Impact Factor (SJIF): 5.301

International Journal of Advance Research in Engineering, Science & Technology

e-ISSN: 2393-9877, p-ISSN: 2394-2444

Volume 5, Issue 3, March-2018

Stormwater Management of Developing City Using Storage Practice

Sanjaybhai Parmar[1], Vikas Bhavsar[2]

[1]*PG Student, M.E. (Civil) Infrastructure Engineering, L.D.R.P. Institute of Technology & Research* Gandhinagar
[2]*Faculty, Department of Civil Engineering, L.D.R.P. Institute of Technology & Research, Gandhinagar,*

Abstract — Stormwater management means to manage surface runoff. Stormwater management reduce or eliminate the negative impact of e impacts of Stormwater runoff. Its include controlling flooding and reducing erosion to improve water quality. This Strategy used in the Gandhinagar city to planning of prevents the impacts of Stormwater. In the rainy season much water flowing over the ground surface. This rain water has no impurity, its flowing by gravitation force and drainage through discharge in near lake or river. This river or lake already polluted by Industrial and Residual sewer system. Stormwater runoff polluted on Ground surface such contain as vehicle dropping oil and grease, metal, sediments, nitrogen, trash, phosphorus, pesticides, bacteria and other. Urbanization reduce the infiltrate land its causes of the flooding its occurs scouring and waterlogging problem. In this study to planning of use Best Management Practice to prevent impact of Stormwater, and store the Stormwater and use in green infrastructure. In this study to collect the past year rainfall data and calculate of runoff volume. Then after to identify location of storage tank and determine storage volume and suggest the storage tank.

Keywords-Rainfall; Runoff; Storage Volume; Storage Tank; Storage site.

I. INTRODUCTION

The Gandhinagar is Green city and the capital Gujarat state. The urbanization of city impact reduces the infiltration land, it occurs the low infiltration of rain water in ground. The stormwater runoff occurs when the rainfalls over the infiltration land such as roadway, walk way, parking lots, rooftop and other surface that prevent the infiltration of stormwater and. This runoff volume increase and flooding problem generate in city. This runoff existing in the drain in near lake and river. The sedimentation, nitrogen, bacteria, phosphorus, oil, grease, trash, pesticides, metal and other matter pollute the storm water in urban areas. The stormwater drain in sewer line to meet the sewage water its more pollute, then after drain in lake or river the other industrial wastewater pollutes the stormwater.

The Stormwater management practice to prevent the pollution of runoff and use in storing tank the and water infiltration in ground. Stormwater management is the science of managing stormwater runoff to prevent adverse impacts on the environment. The main goal is to manage water quantity in addition to protecting water quality. This study to analysis of stormwater impact, and give solution based on BMPs (Best Management Practice). To analysis the runoff and planning to managing runoff flow.

II. STUDY AREA

A. Gandhinagar City

Select the Area of Gandhinagar the problem of the Stormwater. Study area select East side KH 7 to CH 7 And South side CH 7 to CH 4. The total study area 7.21km^2 in Include sector 27,28,29,22,23,24,15,16 and 17. Gandhinagar located on the latitude of Gandhinagar, Gujarat India is 23.233086 and the longitude is 72.651634**.** India is located at India country in the Cities place category with the GPS coordinates of 23° 13' 59.1096" N and 72° 39' 5.8824" E

Figure 1. Map of Gandhinagar City

Figure 2. Map of Study Area

B. Problem of Stormwater

After survey of study to area, identify problem of the Stormwater. In the city both side of road provided the Stormwater drain line network to discharge of Stormwater in Sabarmati river. But this network was doing not work perfectly. The Stormwater problem is Flooding and waterlogging. The inadequate storm drainage network are does not escape storm water

The storm drainage line due sedimentation not properly work the debris close the storm drain. The impervious area reduces the infiltration. In the rainy season much water flowing over the ground surface. This rain water has no impurity, its flowing by gravitation force and drainage through discharge in near lake or river. This river or lake already polluted by Industrial and Residual sewer system. Stormwater runoff polluted on Ground surface such contain as vehicle dropping oil and grease, metal, sediments, nitrogen, trash, phosphorus, pesticides, bacteria and other. Due to flooding erosion of the pavements.

The Stormwater is the main source of fresh water its drain through discharge into river. this water need to storage for domestic purpose.

III. DESIGN STORAGE TANK

A. Site Selection

A Site select for provide storage tank consider 0.3 ha. area of near Gh-4 garden area The Storage site is relatively small and is situated on a significantly higher elevation. than the adjoining public roads and drainage networks. As such, an online gravity discharge detention tank to serve the entire site would be most suitable.

.

Table 1 Site Detail

Step	Description		Equation
A	Site area	A (ha) =	0.3ha
B	Weighted runoff coefficient of site	C_{post} =	0.92
C	Time of concentration	t_c (min) =	5min
D	Average rainfall intensity for 10yr storm event	i_{10} (mm/hr) =	217mm/h
E	Peak discharge from site	Q_{post} = (m^3/s)	0.166m^3/s
F	Target runoff coefficient Ctarget	C_{target}	0.55
G	Target peak discharge	Q_{target} =	0.099m^3/s

A proposed for a 0.3ha site. The proposed site layout is shown in Figure 3. A detention tank is required to control the peak discharge of the site to ensure it complies with the maximum allowable peak discharge requirement specified in the COP. This tank provided underground at near the Gh-4 garden to collect and use the Stormwater in garden for irrigation.

Figure 3. Storage Tank Site

B. Storage Volume Determine

Determine 82.0 m^3 storage volume using rational formula.

$$\text{Storage Volume, } V_t = \text{Qinflow } (t_c+t_x) - \frac{1}{2}\,\text{Qtarget}(2t_c+t_x)\ [m^3] \quad \text{(Equation 1)}$$

Where, Qinflow = $\frac{1}{360}$Cpost $\frac{1}{360}$ $(\frac{8913}{td+36})$A

Qtarget = $\frac{1}{360}$Ctaget $\frac{1}{360}$ $(\frac{8913}{td+36})$A

C. Provide Storage Tank

Provided underground at near the Gh-4 garden to collect and use the Stormwater in garden for irrigation. The tank capacity of 85000 liters. Its use in dry season irrigation of garden. Cost of Construction – Rs 840262

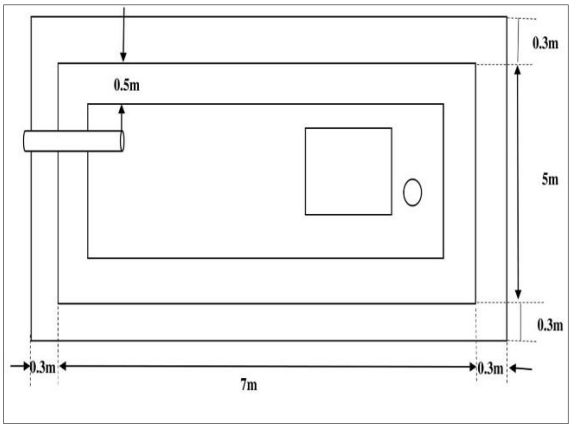

Figure 4 Plan of Water Tank

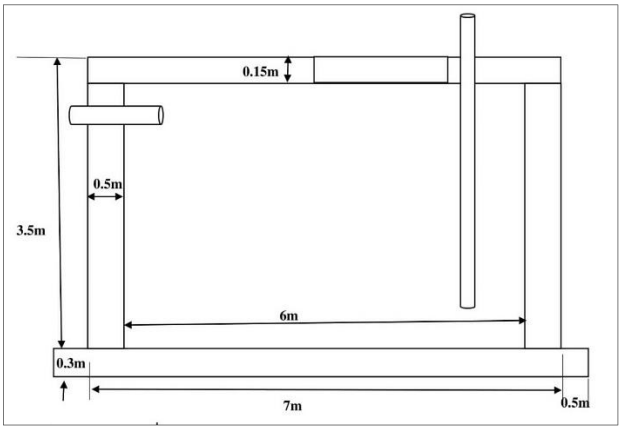

Figure 5 Elevations of Water Tank

IV. CONCLUSION

Following conclusion are made from the above study:

1.Use Rational formula calculate runoff and select site for storage tank.

2.Determine 82.0 m^3strage volume of Stormwater and Provide 85000 liters' capacity underground tank.

3.The cost of construction of tank is Rs 840262.this water use in dry season to irrigate the garden.

4. location of storage tank near the Gh-4 garden, because its use directly through pipe

REFERENCES

[1]."Wikipedia" https://en.wikipedia.org/wiki/Stormwater management.

[2] Wikipedia" https://en.wikipedia.org/wiki/Gandhinagar.

[3] "Google maps" https://maps.google.com /web/Gandhinagar

[4] Public Utilities Board(SG) "On Site Stormwater Detention Tank System"