El Paso County, Colorado
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Conceptual Design Report
Eastonville Road Project

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WILSON &COMPANY

EASTONVILLE ROAD PROJECT CONCEPTUAL DESIGN REPORT

El Paso County Contract Number 17-067-47

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TABLE OF CONTENTS

Appendices

List of Figures

List of Tables

1 – INTRODUCTION

1.1 Purpose and Scope

The Eastonville Road Project corridor is located in the northeastern quadrant of El Paso County (EPC), an area that continues to experience significant development pressures, including near-term development of the area adjacent to the northern portion of the project corridor, between Snaffle Bit Road and the proposed Rex Road.

The purpose of this report is to establish an understanding of deficiencies and improvement needs and develop a framework for making phased improvements in the corridor. To accomplish this, a near-term and long-term baseline analysis was completed for five-year increments through the year 2040. This report documents the analysis process that was used for the existing conditions and identifies long-term improvement needs.

1.2 Background

The Eastonville Road Project includes the corridor between McLaughlin Road and Latigo Boulevard, as shown in **Figure 1.1**. The road currently provides residential access to the eastern side of Falcon, generally paralleling US Highway 24.

To accommodate expedited developer-led improvements in this area, the project corridor has been divided into Phase I and two Phase II segments. Phase I is the section between Snaffle Bit Road and the proposed Rex Road intersection. Phase II is divided between the southern and northern portions of the corridor, from McLaughlin Road to Snaffle Bit Road and from the proposed Rex Road to Latigo Boulevard, respectively.

Phasing was implemented to accommodate pending developer designs and to expedite recommendations, thus avoiding adverse impacts to the development timeline. The entire corridor has been analyzed as a whole in this report.

Existing characteristics of Eastonville Road are as follows:

- Posted Speed Limit: 35-45mph
- Surface Type: Paved (asphalt and chip-seal) from McLaughlin Road to Londonderry Drive and Non-Paved (gravel) from Londonderry Drive to Latigo Boulevard
- Surrounding Land Use: Residential, Parks, School, Vacant
- Drainage: Curb/Gutter (portions of south end) and Open System
- Utilities: Underground and Overhead Utilities

1.3 Study Objectives

The project goal is to verify/confirm the classification of the roadway and determine linear and intersection-specific improvements that should be implemented as a result of the likely increase in traffic volumes due to surrounding development.

Specific recommendations include geometric improvements, anticipated right-of-way identification, and a planning-level cost estimate.

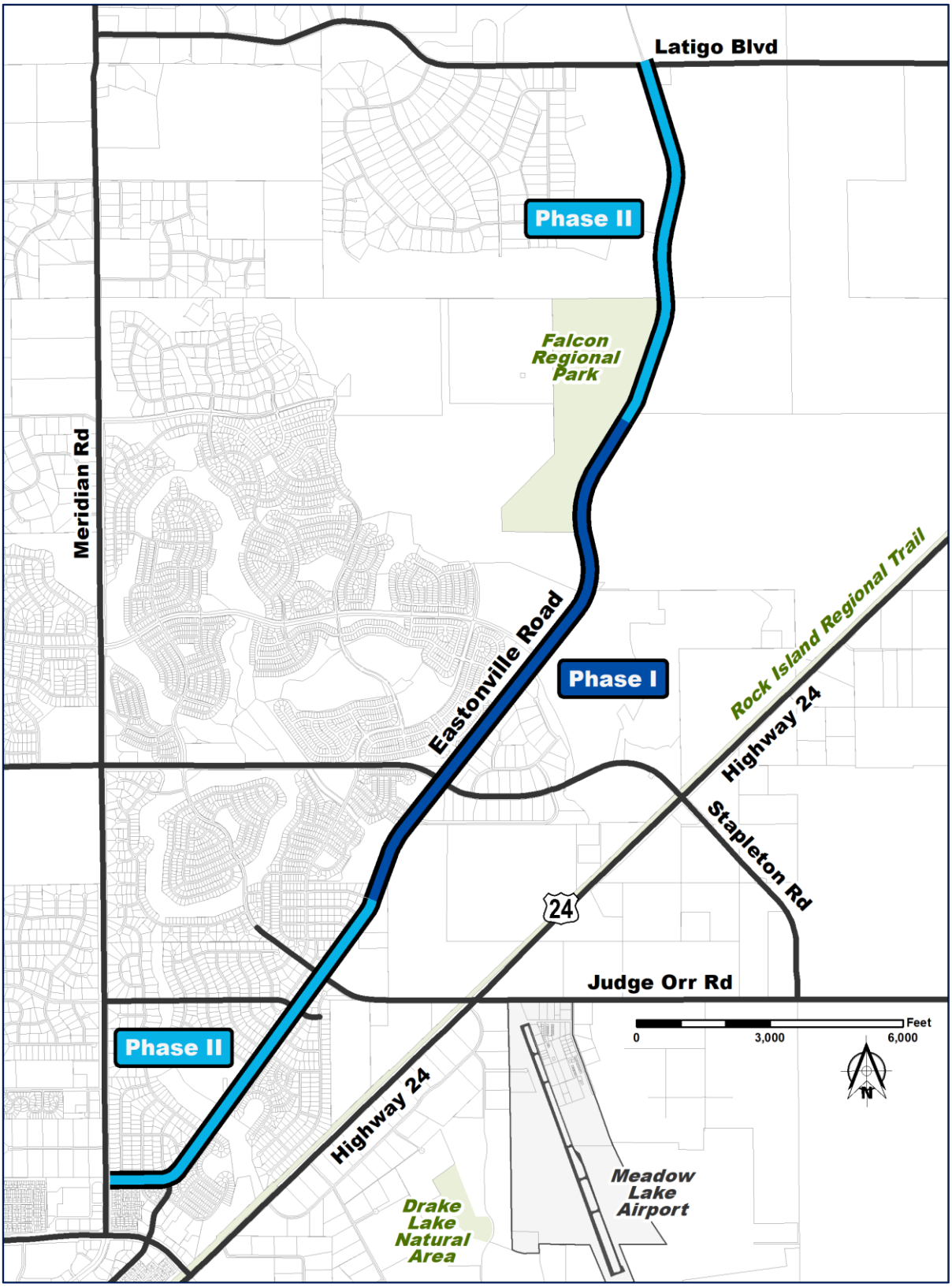

Figure 1.1. Vicinity Map

2 – EXISTING CONDITIONS

The project team conducted an existing condition analysis as a basis to identify corridor deficiencies and improvement needs. The results of the baseline analysis were used together with public and stakeholder input from the public outreach project website (www.eastonvilleroad.com) to identify and confirm corridor issues to be addressed. A full range of improvement alternatives were then developed, evaluated, and iteratively refined to provide the following:

- Improved motorist and pedestrian safety
- Improved roadway alignment and cross sections
- Improved intersection layout and control
- Improved access management
- Improved roadway drainage

2.1 Pavement

The southern half of the corridor is paved (asphalt and chip seal) whereas the northern half is non-paved (gravel). The condition of the existing pavement was not reviewed as part of this study.

2.2 Drainage Facilities

Woodmen Hills Pond #3, located north of Tompkins Road, discharges under Eastonville Road through a 72-inch corrugated metal pipe (CMP). The Bennett Ranch Regional Detention Basin, located between Snaffle Bit Road and Bandanero Road, discharges under Eastonville Road through a 30 x 7-feet (W x H) box culvert. There is a pond southwest of Londonderry Drive and Eastonville Road with two discharge points, both box culverts; the southern one is 15 x 7-feet (W x H) and the northern one is 30 x 7-feet (W x H). Other smaller crossings within the corridor are managed by culverts. There are several ponds within the corridor that cross Eastonville Road in culverts. Analysis of the culverts and capacity was not included in this report.

Concerns have been expressed by the public about the capacity of some of these ponds and outfall facilities. As development occurs along the corridor, both roadway and local drainage items will be reviewed and addressed according to the relevant design standards.

2.3 Bicycles and Pedestrians

The El Paso County (EPC) Major Transportation Corridors Plan (MTCP) designates the Eastonville Road corridor as a proposed primary trail corridor. The Woodmen Hills Trail crosses Eastonville Road at a signalized intersection north of Tompkins Road; no other Eastonville Road pedestrian crossings exist in this corridor. Falcon Regional Park, located north of Londonderry Drive, near the proposed Rex Road intersection, has baseball fields, a trail, and a dog park.

2.4 Functional Classification

The existing corridor alternates between three- and two-lane sections:

- Three lanes from McLaughlin Road to Comeapart Road
- Two lanes from Comeapart Road to Tibbs Road
- Three lanes from Tibbs Road to Snaffle Bit Road
- Two Lanes from Snaffle Bit Road to Latigo Boulevard

The traffic analysis completed as part of the project determined a three-lane section will adequately serve forecast 2040 traffic demands within the Eastonville Road corridor. This is consistent with the EPC 2040 MTCP Update.

The proposed cross-section for this corridor corresponds most closely with EPC's urban nonresidential collector. In addition to the elements of that roadway classification, the Eastonville Road corridor is designated a proposed primary regional trail by the El Paso County Parks and Leisure Services Master Plan, so these trails are incorporated into the proposed section.

2.5 Cross-Section

The proposed Eastonville Road cross-section was derived from the El Paso County Engineering Criteria Manual (ECM) classification of an urban nonresidential collector section that is shown in **Figure 2.1**.

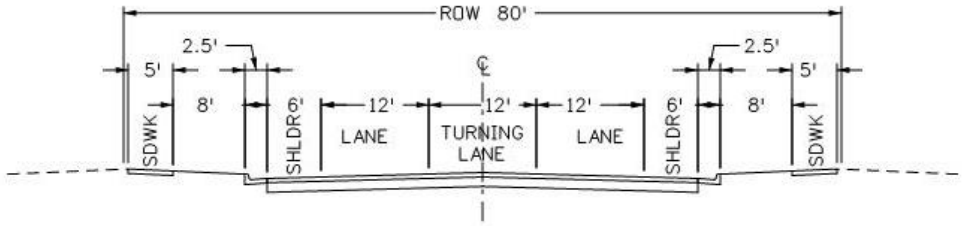

Figure 2.1. El Paso County Typical Cross-Section - Urban Nonresidential Collector

Single-lane through traffic in each direction will be accompanied by a single two-way left-turn lane in the center median. Within this corridor, intersection turn bays will improve traffic flow by eliminating spillback queuing into the through lanes. Additionally, 6' outside shoulders will be incorporated. This proposed Cross Section is shown in **Figure 2.2**, below. An 8-foot detached, meandering sidewalk on both sides of the roadway will be included north of Stapleton Drive to meet the Regional Trail requirements, This will facilitate pedestrian and bicycle travel within the project corridor travel shed and will improve pedestrian and bicycle travel connectivity between Eastonville Road and the trails and bicycle routes that are located adjacent to the corridor.

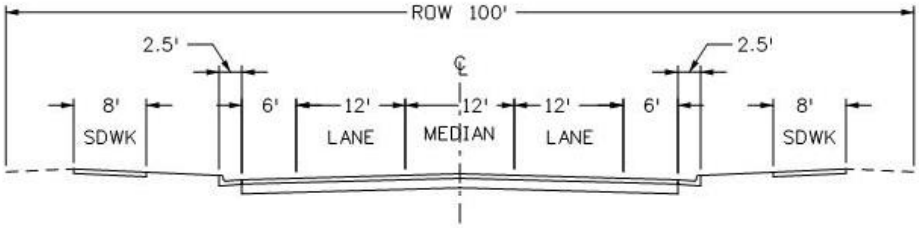

Figure 2.2. Proposed Eastonville Road Cross-Section North of Stapleton Drive

South of Stapleton Drive, a 6-foot detached sidewalk will be included in an 80' ROW to limit additional ROW needs in the developed segment, as shown in **Figure 2.3**.

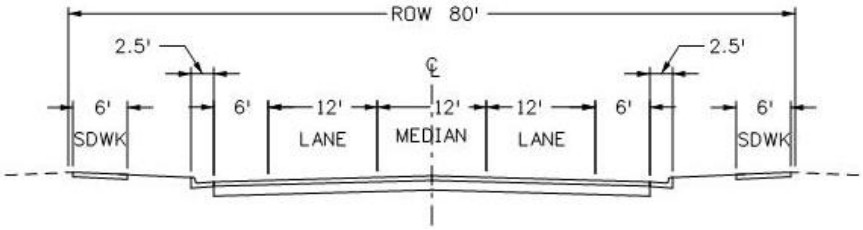

Figure 2.3. Proposed Eastonville Road Cross-Section South of Stapleton Drive

2.6 Intersections

Eastonville Road consistently has one lane in each direction, northbound and southbound. **Table 2.1** outlines the crossings and cross-section of the crossroads, from south to north, within the corridor.

Of note in **Table 2.1** is the approximate distance to the next intersection north. The EPC ECM lists a distance of 660 feet, between accesses on an urban nonresidential collector. However, when intersecting local roadways that distance can be reduced as low as 330 feet. As **Table 2.1** shows, all crossings do meet this modified minimum distance.

Table 2.1. Existing Corridor Intersections

Road	Classification	Cross Street		Eastonville Road	
		Thru Lanes *(each direction)*	Turn Lanes	Turn Lanes	Distance to next Intersection
McLaughlin Road	Local Street	1-12'	12' NB LT	12' TWLTL 12' SB LT	600'
Comeapart Road	Local Street	1-15'	None	12'' NB LT	700'
Tompkins Road	Local Street	1-15'	None	None	900'
Gladwater Road	Local Street	1-14''	None	None	1,000'
Del Rio Road	Local Street	1-19''	None	None	450'
Bohleen Road	Local Street	1-14'	None	None	450''
Tibbs Road	Local Street	1-14'	None	None	700'
Woodmen Hills Drive	Collector	1-18'	None	None	950'
Meridian Ranch Boulevard/ Judge Orr Road	Collector/ Minor Arterial	1-12'	12' EB LT 12' WB LT 12' WB RT	12' NB LT 12' SB LT	850'
Copenhagen Road	Local Street	1-14'	None	12' TWLTL	350'
Tex Tan Road	Local Street	1-14'	None	12' TWLTL	350'
Motley Road	Local Street	1-14'	None	12' TWLTL	500'
Snaffle Bit Road	Local Street	1-14'	None	12'' TWLTL	1,650'
Unnamed Access Drive	Access Drive	1-12'	None	12' TWLTL	450'
Bandanero Road	Local Street	1-12'	12' EB LT	None	450'
Stapleton Drive	Principal Arterial	1-12''	12' EB Accel. 12' WB RT 12 WB Accel.	None	3,550'
Londonderry Drive	Collector	1-12'	12' EB LT	None	14,300'
Latigo Boulevard	Collector	1-12'	None	None	NA

2.6.1 Rex Road Intersection Location

Rex Road terminates at Sunrise Ridge west of Eastonville Road (shown in green in **Figure 2.4**).

The Meridian Ranch development plans to extend Rex Road to intersect with Eastonville Road from the west between Falcon Regional Park and Falcon Dog Park.

The Grandview Reserve Traffic Impact Analysis introduces three Rex Road alignments, with two different intersection locations of east Rex Road, shown in **Figure 2.4**.

- Alignment 1 connects to Eastonville Road approximately 2,500 feet south of the proposed west Rex Road intersection. This southern tie-in location provides eastern communities closer access to the existing Falcon High School and the proposed new middle and elementary school locations.
- Alignment 2 and Alignment 3 connect to Eastonville Road at the same location as the proposed west Rex Road intersection. This option fits the roadway grid in the area and provides connection opportunities between Highway 24 and Eastonville Road at adequate spacing as defined in the EPC ECM. This alignment is consistent with the El Paso County 2060 Corridor Preservation Plan.

The full intersection of Eastonville Road with Rex Road, both eastbound and westbound, as shown in Alignment 2 and Alignment 3, is recommended. Consistent with this recommendation, as of August 2020, the Grandview Reserve sketch plan was approved using Alignment #3.

Figure 2.4. Rex Road Potential Alignments

2.7 Access Management

The number and complexity of access points relate to the safety performance of the roadway. Each access point represents a potential conflict point. Therefore, access should be managed to balance the safety and operating efficiency of the roadway.

The Transportation Research Board (TRB) Access Management Manual identifies the following 10 "Principles of Access Management":

1. Provide a specialized roadway system
2. Limit direct access to major roadways
3. Promote intersection hierarchy
4. Locate signals to favor through movements
5. Preserve the functional area of intersections and interchanges
6. Limit the number of conflict points
7. Separate conflict area
8. Remove turning vehicles from through-traffic lanes
9. Use non-traversable medians to manage left-turn movements
10. Provide a supporting street and circulation system

2.7.1 Right-of-Way and Land Use

The existing right-of-way (ROW) along Eastonville Road is primarily residential, both rural and suburban along with planned unit development. Portions of the ROW along the eastern side of Eastonville Road is zoned agricultural, both the areas between Judge Orr Road and Bandanero Drive and between the proposed Rex Road intersection and Latigo Boulevard. Falcon Regional Park and Falcon Dog Park are on the west side of Eastonville Road, near the proposed Rex Road intersection.

Land use along the corridor is primarily residential with some adjacent parks and schools.

There are several Metro Districts adjacent to the corridor, including 4 Way Ranch Metro District #2, Falcon Regional Transportation Metro District, Latigo Creek Metro District, Meridian Ranch Metro District, Woodmen Hills Metro District, and Woodmen Road Metro District. Mountain View Electric Association has a substation at the southeast corner of Eastonville Road and Latigo Boulevard. All these entities may have utilities along the Eastonville Road corridor, however, an inventory of the utilities was not included in this report.

NuStar Logistics has a pipeline through this corridor that carries either refined products or jet fuel.

Falcon High School from School District 49 is located along Eastonville Road, north of Londonderry Drive. An elementary and middle school are proposed to share the campus with the high school.

2.7.2 Access Control

The EPC ECM recommends access to a collector be spaced at 660' or greater, with an allowance to reduce this spacing to 330' when intersecting with local roads. This has been met for corridor, as discussed above in Section 2.6, "Intersections." With concentrated effort on maintaining access control, the spacing of access can be maintained for the portion of the corridor north of Stapleton Drive.

To preserve the functionality of the corridor as an urban two-lane collector, new access should be more limited as development continues. Limiting access to the corridor will help to satisfy the principles above and contribute to the safety of corridor users.

3 – GEOMETRIC DESIGN

After documenting the existing conditions, the horizontal and vertical alignments and the typical roadway cross-sections were compared to EPC and American Association of State Highway Transportation Officials (AASHTO) design criteria, the roadway cross-section, and functional classification specified by the MTCP.

3.1 El Paso County Design Criteria

Based on existing and proposed adjacent land use and roadway usage, the Eastonville Road corridor was analyzed as an urban non-residential collector section.

3.1.1 Urban Non-residential Collector

The 2040 MTCP lists Eastonville Road as an urban minor arterial, however based on projected capacity needs the corridor will be reclassified as an Urban Non-Residential Collector. The speed limit is posted at 35 miles per hour from Meridian Road to Stapleton Drive and at 45 miles per hour from Stapleton Drive to Latigo Boulevard.

Modified project specific criteria were used for analysis. These modified project specific criteria, shown in **Table 3.1**, are a combination of Urban Non-residential Collector and Urban Minor Arterial standards.

The primary changes between Urban Non-residential collector and the project specific standards are related to ROW and Sidewalk Width. The corridor south of Stapleton drive is mostly developed, and in this section an 80' ROW will be used to reduce new right-of-way requirements. To accommodate this smaller footprint, a 6' detached sidewalk will be included on either side of the roadway. North of Stapleton Drive has yet to be developed, a 100' ROW corridor is recommended here to accommodate an 8' meandering sidewalk per the EPC Parks and Leisure Services plan.

Table 3.1. Project Design Criteria

Criteria	Urban Minor Arterials	Urban Collector Non-Residential	Modified Project Specific
Design Speed / Posted Speed (MPH)	40 / 35	40/35	40/35
Clear Zone	14'	14'	14'
Minimum Centerline Curve Radius	565'	565'	565'
Number of Through Lanes	4	2	2
Lane Width	12''	12'	12'
Right-of-Way	100'	80'	80' minimum South of Stapleton Dr 100' North of Stapleton Dr
Paved Width	60'	48'	48'
Median Width	14''	12'	12'
Outside Shoulder Width (paved/gravel)	n/a	6'	6'
Inside Shoulder Width (paved/gravel)	n/a	n/a	n/a
Required Curb/ Gutter Type	6" vertical	6" Vertical	6" Vertical
Sidewalk Width (at Flow line)	6' detached	5' detached	6' detached (80' ROW) 8' detached (100' ROW)
Design ADT	20,000	20,000	20,000
Design Vehicle	WB-67	WB 50	WB 67
Bike Lanes Permitted	No	No	No
Access Permitted	No[1]	No	No[1]

Table 3.1. Project Design Criteria (Cont.)

Criteria		Urban Minor Arterials	Urban Collector Non-Residential	Modified Project Specific
Access Spacing	Passenger Cars, Pickup Trucks	420	350	350
	Single-Unit Trucks	525	455	455
	Multi-Unit Trucks	700	595	595
Intersection Spacing		¼ mile	660'[2]	¼ mile
Parking Permitted		No	No	No
Minimum Flow Line Grade		0.50%	0.50%	0.50%
Centerline Grade (Min.-Max.)		0.5–6%	0.5-6%[3]	0.5-6%[3]
Intersection Grades (Min.-Max.)		0.5–4%	0.5-4%	0.5-4%

[1]Where no local public or private roadway can provide access, temporary or partial turn movement parcel access may be permitted.
[2]330 feet when right-of-way plus two 5-foot Public Improvements Easements granted to El Paso County.
[3]10% maximum grade permitted at the discretion of the ECM Administrator."
Source: Data from El Paso County, 2016, Tables 2-4, 2-6.

3.1.2 Other Criteria

Additional EPC design criteria address roadway alignment and its relationship to sight distance adequacy. The EPC design criteria are specified for 10 mph increments. These mirror design criteria provided in AASHTO's *A Policy of Geometric Design of Highways and Streets*. The AASHTO values, broken down in 5 mph design speed increments, supplement the EPC criteria and are summarized in **Table 3.2** and **Table 3.3**.

Table 3.2. Design Controls for Stopping Distance and Crest Vertical Curves

Design Speed (mph)	Stopping Sight Distance (feet)	Rate of Vertical Curvature, K-Value	
		Calculated	Design
30	200	18.5	19
35	250	29.0	29
40	305	43.1	44
45	360	60.1	61
50	425	83.7	84
55	495	113.7	114
60	570	150.6	151

Source: Data from AASHTO, 2011.

Table 3.3. Design Controls for Stopping Distance and Sag Vertical Curves

Design Speed (mph)	Stopping Sight Distance (feet)	Rate of Vertical Curvature, K-Value	
		Calculated	Design
30	200	36.4	37
35	250	49.0	49
40	305	63.4	64
45	360	78.1	79
50	425	95.7	96
55	495	114.9	115
60	570	135.7	136

Source: Data from AASHTO, 2011.

3.2 Geometric Analysis

Data from the Open State of Colorado Data Office of Information Technology – Geographic Information Systems (OIT-GIS) was used to construct CAD modeling of the full roadway alignment within the project corridor. This included the development of a digital terrain model (DTM) to represent the existing vertical alignment of the roadway. The adherence of the existing condition to the adopted EPC design criteria was then evaluated.

A review of the existing conditions models found that many areas along the Eastonville Road corridor do not meet EPC design criteria for the posted and/or the designated design speed and roadway

functional classification as designated by the EPC 2040 MTCP. Although areas throughout the corridor exhibit minor variances, there are one notable horizontal curve and nine notable vertical curves, outlined below, that fall short of meeting the EPC design criteria.

3.2.1 Existing Horizontal Alignment

The identified area in which the horizontal curvature is of concern is at the intersection of Eastonville Road and McLaughlin Road. The curve radius is too small to meet the minimum design criteria, which increases the likelihood that a vehicle may lose control while navigating the curve. The specific variance from EPC standards at this location is listed in **Table 3.4**.

Table 3.4. Existing Horizontal Curve Analysis

Horizontal Curve Existing Conditions					
Location of Curve PI	Radius (ft)	Length of Curve (ft)	Posted Speed[1] (mph)	Existing e (%)	Corresponding Design Speed[2] (mph)
113+70.78	515	480	35	4%	35

[1]Design Speed is 5 mph above posted speed.
[2]Design speed is calculated on the assumptions that e_{max} = 4%.

3.2.2 Existing Vertical Alignment

The locations of vertical curves that do not meet criteria for grades are listed in **Table 3.5.** The specific variances for vertical curves that do not meet EPC/AASHTO criteria for stopping sight distance are listed in **Table 3.6**.

The posted speed K-values for vertical curves are not met for any of the listed vertical curves. Graphical representation of the profile of the road is shown in Appendix A. In addition, Corresponding Design Speed values represent the effective design speed under existing conditions. In these cases, the effective design speed is less than or equal to the existing posted speed limit, which reduces the sight distance of drivers traversing these curves.

Table 3.5. Locations of Vertical Grade Deficiencies

Grade at an intersection is not between 0.5% and 4% at the following vertical curve locations:
Centered at Tompkins Road (Curve VPI – 123+07.07)
Centered at Meridian Ranch Boulevard (Curve VPI – 168+42.64)
Centered at a Londonderry Drive (Curve VPI – 258+30.11)
Minimum grade of 0.5% is not met at the following locations:
Between Tompkins Road and Gladwater Road (VPT – 126+57.07, VPC – 129+36.57)
Between Tibbs Road and Woodmen Hills Drive (VPT – 15540.22, VPC – 157+85.76)
Between Meridian Ranch Boulevard and Copenhagen Road (VPT – 170+92.64, VPC – 175+61.81)
Between Snaffle Bit Road and Bandanero Road (VPT – 202+74.42, VPC – 210+61.28)
Between Stapleton Drive and Londonderry Drive (VPT – 223+63.40, VPC – 226+76.25)
Between Stapleton Drive and Londonderry Drive (VPT – 247+18.16, VPC – 256+80.11)
Between Londonderry Drive and Latigo Boulevard (VPT – 277+66.80, VPC – 218+85.99)
Between Londonderry Drive and Latigo Boulevard (VPT – 286+85.99, VPC – 295+99.97)
Between Londonderry Drive and Latigo Boulevard (VPT – 306+81.76, VPC – 308+45.28)
Between Londonderry Drive and Latigo Boulevard (VPT – 328+78.87, VPC – 341+93.93)
Between Londonderry Drive and Latigo Boulevard (VPT – 348+09.66, VPC – 355+20.39)
Between Londonderry Drive and Latigo Boulevard (VPT – 380+78.83, VPC – 382+61.76)
Between Londonderry Drive and Latigo Boulevard (VPT – 358+61.76, VPC – 393+35.92)
Between Londonderry Drive and Latigo Boulevard (VPT – 396+35.92 to END)

Table 3.6. Existing Vertical Curve Analysis

Deficient Stopping Sight Distance on Existing Vertical Curves							
Location of Curve VPI	Type of Curve	SSD (feet)	Length of Curve (feet)	Posted Speed (mph)	Design K Value	Calculated K Value	Corresponding Design Speed (mph)
265+13.96	Crest	407	250	55	151	65.28	45
267+53.08	Sag	214	200	55	136	39.71	30
275+16.80	Crest	539	500	55	151	133.72	55
343+18.93	Sag	291	250	55	136	58.50	35
346+84.66	Crest	324	250	55	151	46.15	40
356+70.39	Sag	345	300	55	136	72.80	40
361+82.44	Crest	232	200	55	151	24.40	30
365+66.21	Sag	237	400	55	136	45.62	30
372+57.61	Crest	303	200	55	151	37.63	35

3.3 Summary of Geometric Deficiencies

As discussed in the existing conditions section, portions of the existing vertical and the existing horizontal alignments do not meet the design criteria for the given speed and roadway classifications. At the same time, much of the corridor is developing such that realignment of the full roadway corridor would create significant impacts to adjacent homes and businesses. Initially, the project team developed a “best fit” alignment for the full corridor that was designed to address adherence to EPC design criteria with consideration given only to physical constraint, including corridor terrain and existing corridor development. However, the “best fit” concept is not a practical alternative because its implementation would require full reconstruction of almost all of the alignment, a circumstance that would: complicate, if not preclude, maintenance of existing traffic, significantly impact adjacent development in terms of right-of-way acquisition, slope easements, and so forth; and cost far more than the benefit to be derived from the improvement. The “best fit” alignment layout exercise was nonetheless valuable, proving a clear understanding of logical limits for essential alignment improvements. Adjustments to refine the geometric deficiencies, particularly in the north portion of the corridor should be considered during final design. Any deviations will require documentation and approval by ECM Administrator per El Paso County Engineering Criteria Manual.

4 – ALTERNATIVES ANALYSIS

The alternative was developed to illustrate the scope of the improvements necessary to address the safety, pavement, traffic, and other performance issues identified in the corridor. It is focused on an engineering solution to provide a long-term asset. While cost and right-of-way are reflected, it is assumed that the improvements may need to be phased to meet available funding.

To balance the need to make alignment improvements with the desire to minimize property impacts, the project team identified select locations where more beneficial alignment modifications could be made to improve the alignment in such a way that the intent of the EPC design criteria would be met and corridor safety would be improved.

4.1 Right-of-Way

The existing right-of-way for Eastonville Road varies from 0 feet to 80 feet, as defined by the GIS parcel lines. With this width of right-of-way, it is not possible to reconstruct the pavement, construct roadway shoulders for safety, grade the ditches, and fill slopes for the road without the limits of construction exceeding the limits of the right-of-way. To accommodate the footprint of the road improvements, right-of-way and easements (both permanent and temporary) will need to be acquired.

4.2 Alternatives

Due to existing terrain, the need to maintain traffic on the existing roadway, and benefit-cost considerations, a total rebuild of the roadway was neither a feasible nor practical alternative. As a result, not all of the EPC design criteria can be met. Instead, a balance was achieved that effectively improves corridor safety and capacity, and the proposed design represents a significant improvement over the existing condition that will be adequate to meet future traffic demand.

Horizontal alignment adjustments were made only within the current unpaved section of the project corridor in which adjacent development was located at some distance from the existing roadway. These adjustments generally resulted in lengthening the curves such that sight distances could be improved, and oftentimes were coupled with complementary vertical curve adjustments. All horizontal curve adjustments are shown in the plan and profile sheets in Appendix A.

The unpaved area between Londonderry Drive and Latigo Boulevard is relatively undeveloped, and this section was selected as the primary focus of vertical curve improvements. Additional minor adjustments are proposed at other locations throughout the corridor, particularly in combination with intersection improvements. All vertical alignment adjustments are shown in the plan and profile sheets in Appendix A.

Meridian Ranch Boulevard/Judge Orr Road at Eastonville Road is currently all-way stop-controlled and will experience increased delays in the future, with increasing difficulty entering heavier Eastonville Road traffic from the side streets. The left turn onto Eastonville Road will be impacted most by increased Eastonville Road traffic volumes. However, the increased delays do not warrant a change to the stop-controlled condition, and it is recommended that all intersection traffic control alternatives include only stop-controlled intersections for the 2040 traffic.

The Stapleton Road intersection (currently only two-way stop controlled), will need to be monitored for conversion to an all-way stop-controlled intersection in the short term and will require additional changes (either a modern roundabout or a traffic signal) in the future. The selection of the ultimate alternative for this intersection should be determined through additional analysis as part of preliminary engineering phases for the corridor.

A signalized intersection was considered at Londonderry Drive. Due to anticipated 2040 traffic, signalization is not warranted; however, adding a dedicated left turn on all Eastonville Road intersection approaches, including on the northbound approach at Londonderry Drive, is recommended.

Dedicated right turn lanes are not warranted anywhere in the corridor except on the Stapleton Road approach to the Eastonville Road/Stapleton Road intersection and both the eastbound and westbound right-turn lanes to the Eastonville Road/Rex Road intersection. Left-turn bays/lanes 100 feet long are adequate except where the existing condition has longer lengths.

5 – COST ESTIMATE

The total project program cost includes an evaluation of the identified costs associated with implementing the typical section and documented design solution identified in this report. The estimate includes appropriate contingencies for this level of design.

ROW, mobilization, and force account provisions were evaluated as a percentage of the major bid item costs that were calculated for the project. Major structures within the project corridor include the reconstruction of three box culverts and one 72-inch CMP.

Utility plans and drainage/ water quality plans are not included as part of this report and were not specifically designed; however, an estimate of relocations is included as a percentage of the major bid items.

Final design, environmental clearance, and construction management were accounted for in the cost estimate as a percentage of the construction subtotal.

Table 5.1. Engineer's Estimate of Probable Costs

Item No.	Item Description	Unit	Unit Cost	Quantity	Cost
202-00240	Remove Asphalt Mat (Planing)	Square Yard	$2.50	154,000	$385,000
203-00060	Embankment Material (CIP)	Cubic Yard	$16.00	61,000	$976,000
304-06000	Aggregate Base Course (CL 6)	Ton	$29.00	93,000	$2,697,000
403-34721	HMA (Gr SX) (75) (PG 58-28)	Ton	$92.00	39,000	$3,588,000
608-00000	Concrete Sidewalk	Square Yard	$50.00	45,000	$2,250,000
609-21020	Curb and Gutter Type 2 II-B	Lin Foot	$35.00	58,000	$2,030,000

NOTES:			
The design upon which this opinion of probable cost was based is highly conceptual. A 20–30% contingency is recommended to cover additional costs.	Major Structures:	LUMP SUM	$1,240,000
	Drainage/Water Quality:	10.00%	$1,193,000
	ITEM COST SUBTOTAL:	**$14, 359,000**	
	Contingency:	***30%***	***$4,308,000***
	ITEM COST WITH CONTINGENCY:	**$18,667,000 (a)**	
	Mobilization:	10.00%	**$1,867,000**
	Utilities:	5.00%	**$933,000**
	Right-of-Way:	5.00%	**$933,000**
	Force Account Provision:	7.00%	**$1,307,000**
	CONSTRUCTION SUBTOTAL:	**$5,040,000 (b)**	
	Engineering and Environmental Fees		
	Design Fee:	10.00%	**$1,867,000**
	Environmental Clearance Fee:	1.00%	**$187,000**
	Construction Engineering:	10.00%	**$1,867,000**
	FEE SUBTOTAL:	**$3,921,000 (c)**	
		d = a+b+c	
	TOTAL PROGRAM COST:	**$27,600,000 (d)**	

Costs highlighted in dark blue are percentages applied to the Item Cost With Contingency (a).

6 – NEXT STEPS

The recommended roadway improvements will bring the full corridor to a uniform standard. Implementation of the proposed design begins with the four steps described below. The immediate near-term steps are presented first in Steps 1–3. Step 4 includes elements necessary for the completion of the final design based on identified priorities.

Step 1: Add an all-way stop control at Stapleton Road.
Conversion to an all-way stop control at Stapleton Road is recommended as the preferred near-term alternative because it can be implemented quickly and cost-effectively. This immediate improvement affords the flexibility to accommodate long-term improvements compatible with yet to be identified long-term improvements to Stapleton Road. The selection of the ultimate alternative (i.e. signalized intersection or a two-lane modern roundabout) will be determined through additional analysis as a part of the preliminary engineering and final design phases (Step 4). Until full AWSC warrants are met, the location should be monitored and reevaluated as needed.

Step 2: Complete Preliminary Design.
The completion of the final design includes the identification of long-term improvements along the entire corridor. Several factors need to be considered during the final design phase, including the following:

- A property acquisition specialist may be needed to provide a more accurate depiction of right-of-way costs.
- Private utility information regarding specific locations was limited, therefore further utility coordination and subsurface utility exploration is required for final design. Every attempt shall be made to coordinate proposed utility and facility installations with existing conditions and other proposed construction activities, such as utility main lines and service lines, including location of existing utilities and a full-scale SUE report, per EPC guidelines.
- The ultimate alternative should be analyzed to: 1) determine whether either a roundabout or signalization at Eastonville Road and Stapleton Road is necessary to replace the near-term all-way stop control in order to accommodate increased traffic flow that results from development and 2) consider the recommended conversion of the McLaughlin Road intersection to a two-lane roundabout.
- Review and analyze regional drainage as development occurs along the corridor. Both roadway and local drainage items will be reviewed and addressed according to the relevant design standards.
- Draft design-bid-build engineering documents, with cost estimates and construction specifications, per the design criteria described in Section 3 of this report. Designers should also reference the proposed cross section differences north and south of Londonderry as noted in Section 2.

Step 3: Acquire right-of-way and begin roadway improvements in Phase 1.
Once the corridor wide design has been completed, the developer in the Phase 1 vicinity can dedicate right-of-way, and design and implement the recommended improvements between Stapleton and Londonderry, conforming to the corridor wide design completed in Step 2.

Step 4: Begin right-of-way acquisition in the rest corridor.
Acquisition of right-of-way for the rest of the corridor should begin early so that implementation of

each phase of the preferred design alternative may be implemented without delay as needed. Areas requiring additional right-of-way are indicated in Appendix A.

Step 5: Implement Phase 2 Design. Ultimately, the entire corridor should have the recommended urban cross section. Due to funding constraints, recommended improvement areas with logical termini include: 1) between Londonderry Road and Rex Road; 2) between Snaffle Bit Road and Londonderry; and 3) between Comeapart Road and Tibbs Road. During final implementation:

- A property acquisition specialist may be needed to provide final coordination with all property acquisition actions.
- Interim improvements to minimize maintenance maybe be needed in advance of full buildout/development needs and will be identified as needs arise.
- Continued private utility coordination and subsurface utility exploration is required for final design. Every attempt shall be made to coordinate final utility and facility installations with existing conditions and other final construction activities, such as utility main lines and service lines, including location of existing utilities and a full-scale final SUE report, per EPC guidelines.
- Finalize drainage plans in coordination of regional drainage requirements as development occurs along the corridor. As before, both roadway and local drainage items will be reviewed and addressed according to the relevant design standards.
- Complete traditional design-bid-build final engineering documents, with cost estimates and construction specifications, per the design criteria described in Section 3 of this report. Designers should also reference the proposed cross section differences north and south of Londonderry as noted in Section 2.

A phased approach to corridor improvements supports implementation of near-term priorities that will result in immediate positive impacts while accommodating desired improvements over the long term.

List of Acronyms and Definitions

AASHTO
American Association of State Highway Traffic Engineers is the federal organization governing high way design. Their guide informs many design recommendations and decisions.

CMP
Corrugated metal pipe is a type of drainage culvert used to convey water under a roadway.

ECM
Engineering Criteria Manual is El Paso County's design guide book containing standards for design.

EPC
El Paso County is the owner of this project.

K-Value
A measure of the curvature of a vertical curve. It is the ratio of the length of the curve to the grade change across the curve (*K=L/A)*. It is useful in determining the minimum lengths of vertical curves for various design speeds.

Lane
A portion of the roadway surface designated for motor vehicle travel, typically in a single direction, that is delineated by pavement marking stripes. Types of lanes include: *through* or *thru lane*s for travel along the length of the roadway, often through intersections; *turn lanes,* which are typically on intersection approaches and provide space for left or right turning motorists; "*bike lane*s, which are designated for bicycle travel in the same direction as the automobile travel, are typically narrower than vehicle lanes, and are usually located along the outside edges of the roadway.

MTCP
El Paso County's Major Transportation Corridors Plan is a long-range plan focusing on the multimodal transportation systems in unincorporated El Paso County.

TRB
Transportation Research Board is one of seven program units of the National Academies of Sciences, Engineering, and Medicine, which provides independent, objective analysis and advice to the nation and conducts other activities to solve complex problems and inform public policy decisions.

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