Research Paper Engineering

Reducing the Effect of Flood through River Training Work on Shedhi River at Khumarvada Village of Kheda District, Gujarat

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ABSTRACT

Floods are common and mostly natural disasters. When rivers overflow their banks they cause damage to lives, property, infrastructure and crops. Floods usually are local, short-lived events that can happen suddenly and sometimes with little or no warning.

The Aim of this paper is to reducing the flood effect through flood protection work at khumarvada village. khumarvada village is located on shedhi river bank in kheda. In the Shedhi River flood are occurred frequently and adverse effect of flood are bank erosion reduction in crops yield, loss of human life, level erosion.

The mechanism of River training work first the design flood Then selecting the river training structure and the design & analysis of river training structure and find the benefit cost ratio & find the which river training structure are economical and better flood protection by khumarvada village in kheda

Keywords : River training work ,prevention of bank erosion, flood protection work

I. Introduction

Floods are common and mostly natural disasters. When rivers overflow their banks they cause damage to lives, property, infrastructure and crops. Floods are common and mostly natural disasters. Floods usually are local, short-lived events that can happen suddenly and sometimes with little or no warning. .

- In order to minimize flood hazards, it is intended to distinguish between flood ways, defined as channels through which water passes at substantial depths or velocities, and bordering areas needed for structural controls, and flood plains where inundation may occur but where depth and velocities are generally low during floods.

- The Khumarvada village is situated on right bank of Shedhi River. The village was heavily affected during the flood in the year 2006 & 2007. The River flow is outflanking the banks and flooding the nearby agricultural land and damaging properties. Presently, right bank of Shedhi River is about 300m in length being eroded gradually due to migration of soil particles from the bank by strong current. The exact location of the Khumarvada flood protective scheme is at latitude 22o44'58"N and longitude 72o43'33" E (See Plate-I).

- In view of the site condition, there is a general demand from Honorable M.L.A (Matar) and local peoples to construct a flood protection wall to prevent further erosion of the right bank of Shedhi river and also to protect the valuable agricultural land on the bank.

NEED OF THE PRESENT STUDY

Khumarvada village is located on the Shedhi river bank in Kheda in the Shedhi river flood are occurred frequently and adverse effect of flood are

- bank erosion
- reduction in crops yield
- Loss of human life
- lend erosion
- Water supply affected due to flood
- The river flowing in alluvium plain during the heavy rain water generates floods and causes loss of the soil in the alluvium plain and silting of river beds. The Shedhi river banks are formed of alluvium strata, of alternative layer of sand and clay, or sand and silty sand, which are not able to resist the effects of waves and current forces of flood water, ultimately resulting in erosion of banks.
- The river has shown the tendency of meandering. The effect of meandering is mainly due to friable bank and heavy silt deposition in the river bed or convex bank.

OBJECTIVES OF THE STUDY

- Detailed survey, soil investigation and detailed study of the available data and findings; it is observed that Khumarvada village River training work is necessary to prevent further erosion of the right bank of Shedhi River.
- To protect The River flow is outflanking the banks and flooding the nearby agricultural land and damaging properties.

3 *STUDY AREA*

The map of kheda districts in Gujarat state is given in Fig.1.1

Fig. 1.1- Map of Gujarat State

- Study area has been limited to Villages of KHUMARVADA

on Shedhi River in kheda district saw in following map.

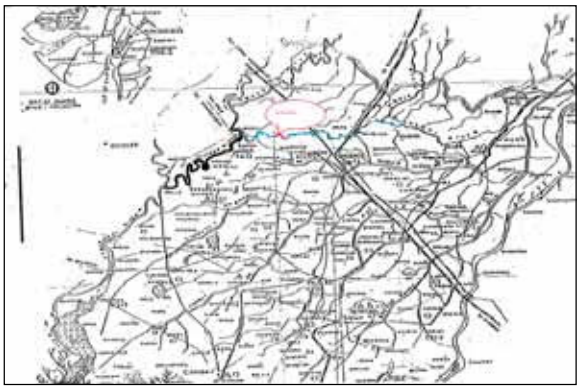

Fig. 1.2- Map of kheda Districta

FLOOD DATA IN SHEDHIRIVER COLLECTED BY WATER DATA CENTRE, GANDHINGAR		
Sr. No.	Year	discharge
		cumecs
1	2	3
1	1981	1167.74
2	1982	251.28
3	1983	1.07
4	1984	1214.45
5	1985	465.1
6	1986	85.1
7	1987	146
8	1988	590.2
9	1989	441.71
10	1990	954.16
11	1991	958.17
12	1992	72.44
13	1993	3147
14	1994	1418.34
15	1995	110.82
16	1996	499.58
17	1997	1401.58
18	1998	461.32
19	1999	323.69
20	2000	463.68
21	2001	164.86
22	2002	78.68
23	2003	33.2
24	2004	640.04
25	2005	1500
26	2006	1204.34
27	2007	1077

SOIL INVESTIGATION

drilled three boreholes at the proposed site for depth of 10m which is more than the scour depth and soil samples collected from the boreholes and testing done for engineering properties like grain size, type of soil, safe bearing capacity etc.

BH No.	Type of soil	Natural field density(T/m^3)	Cohesion (T/m^2)	Angle of internal friction (Φ)	Silt factor	Recommended S.B.C (T/m^2)
B.H-1	CI	17.58	0.4	17	1.07	15
B.H-2	CL	17.23	0.14	17	1.03	11.5
B.H-3	SM	17.4	0	23	1.09	14

METHODOLOGY:

Runoff data & flood data collected by state water data centre in gandhinagar. First the detail survey work and the shedhi river having catchment area & available flood data using The following methods are considered for calculating the design flood:

1) By Gumbel Distribution method
2) By Unit Hydrograph method
3) By Observed HFL Method

Then design & analysis of river training structure and find the benefit cost ratio & find the which flood protection measure are economical and better flood protection by khumarvada.

1. Gumbel's Method

This extreme value distribution was introduced by Gumbel (1941) and is commonly known as Gumbel's distribution. It is one of the most widely used probability-distribution functions of extreme values in hydrological and meteorological studies for prediction of flood peaks, maximum rainfalls, maximum wind speed, etc.

Gumbel defined a flood as the largest of the 365 daily flows and the annual series of flood flows constitute a series of largest values of flows. According

2. *Unit hydrograph method*

Central water commission (CWC), Research Design and Standard Organization (RDSO), India Metrological Department (IMD) and Ministry of Surface Transport (MOST) has jointly studied and issued a report for estimation of Standard Project Flood and design flood for large Catchment area, more than125 sq.kms, by Synthetic unit hydrograph method. For the purpose of estimating the peak Flood discharge of catchment area, India has been divided into 7 zones and 24 subzones depending on their topographical and Hydro-characteristics. The flood estimation as per flood hydrograph is done for return period of 1 in 5 years, 1 in 25 years and 1 in 50 years.

3. Observed HFL method

The River on upstream side out flanks at many places and hence the full discharge shall not come at this site and hence the discharge by unit hydrograph method being more may not be considered. However, the observed discharge being more than Gumbel method the same is adopted.

Shedhi River is having the catchment area of about 2026sq. km, which is conformed on top sheet and relevant map is shown in Plate-III.

RIVER TRAINING WORK

The site is visited with officers of Naidad Irrigation Division, Nadiad. The Shedhi River passes near village Khumarvada. The existing section of the river is less compared to the required for passing the high flood and hence during high floods river overtops on both the banks and flooding the nearby area and damages properties.

Due to the meandering tendency of river and steeper bed gradient, flood generates high velocity in the river hence the right bank of the river eroded gradually every year. dency of river

and steeper bed gradient, flood generates high velocity in the river hence the right bank of the river eroded gradually every year. It is necessary to protect the bank from further erosion.

In view of the above the below mentioned alternatives can be considered for the protection of the banks of the rivers.

Alternative –I Flood embankment
For the flood embankment, required higher ground level i.e 99.387m on the upstream and downstream of the proposed reach is not available and hence the flood embankment on the banks of the river is not to serve flooding problem in near-by area.

Alternative –II Rigid type RCC wall
The side slope of the river in the proposed reach is flatter to the tune of 3.5H:1V and hence in case of location of rigid R.C.C wall near the bank of the slope may require much more excavation of the slopes as the rigid wall shall be vertical.

Alternative –III Flexible structure
As per the site situation, River side slope is flatter and river flow currents are strong; hence protection of the bank has to be provided by pitching with stone revetment or mattresses. Pitching bank shall be protected at toe by launching apron with toe wall. Launching apron has to be designed for the maximum scour depth. Gabion mattress is having following advantages.

1	Flexibility	:	It permits to tolerate differential settlement without fracture. The property of the flexible structure is especially important when a structure is on unstable ground or in an area where scour from currents can undermine it.
2	Strength	:	It is also utilized to with stand absorb the forces generated by retained earth or flowing water.
3	Permeability	:	Because of the permeable nature, hydrostatic heads do not develop behind gabion structure.
4	Economy	:	Gabion mattress installation are more economical than rigid or semi rigid structures for a numbers of reasons. The following are the most important once :
			♦ Little maintenance is required
			♦ Gabion construction is simple, does not required skilled labour
			♦ Suitable stone fill is available normally on site or from nearby quarries
			♦ Minimum foundation preparation is required; the surface needs to be only reasonably plane.
			♦ No costly drainage provision is required, as gabions are permeable.
5	Durability	:	It is a heavy monolithic gravity unit able to with stand earth trust. Its efficiency increases instead of decreasing with age since further consolidation takes place as silt and soil collect in the void and vegetation establishes itself.
6	Ecology	:	Because gabion permits the growth of vegetation and maintains the existing environment, provides attractive and natural building blocks for decorative landscaping.

Keeping in view of above the Gabion structures are the ideal solution on account of their flexibility, natural drainage capacity due to the stone filling, and high structural resistance. The proposal of the same is made as under and shown in Plate-IV & V:

Gabion mattress in 0.5 m thick PVC double twisted hexagonal shaped steel woven wire & mechanically selvedge mesh type 10 cm x 12 cm, wire dia 2.7/3.7 mm with Zinc + PVC coating for length of 300 m (Ch.450m to Ch. 750m) along the RHS bank.

Conclusion
Based on the reconnaissance survey, detailed survey, soil investigation and detailed study of the available data and findings; it is observed that Khumarvada village River training work is necessary to prevent further erosion of the right bank of Shedhi River. The proposed work consists of construction of total 300m long flood protective work . The Gabion mattress type structure is flexible and free draining structure.

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