

Precipitation in Lincoln, NE

Daily precipitation data of the Lincoln Municipal Airport weather station was obtained through the High Plains Regional Climate Center (HPRCC) for the purpose of conducting this rainfall analysis. The records are also kept by the National Weather Service through the National Climatic Data Center. The Lincoln Airport station (COOP 254795) is part of the National Weather Service (NWS) Cooperative Station Network. NWS Cooperative Summary of the Day, DS3200 was used as it contains 24-hour precipitation totals consistently back to September of 1972. For this analysis daily precipitation totals from 1973 to 2011 were used to develop a precipitation frequency relationship.

Rainfall Analysis

A rainfall frequency analysis was conducted using procedures from the EPA (*Technical Guidance on Implementing the Stormwater Runoff Requirements for Federal Projects under Section 438 of the Energy Independence and Security Act, 2009*). The 24-hour daily precipitation totals represent precipitation events. These precipitation events were then summarized to only include those that produce runoff. First, rainfall events of 0.1 inches or less were excluded since these small events generally do not produce any measurable runoff. Similarly, days that had recorded snowfall were eliminated from the analysis as snowfall does not produce immediate runoff. The figure below shows the results of the analysis. The graph describes the relationship between the rainfall depth and corresponding percentage of rainfall events that don't exceed it for the time period. The

90th percentile rainfall depth was derived from these results.

90th Percentile Rainfall Depth

The 90th percentile rainfall depth represents the depth of rainfall which is not exceeded in 90 percent of all runoff producing rainfall events within the time period analyzed. In other words 90 percent of the rainfall storm events that produce runoff will be less than or equal to this depth. It was found for Lincoln the 90th percentile rainfall depth is 1.25 inches, similarly the 95 percent rainfall depth is 1.65 inches. The rainfall depth corresponds directly to rainfall volume (not the same as runoff volume) when applied over an area. For example the 90% rainfall depth applied over 100 Acres equates to 10.4 Acre-Feet.

Summary

One possibility is that a volume based storm event equal to the 90th percent rainfall depth of 1.25 inches be used as the Water Quality Control Volume (WQCV) threshold to capture and treat water quality in stormwater runoff. This approach is simple to understand and easily implemented. It ensures the majority of runoff volume from 90 percent of the storms consists of cleaner water for the site and downstream resources in the short and long term. The 90 percent depth is commonly recognized to maximize the cost of control and water quality benefits, as graphically portrayed by the upward inflection of the curve. The rainfall based criteria also incentivizes limiting impervious areas and promotes green infrastructure.

Other References

- EPA's Section 438 Technical Guidance (2009) recommends control of the 95th percentile storm.
- The Stevens Creek Watershed Masterplan (2005) calculated the 90 percent rainfall depth to be 1.3 inches and subsequently recommended its use for calculating the Water Quality Control Volume for structural BMP's.

