# ANALYSES OF PRECIPITATION-FREQUENCY AND STORM CHARACTERISTICS FOR THE CITY OF SEATTLE

Prepared for:

**Seattle Public Utilities**

By:

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Table 5 – Intensity-Duration-Frequency Values for Durations from 5-Minutes through 180-Minutes for Selected Recurrence Intervals for the Seattle Metropolitan Area

| DURATION (minutes) | PRECIPITATION INTENSITIES (in/hr) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | RECURRENCE INTERVAL (Years) | | | | | | | |
| | 6-Month | 2-YR | 5-YR | 10-YR | 20-YR | 25-YR | 50-YR | 100-YR |
| 5 | 1.01 | 1.60 | 2.08 | 2.45 | 2.92 | 3.08 | 3.61 | 4.20 |
| 6 | 0.92 | 1.45 | 1.87 | 2.21 | 2.62 | 2.76 | 3.23 | 3.75 |
| 8 | 0.80 | 1.24 | 1.59 | 1.87 | 2.21 | 2.32 | 2.71 | 3.13 |
| 10 | 0.71 | 1.10 | 1.40 | 1.64 | 1.93 | 2.03 | 2.36 | 2.72 |
| 12 | 0.65 | 1.00 | 1.27 | 1.48 | 1.74 | 1.82 | 2.11 | 2.43 |
| 15 | 0.58 | 0.88 | 1.12 | 1.30 | 1.52 | 1.60 | 1.84 | 2.11 |
| 20 | 0.50 | 0.75 | 0.95 | 1.10 | 1.28 | 1.34 | 1.54 | 1.76 |
| 25 | 0.45 | 0.67 | 0.84 | 0.97 | 1.12 | 1.18 | 1.35 | 1.53 |
| 30 | 0.41 | 0.61 | 0.76 | 0.87 | 1.01 | 1.05 | 1.21 | 1.37 |
| 35 | 0.38 | 0.56 | 0.69 | 0.80 | 0.92 | 0.96 | 1.10 | 1.24 |
| 40 | 0.35 | 0.52 | 0.64 | 0.74 | 0.85 | 0.89 | 1.01 | 1.14 |
| 45 | 0.33 | 0.49 | 0.60 | 0.69 | 0.79 | 0.83 | 0.94 | 1.06 |
| 50 | 0.32 | 0.46 | 0.57 | 0.65 | 0.74 | 0.78 | 0.88 | 0.99 |
| 55 | 0.30 | 0.44 | 0.54 | 0.61 | 0.70 | 0.73 | 0.83 | 0.94 |
| 60 | 0.29 | 0.42 | 0.51 | 0.58 | 0.67 | 0.70 | 0.79 | 0.89 |
| 65 | 0.28 | 0.40 | 0.49 | 0.56 | 0.64 | 0.66 | 0.75 | 0.84 |
| 70 | 0.27 | 0.38 | 0.47 | 0.53 | 0.61 | 0.64 | 0.72 | 0.80 |
| 80 | 0.25 | 0.36 | 0.43 | 0.49 | 0.56 | 0.59 | 0.66 | 0.74 |
| 90 | 0.24 | 0.33 | 0.41 | 0.46 | 0.52 | 0.55 | 0.62 | 0.69 |
| 100 | 0.22 | 0.32 | 0.38 | 0.43 | 0.49 | 0.51 | 0.58 | 0.64 |
| 120 | 0.20 | 0.29 | 0.35 | 0.39 | 0.44 | 0.46 | 0.52 | 0.57 |
| 140 | 0.19 | 0.26 | 0.32 | 0.36 | 0.40 | 0.42 | 0.47 | 0.52 |
| 160 | 0.18 | 0.24 | 0.29 | 0.33 | 0.37 | 0.39 | 0.43 | 0.48 |
| 180 | 0.17 | 0.23 | 0.27 | 0.31 | 0.35 | 0.36 | 0.40 | 0.45 |

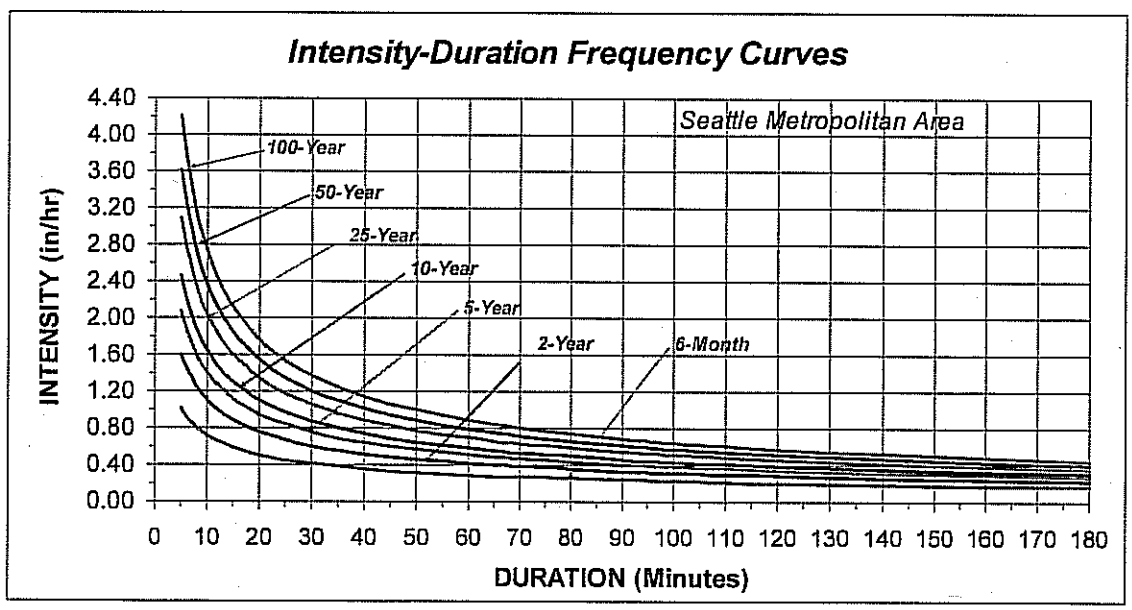


Figure 15a – Intensity-Duration-Frequency Curves for the Seattle Metropolitan Area

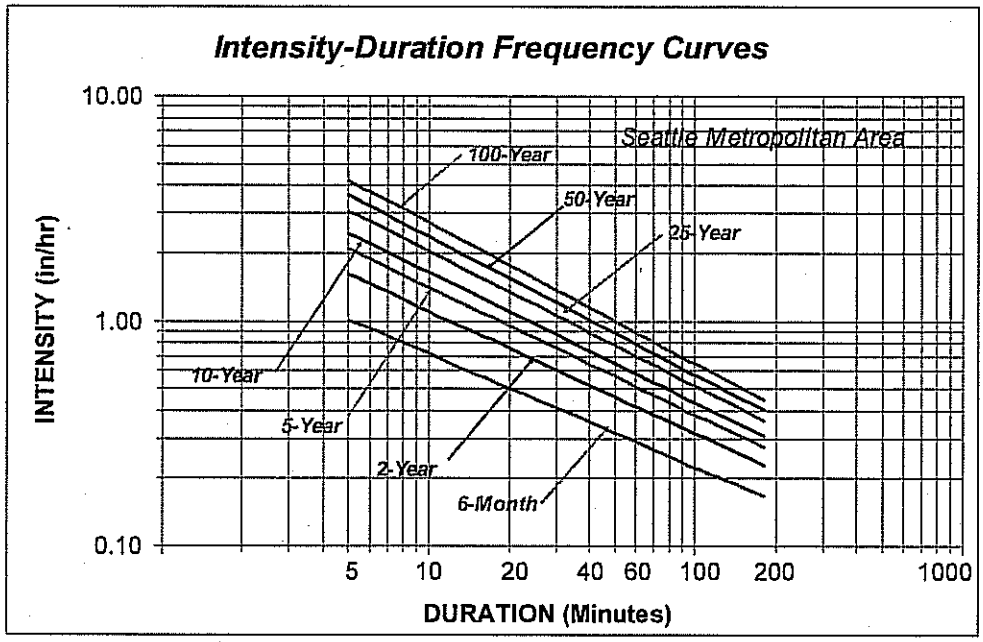

Figure 15b – Intensity-Duration-Frequency Curves for the Seattle Metropolitan Area

## SPATIAL DISTRIBUTION OF 6-HOUR THROUGH 7-DAY PRECIPITATION

Homogeneity of at-site means was examined in the prior section. From those analyses it was concluded that the Seattle Metropolitan Area was heterogeneous regarding at-site mean values for durations of 6-hours and greater. Heterogeneity of the at-site means results in variation of precipitation-frequency values across the City of Seattle for durations of 6-hours and greater. The existence of this heterogeneity requires that the spatial distribution of precipitation be described for durations of 6-hr, 12-hr, 24-hr, 48-hr, 72-hr and 7-days.

Description of the spatial distribution of precipitation across the City is accomplished by developing gridded datasets of at-site mean values for each of the various durations. These gridded at-site mean datasets may then be used with the appropriate regional growth curve for each duration (Figure 2), Equations 2a, 2b, and 3 and distribution parameter values for the GEV distribution (Table 4), to developed gridded precipitation datasets for any selected recurrence interval for a given duration. These gridded datasets can then be used in GIS applications for preparing precipitation-frequency isopluvial maps.

Gridded datasets are provided in ASCII text files on a compact disc (CD) that is included as part of the deliverables for this project. They may be viewed with any standard electronic text editor. They may also be imported into any standard electronic spreadsheet or converted to a raster file for importing into spatial mapping software such as *ArcGIS* by ESRI.

### Gridded Dataset for 24-Hour At-Site Mean Values

Gridded datasets of the at-site mean values were developed in several steps. First, a comparison was made between the observed values of the 24-hour at-site means for the collection of gages (Tables 1a,b,c) and corresponding values of the 24-hour at-site means contained within the WSDOT[19] 24-hour gridded dataset for the gage locations (Figure 16). The results of this comparison are shown