

# Existing Conditions Report

## May 2003

Project No. NH 0504-037



*THE TIME IS NOW...*

***US 50 Corridor  
Pueblo To Kansas***

**URS**

**WILSON  
& COMPANY**



# Contents

- 1 INTRODUCTION..... 1
- 2 EXISTING DRAINAGE ..... 2
- 3 EXISTING RIGHT OF WAY ..... 3
  - 3.1 HIGHWAY RIGHT OF WAY ..... 3
  - 3.2 RAILROAD RIGHT OF WAY..... 4
- 4 EXISTING CONDITIONS – ACCESS ..... 5
- 5 EXISTING ROADWAY GEOMETRY..... 6
  - 5.1 METHODOLOGY ..... 6
  - 5.2 TYPICAL ROADWAY SECTIONS ..... 6
  - 5.3 HORIZONTAL GEOMETRY..... 6
  - 5.4 VERTICAL GEOMETRY ..... 6
- 6 EXISTING STRUCTURE CHARACTERISTICS ..... 7
  - 6.1 STRUCTURE DATA ..... 7
  - 6.2 STRUCTURE CONDITION..... 7
- 7 EXISTING UTILITIES..... 9
- 8 EXISTING TRAFFIC EVALUATION..... 10
  - 8.1 REVIEWED STUDIES ..... 10
  - 8.2 EXISTING CORRIDOR TRAFFIC CHARACTERISTICS ..... 10
  - 8.3 EXISTING TRAFFIC VOLUMES ..... 10
  - 8.4 HISTORICAL TRAFFIC TRENDS ..... 10
  - 8.5 ACCESS ISSUES ..... 11
  - 8.6 RECENTLY IMPROVED ..... 11
  - 8.7 VEHICLE SPEED ANALYSIS ..... 11
  - 8.8 EXISTING HIGHWAY LEVELS OF SERVICE (LOS) ..... 12
    - 8.8.1 Methodology ..... 12
    - 8.8.2 Summary of Two-Lane Highway LOS..... 12
    - 8.8.3 Summary of Four-Lane Highway LOS ..... 12
  - 8.9 REGIONAL TRANSPORTATION NEEDS..... 13
    - 8.9.1 Truck Directional Distribution/Origin/Destination Study..... 13
    - 8.9.2 Travel Time Analysis..... 13
  - 8.10 ACCIDENT ANALYSIS AND SAFETY PRIORITY ..... 14
    - 8.10.1 Corridor-Wide Accident History..... 14
    - 8.10.2 Accident Type, Severity and Distribution ..... 15
    - 8.10.3 Accident Prone Non-Intersection Locations..... 16
    - 8.10.4 Need for Roadway Improvements ..... 18

# List of Tables and Figures

- TABLE 4-1 ACCESS DESCRIPTIONS ..... 5
- TABLE 6-1 IN-TOWN TOTAL ACCIDENT RATES ..... 7
- FIGURE 6-1 HISTORIC BRIDGE OVER HUERFANO RIVER ..... 7
- TABLE 6-2 STRUCTURES CONDITION RATING..... 8
- TABLE 6-3 STRUCTURES APPRAISAL RATING ..... 8
- FIGURE 8-1 TRAFFIC GROWTH ALONG CORRIDOR ..... 10
- TABLE 8-1 GEOMETRICALLY DEFICIENT INTERSECTION LOCATIONS ..... 11
- TABLE 8-2 TRAFFIC OPERATIONS SUMMARY FOR 2-LANE SEGMENTS ..... 12
- TABLE 8-3 TRAFFIC OPERATIONS SUMMARY FOR 4-LANE SEGMENTS ..... 12
- TABLE 8-4 TRUCK DIRECTIONAL DISTRIBUTION ANALYSIS ..... 13
- FIGURE 8-2 SPEED LIMIT CHANGE THROUGH CORRIDOR ..... 13
- FIGURE 8-3 CUMULATIVE TRAVEL TIME THROUGH CORRIDOR..... 14
- TABLE 8-5 CORRIDOR ACCIDENT DATA BREAKDOWN ..... 14
- FIGURE 8-4 IN-TOWN INJURY ACCIDENT RATES ..... 15
- TABLE 8-6 IN-TOWN TOTAL ACCIDENT RATES ..... 15
- FIGURE 8-5 TYPE AND DISTRIBUTION OF ACCIDENTS ON US 50..... 15
- FIGURE 8-6 BREAKDOWN OF ACCIDENT SEVERITY..... 16
- TABLE 8-7 BREAKDOWN OF ACCIDENT SEVERITY..... 16
- TABLE 8-8 ACCIDENT-PRONE NON INTERSECTION LOCATIONS..... 17
- TABLE 8-9 ROADWAY IMPROVEMENTS..... 17
- FIGURE 8-7 SAFETY BENEFITS OF WIDENING US 50 TO FOUR LANES ..... 18
- TABLE 8-10 IDENTIFIED ACCIDENT PRONE INTERSECTION LOCATIONS..... 18

# List of Appendices

- Appendix A Corridor Plans
- Appendix B Roadway Geometry
- Appendix C Structures Inventory and Photos
- Appendix D Utilities Contacts
- Appendix E Traffic Analysis Maps
- Appendix F Highway Capacity Software Analysis

# 1 Introduction

The primary goal of the *US 50 Existing Conditions Report* is to document known existing features including roadway geometry, drainage features, right of way, access, utilities, structures and traffic characteristics. Additionally, this report will identify deficiencies with existing roadway geometry, structures and safety conditions.

The report is divided into two primary sections: a chapter section with narratives on drainage, right of way, access roadway geometry, structures, utilities and traffic evaluation, and an appendix section that provides detailed graphics, tables and other data to support the narrative section.

The intent of this report is to provide the Colorado Department of Transportation (CDOT) staff and future designers a comprehensive inventory of the existing conditions along the corridor. This report can be a valuable resource for the regional staff in the Pueblo office as well as staff in residency offices. This document can also be a valuable resource for local agencies along the corridor.

## 2 Existing Drainage

Existing conditions for known and potential surface drainage problems and related issues for the US 50 corridor from Pueblo to the Colorado/Kansas state line are reviewed and presented in a separate report prepared by URS in 2001: *Drainage Assessment Report US 50 Corridor Pueblo to Kansas*, Colorado Department of Transportation, State Number: NH0504-37, 12812, Contract Number: 00HA2 00045.

The study included photo documentation and an inventory of all drainage structures listed on the CDOT Field Log of Structures, interviews with CDOT maintenance personnel and irrigation company points of contact (ditch riders), review and analysis of Federal Emergency Management Agency (FEMA) Floodplain studies and maps and preparation of the Drainage Assessment Report.

Within this portion of the US 50 corridor, there are approximately seventy-nine individual structures listed on the *CDOT Field Log of Structures*, crossing creeks, rivers, streams or irrigation canals. Each structure location was visited and photographed during the fall of 2000 or spring of 2001. Sixty-six specific CDOT structure records were retrieved, reviewed and included in this report for reference.

Thirty-three individual locations were identified where future highway construction or improvements might cause or exacerbate the encroachment onto known floodplains of the Arkansas River or its tributaries. The majority of identified locations and associated issues will require additional detailed study to support the design of any future improvements.

US 50 crosses numerous major and minor irrigation canals and ditches throughout the corridor. Site visits and interviews with irrigation company personnel were conducted for each of the following irrigation facilities:

Excelsior Ditch	Rocky Ford Highline Canal
Oxford Farmers Ditch	Otero Ditch
Catlin Canal	Rocky Ford Ditch
Las Animas Consolidated Canal	Lamar Canal
Manvel Canal	X-Y Canal

In general, existing irrigation crossing sites and structures are adequate for current operations. However, changes in highway alignment or alterations of existing crossings of any of the irrigation canals or ditches should be closely coordinated with the affected irrigation company.

Site visits and interviews were conducted with CDOT maintenance personnel for four separate sections of the US 50 corridor. The four sections were:

- Pueblo to Nepesta Road
- Nepesta Road to La Junta
- La Junta to McClave Junction
- McClave Junction to the Kansas state line

Pueblo to Nepesta Road had nine recurrent drainage issues that will need remediation in the future. The segment from Nepesta Road to La Junta had 13 issues and from La Junta to McClave Junction there were seven issues. From McClave Junction to the Kansas state line there were a total of 10 issues.

The *Drainage Assessment Report* includes a review of applicable hydraulic design criteria extracted from the *CDOT Drainage Design Manual* and water quality issues described in the *CDOT Erosion Control and Stormwater Quality Guide*.

Finally a summary of generic field survey data was compiled for typical drainage structures, irrigation canal crossings and storm drains. This information was based on the combined requirements of the *CDOT Survey Manual* and *CDOT Drainage Design Manual*. Corridor topographic maps, aerial photos, structure photos, interview records with irrigation companies and CDOT structure records are included in the appendices of the *Drainage Assessment Report*.

## 3 Existing Right of Way

### 3.1 Highway Right of Way

The existing right of way width along the US 50 corridor was obtained using Department of Highways as-built plans. The right of way width generally varies throughout the corridor, from 60 feet to 140 feet, with a few exceptions where the right of way reaches 500. US 50 is located in Pueblo, Otero, Bent and Prowers counties, beginning at Interstate 25 (I-25) and running east to the Colorado/Kansas border. The right of way is described below, in order of county from west to east.

#### Pueblo County

- In Pueblo County, the right of way averages 200 feet from I-25 to the State Highway (SH) 96 interchange, accommodating a 4-lane highway.
- East of the SH 96 interchange, the highway turns from four lanes to two lanes, and has a right of way of 100 to 120 feet to the Pueblo/Otero county line.

#### Otero County

- At the east edge of Otero County, it decreases from 100 feet to 60 feet at the west city limits of Fowler, and then widens to 80 feet at the east limits.
- The right of way continues at 80 feet to Manzanola, with small portions increasing to as much as 184 feet.
- As US 50 leaves Manzanola, ROW increases from 325 to 385 feet for a short distance.
- After crossing the bridge over the railroad east of Manzanola, the right of way again becomes 80 feet, and the highway lanes increase to four.
- At the west city limits of Rocky Ford, the highway separates, with an 80-foot right of way for each direction, the eastbound and westbound lanes being separated by one city block.
- The highway comes together again east of Rocky Ford, and the right of way increases to 185 feet.
- The right of way then decreases to 130 feet at the Swink city limit and remains there through Swink.
- At the east city limits of Swink, the right of way increases to 150 feet for .9 miles, increasing to 170 feet for 1.8 miles, and then to 185 feet until reaching the intersection of US 50 and US 350.
- The right of way through the town of La Junta is 100 feet in each direction.
- East of La Junta, the right of way increases to 290 feet until it reaches the Otero County/Bent County line.

#### Bent County

- East of the Bent County line, the right of way decreases to 175 feet and two lanes until reaching Las Animas.
- At the west side of Las Animas, the right of way decreases to 80 feet and continues through the city limits. North of Las Animas, the right of way increases to 585 feet for a very short distance near the SH 194 interchange, turns east, and then decreases to 160 feet at the intersection of US 50 and N. 12<sup>th</sup> Lane.
- This width continues for .25 miles past SH 183, and then decreases to 120 feet.
- The 120-foot width continues for 2.9 miles, increases to 150 feet for 6 miles, and varies from 80 feet to 255 feet for the next 2.5 miles.
- The right of way then stays at 100 feet to the Bent /Prowers county line.

#### Prowers County

- East of the Prowers County line, it increases from 100 feet to 160 feet to the west city limit line of Lamar.
- Right of way information within the city of Lamar is not included here because US 50 through Lamar is part of a separate project (the US 287 at Lamar project).
- The right of way east of Lamar varies from 200 feet to 125 feet until reaching the east side of the Bent Canal bridge in Section 35, Township 22 South, Range 45 West of the 6<sup>th</sup> PM, where the right of way decreases to 120 feet.
- It decreases to 110 feet at 22.5 Road, west of Granada, and then decreases to 100 feet at .3 miles east of that.
- The right of way remains at 100 feet until US 50 intersects SH 28, where it then increases to 190 feet.
- It again decreases to 100 feet at 29.5 Road and stays at 100 feet until it reaches the intersection of County Road 33.
- The right of way gradually decreases to 80 feet until it reaches the city limits of Holly, and remains at 80 feet through Holly and 1.5 miles beyond the east city limits.
- The right of way then increases to 100 feet, where it remains until .5 miles east of the Colorado/Kansas border. It then varies to the state line.

### 3.2 Railroad Right of Way

The existing US 50 corridor project right of way crosses, encroaches on, or now has title to railroad right of way. The railroads along the corridor are Union Pacific Railroad (UPRR), formerly Missouri Pacific and Burlington Northern Santa Fe Railway (BNSF), formerly known as the Atchison, Topeka, & Santa Fe Railway.

The UPRR runs adjacent to US 50 in Pueblo County. At the town of Boone, the highway turns southeast while the railroad continues east. The railroad sold the following land to the State of Colorado:

- 100 feet wide bridge in the NW ¼ Section 34, Township 20 South (T20S), Range 64 West (R64W) of the 6<sup>th</sup> PM
- Southerly 50 feet of railroad right of way from the west line of the NE ¼ Section 34, T20S, R64W of the 6<sup>th</sup> PM
- Southerly 50 feet to 75 feet of railroad right of way from approximately 90 feet east of the west line of the SE ¼ of Section 29, T20S, R63W of the 6<sup>th</sup> PM to a point approximately 220 feet east of the west line of Section 31, T20S, R63W of the 6<sup>th</sup> PM

This land was sold to the state under quitclaim deed number 76001.

The BNSF does not run near US 50 until it crosses the west line of Section 12, T22S, R60W of the 6<sup>th</sup> PM. Under quitclaim deeds Secretary's numbers 20298 and 28639, dated 12/1/09 and 6/26/20 respectively, the railroad conveyed the following land to Otero County for roads:

- Southerly 50 feet of railroad right of way from the Otero County line, also being the west line of Section 7, T22S, R59W of the 6<sup>th</sup> PM to west line of the NE ¼ SE ¼ Section 17, T22S, R59W of the 6<sup>th</sup> PM
- Southerly 50 feet of railroad right of way from the west line of the SE ¼ Section 16, T22S, R59W of the 6<sup>th</sup> PM to the east line of the NW ¼ Section 23 T22S, R59W of the 6<sup>th</sup> PM
- Southerly 50 feet of railroad right of way from approximately 200 feet east of the west line of the NW ¼ Section 24, T22S, R59W of the 6<sup>th</sup> PM to approximately 170 feet west of the east line Section 24 T22S, R59W of the 6<sup>th</sup> PM
- Southerly 50 feet of railroad right of way from approximately 900 feet east of the west line of Section 19, T22S, R58W of the 6<sup>th</sup> PM to the east line of Section 27, T22S, R58W of the 6<sup>th</sup> PM
- Northerly 50 feet of railroad right of way from approximately 720 feet east of the west line of the NE ¼ NE ¼ Section 26, T22S, R58W of the 6<sup>th</sup> PM to the east line of Section 12, T23S, R57W of the 6<sup>th</sup> PM
- Northerly 50 feet of railroad right of way from the west line of Section 17, T23S, R56W of the 6<sup>th</sup> PM to the east line of the SW ¼ Section 25, T23S, R56W of the 6<sup>th</sup> PM

- Southerly 50 feet of railroad right of way from the west line of the NE ¼ NW ¼ Section 31, T23S, R55W of the 6<sup>th</sup> PM to the East line of Section 4, T24S, R55W of the 6<sup>th</sup> PM

In Bent County, the land between the railroad and US 50 in Section 9, T23S, R52W of the 6<sup>th</sup> PM was vacated by the railroad by order of Commerce Court resolution Secretary's number 77006 ½.

In Prowers County, 2 parcels were conveyed to the county, and a document for encroachment was issued as follows:

- In the SW ¼ Section 34, T22s, R46W of the 6<sup>th</sup> PM, 10.2 acres was conveyed to Prowers County under QC deed Secretary's number 31182.
- In the SE ¼ Section 36, T22S, R45W and the NE ¼ Section 1, T23S, R45W of the 6<sup>th</sup> PM, railroad land at Grote was conveyed to the County of Prowers under OGQCD number 23201 and Secretary number 50383.
- In Section 12, T23S, R44W on US 50 between Cline Street and Holsington Street in Granada, and the east line of said section, Secretary's number 72006 covers the encroachment of US 50 on the railroad's right of way on the south.

The railroad is not adjacent to US 50 from Granada to the Colorado/Kansas border.

## 4 Existing Conditions – Access

The existing US 50 roadway from the I-25 interchange to the Colorado/Kansas border is classified into four categories throughout the project corridor. The categories are assigned to each state highway segment pursuant to the requirements of State Highway Access Code, March 2002.

Access Category Classifications along US 50 Project Corridor:

- EX – Expressway, Major Bypass
- R-A – Rural Regional Highway
- NR-A – Non-Rural Region Highway
- NR-B – Non-Rural Arterial

The general location of these roadways, by classification, is provided in Table 4-1.

Table 4-1 Access Descriptions

Mile Post		Category	Physical Description of Category Segment
From	To		
316.001	329.334	EX	I-25 Interchange to Jct SH 96
329.334	350.710	R-A	Jct SH 96 to Cranston Ave (CRLL3) in Fowler
350.710	351.321	NR-A	Cranston Ave (CRLL3) in Fowler to 781 feet west of CR LL4 & LL3.5
351.321	359.308	R-A	781 feet west of CR LL4 & LL3.5 to CR 11.10
359.308	360.013	NR-A	CR 11.10 to 1315 feet west of Catlin Canal Str L-21-K
360.013	368.047	R-A	1315 feet west of Catlin Canal Str L-21-K to 174 feet East of CR 18.9
368.047	369.238	NR-A	174 feet East of CR 18.9 to Railroad Ave in Rocky Ford
369.238	374.349	R-A	Railroad Ave in Rocky Ford to Reynolds Ave in Swink
374.349	374.839	NR-A	Reynolds Ave in Swink to 433 feet west of Swink Drive
374.839	376.952	R-A	433 feet west of Swink Drive to Crooked Arroyo Strs M-22-K EB & M-22-A WB in La Junta
376.952	380.861	NR-A	Crooked Arroyo Strs M-22-K EB & M-22-A WB in La Junta to Malouff Ave in La Junta
380.861	398.007	R-A	Malouff Ave in La Junta to Oak Ave in Las Animas
398.007	399.940	NR-A	Oak Ave in Las Animas to Arkansas River Strs L-24-D EB & L-24-A WB
399.940	434.117	R-A	Arkansas River Strs L-24-D EB & L-24-A WB to Arkansas River Strs L-26-H EB & L-26-BW WB
434.117	436.232	NR-B	Arkansas River Strs L-26-H EB & L-26-BW WB to 2365 feet west of CR 9
436.232	452.559	R-A	2365 feet west of CR 9 to Inge Street In Granada
452.559	452.964	NR-B	Inge Street In Granada to Hoisington Street in Granada
452.964	462.740	R-A	Hoisington Street in Granada to 11 <sup>th</sup> Street in Holly
462.740	463.506	NR-A	11 <sup>th</sup> Street in Holly to Jct SH 89
463.506	467.583	R-A	Jct SH 89 to CR 39 at Colorado/Kansas state line

(State Highway Access Category Assignment Schedule, 2002)

- Pueblo County: 223 Permitted Access
- Otero County: 84 Permitted Access
- Bent County: 17 Permitted Access
- Prowers County: 70 Permitted Access (25 within Lamar)

According to CDOT, some permitted accesses were never built or may no longer be in use by the permit holder.

## 5 Existing Roadway Geometry

### 5.1 Methodology

The geometric analysis of the US 50 corridor from Pueblo to the Colorado/Kansas state line was completed by utilizing aerial photographic mapping technology. Detailed results of this analysis are located in Appendix B. A digital terrain surface was used to model the roadway. Nine separate horizontal and vertical alignments are represented in this analysis. A main line alignment was created from Fountain Creek in Pueblo to the Colorado/Kansas state line. In areas where the road is separated, the longer path was used to establish the mainline. Road stationing matches the mainline at the onset of each divided section.

Milepost locations were established from CDOT's *Geographic Information Systems (GIS)* database. Each milepost was correlated with the main line stationing. Interpolating between successive mileposts identified locations that fell between mileposts.

The information for posted speed limits referenced in Appendix B originated from CDOT's database, *Information for Highway 50 B*. An existing design speed of 5 miles per hour above posted speeds was assumed. A design speed of 70 miles per hour was used for the future condition.

### 5.2 Typical Roadway Sections

CDOT's inventory database, *Geometric Information for Highway 50 B*, established the cross-sectional geometry referenced in Appendix B.

### 5.3 Horizontal Geometry

Horizontal curves were determined by producing a best fit of the roadway centerline from the aerial photography. Design speed criteria were based on curve radius and assumed a normal crown non-superelevated section as referenced in *AASHTO's 2001 Policy on Geometric Design of Highways and Streets (PGDHS)*, page 168.

The majority of the existing horizontal curves were found to be deficient using the non-superelevated assumption. The analysis referenced in Appendix B reveals that 209 curves failed to meet the existing design speed along the corridor, with a total of 213 failing to meet the future design speed criteria of 70 miles per hour.

### 5.4 Vertical Geometry

Vertical alignments were established with profiles created from the digital terrain model. Utilizing a tolerance of one foot, the existing road was fitted to the terrain model profile. Design speeds for the vertical curves were based upon the "K" value utilizing *AASHTO's 2001 PGDHS*, pages 274 and 280, for crest and sag vertical curves respectively.

A total of 150 vertical curves do not meet the existing design speed criteria with 193 failing to meet the future design speed criteria.

## 6 Existing Structure Characteristics

### 6.1 Structure Data

There are a total of 94 structures that are either on or over US 50 between I-25 and Pueblo and the Kansas state line. They are summarized as follows:

- Bridges on US 50 (85)
  - Over other roads 5
  - Over railroads 4
  - Over channels 74
  - Over pedestrian facilities 2
  
- Bridges over US 50 (9)
  - Other roads 4
  - Railroads 4
  - Pedestrian facilities 1

The bridge superstructures have been constructed of multiple material types. They can be categorized as follows:

**Table 6-1 In-Town Total Accident Rates**

Type	Number
Reinforced Concrete	24
Prestressed Concrete	15
Concrete Arch	2
Culvert	19
Steel	23
Timber	11

Seventy-three of the structures have structural decks. The decks were built almost exclusively of concrete; 67 are concrete, one is corrugated steel, and five are timber. The wearing surfaces of the decks are comprised of 62 bituminous, seven concrete, and four are categorized as “other”.

The bridges span pedestrian facilities, roads, rail, and numerous channels consisting of very small drainage swales to the Arkansas River. The span lengths range from six feet to 126 feet. Structure lengths vary from six feet to 1448 feet. Due to the many channel and river crossings, 58 percent of the structures are three spans or more. Thirty percent are single span and 12 percent are two span. Twenty-eight of the structures have a similar parallel structure for the opposite traffic lanes.

### 6.2 Structure Condition

The average age of all of the bridges is 44 years, with 54 percent of the bridges built before 1960. The bridge over the Huerfano River just east of Boone was constructed in 1921, is the oldest of the structures along the corridor. It is listed on the National Register of Historic Places, and is one of two concrete arch bridges along the US 50 corridor. There is one other bridge that is eligible for the list. Twenty-two additional structures are categorized as possibly eligible for the Register.

**Figure 6-1 Historic Bridge over Huerfano River**



Eight of the structures currently have recommendations for major repair. Seven are recommended for rehabilitation due to general deterioration or inadequate strength, and one for full replacement due to capacity or geometry. The approximate total cost for the recommended repairs is \$5.5 million. There are only four of the 94 structures that are currently eligible for federal funding using FHWA’s ten-year rule. None of the bridges are posted for load restriction.

Based on a CDOT bridge database, the condition ratings of the bridge components in the corridor can be summarized as follows:

**Table 6-2 Structures Condition Rating**

Rating	Description	Deck	Superstructure	Substructure	Channel	Culvert
9	Excellent	0	0	0	0	0
8	Very Good	7	12	7	40	3
7	Good	15	29	28	21	12
6	Satisfactory	39	23	25	11	4
5	Fair	11	11	13	1	0
4	Poor	3	0	2	2	0
3 or below	Serious to Failed	0	0	0	0	0
N	Not Applicable	19	19	19	19	75

Generally, the bridges are in satisfactory condition. The majority of the bridge components are rated a 6 (satisfactory) or higher. The lowest rating of all structural components on the US 50 corridor is 4 (poor condition), and there are only four bridges that have components rated this low.

The appraisal rating of a bridge evaluates it in relation to a new bridge built to current standards. The following is a table of appraisal ratings of the structures in the corridor:

**Table 6-3 Structures Appraisal Rating**

Rating	Description	Structural	Deck Geometry	Under-clearance	Bridge Posting	Waterway Adequacy	Approx.. Roadway Alignment
N	Not Applicable	0	20	76	0	19	0
9	Superior to present criteria	0	11	0	0	16	0
8	Equal to present criteria	8	3	2	1	54	85
7	Better than minimum criteria	31	12	0	0	1	1
6	Equal to minimum criteria	24	1	5	1	3	6
5	Tolerable	29	5	2	92	0	2
4	Barely Tolerable	2	36	3	0	0	0
3	Intolerable (corrective action)	0	2	6	0	1	0
2	Intolerable (replace)	0	4	0	0	0	0

Generally speaking, the bridges are rated fair to good. The only slight exception is Deck Geometry, which indicates that the roadway and shoulders are probably narrower than current roadway practice incorporates.

Another rating mechanism, the sufficiency rating, is a calculation that gives the overall ability of the bridge to remain in service. It is calculated in percentages and involves the combination of the structural adequacy and safety of the bridge (55 percent maximum), the serviceability and functional obsolescence (30 percent maximum), and the essentiality for public use (15 percent maximum). Sixty-eight percent of the structures received a sufficiency rating of 70% or better and 29% were rated above 90%. This indicates that the bridges are in good shape overall and many are almost entirely sufficient. Bridges scoring below 80% are typically eligible for rehabilitation funds and bridges scoring below 50% are usually eligible for replacement funds.

There are four structures in the corridor that are considered structurally deficient, which indicates that the structure is weight restricted due to condition, in need of rehabilitation, or closed. Nine bridges are classified as functionally obsolete, which means that the bridge may be structurally sound but does not meet current standards due to inadequacies in deck geometry, clearances, or approach roadway alignment. These are identified in Appendix A.

Relevant data and photos of the structures can be found in Appendix C.

## 7 Existing Utilities

The information in this section was gathered between October and December 2002. Updates to contact information should be verified prior to completing any design work.

There are 67 separate utility companies or facilities owners within the 151 miles of the US 50 corridor study area. A large number of them own the water, sanitation and some electric utilities within their corporate limits.

Ten towns and cities within this study area are classified as governmental entities. The cost for any existing utility relocation required in these areas for upgrading the existing highway would be borne by the Colorado Department of Transportation. These towns and cities are responsible for sanitary sewer, water and electric utilities.

The locations of the existing utilities, as shown in Appendix D, are approximate, according to existing maps and personal knowledge of where utility lines are located. Final design will require field locates and pot holing.

Information on existing utilities was gathered by personal visits to every possible utility company along the corridor. Additional information was obtained from CDOT's utility permits, as-built construction plans and field inspection and verification.

Numerous water associations are classified as governmental entities, since they are created to provide water to a predefined service area. These entities will need to be verified at or near the start of design.

Qwest and CenturyTel have several private easements in the study area. The telephone and fiber optic lines are located primarily in the highway right of way, crossing it numerous times throughout the corridor.

Numerous irrigation ditches located along the corridor may require adjustments or relocations during future design projects. Identifying the specific locations of each ditch is beyond the scope of this report.

## 8 Existing Traffic Evaluation

US 50 is the major east-west connection between Pueblo and numerous cities and towns located in southeast Colorado. The corridor includes both rural and smaller urban areas such as the cities of La Junta, Las Animas and Lamar. This existing condition analysis evaluated US 50 from I-25 (mp 316.00) to the Kansas state line (mp 467.58), a distance of 151.58 miles. The following sections describe transportation characteristics, regional mobility, planning level traffic operations and deficient traffic areas along the corridor.

### 8.1 Reviewed Studies

The following safety studies were reviewed and incorporated into this document:

- *SH115 and SH-50 Safety Study-1989 for CDOH District II*, prepared by HDR Engineering, Inc.
- *Safety Assessment Report, State Highway 50 Corridor, Pueblo to Kansas (mp 316.00 to 467.5)-January 2003 for CDOT Region 2*, prepared by CDOT Safety and Traffic Engineering Branch.

### 8.2 Existing Corridor Traffic Characteristics

- US 50 is classified as a Federal-Aid Primary (FAP) highway and is included in the National Highway System.
- The estimated average daily traffic (ADT) volume over the entire segment is approximately 5,500 vehicles per day, with peak volumes exceeding 19,000 ADT.
- The average percentage of trucks over the entire corridor is nearly 16% with peak truck percentages exceeding 25% near Lamar.
- In general, traffic volumes in the urban areas were highest in the afternoon from 3 p.m. to 6 p.m.
- The corridor is comprised of 96 miles (63%) of 2-lane highway and 56 miles (37%) of 4-lane highway.
- Thirteen (13) signalized intersections were noted along the corridor. Four are within the Pueblo urban limits, four through Lamar, three near La Junta and one each in Rocky Ford and Las Animas.
- Rocky Ford, La Junta and Lamar each had an at-grade railroad crossing.
- Three grade-separated crossings exist at SH 42/US 50, Paul Harvey Blvd./US 50, and US 287/US 50 west of Lamar.

- Farm equipment is prevalent on the roadway during the summer months. Passing farm equipment on the road where narrow shoulders with rumble strips exist can be difficult.

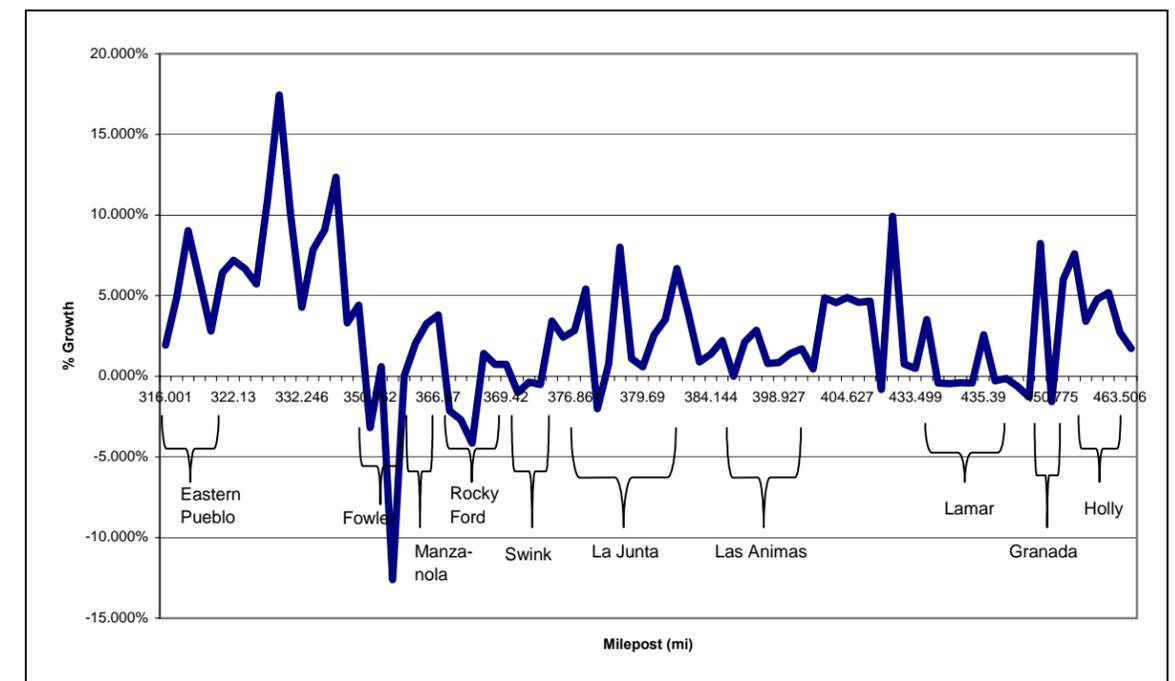
### 8.3 Existing Traffic Volumes

Traffic counts were collected in the spring and summer of 2000 to document current automobile and truck traffic characteristics. Data from the traffic count program has been depicted in Appendix E. The figures portray the average daily volumes, and estimated percentage of trucks along the corridor. Traffic volume information has been shown at locations between the cities and towns on the two and four-lane segments.

### 8.4 Historical Traffic Trends

Historical traffic trends were evaluated over a five-year period beginning in 1995. Overall, the corridor experienced an average 2.8% growth rate in traffic volume while the 10-year census shows an average 0.95% population growth in cities along the corridor. Figure 8-1 shows the traffic growth trends are greatest from Pueblo to Fowler.

Figure 8-1 Traffic Growth Along Corridor



## 8.5 Access Issues

Thirteen signalized and numerous stop-controlled intersection locations control access to US 50. On average the number of stop-controlled locations between the cities and towns is approximately two per mile. Many intersecting roadways are geometrically deficient, poorly spaced and have many substandard design elements that increase the potential for future accidents with injuries. Table 8-1 lists the intersection locations that are the most deficient and identifies the recommended improvements.

**Table 8-1 Geometrically Deficient Intersection Locations**

Item	Identifier	MP	Description	Recommended Improvement
1	320A	320.3	US 50/27 <sup>th</sup> , Lanes	Need for Accel and Decel lanes
2	320B	320.89	US 50/28 <sup>th</sup> , Lanes	Need for Accel and Decel lanes
3	321A	321.14	US 50/29 <sup>th</sup> , Lanes	Need for Accel and Decel lanes
4	-----	322.14	US 50/Baxter	Signal
5	322A	322.38	US 50/32 <sup>nd</sup> Lane	Need Left Turn Decel lane
6	322B	322.95	US 50/33 ½ Lane	Need Left Turn Decel lane
7	-----	322.14	US 50/US50C	Turn Lanes
8	350A	350.08	US 50 west of Fowler	Two Way Continuous Left Turn Decel Lane
9	358A	358.07	US 50/CR10	Need Left Turn Decel Lane
10	-----	374.91	US 50/Columbia Ave	Possible Needs for Left Turn Lane
11	-----	376.63	US 50/CR 26.5 (Super Wal-Mart)	Signal
12	377A	377.85	US 50/ McDonald's access	Combine the two access points, New Signal
13	380B	380.78	US 50/Lacey	Need Left Turn Decel Lane

## 8.6 Recently improved

Recently, CDOT has improved four intersection locations. These locations, shown in gray, were improved to address safety and improve access to businesses along the corridor. Color mapping of traffic deficiencies has been included in the report. The identifier column has been included to assist the reader in locating the problem locations on maps included in Appendix A.

## 8.7 Vehicle Speed Analysis

A vehicle speed analysis was prepared as part of the Safety Assessment Report. The report determined that eastbound and westbound traffic on rural segments of US 50 appear to conform closely to existing speed limits. The results suggest that speed limits are generally appropriate and the speed differential within the traffic flow is not expected to be extreme or a significant accident causal factor. In the more urbanized areas, the spot speed data indicated that drivers are generally exceeding posted limits by an average of 14%.

## 8.8 Existing Highway Levels of Service (LOS)

The existing traffic operations were evaluated along the corridor. The Level of Service (LOS) analysis evaluated both the two- and four-lane highway segments. The planning LOS analysis considered representative traffic volumes, access points, free flow speed, lateral clearance, shoulder widths, directional distribution, percentage of no-passing zones and median areas for each studied segment.

### 8.8.1 Methodology

The performance of the two- and four-lane segments was analyzed using reference tables from and in accordance with the Highway Capacity Manual (HCM) 2000 from the Transportation Research Board.

### 8.8.2 Summary of Two-Lane Highway LOS

The results for the two-lane traffic analysis are listed in Table 8-2 and show that the overall LOS is acceptable with average travel speed varying below the posted speed limit. The longest two-lane segment with the poorest LOS performance is Segment 7, which has a Percent-Time-Spent-Following (PTSF) value of 68.1% and a Level of Service rating D.

**Table 8-2 Traffic Operations Summary for 2-lane Segments**

Segment Number	MP start	MP end	Length of segment [mi]	Average Travel Speed	% Time Following	LOS
1	332.683	335.764	3.081	56.6	60.8%	C
2	335.764	350.642	14.878	57.2	59.2%	C
3	351.246	359.121	7.875	56.8	57.1%	C
4	366.970	368.047	1.077	46.2	70.8%	D
5	369.374	369.759	0.385	42.9	76.8%	D
6	386.085	398.067	11.982	58	52.6%	C
7	405.010	428.488	23.478	55.1	68.1%	D
8	436.262	452.272	16.01	56.3	57.4%	C
9	452.964	462.740	9.776	57	55.9%	C
10	463.506	467.583	4.077	58.5	49.0%	B

### 8.8.3 Summary of Four-Lane Highway LOS

Similarly, the four-lane sections of US 50 had acceptable LOS performance levels. The following table summarizes the data for the multi-lane sections of roadway. The results show an average travel speed close to the posted limit with greater traffic density on the westbound sections. The greatest density occurs near the city of Pueblo (Segment 1).

**Table 8-3 Traffic Operations Summary for 4-Lane Segments**

Segment Number	MP start	MP end	Length of segment [mi]	Average Travel Speed	Directional Density (WB/EB)	Directional LOS (WB/EB)
1	318.831	322.131	3.3	59.5	12.8/6.9	B/A
2	322.131	332.693	10.562	59.5	7.51/4.1	A/A
3	359.121	359.463	0.342	57.9	2.8/2.3	A/A
4	360.013	366.97	6.957	57.9	3.9/3.2	A/A
5	369.759	374.259	4.5	59.3	6.1/5.0	A/A
6	374.839	376.952	2.113	54.5	9.1/7.4	A/A
7	380.861	386.085	5.224	59.8	2.6/2.1	A/A
8	399.848	405.01	5.162	59.8	3.1/2.5	A/A
9	428.488	434.32	5.832	59.5	7.4/5.0	A/A

The detailed Highway Capacity Software (HCS) analysis for the two- and four-lane highway segments has been included in Appendix F.

## 8.9 Regional Transportation Needs

US 50 has the following regional transportation characteristics:

- US 50 is a historic highway and the primary truck route connecting the Front Range cities of Pueblo and Colorado Springs to southeast Colorado.
- The Ports to Plains Trade Corridor has identified that a segment of US 50/US 287 in Lamar is a vital link in the development of this "High Priority Corridor" truck corridor.
- CDOT has initiated a bypass study to address the impact of existing and future truck traffic on small towns like Lamar.

### 8.9.1 Truck Directional Distribution/Origin/Destination Study

A trip directional distribution analysis was completed in January 2003. Truck travel patterns were analyzed at the US 287/US 50 interchange. The results of the analysis are summarized in Table 8-4.

**Table 8-4 Truck Directional Distribution Analysis**

From:	To:	Turning Movement	Percentage
US287-Southbound	US50-Eastbound	Left	97%
US287-Southbound	US50-Westbound	Right	3%
US50- Eastbound	US287-Northbound	Left	5%
US50- Eastbound	US50- Eastbound	Through	95%
<b>US50-Westbound</b>	<b>US287-Northbound</b>	<b>Right</b>	<b>74%</b>
<b>US50-Westbound</b>	<b>US50-Westbound</b>	<b>Through</b>	<b>26%</b>

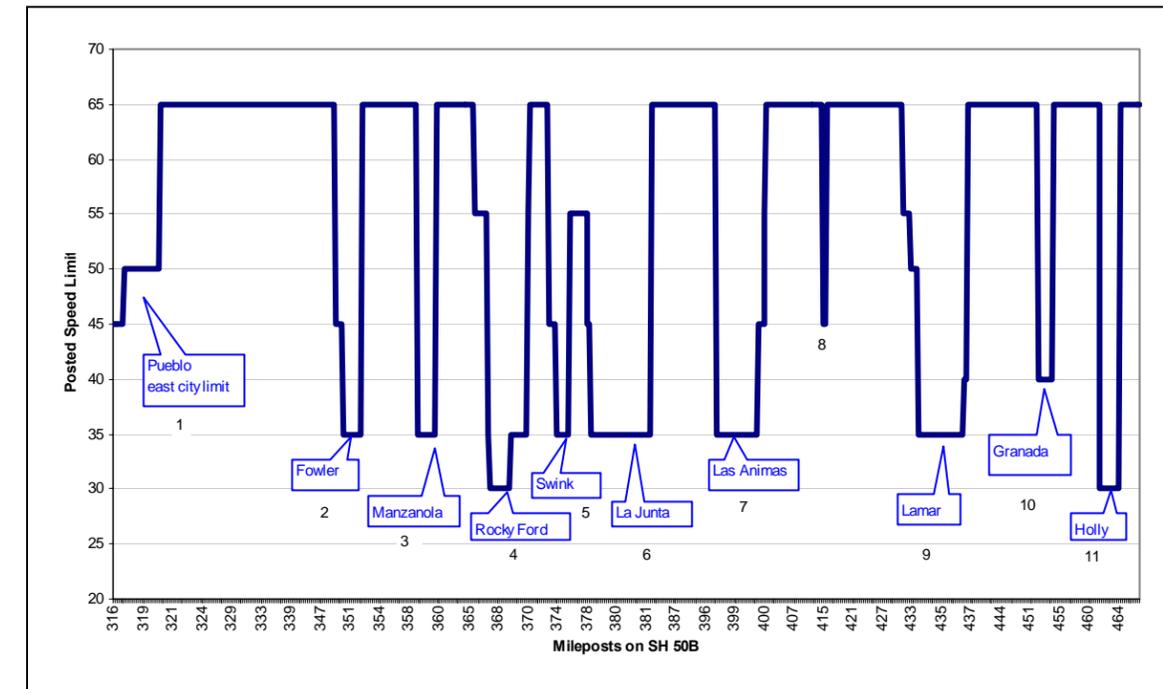
The survey determined that twice as many trucks travel on US287 as compared to US 50 and that three out of every four westbound trucks travel north to Limon, CO.

Results of the Origin/Destination study prepared for CDOT, in proximity to Lamar, was not available for review.

### 8.9.2 Travel Time Analysis

A planning level travel-time analysis was completed for the 152-mile corridor to determine the overall travel efficiency. The travel-time analysis evaluated the impact of speed reduction zones and signal timing on corridor efficiency. Figure 8-2 graphically shows the 11 speed reduction zones and their locations along the corridor.

**Figure 8-2 Speed Limit Change Through Corridor**



A graph showing existing travel time has been shown in Figure 8-3. The travel time graph includes the time delay caused by the 10 speed reduction zones and the 13 traffic signals. Corridor delay is greatest in the towns where the travel time line appears as a vertical line. Focusing on corridor mobility, the existing travel time was compared to a 65 mph highway without speed reduction zones or traffic signals. This ideal highway would have a total travel time of approximately 2 hours 15 minutes. Because of signal delay, the additional time to traverse the corridor is approximately 1 hour 30 minutes. With speed reduction zones adding an additional 15 minutes of delay, the total travel time through the corridor is approximately 4 hours with an average corridor travel speed of 37.55 mph. The thirteen signals create the greatest delay in the system. Delay from the three railroad crossings, which further increase travel time, was not included in the analysis.

### 8.10.1 Corridor-Wide Accident History

The accident history for the corridor from MP 316.00 and 467.58 was reviewed to evaluate the accident frequency, identify general accident characteristics and to locate accident clusters or areas of accident concentration. The accident analysis focused on the accident rates, accident frequency and spatial distribution of accidents.

During the 5-year study period approximately 2,015 total accidents were recorded along the corridor. An annualized breakdown of accident experience, including accident severity is given in Table 8-5.

Figure 8-3 Cumulative Travel Time Through Corridor

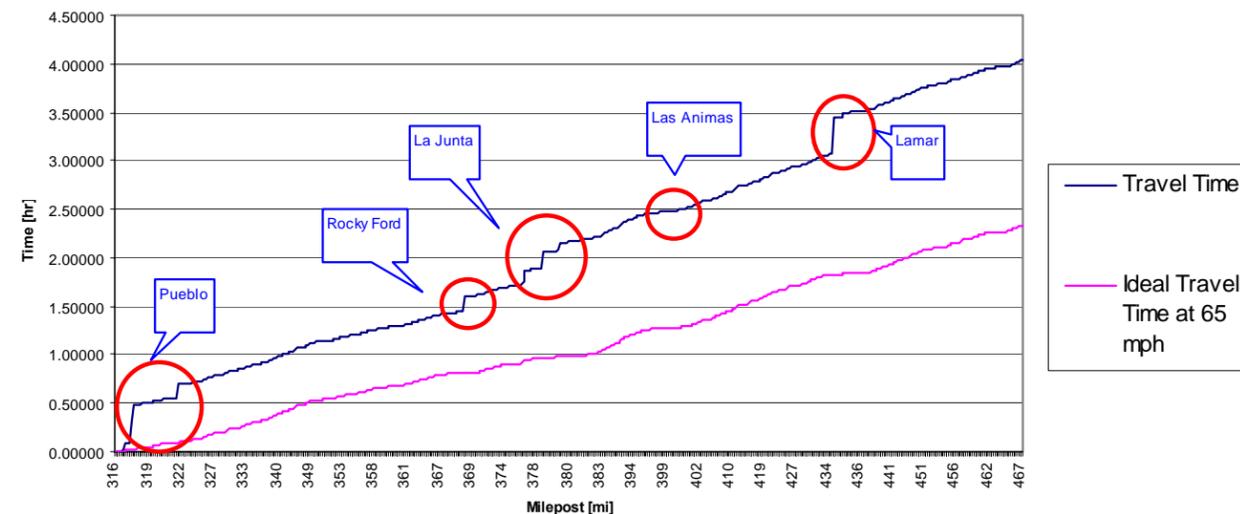


Table 8-5 Corridor Accident Data Breakdown

Accident Severity	Number of Accidents 10/1-9/30					Total	Annual Average
	1995-96	1996-97	1997-98	1998-99	1999-00		
PDO	223	280	294	262	273	1332	266
Injury	113	128	150	145	122	658	132
Fatal	5	5	6	7	2	25	5
<b>Total</b>	<b>341</b>	<b>413</b>	<b>450</b>	<b>414</b>	<b>397</b>	<b>2015</b>	<b>403</b>
Weighted Hazard Index (WHI)	-0.79	-0.23	-0.13	-0.54	-0.77		-0.49

The approximate Weighted Hazard Index (WHI), which considers exposure and accident severity and roughly compares the corridor to other similar highway segments, is also provided. From a yearly perspective, the accident frequency on US 50 has remained relatively stable over the 5-year period examined.

The 5-year average WHI for the overall corridor is -0.49. The negative value suggests that US 50 is slightly better (safer) when compared to other similar highways statewide.

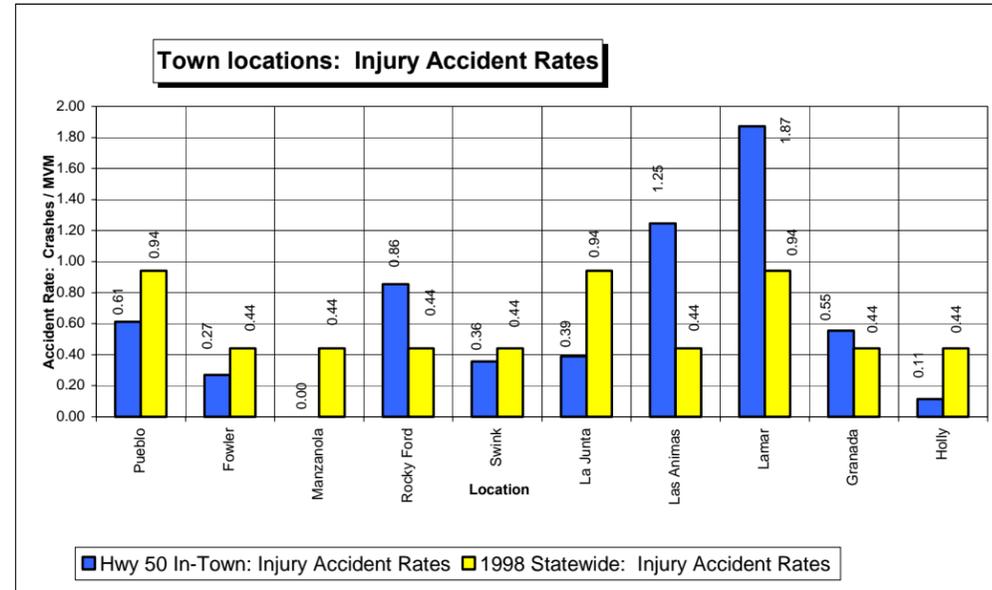
Figures 8-4 and 8-5 show that specific roadway segments through the towns of Rocky Ford, Las Animas and Lamar have 5-year injury and total accident rates which are higher than the corresponding state average for 1998.

## 8.10 Accident Analysis and Safety Priority

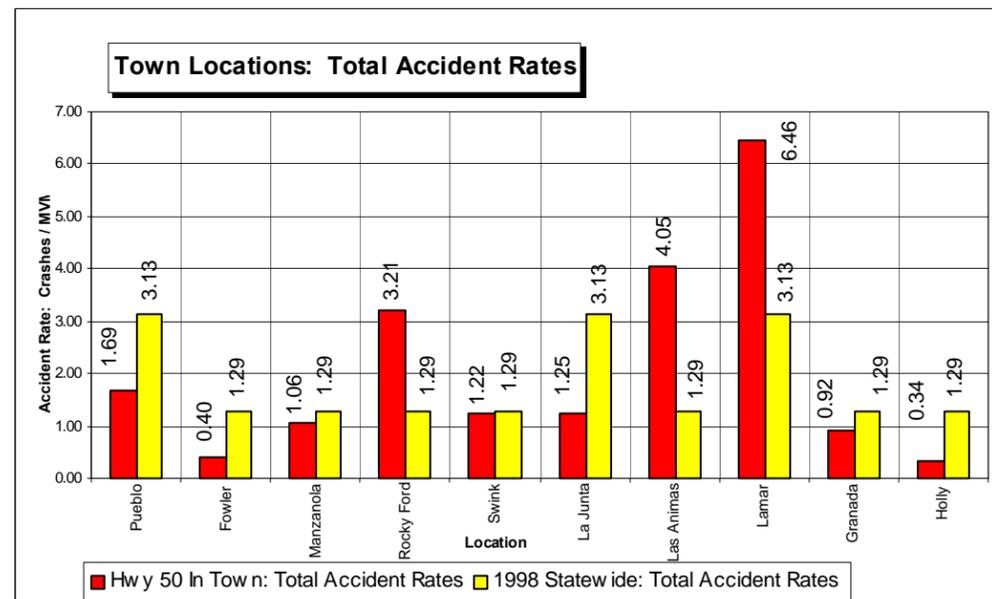
CDOT prepared a safety assessment report with the identification of safety problems being the primary objective. The report (1) included accidents over a 5-year period between October 1, 1995 and September 30, 2000. Excerpts from the report have been summarized here.

<sup>1</sup> Safety Assessment Report, US 50 Corridor Pueblo to Kansas (SH50B mp 316.00 to mp 467.5) CDOT Region-2, January 2003

**Figure 8-4 In-Town Injury Accident Rates**



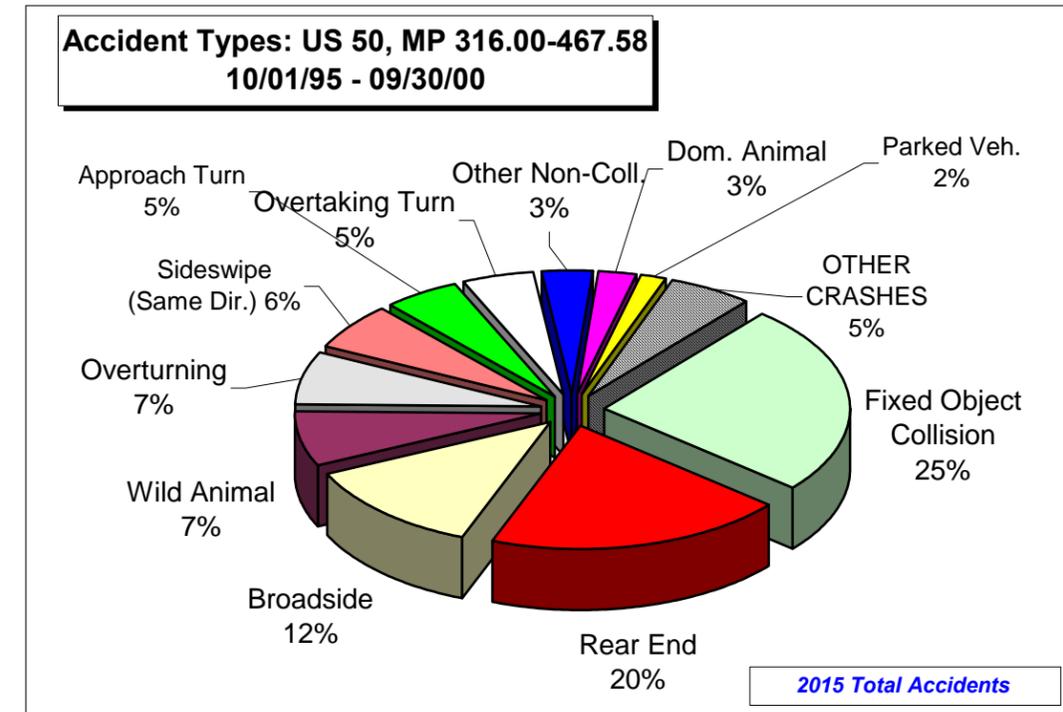
**Table 8-6 In-Town Total Accident Rates**



### 8.10.2 Accident Type, Severity and Distribution

The types of accidents occurring along the corridor have been graphically shown in Figure 8-6. The predominant and secondary accident types are the fixed object type (25%) and rear-end (20%). Approximately 95% of the fixed objects collisions are of the single vehicle, running-off-the-road type, with the majority (58%) running off to the right.

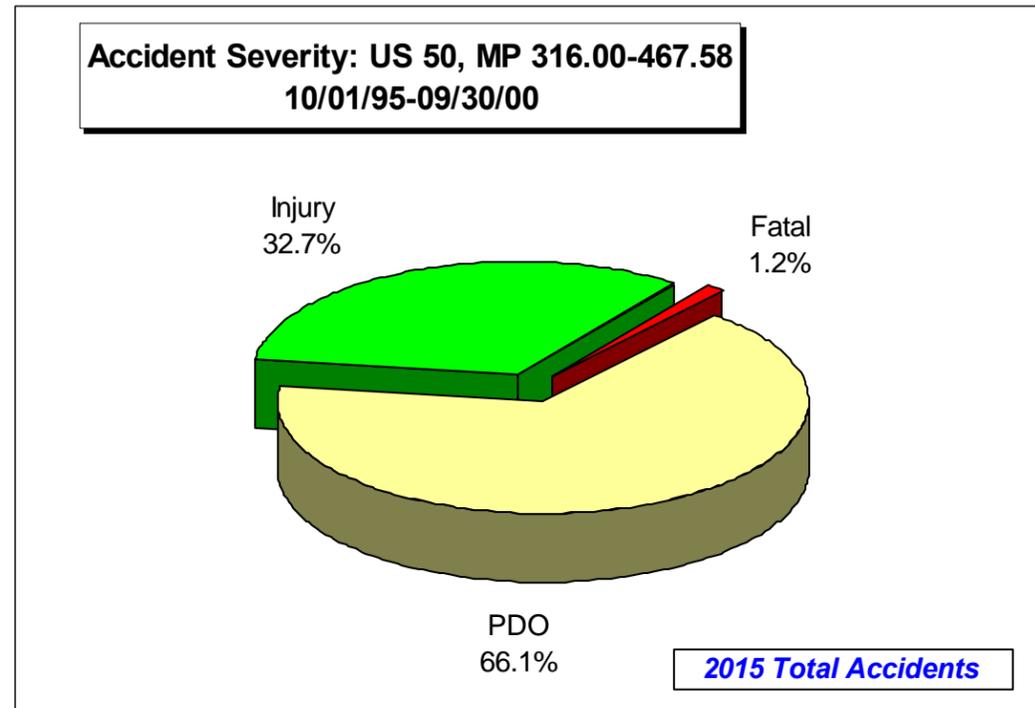
**Figure 8-5 Type and Distribution of Accidents on US 50**



Similarly, the safety report determined that accident rates on the two-lane road connecting the towns of Fowler and Manzanola, CO were also slightly higher than the statewide rates.

Analysis of crash severity along US 50 determined that overall the corridor exhibits a history that is less severe than comparable locations. However, as shown in Figure 8-6, nearly one-third of all the accidents reported resulted in injury.

**Figure 8-6 Breakdown of Accident Severity**



The accident distribution pattern is basically predictable. Nearly half of all collisions (47%) took place in the larger cities and towns of Pueblo, Rocky Ford, La Junta and Lamar.

Accident clusters or concentrations of accident locations were analyzed to determine the best opportunities for safety improvements. Broad zones of accident clustering are indicative of the high percentage of intersection-related accidents. The Safety Study determined three levels of accident clustering; these are broad, moderate and lower overall accident densities. Table 8-6 summarizes only the broad and moderate accident cluster areas.

**Table 8-7 Breakdown of Accident Severity**

Broad Accident Cluster Zones	
Description:	Location:
The Pueblo Area	Milepost 316-318
The one-way pair roadway segments of Rocky Ford	Milepost 367-370, (Hwy 50Z mp 0-2.6))
Las Animas	Milepost 398-400
Lamar	Milepost 433-438
Moderate Accident Cluster Zones	
East of Pueblo	Milepost 318-324
La Junta and Swink	Milepost 370-382

The broad accident cluster zone analysis determined that nearly 68% of all accidents were intersection related, while analysis of the moderate zones determined that intersection-related accidents accounted for 50% of the accidents.

### 8.10.3 Accident Prone Non-Intersection Locations

The safety assessment report identified 20 non-intersection related accident-prone roadway segments. These segments have roadway deficiencies that can be attributed to accidents along the corridor. Table 8-7 lists the roadway locations by milepost and identified deficiency.

A potentially dangerous segment of four-lane highway was not identified in the Safety Study. An unprotected concrete ditch lies directly adjacent to the highway. At milepost 361.4 (Identifier 361A), a 5.6 mile long, three-foot deep drainage channel often collects cars that slide off the road. A tow truck is required to extract these trapped vehicles.

**Table 8-8 Accident-Prone Non Intersection Locations**

Type of Segment (2- or 4-lane)	MP location	Existing Deficiency
<b>City of Pueblo</b>	--	--
4-lane	319.5 - 320.0	tight curve
4-lane	328.5 - 328.9	isolated curve
4-lane	332.38	ramp merge
2-lane	343	isolated curve
<b>Town of Fowler</b>	--	--
2-lane	355	poor approach delineation
4-lane	348 - 360	passing area
<b>Town of Manzanola</b>		
	359.5	poor signing westbound
4-lane	361.1	deficient curve
4-lane	<b>361.5 - 366.97</b>	close fixed objects
2-lane	<b>366.97 - 367.3</b>	close fixed objects
<b>Town of Rocky Ford</b>		
	368 - 369.6	poor signing
4-lane	370.35	poor signing
4-lane	372 - 373	close fixed objects
4-lane	374.1	poor signing, illumination
<b>Town of Swink</b>	--	--
<b>Town of La Junta</b>		
	376.99 - 378	deficient signal timing
4-lane	<b>381.5 - 386.085</b>	driver fatigue/ tight curves
2-lane	<b>386.085 - 387</b>	driver fatigue/ tight curves
2-lane	397	poor signing
<b>Town of Las Animas</b>	--	--
2-lane	416 - 427	narrow shoulders
<b>Town of Lamar*</b>		
	434 - 436	dangerous intersections
2-lane	444 - 446	poor signing
<b>Town of Granada</b>	--	--
2-lane	456	poor signing, deficient delineation/ guardrail
<b>Town of Holly</b>	--	--

\* Intentionally Omitted

Legend:
2-lane section
4-lane section

A general list of roadway improvements applicable to this corridor are tabulated below. These types of improvements will remedy roadway deficiencies and improve safety and mobility along the corridor.

**Table 8-9 Roadway Improvements**

General Roadway Improvements	
1	Signing and Striping Improvements
2	Shoulder Widening/Improvements
3	Localized Lighting Improvements
4	Guardrail Improvements
5	Auxiliary Lanes
6	Horizontal and Vertical Alignment Improvements
7	Additional Lanes/Widening
8	Bridge and Culvert Widening
9	Speed Limit Revisions
10	Miscellaneous Improvements
11	Acceleration/ Deceleration Lanes
12	Additional Turn Lanes
13	Remove roadside hazards
14	Access Control

### 8.10.4 Need for Roadway Improvements

The Safety Assessment Report justified the need to upgrade the two-lane roadway segments of US 50 to four lanes with a divided median. The report evaluated the safety characteristics of rural flat and divided four-lane roadways. The analysis, based on safety performance models developed by CDOT, shows that a 37% reduction in total accident frequency can be attributed to widening US 50. The benefit of reduced accident frequency will continue to be experienced as the corridor traffic volumes increase. Figure 8-8 has been included to show the safety benefits attributed to widening based on representative ADT volumes.

Similarly, safety benefits (up to 40% accident reduction) can be achieved when a rural four-lane non-divided segment of road is improved to include a divided median<sup>2</sup> of adequate size.

Figure 8-7 Safety Benefits of Widening US 50 to Four Lanes

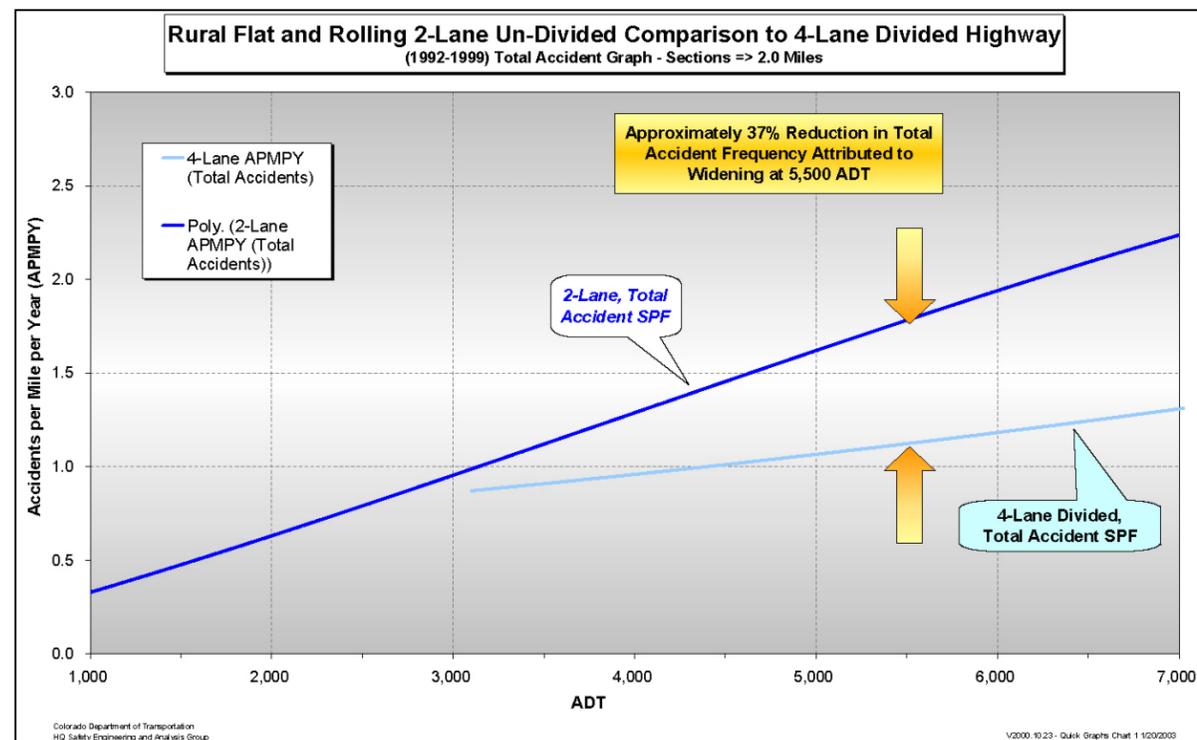


Table 8-10 Identified Accident Prone Intersection Locations

Item	Identifier	Location	Milepost	5-Year Accident Count	Prevailing Accident Type	Prevailing Accident Type Count
1	316A	Bonforte/ Hudson	316.55	124	rear-end	80
2	317A	Norwood Ave.	317.05	39	broadside	11
3	435C	Hwy287/ Main, in Lamar	435.39	24	various accidents	<3 of any statistically significant type
4	368B	Hwy 71/266, Rocky Ford	368.93	22	broadside	14
5	435A	Maple Street, Lamar	435.07	20	broadside	9
6	366A	Hwy 71/CR 18, Rocky Ford	366.97	16	broadside	13
7	434A	Washington Street, Lamar	434.87	13	broadside	5
8	330A	CR 327, Avondale	330.68	11	dark unlighted	5
9	399A	2 <sup>nd</sup> Street, Las Animas	399.28	11	various accidents	<3 of any statistically significant type
10	435D	2 <sup>nd</sup> Street, Lamar	435.6	10	various accidents	<3 of any statistically significant type
11	435B	Beech Street, Lamar	435.31	9	various accidents	<3 of any statistically significant type
12	335A	Hwy 209, Hughes Ave., Boone	335.76	8	rear-end	3
13	368A	Main Street, Rocky Ford	368.69	8	various accidents	>3 of any statistically significant type
14	398A	Hwy 101, Las Animas	398.77	8	same direction sideswipe	3
15	398B	6 <sup>th</sup> Street, Las Animas	398.93	8	approach turn	3
16	433A	Hwy 196 west of Lamar	433.49	8	run off the road, dark lighted	3 and 3

According to safety data from CDOT, the above intersections are the top 16 accident-prone intersections, with the most commonly occurring accident listed for each. Certain intersections have been intentionally left out of the analysis because of recent improvements. US 50 at Troy Ave had illumination improvements and Wal-Mart, a major traffic generator, closed its store at the intersection of US 50/Cuchara Ave and reopened at Conley Road in La Junta.

<sup>2</sup> Safety Effects of the Conversion of Rural Two-Lane to Four-Lane Roadways Based on Cross- Sectional Models, TRB Paper Number 990327, Forrest M. Council