

2.4.2 Time of Concentration

A. Sheet Flow. Sheet flow is shallow flow over land surfaces, which usually occurs in the headwaters of streams. The engineer should realize that sheet flow occurs for only very short distances, especially in urbanized conditions. Sheet flow for both natural (undeveloped) and developed conditions should be limited to a maximum of 100 feet. Sheet flow for developed conditions should be based on the actual pavement or grass conditions for areas that are already developed and should be representative of the anticipated land use within the headwater area in the case of currently undeveloped areas. In a typical residential subdivision, sheet flow may be the distance from one end of the lot to the other or from the house to the edge of the lot. In some heavily urbanized drainage areas, sheet flow may not exist in the headwater area. The NRCS method employs equation 2-3, which is a modified form kinematic wave equation, for the calculation of the sheet flow travel time.

$$T_t = 0.0070.42(nL)^{0.8}/[(P_2)^{0.5}s^{0.4}] \quad (\text{Eq. 2-3})$$

Where,

T_t = Sheet flow travel time in minutes

L = Length of the reach in ft.

n = Manning's n (see Table 2-2)

P_2 = 2-year, 24-hour rainfall in inches (see Table 2-3)

s = Slope of the ground in ft/ft