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An Epidemiologic Characterization of Motor Vehicle Crashes on, and an Evaluation of Geometric Design Criteria for, U.S. Highway 666, Milepost 92.7 to 93.6, Shiprock, New Mexico

Indian Health Service, Office of Environmental Health.

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An Epidemiologic Characterization of Motor Vehicle Crashes on, and an Evaluation of Geometric Design Criteria for, U.S. Highway 666, Milepost 92.7 to 93.6, Shiprock, New Mexico.

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An epidemiologic study was conducted which examined a random sample of motor vehicle crashes occurring in 1986 in that geographic portion of the Navajo Reservation under the jurisdiction of the Shiprock District, Navajo Division of Public Safety [15]. A major finding of this study revealed that 23% of all injury crashes in this rather large geographic area had occurred on U.S. Highway 666, between milepost points 92.7 and 93.6, in Shiprock, New Mexico. Although traffic volume data were not analyzed as part of this study, it was believed that the traffic volume on this section of highway was not significantly greater than for other comparable sections of highway in Shiprock. It was concluded that this 0.9 mile section of highway was over-represented by motor vehicle crashes involving injury.

U.S. Highway 666, within Shiprock, is a divided, four-lane, arterial highway. The highway is divided by a raised, curb-type, concrete median. Two traffic lanes for each traffic direction are separated by the median. The 0.9 mile section of highway, located between milepost points 92.7 and 93.6, connects two major intersections: U.S. 666 - New Mexico 504, and U.S. 666 - U.S. 550. Both intersections are T-type intersections controlled by pre-timed traffic signals. This section of highway primarily occupies a business/commercial corridor, although some small residential areas are not far off the highway. Also located within this section of highway is a State-operated Port-of-Entry weighing station for commercial truck traffic. All commercial trucks traveling through Shiprock are required to be weighed here. This section of highway is interspersed with several median left turn lanes, and with several median crossovers for side street intersections. The posted speed limit is 40 miles per hour, although speeds in excess of the speed limit are not uncommon. This highway receives local, commercial, and tourist traffic. No physical modifications to this section of highway have been made since before 1986. This highway is under the maintenance jurisdiction of the New Mexico Highway and Transportation Department.

Based on the 1986 motor vehicle crash study findings, it became apparent that further study of this 0.9 mile section of highway would be necessary to better understand the etiology of the crashes in this cluster area. As such, the objectives of this study involved two major components. The first objective was to epidemiologically characterize the motor vehicle crashes occurring on this section of highway in order to better define their etiologies and to identify particular risk factors associated with the crashes. The second objective involved an examination of four specific geometric highway design features to determine if they met the appropriate design standards, and to determine if they played a contributory role in the causation of some of the crashes. This examination involved a comparison of existing geometric design features to appropriate geometric design standards, and a cross-reference to the epidemiologic characterization data to determine if any sites having the described design features were also at a high risk for crashes.

Motor vehicle crashes typically are the result of the interaction of a number of causative and contributory factors. Such factors may be generically grouped into three categories: driver factors, vehicle factors, and environmental/roadway factors. In analyzing motor vehicle crashes, it is often possible to identify one or more major causative factors as well as less important contributing factors. Rarely is a crash attributable to a single causative factor. One study of motor vehicle crashes in Georgia found that in 48% of the cases the driver factor was identified as the major causative factor [19]. This same study indicated that environmental and roadway factors played an important role in 34% of the cases; however, only 4% of the crashes were

attributed to environmental factors alone. However, another researcher indicates that roadway and vehicle factors play a much greater role in motor vehicle crash causation, but are less frequently identified due to the lack of the standard police crash report form to have a place to code such information [2]. All motor vehicle crashes are not necessarily due to faulty geometric roadway design; however, a concentration of crashes at a specific location does imply some failure of the roadway system. While the individual driver does have a role in highway safety, the designer of the highway plays an essential role in the provision of a safe highway system. In fact, a properly designed highway is intended to minimize driver error or its consequences. While this study will attempt to identify all specific risk factors associated with motor vehicle crashes along this crash cluster area, it will also focus on those environmental and roadway features which are implicated in the crash problems and which can be modified to reduce those problems.

The ultimate goal of this study is the identification of specific problems or risk factors upon which intervention efforts can be logically focused, with the intent of reducing the number of motor vehicle crashes and resultant injuries. This report does not intend to supplant any police reports or highway engineering reports which may have already addressed this problem. Instead, it is hoped that the information included in this report will be of value to the responsible police and highway department jurisdictions, and will be used in the design of a comprehensive injury prevention program.

III. METHODS

Information implicating U.S. Highway 666, milepost points 92.7 to 93.6, as a significant motor vehicle crash cluster area was provided from a sample of crashes for a one-year period. This study was designed to provide a more detailed description of specific types of motor vehicle crash problems occurring on this section of highway by examining all crashes over a two-year period. The study was also designed to compare four geometric highway design features, which were hypothesized as possible motor vehicle crash contributing factors, against appropriate design standards.

The data for the epidemiologic characterization were acquired through the Records and Data Control Section, Navajo Nation Division of Public Safety, Toyei, Arizona. The data were acquired by reviewing all individual police crash reports on file for motor vehicle crashes which occurred on U. S. Highway 666, milepost points 92.7 to 93.6, from January 1, 1987 to December 31, 1988. The police crash reports were reviewed manually, with the desired information from each crash report recorded onto an individual data collection form. The information recorded from the police crash reports included various causative and contributing factors related to the crashes, the drivers, the vehicles, the environment, and the roadways. Most factors consisted of a list of conditions which were mutually exclusive, and had only one condition checked. For example, under the factor driver sobriety, one of the following conditions would be met: DUI, Had Been Drinking-Ability Impaired, Had Not Been Drinking, or Sobriety Unknown. However, multiple condition entries were possible under the factor of apparent contributing factors. For the purpose of recording driver residence onto the data collection form, the driver residence was coded as one of two conditions: local or non-local. Local residence was defined as residing within a 30-mile radius of Shiprock.

The information from the data collection forms was entered into a computer database management program, using a Wyse AT personal computer. The program used was dBase III Plus, Version 1.1 (Ashton-Tate, 1987). The crash data were described by all crashes, and by crashes involving injury. Factors were described statistically for frequency. Component conditions within each factor were also described for frequency and as a percentage of the factor total. Factors and factor conditions were cross-referenced to better define risk factors.

The four geometric highway design features selected for comparison to appropriate standards were subjectively chosen by the author based on direct observation of actual crashes, "near-miss crashes", patterns of unusual or unsafe traffic maneuvers, and patterns of traffic conflicts at locations having one or more of the design features. It was hypothesized that the existing design features may have played contributory roles in the occurrence of some motor vehicle crashes occurring on this section of highway. The four geometric design features were: 1) median width, 2) the location and control of side street cross traffic, in particular the exit from the Port-of-Entry commercial truck weigh station, 3) left-turn lane availability and positioning, and 4) median crossover positioning in relation to business access locations. On-site measurements of the existing design features were made manually. Measurements of distance were made using a standard tape measure. Estimates of traffic volume were made using vehicle counts. The appropriate standards against which the existing geometric design features were compared were derived from two sources: The American Association of State Highway and Transportation Officials - A Policy on Geometric Design of Highways and Streets, and the Federal Highway Administration - Manual on Uniform Traffic Control Devices. Applicable sections of these reference documents were used to establish the required design for the particular design feature.

Three additional measurements were made as part of the study. One measurement involved the length of time it took tractor-trailers to clear the northbound lane when making a left turn from the Port-of-Entry exit. A second measurement involved the length of time for any vehicle to clear the northbound lane while making a long left turn into the convenience store at milepost point 92.8. The third measurement involved timing the traffic signal left-turn yellow arrow light phase at the intersection at milepost point 93.6. The first two measurements involved timing all vehicles making the particular maneuver in a one-hour period, and then deriving an average time. The third measurement involved two measurements of the yellow arrow signal phases, and then deriving an average time. All measurements were taken with a digital stopwatch.

IV. DISCUSSION

A. Epidemiologic Characterization

A total of 87 motor vehicle crash reports were reviewed for the two year study period. Of this total, 25% (22) involved at least one injury. The total number of injuries was 44. One fatality was documented, although any fatalities occurring subsequent to the day of the crash would likely not have been reflected in the police crash report. All crashes but one involved motor vehicles only. The exception involved a motor vehicle-pedestrian collision, which accounted for the only fatality. Of the total number of crashes, 90% (78) involved two or more vehicles, while only 10% (9) were single vehicle crashes. Seventeen percent (15) of the crashes involved at least one driver under the influence of alcohol.

This discussion will primarily focus on those crashes which involved injuries, since the incidence of injury is of greater concern from a public health perspective. In order to simplify the language, the term "crash which involved injury" will be shortened to "injury crash". Following are discussions of a number of causative and contributing factors in relation to the motor vehicle crashes.

Injury Crashes

Twenty-two of the motor vehicle crashes involved an injury, with a total of 44 injuries resulting. Eleven of the 22 injury crashes involved multiple injuries, with the greatest single crash total at 5 injuries. Milepost point 93.6 accounted for 45% (10) of the injury crashes, while 41% (9) of the injury crashes were attributed to rear-end collisions. Alcohol was involved in 32% (7) of the crashes. Fifty percent (11) of the injury crashes occurred between the hours of noon and 6:00 PM, and 23% (5) occurred on Wednesdays. Four injury crashes each occurred in the months of January, September, and October. Of all the drivers in injury crashes, 57% (24) were male drivers and 32% (7) were in the 21-25 year old age group. Driver inattention was most frequently cited as an apparent contributing factor in injury crashes.

Crash Location

Motor vehicle crashes occurred with greater frequency at milepost point 93.6 than at any other location along this section of highway. Milepost point 93.6 is the site of the U.S. 666-U.S. 550 signalized intersection. Thirty-four percent (30) of all crashes occurred at this location, as did 45% (10) of all injury crashes. Of the total crashes occurring at this intersection, 14 were rear-end collisions and 12 involved vehicles making a left turn to the north in front of an oncoming vehicle. Injury crashes were next most frequent at milepost points 93.5, 92.7 and 93.4, each with 14% (3) of the total.

Of the 10 injury crashes at milepost point 93.6, 4 involved rear-end collisions, and 4 involved left turns to the north in front of an oncoming vehicle. All of the injury crashes at this location occurred on a weekday, with 3 occurring on Wednesday. Four of the 10 injury crashes occurred between noon and 6:00 PM, while 3 occurred between 6:00 AM and noon. Two of the crashes occurred in October. Only 1 of the 10 injury crashes at this location involved alcohol. Six of the crashes involved all local drivers. The 10 injury crashes at milepost point 93.6 accounted for 17 total injuries, which is 39% of the total number of 44 injuries.

Forty percent (12) of the 30 total crashes at milepost point 93.6 involved vehicles at this intersection making a left turn to the north in front of an oncoming vehicle. Of these 12 left turn collisions, 11 occurred on a weekday, 8 occurred between noon and 6:00 PM, and 4 involved an injury with a total of 5 injuries. Only 1 of these crashes involved alcohol. Eight of the 12 left turn crashes involved all local drivers.

Forty-seven percent (14) of the 30 total crashes at milepost 93.6 involved rear-end collisions. Of these 14 rear-end collisions, all occurred in clear weather, 11 occurred during daylight hours, 12 occurred on weekdays, and 8 occurred between noon and 6:00 PM. Also, 4 of the 14 rear-end crashes occurred in September. Two of these 14 crashes involved alcohol. Four of these rear-end crashes involved an injury, with a total of 9 injuries.

Milepost point 93.5 accounted for 21% (18) of all 87 crashes, but only 14% (3) of the injury crashes. Milepost point 93.5 is the site of the exit from the commercial truck port-of-entry weigh station, of a median cross-over, and of a business access. Five of the 18 crashes at this location involved collisions with vehicles making a left turn from the port-of-entry exit. Two of the 5 collisions involving left turns from the port-of-entry exit involved tractor-trailers. None of the 5 collisions involved alcohol or injury. Eight of the 18 total crashes occurring at milepost point 93.5 involved rear-end collisions. Three of the 8 rear-end collisions at this location involved backed-up traffic from the intersection at milepost 93.6. Three of the 18 crashes occurring at milepost point 93.5 involved injury, with a total of 9 injuries.

Type of Collision

Forty percent (35) of all crashes involved rear-end collisions, while this same type of crash contributed to 41% (9) of the injury crashes and to 55% (24) of the total injuries. Fourteen of the total rear-end collisions occurred at milepost point 93.6, with 9 occurring at milepost point 93.5. Rear-end collisions occurred most often between noon and 6:00 PM (19), on Friday (8), and in September (4). Thirty-three of the total rear-end collisions occurred with dry road conditions, and 4 involved alcohol. Of all the drivers involved in the rear-end crashes, 57% (40) were male, and 21% (15) involved 21 to 25 year olds. Sixty-nine percent (24) involved all local drivers. Nationally, only 9% of all urban crashes involved rear-end collisions [13].

Of the 9 rear-end collisions resulting in an injury, 8 occurred on dry roads, 4 occurred between 6:00 AM and noon, and 4 occurred in September. These crashes predominantly occurred on weekdays, with only 1 occurring on a weekend. One of the rear-end injury crashes involved alcohol. Six of the crashes involved all local drivers. Sixty-one percent (11) of the drivers in rear-end injury crashes were male.

Twenty-four percent (21) of all crashes involved a left turn in front of an oncoming vehicle. This type of crash also resulted in 27% (6) of the injury crashes and 18% (8) of the total injuries. Twelve of these 21 crashes occurred at milepost point 93.6, with 3 each also occurring at milepost points 93.5 and 92.8. Two of the 3 crashes occurring at milepost point 92.8 involved making a long, offset left turn into a convenience store. This problem is discussed more thoroughly in the geometric design analysis section of this report. Also, of the 21 crashes involving a left turn in front of an oncoming vehicle, 17 occurred during daylight hours, 16 involved dry road conditions, 12 occurred between noon and 6:00 PM, and 6 occurred on Wednesday. Three of these crashes involved alcohol, and 13 involved all local drivers. Sixty-four percent (27) of the drivers in this type of collision were male.

Of the 6 injury crashes involving a left turn in front of an oncoming vehicle, all involved local drivers, 4 occurred during daylight hours, 4 occurred at milepost point 93.6, and 4 occurred between noon and 6:00 PM. Two of the 6 crashes involved alcohol. In addition, 3 of these injury crashes occurred on wet road conditions. Six of the drivers were male and 6 were female.

Alcohol Involvement

Driver use of alcohol was a factor in 17% (15) of all crashes and in 32% (7) of the injury crashes. Of the 15 total crashes involving alcohol, 14 included driving under the influence of alcohol (DUI) citations, while 1 driver was classified as "had been drinking-ability impaired". Of the 15 crashes involving alcohol, 4 crashes each occurred at milepost point 92.7 and 93.6, which are the locations of the 2 signalized intersections on this section of highway. Four of the 15 crashes involved rear-end collisions, and 6 crashes each occurred between noon to 6:00 PM and 6:00 PM to midnight. Four of the 15 crashes involving alcohol occurred in October, with 3 each in January and August. In addition, 4 of the 15 crashes occurred on Friday, with 3 each on Thursday and Saturday. Of all drivers identified as alcohol impaired, 40% (6) were in the 26 to 30 year old age group. Ninety-three percent (14) of the 15 alcohol impaired drivers were male. Nationally, alcohol is a contributing factor in about 20% of all injury crashes [3].

Alcohol impaired drivers were involved in 7 injury crashes, resulting in 12 total injuries. Six of the alcohol impaired drivers in injury crashes were cited for DUI, while 1 was identified as ability impaired. Three of the alcohol involved injury crashes occurred at milepost point 92.7, while 2 involved making a left turn in front of an oncoming vehicle. Three of these crashes each occurred from noon to 6:00 PM and 6:00 PM to midnight; only 1 occurred between midnight to 6:00 AM. Three of the alcohol involved injury crashes occurred in January, and 2 each occurred on a Thursday or a Saturday. Of the alcohol-impaired drivers in the injury crashes, 43% (3) were in the 26 to 30 year old age group, and 86% (6) were male.

Time Factors

The 6 hour time period from noon to 6:00 PM accounted for 52% (45) of all crashes, 50% (11) of the injury crashes, and 48% (21) of the total injuries. Four of the 11 injury crashes occurring in this 6 hour period occurred between the hours of 5:00 PM to 6:00 PM. Of the 11 injury crashes occurring between noon and 6:00 PM, 4 occurred at milepost point 93.6, 4 involved left turns in front of an oncoming vehicle, 3 involved alcohol and 3 each occurred in January and March. Ten of these crashes involved 2 or more vehicles. The time period from 6:00 AM to noon was next most frequent in number of crashes, with 24% (21) of all crashes and 23% (5) of all injury crashes.

There was not a wide variation in number of crashes by day of week. Twenty percent (17) of all crashes occurred on Wednesday, as did 23% (5) of the injury crashes. Of the 5 injury crashes occurring on Wednesday, 3 occurred at milepost point 93.6, 2 involved rear-end collisions, and 1 involved alcohol. These five injury crashes resulted in 23% (10) of the total

injuries. Wednesday was followed in frequency of crashes by Saturday, with 18% (16) of all crashes and 14% (3) of the injury crashes, and by Friday, with 16% (14) of all crashes and 14% (3) of the injury crashes. The highest incidence of crashes on Wednesday may be explained by Tribal employees' payday falling on every other Wednesday, with a possible increase in traffic in or through Shiprock.

More crashes occurred in October than any other month. Seventeen percent (15) of all crashes occurred in October, as did 18% (4) of the injury crashes. Eighteen percent (4) of the injury crashes also occurred in January and in September, although each contributed fewer total crashes. Of the 4 injury crashes occurring in October, 1 involved DUI, 1 occurred at milepost point 93.6, and 2 involved left turns in front of an oncoming vehicle. The higher incidence of crashes in October is very likely due to the large attendance at the Northern Navajo Fair which is held every October in Shiprock.

Lighting Conditions

Seventy-six percent (66) of all crashes and 68% (15) of injury crashes occurred during daylight hours. Of the 15 injury crashes which occurred in daylight, 7 involved rear-end collisions, 7 occurred at milepost point 93.6, 3 involved a DUI, and 3 each occurred in January and March. Of all drivers in injury crashes during daylight hours, 90% (26) were local residents, 55% (16) were male, and 21% (4) were in the 46 to 50 year old age group. The 15 injury crashes occurring during daylight hours accounted for 77% (34) of the total injuries.

Fourteen percent (12) of all crashes occurred in the dark with no artificial lighting (i.e. street lights) provided, as did 18% (4) of the injury crashes. Of the 4 injury crashes which occurred under dark-not lighted conditions, 3 occurred on wet road conditions, 2 involved a DUI, 2 each occurred at milepost points 93.4 and 93.6, and 2 each occurred on Wednesday and Friday. Of the drivers involved in injury crashes under dark-not lighted conditions, 71% (5) were local residents, and 71% (5) were male. Injury crashes occurring in dark-not lighted conditions contributed to 14% (6) of the total crashes.

Weather Conditions

Eighty-three percent (72) of all crashes and 77% (17) of injury crashes occurred during clear weather conditions. Of the 17 injury crashes occurring in clear weather, 13 occurred during daylight hours, 8 involved rear-end collisions, and 8 occurred at milepost point 93.6. Also, 8 occurred between the hours of noon and 6:00 PM, and 11 involved all local drivers. Five of the 17 injury crashes involved alcohol. Of the drivers involved in injury crashes in clear weather, 64% (21) were male and 18% (6) were in the 46 to 50 year old age group. The 17 injury crashes occurring in clear weather accounted for 80% (35) of the total injuries.

Eight percent (7) of all crashes occurred in rainy weather. However, 23% (5) of the injury crashes occurred in rainy weather, as did 20% (9) of the total injuries. Of the 5 injury crashes occurring in rainy weather, all occurred on a weekday, 3 involved alcohol, 3 involved left turns in front

of an oncoming vehicle, and 3 occurred between noon and 6:00 PM. In addition, 2 of these crashes occurred in October, 2 occurred at milepost point 93.6, and 2 occurred under dark-not lighted conditions. Of the drivers in injury crashes in rainy weather, all were local drivers and 67% (6) were female.

Crashes occurring in snowy weather included 9% (8) of the total crashes, but none involved injury.

Road Conditions

Eighty-two percent (71) of all crashes and 73% (16) of injury crashes occurred on dry roads. Of the 16 injury crashes occurring on dry roads, 13 occurred during daylight hours, 8 involved rear-end collisions, 8 occurred between noon and 6:00 PM, and 7 occurred at milepost point 93.6. Also, 5 involved alcohol. Of the drivers involved in injury crashes occurring on dry roads, 77% (24) were local residents, 61% (19) were male, and 19% (6) were in the 46 to 50 year old age group. Injury crashes occurring on dry roads contributed to 75% (33) of the total injuries.

Sixteen percent (14) of all crashes occurred on wet roads, as did 27% (6) of the injury crashes. Of the 6 injury crashes involving wet roads, all occurred on weekdays, 3 involved left turns in front of an oncoming vehicle, 3 occurred at milepost point 93.6, 3 occurred between noon and 6:00 PM, and 3 occurred in dark-not lighted conditions. In addition, 2 involved alcohol. Of the drivers involved in injury crashes on wet roads, 91% (10) were local drivers, 55% (6) were female, and 27% (3) were in the 16 to 20 year old age group. Injury crashes on wet roads accounted for 25% (11) of all injuries.

One crash each occurred on a snowy road condition and an icy road condition. Neither crash resulted in injury.

Intersection

Sixty-four percent (56) of all crashes and 73% (16) of injury crashes occurred at an intersection. Of the 16 injury crashes occurring at an intersection, 12 occurred on dry roads, 10 occurred during daylight hours, and 9 occurred at milepost point 93.6. In addition, 7 involved alcohol, and 8 occurred between noon and 6:00 PM. Of the drivers involved in intersection injury crashes, 74% (23) were local residents, and 61% (19) were male. Injury crashes occurring at an intersection contributed to 61% (27) of the total injuries.

Driver Possession of a Driver's License

In 26% (23) of all crashes and 18% (4) of injury crashes, at least one driver involved in the crash did not possess a driver's license. In all crashes involving at least one driver without a driver's license, 11 occurred between noon and 6:00 PM, 10 involved rear-end collisions, 7 involved a DUI, 7 occurred on Friday, and 5 occurred each in August and November. All 7 unlicensed drivers cited for DUI were male. Of all drivers without a driver's license who were involved in a crash, 78% (18) were male, 30% (7) were in the 21 to 25 year old age group, and 26% (6) were in the 16 to 20 year old age group. The 4 injury crashes involving at least one driver without a driver's license resulted in 7 total injuries.

Age and Sex

A total of 172 drivers were involved in all of the crashes, and a total of 47 drivers were involved in the injury crashes. Of all drivers in all crashes, 60% (104) were male and 31% (53) were female. No information was provided for 9% (15) of the drivers. Of all drivers in injury crashes, 55% (26) were male and 36% (17) were female. No information was provided for 9% (4) of the drivers. For male drivers in injury crashes, the leading age group was 21 to 25 years old (5), followed by the age group of 31 to 35 years old (4). For female drivers in injury crashes, the leading age group was a tie, with 3 crashes each in the 16 to 20, 21 to 25, and 26 to 30 year old age groups. The ratio of male to female drivers in all crashes was 1.9:1. The ratio of male to female drivers in injury crashes was 1.5:1.

Apparent Contributing Factors

Multiple conditions were marked under Apparent Contributing Factors in many of the police crash reports. The 5 most frequently marked apparent contributing factors for all crashes were: too fast for conditions (65), excessive speed (60), none (54), other - not involving driver error (23), and driver inattention (22). The 5 most frequently marked apparent contributing factors for injury crashes were: driver inattention (15), none (15), under the influence of alcohol (8), failed to yield (6), and improper turn (5).

There is considerable subjectivity in identifying apparent contributing factors involved in motor vehicle crashes. Some evidence of bias in reporting based on professional outlook has been documented [2]. For example, police may tend to focus on legal and driver error problems, which are their areas of training, at the expense of the highway design or roadway environment problems. The accuracy of the apparent contributing factors identified in these crash reports is unknown. However, the importance of a comprehensive identification of all apparent contributing factors in a motor vehicle crash cannot be underestimated for both the determination of the crash etiology and for the design of an intervention program.

Summary

This epidemiologic characterization has identified a number of causative and contributing factors associated with the motor vehicle crashes occurring along the 0.9 mile crash cluster area. It is necessary to identify those important risk factors and specific circumstances that can be changed, so that remedial efforts can be appropriately prioritized.

The cluster of crashes at milepost point 93.6 identified this intersection as a particularly dangerous traffic location. Although less of a problem from an injury crash perspective, a smaller crash cluster was identified at milepost point 93.5. Both of these problems lend themselves to correction by modification of geometric design and, as such, are discussed in more detail in the following section on geometric design analyses.

A considerable problem was identified with rear-end collisions, and to a smaller extent with collisions involving left turns in front of an oncoming vehicle. Both types of collisions displayed clusters at specific locations, again lending themselves to correction by modification of geometric design.

Other significant risk factors identified included a high incidence of crashes between noon and 6:00 PM, a higher weekday incidence - particularly on Wednesday, a problem with speeding, a problem with alcohol involvement, and a problem with some drivers having no driver's license. Some of these problems may be alleviated to a certain extent by changes in geometric design. However, all will probably require enforcement or policy action to achieve a greater degree of correction.

B. Evaluation of Geometric Design Criteria

Design Feature 1 - Median Width

The median width was of interest because of frequent occurrences of vehicles, when stopping within a median crossover, to pull too far forward or to fail to pull forward far enough so that either the front or the rear of the vehicle would protrude into one of the traffic lanes. Although no crashes were directly observed as a result of this practice, avoidance maneuvers on the part of vehicles in the traffic lanes were directly observed on numerous occasions.

The median width throughout this 0.9 section of highway is 18 feet. No specific geometric design criterion exists regulating the exact width of medians. Instead, a suggested width range is provided, since the installation of a median may be dependent upon the amount of land available when constructing the roadway and upon the cost of that land. The suggested width range is 4 to 80 feet. Medians which accommodate a left-turn lane should not be less than 14 feet.

The design vehicle length for a passenger car is 19 feet. Median widths in excess of 22 feet are required to allow separate roadway crossings for passenger cars. A separate roadway crossing refers to crossing one lane(s) of traffic, with storage in a median cross-over before crossing or entering the second traffic lane(s). Median widths of 14 to 22 feet are not designed to allow separate roadway crossings; they are designed instead for providing left turn lanes only.

While the existing median width of 18 feet is realistically sufficient for the perpendicular storage of compact and sub-compact passenger vehicles, the existing median width is not sufficient for any vehicle as long as or longer than a standard size passenger vehicle. The problem, in terms of geometric design standards, is one of a design limitation, namely the median width was not designed to accommodate separate roadway crossings. However, in practice due to a sizeable highway traffic volume, separate highway crossings maneuvers do occur on a regular basis. While such maneuvers may be unsafe or cause traffic conflicts, no actual violation of design standards exists. It is, however, within the realm of the responsible highway department to evaluate the problem and pursue corrective action if deemed necessary.

Design Feature 2 - The Location and Control of Side Street Cross Traffic (in particular the exit from the port-of-entry weigh station).

This design feature was examined due to a relatively large volume of commercial truck traffic exiting from this port-of-entry weigh station.

Four one-hour traffic counts were conducted to estimate the weekday, daytime traffic volume exiting at this location. An hourly average was derived from these counts. Thirty-three tractor-trailers exit at this location per hour, 27% (9) of which make a left turn. A total of 80 vehicles exit at this location per hour, 33% (26) of which make a left turn.

Of particular concern are the left turn maneuvers made by the tractor-trailers. As stated in the previous section, the median is not wide enough to allow perpendicular storage of a standard size passenger vehicle, let alone a tractor-trailer. As such, tractor-trailers are required to make a single movement across the north bound traffic lanes, across the median, and into the south bound traffic lane. Potential traffic conflicts due to this type of maneuver are common. In fact, during the study period 5 crashes were specifically attributed to left turns from this port-of-entry exit. Two of these crashes involved tractor-trailers.

Left turn exits by tractor-trailers from the port-of-entry present potential traffic conflicts on a regular basis for traffic in either direction. A tractor-trailer must first cross the two northbound traffic lanes and the median, before making the left turn into the southbound lane. This is not a rapid maneuver. Tractor-trailers making this left turn were timed from the moment they started forward at this exit until the rear of the trailer cleared the inside north bound traffic lane. The average time was 11 seconds. At 40 miles per hour, this crossing time provides a potential conflict zone to north bound traffic for 645 feet upstream from that exit. This is particularly a problem during periods of heavier traffic to drivers who are several vehicles back from the port-of-entry exit. These drivers may not notice the exiting tractor-trailer but suddenly have to contend with the braking vehicle ahead of them. An even more serious problem is occasionally seen, also during periods of heavy traffic. As several tractor-trailers queue up at this exit, the leader, through presumed impatience, will cross to the median and stop until the southbound lanes clear, and then will complete the left turn. During the median stop the north bound traffic lanes are blocked by the trailer.

A second problem involving exiting tractor-trailers at this exit also affects north bound traffic. A tractor-trailer making a right turn from the port-of-entry exit, and desiring to make a left turn at the U.S. 666-U.S. 550 intersection, must make an almost immediate movement across two traffic lanes into the left turn lane. In fact, the distance between the end of the right turn exit lane and the start of the left turn lane, on the opposite side of the road, is only 26 feet. Again, this is not a rapid maneuver. Tractor-trailers must either wait for a clear path, or proceed under less optimal traffic conditions and let the traffic beware. In periods of high traffic volume, clear paths are rare, so the second alternative is not uncommon.

Tractor-trailers exiting the port-of-entry exit also affect the south bound traffic. As previously stated, it takes the average tractor-trailer 11 seconds to clear the north bound lane. As such, it takes another several seconds for that same tractor-trailer to become fully merged into a south

bound traffic lane, and even longer still for the vehicle to attain the running speed of the through traffic. Potential traffic conflicts are relatively frequent with this type of maneuver, particularly during heavy traffic. A safe left turn from this port-of-entry exit is dependent upon several variables that the exiting driver must rapidly judge: clear north bound traffic, clear south bound traffic, no left turns or U turns at this median crossover by south bound traffic, and no exiting vehicles from the service station exit opposite the highway from this exit. It may be an overestimation of the average driver's ability to consistently negotiate this maneuver in a safe manner.

In determining appropriate standards against which to compare this existing design feature, three applicable standards were found. The Federal Highway Administration Manual of Uniform Traffic Control Devices (MUTCD) was referenced for warrants on the signalization of intersections. MUTCD Warrant 1, Minimum Vehicular Volume, was examined to determine if the existing conditions met the warrant requirements for signalization. For this traffic situation, a minimum hourly traffic volume on the highway would be 600, with a side street minimum hourly traffic volume of 150. However, when an intersection lies within a built-up area of an isolated community of less than 10,000 population, the volume requirements are reduced to 70% of the normal requirements, which would be traffic volumes of 420 and 105 respectively. With an average daytime hourly traffic volume of 80 at the port-of-entry exit, these warrant requirements are not met.

MUTCD Warrant 2, Interruption of Continuous Traffic, was also examined. This warrant is for conditions where traffic volume on the major street is so heavy that the minor intersecting street experiences excessive delays or hazards in entering or crossing the main street. These warrant requirements were minimum hourly traffic volumes of 900 for the major street and 75 for the minor street. The same 70% rule which applied in Warrant 1 applies in this Warrant, resulting in the reduced traffic volumes of 630 and 52. While the Warrant requirement for the minor street volume was satisfied, insufficient traffic volume data were available against which to compare the warrant requirement for major street volume. It is believed that the average hourly traffic volume on U.S. 666 would exceed 630 vehicles. If so, both Warrant volumes would be satisfied and justification would be provided for the modification of this intersection.

A third standard was used in the evaluation of this intersection. The American Association of State Highway and Transportation Officials (AASHTO) Policy on Geometric Design of Highways and Streets was referenced, and that portion of this manual involving required sight distance was used for comparison to the existing design. Specifically, required sight distance was analyzed in terms of a left turn movement into a crossroad with a narrow median, where both lane clearances are made in a single maneuver. The required sight distance refers to the sight distance required to complete the left turn maneuver and accelerate to the average running speed of the major road without being overtaken by approaching vehicles in the same direction. The required sight distance for passenger vehicles is approximately 650 feet. The required sight distance for tractor-trailers making the same maneuver would be substantially longer than for passenger vehicles, due to their much slower acceleration rates.

This port-of-entry exit intersection is less than 550 feet west of the U.S. 666-U.S. 550 intersection. Sight distance beyond this main intersection is hampered. The north leg of the main intersection is visible for some distance to the north of that intersection, but the traffic signal phase must also be evaluated to determine if that approaching traffic will affect the left turn maneuver from the port-of-entry exit. The east leg of the U.S. 666-U.S. 550 intersection is not readily visible beyond that intersection due to a curve and due to vision interference by traffic signals. The failure to have sufficient sight distance for left turn maneuvers from the port-of-entry exit, particularly for the tractor-trailers, would justify the modification of this intersection.

Design Feature 3 - Left Turn Lane Availability and Positioning

Left turn lane availability was of interest because of the lack of a left turn lane for south bound traffic at milepost point 93.5, and because of a significant number of left turns made at this location. Vehicles making left turns at this location typically turn partially into the median cross-over for storage, with the rear end of the vehicle remaining partially in the through lane. Some vehicles making this maneuver just stop in the through lane until they make the left turn. Either variation provides potential traffic conflicts, particularly for rear-end crashes.

Left turn lane positioning was of interest because of an off-set left turn lane for southbound traffic near milepost point 92.8. Drivers using this left turn lane for access into the 7-2-11 Convenience Store have to make a long diagonal movement across the northbound traffic lanes to reach the business access. The extent of the off-set from the end of the center median to the nearest side of the business access is 134 feet. This maneuver is not rapid, and the potential for traffic conflicts is considerable. Passenger vehicles performing this maneuver were timed, with an average time calculated. The average time from start of forward movement until the outside north bound traffic lane was cleared by the rear of the vehicle was 6.9 seconds. At 40 miles per hour this provides a potential conflict zone of 405 feet upstream from the business access point in the north bound lane. This potential conflict zone extends around a curve and more than half way to the major intersection (U.S. 666-State 504) at mile post point 92.7. During the two year study period, two crashes were attributed to these long left turns into the 7-2-11 store.

At the long left turn near milepost point 92.8, the median itself is a significant contributor to the problem. A major function of a median is to channel traffic into desired paths or directions. In this case, the median left turn lane for southbound traffic is channeling traffic into an unsafe maneuver.

No specific geometric design criteria were found which addressed left turn lane availability or positioning The AASHTO policy describes the provision of left turn lanes as desirable and an enhancement to traffic safety, particularly on arterial streets. However, no specific guidelines were provided. No requirement was found concerning the degree of intersection off-set which was allowable. The AASHTO policy states simply that intersections should be as near to perpendicular as possible.

Design Feature 4 - Median Cross-Over Positioning

Median cross-over positioning or location was of interest due to observed occurrences of U-turns by vehicles in order to gain access to businesses or side streets. This 0.9 mile section of highway is interspersed with 5 median cross-over points, 3 for side street intersections and 2 presumably for business access. Three of these median cross-overs were between mile-post points 92.7 and 93.0. This same 0.3 mile section contains 9 business access locations and 1 side street intersection. Of concern was whether the existing number of median cross-overs, particularly in the described 0.3 mile section, was too few, was correct, or was too many in view of applicable standards.

No requirements were found which specifically address median cross-overs. The provision, or lack of median cross-overs is primarily a matter of access control. A principal characteristic of an arterial street should be limited access, and the access which is provided should be located at points best suited to fit traffic safety needs. Individual business access should be secondary to the primary role of the street in safely transporting traffic. Considerable subjectivity exists in evaluating the need or lack of need for median cross-overs.

Design Feature 5 - U.S. 666-U.S. 550 Intersection

A fifth design feature evaluation was included, based on the motor vehicle crash cluster at milepost point 93.6 discovered in the motor vehicle crash epidemiologic characterization section of this report. The predominant types of crashes occurring at this intersection were rear-end collisions and collisions involving left turns to the north in front of oncoming traffic. Both types of crashes suggest some problem with the signalization at this intersection.

One observed problem at this intersection was related to the traffic signal. Vehicles making a left turn to the north at this intersection first are allowed to make a provided left turn on a green arrow simultaneous to the regular green light for forward east bound traffic. The green arrow is followed by a yellow arrow, which ends leaving only the regular green light. After the yellow arrow ends, the opposing west bound traffic receive the green light signal for forward movement. A permitted left turn to the north is allowed on the east bound green light phase, although no sign indicating the need to yield to oncoming traffic is present. Confusion concerning who has the right of way is inherent with the present system. All 12 collisions involving a left turn in front of oncoming traffic occurred during the permitted left turn phase. None occurred on the provided left turn phase.

A second problem was observed which involved the traffic signal at this intersection. The yellow arrow phase for north bound left turn traffic was timed at 2.9 seconds. Based on a formula in the Traffic Engineering Hand-Book for calculating the safe stopping distance for timing yellow light phases, a yellow arrow phase of 5.4 seconds should be provided. This was calculated assuming a speed of 15 miles per hour in the left turn lane. In fact, the yellow light phase for east bound traffic was also insufficient. This phase was timed at 3.6 seconds, while the same formula calculated a need for a 7 second phase.

The Manual of Uniform Traffic Control Devices was consulted to determine if there are any problems with the existing traffic signal structure or installation. No problems were determined. However, under the MUTCD warrants for traffic signalization, Warrant 6, Accident Experience, becomes primarily satisfied when 5 or more reported crashes have occurred within a 12 month period. The crashes must have involved at least $100 or more in damage. Thirty crashes occurred at this intersection over a two-year period, 12 of which were the "left turn to the north" collisions. The three other factors under this warrant are satisfied since the intersection is already signal controlled. Satisfaction of this warrant should provide justification for the modification of the traffic signalization at this intersection.

V. RECOMMENDATIONS

The results of this study have indicated a number of risk factors or geometric design problems which lend themselves to effective intervention. The majority of the risk factors or design problems are problems with the roadway environment, and the proposed solutions to the problems are through environmental modifications. Several problems involve factors intrinsic to the vehicle drivers, and as such, the proposed solutions are more in the realm of enforcement modifications or policy changes.

The following recommendations are presented to address the most serious traffic safety problems identified in this report. The recommendations are not intended to be exhaustive or exempt from discussion or comment. They are intended to present viable intervention options, and to encourage further dialogue towards the solutions of the problems. As with any major injury prevention initiative, the success of the intervention rests largely on the cooperation of all groups who are involved. In this case, cooperation and input are needed from a number of groups, including: the Shiprock Chapter, the Navajo Tribe, The Navajo Department of Public Safety, The Indian Health Service, the New Mexico Highway and Transportation Department, and the New Mexico office of the Federal Highway Administration.

1. The New Mexico Highway and Transportation Department (NMHTD) should conduct an in-depth engineering study at the U.S. 666-U.S. 550 intersection (milepost point 93.6). Such a study may well identify additional traffic flow and traffic safety problems not identified in this report. It should be emphasized that NMHTD traffic crash data should not be used in any engineering study, since the NMHTD crash data system has a serious problem with underreporting of crashes. NMHTD data reflects 0 crashes for this 0.9 section of highway for 1985-1987, while 52 crashes occurred on this 0.9 mile section of highway in 1987 alone, according to Navajo Division of Public Safety records reviewed for this study.

2. The NMHTD should conduct an in-depth engineering study at the U.S. 666-Port-of-Entry exit intersection at milepost point 93.5, particularly to evaluate the traffic flow patterns, and to identify the current highway traffic volume.

3. The traffic signal at the U.S. 666-U.S. 550 intersection should be modified to include at least the following changes: a) eliminate permitted (as opposed to provided) left turns for north bound traffic, b) lengthen the left turn phase for north bound traffic during peak traffic volume periods, c) increase the north bound, left turn, yellow-arrow phase to 5.4 seconds, d) increase the east bound yellow light phase to 7 seconds, and e) consider double left turn lanes for northbound left turn traffic (for provided turns only).

4. The Port-of-Entry exit at milepost 93.5 should be rerouted to exit at the signalized intersection at milepost point 93.6. This would involve the change of this intersection from a 3-leg to a 4-leg intersection. This would eliminate many of the traffic problems at milepost point 93.5.

5. Concomitant to the rerouting described in item 4, the Port-of-Entry exit at milepost point 93.5 should be blocked off to eliminate continued use of this exit.

6. The NMHTD should evaluate the function of the median from milepost points 92.7 to 93.0, to determine whether the median enhances traffic safety by effective channelization or whether it creates traffic safety problems by limiting left turns and access to business entrances. This evaluation should include an analysis of the adequacy of the existing number and locations of median cross-overs along this 0.3 mile section of highway, particularly in view of the insufficient width of the median for perpendicular vehicle storage.

7. If no changes are deemed necessary to the median at milepost point 92.8, then changes should be made to the long, off-set left turn for south bound traffic to access into the 7-2-11 store. This may involve relocating the entrance access to this store, so that the business access is perpendicular to this intersection.

8. The Navajo Division of Public Safety should consider increased enforcement action along this section of highway, particularly during the peak crash periods of weekdays between noon and 6:00 PM. The police may also consider increased enforcement action related to speeding and DUI related offenses.

9. The Navajo Division of Public Safety and/or the Tribal Court system should consider a follow-up study concerning the problem with drivers without driver's license to determine why these drivers are without driver's licenses. Appropriate policy changes can be made once the exact nature of the problem is understood.

10. The Indian Health Service, Office of Environmental Health and Engineering should follow-up on the injuries sustained in the motor vehicle crashes, specifically to determine the severity of the injuries, the severity of injuries by crash type and location, and to estimate the overall costs of these injuries.

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VII. APPENDICES LISTING

APPENDIX A - Location Maps

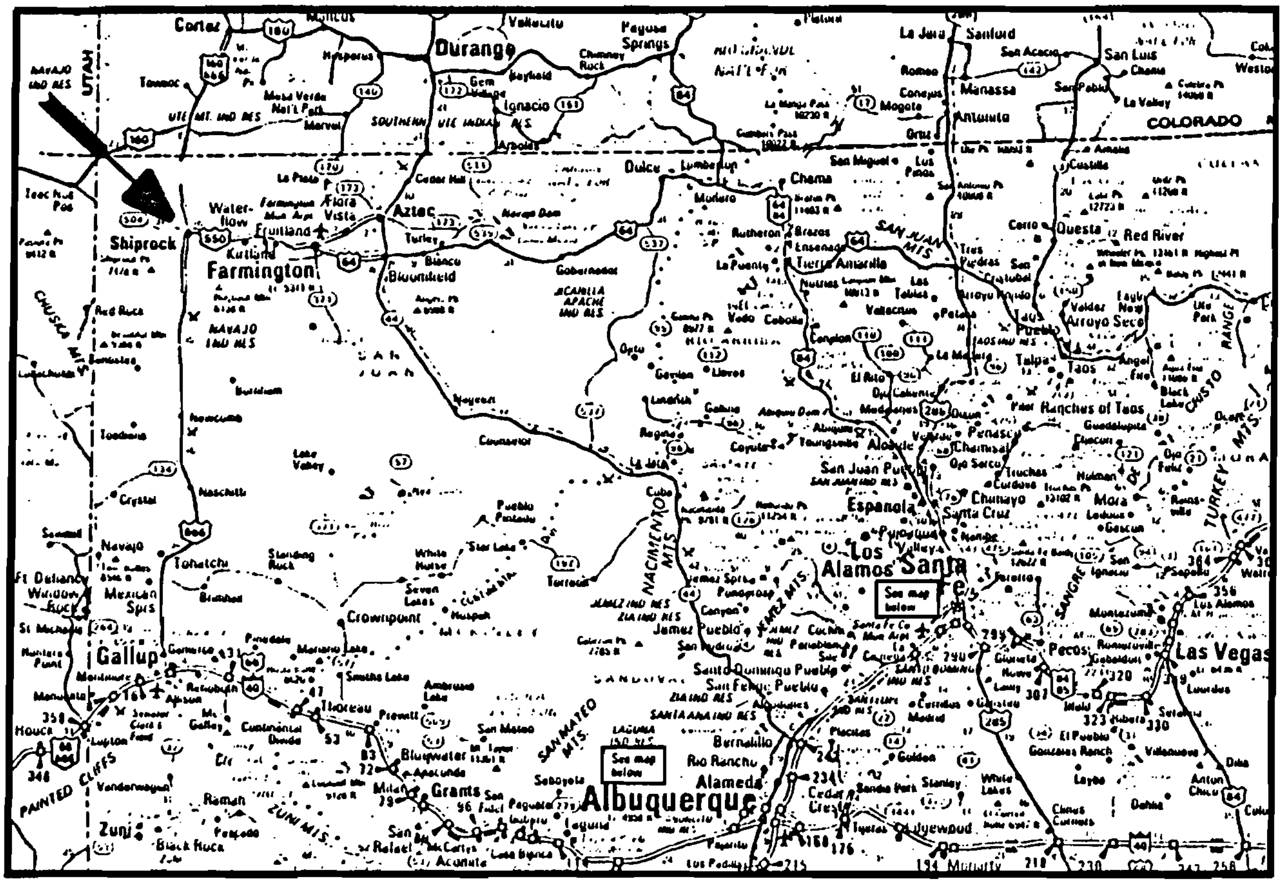
APPENDIX B - Detail Map, U.S. 666, milepost points 92.7 to 93.6

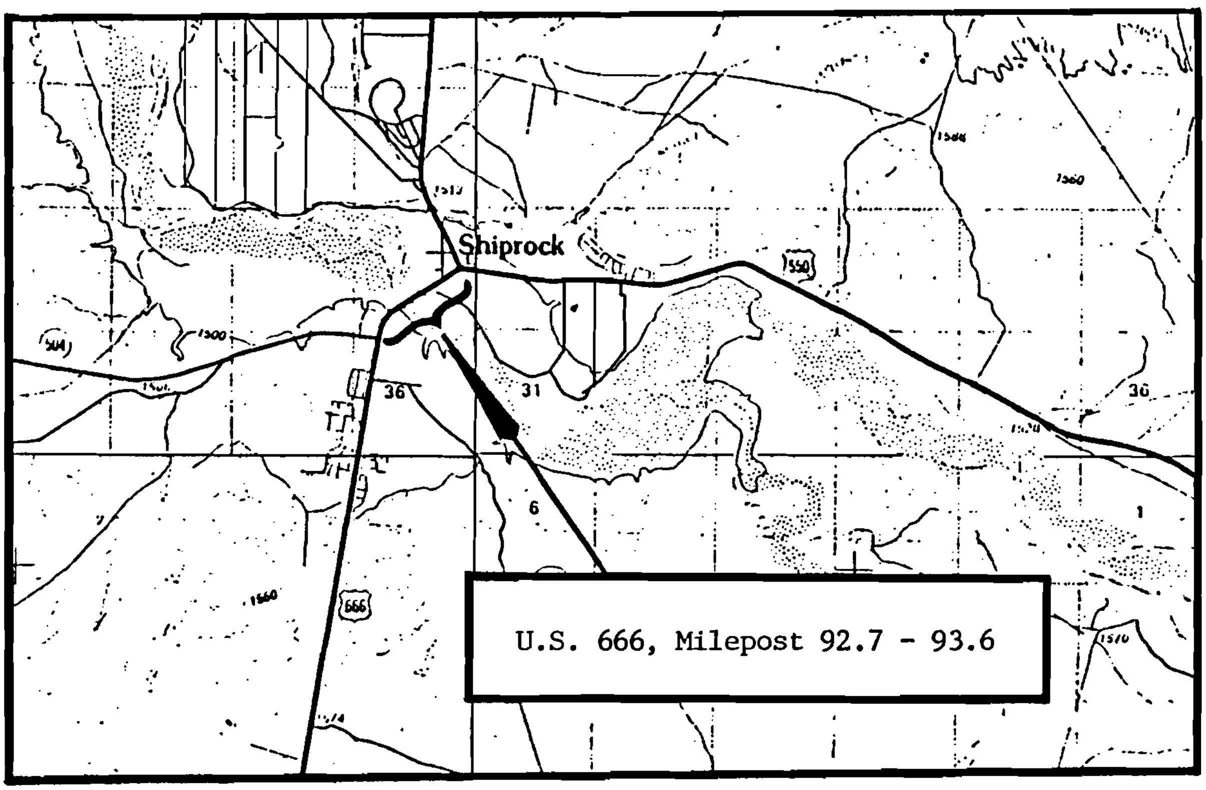
APPENDIX C - Detail Map, U.S. 666, milepost points 93.5 to 93.6

APPENDIX D - Detail Map, U.S. 666, milepost point 92.8

APPENDIX E - Sample Data Collection Form

APPENDIX A - Location Maps



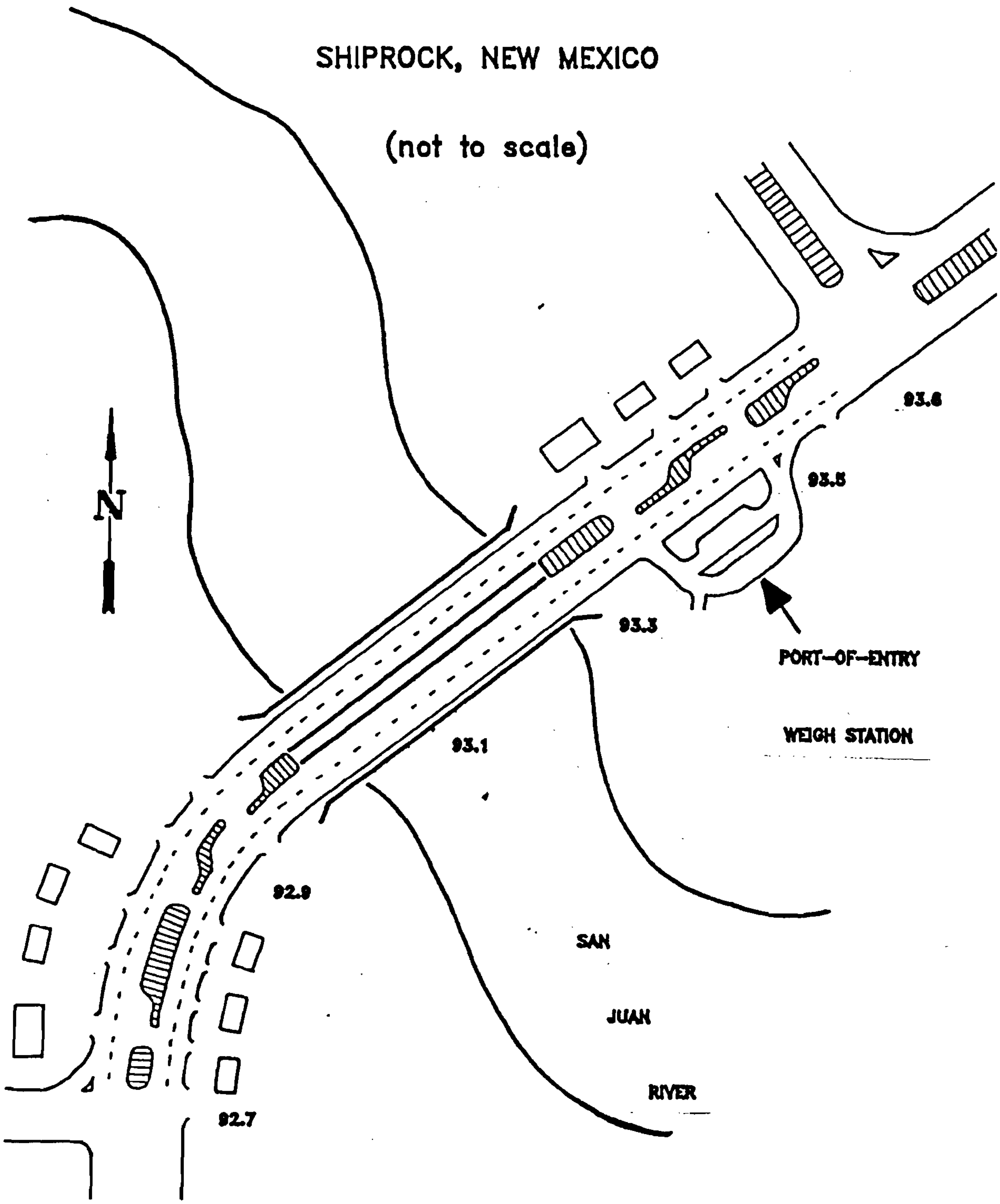


APPENDIX B - Detail Map

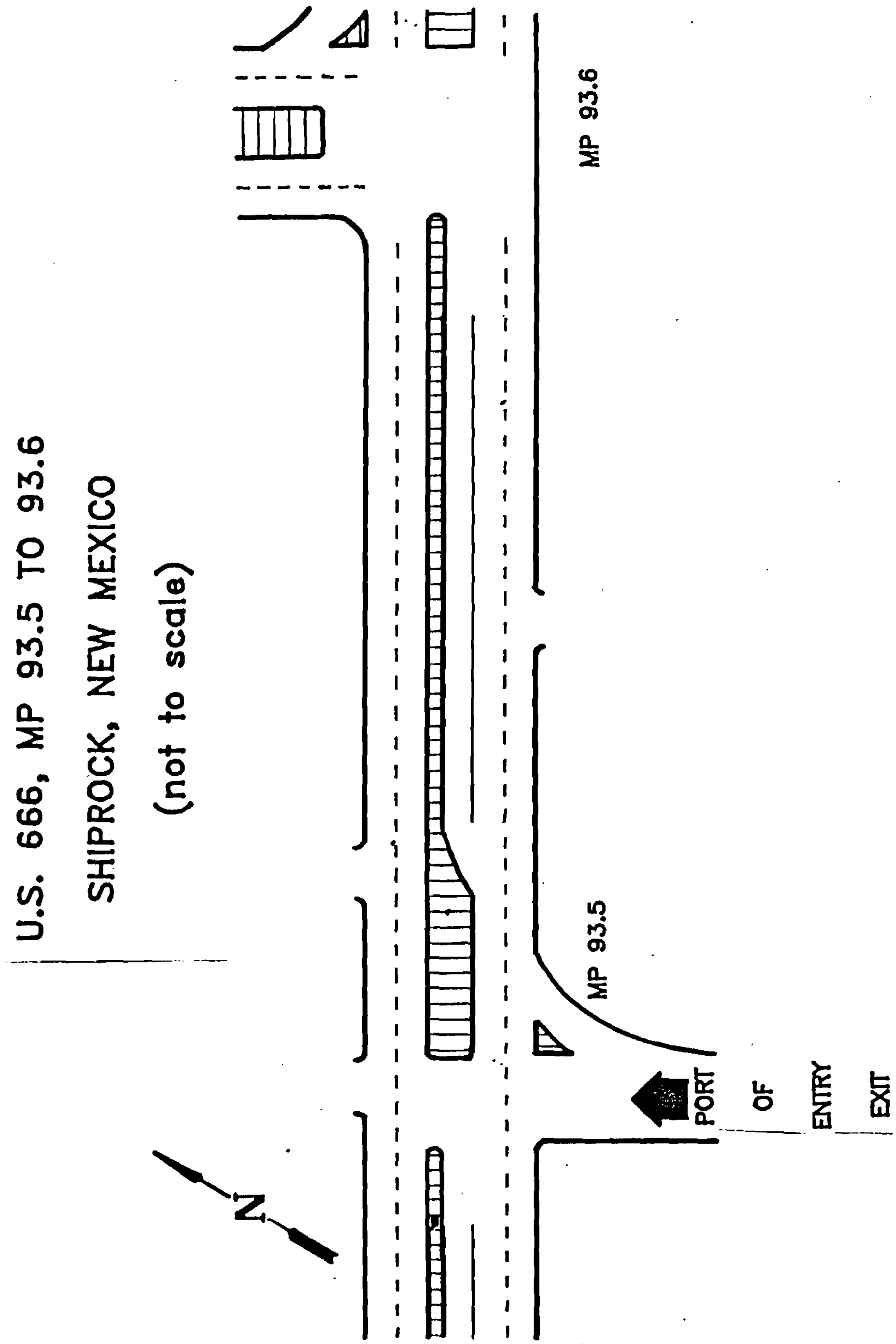
U.S. 666, MP 92.7 TO 93.6

SHIPROCK, NEW MEXICO

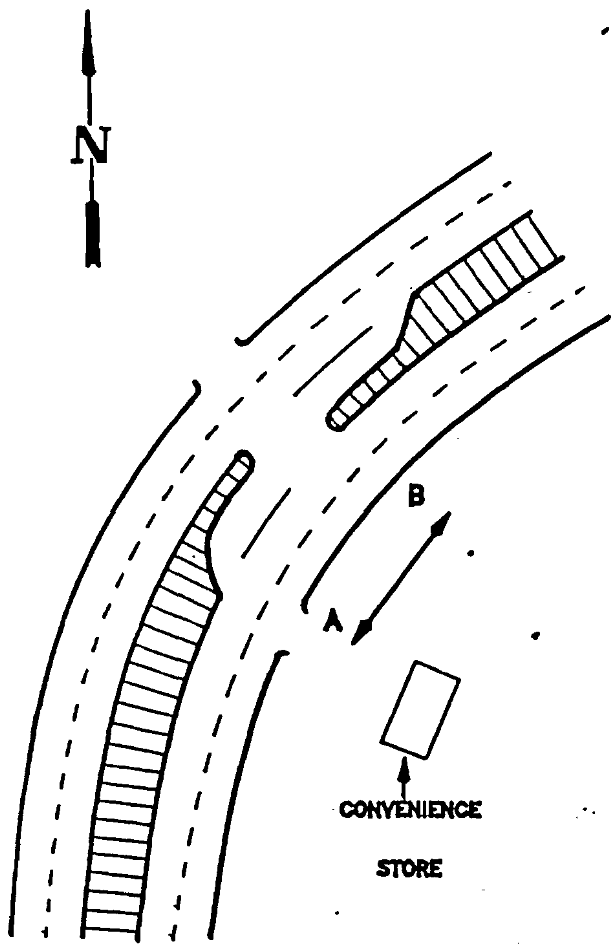
(not to scale)



APPENDIX C - Detail Map



OFF-SET LEFT TURN
U.S. 666, MP 92.8
SHIPROCK, NEW MEXICO
(not to scale)



-DISTANCE FROM POINT A TO POINT B = 134 FT.

-AVERAGE TIME TO COMPLETE TURN = 6.9 SECONDS.

-POTENTIAL UPSTREAM CONFLICT ZONE = 406 FT.

DATA COLLECTION FORM
U.S. 666 MP 92.7 - 93.6 MOTOR VEHICLE CRASH STUDY
SHIPROCK, NEW MEXICO

File Number: ______________________ Date of File Review: ______________
Date of Crash: ______________ Day of Week: ______________ Time: ______________
Crash Location: ____
______________________________ Number of Vehicles Involved: ______________

VEHICLE 1: Type vehicle: ______________ Direction of travel: ______________
Driver: Residence: ______________ Driver License: Y N U Age: ______________
Number injured: ______________ Number killed: ______________

VEHICLE 2: Type vehicle: ______________ Direction of travel: ______________
Driver: Residence: ______________ Driver License: Y N U Age: ______________
Number injured: ______________ Number killed: ______________

Pedestrian Involved: Y N ....Injured killed

ROAD · WEATHER

LIGHTING (Check One)
- ☐ Daylight
- ☐ Dawn
- ☐ Dusk
- ☐ Dark Lighted
- ☐ Dark-Not Lighted
- ☐ Other

WEATHER (Check One)
- ☐ Clear
- ☐ Raining
- ☐ Snowing
- ☐ Fog
- ☐ Dust
- ☐ Wind
- ☐ Other

ROAD COND. (Check One for each)
- ☐ ☐ Dry
- ☐ ☐ Wet
- ☐ ☐ Snow
- ☐ ☐ Ice
- ☐ ☐ Loose Material
- ☐ ☐ Other

ROAD SURFACE (Check One for each)
- ☐ ☐ Paved Unstriped
- ☐ ☐ Paved Center Stripe
- ☐ ☐ Paved Center & Edgeline
- ☐ ☐ Unpaved

TRAFFIC CONTROL (Check One for each)
- ☐ ☐ No Passing Zone
- ☐ ☐ Stop Sign
- ☐ ☐ Traffic Signals
- ☐ ☐ Yield Sign
- ☐ ☐ R R Gate
- ☐ ☐ 4 Way Stop
- ☐ ☐ Flashers
- ☐ ☐ No Control
- ☐ ☐ Other

ROAD CHARACTER (Check One)
- ☐ Straight
- ☐ Curve

GRADE (Check one)
- ☐ Level ☐ Dip
- ☐ Hillcrest
- ☐ On Grade

ROAD DESIGN (Check One Or More For Each)
- ☐ ☐ 1 Lane
- ☐ ☐ 2 Lanes
- ☐ ☐ 3 Lanes
- ☐ ☐ 4 Lanes
- ☐ ☐ Undivided
- ☐ ☐ Physical Div.
- ☐ ☐ Painted Div.
- ☐ ☐ One-Way
- ☐ ☐ Ramp
- ☐ ☐ Freeway
- ☐ ☐ Underv.
- ☐ ☐ Alley
- ☐ ☐ Other
- ☐ ☐ Constr. Zone

31 - VISION OBSCUREMENT
CHECK ONE PER UNIT (1 2)
- 1 ☐ ☐ NOT OBSCURED
- 2 ☐ ☐ BY PARKED STOPPED VEHICLE
- 3 ☐ ☐ BY MOVING VEHICLE
- 4 ☐ ☐ BY BUILDING
- 5 ☐ ☐ BY EMBANKMENT
- 6 ☐ ☐ BY SIGNBOARD
- 7 ☐ ☐ BY HILLCREST
- 8 ☐ ☐ BY LOAD ON VEHICLE
- 9 ☐ ☐ BY TREES, BUSHES
- 10 ☐ ☐ BY HEADLIGHT
- 11 ☐ ☐ BY SUN GLARE
- 12 ☐ ☐ BECAUSE OF BADWEATHER
- 13 ☐ ☐ OTHER
- 14 ☐ ☐ RAIN, SNOW, FOG ON WINDSHIELD
- 15 ☐ ☐ WINDSHIELD OBSCURED - OTHER
- 16 ☐ ☐ UNKNOWN

EVENT

APPARENT CONTRIBUTING FACTORS (Check One Or More For Each)
- ☐ ☐ Excessive speed
- ☐ ☐ Speed too fast for conditions
- ☐ ☐ Failed to yield right of way
- ☐ ☐ Passed stop sign
- ☐ ☐ Disregarded traffic signal
- ☐ ☐ Drove left of center
- ☐ ☐ Improper overtaking
- ☐ ☐ Followed too closely
- ☐ ☐ Made improper turn
- ☐ ☐ Driver inattention
- ☐ ☐ Under influence of alcohol
- ☐ ☐ Other improper driving
- ☐ ☐ Pedestrian error
- ☐ ☐ Inadequate brakes
- ☐ ☐ Defective tires
- ☐ ☐ Other mechanical defect
- ☐ ☐ Road defect
- ☐ ☐ Other—not involving driver error
- ☐ ☐ Traffic Control not functioning
- ☐ ☐ Improper lane change
- ☐ ☐ Improper backing
- ☐ ☐ None

WHAT DRIVERS WERE DOING (Check One For Each)
- ☐ ☐ Going Straight
- ☐ ☐ Overtaking-Passing
- ☐ ☐ Right Turn
- ☐ ☐ Left Turn
- ☐ ☐ U Turn
- ☐ ☐ Slowing
- ☐ ☐ Backing
- ☐ ☐ Stopped for Traffic
- ☐ ☐ " for Sign / Signal
- ☐ ☐ Start in Traffic Ln.
- ☐ ☐ Start from Park
- ☐ ☐ Parked
- ☐ ☐ Other

DRIVER

DRIVER OR PEDESTRIAN SOBRIETY (Check One For Each)
- ☐ ☐ HBD Obv. Drunk
- ☐ ☐ HBD Ability Impaired
- ☐ ☐ Had Not Been Drinking
- ☐ ☐ Sobriety Unknown

DRIVER OR PEDESTRIAN PHYSICAL CONDITION (Check One Or More For Each)
- ☐ ☐ Fatigue Asleep
- ☐ ☐ Eyesight Imp.
- ☐ ☐ Hearing Imp.
- ☐ ☐ Ill
- ☐ ☐ Medication
- ☐ ☐ Amputee
- ☐ ☐ No App. Defects
- ☐ ☐ Other Physical Impairment

Specify ______________

PEDESTRIAN

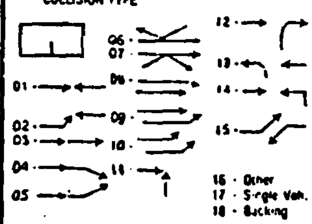
PEDESTRIAN ACTION

At Intersection
- ☐ ☐ With Signal
- ☐ ☐ Against Signal
- ☐ ☐ No Signal
- ☐ ☐ Diagonal

Not At Intersection
- ☐ From Behind
- ☐ No Crosswalk
- ☐ Crosswalk
- ☐ Walking W/Tr.
- ☐ Other
- ☐ Walking Against Traf.
- ☐ Standing
- ☐ Pushing or Working On Veh.
- ☐ Playing in Road

Specify ______________

COLLISION TYPE



Comments: ____
____
____
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