EFFECTIVE UTILIZATION OF THIRUMALAIRAJAN RIVER WATER IN NERAVY VILLAGE AT KARAIKAL DISTRICT

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ABSTRACT

The entire karaikal region agriculture is mainly depend the water released from the upstream of TamilNadu state through the river Cauvery and its tributaries. Thirumalairajan is a river flowing in the Thanjavur,Tiruvarur and Nagapattinam district of the Indian state of Tamil Nadu. The river splits from kudamurutti, a tributary of river Cauvery at Rajagiri village near Papanasam, Thnjavur district.The river enters the Bay of Bengal at Thirumalairajanpattinam near Karaikal.The length of Thirumalairajan river is 11000 M from the Karaikal district, Pondicherry state. Water scarcity is the lack of sufficient available water resources to meet the demands of water usage within a region. The river water is flowing to end at the Bay of Bengal at a discharge of 134 cumecs. The water discharge could be saved for irrigation purposes to the Karaikal district through the neravy channel. Hence we construct a water retaining structure across a Thirumalairajan river near Neravy village at a chainage of CH6000 to avoid the surplus water flowing through the sea.By implementing this investigation, with in the zone of influence of about 1 KM radius from the proposed site will be benefited by way of percolation. These structures can be used not only to slow flow velocity but also to distribute flows across a river to avoid preferential paths and guide flows towards vegetation.Under this investigation 1500 acres will be benefited.

KEYWORDS :*Water demand, Water scarcity, irrigation purposes, water retaining structures, slow flow velocity,percolation.*

I.INTRODUCTION

Water retaining structures is used to create large bodies of water or reservoirs,that have a variety of functions , including land irrigation, power generation , water supply and flood control.The retaining structures used to build reservoirs are called dams and dikes.A dam is built on the river bed;it serves to hold back water and raise the water level of the resulting reservoir.Dikes are often built to increase a dam's effectiveness by preventing water from leaving the reservoir through secondary valleys.A check dam is a small barrier or dam constructed across a swale, drainage ditch or other area of concentrated flow for the purpose of reducing channel erosion. Channel erosion is reduced because check dams flatten the gradient of the flow channel and slow the velocity of channel flow. Most check dams are constructed of rock, but hay bales, logs and other materials may be acceptable.

II. OBJECTIVES

The broad objectives of Check Dams (water retaining Structures) are :

i. To provide drinking water facilities in the villages along both the sides of the river after monsoon period.
ii. Ground Water recharge

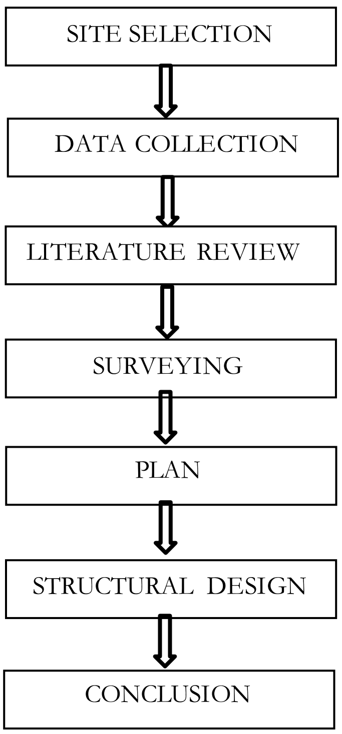
iii. To provide incidental irrigation during late Kharif and Rabi by storing water at the end of monsoon mainly through lifting devices.

iv. Irrigation use of water flowing down drainage channels.

v. To divert water from perennial / semi-perennial streams in hilly areas for irrigation purpose.

vi. Other uses by villagers like bathing, washing, fishing, recreation etc. depending on location and potentiality

III. METHODOLOGY



III. LITERATURE REVIEW

Stability analysis of an earth dam under steady state seepage- 17 March 1996 **Tien-kuen Hnang**

The aim of the work described in this paper is to describe a numerical procedure for performing stability analysis of an earth dam after the filling of a reservoir. Firstly, the piezometric heads at different points in an earth dam after the filling of a reservoir are obtained with a trial-and-error procedure. Then, the numerical analysis of the dam is performed using the finite element method, with a cap model used for representing soil behaviors. A special technique to handle the effect of steady state seepage is introduced. An example of a reservoir completed recently in Taiwan is illustrated. The results indicate that the factor of safety against stability failure of the dam is adequate.

IV. SITE SELECTION

Our study site is located across the THIRUMALAIRAYAN RIVER near the Neravy village in Karaikal district at Pondicherry state for the purpose of irrigation.This river off taking from the river Kudamuruti near Rajagiri village in Tamilnadu and the entry point of this river into this region is at Manapet village, where a cross regulator exists.The length of this river is about 11.00 KM.The off-take estuaries in Left bank of Thirumalairayan river in this site is supply link to Neravy channel.The Neravy channel is irrigating about 1717 acres of land.Our Proposed site is located at 6KM from the Manapet at upstream side while the downstream side had a Tail end Regulator at T.R Pattinam which is 3KM from proposed site.In our site location had a Pumping station and Infiltartion wells.

V. SITE SURVEYING

Before starting surveying work to select the area where the check dam is constructed and some procedures should be consider for selecting a site the water demand and ground water is necessity for cultivate crops and increase revenue and standard of living afterwards opinion from public and grievance should be noted.Levelling should be done in the proposed site with the use of surveying instrument like dumpy level, tripod, tape, levelling staff. Surveying work of levelling is carried out from upstream to downstream of the river.In this work is done from the Ananthanallur Regulator to Panakattankudi Bridge for every 50 M from the site and the cross section of river is carried at proposed site.Then reduced level of each points should be calculated from height of collimation method.Site should be cleared from vegetable, leaves, un bushy level.

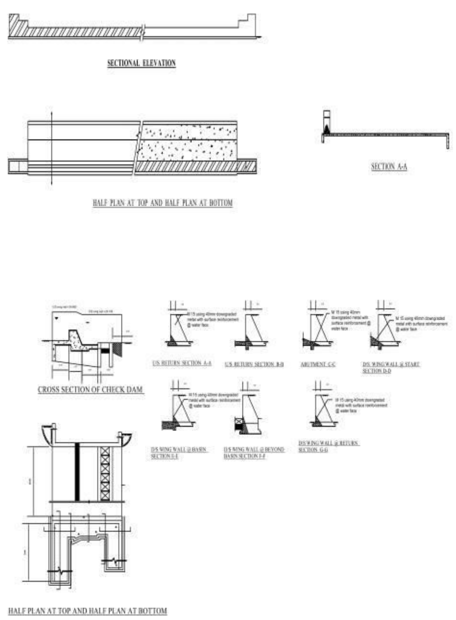
V. HYDRAULIC PARTICULARS

The following are the hydraulic details of proposed construction:

NORMAL SUPPLY LEVEL	+2.29
MAXIMUM FLOOD LEVEL	+2.58
SILL LEVEL	+3.20
AYACUT	33.86 Sq.Miles
MAXIMUM FLOOD DISCHARGE	134.05 Cumecs
LENGTH OF CHECK DAM	72 M
CREST LEVEL	3.15 M
TOP WIDTH	0.90 M
BOTTOM WIDTH	1.46 M
SCOUR DEPTH	2.45 M
HEIGHT OF CHECK DAM	1.50 M
AYACUT BENEFITS	1500 Acres

VI. PLAN

Plan and Cross Section of Check Dam are shown in below:



VI. STRUCTURAL DESIGN

Hydraulic Details Of Proposed Structures:

Bed level = + 3.20

Maximum flood level (MFL) = + 2.58

Normal supply level (NSL) = +2.29

Catchment area, M = 33.86 sq.miles

DESIGN

1. Maximum Flood discharge

$Q = C\ M^{(2/3)}$

C= Ryve's constant = 6.8

$Q= 6.8\ X\ {}^{2/3}\sqrt{33.86} = 134.05$ Cumecs

2. Scour depth & Linear water way calculation

Stable width of river required to

pass maximum discharge $= L = 4.75\sqrt{Q}$

$= 4.75\ X\sqrt{134.05}$

= 55 m

q = Q/L = (134.05/55) = 2.347

Scour depth $R = 1.35\ (q^2/f)^{(1/3)}$

Assuming, f =1

$R = 1.35\ X\ (2.437^2/1)^{(1/3)}$

R = 2.45 m

Regime Velocity = q/R

= 2.437/2.45 = 0.99m/sec

Velocity head $= V^2/2g$

= 0.05 m

Highest flood level before construction = +2.58 m

Therefore D/S T.E.L $= 2.58 + V^2/2g$

= 2.58 + 0.05 = 2.63 m

Assuming afflux as 0.17 m

U/S T.E.L level = 2.63 + 0.17 = 2.8 m

U/S M.F.L after construction = U/S MFL- $V^2/2g$

= 2.8 – 0.05 = 2.75m

Linear water way required (as per drowned weir formula neglecting velocity of approach)

$Q = 2/3\ C_1 L\sqrt{2g}\ h^{3/2} + C_2\ L\ d\sqrt{2gT}$

Where $C_1 = 0.577$, $C_2 = 0.800$

h= difference in water level measured above U/S & D/S

d= depth of D/S water level measured above crest

$134.05 = 2/3 X 0.577\ L\sqrt{2X9.81}\ X\ (0.17)^{3/2} + 0.800\ L\ X\ 1.2\ \sqrt{2X9.81X0.17}$

L = 71.6 m ~ 72 m

3. Crest of the body wall

$q = 1.70\ K^{3/2}$

where K= depth of water over crest from U/S T.E.L

$K = (q/1.70)^{2/3}$

$= (1.26/1.70)^{2/3} = 1.27$ m

Crest level = U/S T.E.L – K

= 2.8 – 1.27

= 1.53 m

However crest level fixed as 1.5m to suit the proposed bed level

4. Design of Body Wall

Discharge is more than 14cusecs.Hence trapezoidal with front slope 1:4 & rear slope 1:8 is adopted

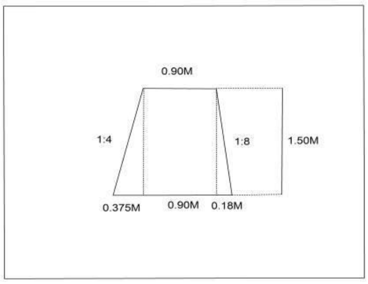
Top width of body wall = $0.55\sqrt{H + d}$

$= 0.55\ \sqrt{1.5 + 1.2}$

= 0.90 m

Bottom width = 0.375+0.90 + 0.188

= 1.46 m



5. Cut Off Wall

Scour depth = 2.45 m

R.Lof bottom of cut off wall inU/S=U/SHFL-1.50R

= 2.85-(1.5 X 2.45)

=- 0.825 m

R.Lof bottom of cutoff wall in D/S=D/S HFL-2.0R

=2.58 – (2 X 2.45)

=-2.32 m

But the existing Bed level at proposed site=3.20m

However provide a cutoff wall depth of 2.50m in D/S & 1.50 m U/S

6. Design of Impervious apron

Total creep length L = CH

Assuming, C=12 (co-efficient of soil)

L= 12 X 1.5=18 m

D/S impervious apron, $L_1 = 2.21\ C\sqrt{H/10}$

$= 2.21\ X\ 12\ \sqrt{1.5/10} = 10.27$ m

Total Length of D/S apron, $L_3 = 18C\sqrt{(\frac{H}{10})\ X(\frac{q}{75})}$

$= 18\ X 12\sqrt{(\frac{1.5}{10})\ X(\frac{2.44}{75})} = 15.09$ m

Length of Tauls, = L_3-L_1 = 15.09-10.27 = 4.82 m

Length U/S apron = L=(L_1+B+D_1+D_2)

= 18-(10.27+1.46+5+5) = (-3.73 m)

However,provide U/S apron = 5.00 m

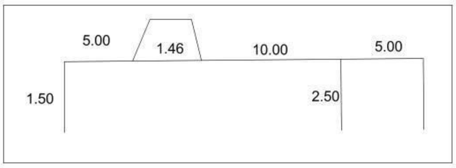
D/S impervious apron = 10.00 m

D/S Tauls apron = 5.00 m

Total creep length provided

Total creep length=1.50X2+5.0+1.46+10+(2.5 X 2)

= 24.46 m



7. Check for uplift pressure

Creep length upto the wall = 2.50+2.50+5.0+1.46

= 11.46 m

Residual head = 1.5-(1.5/24.46)X11.46

= 0.58

Thickness of floor required = 4/3(H-h/f-1)

=4/3(0.58/1)=0.77

However provide (or)minimum thickness of 0.90 including wearing coat of 0.15m.

VII. MAINTENANCE AND INSPECTION

i. Conduct inspections as required by the NPDES permit or contract specifications.

ii. Make any repairs necessary to keep the check dams in good working order and check for signs of undercutting.

iii. Remove accumulated debris and sediments from behind the check dams when sediment reaches a depth of one-half the original height of the dam and prior to permanent seeding or soil stabilization. Dispose of all materials properly at an approved site.

iv. For sediment retention fiber rolls, clean out accumulated sediment or replace the roll as necessary.

v. Replace rock as necessary to maintain the correct height of rock check dams.

vi. Replace sandbag dam fabric as necessary.

vii. Remove check dam when no longer needed or when directed by the Engineer.

VIII. CONCLUSION

From this study, by observing the results the following conclusions were made

i. The purpose of the project is increase the Ground Water recharge through the increase a yield of Crops and store water for the purpose of irrigation.
ii. In this study consist of Surveying, Planninng and designing.
iii. The Surveying work carried with the instrument of Auto-Level.
iv. The IS code of 6966 – 1973 Design is followed
v. This method of design is considered to be better than the other methods available for design particularly for check dams
vi. From the design result it has been concluded that this design can be adopted for any check dams.

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