

## MEMO: Methodology for Identifying Top 40 High-Crash Intersections

*(Disclaimer: MORPC conducts its analyses only on local arterial roads, excluding freeway, freeway-look-alike, and ramp locations)*

MORPC identifies the top high-crash intersections for a given 3-year period in a two-step process: 1) Analyzing the crash frequency for all intersections in the transportation planning area; and 2) Ranking the top 100 locations based on three criteria (crash frequency, crash severity, and crash rate).

Step 1 is conducted by using GIS to calculate the number of crashes within a 250 foot radius of each arterial intersection (see Figure 1). Applying this method provides an initial set of high-crash locations based on frequencies. The top 100 intersections by frequency are then examined to ensure accuracy. Any crashes that are clearly not related to an intersection are excluded. This process results in a slightly modified list of the top 100 locations. In step 2, the locations on this list are then ranked by crash frequency, crash severity, and crash rate utilizing current estimated traffic volumes (see Table 1).

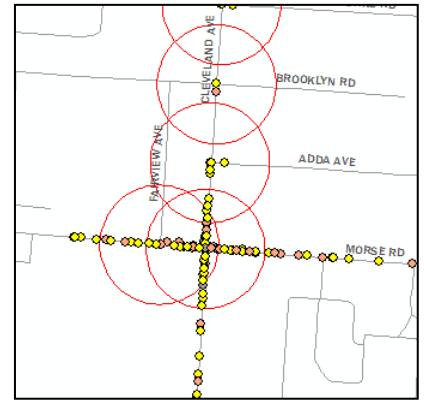


Figure 1 - 250-foot buffers drawn around each intersection

### Table 1: Methodologies used for ranking intersections

**Crash frequency** is defined as the total number of crashes occurring at each intersection.

$$\text{Crash Frequency} = N \quad N = \text{Total number of crashes at the particular location}$$

The **Severity Index** indicates the crash severity at a given intersection. Crashes are weighted according to their severity level, with fatal crashes being the most severe, followed by injury crashes and property-damage only (PDO) crashes. The following equation is used to weight crashes of various severity levels:

$$\text{Severity Index} = \frac{12 * F + 3 * I + 1 * PDO}{N}$$

$F$  = Total number of fatal crashes at the particular location  
 $I$  = Total number of injury crashes at the particular location  
 $N$  = Total number of crashes at the particular location

**Crash rate** (per million entering vehicles) takes into account the total number of crashes compared to the average daily traffic volume entering the intersection.

$$\text{Crash Rate} = \frac{N}{\Sigma \text{ADT} * 3 \text{ years} * 365 \text{ days} * 10^{-6}}$$

$\Sigma \text{ADT}$  = Sum of average daily traffic entering the intersection  
 $N$  = Total number of crashes at the particular location

The top 100 intersections are each assigned 3 different rank numbers: one for the crash frequency (i.e. the total number of crashes), one for the severity index, and one for the crash rate. In each case, the highest number equals the lowest rank score. The 3 rank scores are then summed for each intersection to produce a Rank Sum:

$$\text{Rank Sum} = \text{Crash Frequency Rank} + \text{Severity Index Rank} + \text{Crash Rate Rank}$$

The Rank Sums are then used to produce a final ranking for the top 40 high-crash intersection list, where the lowest Rank Sum equals the lowest rank score (1), which in return refers to the top high-crash intersection in the region.

The formula derived from a discussion at MORPC's regional safety plan workshop on July 31, 2007 which was attended by local engineers and planners as well as by ODOT and COTA representatives. All participants agreed that the variables crash frequency, crash severity, and crash rate should be factored into the final ranking methodology. While the originally proposed formula combined fatalities and injuries in calculating the severity index, the majority of participants believed that it was important to weight them differently.

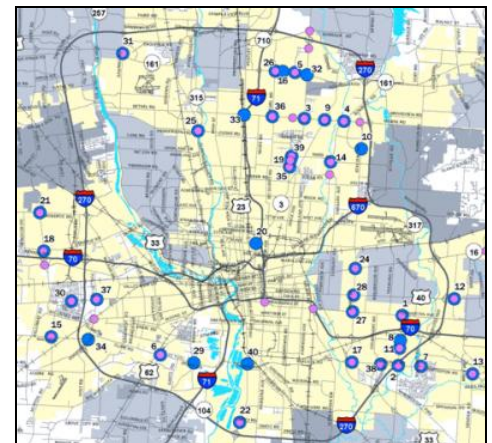


Figure 2 - High crash locations are identified and ranked

## **MEMO: Methodology used in the Pedestrian and Bicycle high-crash locations analysis**

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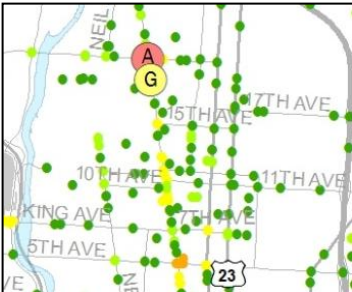
In order to develop its regional high crash location and corridor list for pedestrian and bicycle crashes only, MORPC uses a full set of 5 years of crash data to allow for a higher number of crashes to be analyzed.

As with the general high-crash location list, most of the analysis is conducted using GIS. However, the parameters used for the analysis are different, as explained below.

### **High-Crash Locations:**

Each crash location is mapped as a dot on the GIS roadway layer.

**Map 1: High crash locations**



1. A 250 foot buffer is created around each dot (not intersection).
2. Within each buffer, the number of crashes is added up (also referred to as *crash frequency*).
3. The 20 locations with the highest crash frequency are selected.
4. A 500 foot buffer is created around each of these 20 locations to help identify the top 10 locations. Again, the number of crashes in each buffer is added up (see map 1).

The 250 foot buffer methodology is used to identify the top high-crash locations (pedestrian and bicycle crashes combined) in the transportation planning area.

### **High-Crash Corridors:**

Each crash location is mapped as a dot on the GIS roadway layer.

1. A ¼ mile grid is created for the entire transportation planning area.
2. A crash density is assigned to each grid cell (see map 2). *Crash density* indicates the number of crashes that fall within each grid cell.
3. The streets within the transportation planning area are provided as different road segments. Each road segment travels through several different grid cells. Each road segment is assigned the crash density of the grid cell with the highest number, as illustrated in map 3 (red indicates a high crash density).
4. Where several segments on the same road show a high crash density, the segments are combined to create one corridor. The 20 corridors with the highest crash density are chosen for more review.
5. A 100 foot buffer is created around each of the top 20 corridors (see map 4). All crashes within each buffer are analyzed based on the following 6 criteria: Number of pedestrian crashes, number of bicycle crashes, number of crashes involving children (15 or younger), number of crashes involving seniors (65 or older), number of incapacitating injuries, and number of fatal injuries.
6. The number of relevant crashes per mile is calculated for each of the 6 criteria. The 6 numbers are added up to create a total score for each corridor.
7. The top 10 corridors are selected for the Central Ohio region based on the highest scores.

