

### Primary Regression Equations

The regression equations have been updated to include the latest gaged data for Delaware and the surrounding area. The new regression equations should be used for all projects within the window of applicability, as part of the development of the design storm.

The regression equations report as well as a program called StreamStats to assist with the calculations of the basin characteristics can be found at;

<http://water.usgs.gov/osw/streamstats/delaware.html>

A MathCAD template was developed to run the regression equations and urban equations at various confidence intervals. The MathCAD can be found on the DRC website.

### Future Development Procedure

For primary regression equations with Percent Impervious as a variable, adjust that variable for future development in accordance with section 3.1.1 of the Bridge Design Manual.

Otherwise, use Urban equations for existing watershed. Determine future development conditions of the basin in accordance with section 3.1.1 of the Bridge Design Manual. Use Urban equations for ultimate conditions watershed. Determine percent increase. Use primary regression equations for existing watershed conditions. Adjust for the appropriate confidence interval. Increase adjusted flood flows, using percent increase found with sub equations to determine the design storm.

In either case, variables should stay within the window of applicability given for each set of equations.

### Confidence Intervals

	Design Frequency (Years: Confidence Interval)	
	Bridges (Over 20 foot span)- 2	Pipes and Culverts-1
Interstates and Freeways	50:90	50:67
Principal Arterials and Minor Arterials	50:75	50:67
Major Collectors and Minor Collectors	50:67	50:50
Local Roads and Streets and Subdivision Streets	25:50	25:50

Note:

1 – Greater than 20 s.f.

2 – Span determination includes total out-to-out length of multiple pipe installations.

3 – Confidence Intervals given in Bridges column apply only to bridges. All culverts, regardless of number and size shall use confidence intervals given in Pipes and Culverts column.

The engineer is given leeway for adjusting design frequency and/or confidence interval to account for special circumstances as warranted for individual projects based on risk/failure analyses.