GOVERNMENT OF BALOCHISTAN

BALOCHISTAN COMMUNITY IRRIGATION AND AGRICULTURE PROJECT

FARMERS' SCHEME OPERATION AND MAINTENANCE MANUAL

Marufzai Flood Irrigation Scheme

HALCROW - EUROCONSULT
NESPAK - TECHNO CONSULT
Technical Assistance Team
PO Box 255, Quetta, Balochistan

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OPERATION AND MAINTENANCE MANUAL

Scheme Name:	Marufzai Flood Irrigation Scheme
Status of Plan:	Draft by MMU
Date of revision:	18 May 2001

1. Operation & Maintenance Arrangements

Flood water is only used in Kharif (June to September) when floods are frequent. Night irrigation is not practised by the community. The flood channel is cleaned and maintained annually in March, by a team of farmers from all *wush* working as skilled and unskilled labourers. If a need arises to clean the flood channel more than once, appropriate arrangements will be made. The Chairman/ Malik mainly organises labour (from the community) for operation and maintenance of the flood channel and other infrastructure.

For future O&M of the scheme, selected persons of the community will be trained in scheme maintenance techniques by a Community Maintenance Engineer from the Project. The labour and cash required for O&M of the scheme will be arranged by the Chairman/Malik from all thirteen "*wush*".

Since cash was not involved in the old system, the community has developed a new mechanism of cash collection for operation and maintenance of the scheme. Each "*wush*" will provide four bags of 100-kg wheat to the FO Chairman of which 52 will be sold. The funds generated will be utilised for O&M. If further cash is required, it will be obtained through leasing of communal grazing land.

For operating the sluice gate, each "*wush*" will provide a person for ten days thus covering 130 days. As the gate operator is only required for four months(120 days), nominees of the last "*wush*" will identify and select an operator to clean and maintain the sluice gate on a monthly basis. The operator will not be paid for his services but in compensation will be exempted from manual labour during desilting and cleaning of infrastructure. However, other farmers in his "*wush*" will have to participate in this activity.

The FO has appointed one tractor driver who will operate and maintain the tractor, his salary (Rs 2,000 per month as agreed by the FO Committee) will be paid from the income generated by tractor use.

The community has deposited Rs 84,000 in the scheme's Works Account (No. 6301-4, National Bank of Pakistan, Dukki Branch) on 25th April 1998. This account is being converted to MFA.

The cash contribution for operation and maintenance will be contributed in proportion to land holdings of all 13 *wush*. In each of these, several families are combined customarily however. the names of farmers who hold each *wush* are as below;

1.	Malik Taj Mohd	(2 *wush*)	7.	Laloon	(1 *wush*)
2.	Haider Khan	(2 *wush*)	8.	Ezat Noor	(1 *wush*)
3.	Gula Jan	(1*wush*)	9.	Pista Khan	(1 *wush*)
4	Fateh Khan	(1 *wush*)	10.	Niazoon	(1 *wush*)
5.	Yasin	(1 *wush*)	11.	Khanan	(1 *wush*)
6.	Mian Khan	(1 *wush*)			

2. Salient Features of Scheme and Construction Costs and Maintenance Requirements (See Appendix A)

3. Scheme Operation and Maintenance Requirements and Resources Needed

Scheme operation and maintenance will be carried out as and when the need arises. Guidelines for the most important components are given below;

3.1 Weir

The crest of the weir may start wearing out after a few years if constantly hit by high floods carrying large boulders. Major damages may occur to the downstream stone armouring and tipped rock protection. Concrete surfaces will also need repairs including filling and repair of worn out sections. These will be carried out with rich cement mortar of 1:3 ratio. Unskilled labour for such works will be provided by the community (from all *wush)* and skilled labour by those farmers previously trained by the Project in maintenance techniques.

With time, high floods will deposit silt upstream of the weir which will require desilting using the tractor provided by the Project.

3.2 Sluice Channel

With time the sluice gate may rust. This will require removal using a scraper followed by a coating of anti-rust paint. Old grease will also need to be removed from moving parts with a cloth or rag followed by instant application of fresh grease. Nominees of the last "*wush*" will identify and detail an operator to clean and maintain the sluice gate once in a month throughout the year. The required paint, grease or oil will be purchased from MFA. Cracks in concrete that may develop on the upstream face of the sluice gate pillars, will be filled with rich cement mortar of 1:3 ratio. Since the sluice channel may also silt up, each "*wush*" will contribute labour for desilting. For operation of the sluice gate, each "*wush*" will provide a person for ten days which will cover 130 days period (10 days in excess of the flood season).

3.3 Marginal bunds

Major damages may occur to gabion mattresses due to impact of boulders carried by high floods.

The stone pitching may also get disturbed after a few high floods, stones will need to be removed and firmly placed back in position.

The gabions may get disturbed either due to unforeseen cutting of wires or otherwise may wear out in a due course of time (say 10 to 15 years). Loose gabion baskets should be emptied and reshaped, filled with stones and firmly re-tightened. To do this, the following stages are recommended;

- In case of broken wires, old baskets should be reopened and stones, tying wire and partitions(diaphragms) removed. Broken wires will also have to be removed and new wires knitted, overlapping the old gabion.
- After ensuring the sides of baskets are erect, the box is re-partitioned by placing diaphragms at three feet intervals. Large boulders are selected for filling partitions.
- Filling of the next partitioned portion will start once the preceding portion has been filled up to a foot height. At subsequent intervals of one foot height and width, cross tying

wires shall be provided that need to be stretched after the basket has been entirely filled.

- The basket has to be filled up to additional two inches height since with time, stones will settle. Lids will be provided and stretched tightly as well as all cross tying wires.

Material needed for these works, particularly gabion wire, will be purchased from the MFA. Farmers previously trained by the Project in maintenance techniques will be selected as skilled labour. Since flood water runs parallel to the bunds, face wearing of the structure may be assumed as negligible.

3.4 Flood Channel

The community has decided to clean and maintain the flood channel annually in March. Until the channel is in regime, scouring and deposition of the bed may take place which will require the necessary remedial works. With time, lateral erosion may also occur which will be rectified by strengthening the embankments rather than trying to reinstate the eroded sections.

Vegetation growth in the channel bed and on side slopes will require removal as a part of annual maintenance.

The tractor can be used for collecting soil from borrow pits which will be piled at the sides and bottom of the flood channel, followed by manual compaction.

3.5 Gabion Spillway

With time, the concrete skin may wear out due to impact of boulders in high floods. This can be repaired with Class-B concrete, 1:2:4 ratio. Skilled labour will be provided by those previously trained by the Project in maintenance techniques.

4. Duties & Responsibilities

4.1 Gate Operator

The community has nominated **Guley** alias **Mohammad Khan**, son of Sher Mohammd from Niazoon "*wush*" as the gate keeper. His duties and responsibilities are as follows;

- Manually operated vertical lift gates are provided to the scour sluice at Marufzai. If the gates are not opened during floods, debris and sediment will accumulate in the pocket upstream of the gate and coarse sediment will enter and cause sedimentation of the flood channel.

- If the gates are opened, then the scour sluice will function, returning debris and sediment to the river. In general, the scour sluice gate should be opened as the flood level reaches the crest level of the main weir, and should be closed as the flood level declines below the main weir crest level.

- The sluice gate should also be opened to allow flood water to pass through the sluice gate when irrigation water is not required, especially at night. However, he must close the gate when required to do so.

- He must ensure that the gates are operational and can be lifted easily during the flood.

- He must report the condition of the headworks after recession of the flood, to the FO Chairman.
- He must accompany FO members whenever the operational status of the headworks is being examined and note down the immediate maintenance requirements
- He must assist the FO, or preferably carry out himself, oiling and lubrication of moving parts of the gates.

4.2 Tractor Driver

- He must regularly maintain the tractor as per guidelines provided to him.
- He would need to maintain a diary in which the tractor's running hours are to be regularly endorsed. When hired out to any work or person of the community, these hours shall also be noted in the same diary and conveyed regularly to the FO Chairman.
- If any fault arises in the tractor, he shall immediately report the matter to the FO Chairman for rectification.
- He will not utilise the tractor for any work without the consent of the FO Chairman.
- While away from duty for more than a day, he shall deposit the keys of the tractor with the FO Chairman

Annual Replacement and Maintenance Costs for Marufzai FIS

Annexture 'A'

Scheme Component	Description	Construction Cost (Rs)	Serviceability (years)	Annual Replacement Cost (Rs)	Components to be Maintained	Annual Maintenance Estimate (%)	Quantity to be Maintained	Units	Annual Repair Quantity	Unit Rate (Rs/unit)	Annual Repair Cost (Rs)
Weir	150 ft wide concrete weir with stone armouring and tipped rock	[illegible]	30	[illegible]	a) Stone armouring b) Tipped rock	2 10	12,600 10,190	sft sft	252 1,019	55 [illegible]	13,860 [illegible]
Sluice Gate	Steel gate	100,000	30	3,333	Movable steel parts					lumpsum	1,000
Right Marginal Bund	885 ft long earthen bund with a 50 ft gabion mattress apron and a sloping pitched stone protection	554,650	10	55,465	a) Gabion	6	1,332	sft	80	35	2,797
Flood Channel											
a *Earthen Channel*	13591 ft long earthen trapezoidal channel with bed width of 22 ft and 16 ft and design discharge of 350 cusecs and 175 cusecs for the main and branch channels respectively, with a 250 ft long silt settling basin	4,174,950	10	417,495	Earthwork	10	820,000	cft	82,000	1.5	123,000
Box Culverts	RCC Cross Drainage Structures on the flood channel, with gabion matresses and stone pitching protections	1,257,645	30	41,922	Wearing of the concrete surface of the components b, c, d and e	10 % of the annual maintenance cost of the earthen channel					12,300
c *Flow Inlet Structures and a Flow Division Structure at Tail*	Earthen flow inlet and division strucutres with some pitched rock protection	153,645	30	[illegible]							
d *Outlet Structures*	Concrete and stone masonry outlets with some pitched rock protection	574,303	30	19,143							
e *Drop Structures and a Flow Division Structure at RD 7054*	Concrete and stone masonry strucutres with some pitched rock protection	3,840,245	30	128,008							
Spillway	Concrete skin gabion spillway, 1625 ft wide, with an RCC wall and left marginal bund of gabion matresses pitched rock protection, designed for a maximum flood discharge of 30,000 cusecs	7,449,048	20	372,452	a) Concrete skin b) Tipped rock	3 10	25,840 12,500	sft sft	775 1,250	24 15	18,605 18,750
											166,847
Totals:		31,678,530		1,495,332							

Signatures/Thumb Impressions of the FO Committee Members

Chairman: MALIK TAJ MOHAMMAD ملک تاج محمد

Vice Chairman: NAZAR MOHAMMAD نظر محمد

Secretary: RAMZAN رمضان

Treasurer: KHAN MOHAMMAD خان

Members: NIAZ MOHAMMAD نیاز محمد

طالب محمد

محمد خان عرف کالے (Gate operator)
Molammad khan

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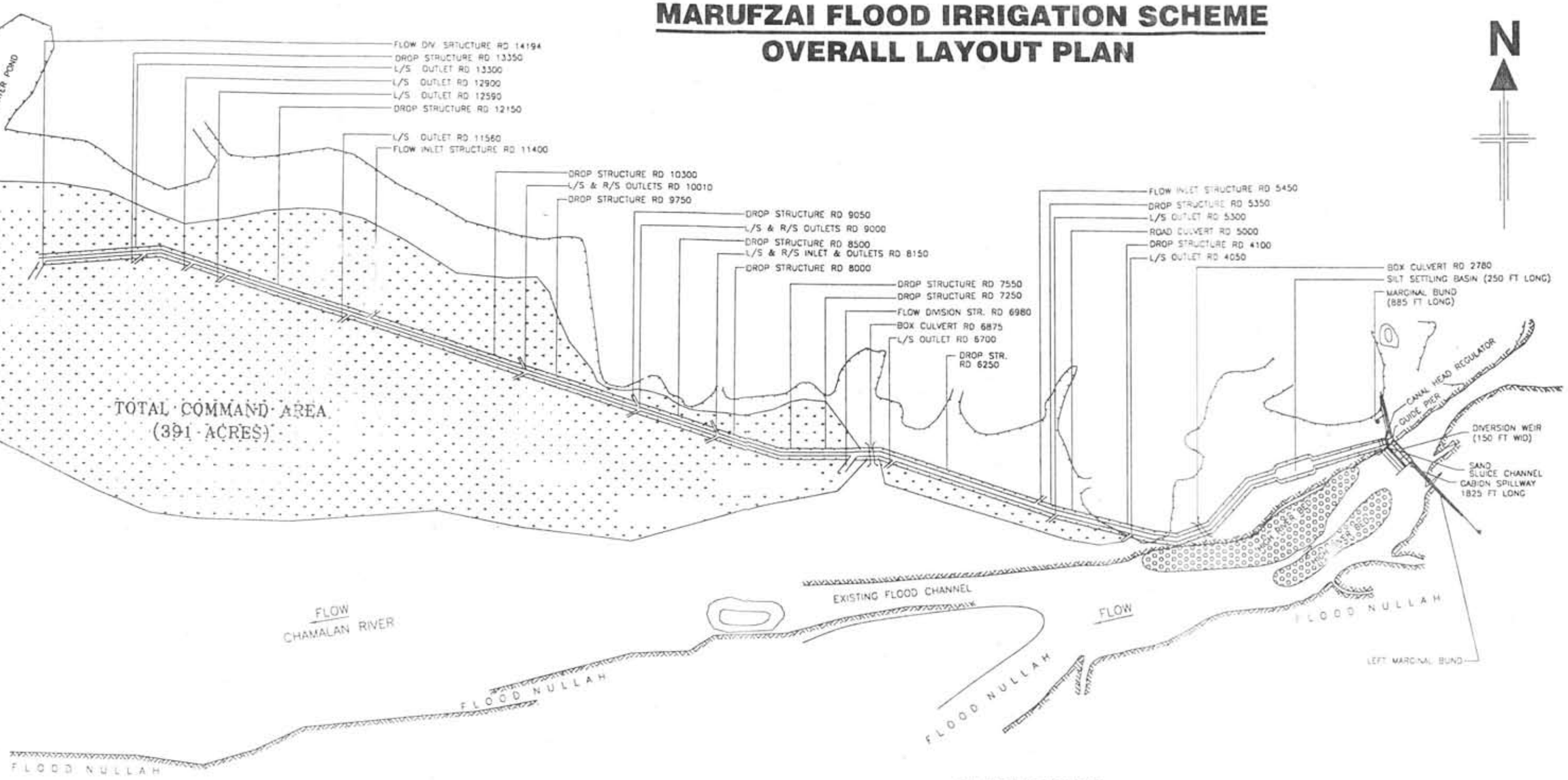
MARUFZAI FLOOD IRRIGATION SCHEME
OVERALL LAYOUT PLAN



SCHEME'S COMPONENTS

SCHEME'S COMPONENTS	MAIN CONTRACT	FO CONTRACT	TOTAL
DIVERSION WEIR	150 FT	–	150 FT
MARGINAL BUND	885 FT	–	885 FT
GABION SPILLWAY	1825 FT	–	1825 FT
FLOOD CHANNEL	12141 FT	1450 FT	13591 FT
SILT SETTLING BASIN	–	250 FT	250 FT
BOX CULVERTS	2 NOS	–	2 NOS
ROAD CULVERT	1 NO	–	1 NO
FLOW DIVISION STRUCTURES	2 NOS	–	2 NOS
FLOW INLET STRUCTURES	2 NOS	–	2 NOS
L/S & R/S OUTLETS	10 NOS	–	10 NOS
DROP STRUCTURES	12 NOS	–	12 NOS
TAIL STRUCTURE	1 NO	–	1 NO

SALIENT FEATURES

			TOTAL COST
ESTIMATED COST			31,678,530
LOCATION:	140 KM SOUTH EAST OF LORALAI TOWN		
SOURCE	SURFACE FLOW OF CHAMALAN RIVER		
STARTING DATE OF MAIN CONTRACT			30 OCT 1998
EXPECTED DATE OF COMPLETION			02 MAY 1999
MAX. FLOOD DISCHARGE OF RIVER (50 YEARS RETURN PERIOD)			30,000 CUSECS
DISCHARGE OF FLOOD CHANNEL			350 CUSECS
DISCHARGE OF FLOOD CHANNEL D/S FLOW DISTRIBUTION STRUCTURE			175 CUSECS
EXISTING CROPPED AREA			229 ACRES
WITH PROJECT CROPPED AREA			391 ACRES
NO OF SHARE HOLDERS			39 PERSONS
NO OF BENEFICIARIES			458 PERSONS

MAR-FOJ/CD/SR/002.DWG