

**Bellehaven Avenue (Wyoming Boulevard to Indian School Road)
Speed Study
FINAL REPORT**

February 2015





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I. INTRODUCTION

The City of Albuquerque – Department of Municipal Development (Engineering Division and Traffic Engineering Division) was requested to conduct a speed study along Bellehaven Avenue in northeast Albuquerque.

II. PROJECT PURPOSE

A speed study on Bellehaven Avenue was conducted between Wyoming Boulevard and Indian School Road to determine the following:

- Evaluate the 85th percentile speed along Bellehaven Avenue
- Determine from the speed study if there is a speeding along Bellehaven Avenue
- If speed humps are warranted based on the City’s Neighborhood Traffic Management Program

As part of this study, an evaluation and cataloging of existing roadway conditions, collection of historical ADT and crash data, field speed surveys at three (3) locations within the study area, and evaluation the survey data will be completed.

III. PROJECT DESCRIPTION

The study area will be a 0.5 mile section of Bellehaven Avenue between Wyoming Boulevard and Indian School Road

Please refer to Figures III.A.1 below showing the project area.



**Figure III.A.1
Project Vicinity Map**



IV. BACKGROUND OF SPEED LIMITS

Speed limits are established on roadways of virtually all classifications, from interstate freeways to low-volume local streets. The primary purpose of speed limits is to give motorists clear instruction as to what is a reasonable speed for them to drive at while traveling on a given roadway.

Among regulatory signage, speed limit signs arguably contain the most critical information that motorists need to be informed of while driving (next to stop signs, which are considered the highest impact regulatory sign). Drivers unfamiliar with a roadway often do not realize what characteristics the roadway has, and properly established speed limit signs give them the information they need to drive the roadway safely.

The NMDOT has guidelines for analyzing and establishing posted speed limits; the following text is based on one such example:

Realistic posted speed limits are of public importance for many reasons:

- They invite public compliance by conforming to the behavior or the driving majority
- They give clear reminders of safe and reasonable speeds to non-conforming violators
- They offer the most effective tool for law enforcement of safe driving
- They will minimize public antagonism toward law enforcement that results from unreasonable regulations

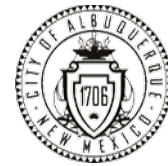
Improperly, or artificially low, posted speed limits can cause problems for state and local agencies for several reasons:

- They do not encourage voluntary compliance, since they do not reflect the behavior of the majority
- They make the behavior of the majority unlawful
- They maximize public antagonism toward law enforcement, since the perception is that the police are enforcing a “speed trap”
- They create a bad image for a community in the eyes of visitors/tourists

IV.A SETTING SPEED LIMITS

In accordance with Section 66-7-303 of the New Mexico Criminal and Traffic Law Manual, the speed limit on state highways shall be set by the Cabinet Secretary of the Department of Transportation, based on an engineering survey and traffic investigation that includes the following parameters:

- Spot speed studies (typically consisting of 100 vehicles)
- Roadway geometry/number of lanes
- Roadside environment and characteristics
- Building setbacks (if within a commercial business district)
- Driveway and intersection spacing/density
- Historical crash data for the roadway study area



Many speed limits are established using the theory of the 85th percentile. Out of the (typically) 100 vehicles surveyed, beginning with the fastest vehicle speed recorded the 15th vehicle from that speed is determined to show where the 85th percentile speed is. This is assuming that most drivers (85%) drive within reasonable limits. The posted speed limit can then be established and is usually the 5-mph increment just below the 85th percentile speed. For example, if the 85th percentile speed has been determined by an engineering survey to be 47 mph, the posted speed would be 45 mph. This method of posting speed limits allows for a reasonable posted speed limit that can be enforced by local agencies, without creating a speed trap.

For surveys with a different amount than 100 vehicles, the 85th percentile speed is determined by the following formula: $100/15 = \# \text{ of vehicles surveyed}/X$ (where x is the vehicle at the 85th percentile). For example, a 50 vehicle survey would result in:

$$100/15 = 50/X$$

$$X = 7.5, \text{ or the } 8^{\text{th}} \text{ vehicle in the survey}$$

Other methods are frequently used to further analyze the posting of speed limits – these are the mode, median and geometric mean:

- The mode is the most frequently clocked vehicle speed in a given survey – for example, in a 100 vehicle survey where 12 vehicles were clocked traveling 55 mph and no other speed was observed as frequently, the mode is 55 mph.
- The median is the numerical midpoint of a given survey – in a survey of 100 vehicles, the speeds of the 50th and 51st vehicles are added and divided by 2 to obtain the median speed. If the 50th vehicle of such a survey was traveling 56 mph and the 51st vehicle was also traveling 56 mph, the resulting median speed would be $(56+56)/2 = 112/2 = 56$ mph.
- The geometric mean is described as follows: *“an average of a set of numbers that is calculated by multiplying all the numbers (“n”), and taking the nth root of the total.”*

Formula for Geometric Mean:

$$\text{Geometric Mean} = ((X_1)(X_2)(X_3)\dots\dots(X_N))^{1/N}$$

where

X = Individual Score (speed)

N = Sample size (Number of scores)

Geometric Mean Example: To find the Geometric Mean of speeds 51, 52, 55, 58, and 60 mph.

Step 1: N = 5, the total number of values. Find 1/N.

$$1/N = 0.2$$

Step 2: Determine Geometric Mean using the formula.

$$((51)(52)(55)(58)(60))^{0.2} = (507,592,800)^{0.2}$$

$$\text{Geometric Mean} = 55.09 \text{ mph}$$

**BELLEHAVEN AVENUE SPEED STUDY (WYOMING BOULEVARD TO INDIAN SCHOOL ROAD)
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In most cases, the geometric mean of a speed study will be of similar value of the median, often within 1 to 2 mph on either side of the median. In the above example, the median speed would be the third vehicle surveyed (55 mph), and the geometric mean is 55.09 mph.

IV.B STUDY AREA

The study area is along Bellehaven Avenue between beginning at Wyoming Boulevard and ending at Indian School Road. Within the study area is a section of roadway is within the Indian Moon Neighborhood Association. The existing speed limit along Bellehaven Avenue is 25 mph.

Traffic counts and speed data was collected at three (3) locations along Bellehaven Avenue. Traffic/speed count locations were collected at the following locations:

- West Count Station: Bellehaven Avenue just east of Bellehaven Lane
- Middle Count Station: Bellehaven Avenue between Luthy Drive and Bellehaven Court
- East Count Station: Bellehaven Avenue just south of Indian School Road

The AADT for the three locations listed above are listed below:

	Lane 1 (EB)	Lane 3 (WB)	AADT
West Count Location	229	208	437
Middle Count Location	246	224	470
East Count Location	206	243	449
AADT	227	225	452

**Table IV.B.1
AADT Count Data Results**

Bellehaven Avenue study area ranges from 437 to 470 vehicles per day.

The speed survey segments are described in more detail below, beginning with the westernmost portion of the corridor at Wyoming Boulevard. Each study segment will have descriptions of roadside environment, driveway and intersection density and photographs illustrating the study segment. From the westerly terminus of the study area, each survey segment is described as follows:

Traffic count data is located in Appendix A.



IV.B.1 – SEGMENT 1: BELLHAVEN AVENUE BETWEEN WYOMING BOULEVARD AND BELLEHAVEN LANE

This segment of the study area is ROW width of 49’. A breakdown of the ROW is listed below:

- 28’ asphalt pavement
- 2.5’ curb and gutter
- 4’ landscape buffer
- 4’ sidewalk

Sidewalk, landscape buffer, curb and sidewalk exist on both sides of Bellehaven Avenue. Below is a photo showing the cross-section listed above.



**Figure IV.B.1
Bellehaven Avenue east Wyoming Boulevard**

There is one intersection (Luthy Drive) and 33 driveways within this segment of the study area. All driveways provide access to residential homes.

Results of the speed study for Segment 1 is listed below:

	Lane 1 (EB)	Lane 3 (WB)	Comb Total
West Count Location			
Average	23.7	22.1	22.8
50th Percentile	24.7	23.9	24.2
10mph Pace	27.7	26.5	27.2
85th Percentile	31.8	29.3	29.9

**Table IV.B.2
West Count Location Speed Study Results**



IV.B.2 – SEGMENT 2: BELLEHAVEN AVENUE BETWEEN BELLHAVEN LANE AND LUTHY DRIVE

This segment of the study area is ROW width of 49’. A breakdown of the ROW is listed below:

- 28’ asphalt pavement
- 2.5’ curb and gutter
- 4’ landscape buffer
- 4’ sidewalk

Sidewalk, landscape buffer, curb and sidewalk exist on both sides of Bellehaven Avenue. Below is a photo showing the cross-section listed above.



**Figure IV.B.2
Bellehaven Avenue east of Luthy Drive**

There are two (2) intersections (Bellehaven Court & St Court) and 18 driveways within this study area. All driveways provide access to residential homes.

Results of the speed study for Segment 2 is listed below:

	Lane 1 (EB)	Lane 3 (WB)	Comb Total
Middle Count Location			
Average	21.1	19.7	20.4
50th Percentile	23.1	22	22.6
10mph Pace	26.7	25.4	26.1
85th Percentile	29.5	29	29.5

**Table IV.B.3
Middle Count Location Speed Study Results**



IV.B.3 – SEGMENT 3: BELLHAVEN AVENUE BETWEEN LUTHY DRIVE AND INDIAN SCHOOL ROAD

This segment of the study area is ROW width of 49’. A breakdown of the ROW is listed below:

- 28’ asphalt pavement
- 2.5’ curb and gutter
- 4’ landscape buffer
- 4’ sidewalk

Sidewalk, landscape buffer, curb and sidewalk exist on both sides of Bellehaven Avenue. Below is a photo showing the cross-section listed above.



Figure IV.B.3
Bellehaven Avenue south of Indian School Road

There are no intersections and 12 driveways within this study area. All driveways provide access to residential homes.

Results of the speed study for Segment 3 is listed below:

	Lane 1 (EB)	Lane 3 (WB)	Comb Total
East Count Location			
Average	17.6	17.2	17.4
50th Percentile	20.8	20.3	20.6
67th Percentile	22.7	22.5	22.6
85th Percentile	24.9	24.8	24.9

Table IV.B.4
East Count Location Speed Study Results



Speed study results for all three locations are listed in Appendix B.

V. CRASH DATA

Crash data was requested from the Traffic Safety Bureau at New Mexico Department of Transportation. NMDOT stated that there were no reported crashes along Bellehaven Avenue within the study area. The only crashes that were reported were at the intersections of Wyoming Boulevard/Bellehaven Avenue and Indian School Road/Bellehaven Road.

VI. SPOT SPEED STUDY RESULTS

When considering establish a new posted speed limit, or revising an existing posted speed limit, on a given roadway a survey of traffic speeds is critical to determine a reasonably posted speed limit.

But before a posted speed limit can be modified, analysis must be conducted to ascertain whether or not the speed limit can be adjusted without resulting in further increases of motorists’ travel speeds. Motorists usually drive at speeds that they feel safe, based on the observable roadway conditions; this means that if a roadway is wide, flat and straight, the motorist will drive at a speed they feel comfortable based on what they observe as opposed to what a speed limit sign would say. To elaborate further, a four-lane street that is flat and straight with no unusual conditions that has a posted speed of 30 mph would probably result in most motorists traveling well over that posted speed, because the roadway conditions dictate that they could safely drive much faster.

In the case of Bellehaven Road between Wyoming Boulevard and Indian School Road, the posted speed limit is 25 mph, and roadway conditions throughout the corridor are fairly consistent: controlled access, good pavement condition with wide (11’) travel lanes, and on-street parking. Thus, there are no unusual roadway conditions through the corridor.

Also, over 800 vehicles were surveyed at three (3) locations within the study area. The surveyed vehicles showed that 46% of those surveyed vehicles were traveling higher than the posted speed limit. This percentage indicates that the 25 mph speed limit on the study area of Bellehaven Avenue is probably not a reasonably posted speed limit and that in order to maintain this speed limit, speed humps would be warranted. The survey results essentially make lawbreakers of 46% of the motorists who use this roadway.

Results of the speed study for the entire study area is listed below:

	Lane 1 (EB)	Lane 3 (WB)	Comb Total
Entire Study Area			
Average	20.80	19.67	20.23
50th Percentile	22.87	22.07	22.47
67th Percentile	25.70	24.80	25.25
85th Percentile	28.73	27.70	28.22

**Table VI.1
Bellehaven Avenue Speed Study Results**



VII. U.S. LIMITS SPEED LIMIT PROGRAM

U.S. Limits is an FHWA sponsored program used to analyze speed limits. This program calculates a recommended speed limit based on the criteria given, which is listed on the website as follows:

- *density of surrounding development (e.g. high density, low density or rural);*
- *frequency of roadside access (e.g. number of residential driveways, commercial, industrial, shopping, and special activity properties, and the number and type of intersecting roads);*
- *road function (e.g. traffic movement vs. access to abutting properties);*
- *road characteristics (e.g. paved width, divided or undivided, lane width and number of lanes, sight restrictions);*
- *road conditions and important high speed road characteristics (e.g. interchange spacing, AADT, shoulders);*
- *existing vehicle operating speeds;*
- *adjoining speed limits; and*
- *any special conditions that may exist on the road section (e.g. adverse alignment, pedestrian and roadside activities, high crash rates, etc).*

This analysis was used for Bellehaven Avenue. Based on the data entered for the above-listed categories, the program concluded that a 25 mph posted speed limit was warranted for the corridor. The output sheet is shown in Appendix C – U.S. Limits Output.

This site can be accessed at <http://www.uslimits.com>

VIII. CONCLUSION

After evaluating the traffic and speed study data collected through the project area, it apparent that none of criteria outlined in the City's Neighborhood Traffic Management Plan has been met to warrant speed humps.