)
- Proposed Sluice (DS, SS)
- Sluice to be Repaired (DS, SS)
- Net Protected Area

PEOPLE'S REPUBLIC OF BANGLADESH
MINISTRY OF IRRIGATION, WATER DEVELOPMENT AND FLOOD CONTROL
BANGLADESH WATER DEVELOPMENT BOARD

CYCLONE PROTECTION PROJECT II

MID TERM PROGRAMME-PHASE 1 & 2 PROPOSED WORKS			POLDER 69, 70
Design:	Recomm.	Appr.:	DATE:01-02-92
KAMPSAX INTERNATIONAL A/S, BCEOM and DANISH HYDRAULIC INSTITUTE in association with DEVELOPMENT DESIGN CONSULTANTS LTD. 23, New Eskaton Road, Dhaka-1000. Tel. 405477. Fax 880 02 832951			SCALE : 1:100 000
			DRAWING NO. :

Polder no. 71

Project Type:	Flood Control, Drainage and salinity exclusion (FCD).
Location:	District: Cox's Bazar Upazila: Kutubdia O&M division: Cox's Bazar Circle: Chittagong
Status:	Polder not complete.
Area(ha):	Gross protected 5,450 Net cultivable 3,540 Net benefitted 4,400
Land elevation:	3.5-4.0 m PWD.
Tidal range: (m PWD)	Lemsikhali Gauge Station: Return Period 2.33 Year 20 Year HWL 3.802 4.780 LWL (-)1.285 (-)2.260
Land usage:	Paddy cropping, salt production and (minor) shrimp cultivation.
Embankment length and type:	33 km sea and 217 km Interior Crest level 6.7 m of sea and 5.5 m of interior embankment.
Constructed:	1965-70 under CEP phase I.
Major Cyclone Damage:	By 1960, 1965, 1970 and 1991.
Major Flood Damages:	None.
Repair/rehabilitation:	Emergency repair by FFW since 1975, IDA funded FDR since 1986 & ECRR in 1991.
O & M:	Practically no routine or periodic maintenance have been carried out since construction of the embankment.
Remarks:	The southern narrow strip of salt producing area is uneconomic to strengthen against cyclonic surges for the long 12.5 km (from chainage 28.5 to 41 km) embankment.

Damaged embankments and embankments exposed to damage.

The embankment chainage 0 to 11.7 km and 41 to 50 km along Kutubdia channel and chainage 11.7 to 27.8 km along the Bay of Bengal is exposed to frequent and direct wave attack causing extensive erosion of the channel and sea side slopes.

Damages on structure.

Four drainage sluice and four surface sluices along Kutubdia channel have been damage severely.

Afforestation.

Some mangrove afforestation in the foreland and plantation on embankment along Kutubdia channel but no afforestation in the sea side foreshore except an attempt to grow casuarina afforestation in a small piece of land. A few and scattered plantation on embankment is present along sea side slope of embankment.

Recommended remedial measures.

Embankment chainage 0 to 11.7 km, 25.1 to 27.8 km & 41 to 50 km:

Resectioning to provide flatter and well compacted channel side slope with durba grass turfing.

Embankment chainage 11.7 to 25.1 km and 27.8 to 30.5 km:

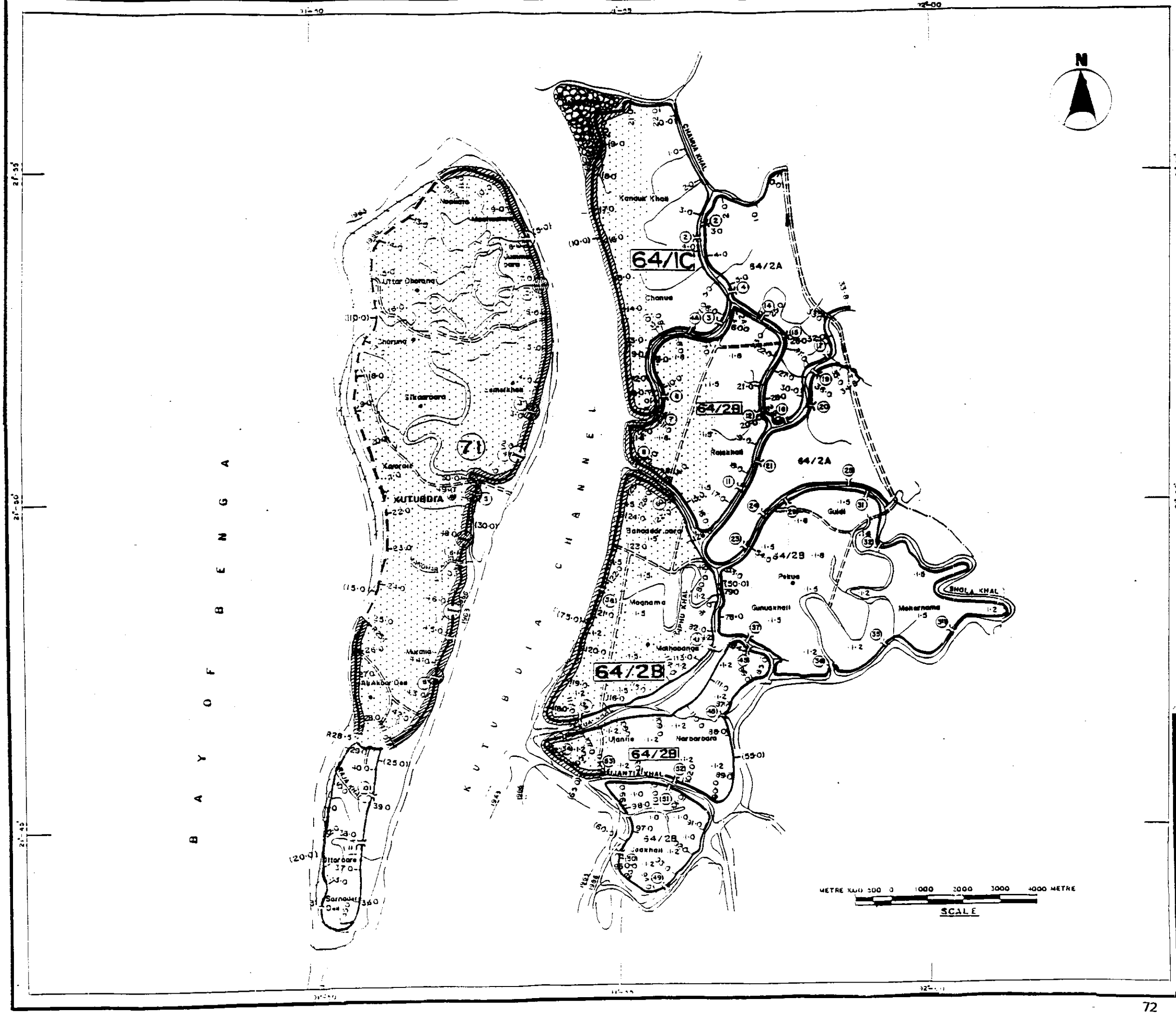
Providing 13.4 km retirement & 2.7 km new embankment respectively for sea side and cross connection of embankment between 27.8 and 41 km with flatter and well compacted slops and durba grass turfing.

Reconstructing drainage sluice no 1 and surface sluices nos. 4 &7, and reconstructing drainage sluices nos. 3,5 & 8 and surface sluices nos. 3 & 6 to provide well design with newly developed catchment area.

Mangrove and casuarina afforestation in the foreshore and borrow pits.

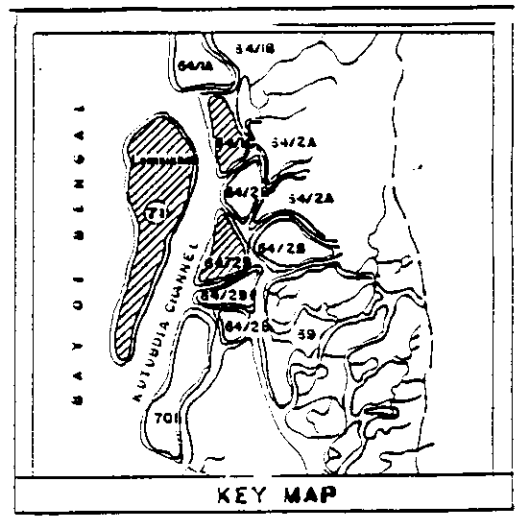
Babla tree plantation on embankment slopes.

POLDER NO. 64/2B, 64/1C & 71



LEGEND

- River & Khal
- Roads...
- Shore Line 1965
- Shore Line 19
- Limit of Protected Area
- Spot Heights in Metre (PWD)... 3·4
- Embankments Ch. Km. 8·0/ Mile(5·0) (5·0)
- New/Retired Embankment
- Reasectioning Embankment...
- Protective Works
- Original CEP Embankment
- Portuguese
- Existing Sluice DS SS
- Proposed Sluice DS SS
- Sluice to be Resetted... DS SS
- Net Protected Area



PEOPLE'S REPUBLIC OF BANGLADESH
MINISTRY OF IRRIGATION, WATER DEVELOPMENT AND FLOOD CONTROL
BANGLADESH WATER DEVELOPMENT BOARD

CYCLONE PROTECTION PROJECT II

MID TERM PROGRAMME-PHASE 1 PROPOSED WORKS			POLDER 71 64/2B, 64/1C
Design:	Recomm.	Appr.:	DATE:01-02-92
KAMPSAX INTERNATIONAL A/S, BCEOM and DANISH HYDRAULIC INSTITUTE in association with DEVELOPMENT DESIGN CONSULTANTS LTD. 23, New Eskaton Road, Dhaka-1000. Tel 405477, Fax 880 02 832951			SCALE : 1:100 000
			DRAWING NO. :

Polder no. 72

Project Type:	Flood Control, Drainage and salinity exclusion (FCD).
Location:	District: Chittagong Upazila: Sandwip O&M division: Chittagong II Circle: Chittagong
Status:	Polder not complete.
Area(ha):	Gross protected 18,700 Net cultivable 15,700 Net benefitted 14,600
Land elevation:	3.1-3.7 m PWD.
Tidal range (m PWD):	Sandwip Gauge Station:

Return Period	2.33 Year	20 Year
HWL	4.514	6.143
LWL	(-)1.777	(-)4.020

Land usage:	Paddy cropping & winter cropping.
Embankment length and type:	60.2 km sea Crest level 6.7 m along sea.
Constructed :	Started in 1965-70 under CEP phase I and completed in 1988-89 under Early Implementation Project by Dutch grant starting in 1979-80.
Major Cyclone Damage:	By 1960, 1965, 1970 and 1991.
Major Flood Damages:	None.
Repair/rehabili-tation:	Emergency repair by FFW since 1975, IDA funded FDR since 1986 & ECRR in 1991.
O & M:	Practically no routine or periodic maintenance have been carried out since construction of the embankment.
Remarks :	The Sandwip town is under the threat of river erosion and needs care for protection.

Damaged embankments and embankments exposed to damage.

The embankment chainage 21.5 to 46.5 km along Sandwip channel, chainage 46.5 to 60.5 km along Hatia and chainage 0 to 21.5 km along the Bay of Bengal are exposed to the direct wave action in association with some river erosion causing severe erosion of the channel, river and sea side slopes.

Damages on structure.

By the waves and cyclonic surges almost all the drainage and surface sluices have been severely damaged.

Afforestation.

There is no foreshore afforestation in this island. There exists damaged babla free plantation on short length of embankment from chainage 28 to 32 km and from 35 to 40 km.

Recommended remedial measures.

Embankment chainage 3 to 8.5 km, 21.3 to 51 km, 52.5 to 57.5 km and 59.5 to 60.2 km:

Resectioning to provide flatter and will Compacted Channel Side Slope with durba grass turfung.

Embankment Chainage 0 to 3 km, 8.5 to 21.3 km, 51 to 52.5 km and 57.5 to 59.5 km:

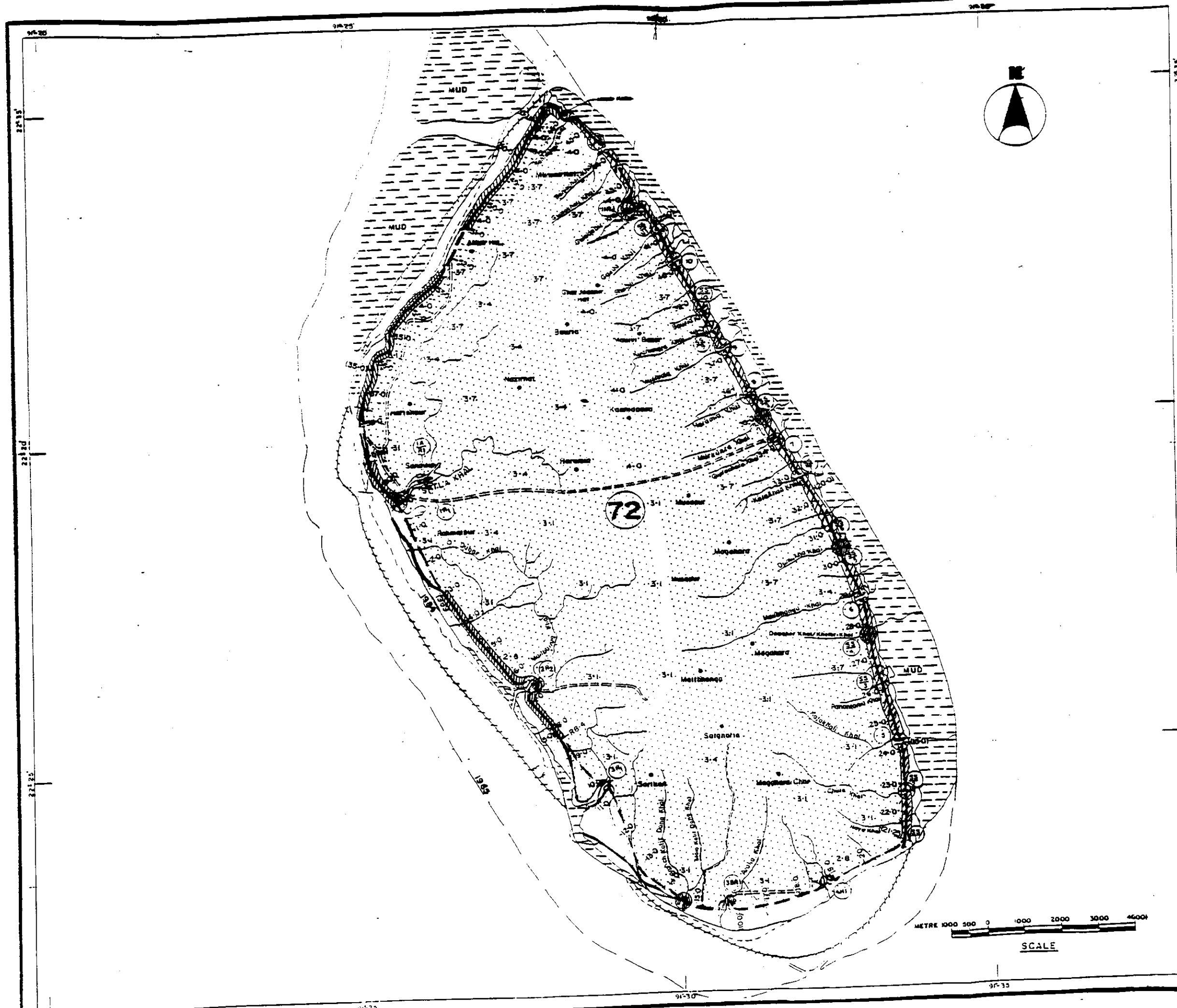
Providing retirement embankment with higher crest level and flatter and well compacted sea and river side slope with durba grass turfing.

Repairing 10 drainage sluice and 8 surface sluices and constructing one new drainage sluice and 5 surface sluices for proper and efficient drainage of water.

Mangrove afforestation on the foreshore area and in borrow pits.

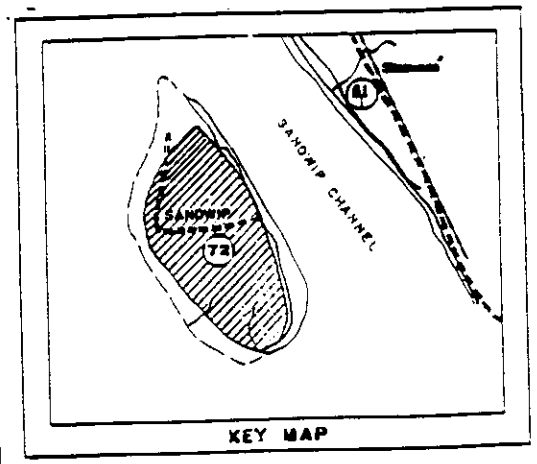
Babla tree plantation on embankment slopes.

POLDER NO. 72



LEGEND

- River & Khal
- Roads...
- Shore Line 1985 ..
- Shore Line 19
- Limit of Protected Area ..
- Spot Heights in Metre (PWD)..
- Embankments Ch. Km. 8-0/ Mile(5-0)
- New / Retired Embankment
- Resectioning Embankment ..
- Protective Works ..
- Original CEP Embankment
- Peresioma ..
- Existing Sluice ..
- Proposed Sluice ..
- Sluices to be Repaired ...
- Net Protected Area ...



KEY MAP

PEOPLE'S REPUBLIC OF BANGLADESH
MINISTRY OF IRRIGATION, WATER DEVELOPMENT AND FLOOD CONTROL
BANGLADESH WATER DEVELOPMENT BOARD

CYCLONE PROTECTION PROJECT II

MID TERM PROGRAMME-PHASE 1 & 2 PROPOSED WORKS	POLDER 72
Design: Recomm. Appr.:	DATE:01-02-92
	SCALE : 1:100 000
	DRAWING NO. :

KAMPSAX INTERNATIONAL A/S, BCEOM and DANISH HYDRAULIC INSTITUTE in association with DEVELOPMENT DESIGN CONSULTANTS LTD.
23, New Eskaton Road, Dhaka-1000, Tel. 405477, Fax 880 02 832951

Polder no. 73/1B

Project Type:	Flood Control, Drainage and salinity exclusion (FCD).
Location:	District: Noakhali Upazila: Hatia O&M division: Noakhali Circle: Muhuri
Status:	Polder not complete
Area(ha):	Gross protected 10,200 Net cultivable 8,160 Net benefitted 7,900
Land elevation:	3.1-4.0 m PWD
Tidal range (m PWD):	Hatia Gauge Station:

Return Period	2.33 Year	20 Year
HWL	4.262	5.182
LWL	(-)0.976	(-)2.296

Land usage:	Paddy cropping and winter cropping
Embankment length and type:	18.4 km sea and 16.7 km Marginal Crest level 6.2 m along Hatia river 5.5 m along Changar Dona Khal.
Constructed:	1965-70 under CEP phase I
Major Cyclone Damage:	By 1961, 1970, 1985 & 1991
Major Flood Damages:	None
Repair/rehabilitation:	Food for work (FFW) since 1975 and Flood Damage Rehabilitation since 1986.
O & M:	Practically no routine or periodic maintenance have been carried out since construction of the embankment.
Remarks:	North & Western coast is severely eroded by the current of Shahbajpur river.

Damaged embankments and embankments exposed to damage.

The embankment chainage 51.5 to 56.5 km along Hatia river is exposed to severe attack of waves. Chainage 74 to 84 km in the west coast is severely eroded by Shahbajpur river and is not economically feasible to protect the bank of river or to train the river course.

Damages on structure.

None

Afforestation.

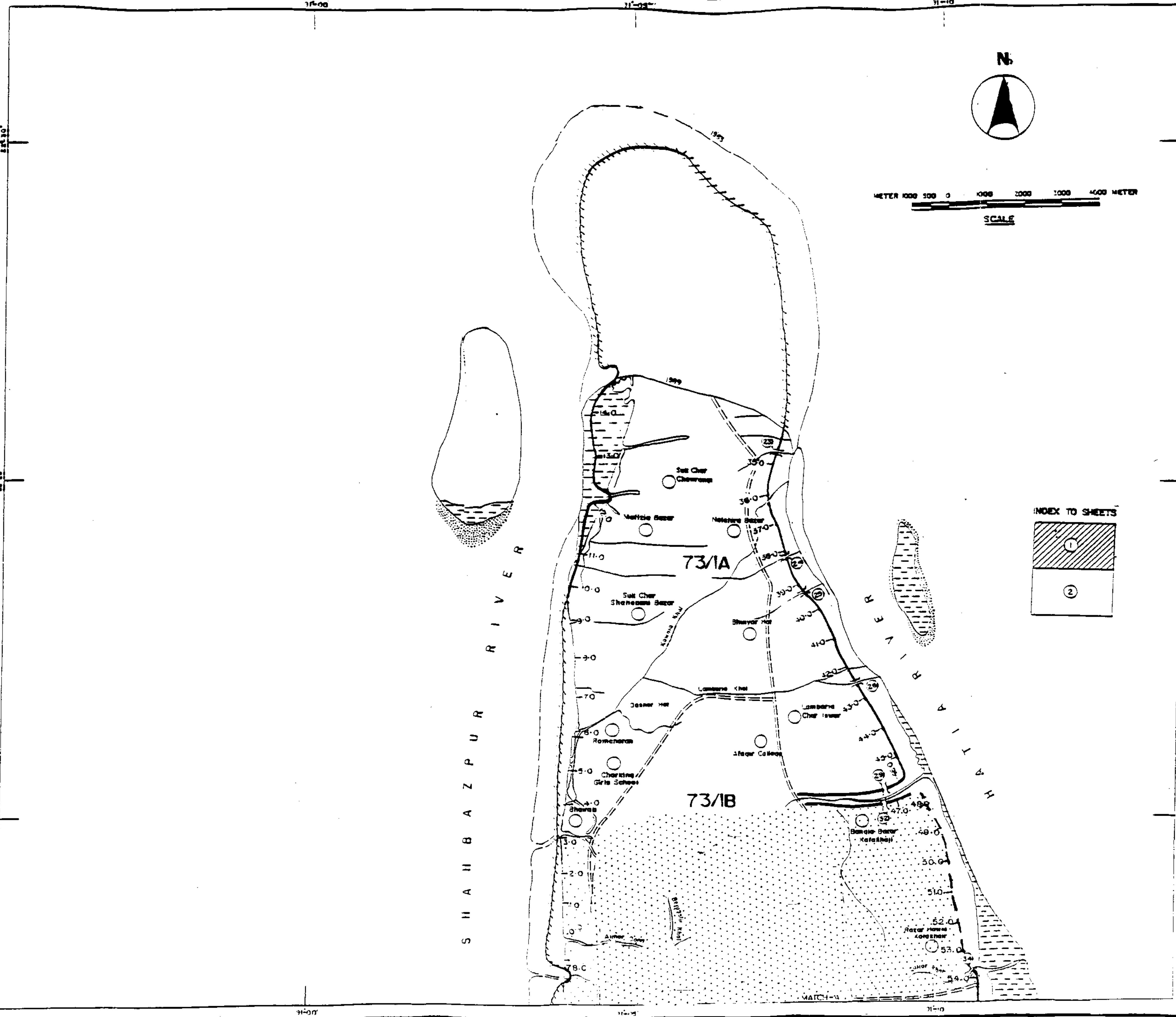
Good mangrove afforestation of ½ to 1 Km wide is established in the nearly acreted foreland. A few plantation is found on the embankment slope.

Recommended remedial measures.

Embankment chainage 51.5 to 56.5 km:
Retirement to provide protection against waves by flatter and well compacted slope with durba grass turfing.

Mangrove afforestation on foreshore area and in borrow pits.

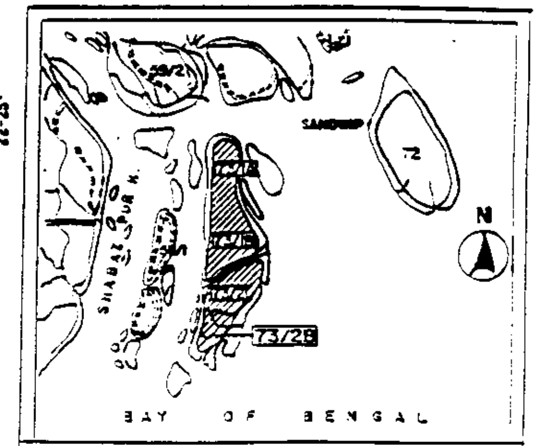
Babla tree plantation on embankment slopes.



POLDER NO. 73/1A, 1B
(SHEET 1 OF 2)

LEGEND

- River & Khal
- Roads
- Shore Line 1965
- Shore Line 19
- Limit of Protected Area
- Spot Heights in Metre (PWD)
- Embankments Ch. Km. 8-0/Mile(5-0)
- New/Retired Embankment
- Resectioning Embankment
- Protective Works
- Original CEP Embankment
- Porcupine
- Existing Sluice DS SS
- Proposed Sluice DS SS
- Sluice to be Repaired DS SS
- Not Protected Area



KEY MAP

PEOPLE'S REPUBLIC OF BANGLADESH MINISTRY OF IRRIGATION, WATER DEVELOPMENT AND FLOOD CONTROL BANGLADESH WATER DEVELOPMENT BOARD	
CYCLONE PROTECTION PROJECT II	
MID TERM PROGRAMME-PHASE 2 PROPOSED WORKS	POLDER 73/1A, 73/1B
Design: | Recomm. | Appr.:	DATE:01-02-92
KAMPSAX INTERNATIONAL A/S, BCEOM and DANISH HYDRAULIC INSTITUTE in association with DEVELOPMENT DESIGN CONSULTANTS LTD. 23, New Eskaton Road, Dhaka-1000, Tel. 405477, Fax 880 02 832951	SCALE : 1:100 000 DRAWING NO. :

POLDER NO. 73/1A, 1B
(SHEET 2 OF 2)

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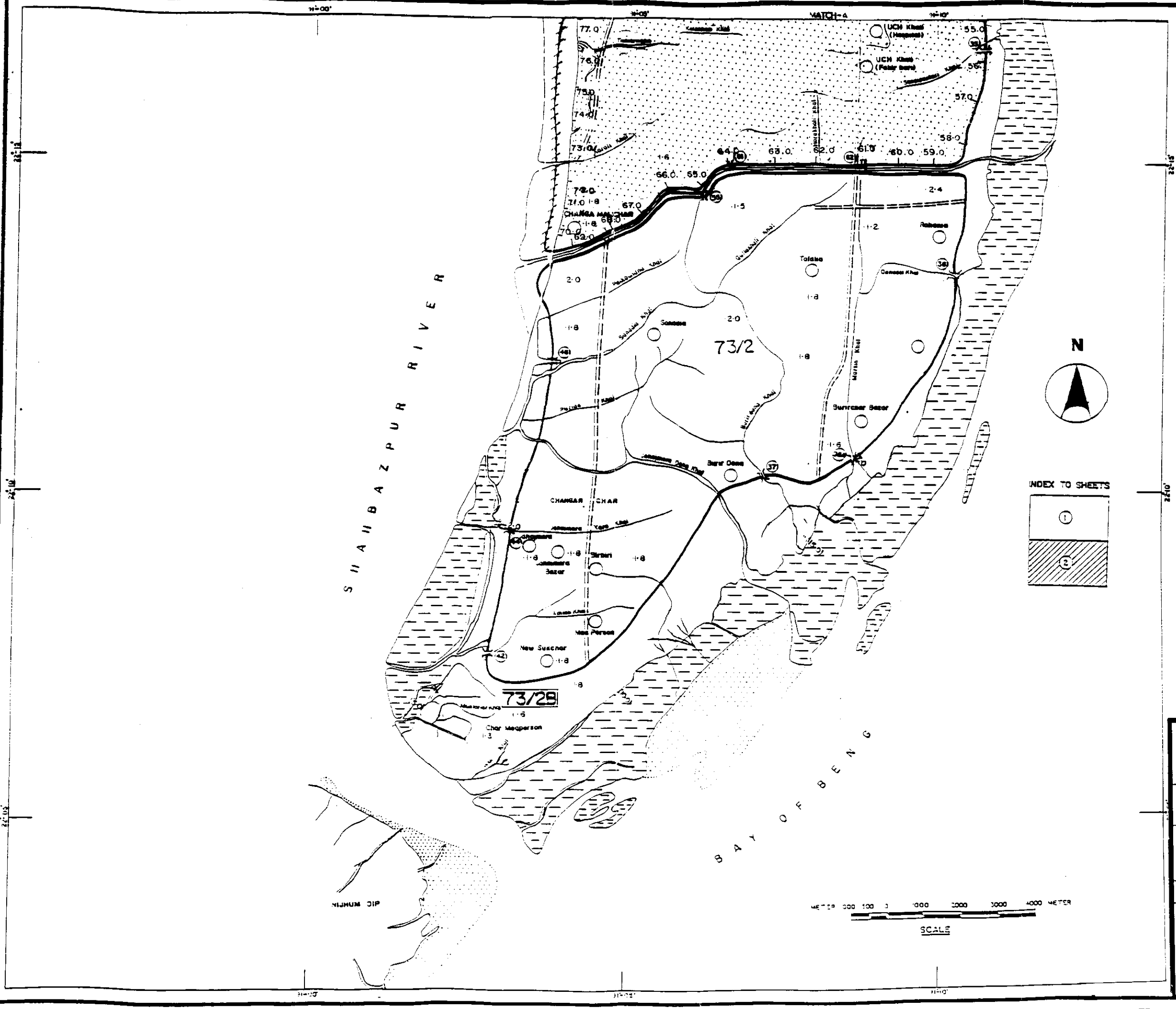

LEGEND & KEY MAP REFER TO SHEET NO. 1

PEOPLE'S REPUBLIC OF BANGLADESH
MINISTRY OF IRRIGATION, WATER DEVELOPMENT AND FLOOD CONTROL
BANGLADESH WATER DEVELOPMENT BOARD

CYCLONE PROTECTION PROJECT II

MID TERM PROGRAMME-PHASE 2 PROPOSED WORKS			POLDER 73/1A, 73/1B
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