

Stormwater System Capacity

Marsh Creek Watershed Study

Model Overview

A computer model was developed for the stormwater system in the Marsh Creek watershed using the United States Environmental Protection Agency (USEPA) Stormwater Management Model (SWMM) platform. The watershed model includes the major pipes and channels within the primary conveyance system.

The model was used to determine the hydraulic capacity of the stormwater system, which is its ability of the stormwater system to convey a range of stormwater events. It was also used to evaluate the frequency and severity of potential flooding impacts to structures, such as homes and other buildings, and roadways in the study area extent. This evaluation was based on the City's flooding level of service (LOS) criteria.

Model Results

Hydraulic capacity was evaluated for seven design storm return intervals: 1-year, 2-year, 10-year, 25-year, 50-year, 100-year, and 500-year. The model results indicate that 53 percent of the modeled stormwater system does not meet the desired LOS. This figure shows three key pieces of information developed from this analysis:

1. Modeled Flooding Extents - the modeled extents of flooding for a given storm return interval.
2. Potential Structure Impacts – structures (homes, businesses, etc.) that may be impacted by flooding for up to the 100-year event.
3. Stormwater System LOS – each modeled pipe or culvert was labeled with 'Yes' or 'No'. 'Yes' indicates it meets the desired LOS, and 'No' indicates it does not meet the desired LOS.

Storm Return Interval

Storm return interval, also known as recurrence interval, is a measure of how often a certain magnitude of storm is expected to occur at a given location.

A 100-year storm event is a storm that has a one in 100, or 1% chance of occurring or being exceeded in any given year. It is not a storm that occurs exactly once every 100 years. Rather, it is a statistical term that describes the probability of a storm of a certain magnitude. Similarly, a 10-year storm event is an event that has one in ten, or 10% chance of occurring in a given year.

Storm return intervals are used in stormwater system modeling to understand potential risk of flooding and are also used to design infrastructure to minimize the risk of flooding to a particular storm recurrence interval.

Level of Service

The City of Raleigh has Level of Service criteria for stormwater infrastructure built as part of new construction, which are detailed in the Unified Development Ordinance (UDO) and the Stormwater Design Manual. Because much of the Marsh Creek watershed was developed prior to these standards, a modified version of these criteria--referred to as the desired LOS--was used to evaluate the hydraulic capacity of existing stormwater infrastructure for this study. The desired LOS is met based upon whether the storm return interval can be retained within the stormwater infrastructure before flooding may occur.

Legend

- Pipe Meets LOS
 - No
 - Yes
- Culvert Meets LOS
 - No
 - Yes
- Potentially Impacted Structures
- Modeled Flood Extent
 - Storm Return Interval
 - 1 Year
 - 25 Year
 - 100 Year
- Watershed Boundary
- Area Outside of Corporate Limits

