# May 2014

# US 160 Traffic Feasibility Study Town of Bayfield











# US 160 Traffic Feasibility Study Town of Bayfield

## May 2014

Prepared for:

Town of Bayfield P.O. Box 80 1199 Bayfield Parkway Bayfield, CO 81122 Chris La May, Town Manager

Colorado Department of Transportation Region 5 – Traffic and Safety 3803 North Main Avenue, Suite 100 Durango, CO 81301 Michael McVaugh, P.E., Traffic and Safety Engineer

La Plata County 1060 Main Avenue, Unit 104 Durango, CO 81301 Jim Davis, P.E., Director of Public Works

Prepared by:

Stolfus & Associates, Inc. 5690 DTC Boulevard, Suite 101W Greenwood Village, CO 80111 Andrew Amend, P.E., Project Manager

SAI Reference No. 13021

# Table of Contents

List of A	cronyms	iii
Executiv	/e Summary	iv
1.0 Intro	oduction	1
1.1	Project Background	1
1.2	US 160 Environmental Impact Statement	2
1.3	Local Planning	5
1.4	Project Coordination	5
1.5	Public Involvement	5
2.0 Exis	sting Conditions	6
2.1	Roadway Network	6
2.2	Land Use Characteristics	9
2.3	Traffic Conditions	9
3.0 Fut	ure Traffic Conditions	13
3.1	Background Traffic Growth	13
3.2	Potential Development	13
4.0 Tec	hnical Evaluation Criteria	19
4.1	Traffic Operations	19
4.2	Roadway Geometry	19
4.3	Functional Intersection Area	20
4.4	Roadway Improvement Phasing	21
4.5	Emergency Vehicle Access	21
5.0 Alte	ernative Evaluations	22
5.1	US 160 EIS Modified	22
5.2	Bayfield Parkway Option	25
5.3	King Ditch Option	29
5.4	Other Options	29
6.0 Red	commendations	33

# List of Figures

Figure 1. Vicinity Map	. 1
Figure 2. US 160 EIS Record of Decision	. 3
Figure 3. Area Roadway Network	. 7
Figure 4. Existing Traffic Demands	11
Figure 5. 2035 Background Traffic Demands	15
Figure 6. Traffic from Potential Local Development	17
Figure 7. Total 2035 Traffic Demands	18
Figure 8. US 160 Intersection Functional Area	20
Figure 9. US 160 EIS Modified Option	23
Figure 10. Bayfield Parkway Option	27
Figure 11. King Ditch Option	31
Figure 12. Bayfield Parkway Recommended Option	35

# Appendices

Appendix A – Record of Decision- US Highway 160 from Durango to Bayfield

- Appendix B Traffic Count Data
- Appendix C Traffic Calculations
- Appendix D Exhibits from November 2013 Open House

# List of Acronyms

AASHTO	American Association of State Highway and Transportation Officials
ADT	Average Daily Traffic
ATR	Automatic Traffic Recorder
CDOT	Colorado Department of Transportation
EA	Environmental Assessment
EIS	Environmental Impact Statement
FEIS	Final Environmental Impact Statement
FHWA	Federal Highway Administration
MP	Mile Point
mph	Miles per hour
ROD	Record of Decision
SHAC	State Highway Access Code
TMC	Turning Movement Count
US	United States Highway

### **Executive Summary**

#### BACKGROUND AND PURPOSE

United States Highway 160 (US 160) serves as the most prominent east-west regional transportation route for southern Colorado. The Town of Bayfield's western limit crosses US 160 at approximately the Pine River. The eastern limit crosses US 160 at approximately Mile Point 104 (MP 104). This study focuses mainly on areas located west of the Pine River in LaPlata County that lie within the Town's planning radius. The study is a cooperative effort by Bayfield, La Plata County, and the Colorado Department of Transportation (CDOT) to respond to and evaluate new information regarding future conditions. Ultimately, the project seeks to identify a future public roadway network that supports future conditions.

In October 2006, the Federal Highway Administration (FHWA) issued a Record of Decision (ROD) on approximately 16 miles of improvements on US 160 from Durango to just east of Bayfield.

Specifically, the ROD states that the purpose of the project was to:

- Increase travel efficiency/capacity to meet current and future needs
- Improve safety for the traveling public by reducing the number and severity of accidents
- Control access

#### **EXISTING CONDITIONS**

US 160 provides the primary regional access to Bayfield and the nearby areas within La Plata County. The US 160 analysis limits extend from Gem Lane (MP 100.468) to CR 502 (MP 102.261). This section of US 160 functions as a Principal Arterial per FHWA guidelines and falls within the E-X: Expressway access category. Off of the highway, limited connectivity exists between county and local roads from Gem Village to the Pine River.

#### **FUTURE TRAFFIC CONDITIONS**

To provide consistency with the EIS and current CDOT growth estimates, an annual compound growth rate of 1.80% was applied to 2013 traffic volumes to predict future highway traffic volumes. Additionally, the study incorporated anticipated localized growth by estimating development trip generation as follows:

- 35,600 Daily Trips Generated
- 1,130 trips generated during the morning peak hour
- 3,200 trips generated during the afternoon peak hour

#### **TECHNICAL EVALUATION CRITERIA**

Technical evaluations were performed for operational and geometric elements of US 160 and local roadway network components of the Bayfield area transportation system for existing and future scenarios. Operational analyses were conducted using the Federal Highway Administration (FHWA) Cap-X tool. Geometric analyses were conducted with American Association of State Highway and Transportation Officials (AASHTO) design criteria by roadway function. In particular, the concept of functional intersection area was applied on US 160.

Since implementation of future transportation system improvements is likely to occur over time, project phasing was also analyzed by the study team. Topics evaluated included compatibility with existing conditions, independent utility, and relationship to US 160 improvements. Phasing evaluations identified a need to explicitly incorporate emergency access into any concept developed for consideration.

#### **ALTERNATIVE EVALUATIONS**

The project team reduced nine technically feasible options to four options based on public comment taken at an open house held on November 14, 2013. The following were the publically supported options:

- US 160 Record of Decision
- US 160 EIS Modified Option
- Bayfield Parkway Option
- King Ditch Option

After the open house, these options were subsequently updated to incorporate public comments, which included a new connection from CR 506 to CR 502 and a grade separated connection over US 160.

Since traffic operations meet acceptable performance expectations for all four final options, project phasing requirements and impacts to existing conditions are the primary differentiators between options.

#### RECOMMENDATIONS

A comparison of the alternatives is summarized below:

		Impacts to		
Option	Operations	Existing Roads	Phasing	Public Support
ROD	Middle	Middle	Limited	Least
Modified	Middle	Middle	Limited	Least
Bayfield Pkwy	Worst	Best	Best	Most
King Ditch	Best	Worst	Limited	Some

Since the Bayfield Parkway Option has the least impact to existing roads and provides the greatest flexibility for phased implementation while maintaining acceptable operations, the project team recommends this option. This recommendation was made to the Bayfield Town Board at a January 2014 work session, with La Plata County and CDOT representatives present, where it was approved pending minor changes. Those changes have been made and are incorporated into this report.

# 1.0 Introduction

#### 1.1 Project Background

United States Highway 160 (US 160) serves as the most prominent east-west regional transportation route for southern Colorado. The highway enters the southwest corner of the state and continues on to Interstate 25 After jogging to the south along the interstate, US 160 continues east across the border with Kansas. In southwest Colorado, US 160 is the primary connection between communities such as Cortez, Durango, Pagosa Springs, and Alamosa. The Colorado Department of Transportation (CDOT) is responsible for managing the highway throughout the state.

Shown in Figure 1, the Town of Bayfield is located along US 160 in La Plata County. The Town's western limit crosses US 160 at approximately the Pine River. The eastern limit crosses



Figure 1. Vicinity Map

US 160 at approximately Mile Point 104 (MP 104). This study focuses mainly on areas located west of the river in LaPlata County that lie within the Town's planning radius. These areas include the community of Gem Village and a number of existing agricultural, rural residential, and undeveloped private properties in close proximity to US 160. The future of the study area and the Town of Bayfield are interrelated; therefore the segment of US 160 that passes through the area is considered a component of the local transportation network.

#### 1.2 US 160 Environmental Impact Statement

In October 2006, the Federal Highway Administration (FHWA) issued a Record of Decision (ROD) on approximately 16 miles of improvements on US 160 from Durango to just east of Bayfield. The ROD was based on a formalized process that included a feasibility study, a preliminary Environmental Assessment (EA), and an Environmental Impact Statement (EIS) conducted between 1996 and 2006. The EIS process included a 2003 scoping meeting where the public and local agencies were encouraged to identify issues with the alternatives under consideration. Public comments were also collected with the 2005 Draft EIS and 2006 Final Environmental Impact Statement (FEIS).

Specifically, the ROD states that the purpose of the project was to:

- Increase travel efficiency/capacity to meet current and future needs
- Improve safety for the traveling public by reducing the number and severity of accidents
- Control access

The need for the project was based upon *"the projected increase in travel demands on highway capacity and efficiency, and the existing substandard design that contributes to accidents associated with roadway deficiencies."* Select sections of the ROD have been included in Appendix A.

Within the area focused on in this study, the Selected Alternative for US 160 is shown in Figure 2. This figure includes proposed modifications to the public road access to the highway as well as the areas surveyed during the environmental review. Generally, improvements will consist of widening the highway to two travel lanes in each direction separated by non-traversable median. It is noted that the EIS did not address driveway access to US 160 and only considered the location of full-movement intersections along the highway.

From the west, per the ROD, US 160 will be realigned to the south of Gem Village and a new full movement intersection will be established at Homestead Drive. Moving east, access to US 160 from CR 502, CR 506, and Bayfield Parkway will be eliminated. These connections will be replaced with a new roadway that connects CR 502 to Lariat Road. South of CR 506, a new roadway will be built to connect to US 160 with a full-movement intersection and then extend on to Bayfield Parkway.



Figure 2. US 160 EIS Record of Decision

#### 1.3 Local Planning

The Bayfield Comprehensive Plan was most recently updated and adopted in 2005. The Future Land Use section of the plan notes the eventual annexation of Gem Village along with new development that occurs between the two. Transportation improvements identified in the plan are limited to areas within current town boundaries along with some areas east of town. While specific plans for areas west of the Pine River are not defined, a set of Transportation System Policies are included in the plan. These policies provide guidelines for future streets and how they will constructed with new development. The need for development to provide collector streets that access existing arterial streets, such as US 160 and Bayfield Parkway, is addressed in the policies.

In 2012, the US 160/160B (West Side) Transportation Study was prepared on behalf of the town without input from CDOT. The purpose of the study was to examine whether the existing full movement intersection at US 160/Bayfield Parkway could remain in place while maintaining the Purpose and Need of the US 160 FEIS. As expressed in the study, the Bayfield community is interested in preserving existing transportation infrastructure to the extent possible rather than having to accommodate and implement improvements shown in the FEIS Selected Alternative that may or may not provide a substantial local benefit.

#### 1.4 Project Coordination

In order to facilitate future development of the transportation system, the local agencies and CDOT agreed that a cooperative transportation planning effort was needed. Beginning in August 2013, the Town of Bayfield, La Plata County, and CDOT worked together with the assistance of Stolfus and Associates, Inc. to identify a future public roadway network that could operate effectively. This network would ultimately provide access to US 160 in a manner consistent with the needs of all partners. Additionally, preservation of the Purpose and Need of the FEIS was essential to the success of any potential alternative. Planning efforts concluded in February 2014 with the selection of a preferred alternative by the Bayfield Town Board in concurrence with La Plata County and CDOT.

#### 1.5 Public Involvement

Given the critical relationship between changes to the transportation network and local quality of life, public involvement was considered essential to the success of this project. Nine alternatives, all of which had been determined to be "technically feasible," were presented to the public at an open house held on November 14th, 2013. The open house was advertised in local newspapers and on the town website. All options shown at the public open house are included in Appendix D for reference. Property owners adjacent to the highway were invited directly through mailings. Town, County, and CDOT representatives were all in attendance to discuss the project and record feedback on the alternatives.

Input from the open house was collected and incorporated into the alternatives. The three options gathering the most support were then presented to the Bayfield Town Board and La Plata County representatives at a work session held on January 7th, 2014. The work session was open to the public. Property owners and their representatives were in attendance and offered their comments on the revised alternatives.

# 2.0 Existing Conditions

#### 2.1 Roadway Network

Shown in Figure 3, US 160 provides the primary regional access to Bayfield and the nearby areas within La Plata County. The US 160 analysis limits extend from Gem Lane (MP 100.468) to CR 502 (MP 102.261). This section of US 160 functions as a Principal Arterial per FHWA guidelines and falls within the E-X: Expressway access category. Travelling east through Gem Village, the highway speed limit decreases from 60 miles per hour (mph) to 50 mph. East of Gem Village, the US 160 speed limit increases to 55 mph until the highway crosses the Pine River.

Off of the highway, limited connectivity exists between county and local roads from Gem Village to the Pine River. Within Gem Village, a frontage road runs along both sides of the highway connecting to Gem Lane (CR 508) and CR 507. Gem Lane serves a small number of residences, industrial areas, and agricultural uses to the north while CR 507 only extends about one quarter mile north of US 160. Homestead Drive has gated access from the south frontage road for emergency vehicles at this location.

In 2011, CDOT devolved a section of highway designated US 160B to the Town. The former US 160B is now known only as Bayfield Parkway. Bayfield Parkway is one of the primary arterials serving the town by connecting US 160 west of the Pine River to CR 509 (Missouri Center Road), CR 516, CR 521 (Buck Highway), CR 522, and CR 501 before intersecting back with US 160 at the town's eastern boundary. Approximately 250 feet from US 160, Homestead Drive intersects Bayfield Parkway's western end. This is the only public access to the Homestead development in the existing configuration. The close proximity of Homestead Drive and US 160 intersections combined with the "hook" in Bayfield Parkway's alignment at this location are both undesirable for operational as well as safety reasons.

East of Bayfield Parkway, CR 506 hooks into US 160 near two private drives, also an undesirable geometric condition. CR 506 provides connections to Heartwood Lane and Lariat Road, which serve residences to the north. One thousand feet east of the CR 506, CR 502 descends to connect with the highway. CR 502 provides the highway access for numerous rural properties to the north and connects with other county roads.



Figure 3. Area Roadway Network

US 160 Traffic Feasibility Study

#### 2.2 Land Use Characteristics

Today, the majority of land between Gem Village and the Pine River is rural without intense development. Gem Village itself is largely mixed use with both commercial uses and single family homes. Southeast of Gem Village is the partially completed Homestead development which is planned as primarily suburban density single family homes along with a commercial component near the US 160/Bayfield Parkway intersection. The remaining land south of US 160 to the Pine River consist of agricultural and rural residential development with some commercial properties along Bayfield Parkway. Rural residential properties are dispersed north of US 160.

#### 2.3 Traffic Conditions

Turning Movement Counts (TMC) were collected on Tuesday, August 13<sup>th</sup> and Thursday, August 15<sup>th</sup> at five intersections near US 160 between CR 507 and 506. TMCs at three intersections east of the Pine River were also collected for future planning efforts. Daily traffic data along US 160 was collected on August 14<sup>th</sup> and 15<sup>th</sup>. These counts were located west of CR 507 and east of Bayfield Parkway. Traffic count data is presented in Figure 4.

August 15<sup>th</sup> and 16<sup>th</sup>, 2012 count data from CDOT Automatic Traffic Recorder (ATR) 000217 located east of Homestead Drive shows ADT of 11,200. Daily traffic data collected on Tuesday, June 5<sup>th</sup>, 2012 east of Bayfield Parkway (East) shows ADT of 5,700 at that location. Consistency among the data indicate that the data collected in 2013 is similar to typical traffic patterns in the area and is representative of peak season traffic volumes. CDOT data indicates truck percentages of 4.8% and 9.6% at the Homestead Drive and Bayfield Parkway locations, respectively.

Daily counts west of CR 507 indicated that highway traffic peaked at the hours beginning at 7:30 AM and 5:00 PM on both days, with approximately 10% more traffic on the 14<sup>th</sup> than the 15th. Since the TMC count peaks occurred during the peak hours of travel, it is reasonable to conclude that the TMCs captured the peak traffic periods in the corridor. Counts at the western location indicate that peak hour traffics makes up 8.2% of daily traffic in the morning peak and 8.6% of daily traffic in the afternoon peak hour. Raw traffic count data has been included in Appendix B.

TMC data was tabulated and combined in order to determine the peak morning and afternoon hours for the network. A "system peak" was used for analysis rather than the peak at each intersection individually in order to maintain continuity between intersections to the extent possible. The system peak hours found from TMCs were found to begin at 7:15 AM and 5:00 PM, which is largely consistent with the daily traffic data.

A planning level evaluation of existing traffic operations was conducted to estimate the general quality of traffic operations within the study area. The result of this evaluation does not indicate any significant areas of concern given the traffic demands at study intersections. A comparison of traffic demands at Bayfield Parkway with those at CR 501 does yield some interesting results. Approximately double the amount of traffic leaving south Bayfield for destinations to the west uses CR 501 the morning peak hour; however, in the afternoon when a similar pattern in the opposite direction would be expected, nearly 50% more traffic enters the area via Bayfield

Parkway. This difference may indicate that the increased difficulty of making left turns onto the highway from Bayfield Parkway influences travelers to gain access at the signalized CR 501 intersection with US 160 instead.



Figure 4. Existing Traffic Demands

# 3.0 Future Traffic Conditions

#### 3.1 Background Traffic Growth

In the EIS, future traffic demands were estimated by growing traffic 1.79% per year. Consistent with this growth rate assumption, the CDOT estimate of 20-year growth at ATR 000217 was a factor of 1.43, which equates to 1.80% compounded annually. A straight line analysis of historical data from the ATR shows August ADT increasing from 7,700 in 1992 to 10,600 in 2012. This equates to an annual compound growth rate of 1.60%.

To provide consistency with the EIS and current CDOT growth estimates, an annual compound growth rate of 1.80% was applied to 2013 traffic volumes to predict future highway traffic volumes. At this rate, 2025 p.m. peak hour traffic demands at the US 160/CR 501 intersection are estimated to be approximately 11% lower than projected in the EIS. However, this traffic feasibility analysis will consider the 2035 design year. At that time, traffic demands at the intersection are forecasted to be 3% greater than the 2025 demands from the EIS.

Daily traffic counts were previously collected by La Plata County on roads in the study area. This data indicates varying growth patterns along the county roads. Using counts between 1991 and 2012, the growth rate on CR 502 was equivalent to 1.45% compounded annually. The project team considered the CR 502 historical rate to be reasonably representative of likely growth in the areas influencing the immediate study area. This growth rate was applied to existing traffic on all county roads in the study area. The resulting 2035 background traffic, shown without the implementation of any ROD improvements, is presented in Figure 5.

#### 3.2 Potential Development

New development accounted for in this study considered properties near US 160 with development potential as estimated by the project team with consideration of proximity to US 160 as a primary factor. An economic study was not performed. Generally, those properties were consistent with those considered in the *US 160/160B (West Side) Transportation Study* prepared in 2011. This study is not intended to define the future land use of specific properties so only an estimate of development intensity was made. Roughly consistent with the 2011 study, development of 380 acres of land was assumed.

Areas adjacent to US 160 were assumed to be developed as retail and areas farther from the highway were assumed to be single family homes. The following summarizes the traffic generating impacts of these assumptions from the ITE *Trip Generation, 9<sup>th</sup> Edition* based on average rates for Single-Family Detached Housing and Shopping Center:

- 35,600 Daily Trips Generated
- 1,130 trips generated during the morning peak hour
- 3,200 trips generated during the afternoon peak hour

Development trips were reduced to account for internal trips and pass-by trips where applicable. Trip generation tables and assumed distribution are included in Appendix C. The resulting traffic demands, shown with the changes presented in the ROD, are shown in Figure 6. Background traffic was reassigned to the ROD network and combined with development traffic to estimate total 2035 traffic demands shown in Figure 7.



Figure 5. 2035 Background Traffic Demands



Figure 6. Traffic from Potential Local Development



Figure 7. Total 2035 Traffic Demands

# 4.0 Technical Evaluation Criteria

#### 4.1 Traffic Operations

The FHWA Cap-X tool for the planning of junctions was used to evaluate the capacity of highway access points. The Cap-X tool separates junction types into intersections, roundabouts, and interchanges. Numerous configurations of these junction types can evaluated at a planning level with results presented as volume-to-capacity ratio (v/c) for the junction.

Analysis of the ROD improvements with 2035 background and development trips was conducted using the Cap-X tool. The Lariat Road connection to US 160 included in the Selected Alternative from the ROD was analyzed assuming two through lanes, a left turn lane, and a right turn lane for both highway approaches. The two public street legs were assumed to have left turn, through, and right turn lanes on both approaches. The resulting v/c for the AM and PM peak hours were 0.48 and 0.77, respectively. Cap-X analysis worksheets are included in Appendix C.

These results indicate that traffic operations of the US 160/Lariat Road intersection will operate well within the acceptable range. While the 2035 demands from background and project trips likely warrant a traffic signal here, it does not appear that any additional traffic operational improvements would be required beyond right-turn acceleration/ deceleration lanes. Given the planning level estimates of new development traffic accessing the roadway network and the limited number of highway access points in all scenarios, traffic capacity analyses were not conducted for individual alternatives. None of the final alternatives considered deviated from the ROD in a way that would lead to modified traffic patterns at the intersection.

#### 4.2 Roadway Geometry

All roadway alignment concepts developed in this study were required to meet technical requirements appropriate for a planning level study. Horizontal geometric design guidelines were applied based on the requirements of the American Association of State Highway and Transportation Officials' (AASHTO) *A Policy on Geometric Design of Highways and Streets, 6<sup>th</sup> Edition, 2011*, more commonly known as the "*Green Book*." Topographical features such as stream crossings, surveyed wetlands, and gas wells were all considered in the design. Vertical design feasibility was evaluated at a very conceptual level using topographical maps from the La Plata County Geographic Information System.

On the south side of US 160, *Green Book* design standards for low speed urban streets were applied. A design speed of 30 mph was assumed with -2% superelevation providing for a normal roadway crown through horizontal curves. These assumptions result in a 333-foot minimum curve radius design standard for the local streets. The areas on the north side of the highway were considered less urbanized in the future and were thus designed for moderate speeds. A design speed of 40 mph with a maximum superelevation of 4% was used, with a resulting minimum curve radius of 533 feet.

Design criteria for tangent lengths were also applied. Between all reverse curves a minimum of 100 feet of tangent section was included. At intersections, the minor street extends at least 100 feet before curving. Additional design effort and detailed field survey will be necessary to develop proposed alignments beyond this conceptual level.

#### 4.3 Functional Intersection Area

An intersection's functional area is a concept introduced in the AASHTO *Green Book* and elaborated upon in the 2003 *Access Management Manual* published by the Transportation Research Board. The functional area extends both upstream and downstream of the physical intersection and represents a window where it is undesirable to have additional driveways or access points. The length of the functional area upstream of the intersection is dependent on perception-reaction, deceleration, and queue storage lengths. On an Expressway such as US 160, right turn acceleration lanes are required per the Colorado State Highway Access Code (SHAC) and form the downstream functional area.

When applied to US 160, the resulting functional area at an intersection improved to meet minimum requirements set by the SHAC and AASHTO *Green Book* is shown in Figure 8. This concept can also be applied to a system of two full movement intersections along the same highway to determine minimum spacing requirements. Assuming the distance from the storage lane to the cross street center line is 30 feet, the typical minimum distance between full movement intersections on 55 mph portions of US 160 is approximately 2,240 feet. If SHAC requirements for deceleration are strictly followed, the distance between intersections increases to 2,540 feet. This comes very close to the minimum permissible spacing of intersections on Expressways in the SHAC of 2,640 feet (1/2 mile).

This concept of functional intersection area was used by the project team in evaluating the acceptability of new and relocated intersections along US 160.



Figure 8. US 160 Intersection Functional Area

#### 4.4 Roadway Improvement Phasing

Implementation requirements of all options were included in the feasibility analysis. None of the improvements planned in the area, both on US 160 and to local streets, have established timelines so phasing was considered for a variety of scenarios. It was particularly important to local interests that existing infrastructure be maintained for the longest extent possible without having to restrict highway access. In order to accommodate an interim scenario with two intersections in close proximity to one another, access restrictions would likely be required at one or both locations to resolve conflicts within functional intersection areas discussed in Section 4.3. The project team also assumed that development would likely spur local roadway improvements in many scenarios and that access restrictions at a new intersection location, even as an interim condition, might make implementation undesirable to development interests.

#### 4.5 Emergency Vehicle Access

As noted in Section 2.1, CR 502 connects US 160 to dispersed homes to the north in unincorporated La Plata County. Emergency services and specifically fire protection are provided from Bayfield. Maintaining response time is a critical issue to county residents and emergency responders alike. To facilitate this, all options that will increase the travel distance from the Bayfield station to CR 502 will provide emergency only access until the issue is resolved. Once it is, any emergency only access will be removed.

# 5.0 Alternative Evaluations

#### 5.1 US 160 EIS Modified

Shown in Figure 9, this option retains the same full movement access location as presented in the EIS. However, instead of forming a connection to CR 502 from Lariat Road, CR 506 extends to align with CR 502. This proposed change came directly from public comment. While there are challenges associated with the hilly terrain in this area, it was determined that the proposed connection is feasible. The Lariat Road-CR 502 connection was therefore replaced in all options with the CR-506-CR 502 realignment.

Public comment also presented the idea of a grade separated connection from CR 502 to Bayfield Parkway via Missouri Center Road. Planning level technical analyses show that a bridge at this location is feasible and the project team agrees that such a connection would be an asset to the community so it has been included at a conceptual level in all options.

In addition to full movement access at a Lariat Road/US 160 intersection, some level of public street access to the north of the US 160/Bayfield Parkway intersection would provide a significant benefit. Therefore, a new public street extending Bayfield Parkway to CR 506 was included. Given intersection functional area requirements, full movement access at this location cannot occur with the Lariat Road/US 160 intersection nearby. While variations were examined, the most suitable access configuration at this location allows right and left turns from US 160 onto the north leg of the intersection while only allowing right turns on to Bayfield Parkway. No left turns onto US 160 or crossing movements would be allowed at the intersection.

The US 160 ROD shows Lariat Road extending south of the highway through currently undeveloped portions on the same property as the existing power substation. Plans for expanding the substation are currently underway and are anticipated to conflict with the proposed Lariat Road extension The US 160 EIS Modified option shows an alternate alignment for south Lariat Road. Removal of existing structures would likely be required for implementation of this option.

The US 160 EIS Modified Option retains Bayfield Parkway along its existing alignment and could also provide full movement access at the US 160 intersection until the Lariat Road intersection with the highway is constructed. However, future signalization at the Bayfield Parkway/US 160 intersection is not permissible. If traffic problems develop at the intersection, access would have to be restricted even without the Lariat Road/US 160 intersection in place. These access restrictions would not likely find easy acceptance from the community at the time of implementation, especially if other elements of the future transportation network designed to accommodate the diverted trips are not yet in place.



Figure 9. US 160 EIS Modified Option

#### 5.2 Bayfield Parkway Option

Shown in Figure 10, this option allows for long term, full movement access at the existing Bayfield Parkway/US 160 intersection. In this alternative, no additional permanent highway connections between Bayfield Parkway and the Pine River are provided except for emergency access at the existing CR 502 intersection. While the proposed northern leg of the Bayfield Parkway/US 160 is similar to that shown in the US 160 EIS Modified Option, improvements to the south side will likely be required.

The existing "hook" in Bayfield Parkway and the close proximity of Homestead Drive to the intersection with US 160 are not compatible with projected traffic demands. Especially if signalization is warranted, there is not adequate space between intersections to accommodate queues. To address this problem, Homestead Drive will be extended to intersect with the US 160 instead of Bayfield Parkway. Bayfield Parkway will then be realigned to intersect with the new Homestead Drive south of the existing intersection. While avoiding a new ditch crossing and property impacts to the extent possible, a separation of approximately 280 feet between the centerlines of US 160 and a new Bayfield Parkway/Homestead Drive intersection is achievable.

Traffic projections discussed in Section 3.0 indicate a demand of 300 left turns onto the highway from the new Homestead Drive intersection in 2035. In most circumstances, this traffic volume can be accommodated by a single 300-foot long left turn lane. However, only an estimated 200 feet of storage is available between US 160 and Bayfield Parkway. To accommodate left turns, dual lanes would be required entering the highway. Left turns from the new Homestead Drive to eastbound Bayfield Parkway would be accommodated by a single left turn lane lane side-by-side with the dual left turn lanes going the opposite direction. Assuming that the new Homestead Drive/Bayfield Parkway intersection also has a western leg providing access to new development, this short section of road between US 160 and Bayfield Parkway would be as many as seven lanes wide.

The long term implementation of the Bayfield Parkway Option allows full movement access at the new Homestead Drive/US 160 intersection; however, there is a possibility of an interim scenario with access restrictions at the intersection. If traffic demands reach the point that a signal is warranted at the intersection, but the supporting improvements to increase intersection spacing and alignment for Bayfield Parkway and Homestead Drive are not complete, installation of a signal is not permissible. In this case, turn movement restrictions would likely be implemented at the intersection until improvements to the local streets are constructed.


Figure 10. Bayfield Parkway Option

Page | 27

THIS PAGE INTENTIONALLY LEFT BLANK

# 5.3 King Ditch Option

Shown in Figure 11, this option modifies the existing Bayfield Parkway alignment to intersect US 160 approximately 600 feet to the east. Homestead Drive would also be modified to intersect Bayfield Parkway farther east. Bayfield Parkway is one of the primary arterials in the local street network and this option maintains its direct connection with the highway. This realignment also creates a separation of approximately 440 feet along Bayfield Parkway between US 160 and Homestead Drive, which provides sufficient storage for left turns from a single lane onto US 160.

Particularly on the south side of the highway, this option has significant impacts that may make it a more difficult option to implement. Structures on both sides of Bayfield Parkway are likely to be affected, including an existing natural gas well. The new Bayfield Parkway alignment also crosses the King Ditch and would likely require significant drainage improvements. None of these issues were determined to make the option technically infeasible.

Full build out of this option addresses traffic and geometric concerns at the new intersection. However, in the likely case that the north leg of the new intersection is constructed prior to improvements south of US 160, the interim condition would require access restrictions at both intersections. Given intersection functional area requirements, access from the north leg of the new intersection would limited to right turns on to US 160 (3/4 access). If the north leg of new intersection is constructed first, access at the existing Bayfield Parkway/US 160 intersection would be limited to right turns in and out.

Alternatively, full movement access could be maintained at the existing Bayfield Parkway intersection in an interim scenario, but this would require right-in/right-out restricted access at the new intersection. The north leg of the intersection is likely to be constructed with new development in the area, but such development is unlikely to proceed if access to the highway is limited as described.

# 5.4 Other Options

Several other options were also considered and presented to the public. These options included some of the following features:

- Change the Gem Village intersection from Homestead Drive to CR 507
- New intersection located west of existing Bayfield Parkway/US 160
- North side frontage road approximately 300 feet from US 160

These options were all reviewed and determined to be feasible at planning level; however, they did not receive any public support and were thus eliminated from further consideration. All options presented at the public open house are included in Appendix D.

THIS PAGE INTENTIONALLY LEFT BLANK



Figure 11. King Ditch Option

THIS PAGE INTENTIONALLY LEFT BLANK

# 6.0 Recommendations

After incorporating comments from the public open house, the three final options along with the ROD Selected Alternative were reevaluated by the project team. Since all of the options were already determined to be technically feasible, operations were weighed against phasing requirements, improvement impacts, and public support in order to make a recommendation.

The King Ditch Option provides the highest operational level of the options. The location the new Homestead Drive/Bayfield Parkway intersection provides adequate spacing from US 160 while maintaining Bayfield Parkway's direct connection to the highway. The US 160 EIS Modified and US ROD options also provide sufficient separation from the highway at the new intersection, but requires turning from Bayfield Parkway onto the new south leg of Lariat Road. The Bayfield Parkway Option is the weakest operationally given its less than ideal separation between intersections along the realigned Homestead Drive.

The Bayfield Parkway Option allows for the most easily implemented interim scenarios since the north leg of the intersection can be opened without restricting movements on the south leg. All of the other options require movement restrictions at one or both intersections in an interim scenario. Given that an interim condition would potentially be in place for an extended period of time, phasing was weighted heavily in the evaluation.

No formal attempt to define specific impacts related to the design or construction of the options was made as part of the evaluation. Qualitatively, the new roadway length, property impacts, and environmental elements were all considered. All options are likely to have wetland impacts, however it is noted that the ROD Selected Alternative also showed significant impacts between CR 506 and US 160. Implementation of the King Ditch Option would also be complicated by the adjacent waterway for which it is named. While the Bayfield Parkway Option has the least amount of property impacts, all options will impact existing structures. Based on these observations, the King Ditch Option is likely the most difficult and the Bayfield Parkway Option is likely the easiest to implement of the three.

The Bayfield Parkway Option received by far the most public support at the open house, primarily due to minimal changes to the existing roadway system required and direct access to properties with development interest. The King Ditch Option received some support since it maintains direct access from Bayfield Parkway to the highway. The US 160 EIS Modified and US 160 ROD options also received some support, but the required property impacts and location of the new intersection were undesirable to some members of the public.

		Impacts to		
Option	Operations	Existing Roads	Phasing	Public Support
ROD	Middle	Middle	Limited	Least
Modified	Middle	Middle	Limited	Least
Bayfield Pkwy	Worst	Best	Best	Most
King Ditch	Best	Worst	Limited	Some

The comparison of the alternatives described above is summarized below:

Since the Bayfield Parkway Option has the least impact to existing roads and provides the greatest flexibility for phased implementation while maintaining acceptable operations, the project team recommends this option. This recommendation was made to the Bayfield Town Board at a January 2014 work session, with La Plata County and CDOT representatives present, where it was approved pending minor changes.. Those changes have been made and are incorporated into this report. A more detailed view of this recommended option is presented in Figure 12.



Figure 12. Bayfield Parkway Recommended Option

THIS PAGE INTENTIONALLY LEFT BLANK

Appendix A – Record of Decision- US Highway 160 from Durango to Bayfield

FHWA-CO-EIS-05-02-F October 2006 RECORD OF DECISION US HIGHWAY 160 FROM DURANGO TO BAYFIELD LA PLATA COUNTY, COLORADO



A Federal agency may publish a notice in the Federal Register, pursuant to 23 USC §139(1), indicating that one or more Federal agencies have taken final actions on permits, licenses, or approvals for a transportation project. If such notice is published, claims seeking judicial review of those Federal agency actions will be barred unless such claims are filed within 180 days after the date of the notice, or within such shorter time period as is specified in the Federal laws pursuant to which judicial review of the Federal agency action is allowed. If no notice is published, then the periods of time that otherwise are provided by the Federal laws governing such claims will apply.

# **TABLE OF CONTENTS**

Section 1	Decision	1-1
	<ul> <li>1.1 Introduction</li></ul>	1-1 1-1 1-1 1-2 1-2 1-2 1-2 1-2 1-3 1-4
Section 2	Alternatives Considered	2-1
	<ul> <li>2.1 Alternatives Considered</li></ul>	2-1 2-2 2-3 2-4 2-4 2-5 2-6 2-6
Section 3	Section 4(f) Properties	3-1
Section 4	<ul> <li>3.1 Section 4(f) Properties</li></ul>	
Section 5	Monitoring/Enforcement Program	5-1
	<ul><li>5.1 Specific Monitoring Required by Mitigation Measures</li><li>5.2 Permits</li></ul>	5-1 5-1
Section 6	Comments on FEIS	6-1
Section 7	References	7-1
Section 8	Conclusion	8-1

# **TABLE OF CONTENTS**

### Tables

- Table 2.1
   Summary of Advanced Alternatives Screening
- Table 3.1Historic Section 4(f) Properties
- Table 4.1Summary of Mitigation Measures
- Table 6.1Comment Index

### Figures

Figure 1.1	Project Location
Figure 2.1	Advanced Alternatives, Grandview to Florida Mesa and Valley Sections
Figure 2.2	Advanced Alternatives, Dry Creek and Gem Village and Bayfield Sections

## Appendices

Appendix A	FEIS Public Hearing Materials			
	Attachment A – Comment Letters			
	Attachment B – Transcript			
	Attachment C – Handout Materials			
Appendix B	Section 404 Permit Materials			
	Attachment A – Section 404 Permit Public Notice			
	Attachment B – Correspondence			
	Attachment C - Section 404 Permit Comments and Responses			
	Attachment D – Section 404(b)(1) Analysis			

ERRATA

ACHP	Advisory Council on Historic Preservation
AVC	animal-vehicle collisions
BO	Biological Opinion
BLM	Bureau of Land Management
BMP	Best Management Practice
CDOT	Colorado Department of Transportation
CDOW	Colorado Division of Wildlife
CDPHE	Colorado Department of Public Health and Environment
CFR	Code of Federal Regulations
CR	County Road
CNHP	Colorado Natural Heritage Program
DEIS	Draft Environmental Impact Statement
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	US Environmental Protection Agency
FEIS	Final Environmental Impact Statement
FHWA	Federal Highway Administration
LEDPA	Least Environmentally Damaging Practicable Alternative
LOP	Letter of Permission
LOS	Level of Service
MOA	Memorandum of Agreement
MP	milepost
mph	miles per hour
NAC	Noise Abatement Criteria
NEPA	National Environmental Policy Act
NOx	nitrogen oxide
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
PCA	potential conservation area
ROD	Record of Decision
ROW	right-of-way
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users

SH	State Highway	
SHPO	State Historic Preservation Office	
SMART	Safe Multimodal Aesthetic Regional Transportation	
STIP	Statewide Transportation Improvement Program	
SUIT	Southern Ute Indian Tribe	
TPR	Transportation Planning Region	
Uniform Act	Surface Transportation and Uniform Relocation Assistance Act of 1987	
URSG	URS Greiner	
US	United States	
US 160	US Highway 160	
US 550	US Highway 550	
USACE	US Army Corps of Engineers	
USDOI	US Department of the Interior	
USFWS	US Fish and Wildlife Service	
VOCs	volatile organic compounds	

## 1.1 INTRODUCTION

The purpose of this Record of Decision (ROD) is to document the Federal Highway Administration's (FHWA) decision on improvements to US Highway 160 (US 160) from west of the US 160/US Highway 550 (US 550) (south) intersection in Durango to east of Bayfield in La Plata County, Colorado (see Figure 1.1, Project Location). The project length on US 160 is 16.2 miles, extending from milepost (MP) 88.0, located east of Durango, to MP 104.2, located east of Bayfield. The project length on US 550 will be 1.2 miles, extending from MP 16.6, located at the US 160/US 550 (south) intersection, to MP 15.4, located south of the US 550/ County Road (CR) 220 intersection. This ROD has been prepared in accordance with FHWA Regulation 23 Code of Federal Regulations (CFR) 771, Council on Environmental Quality Regulations 40 CFR 1500-1508, and the requirements of the National Environmental Policy Act (NEPA), as amended.

This ROD states what the decision is, presents the basis for the decision, identifies all reasonable alternatives considered, specifies the environmentally preferred alternatives, summarizes the mitigation measures, includes monitoring and enforcement requirements, and documents the Section 4(f) approval in accordance with FHWA Regulation 23 CFR 771.135(l).

## 1.2 BACKGROUND

In February 1999, the *Final US 550 and US 160 Feasibility Study* [URS Greiner (URSG 1999)] (Feasibility Study) was published after nearly three years of performing technical studies and gathering public input. Between February 1999 and January 2002 a preliminary Environmental Assessment (EA) was prepared by the Colorado Department of Transportation (CDOT) for the FHWA, the lead agency for this project. Based on the preliminary EA, FHWA and CDOT determined an Environmental Impact Statement (EIS) was the appropriate level of NEPA documentation for this project [40 CFR 1501.4 (c)].

The EIS process commenced with a publishing of the notice of intent to prepare an EIS in the *Federal Register* on December 24, 2002. A public and agency scoping meeting was held on March 5, 2003 to identify public and agency issues and possible alternatives to be considered in the EIS. On September 23, 2005, the Draft EIS was made available to the public for a 45-day comment period concluding on November 7, 2005. The US Highway 160 Durango to Bayfield Final Environmental Impact Statement (FEIS) was signed in May 2006. The FEIS was made available for public review and comment for 30 days, from May 26, 2006 to June 26, 2006, with a public hearing on June 7, 2006. Attachment A to Appendix A, Comment Letters, includes the comments received during the public comment period. The comments are addressed in Section 6, Comments on FEIS, of this ROD.

### 1.3 PURPOSE AND NEED

The purpose of this project is to improve the conditions for the traveling public along US 160 in the project corridor. Specifically, the purpose of the project is to:

- Increase travel efficiency/capacity to meet current and future needs
- Improve safety for the traveling public by reducing the number and severity of accidents
- Control access

The need for this project is based on the projected increase in travel demands on highway capacity and efficiency, and the existing substandard design that contributes to accidents associated with roadway deficiencies. The US 160 purpose and need is summarized in the following sections. More detail can be found in Chapter 1, Purpose and Need, of the FEIS.

## 1.3.1 Travel Efficiency and Capacity

Accident rates throughout the corridor demonstrate the design deficiencies that include poor sight distance, steep roadway grades, lack of shoulders, insufficient recovery zones, uncontrolled access, steep embankments, lack of wildlife crossings, and lack of turning lanes.

The growth in population and associated commercial and office-related facilities are the major reasons for the expected traffic volume increases throughout the county and especially along the US 160 project corridor. Tourism traffic is anticipated to remain high during the summer months, and would likely increase as the number of resort and recreational facilities increases in the region. Highway improvements were made on the existing US 160 in La Plata County in the 1950s and1960s. At that time, the population of La Plata County was less than 20,000 residents. Since then, the population has more than doubled, and tourist activity has increased as well. As a result, traffic volumes along the US 160 project corridor have increased and traffic volumes in the region increase by 50 percent in the summer months with the influx of tourists.

In summary, demand would exceed capacity by 2025 throughout the project corridor and at key intersections. Traffic volumes along the project corridor are expected to more than double over the next 20 years as residential and commercial development increases. These increases in traffic volume are expected to result in failing levels of service – below Level of Service (LOS) D for urban highways and below LOS C for rural highways. Consequently, traffic operations would be unacceptable to most drivers at peak periods.

### 1.3.2 Safety Issues

US 160 has a higher than average number and severity of accidents in the state. Contributing to this rating is uncontrolled access; lack of shoulders, turning lanes, and wildlife crossings; and steep grades with insufficient lanes for passing. These problems are compounded by the increasingly high traffic demands that are being placed on this section of highway. Design improvements are needed for US 160 to reduce both the accident rates and the severity of the accidents, as well as mitigate wildlife collisions through the use of wildlife crossings.

## 1.3.3 Access Control

Uncontrolled access is one of the contributors to accidents in the project corridor. There are almost 200 access points on this segment of US 160, creating a situation where unsafe movements are a common occurrence. For example, drivers have been observed traveling on the shoulder and on the wrong side of the highway, and passing left-turning vehicles on the right shoulder. This situation is due in part to the extensive development in the urban areas along US 160 over the past 20 years. Numerous roads and driveways intersect US 160. Most of these driveways and roads are unsignalized intersections. The following access issues contribute to the traffic capacity and safety problems:

• High density of undefined business and private accesses

- Terrain features that affect sight distance and intersection geometry
- Areas with poorly defined accesses that create problems for drivers to predict when cars are going to turn
- The density of development along US 160 that is anticipated to increase in the future

# 1.4 SELECTED ALTERNATIVE

FHWA and the CDOT have identified the Selected Alternative as a combination of the preferred alternatives for each project section, as described in Section 2.5, Advanced Alternatives, of the *Final Environmental Impact Statement/Final Section 4(f) Evaluation for US Highway 160 from Durango to Bayfield, La Plata County, Colorado.* For the reasons stated in Section 2.5, Advanced Alternatives, and Table 2.5.1, Summary of Preferred Alternatives, of the FEIS, the preferred alternatives selected in each project section were:

- Grandview Alternative G Modified
- Florida Mesa and Valley Alternative C
- Dry Creek and Gem Village Alternative H
- Bayfield Alternative B

The major components of the Selected Alternative are summarized below, and are discussed further in Section 2.0, Alternatives Considered, of this ROD.

On US 160, the Selected Alternative will extend the existing four-lane highway from Grandview east to Bayfield where it will transition to a two-lane highway. The four-lane typical section will provide two 12-foot travel lanes in each direction, 10-foot outside shoulders, and 4-foot inside shoulders. The median width will vary from 10 feet to 46 feet with narrower median widths used in conjunction with access roads, interchanges, or intersections in the more urbanized areas of Grandview, Gem Village, and Bayfield.

Beyond MP 104.2, the roadway provides sufficient capacity; accident data do not dictate the need for capacity and safety improvements by 2025. In Gem Village, from MP 100 to MP 101, US 160 will be realigned to the south. From the west project limit to the proposed US 160/US 550 (south) intersection, a westbound auxiliary lane and an eastbound climbing lane will be required. In addition, the project will realign approximately 1.2 miles of US 550 south of US 160. The realigned portion of US 550 will be improved to a four-lane highway.

The Selected Alternative will include reconstruction of the US 160/US 550 (south) intersection as an interchange. A grade separation of this intersection will provide the best option to address the reconnection of US 160 and US 550 due to terrain and traffic volume. The Selected Alternative will also include reconstruction of the US 160 intersections with CR 233 (west) and State Highway (SH) 172/CR 234 as interchanges. The US 160 intersections with CR 233 (east), CR 232 (west), and CR 232 (east) will be eliminated, with CR 233 passing beneath US 160. The realigned CR 222/CR 223 (west) intersection with US 160 will be signalized; improvements will be made to the existing US 160/CR 501 intersection; and numerous direct access points to US 160 for businesses, neighborhoods, and facilities will be consolidated or improved to provide access control.

The US 160/CR 233 (west) intersection has been improved to a signalized intersection to accommodate development north of US 160. As this connection to US 160 will primarily serve the new Three Springs Development, the road will be renamed Three Springs Boulevard.

CR 233 has been realigned and no longer intersects with US 160, but with Three Springs Boulevard north of US 160. However, due to local convention, the FEIS and this ROD refer to the US 160/Three Springs Boulevard intersection as the US 160/CR 233 (west) intersection.

# 1.5 FUNDING STATUS

The approximate cost for the Selected Alternative is \$455.6 million for the entire corridor. The proposed improvements have been identified as a priority for funding in the Southwest Transportation Planning Region (TPR) Preferred Plan (*Southwest TPR 2030 Transportation Plan*). Additionally, US 160 from Durango to Bayfield has been identified as a strategic corridor by the Colorado Transportation Commission. Final design and construction on the US 160 project will be completed in phases as funding becomes available.

The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) signed into law by the President on August 10, 2005 earmarked \$6.8 million for this project. In addition, the US 160 project is included in the 2007-2012 Statewide Transportation Improvement Program (STIP) with \$6.5 million identified for the corridor.

Utilizing this funding, CDOT has identified two projects for immediate design and construction:

- An additional westbound lane through the US 160/US 550 (south) intersection that would be an initial phase of the interchange; and
- The realignment of the CR 222/CR 223 (west) intersection.

Design on these projects would start in 2006 with construction scheduled to begin in 2008.



# 2.1 ALTERNATIVES CONSIDERED

Chapter 2, Alternatives, of the FEIS provides a detailed description of the alternatives development and screening used to identify the reasonable alternatives that were fully considered in the FEIS. Reasonable alternatives that were evaluated in the FEIS are depicted in Figure 2.1, Advanced Alternatives Grandview to Florida Mesa and Valley Sections, and Figure 2.2, Advanced Alternatives Dry Creek and Gem Village and Bayfield Sections. In addition to the Advanced Alternatives, the No Action Alternative was also evaluated. Under the No Action Alternative, US 160 would remain largely unchanged except at specific locations where safety improvements may be constructed, as warranted by traffic and safety data. This alternative was fully assessed as an alternative and for use as a "baseline" against which other alternatives were evaluated. A summary of the Alternatives fully evaluated in the FEIS and the data collected for each alternative are shown in Table 2.1, Summary of Advanced Alternatives Screening.

#### No Action Alternative

In addition to the Advanced Alternatives, the No Action Alternative was also evaluated. Under the No Action Alternative, US 160 would remain largely unchanged except at specific locations where safety improvements may be constructed, as warranted by traffic and safety data. This alternative was fully assessed as an alternative and for use as a "baseline" against which other alternatives were evaluated. The No Action Alternative fails to satisfy the purpose and need for the project because there would be no capacity improvements, the planned safety and access improvement projects would not address corridor-length deficiencies, and travel demand anticipated for 2025 would not be accommodated, creating more congestion in the project corridor.

	Social Feasibility	Cost	Aquatic Ecosystems	Environmental Consequences	
Section/ Alternative	Residential/ Business Relocations	Construction Cost (millions)	Wetlands (acres)	Irrigated Farmland (acres)	Wildlife Habitat (acres)
Grandview					
F Modified	43/14	181.4	8.9	49.4	52.7
G Modified	41/14	211.5	7.3	23.6	68.3
Florida Mesa and Valley					
А	8/1	53.2	1.5	70.6	6.6
С	6/0	52.4	1.3	55.5	6.9
Dry Creek and Gem Village					
С	15/9	144.5	7.3	16.8	129.5
Н	8/0	168	8.2	20.7	140.3
Bayfield					
А	3/0	24.4	5	24.9	19.2
В	3/0	23.7	4.2	21.4	18

 Table 2.1

 Summary of Advanced Alternatives Screening

## 2.1.1 Grandview Section

In addition to the No Action Alternative, two alternatives, Grandview section alternatives F Modified and G Modified, were advanced for detailed analysis in the FEIS.

#### Alternative F Modified

Under this alternative, US 160 would be four lanes from the west project limit in the Grandview section to the south intersection with US 550, with an eastbound climbing lane and a westbound auxiliary lane. From the US 550 (south) intersection to the intersection with SH 172/CR 234, US 160 would be four lanes. There would be a single-point urban interchange at SH 172/CR 234. US 160 would remain on the existing alignment, except near the SH 172/CR 234 intersection, where it would be shifted north to avoid Crestview Memorial Gardens.

US 550 would be four lanes from CR 220 to the intersection with US 160. US 550 would be realigned to the east of the existing US 550 and cross the top of the Florida Mesa before connecting to US 160 with a single-point urban interchange at the existing US 160/CR 233 (west) intersection location.

#### Alternative G Modified

This alternative is similar to Alternative F Modified, except that there would be single-point urban interchanges on US 160 at CR 233 (west) and SH 172/CR 234.

US 550 would be realigned to the east of the existing US 550 and skirt the western edge of the Florida Mesa before connecting to US 160 with a trumpet interchange approximately 0.6 mile east of the existing US 160/US 550 (south) intersection.

#### **Preferred Alternative Selection**

Alternative G Modified is the Selected Alternative over Alternative F Modified because it has an additional access point and therefore more reserve capacity, is preferred by the public, and has less environmental consequences when balancing the impacts to wetlands, wildlife habitat and irrigated farmlands. The rationale for selecting Alternative G Modified is provided below.

The main difference between Alternative F Modified and Alternative G Modified is the location of the US 160/US 550 (south) intersection. In Alternative F Modified, US 550 would cross the top of the Florida Mesa. In Alternative G Modified, US 550 would skirt the western edge of the Florida Mesa. While the interchange types at these locations would vary, the key difference is that Alternative G Modified would provide two access points between the existing US 550 (south) and SH 172/CR 234 intersections with US 160, where Alternative F Modified would provide only one. Alternative G Modified is, in part, the Selected Alternative because of this additional access point which would provide reserve capacity and accommodate additional growth beyond 2025 in Alternative G Modified. In comparison, under Alternative F Modified, this interchange would be near capacity in 2025 and would not accommodate additional growth. This additional access point causes Alternative G Modified to have a higher construction cost (\$211.5 million) versus Alternative F Modified (\$181.4 million). Alternative G Modified also has less effect on the environment than Alternative F Modified when balancing impacts to wetlands, wildlife habitat and irrigated farmlands. Both alternatives affect Wilson Gulch and the associated high quality wetlands. Alternative F Modified has more impacts to wetlands (8.9 acres) and irrigated farmlands (49.4 acres) than Alternative G Modified, which has 7.3 acres

of impacts to wetlands and 23.6 acres of impacts to irrigated farmlands. Conversely, due to its location along the edge of the mesa, Alternative G Modified has more impacts to wildlife habitat (68.3 acres) than Alternative F Modified, which has 52.7 acres of impacts. Although Alternative F Modified has less impacts to wildlife habitat, this alternative is considered to have a greater effect on the environment because it impacts an additional 1.6 acres of wetlands, a sensitive aquatic ecosystem protected under the Clean Water Act, and it bisects and impacts more irrigated farmland that is of statewide importance (see Chapter 3 of the FEIS). Although 1.6 acres of wetlands saved under Alternative F Modified is a smaller acreage compared to 15.6 acres of wildlife habitat saved for Alternative F Modified, only 5 percent of the project corridor comprises wetlands vs. 35 percent of the project corridor comprising wildlife habitat. Additionally, because Alternative F Modified bisects irrigated farmland that is of statewide importance 26.4 acres of irrigated farmland, it limits the useable acreage for pasture and hay. In contrast, Alternative G Modified skirts the western edge of the Florida Mesa keeping the majority of the irrigated farmland intact.

Alternative G Modified is the Selected Alternative because it has an additional access point and therefore more reserve capacity, has less environmental impacts, and is preferred by the public. Alternative G Modified is also the Environmentally Preferred Alternative because it has less effect on the environment than Alternative F Modified when balancing impacts to wetlands, wildlife habitat and irrigated farmlands. Alternative G Modified is also considered to be the Least Environmentally Damaging Practicable Alternative (LEDPA) under Section 404 of the Clean Water Act because it has a less adverse impact on the aquatic ecosystem than Alternative F Modified.

### 2.1.2 Florida Mesa and Valley Section

In addition to the No Action Alternative, two alternatives, Florida Mesa and Valley section alternatives A and C, were advanced for detailed analysis in the FEIS.

#### Alternative A

Under this alternative for the Florida Mesa and Valley section, US 160 would be four lanes and generally remain on the existing alignment, with slight shifts as necessary to avoid residential structures on the north side of US 160 and the Griffin Dairy Farm complex on the south side of US 160. Continuous access roads would be constructed both north and south of the highway. CR 222 and CR 223 would be realigned and connected to US 160 at a new intersection approximately 500 feet west of the existing CR 222/CR 223 (west) intersection with US 160.

### Alternative C

This alternative is similar to Alternative A, except that CR 222 and CR 223 would be realigned and connected to access roads on both sides of US 160. A new intersection with US 160 would be created approximately 4,500 feet east of the existing CR 222/CR 223 (west) intersection. Because this is on the east side of the Florida River, new roadway connections would be made to CR 510 on the south and CR 223 on the north.

### Preferred Alternative Selection

The primary difference between Alternative A and Alternative C is the treatment of the CR 222/ CR 223 (west) intersection with US 160. In Alternative A this intersection would be moved to the west, higher onto the Florida Mesa, while realigning the associated county roads. In Alternative C, this intersection would be moved into the Florida Valley to the east, to the other side of the Florida River. New connections would be made to the county roads while still maintaining access to the existing county roads through access roads near the existing intersection. Alternative C has fewer relocations (6), fewer impacts to wetlands (1.3 acres) and irrigated farmlands (55.5 acres), and is less expensive (\$52.4 million) than Alternative A, which has 9 relocations, 1.5 acres of wetland impacts, and 70.6 acres of impacts to irrigated farmlands. Alternative C is also included in the La Plata County Comprehensive Plan. In addition, the location of the CR 222/CR 223 (west) intersection with US 160 was considered safer in Alternative C due to improved sight distance and intersection geometry. For these reasons, Alternative C is the Selected Alternative, the Environmentally Preferred Alternative, and the LEDPA.

### 2.1.3 Dry Creek and Gem Village Section

In addition to the No Action Alternative, two alternatives, Dry Creek and Gem Village section alternatives C and H, were advanced for detailed analysis in the FEIS.

#### Alternative C

Under this alternative for the Dry Creek and Gem Village section, US 160 would be four lanes and generally remain on the existing alignment with improvements for curvature, grades, and sight distance. CR 223 would be realigned and connected to US 160 approximately 1,500 feet west of the existing US 160/CR 223 (east) intersection. To reduce impacts to high quality wetlands, a 36-foot median would be used at this intersection to separate opposing travel lanes. A 46-foot median would be used in all other areas. Access roads would be provided on both sides of US 160 between MP 94 and MP 95 and on the north side of US 160 between MP 96 and MP 97 to consolidate direct highway access and reduce out-of-direction travel. In Gem Village, US 160 would be widened to the south. Access roads would be constructed on both sides of US 160, and access would be provided at the west end of Gem Village.

#### Alternative H

Under this alternative for the Dry Creek and Gem Village section, US 160 would be four lanes and generally remain on the existing alignment with improvements for curvature, grades, and sight distance from the CR 222/CR 223 (west) intersection to the CR 223 (east) intersection. CR 223 would be realigned and connected to US 160 approximately 1,500 feet west of the existing US 160/CR 223 (east) intersection. To reduce impacts to high quality wetlands, a 36-foot median would be used from MP 98 to MP 99 to separate opposing travel lanes. A 46-foot median would be used in all other areas. Access roads are provided on both sides of US 160 between MP 94 and MP 95 and on the north side of US 160 between MP 96 and MP 97 to consolidate direct highway access and reduce out-of-direction travel. East of the US 160/ CR 223 (east) intersection, US 160 would be realigned and bypass Gem Village to the south. The realigned US 160 would leave the existing US 160 on the west side of Gem Village near MP 100 and rejoin it near MP 101. No access roads would be constructed, but access would be provided at the east end of Gem Village. A one-way slip ramp would provide access to US 160 for westbound traffic at the west end of Gem Village.

#### Preferred Alternative Selection

Gem Village is the distinguishing factor in the Dry Creek and Gem Village section. The majority of the community is centered along the existing US 160 alignment. This close-knit and coherent community consists of a mixture of residences and well-established businesses. Alternative C would follow the existing alignment through Gem Village, while Alternative H would bypass the community. Because it bypasses the community and has a longer length, Alternative H would have a higher construction cost (\$168 million) and have more impacts to wetlands (8.2 acres), irrigated farmland (20.7 acres) and wildlife habitat (140.3 acres) than Alternative C, which would have a construction cost of \$144.5 million, impact 7.3 acres of wetlands, 16.8 acres of irrigated farmland, and 129.5 acres of wildlife habitat. However, because it would be on the existing US 160 alignment through Gem Village, Alternative C would have 15 residential relocations and nine business relocations, as compared to eight residential relocations and no business relocations for Alternative H. Alternative C would remove approximately 50 percent of the downtown district. Impacts of this magnitude would at the very least cause a severe, adverse impact to the community's cohesion, and at worst could cause the deterioration of the entire community. Because of these severe social impacts, Alternative C is not considered to be practicable when compared to Alternative H based on the logistics screening criteria. Therefore, Alternative H is the Selected Alternative, the Environmentally Preferred Alternative, and the LEDPA.

### 2.1.4 Bayfield Section

In addition to the No Action Alternative, two alternatives, Bayfield section alternatives A and B, were advanced for detailed analysis in the FEIS.

### Alternative A

Under this alternative for the Bayfield section, US 160 would be four lanes and generally remain on the existing alignment with improvements for curvature, grades, and sight distance. Three closely spaced intersections with US 160 [US 160B (west), CR 506, and CR 502] would be consolidated into a single unsignalized intersection. CR 502 would be realigned and connect to US 160 approximately 1,500 feet west of the existing US 160/CR 502 intersection. The realigned CR 502 would intersect CR 506 north of US 160 and continue south of US 160 to intersect with US 160B. This realignment would eliminate both of the existing US 160 intersections with CR 502 and CR 506. Access to US 160B would be maintained through an access road on the south side of US 160. CR 501 would be realigned and connect to US 160 approximately 800 feet west of the existing US 160/CR 501 intersection. This new intersection with US 160 would be a diamond interchange. From US 160 to the US 160B/CR 521 intersection, the existing CR 501 would be eliminated. The intersections of US 160B/CR 501 and US 160B/CR 521 would be reconstructed as a roundabout.

#### Alternative B

This alternative is similar to Alternative A, except that the US 160/CR 501 intersection would remain a signalized intersection at its present location. The intersections of US 160B/CR 501 and US 160B/CR 521 would be reconstructed as a roundabout.

#### Preferred Alternative Selection

The difference between Alternative A and Alternative B is the US 160/CR 501 intersection. In Alternative A this intersection would be a diamond interchange. In Alternative B this intersection would remain a signalized intersection. In both alternatives, the intersections of US 160B/CR 501 and US 160B/CR 521 would be reconstructed as a roundabout. Both alternatives would meet the projected traffic demand. Due to the smaller footprint of an intersection instead of an interchange, Alternative B would have fewer impacts to wetlands (4.2 acres), irrigated farmland (21.4 acres), and wildlife habitat (18.0 acres) than Alternative A, which would have 5.0 acres of impacts to wetlands, 24.9 acres of impacts to irrigated farmlands, and 19.2 acres of impacts to wildlife habitat. The US 160/CR 501 intersection in Alternative B would also be less expensive and was supported by the public and the Town of Bayfield. The roundabout at the US 160B/CR 501 and US 160B/CR 521 intersections is opposed by the Town of Bayfield and many members of the public. Because of the proximity to US 160, an intersection at this location under stopped conditions would cause vehicles to back up onto US 160 creating safety and congestion problems on US 160. The roundabout avoids the safety problems of traffic stacking onto US 160, US 160B, or CR 521. For these reasons, Alternative B is the Selected Alternative, the Environmentally Preferred Alternative, and the LEDPA.

# 2.2 ENVIRONMENTALLY PREFERRED ALTERNATIVE

The environmentally preferred alternative is the alternative "that causes the least damage to the biological and physical environment" [40 CFR 1505.2(b)]. Table 2.1, Summary of Advanced Alternatives Screening, presents information regarding impacts to the biological and physical environment. As described above in Section 2.1, Alternatives Considered, the Selected Alternative for each section is considered the Environmentally Preferred Alternative.

# 2.3 SECTION 404 PERMIT

The US Army Corps of Engineers (USACE) has concurred that the Selected Alternative is the LEDPA and is issuing a Section 404 permit in conjunction with this ROD (see Appendix B, Section 404 Permit Materials). The US Fish and Wildlife Service (USFWS) and Colorado Division of Wildlife (CDOW) also have concurred with the Selected Alternative, with particular support for the proposed wildlife crossings.




# Appendix B – Traffic Count Data

### TMCs AM

8/15/2013	BAYFIELD PKWY EAST Southbound				US160 Westbound				BAYFIELD PKWY EAST Northbound					US Eastb		PHF =	0.91	
Start Time	Right	Thru	Left	Other	Rght	Thru	Left	Other	Right	Thru	Left	Other	Rght	Thru	Left	Other	15 minute total	Hour Total
07:00 AM	0	0	0	0	0	33	4	1	4	0	16	0	4	22	0	0	84	410
07:15 AM	0	0	0	0	0	36	9	0	2	0	18	0	9	31	0	1	106	438
07:30 AM	0	0	0	0	0	35	5	0	4	0	17	0	9	35	0	0	105	460
07:45 AM	0	0	0	0	0	48	2	0	2	0	19	0	13	31	0	0	115	467
08:00 AM	0	0	0	0	0	39	5	0	2	0	18	0	10	38	0	0	112	485
08:15 AM	0	0	0	0	0	43	5	0	7	0	11	0	9	53	0	0	128	
08:30 AM	0	0	0	0	0	38	3	0	7	0	13	0	12	39	0	0	112	
08:45 AM	0	0	0	0	0	56	5	0	4	0	13	0	10	45	0	0	133	

#### Continuity Check

07:30 AM US 160 to/from the east 83 -11.7% 94

0/45/0040	COMMERCE DR				US160 Westbound				COMMERCE DR					US		DUE	0.02	
8/15/2013		South	bound	1		vvest	bouna	1		North	bound	1		East	bouna		PHF =	0.93
Start Time	Right	Thru	Left	Other	Rght	Thru	Left	Other	Right	Thru	Left	Other	Rght	Thru	Left	Other	total	Hour Total
07:00 AM	31	0	4	0	5	41	0	0	0	0	0	0	0	25	17	0	123	595
07:15 AM	26	0	5	0	11	44	0	0	0	0	0	0	0	38	18	0	142	638
07:30 AM	38	0	8	0	7	45	0	0	0	0	0	0	0	34	26	0	158	665
07:45 AM	35	0	12	0	13	49	0	0	0	1	0	0	0	33	29	0	172	659
08:00 AM	32	0	13	0	11	46	0	0	0	0	0	0	0	38	26	0	166	665
08:15 AM	26	0	12	0	13	46	0	0	0	0	1	0	0	47	24	0	169	
08:30 AM	22	1	9	0	10	43	0	0	0	0	0	0	0	47	20	0	152	
08:45 AM	23	1	10	0	16	54	0	0	0	0	0	0	0	45	29	0	178	

Continuity Check US 160 to/from the west 07:30 AM US 160 to/from the east

Continuity Check	
US 160 to/from the west	143
07:30 AM	-4.7%
US 160 to/from the east	150

8/15/2013	501 3 Southbound				US160 Westbound					5 North	01 bound			US Eastt		PHF =	0.87	
Start Time	Right	Thru	Left	Other	Rght	Thru	Left	Other	Right	Thru	Left	Other	Rght	Thru	Left	Other	15 minute total	Hour Total
07:00 AM	42	14	3	0	1	45	19	1	18	5	19	1	9	30	5	0	212	1164
07:15 AM	37	27	8	0	2	59	28	0	26	9	35	0	16	23	18	0	288	1192
07:30 AM	49	36	2	0	2	64	22	0	31	13	48	0	18	29	6	0	320	1128
07:45 AM	38	49	3	0	2	54	29	0	29	27	33	0	30	38	12	0	344	1060
08:00 AM	26	15	8	0	3	53	19	0	27	14	20	0	16	30	9	0	240	946
08:15 AM	26	22	2	0	2	38	25	0	21	11	24	0	15	31	7	0	224	
08:30 AM	23	21	3	0	3	44	24	0	21	25	17	0	15	42	14	0	252	
08:45 AM	19	23	9	0	2	36	22	1	21	18	25	0	15	32	7	0	230	

#### nuity Check JS 160 to/from the west 07:30 AM JS 160 to/from the east 197 -5.3% 208

8/13/2013		50 South	)6 bound		US160 Westbound				506 Northbound					US Eastt		PHF =	0.90	
Start Time	Right	Thru	Left	Other	Rght	Thru	Left	Other	Right	Thru	Left	Other	Rght	Thru	Left	Other	15 minute total	e Hour Total
07:00 AM	1	0	0	0	1	103	0	0	0	0	0	0	0	38	0	0	143	731
07:15 AM	2	0	0	0	0	137	0	0	0	0	0	0	0	48	1	0	188	756
07:30 AM	2	0	3	0	0	160	0	0	0	0	0	0	0	45	0	0	210	715
07:45 AM	0	0	1	0	0	113	0	0	0	0	0	0	0	75	1	0	190	660
08:00 AM	5	0	0	0	1	107	0	0	0	0	0	0	0	55	0	0	168	582
08:15 AM	0	0	1	0	0	96	0	0	0	0	0	0	0	49	1	0	147	
08:30 AM	2	0	1	0	1	86	0	0	0	0	0	0	0	65	0	0	155	
08:45 AM	1	0	1	0	1	67	0	0	0	0	0	0	0	41	1	0	112	

Continuity Check US 160 to/from the west 07:30 AM

207 0.5% 206

US 160 to/from the east

8/13/2013	BAYFIELD PKWY WEST Southbound				US160 Westbound				В	AYFIELD F North	KWY WES	т		US Eastt		PHF =	0.88	
Start Time	Right	Thru	Left	Other	Rght	Thru	Left	Other	Right	Thru	Left	Other	Rght	Thru	Left	Other	15 minute total	Hour Total
07:00 AM	0	0	0	0	0	104	0	0	1	0	32	0	8	38	0	0	183	869
07:15 AM	0	0	0	0	0	135	0	0	2	0	17	0	11	46	0	0	211	884
07:30 AM	0	0	0	0	0	161	0	0	2	0	31	0	14	43	0	0	251	846
07:45 AM	0	0	0	0	0	118	0	0	2	0	19	0	12	73	0	0	224	775
08:00 AM	0	0	0	0	0	116	4	0	1	0	11	0	11	55	0	0	198	687
08:15 AM	0	0	0	0	0	93	1	0	0	0	20	0	9	50	0	0	173	
08:30 AM	0	0	0	0	0	84	2	0	1	0	14	0	16	63	0	0	180	
08:45 AM	0	0	0	0	0	68	0	0	0	0	16	0	10	42	0	0	136	

220
-14.4%
257

### TMCs AM

8/13/2013	HOMESTEAD 13 Southbound				US160 Westbound				HOMESTEAD Northbound					US Eastl		PHF =	0.85	
Start Time	Right	Thru	Left	Other	Rght	Thru	Left	Other	Right	Thru	Left	Other	Rght	Thru	Left	Other	15 minute total	Hour Total
07:00 AM	0	0	1	0	2	130	0	0	0	0	0	0	0	48	0	0	181	872
07:15 AM	0	0	0	0	0	153	1	0	0	0	0	0	0	55	0	0	209	877
07:30 AM	1	0	1	0	7	190	0	0	0	0	0	0	0	59	1	0	259	844
07:45 AM	2	0	1	0	16	120	1	0	0	0	0	0	0	83	0	0	223	758
08:00 AM	0	0	4	0	8	111	4	0	0	0	0	0	0	59	0	0	186	671
08:15 AM	0	0	2	0	6	105	1	0	1	0	0	0	0	61	0	0	176	
08:30 AM	0	0	5	0	2	94	1	0	3	0	0	0	0	68	0	0	173	
08:45 AM	0	0	1	0	1	81	2	0	1	0	0	0	2	48	0	0	136	

#### Continuity Check

US 160 to/from	the west

5:15 PM	
US 160 to/from the east	

251 0.4% 250

Г		CR	507		US160 CR507 US160													
8/13/2013		South	bound		Westbound					North	bound			East	bound		PHF =	0.84
Start Time	Right	Thru	Left	Other	Rght	Thru	Left	Other	Right	Thru	Left	Other	Rght	Thru	Left	Other	15 minute total	Hour Total
07:00 AM	0	0	0	0	0	141	1	0	0	0	0	0	0	45	0	0	187	855
07:15 AM	2	0	1	0	1	155	1	0	0	1	0	0	1	55	0	0	217	840
07:30 AM	2	0	1	0	3	174	1	0	1	0	0	0	0	70	1	0	253	803
07:45 AM	0	0	2	0	0	118	4	0	1	0	0	0	1	70	2	0	198	710
08:00 AM	1	0	1	0	1	106	2	0	0	0	2	0	3	56	0	0	172	659
08:15 AM	0	1	1	0	2	104	1	0	1	0	1	0	1	67	1	0	180	
08:30 AM	2	0	1	0	0	96	1	0	1	1	2	0	0	56	0	0	160	
08:45 AM	1	2	1	0	2	84	1	0	0	1	3	0	1	51	0	0	147	

8/15/2013		DRIVI South	EWAY bound			BAYFIEL West	.D PKWY			HOMES North	EAD DR			BAYFIEI Eastl	D PKWY		PHF =	0.87
Start Time	Rght	Thru	Left	Other	Right	Thru	Left	Other	Rght	Thru	Left	Other	Right	Thru	Left	Other	15 minute total	Hour Total
07:00 AM	1	0	0	0	0	15	2	0	2	0	11	0	1	7	0	0	39	145
07:15 AM	0	0	0	0	0	17	0	0	2	0	6	0	0	6	0	0	31	153
07:30 AM	0	0	0	0	0	18	0	0	4	0	8	0	0	7	0	0	37	163
07:45 AM	0	0	0	0	0	20	0	0	0	0	5	0	0	13	0	0	38	157
08:00 AM	0	0	0	0	0	17	0	0	1	0	3	0	3	23	0	0	47	144
08:15 AM	0	0	0	0	0	17	0	0	2	0	5	0	3	14	0	0	41	
08:30 AM	0	0	1	0	0	11	1	0	0	0	3	0	2	13	0	0	31	
08:45 AM	0	0	0	0	0	14	0	0	1	0	2	0	0	8	0	0	25	

							U	S 160 TOTA	LS								PHF =	0.90
Start Time	Right	Thru	Left	Other	Rght	Thru	Left	Other	Right	Thru	Left	Other	Rght	Thru	Left	Other	15 minute total	Hour Total
07:00 AM	74	14	8	0	9	597	24	2	23	5	67	1	21	246	22	0	1113	5496
07:15 AM	67	27	14	0	14	719	39	0	30	10	70	0	37	296	37	1	1361	5625
07:30 AM	92	36	15	0	19	829	28	0	38	13	96	0	41	315	34	0	1556	5461
07:45 AM	75	49	19	0	31	620	36	0	34	28	71	0	56	403	44	0	1466	5089
08:00 AM	64	15	26	0	24	578	34	0	30	14	51	0	40	331	35	0	1242	4695
08:15 AM	52	23	18	0	23	525	33	0	30	11	57	0	34	358	33	0	1197	
08:30 AM	49	22	19	0	16	485	31	0	33	26	46	0	43	380	34	0	1184	
08:45 AM	44	26	22	0	22	446	30	1	26	19	57	0	38	304	37	0	1072	

### TMCs PM

8/15/2013	E	BAYFIELD F South	PKWY EAS	т		US West	160 bound		E	BAYFIELD I North	PKWY EAS bound	т		US Eastt	160 bound		PHF =	0.92
Start Time	Right	Thru	Left	Other	Rght	Thru	Left	Other	Right	Thru	Left	Other	Rght	Thru	Left	Other	15 minute total	Hour Total
04:00 PM	0	0	0	0	0	53	6	0	6	0	11	0	18	50	0	0	144	616
04:15 PM	0	0	0	0	0	54	0	0	9	0	9	0	21	63	0	0	156	620
04:30 PM	0	0	0	0	0	51	4	0	5	0	12	0	27	57	0	0	156	640
04:45 PM	0	0	0	0	0	45	5	0	10	0	20	0	22	58	0	0	160	650
05:00 PM	0	0	0	0	0	40	3	0	9	0	18	0	25	53	0	0	148	623
05:15 PM	0	0	0	0	0	53	2	0	10	0	29	0	28	54	0	0	176	
05:30 PM	0	0	0	0	0	61	4	0	6	0	17	0	23	55	0	0	166	
05:45 PM	0	0	0	0	0	41	3	0	8	0	17	0	26	38	0	0	133	

#### Continuity Check

US 160 to/from the west	
5:15 PM	

145 -7.6% 157

214 -3.6% 222

206 -0.5% 207

US 160 to/from the east

8/15/2013		COMME South	RCE DR			US Westl	160 bound			COMME North	RCE DR bound			US Eastt	160 bound		PHF =	0.91
Start Time	Right	Thru	Left	Other	Rght	Thru	Left	Other	Right	Thru	Left	Other	Rght	Thru	Left	Other	15 minute total	Hour Total
04:00 PM	38	0	12	0	15	45	0	0	0	1	0	0	0	74	43	0	228	961
04:15 PM	37	2	17	0	12	52	0	0	0	0	0	0	1	67	45	0	233	1021
04:30 PM	34	1	15	0	22	48	0	0	2	2	0	0	0	62	61	0	247	1046
04:45 PM	49	0	17	0	19	40	1	0	0	0	0	0	0	59	68	0	253	983
05:00 PM	36	0	21	0	18	62	0	0	0	0	3	0	1	63	84	0	288	912
05:15 PM	28	0	22	0	22	53	0	0	0	0	0	0	0	60	73	0	258	
05:30 PM	27	1	15	0	14	52	0	0	0	0	1	0	0	44	30	0	184	
05:45 PM	25	0	12	0	11	48	0	0	0	0	0	0	0	57	29	0	182	

		50	01			US	160			50	01			US	160			
8/15/2013		South	bound			West	bound			North	bound			East	oound		PHF =	0.98
																	15 minute	5
Start Time	Right	Thru	Left	Other	Rght	Thru	Left	Other	Right	Thru	Left	Other	Rght	Thru	Left	Other	total	Hour Total
04:00 PM	15	24	3	0	3	49	27	0	25	25	15	0	12	69	36	0	303	1276
04:15 PM	17	19	4	0	2	66	30	0	33	30	18	0	22	66	28	0	335	1349
04:30 PM	16	21	3	0	5	44	22	0	47	39	19	0	20	65	21	0	322	1400
04:45 PM	15	24	4	0	5	37	27	0	39	36	18	0	24	63	24	0	316	1446
05:00 PM	20	24	3	0	6	68	36	0	40	49	18	0	20	61	31	0	376	1509
05:15 PM	15	33	2	0	2	50	25	0	54	42	8	0	31	89	35	0	386	
05:30 PM	12	33	2	0	3	50	36	0	51	40	18	0	30	65	28	0	368	
05:45 PM	19	32	3	0	5	46	29	0	26	32	15	0	26	103	43	0	379	

# Continuity Check JS 160 to/from the west 5:15 PM JS 160 to/from the east 274 35.0% 203

		5	06			US	160			5	06			US	160			
8/13/2013		South	bound			West	bound			North	bound			East	bound	-	PHF =	0.91
																	15 minute	
Start Time	Right	Thru	Left	Other	Rght	Thru	Left	Other	Right	Thru	Left	Other	Rght	Thru	Left	Other	total	Hour Total
04:00 PM	2	0	1	0	1	77	0	0	0	0	0	0	0	109	3	0	193	754
04:15 PM	3	0	4	0	0	91	0	0	0	0	0	0	0	104	2	0	204	780
04:30 PM	0	0	0	0	1	73	0	0	0	0	0	0	0	104	3	0	181	782
04:45 PM	1	0	0	0	1	64	0	0	0	0	0	0	0	110	0	0	176	804
05:00 PM	0	0	1	0	1	92	0	0	0	0	0	0	0	124	1	0	219	866
05:15 PM	1	0	0	0	0	62	0	0	0	0	0	0	0	141	2	0	206	
05:30 PM	0	0	0	0	1	79	0	0	0	0	0	0	0	123	0	0	203	
05:45 PM	1	0	2	0	2	70	0	0	0	0	0	0	0	158	5	0	238	

Continuity Check
------------------

US 160 to/from the west 5:15 PM US 160 to/from the east

8/13/2013	B	AYFIELD P South	KWY WES	т		US Westi	160 bound		В	AYFIELD F North	KWY WES	Т		US Eastb	160 ound		PHF =	0.95
Start Time	Right	Thru	Left	Other	Rght	Thru	Left	Other	Right	Thru	Left	Other	Rght	Thru	Left	Other	15 minute total	Hour Total
04:00 PM	0	0	0	0	0	77	1	0	2	0	14	0	23	108	0	0	225	895
04:15 PM	0	0	0	0	0	89	2	0	2	0	8	0	23	105	0	0	229	940
04:30 PM	0	0	0	0	0	79	0	0	2	0	16	0	29	105	0	0	231	980
04:45 PM	0	0	0	0	0	61	2	0	2	0	14	0	22	109	0	0	210	999
05:00 PM	0	0	0	0	0	88	3	0	4	0	8	0	47	120	0	0	270	1069
05:15 PM	0	0	0	0	0	63	2	0	2	0	20	0	42	140	0	0	269	
05:30 PM	0	0	0	0	0	76	3	0	1	0	13	0	36	121	0	0	250	
05:45 PM	0	0	0	0	0	69	1	0	2	0	11	0	37	160	0	0	280	

247
-7.1%
266

Continuity Check US 160 to/from the west 5:15 PM US 160 to/from the east

### TMCs PM

8/13/2013		HOME South	STEAD bound			US West	160 bound			HOME North	STEAD bound			US Eastt	160 bound		PHF =	0.95
o <del>.</del> .	<b>D</b> : 1.4			0.1								0.1				0.1	15 minute	·
Start Time	Right	Thru	Left	Other	Rght	Ihru	Left	Other	Right	Thru	Left	Other	Rght	Thru	Left	Other	total	Hour I otal
04:00 PM	1	1	4	0	6	83	0	0	1	0	0	0	0	124	0	0	220	887
04:15 PM	0	0	2	0	4	90	4	0	3	0	0	0	0	122	0	0	225	924
04:30 PM	1	0	4	0	2	92	3	0	5	0	1	0	1	124	0	0	233	966
04:45 PM	1	0	2	0	4	69	4	0	1	0	0	0	0	128	0	0	209	982
05:00 PM	0	0	10	0	3	90	0	0	4	0	0	0	0	150	0	0	257	1051
05:15 PM	0	0	2	0	2	79	2	0	7	0	0	0	0	174	1	0	267	
05:30 PM	0	0	1	0	0	83	0	0	4	0	0	0	0	161	0	0	249	
05:45 PM	0	0	4	0	2	85	0	0	2	0	0	0	0	185	0	0	278	

261 -4.4% 273

8/13/2013		CR: South	507 bound			US West	160 bound			CR North	507 bound			US Eastt	160 bound		PHF =	0.93
Start Time	Right	Thru	Left	Other	Raht	Thru	Left	Other	Right	Thru	Left	Other	Raht	Thru	Left	Other	15 minute	Hour Total
04:00 PM	1	1	1	0	1	84	2	1	1	1	0	0	1	129	0	0	223	869
04:15 PM	2	1	2	0	5	92	1	0	3	0	3	0	4	108	1	0	222	900
04:30 PM	4	0	2	0	1	83	0	0	4	1	0	0	3	119	2	0	219	956
04:45 PM	2	1	1	0	1	65	2	0	0	0	1	0	3	129	0	0	205	983
05:00 PM	1	2	8	0	2	95	2	1	4	0	1	0	3	135	0	0	254	1031
05:15 PM	1	0	5	0	1	81	0	0	3	0	3	0	1	183	0	0	278	
05:30 PM	0	0	1	0	0	80	2	0	1	0	2	0	0	160	0	0	246	
05:45 PM	0	0	1	0	1	82	2	0	1	0	1	0	1	164	0	0	253	

8/15/2013		DRIVE South	EWAY bound			HOMES West	FEAD DR			BAYFIEL North	D PKWY bound			HOMEST	FEAD DR		PHF =	0.83
Start Time	Right	Thru	Left	Other	Rght	Thru	Left	Other	Right	Thru	Left	Other	Rght	Thru	Left	Other	15 minute total	Hour Total
04:00 PM	0	0	0	0	0	15	0	0	0	0	1	0	1	25	0	0	42	203
04:15 PM	0	0	0	0	0	18	2	0	1	0	0	0	4	24	0	0	49	206
04:30 PM	0	0	0	0	0	15	4	0	2	0	6	0	5	26	0	0	58	219
04:45 PM	0	0	0	0	0	14	4	0	2	0	2	0	5	27	0	0	54	231
05:00 PM	0	0	0	0	0	4	3	0	1	0	0	0	3	34	0	0	45	223
05:15 PM	0	0	0	0	0	10	0	0	3	0	4	0	5	40	0	0	62	
05:30 PM	0	0	0	0	0	13	3	0	1	0	4	0	3	46	0	0	70	
05:45 PM	0	0	0	0	0	6	2	0	3	0	2	0	4	29	0	0	46	

							U	S 160 TOTA	LS								PHF =	0.96
																	15 minute	
Start Time	Right	Thru	Left	Other	Rght	Thru	Left	Other	Right	Thru	Left	Other	Rght	Thru	Left	Other	total	Hour Total
04:00 PM	57	26	21	0	26	468	36	1	35	27	40	0	54	663	82	0	1536	6258
04:15 PM	59	22	29	0	23	534	37	0	50	30	38	0	71	635	76	0	1604	6534
04:30 PM	55	22	24	0	31	470	29	0	65	42	48	0	80	636	87	0	1589	6770
04:45 PM	68	25	24	0	30	381	41	0	52	36	53	0	71	656	92	0	1529	6847
05:00 PM	57	26	43	0	30	535	44	1	61	49	48	0	96	706	116	0	1812	7061
05:15 PM	45	33	31	0	27	441	31	0	76	42	60	0	102	841	111	0	1840	
05:30 PM	39	34	19	0	18	481	45	0	63	40	51	0	89	729	58	0	1666	
05:45 PM	45	32	22	0	21	441	35	0	39	32	44	0	90	865	77	0	1743	

Continuity Check US 160 to/from the west 5:15 PM US 160 to/from the east

# Aug 14 Tubes

Wednesday, August 14, 2013

US 160 W/O CR 507

# US 160 E/O BAYFIELD PKWY EA

Time	EB	WB	Hour Total	EB	WB	Hour Total
12:00 AM	13	4	47	6	4	37
12:15 AM	3	6	45	6	8	33
12:30 AM	2	4	48	2	7	23
12:45 AM	6	9	48	2	2	16
01:00 AM	3	12	38	2	4	19
01:15 AM	6	6	24	2	2	15
01:30 AM	3	3	21	0	2	17
01:45 AM	3	2	23	4	3	18
02:00 AM	1	0	24	1	1	13
02:15 AM	1	8	36	4	2	13
02:30 AM	1	7	37	1	2	7
02:45 AM	3	3	39	0	2	5
03:00 AM	7	6	47	1	1	7
03:15 AM	4	6	38	0	0	13
03:30 AM	4	6	45	0	1	17
03:45 AM	4	10	52	0	4	24
04:00 AM	0	4	57	2	6	26
04:15 AM	3	14	87	0	4	34
04:30 AM	4	13	102	6	2	49
04:45 AM	9	10	140	2	4	58
05:00 AM	10	24	166	4	12	68
05:15 AM	10	22	182	11	8	70
05:30 AM	10	45	242	3	14	73
05:45 AM	8	37	345	9	7	110
06:00 AM	8	42	445	6	12	146
06:15 AM	30	62	577	2	20	196
06:30 AM	42	116	689	12	42	255
06:45 AM	48	97	813	15	37	282
07:00 AM	41	141	919	35	33	332
07:15 AM	66	138	975	33	48	350
07:30 AM	76	206	1009	30	51	362
07:45 AM	80	171	919	45	57	375
08:00 AM	106	132	844	32	54	360
08:15 AM	85	153	805	41	52	376
08:30 AM	75	117	731	50	44	385
08:45 AM	76	100	748	44	43	404
09:00 AM	80	119	786	47	55	427
09:15 AM	77	87	778	47	55	432
09:30 AM	91	118	818	67	46	480
09:45 AM	109	105	809	51	59	497
10:00 AM	90	101	811	65	42	512
10:15 AM	83	121	813	67	83	505
10:30 AM	108	92	809	73	57	456

# Aug 14 Tubes

10:45 AM	99	117	824	59	66	442
11:00 AM	80	113	807	53	47	435
11:15 AM	83	117	803	48	53	441
11:30 AM	92	123	811	58	58	443
11:45 AM	86	113	773	55	63	417
12:00 PM	92	97	764	52	54	390
12:15 PM	103	105	789	55	48	393
12:30 PM	76	101	766	42	48	390
12:45 PM	106	84	761	47	44	412
01:00 PM	111	103	758	48	61	422
01:15 PM	98	87	746	44	56	414
01:30 PM	97	75	766	65	47	430
01:45 PM	95	92	807	47	54	437
02:00 PM	108	94	830	51	50	447
02:15 PM	118	87	846	52	64	452
02:30 PM	116	97	855	68	51	443
02:45 PM	111	99	851	61	50	468
03:00 PM	108	110	872	56	50	489
03:15 PM	130	84	902	55	52	519
03:30 PM	109	100	955	75	69	539
03:45 PM	128	103	1011	68	64	525
04:00 PM	123	125	1033	73	63	508
04:15 PM	154	113	1025	69	58	490
04:30 PM	164	101	1007	80	50	462
04:45 PM	150	103	999	70	45	434
05:00 PM	155	85	1064	51	67	444
05:15 PM	162	87	1034	54	45	469
05:30 PM	167	90	964	54	48	460
05:45 PM	221	97	890	91	34	449
	136	74	740	81	62	403
06:15 PM	120	59	661	44	46	323
	122	01 72	590	51	40	290
06:45 PIVI	96	72	537	42	37	252
07.00 PW	92	39	407	28	35	227
	70	44	451	51	5Z	221
07:30 PW	// 56	47	421	30	1/	213
	50	4Z 27	380	22	22	217
08:15 PM	63	54 //1	356	33	24	214 101
08:30 PM	68	3/	318	28	22	172
08:45 PM	46	22	269	28	23 18	1/2
09:00 PM		19	203	20	14	122
09:15 PM	37	29	210	18	18	122
09:30 PM	29	24	180	11	12	107
09:45 PM	33	14	159		11	106
10:00 PM	29	15	137	26	8	87
10:15 PM	24	12	117	13	8	70

# Aug 14 Tubes

10:30 PM	22	10	96	12	10	57
10:45 PM	13	12	83	2	8	48
11:00 PM	9	15	81	3	14	48
11:15 PM	9	6	57	4	4	31
11:30 PM	10	9	42	4	9	23
11:45 PM	12	11	23	7	3	10
	6217	6137	12354	3135	3048	6183
difference between two days	10.0%	10.1%		10.0%	10.0%	
AM peak/total			0.081674			
PM peak/total			0.086126			

# Aug 15 Tubes

Thursday, August 15, 2013

Time 12:00 AM 12:15 AM 12:30 AM 12:45 AM 01:00 AM 01:15 AM 01:30 AM 01:45 AM 02:00 AM 02:15 AM 02:30 AM 02:45 AM 03:00 AM 03:15 AM 03:30 AM 03:45 AM 04:00 AM 04:15 AM 04:30 AM 04:45 AM 05:00 AM 05:15 AM 05:30 AM 05:45 AM 06:00 AM 06:15 AM 06:30 AM 06:45 AM 07:00 AM 07:15 AM 07:30 AM 07:45 AM 08:00 AM 08:15 AM 08:30 AM 08:45 AM 09:00 AM 09:15 AM 09:30 AM 09:45 AM 10:00 AM 10:15 AM 10:30 AM 10:45 AM 11:00 AM 11:15 AM 11:30 AM

#### US 160 W/O CR 507

## US 160 E/O BAYFIELD PKWY EA

EB	WB	Hour Total	EB	WB	Hour Total	
12	4	43	5	4	33	
3	5	41	5	7	30	
2	4	43	2	6	22	
5	8	43	2	2	16	
3	11	35	2	4	19	
5	5	22	2	2	15	
3	3	20	0	2	17	
3	2	21	4	3	18	
1	0	22	1	1	13	
1	7	32	4	2	13	
1	6	33	1	2	7	
3	3	35	0	2	5	
6	5	42	1	1	7	
4	5	35	0	0	12	
4	5	42	0	1	16	
4	9	49	0	4	22	
0	4	53	2	5	24	
3	13	80	0	4	32	
4	12	93	5	2	45	
8	9	127	2	4	54	
9	22	151	4	11	62	
9	20	165	10	7	63	
9	41	219	3	13	66	
7	34	312	8	6	99	
7	38	403	5	11	133	
27	56	523	2	18	179	
38	105	625	11	38	233	
44	88	738	14	34	257	
37	128	834	32	30	302	
60	125	885	30	44	318	
69	187	916	27	46	328	
73	155	834	41	52	340	
96	120	766	29	49	326	
77	139	731	37	47	341	
68	106	664	45	40	350	
69	91	680	40	39	368	
73	108	714	43	50	389	
70	79	707	43	50	393	
83	107	743	61	42	436	
99	95	735	46	54	451	
82	92	737	59	38	465	
75	110	739	61	75	459	
98	84	735	66	52	415	
90	106	749	54	60	403	
73	103	734	48	43	396	
75	106	730	44	48	401	
84	112	738	53	53	403	

Aug 15 Tubes

11:45 AM	78	103	703	50	57	379
12:00 PM	84	88	694	47	49	355
12:15 PM	94	95	717	50	44	358
12:30 PM	69	92	696	38	44	355
12:45 PM	96	76	691	43	40	375
01:00 PM	101	94	689	44	55	384
01:15 PM	89	79	677	40	51	376
01:30 PM	88	68	695	59	43	390
01:45 PM	86	84	732	43	49	396
02:00 PM	98	85	753	46	45	404
02:15 PM	107	79	768	47	58	409
02:30 PM	105	88	776	62	46	401
02:45 PM	101	90	773	55	45	424
03:00 PM	98	100	792	51	45	444
03:15 PM	118	76	820	50	47	471
03:30 PM	99	91	869	68	63	490
03:45 PM	116	94	920	62	58	477
04:00 PM	112	114	940	66	57	462
04:15 PM	140	103	932	63	53	446
04:30 PM	149	92	915	73	45	420
04:45 PM	136	94	908	64	41	395
05:00 PM	141	77	967	46	61	404
05.15 PM	147	79	940	49	41	427
05:30 PM	152	82	877	49	44	419
05:45 PM	201	88	809	83	31	408
06:00 PM	124	67	672	74	56	366
06:15 PM	109	54	600	40	42	293
06:30 PM	111	55	541	46	36	268
06:45 PM	87	65	488	38	34	200
07:00 PM	84	35	425	25	37	205
07:15 PM	64	40	392	28	29	200
07:30 PM	70	40	382	20	15	193
07:45 PM	51	28	362	29	20	197
08:00 PM	55	30	345	30	20	197
08:15 PM	57	27	272	30	20	172
08:30 PM	57 62	21	220	25	20	155
08:45 DM	42	20	203	20	16	120
	42	17	244	18	12	110
00.00 F M	47 27	26	101	10	15 16	110
09:30 PM	26	20	151	10	10	07
00.00 F M	20	22 12	1/5	10	11 10	97
10:00 PM	50 26	15	145	10	10	90 70
10:15 DM	20	14	123	12	7	79 64
10.10 FM	22	0	107	11	/ 0	04 52
10.30 FINI	20	9 11	8/ 75	11	9 7	23
10.40 PW	12	11	75	2	/	45
	ð	14 -	73	3	13	45
11.10 PIVI	ð	5		4	4	
11.30 PIVI	9	ð 10		4	ð	
1 1.40 MVI	11	10		б	3	
	5650	5574	11224	2850	2771	
				-		

# Aug 15 Tubes

2-DAY ADT

11789

5902

# Appendix C – Traffic Calculations

# Background Traffic

US 160 Growth	1.80%	=	1.48									
CR Growth	1.45%	=	1.37	1.45%	=	1.37						
AM Peak	SC	OUTHBOUN	D	V	VESTBOUN	D	N	ORTHBOUN	ID	E	ASTBOUND	)
INTERSECTION	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
US 160/GEM LN	14	0	7	0	823	7	0	0	0	0	370	0
US 160/ CR 507	7	0	7	11	821	7	3	1	3	4	373	7
US 160/ HOMESTEAD DR	8	0	4	8	854	43	0	0	0	1	380	0
US 160/ BAYFIELD PKWY WEST	0	0	0	5	794	0	107	0	10	0	327	66
HOMESTEAD DR/ BAYFIELD PKWY	0	0	0	0	72	0	22	0	7	0	49	3
US 160/ CR 506	5	0	12	0	767	1	0	0	0	3	331	0
US 160/ CR 502	21	0	41	0	738	7	0	0	0	21	317	0
US 160/ CR 501	29	174	206	135	383	12	187	86	155	62	206	110
US 160/ COMMERCE DR	52	0	180	0	291	58	0	1	0	136	227	0
US 160/ BAYFIELD PKWY EAST	0	0	0	29	244	0	99	0	14	0	205	56
PM Peak	SC	OUTHBOUN	D	V	VESTBOUN	D	N	ORTHBOUN	ID	E	ASTBOUND	)
INTERSECTION	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
US 160/GEM LN	7	0	0	0	500	14	0	0	0	7	937	0
US 160/ CR 507	21	3	3	8	503	5	10	0	12	0	954	7
US 160/ HOMESTEAD DR	23	0	0	3	500	10	0	0	23	1	996	0
US 160/ BAYFIELD PKWY WEST	0	0	0	12	445	0	71	0	12	0	820	222
HOMESTEAD DR/ BAYFIELD PKWY	0	0	0	8	33	0	10	0	8	0	149	15
US 160/ CR 506	4	0	3	0	449	5	0	0	0	11	810	0
US 160/ CR 502	7	0	21	0	433	21	0	0	0	41	772	0
US 160/ CR 501	14	167	91	173	346	22	81	224	235	188	517	147
US 160/ COMMERCE DR	96	1	159	0	338	89	5	0	0	296	363	1
US 160/ BAYFIELD PKWY EAST	0	0	0	16	299	0	111	0	45	0	311	140

# **Trip Generation**

			Trip Generation Rates (average)   Trip Generation Rates (average) AN   AM Avg. Inbout   AM Peak PM Peak Weekday Trips   0.75 1.00 9.52 32   0.75 1.00 9.52 44   0.75 1.00 9.52 4				Tri	ips Generat	ed			Intern	al Trip Redu	uctions
						AM Pe	ak Hour	PM Pe	ak Hour		AM Pe	ak Hour	PM Pe	ak Hour
	Size	Estimated			Avg.	Inbound	Outbound	Inbound	Outbound		Inbound	Outbound	Inbound	Outbound
ITE Land Use Code	(Acres)	Units	AM Peak	PM Peak	Weekday	Trips	Trips	Trips	Trips	Weekday	Trips	Trips	Trips	Trips
#210 Single Family Home	84.5	169 DU	0.75	1.00	9.52	32	95	106	63	1,609	-1	-2	-9	-5
#210 Single Family Home	117.8	236 DU	0.75	1.00	9.52	44	133	149	87	2,247	-1	-3	-12	-7
#210 Single Family Home	10.9	22 DU	0.75	1.00	9.52	4	12	14	8	209	0	0	-1	-1
#210 Single Family Home	53.9	108 DU	0.75	1.00	9.52	20	61	68	40	1,028	0	-1	-5	-3
#210 Single Family Home	43.2	86 DU	0.75	1.00	9.52	16	48	54	32	819	0	-1	-4	-3
SUBTOTAL	310.3	621 DU				116	349	391	230	5,912	-2	-7	-31	-18
#820 Shopping Center	35.4	354 KSF	0.96	3.71	42.7	211	129	630	683	15,116	-4	-1	-9	-16
#820 Shopping Center	26.4	264 KSF	0.96	3.71	42.7	157	96	470	509	11,273	-3	-1	-7	-12
#820 Shopping Center	7.7	77 KSF	0.96	3.71	42.7	46	28	137	149	3,288	-1	0	-2	-3
SUBTOTAL	69.5	695 KSF				414	254	1,238	1,341	29,677	-7	-2	-18	-31
TOTAL	379.8					1,	.133	3,	199	35,588				

Sources: Trip Generation Manual, 9th Edition

Trip Generation Handbook, March 2001

# **Trip Generation**

		Trips afte	r Internal F	Reduction				Pass By	/ Trips Adju	istment			External Tr	ips after A	djustments	
	AM Pe	ak Hour	PM Pe	ak Hour			AM Pe	ak Hour	PM Pe	ak Hour		AM Pe	ak Hour	PM Pe	ak Hour	
	Inbound	Outbound	Inbound	Outbound		PM Peak	Inbound	Outbound	Inbound	Outbound		Inbound	Outbound	Inbound	Outbound	
Weekday	Trips	Trips	Trips	Trips	Weekday	Pass-By %	Trips	Trips	Trips	Trips	Weekday	Trips	Trips	Trips	Trips	Weekday
-145	31	93	98	58	1,464							31	93	98	58	1,464
-202	43	130	137	80	2,045							43	130	137	80	2,045
-19	4	12	13	7	191							4	12	13	7	191
-93	20	60	63	37	936							20	60	63	37	936
-74	16	47	50	29	745							16	47	50	29	745
-532												114	342	360	211	5,380
-271	207	128	621	667	14,845	26.9%			-173	-173		207	128	448	494	14,845
-202	154	95	463	497	11,071	29.3%			-141	-141		154	95	322	357	11,071
-59	45	28	135	145	3,229	42.0%			-59	-59		45	28	76	86	3,229
-532												407	251	846	936	29,144
	1,	114	3,	100	0							1,	114	2,	354	34,524



# **Development Trips**

	US 160	/ GEN		AGE	(NEW)																			
		SOU	тнво	UND				WE	STBO	UND				NC	ORTHBO	UND				EA	STBO	UND		
	Lei	ť	Th	ru	Rig	ht	Le	ft	Th	ru	Rig	ht	Le	eft	Thr	u	Rig	ht	Le	ft	Th	ru	Rig	ht
	AM	PM	АМ	РМ	AM	PM	АМ	PM	АМ	PM	АМ	PM	AM	РМ	AM	PM	AM	РМ	АМ	PM	АМ	PM	АМ	РМ
Northwest																								
Commercial									81	278											117	257		
Southwest									110	221											104	227		
Commercial									110	231											104	237		
East Commercial									15	47											25	42		
Homestead Zone							4	12					14	9			12	7					5	15
North Residential									74	46											25	78		
Southeast									26	16											٥	27		
Residential									20	10											9	27		
	0	0	0	0	0	0	4	12	305	618	0	0	14	9	0	0	12	7	0	0	279	641	5	15

# PROJECT TRIPS AT US 160/ NEW ACCESS

		SOU	гнво	UND		!		WE	STBO	UND		!		NC	RTHBO	JND	ļ			EA	STBO	JND		
	Lef	t	Th	ru	Rig	ht	Le	eft	Th	ru	Rig	ht	Le	ft	Thr	J L	Rig	nt	Le	ft	Th	ru	Rig	ht
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Northwest	50	202	7	25	01	270					OF	107			11	22			117	257				$\square$
Commercial	59	202	<i>'</i>	25	81	278	<u> </u>		$\square$		85	187	$\square'$			23			11/	257	L'		<u> </u>	
Southwest	1						QE	104					110	221	1		00	100	$\Box$		<del></del>		104	227
Commercial	L'						65	194	$\square$		L'		110	231	<u>ا</u>		90	109	$\square'$		L'		104	237
East Commercial									15	47			$\Box$						$\Box$		25	42		
Homestead Zone									4	12			$\Box$						$\square$		12	7		
North Residential	54	33	7	4	74	46			$\Box$ '	$\Box$	18	56	$\Box$		2	7	$\square'$	$\Box$	25	78	$\square'$		$\square'$	
Southeast	1												26	16	1				$\Box$		<del></del>			27
Residential	L'		<b> </b> '				<u> </u>		$\square'$		L'		20	10	<u>ا</u>				$\square'$		L'			27
									$\square$				$\Box$						$\Box$					
	112	235	14	29	154	323	85	194	19	60	103	243	136	248	13	30	90	189	142	335	36	49	113	265

# **Total Trips**

## US 160/ GEM VILLAGE (NEW)

Background	

Pass-By

Internal	Trips
	Tuine

External Trip

	SOUTHBOUND							WESTBOUND							NORTH	BOUND	)	EASTBOUND						
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		Left		Thru		Right	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
und	32	86	0	0	21	12	0	9	854	500	75	40	20	9	0	0	2	1	12	15	370	937	3	14
Trips																								
Trips	0	0	0	0	0	0	4	12	305	618	0	0	14	9	0	0	12	7	0	0	279	641	5	15
	30	90	0	0	20	10	0	20	1,160	1,120	80	40	30	20	0	0	10	10	10	20	650	1,580	10	30

### US 160/ NEW ACCESS

	SOUTHBOUND							WESTBOUND							NORTH	BOUND	)	EASTBOUND						
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		Left		Thru		Rig	<b>sht</b>
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Background									930	549											404	1033		
Pass-By		113				60		49		-109		60		49				92		113		-205		92
Internal Trips			2	8			0	1							1	5								
External Trips	112	235	14	29	154	323	85	194	19	60	103	243	136	248	13	30	90	189	142	335	36	49	113	265
	110	350	20	40	150	380	90	240	950	500	100	300	140	300	10	40	90	280	140	450	440	880	110	360

# Appendix D – Exhibits from November 2013 Open House

















