SECTION 5

Rainfall Analysis

Rainfall patterns were analyzed to identify representative characteristics appropriate for the design of a cost-effective and reliable stormwater drainage system for the City of McMinnville. The resulting design storms were used to model stormwater runoff (described in Section 6) and perform hydraulic analysis of the stormwater drainage system (described in Section 7).

5.1 Review of Design Storm Development Approaches

Three alternative approaches for developing a design storm for the City of McMinnville were evaluated:

- Synthetic storm developed from intensity-duration-frequency (IDF) curves and rainfall distribution curves
- Historical storm from (1) frequency analysis of historical runoff, (2) continuous simulation and frequency analysis of resulting runoff, or (3) frequency analysis of rainfall events
- Synthetic storm based on a single design parameter (peak intensity)

The advantages and disadvantages of these approaches are discussed in the *Design Storm Review and Recommendation for Stormwater Master Plan Technical Memorandum* (CH2M HILL, 2007) provided in Appendix A.

From this review, it was recommended that the City continue to use a 24-hour synthetic storm developed from National Oceanic and Atmospheric Administration (NOAA) isopluvial maps and the NRCS Type 1A rainfall distribution. The 24-hour, Type 1A storm distribution produces large peak runoff in the major drainage ways (compared to other common rainfall distributions) and it is the most commonly used distribution for the region surrounding McMinnville.

However, for analyzing and designing facilities for small project areas (less than 25 acres), it is recommended to use the Rational Method and peak rainfall intensities from the ODOT IDF curves.

5.2 Design Storm Precipitation Depths

The NOAA isopluvial maps are a reliable and readily available source for 24-hour precipitation depths. The total 24-hour precipitation depth estimates for various frequency events are shown in Table 5-1.

TABLE 5-1
Total 24-Hour Precipitation for Select Recurrence Intervals
City of McMinnville Storm Drainage Master Plan

Recurrence Interval	24-hr Precipitation (inches)
2-Year	2.6
10-Year	3.8
25-Year	4.2
50-Year	4.7
100-Year	5.2

* Source: NOAA Isopluvial Maps.

5.3 Development of Rainfall Hyetographs

Using the total 24-hour precipitation, design hyetographs were developed for the various frequency events by applying the NRCS Type 1A rainfall distribution curve. The resulting rainfall hyetographs are shown in Figure 5-1. Rainfall hyetographs are used as input for the HEC-HMS computer model, which uses the distribution of rainfall over time to compute runoff from the basin of interest.

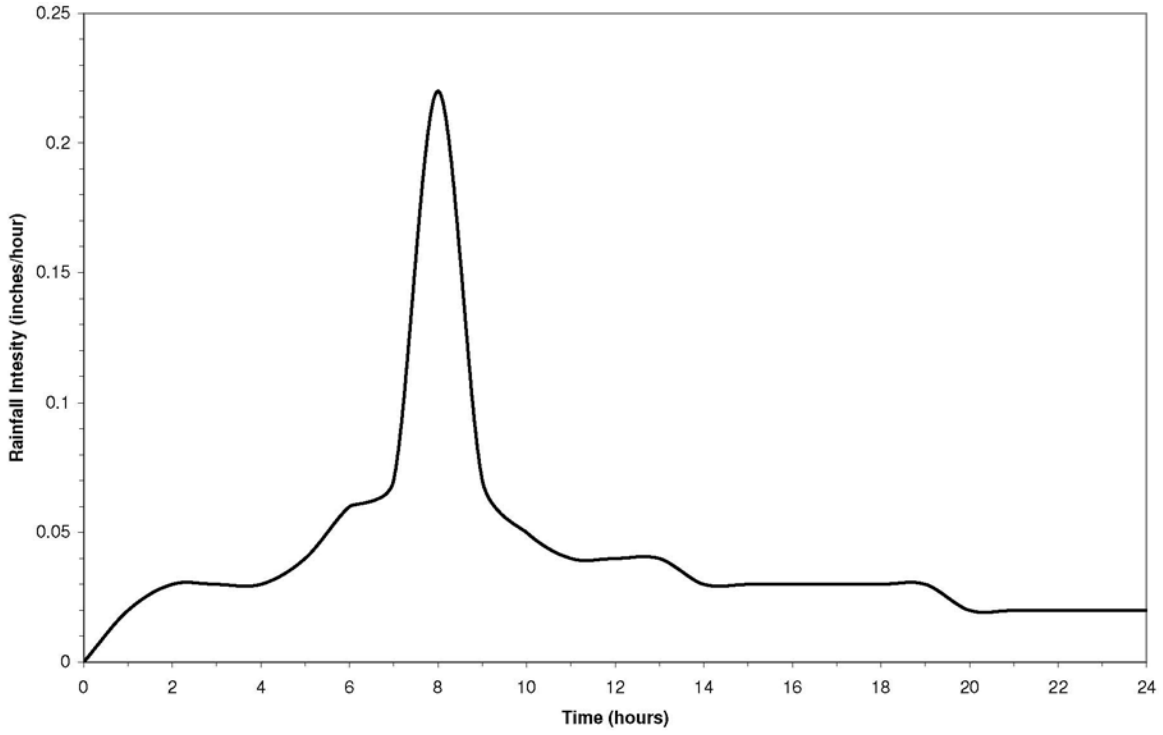

FIGURE 5-1
Unit Design Storm Distribution
NRCS Type 1A, 24-hour Event, Depth = 1 inch
City of McMinnville Storm Drainage Master Plan