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STORM WATER MANAGEMENT USING BIOSWALES

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Abstract- *Storm water management means to manage surface runoff. It reduces or eliminates the negative impact of Storm water runoff and also includes controlling flooding and reducing choking of drain and reducing the load of treatment. This Strategy is already in use at the New York City to planning of prevents the impacts of Storm water. The rain water flowing over the ground surface has no impurity, it flows by gravitational force and discharges in near lake or river via drains. Storm water run-off gets polluted on Ground surface also contain pollutants such as vehicle dropping oil and grease, metal, sediments, nitrogen, trash, phosphorus, pesticides, bacteria and other. Also urbanization reduce the infiltrate land its causes of the flooding it occurs scouring and water logging problem. In this study to planning of use Bioswales as green infrastructure to prevent impact of Storm water and reduce the load from treatment plants and infiltrate into ground. This study is to collect the past year rainfall data and calculate runoff volume. Then after to identify area of problem and suggest type of bioswale.*

Key words: Bioswales, Green infrastructure, Storm water management, drain, highway, etc

1. INTRODUCTION

Green infrastructure has emerged as a viable option for urban storm water management combining reductions in runoff volume and pollutant concentrations, green infrastructure has been successfully introduced into separate and combined sewer areas to decrease storm water pollution and combined sewer overflows. Because green infrastructure uses vegetation, soil, and other innovative materials, these water quality benefits are complemented by additional environmental benefits including improved air quality, reduced urban temperatures, energy savings, aesthetic improvements, and a Potential strategy for reducing carbon footprints. The ability of green infrastructure to provide a framework for sustainable infrastructure provide multiple environmental benefits allows municipalities to use limited economic resources more efficiently and management. The Green Infrastructure Approach for Drainage and Storm Water Management has the key Components: Build Cost Effective Infrastructure Optimize the existing Waste Water System. CoatiaRuogit from Impervious surfaces through Green Infrastructure. Replenish the Ground Water through Installation of Bioswales the Public Right-of-Way includes sidewalks. Parking lanes medians and the roadways, It makes up to 30% of the impervious cover the city generates storm water runoff during rain. Bioswales are linear channels designed to concentrate and convey storm water runoff while removing debris and pollution. It is also useful in recharging groundwater.

2. LITERATURE REVIEW

1) GREEN INFRASTRUCTURE FOR URBAN STORMWATER MANAGEMENT:

Chris Kloss (year 2008):-Green infrastructure has emerged as a viable option for urban stormwater management. Green infrastructure uses vegetation, soil, and other innovative materials, these water quality benefits are complemented by additional environmental benefits including improved air quality, reduced urban temperatures, energy savings, aesthetic improvements, and a potential strategy for reducing carbon footprints.

2) BIOSWALES AND GREEN INFRASTRUCTURE (Lauren Wilmoth lnw28@pitt.edu, Katherine Lebrun kbl15@pitt.edu, Matthew Jaros mcj29@pitt.edu):-

Discuss and analyze the process of water purification through a bioswale, as well as the effects this has on the surrounding environment. This method of purification can be very beneficial to urban areas, as bioswales can combat flooding, and the plants inside are able to purify water as well as capture carbon dioxide from the air.

3) Green Infrastructure Approaches to Control of Combined Sewer Overflows Rajesh Rajan, 2Marc Cammarata, P.E., 3James T. Smullen, Ph.D., P.E., 1Dwayne Myers, P.E., Gary D. Martens, 1Shannon K. Reynolds (2008) :-

The goal is to restore the water environment in the Cityof Philadelphia and the surrounding areas, while achieving regulatory compliance in a cost-effective manner. This paper explains the hydrologic modeling used to design the approach and quantifies potential benefits of stormwater management and green infrastructure in one of the three highly urbanized drainage districts. The results indicate that a significant reduction in stormwater volume can be achieved by requiring stormwater controls for redevelopment and through implementation on public lands.

4) Understanding bioswale as a small water and wastewater treatment plant:
Joshua Lelemia Irvine, Albert S. Kim (2018):-

Storm water threats can be mitigated with the application of sustainable and renewable technologies such as low-impact development (LID) and best management practice (BMP). A discussion of a coherent analogy between the bioswale and a conventional water and wastewater treatment plant (WWWTP) is presented without including biological processes. A discussion of a coherent analogy between the bioswale and a conventional water and wastewater treatment plant (WWWTP) is presented without including biological processes .Fluid dynamic aspects consist of runoff, overland, infiltration and discharge flows. The mass transfer phenomena reviewed include sedimentation of suspended particles, conventional filtration of fine particles, and removal of organic and inorganic pollutants because unsteady variations of (micro) biological processes are theoretically challenging and more importantly chemical, physical and fluid dynamic conditions provide basic conditions to the biological process.

5) Infrastructure, and Sustainability:

Christopher M. Chini 1, James F. Canning 1, Kelsey L. Schreiber 1, Joshua M. Peschel 2,* and Ashlynn S. Stillwell 1(2017):-

Green infrastructure is a unique combination of economic, social, and environmental goals and benefits that requires an adaptable framework for planning, implementing, and evaluating. In this study, we propose an experimental framework for policy, implementation, and subsequent evaluation of green stormwater infrastructure within the context of sociotechnical systems and urban experimentation. Sociotechnical systems describe the interaction of complex systems with quantitative and qualitative impacts. Urban experimentation—traditionally referencing climate change programs and their impacts—is a process of evaluating city programs as if in a laboratory setting with hypotheses and evaluated results. Results indicate that green infrastructure plans should incorporate community involvement and communication, evaluation based on project motivation, and an iterative process for knowledge production. Identified three important needs for green infrastructure experimentation: (i) a fluid definition of green infrastructure in policy; (ii) maintenance and evaluation components of a green infrastructure plan; and (iii) communication of the plan to the community.

3. METHODOLGY

This paper combines academicals articles and conference proceedings by keyword searching and original content and data from official web sites of Bioswales, from New York City.

The method of this paper consists of five elements;

1. Bioswales aren't located just anywhere along the sidewalk. Instead, they are often built very dose to catch basins. Bioswales are primarily constructed just upstream of the catch basins so that by design they can partially collect the storm water flowing down the street and sidewalk before it goes into the catch basin and ends up in the sewer system. By partially catching storm water in the Bioswale first, this water is used as a resource to help trees and plants, rather than going into an overwhelmed sewer system.

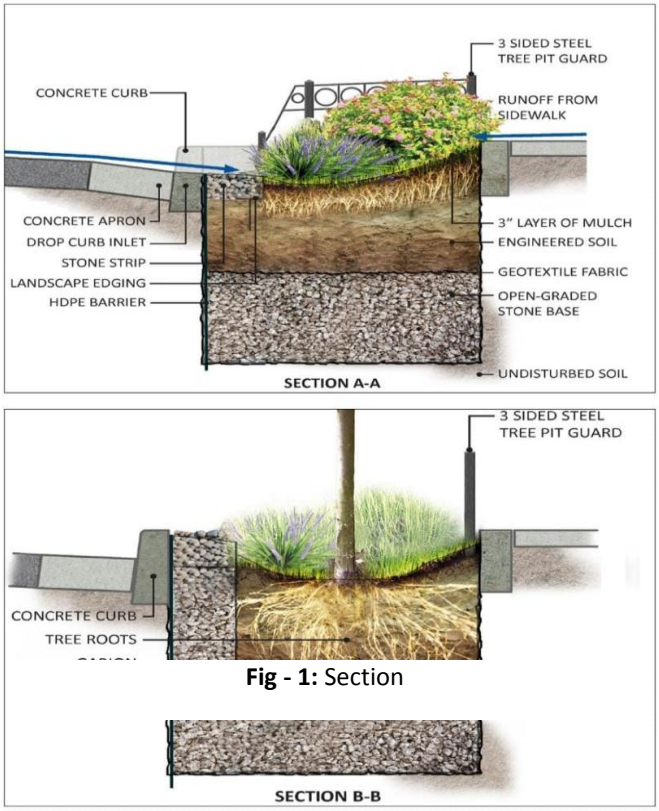

Fig - 1: Section

2. There are different standard sizes for Bioswale beds and they are usually filled with one tree and different types of plants and shrubs. The tree and plants are carefully chosen so they can survive on a busy City street and absorb a lot of storm water. These plants also don't mind when storm water stands for a short time in the slight depression at the center of the Bioswale.

3. EachBioswale has a short metal fence, known as a tree guard that goes along three sides of the planting bed. These tree guards are not just for decoration, they also

protect the Bioswale from people (and dogs!) that may accidently walk inside of the bed and damage the plantsalsohave an inlet which one it rainsthecurb cut that is farthest away from the catchdown the street into the Bioswale.

4. Bioswales You can tell basin. When is the inlet because it is and an outlet which are openings or "curb-cuts"- in the curb. This inlet lets the water flowing is the course closest to the catch basin. If there is a very intense windstorms, or if it rains for a long time, the Bioswale may fill to its capacity. At those times the outlet lets excess water flow can flow into the catch basin the way it normally would.

5. Bioswales also have a one foot wide strip of small stones along the curb to protect the plants from car doors.

4. CONCLUSION

There is no solution that can single-handedly replace gray infrastructure, but our research shows that when paired with other sustainable methods, Bioswales have the potential to replace and improve upon man-made methods of water purification. Gray infrastructure cannot sustain the planet's rapidly growing population indefinitely. Eventually, resources will be depleted, costs will be too high, and construction space will be too scarce for man-made solutions to water filtration to be effective. Luckily, Bioswales and green infrastructure are low-cost, require a small number of resources, and can be constructed in nature without disturbing delicate ecosystems or displacing local population. The only maintenance required is regular mowing (if grasses are planted in the bioswale) and litter removal.

- It may Protect local waterways from storm water pollutants.
- It can Reduce pollution by filtering storm water.
- Can be helpful to reduce standing water (puddles) that can attract mosquitoes.
- Can create colorful gardens with a variety of flowers and plants year round.
- As per our research requires little maintenance after establishment.

2) Implementation of Bioswales, as all life needs access to clean water to survive. The key to constructing effective and beneficial green infrastructure understands the environment in which it will be constructed. Types of green infrastructure that use plants to purify water should only be implemented in areas where the plants are native to avoid invasive species and ensure effectiveness. These plants then act as food sources for the local wildlife, reinforce biodiversity in the ecosystem, and work efficiently to rid water sources of pollution and other contamination. At present, Bioswales are not completely replacing gray infrastructure, but can improve systems of water filtration that are already being used in urban areas. Previous examples of water contamination show that gray infrastructure alone does not function with the efficiency needed to combat pollution in an industrial society. Bioswales make gray infrastructure more efficient and work to mitigate its harmful effect on the environment. When manmade systems flood or reach capacity, Bioswales protect our water sources from unfiltered and hazardous wastewater by collecting and purifying it. As more Bioswales are implemented, they can ease the load of gray infrastructure. It is possible that eventually, Bioswales and other forms of green infrastructure can be implemented widely enough that gray infrastructure is gradually replaced. This is the ultimate goal to create a more sustainable and secure future for generations to come.

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