



Design of Drainage System for Andheri Subway

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Abstract : The complete metropolis of Mumbai is 603.4 kilometers through landfills between seven islands North to South. The city is surrounded by using water on its 3 sides with a lot of the area close to the sea level. Mumbai is served by using five rivers viz. Mithi, Poisar, Dahisar, Oshiwara and Mahul which in the long run discharge in Arabian Sea. Mumbai gets rainfall for 4 months at some stage in June to September, in which 70% of the common rainfall is recorded in July and August. Mumbai suffers the extreme flood event every year which results in loss of lifestyles, monetary loss and cost-effective loss. The drainage structures of Mumbai build in British era are capable of coping with simplest 25mm of rainfall..

The Andheri Subway is also considered one of many places which get heavily flooded at some stage in the monsoon. Effective measures are had to be purposed to forestall the Subway from flood. Because of the flooding the road is closed ensuing into traffic and property damages of the nearby commercial areas. With the flood inclined region and the contemporary drainage lineage we are able to be designing a new drainage system for the Andheri Subway location by means of the usage of Stormcad..

Keywords - Andheri Subway, Drainage, Development, Floods

I. INTRODUCTION

1.1 General

Mumbai is the competitively priced capital of India and also the one of the in the main populated city of South Asian nations. With increasing urbanization the city is rising as a mega metropolis which additionally ends in several financial and social externalities and social issues like deforestation, water logging, traffic congestion, strong waste disposal, air and noise pollution and pollution of water bodies via business and business discharge. In Mumbai there are 5 rivers, but amongst them Mithi river is the most important one in concerning the typhoon water drainage because it separates the principle city from its outskirts. Over the years the invasion of land along the banks of the river has disrupted its route, even as untreated sewage, wastewater, business waste and rubbish from the encircling slums have clogged the river. Flooding because of rain is the main hassle for Mumbai city this is overflowed for many hours in particular because of drainage congestion.

Drainage System refers back to the gadget that is designed and followed to drain the excess water from the diverse areas of the city and different streets that gets occupied or logged because of the wrong drainage facility. Clogged water can pose a completely critical trouble within the urban regions where they do now not get enough soil as well as flowers and bushes to soak up it. It poses the 2 varieties of main problems for the town and they are flooding of such water on being collected in big quantities and the other trouble is the hazard of water pollutants that can be created excessive storage of this unabsorbed water.

1.2. Major flood event in selected area.

Despite of steady upward push in temperature after 2007 the Vulnerability assessment record of World Resource Institute India for Mumbai City indicates that there is substantial boom in intense rainfall in past 5 years. Because of these regions like Dadar, Worli and Andheri face a consistent chance of flooding because of heavy rainfall.

The motion plan organized by using WRI and BMC to counter this hassle makes a speciality of 6 most important attributes:

- 1) Sustainable Waste Management.

- 2) Urban Greening and Biodiversity
- 3) Urban Flooding and Water aid control
- 4) Building Energy performance
- 5) Air Quality
- 6) Sustainable Mobility.

Mumbai has seen on an average six heavy (64.5-a hundred and fifteen.5mm) five very heavy (one hundred fifteen.6-204.4mm) and four extremely heavy (204.Five mm) rain occasions consistent with yr. The most excessive rainfall ever obtained by means of Mumbai turned into on 26th July 2005 which delivered the town to standstill. The rainfall that acquired was 1000mm in 24 hours with an intense precipitation of 136mm according to hour. The flood precipitated around 500 fatalities and most important lack of property. The Andheri Subway turned into flooded recently this yr on twelfth June 2021. The town acquired 107mm of rainfall in 24 hours causing the flooding in regions. The Andheri subway is given the call as Saucer plate due to its constant flooding during monsoon.

1.3 Reason behind Flood.

Flood causes a huge loss of life and property. Waterborne diseases spread as a result of Floods causing health problems. Moreover, the destruction of roadways and infrastructure facilities, the disturbance of ecosystems, improper sewage systems all demand serious efforts of adopting sustainable measures.

There are many different reasons leading of flooding

- a) **Massive rainfall** :- Drainage systems and the effective infrastructure design aid during heavy rains. They help the drainage of excess water into reservoirs in an easy way. But in cases of heavy rainfall, the systems stop working.
- b) **Overflowing of the rivers**:-The people living along the river always have a risk of life from the overflowing of the Rivers. To prevent such a situation, a string of dams are built. However, if these dams are not managed properly, they may cause flooding and huge damage. e.g.; collapsed dams.
- c) **Deforestation**:-Deforestation is also a major cause of man-made flooding. Trees prevent soil erosion and also the loss of crops. The vegetation is also enriched as a result of more and more trees. This also blocks the massive flow of rain, thus preventing flooding.
- d) **Snowmelt**:- At the time of the high melting of snow due to heavy precipitation and other factors, the situation of flood arises.
- e) **Climate change**:-The climatic changes caused due to human practices also add to the risk of flooding. Human beings cut trees in a large number, thus affecting the process of photosynthesis. Thus increased level of carbon-di-oxide in the atmosphere cause changes in climate posing threats of natural disasters like floods etc.

1.4 Role of Drainage System in Flood Protection.

A) Floods are the most risky herbal disasters; they're ruled by means of different factors, consisting of rainfall traits, drainage systems, land use and water control in river basins. The idea of flood control must exchange due to urbanization, industrialization, and improvements in residing requirements, specially in rising nations Flood control usually relies upon on terrestrial traits and local geography, and consists of floodways.

B) The commonplace structural degree for flood protection in lowland or flood-susceptible regions is the building of dikes along rivers or major channels. In compliance with the idea of "room for river and those," a systematic technique to flood danger control is to apply the flood-inclined lowlands correctly. This results in flood defence prioritisation for protective people and assets, and additionally developing area for water storage and channel move-segment modification.

C) Overall, implementation of appropriate actions to decorate flood security is each viable and necessary to reduce the exposure and vulnerability of human beings and belongings to flood hazards. However, long-time period techniques for flood mitigation and manage problems ought to incorporate measures which are perceptibly incorporated with different aspects, which include socio-economics, subculture, nature and the surroundings. Therefore, public participation related to neighborhood communities represents a essential

framework of attention for the choice of control techniques and lengthy-time period methods of flood management.

1.5 Components of Drainage System.

A drainage system can be divided into three components:

1. **Field drainage system** :- A discipline drainage gadget is used to avoid ponding water and/or to manipulate the water desk in the subject. The foremost drainage system is used to carry the water away from the farm place. And the outlet is the point of safe disposal of the drainage water.
2. **Main drainage system** :- The primary drainage gadget consists of collector drains and a essential drain. A collector drain is a drain that collects water from the field drains and contains it to the primary drain for disposal. As area drains, collector drains can be both open or pipe drains. The fundamental drain is the principal drain of a place, it receives water from collector drains, diversion drains, or interceptor drain.
3. **Outlet** :- The outlet is the terminal factor of the whole drainage system, from wherein it discharges right into a river, lake, or sea. When the outer water tiers are excessive, drainage is probably water gathering inside the included location must be stored - in temporarily restricted. This method that the drainage the soil, in ditches, in canals, and or in ponding regions.

II. METHODOLOGY

The process of this project goes as follows:-

- Selection of Area
- Collection of data
- Understanding the current drainage system
- Finding the flood prone area
- Designing the drainage system by Stormcad

2.1. Selection of Area.

The purpose of this project is to design a drainage system which is effective in carrying out storm water into the outlet during heavy rains. The area that we need should be the one suffering with water logging the most times. The Andheri Subway gets flooded even with the moderate continuous rainfall. Some plans were purposed for the betterment of the Subway but were not brought into action. It is very much needed to design a drainage system and also to draw out a plan for the Andheri Subway to prevent the flooding from happening frequently.

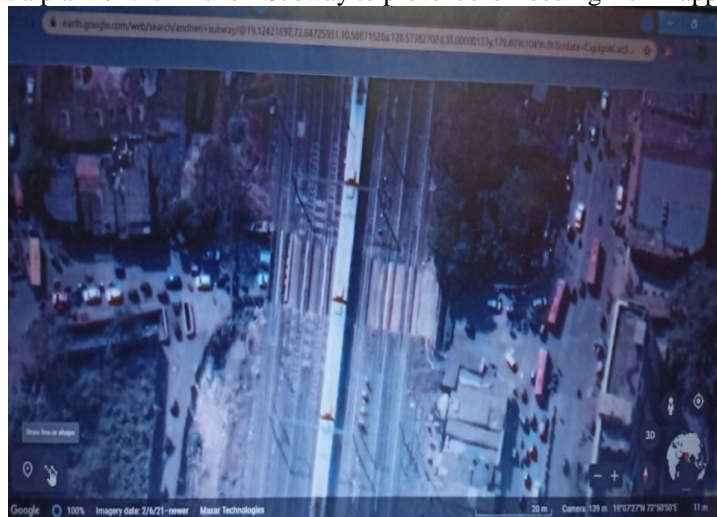


Fig 2.1 Satellite view of Andheri Subway

2.2. Collection of Data.

A preliminary survey is conducted on the selected area to note down some specifications, also by analyzing the data provided by MGCM.

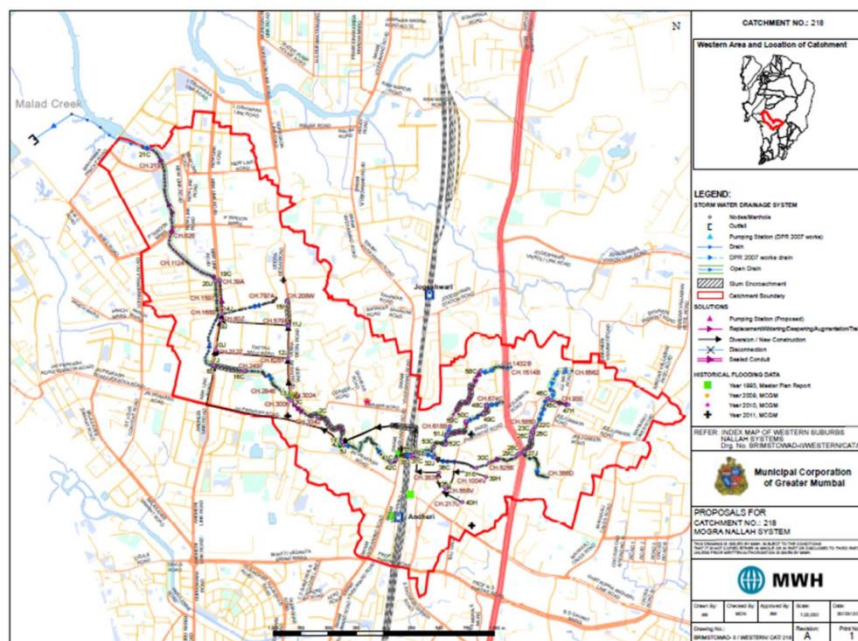


Fig 2.2 Catchment map provided by MCGM/SWD

2.2.1 Catchment Details.

This system serves the area between Andheri and Jogeshwari Railway Station and from Western hills (Malpa Dongri) to Versova.

The pumping station is purposed at the Outfall named as Morga Nulla Storm Water Pumping Station.

TABLE 2.1: Basic Statistics

1	Total Contributing Area	743 Ha.
2	Topography	Sloping towards Malad Creek, ground levels varying from 50.90 m at the head of the system to 27.84 m THD
3	Type of Drains	Open Nullah
4	Total Length of Network	17,320 m
5	Minimum and Maximum Dimensions of Drains	1.50 m to 51.00 m Width
6	Receiving Water Body	Malad Creek
7	Invert of Outfall	23.60 m THD

TABLE 2.2: Works identified/executed from 58 works

Sr. No.	Name of Nullah	From		To		Nodes	
		Width (m)	Depth (m)	Width (m)	Depth (m)	From	To
1	Mogra Nullah system in K/E & K/W ward	-	-	39.00-49.00	5.00-7.00	N.A.	

2.3 Understanding the Current Drainage System.

2.3.1 Specifications of the Drainage.

TABLE 2.3: Table of Specifications

Sr. No	Specifications	Total units
1.	Manholes	20
2.	Inspection Chamber	9
3.	Box Drain	2

2.3.2 Rainfall Data.

Andheri received an average of 794.25mm rainfall in the seasonal months of 2021. The most rainfall received by the city was in July that is 1317.50mm and an approximate of 31 days a month in year 2020.

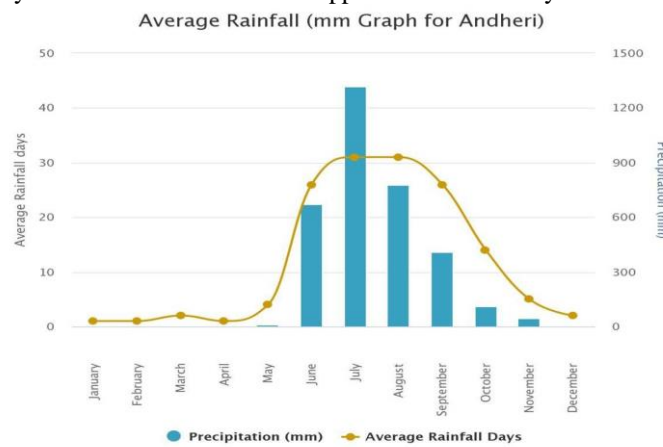


Fig 2.3 Graph for Average Rainfall

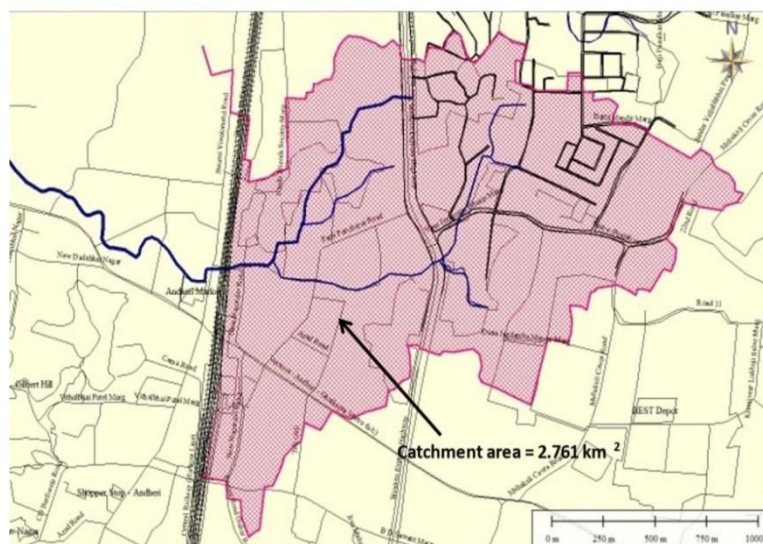


Fig 2.4 Catchment area computed as 2.761 km²

2.4 Designing of Drainage System by Stormcad.

After analyzing the data of the current drainage system, we will rule out the requirements for the area and plan and design the new drainage system according to it.

III. CONCLUSION.

As the city continues on developing specifically within the urban regions, rainfall can cause numerous issues. To keep away from any water logging an excellent drainage device is essential for a place. After designing a sufficient drainage system to save you the location from water logging it will likely be beneficial to the citizens.

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