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PREPARATION OF PROPOSAL FOR REJUVENATION OF VILLAGE LAKE BY USING GIS SOFTWARE

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Abstract - *This paper aim to discuss the problems of village lake and solutions provided to redevelop of lake. Use QGIS Software for lake area mapping and after calculate present quantity of lake water. Depth of lake and outer area lake excavated to increases water capacity. Excavated material dump on outer side lake area due to increases lake height. Calculate of production of equipment's to use in Lake Redevelopment. RCC plus Gabion wall used for supporting of inner side, down side and over flow wall. This lake redevelopment cost is very less. This amount collected very easy from village people and government also help for this work. The case study will take a macro level study on the entire lake redevelopment.*

Key Words: QGIS software, GPS essential app, RCC plus Gabion wall, Equipment Production, Rapid Urbanization.

1. INTRODUCTION

Redevelopment of village lakes is necessary because it increases the development of the agriculture lands and economic development of the village peoples. Lakes are important part of rural ecosystem, though relatively small in size, lakes perform significant environmental, social and economic functions, ranging from being a source of drinking water, recharging groundwater, acting as sponges to control flooding, supporting biodiversity and providing livelihoods (e.g. [2]).

The main source of water for the needs of many sectors of economy such as agriculture, domestic and industrial is easily available from lakes (e.g. [3,4]). These water bodies, whether man-made or natural, fresh water or brackish water play a very vital role in maintaining environmental sustainability particularly in rural environments especially in today's context when the cities are facing the challenges of unplanned rapid urbanization same as villages.

2. CASE STUDY – ITKARE VILLAGE

2.1 A practically affordable effort in redevelopment of lake especially in the increase the lake capacity, ground water level improvement in itkare village and this redevelopment work constructed in minimum cost. Itkare village is located west side form sangli district.

2.2 Problems in Itkare village

i. Ground water level was decreased so redevelopment of village lake is necessary but in low cost.
ii. In summer season, due to ground water level scarcity of water were faced by agriculture areas.
iii. Outside lake area water was not coming into lake which cause the water goes waste without any use.
iv. Lake depth is less.

2.3 Collect all village data and prepare plan of redevelopment lake considering following objectives:

i) To identify area and depth of lake by using GIS software.
ii) To calculate quantity of excavation and production of equipment's.
iii) To calculate quantity of water collected in lake.
iv) To calculate estimated cost of redevelopment of lake.

2.4 Methodology

a) Defined problem and site selection:- I had visited the village. At that time I have noticed above problems and selected the lake for redevelopment.
b) Literature survey:- Data collected form books, research papers (e.g.[1]).
c) Site visit and data collection:- I had visited the village and collected all data like GIS points, depth of lake, photos etc.
d) Use GIS software:- By using GIS software able to create counter line, boundary line, area calculate, slope analysis redevelopment of lake.
e) Calculation excavation material, production of equipment and water quantity:- excavation lake material quantity and production of equipment for excavation and shifting of lake material, future and present water quantity and overflow water wall quantity of material have been calculated.
f) Costing: - Costing for production equipment, construction of overflow water wall and total project cost have been calculated.

2.5 Information of village

1) Population- 7000 nos.
2) Village area- 330,682.41 m^2 (81.71 Acre)
3) Rainfall (in mm) -57.72mm

2.6 Use GPS essential

GPS Essentials features a location-based database that stores all your data into hierarchical streams. GPS essentials will append your current location to a specific stream every few seconds. When you are taking a picture, GPS essentials will collect the image data, your location and the device orientation and append this data to a stream (e.g. [6]).

- Plot Features using GPS and take Co-ordinates
- Calculate length and area

2.7 Use QGIS Software for lake

• QGIS software is easily operating software. In this vector and raster file adding different location after easily counter planning, slope analysis, boundary area and other layer added in map and road, pipeline, electrical line, sewage line, different types of points draw in software (e.g. [5]).
• GPS essential point's kml file import in gis software easily after correct point indicated in map.
• Project counter map consists of slope analysis for road planning, connected two places, other developed planning, boundary line draw on map.
• In gis software lake area plot counter line 0.1m after analysis slope in which area, water maximum collected and which direction water goes down.
• In this present inlet and outlet water flow drawn on map.

After gps point taken on site this point import in gis software and this point connected each other resultilng three lines mark on map. Inner line present lake boundary line, middle line is future boundary line and outer line is end line which should not cross the excavation.

Fig-1: Counter line and Lake boundary area

2.8 Draw section of lake in Auto cad

• The lake length is 78 m and area of lake present is 2,084.396 sq.m.
• Below fig. yellow color is indicated present lake level, Hard rock is available after excavation of below 0.45m
• Blue color indicated present lake depth is 1.1m. Above 1.1m height is level of lake on inlet and outlet point. In this height 0.5m upper part is water over flow part or water limit line.
• Murum has been filled above 1.1m height which resulted increase in the height of lake.

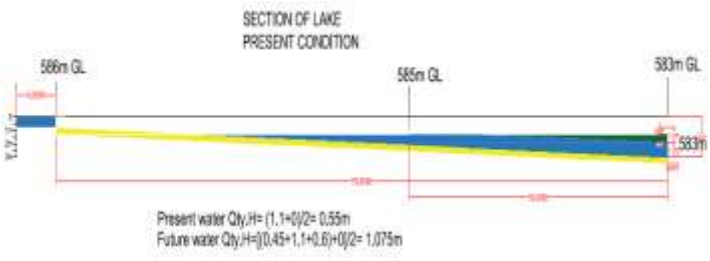

Fig.-2: Cross Section of lake

2.9 Calculate of Present water quantity

Area = 2,084.396 sq.m and Height = 0.55m
Water Quantity = 2084.396 x 0.55= 1146.4178 cub.m
Water Quantity in liter = 1146.4178 x1000 = 11,46,417.8 liters

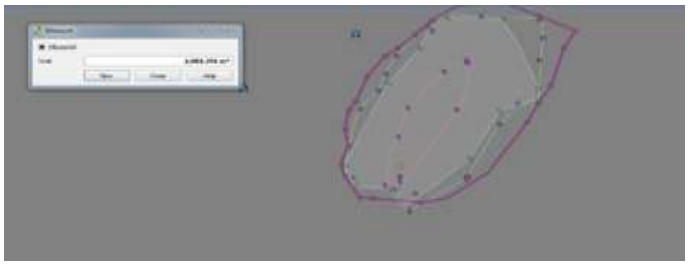

Fig.-3: Present water quantity area on QGIS map

2.10 Calculate of Future water quantity

Area=2,548.607 sq.m, H=[(0.6+1.1+0.45)+o]/2 = 1.075m
Water qty= 2548.607 x 1.075 x1000 = 27,39,752.52liter
Future water qty. increase = 27,39,752.52-11,46,417.80 = 15,93,334.72liter

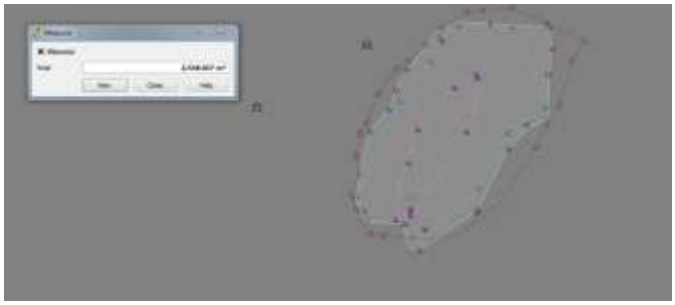

Fig.-4: Future water quantity area on QGIS map

2.11 Calculate of Excavation quantity

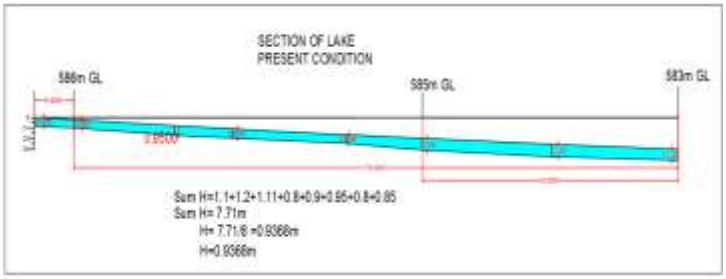

Fig.-5: Section of lake for Depth for excavation

Table-1 Quantity of water and Excavation

	Description	Present	Future	Difference
1	Water Qty. (1Tanker=10000lit)	1,146,417.80 Lit (114 nos. Tanker)	27,39,752.52 Lit (273nos. Tanker)	15,93,334.72Lit (159nos. Tanker)
2	Excavation qty. center		937.97 cub.m	
3	Excavation qty. side		656.3015 cub.m	

2.12 Calculate of Production of Equipment (e.g. [7])

1) Present lake depth excavation upto D= 0.450m

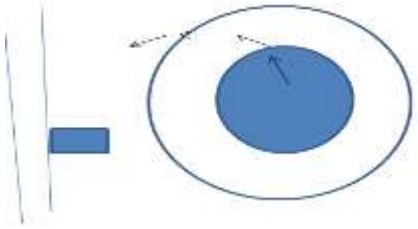

Fig.-6: Center area of lake for excavation

Total cycle time = 17 sec
Production= 352 bcy/hr
Excavator Total time required for excavation = 4.30hrs
Truck cycle time = 4.26 min
No. of trucks required = 3 Nos

2) Outer side work excavation

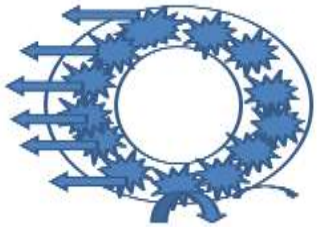

Fig.-7: Outer area of lake for excavation

Total cycle time = 17 sec
Total time required for excavation = 3.30hrs

3) Dozers production and Time
1 Dozer required = 7.30hrs
Extra murum qty = (centre 937.97+side 656.3015) = 1594.27cub.m - level qty 776.47cub.m
Extra murum qty = 817.80cub.m = This qty Dump levelling outer side

Fig.-8: Dozer working area

Table-2 Production of Equipment

	Description	Excavation (excavator)	Hauling (truck)	Leveling (dozer)
1	Production of center work	4.30hrs	3nos.	–
2	Production of side work	3.30hrs	–	7.30hrs
3	Total time (hrs.)	8 hrs	3nos.	7.30hrs

2.13 Lake Out let over flow water wall, construction of RCC+ Gabion wall, Estimation and costing

Outlet over flow wall is constructed in two phases. Firstly, base and middle wall to be of RCC and Secondly, front, back portion is of gabion wall because of which there is no water pressure effect on gabion wall. By following this procedure cost also decreases.

Inner portion of the lake is supported with gabion wall on both sides. The difference between overflow wall and down lake gabion wall kept 1m for support.

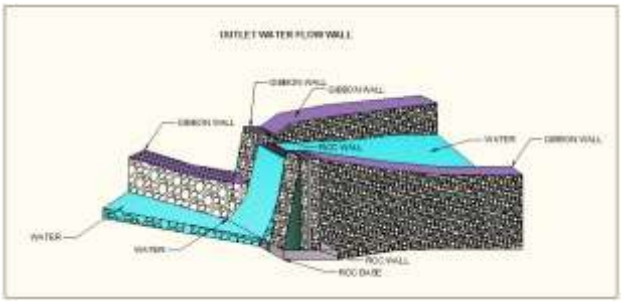

Fig.-9: 3D drawing of out let over flow wall

Fig.-10: Gabion wall photos

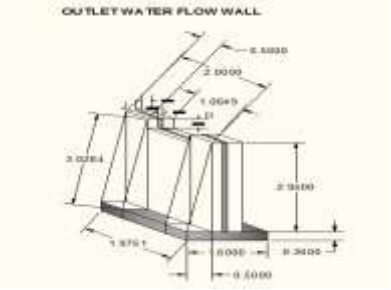

Fig.-11: Design of RCC plus Gabion wall

3. RESULTS

Total Redevelopment of lake cost is Rs.1,08,213/- (Total Project Cost)

Table-3 Details of total project cost

TOTAL PROJECT COST					
Sr.no	Description	Unit	Quantity	Rate	Amount
1	Production of Equipment				
	Excavator	Hrs	8.00	800	6400
	Truck	nos	3	2000	6000
	Dozer	Hrs	7.30	800	5840
2	Water over flow wall				20852.9
3	RCC wall Side Gabion Wall				69120
	TOTAL PROJECT COST				108213

4. CONCLUSIONS

1) Redevelopment of lake is helpful for village people, agriculture and increase ground water level. Present lake water capacity is 11,46,417.80 Lit. If 0.450m depth and side area of lake excavation is increased then water capacity will be 27,39,752.52 Lit. (Difference 15,93,334.72 Lit)
2) Total murum excavation quantity is 1,594.27 Cub.m. Excavated murum can be used for increasing the height of surrounding area of lake.
3) Equipment production for this work is less. The 2.5cy size excavator use for lake excavation only needs 8 hrs and dozer for levelling use only 7.30hrs. Murum shifting outside lake area needs 3nos. of truck.
4) Construction of Outlet wall is made up of using 100mm RCC wall in center because water not percolated in the wall and lake water pressure increase on RCC wall so as to support both side Gabion wall is used. Gabion wall cost is less as compare to RCC wall.
5) Total Rejuvenation of lake work cost is Rs.1,08,213/-. This cost is only one lake and this is very less amount. This amount collected very easy from village people and government also help for this work.

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