HSIP Site Selection Process

DelDOT uses the Critical Ratio methodology to identify high crash locations for all Highway Safety Improvement Program components. The Critical Ratio method (also known as the Rate Quality Control Method) uses a statistical test to determine whether the crash rate at a particular location is significantly higher than a predetermined average crash rate for locations of similar characteristics. The statistical tests are based on the commonly accepted assumption that the occurrence of crashes approximates the Poisson distribution. In this method, the Crash Rate (CR) at a given location is compared to a Critical Crash Rate (CCR), which is based on the average statewide crash rate for the roadway type.

The first step in the Critical Ratio method is to determine Average Crash Rates for different roadway types throughout the state. All roadways included in DelDOT's linear reference milepoint system are divided into functional classifications, urban and rural categories, and two-lane, multi-lane divided, and multi-lane undivided categories. The total of these different roadway types is fifteen (15). After these 15 different roadway types are defined, Average Crash Rates (ACR) for each roadway type are calculated using the following formula:

$$ACR_t = \frac{N_t x 10^6}{L_t x AADT_t x 1095}$$

where:

ACR_t = Average Crash Rate for roadway type "t" per million vehicle-miles traveled
N_t = Total number of crashes in roadway type (3 year period)
L_t = Total length in miles of roadway type
$AADT_t$ = Average Annual Daily Traffic of roadway type (3 year average)
1095 = Number of days in 3-year period

Critical Crash Rates (CCR) for each 0.30 mile segment of roadway are then calculated using the following formula:

$$CCR = ACR_t + K\sqrt{\frac{ACR_t x 10^6}{AADT_s x 1095}} + \frac{10^6}{2 x AADT_s x 1095}$$

where:

ACR_t = Average Crash Rate for Roadway Type
$AADT_s$ = Average Annual Daily Traffic of each roadway section
K = 1.645 (95% Confidence Level)
1095 = Number of days in 3-year period

Critical Crash Rates (CCR) are a statistical test of the significance of the calculated crash rate for each section of roadway. Their values vary as the AADT changes.

A Crash Rate (CR) for any chosen road section is then computed using the following formula:

$$CR_s = \frac{N_s x 10^6}{L_s x AADT_s x 1095}$$

where:

CR_s = Crash Rate for roadway section
N_s = Total number of crashes in section (3 year period)
L_s = Length of section (0.30 miles)
$AADT_s$ = Average Annual Daily Traffic in section (3 year average)
1095 = Number of days in 3-year period

Lastly, the Critical Ratios are calculated as follows:

$$\text{Critical Ratio} = \frac{CR_s}{CCR}$$

Critical Ratios equal to or greater than 1.0 indicate a location with a crash rate that is statistically significantly greater than other similar roadways.