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Preliminary Investigation of K.T. Weir

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Abstract: ***Since ancient times, we have seen many technological advancements in reducing water shortage problems. One such technology is that of K.T Weir which has helped in storing the water with the help of gates and also helped in moving the traffic. K.T Weir also known as Bridge-cum-Bandhara has been a great civil structure serving many purpose. Soon after a weir site has been selected, a preliminary investigation on the location of the proposed site is essential to highlight important considerations. In this paper we will look how the preliminary investigations for K.T Weir take place.***
Keywords*: *Technological, K.T Weir, water shortage, preliminary investigations and civil structure.

I. INTRODUCTION

Since ancient times, we have seen many technological advancements in reducing water shortage problems. One such technology is that of K.T. Weir which has helped in storing the water with the help of gates and also helped in moving the traffic. K.T Weir also known as Bridge-cum-Bandhara has been a great civil structure serving many purpose. The preliminary investigation is usually made at the site to obtain information required to determine both physical and economic usefulness.

II. PURPOSE

The purpose of a preliminary site investigation is to found the geological usefulness of the site and to find out the extent and precision of detailed subsurface investigation required to possess the information needed for design and construction. For some sites preliminary investigation may be adequate to determine the geological conditions and the engineering characteristics of materials. But where enough information for design cannot be obtained during the preliminary investigation then detailed subsurface investigation must be planned.

III.PRELIMINARY INVESTIGATION

A. Study of Available maps Including Remote Sensing Maps

Plotting of contours on Google Earth

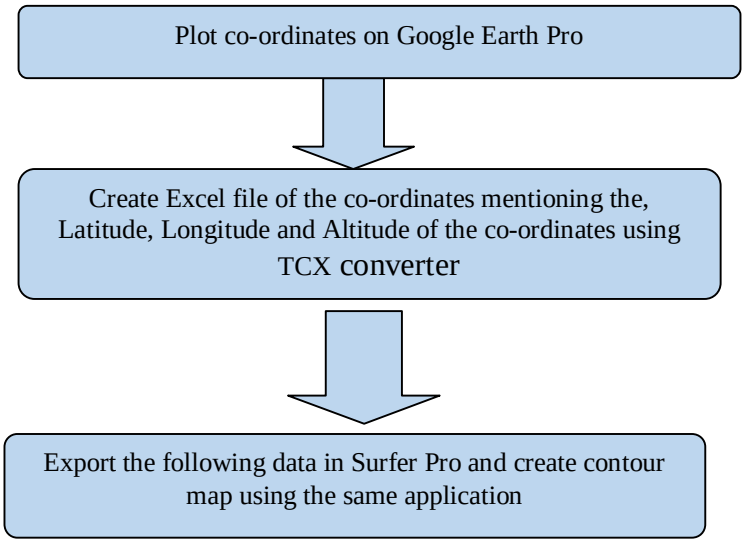

Fig. 1 Plotting of contours on Google Earth

Study of available maps should be made to have a general idea of the topography and to locate possible sites. By using the topographic maps available, calculate the catchment area, flood discharge and flood plain of the reservoir.

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B. Regional and Site Geology

1) Regional Reconnaissance Surveys (P-I stage)

The main purpose is to reduce the areas by identifying select ones for further studies.

a) Systematic geological mapping on 1:50,000 scale.
b) Airborne Geophysical Surveys (Magnetic, Electro-magnetic & Radiometric).
c) Regional geochemical sampling (wide spaced).
d) Regional geophysical survey (wide spaced).
e) Photo-geological and remote sensing studies (PGRS).

2) Preliminary prospecting (P-II stage)

Generally conducted for smaller areas, a few kms. to tens of Sq. kms.

a) Geological mapping on 1:25,000 or 1:12,500 scale.
b) Geochemical grids and ground geophysical grids for prospecting are kept at a closer intervals for the precise selection of the target areas.
c) Pitting and trenching carried out to expose the ore body if near to the surface.

3) Preliminary Exploration (E-I stage)

a) Work is conducted over very small areas (less than a Sq.km to a few Sq. kms).
b) Detailed mapping on 1:2,000 or 1:1,000 scale.
c) Pitting, trenching and bed rock sampling on all out-crop sections.
d) Drilling on systematic pattern up to 60 to 120m depth and at 100m strike interval for gold, 200m for base-metals and 400m - 500m for limestone.
e) Detailed petrological and mineral studies.

Within the mineral deposit economically viable zones, their strike length, width and depth identified based on surface studied and drilling data.

4) Detailed Exploration (E-II stage)

a) Exploratory openings or boreholes are drilled at closer intervals along the strike and also depth wise, to accurately determine the shape, size, disposition of ore and grade of ore body.
b) Mineral phases (by EPMA), beneficiation test carried out.
c) Processing of all databases.

C. Study of Foundation Strata

The choice of the accurate type of foundation is governed by some following factor:-

1) The subsoil characteristics
2) The nature of the structure
3) The load exerted by the structure

For foundation strata, data should be collected by making trial pit, trenches and boreholes. And studies of other project in the nearby area. Following test are to be performed

a) Tests for Foundation Strata

- Plate Load Test
- Standard Penetration Test (SPT)
- Bearing Capacity of Rock

Bearing capacity of rocks are determined by crushing a core sample in a testing machine. Samples used for testing must be free from cracks and defects. Following are common laboratory tests for determining strength of rocks.
Whenever, hard strata for foundation is found then there will be following tests to be performed.

b) Tests for determining strength of Rock

- Unconfined Compression Test
- Splitting Tension Test
- Beam Bending Test

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D. Study of available run-off and flood flow data:

The study of available data, such as rainfall records in the catchment, river gauges and the corresponding discharges should be made with a view to assessing the available 10-daily and monthly run-off and peak flow diversion or storage.

E. Study of existing projects upstream and downstream of barrage:

1) Visit sites having existing projects of weir.
2) Obtain data of them from concerning government authorities.

F. Assessment of water requirement(IS 1172-1993):

Water Demand

1) Domestic Water Demand

a) The water required in private building for drinking, cooking, bathing etc.
b) IS code caps a limit of 135 to 225 lpcd.
c) Maximum domestic demand is considered as 200 lpcd in a town with full flushing system.
d) 135 lpcd for weaker sections and LIG(Low income group)

2) Industrial Water Demand

a) Can vary from 50 l/h/d to high as 450 l/h/d.

3) Commercial Water Demand

a) On average, 20 l/h/d is considered to meet the requirement
b) May be as high as 50 l/h/d

TABLE 1
Water Requirement

Sr. No	Water requirement for commercial buildings	Average consumption in lpcd
1.	Factories • Where bathrooms are provided • Where no bathrooms are required	 45 30
2.	Hospitals • Number of beds less than 100 • Number of beds exceeding 100	 340 450
3.	Hostels	135
4.	Restaurants (per seat)	180
5.	Offices	45
6.	Schools(day scholars)	45

4) Public use

a) Considered to be 5% of total consumption.
b) 10 lpcd is added usually.
5) Fire Demand: 1 lpcd usually considered.
6) Water Required to Compensate losses in Thefts and Wastes: can be high as 15% of the total consumption, nearly 55 lpcd
7) Agricultural Water Demand: Depends upon the area in hectares where agriculture is practiced and per hectare requirement of water depends upon the type of crops, cropping pattern, etc

Total maximum water demand: It is the sum of above demands. Total maximum demand of 335 lpcd is permitted.
Per Capita Demand in lpcd = Total yearly water requirement in litres / (365* Design Population)

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While calculating a water requirement a future population considering a Design Period of Water Supply Unit is considered.

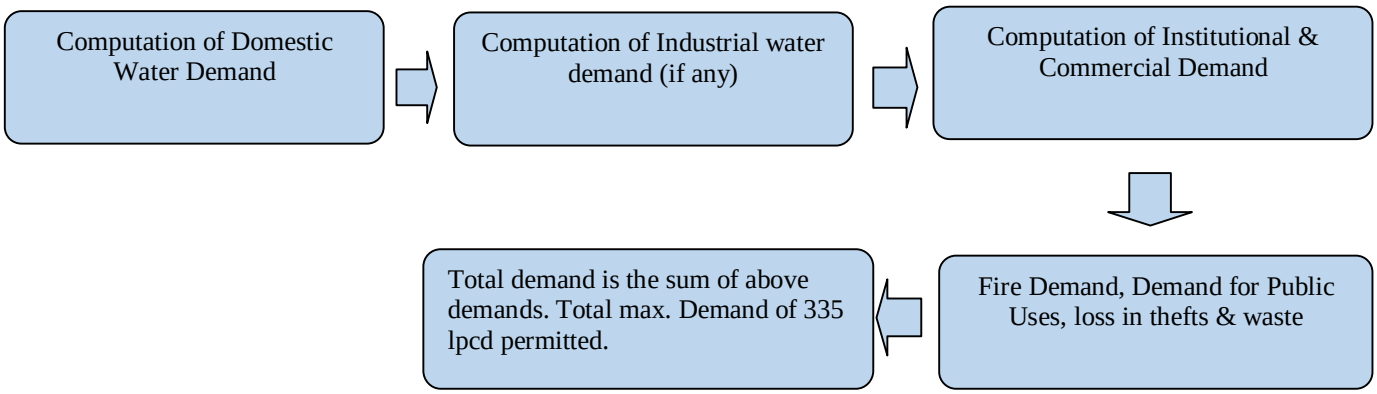

Fig. 2 Process of calculating water demand

G. Effect Of Proposed Barrage Or Weir Contemplated On Environment And Ecology

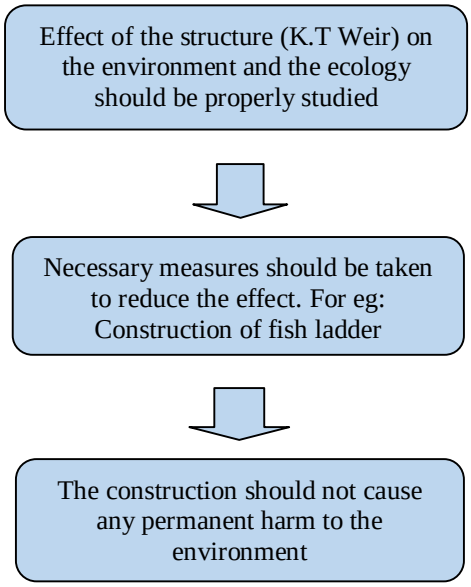

Fig. 3 Necessary steps to be considered for not harming environment and ecology

Because a weir impounds water behind it and alters the flow regime of the river, it can have an effect on the local ecology. Typically, the reduced river velocity upstream can lead to increased siltation (deposition of fine particles of silt and clay on the river bottom) that reduces the water oxygen content and smothers invertebrate habitat and fish spawning sites. The oxygen content typically returns to normal once water has passed over the weir crest (although it can be hyper-oxygenated), although increased river velocity can scour the river bed causing erosion and habitat loss.

H. Limitations Imposed By Custom, Water Laws And Rights Or Accepted Policy

In most areas the amount of water available may not be sufficient at least during some seasons to satisfy all potential demands. A system of water laws or rights, interstate treaty on sharing of water, etc already developed or framed have to be recognized and a careful evaluation is to be made of the human socio-economic factors in the area, their present state, their trends and to the corresponding needs and requirements of the society.

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I. Availability of construction materials:

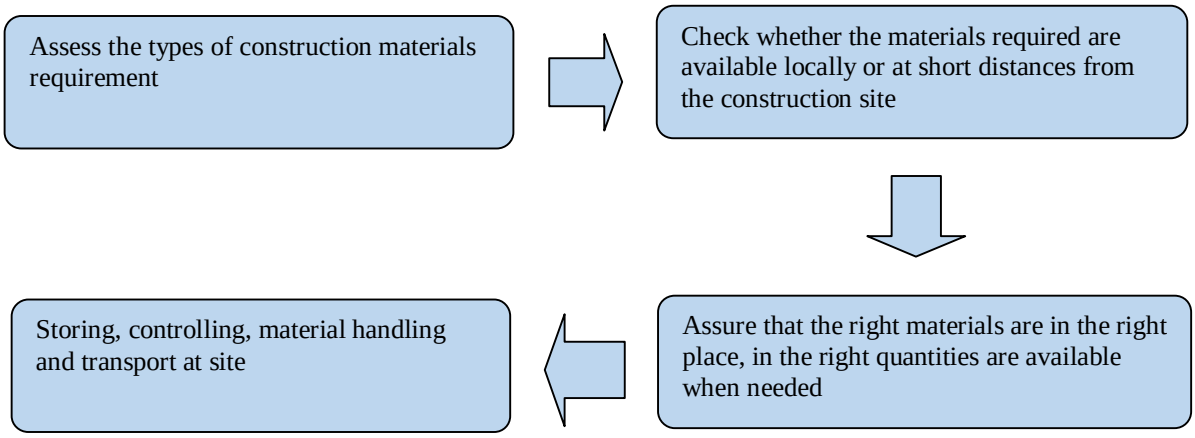

Fig. 4 Availability of construction materials

J. Land for Utility Services

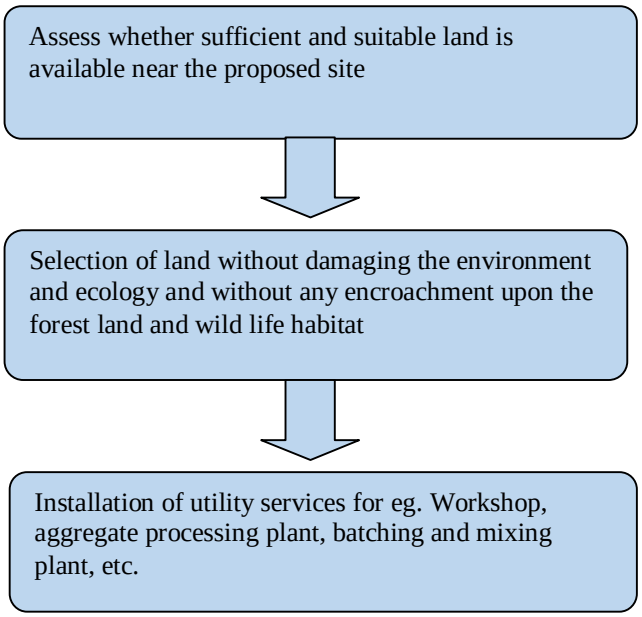

Fig. 5 Land for utility services

K. Communication to the site of work

After deciding on the choice of suitable site, due consideration should be given for easy accessibility and economic transportation of materials to the site of work. Possible sites for the location of the barrage or weir should be marked out on the basis of investigation carried out in accordance with the provisions of study of available map up to utility service for land. It should be possible to eliminate some of these sites on topographical, environmental and other considerations by site inspection. Further investigation should be carried out for the remaining sites by sub-surface explorations. Thereafter, considering the merits and demerits of the different sites, the sites chosen can be graded in order of their suitability.

IV. CONCLUSIONS

Hence from the above description we would be able to carry out the Preliminary Investigation of K. T. weir in a systematic manner.

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V. ACKNOWLEDGMENT

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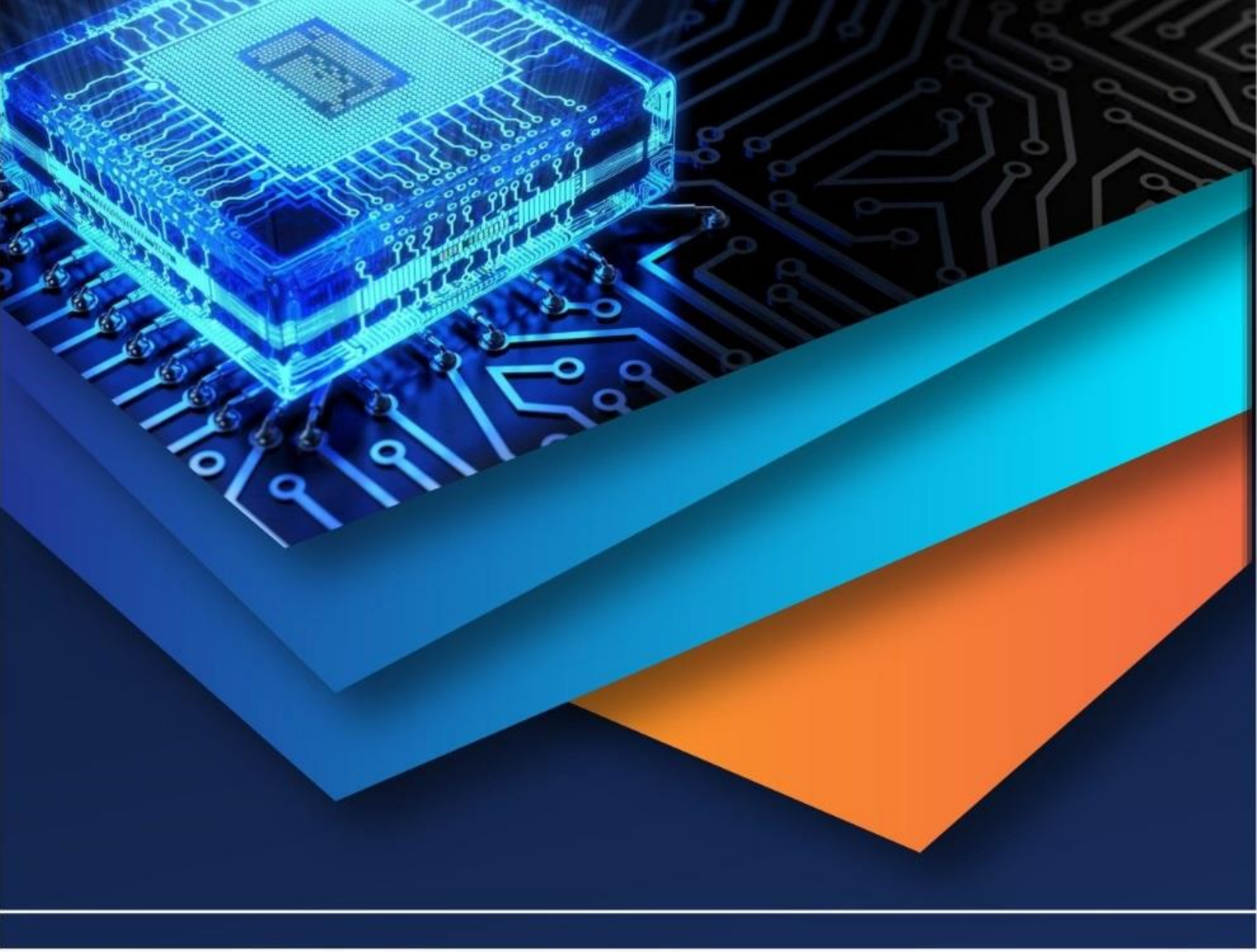

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