Horrocks.
5670 GREENWOOD PLAZA BLVD, SUITE 100W
GREENWOOD VILLAGE, COLORADO 80111

ENCORE MASTER TRAFFIC STUDY

JOHNSTOWN, CO

MAY 30, 2023

PROJECT# CO-2866-2012

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Introduction and Executive Summary

PURPOSE OF REPORT AND STUDY OBJECTIVES

The purpose of this Traffic Impact Analysis (TIA) is to identify the traffic impacts for the proposed development located in Johnstown, Colorado. The analysis objectives are as follows: Collaborate with Johnstown Planning to get the changes to the ACP and Approvals, define study intersections, estimate trip generation and distribution for the site before and after development, analyze AM and PM peak hour traffic conditions with and without project traffic in 2041, recommend improvements to mitigate traffic impacts if necessary.

EXISTING LAND USE & STUDY BOUNDARIES

Site Location and Study Area – The Encore at Johnstown development site is located on the northside of US-34 between County Road 3 (High Plains Blvd) and Larimer County Road 1 (Colorado Blvd) (see **Figure 1**). The development is across the street from Ron Grob Co., and Precision Machine Shop. Other major roads near the site include Poplar Street and Kelim Frontage Road.

This study will address the following intersections near the study area.

- US-34 & Colorado Blvd
- US-34 & Project Access
- US-34 & High Plains Blvd

***Proposed Development Use* –** The development will consist of approximately 200,000 sq. ft. of retail space, 464 single-family units. 941 multifamily units, a high school, and 377,000 sq. ft. of general light industrial.

***Surrounding Land Use* –** The existing and proposed land uses in the vicinity of the development site are residential and service businesses.

***Assumptions* –** The study assumptions were developed from the PEL study and input from CDOT staff. The following base assumptions will be used throughout the study:

- Lane configuration
    - 2025 scenario – Existing Lane geometry
    - 2033 scenario – 6 lanes with no interchanges
    - 2041 scenario – 6 lanes with no interchanges
- RIRO removed when interchanges are installed.

CONCLUSIONS AND RECOMMENDATIONS

1. Existing Conditions: - All study intersections operate at an unacceptable LOS. The study intersection with the highest delay is High Plains Blvd and Highway 34 with LOS F and a delay of 159.0 sec/veh in the PM.

   Recommended Mitigations

   - Intersection Highway 34 & Colorado Blvd
     - Modify southbound lane geometry.
       - Shared left-thru with a right to left with shared thru-right.
   - Intersection Highway 34 & High Plains Blvd (old intersection location)
     - CDOT is planning to shift High Plains Blvd east and construct a new interchange for the Highway 34 & N High Plains Blvd intersection to meet existing demands. No recommended mitigations currently
     - CDOT recommends construction High Plains Blvd intersection in the location of the future High Plains Blvd interchange.

   Mitigated analysis shows acceptable LOS, the mitigated intersection with the highest delay is Highway 34 & Colorado Blvd with LOS D and a delay of 50.3 seconds in the AM.

2. 2025 Background Conditions: - Using the CDOT OTIS site and the US34 Planning and Environmental Linkage (PEL) Study, a growth factor of 1.13 was used for Highway 34 and 1.12 for the other roads in the study area. All study intersections operate at an unacceptable LOS. The intersection with the highest delay is intersection Highway 34 & High Plains Blvd with a LOS F and a delay of 191.2 sec/veh in the AM. This scenario includes all previous mitigations.

   Recommended Mitigations:

   - Intersection Highway 34 & Colorado Blvd
     - Add westbound thru lane to have a total of 3 lanes at the intersection.
     - Add eastbound thru lane to have a total of 3 lanes at the intersection.
   - Intersection Highway 34 & High Plains Blvd (old intersection location)
     - CDOT is planning to shift High Plains Blvd east and construct a new interchange for the Highway 34 & N High Plains Blvd intersection to meet existing demands. No recommended mitigations currently
     - CDOT recommends construction of the High Plains Blvd intersection in the location of the future High Plains Blvd interchange.

   Mitigated analysis shows acceptable LOS, the mitigated intersection with the highest delay is Highway 34 & Colorado Blvd with LOS B and a delay of 19.1 sec/veh in the AM.

3. Site development- The proposed development will be completed in three phases. The project phases are estimated to generate the following number of trips.
   - Phase One (2025) – 4,375 new external daily trips with 679 during the AM peak and 394 during the PM peak.
   - Phase Two (2033) – 12,901 new external daily trips with 1,318 during the AM peak and 1,217 during the PM peak.

- Phase Three (2041) – 19,451 new external daily trips with 1,542 during the AM peak and 1,842 during the PM peak.

4. 2025 plus Project Conditions: - All study intersections function at an acceptable LOS except for intersections Highway 34 & Colorado Blvd, Highway 34 & High Plains Blvd (old intersection), and Highway 34 & High Plains Blvd (new intersection). The intersection with the highest delay is Highway 34 & High Plains Blvd (old intersection) with LOS F and a delay of 189.6 sec/veh in the PM. All other study intersections function at acceptable LOS. This scenario includes all previous mitigations.

   Recommended Mitigations:

   - Intersection Highway 34 & Colorado Blvd
     - Modify lane geometry to two (2) northbound lanes north of Highway 34.
   - Intersection Highway 34 & High Plains Blvd (new intersection)
     - CDOT is planning to shift High Plains Blvd east and construct a new interchange for the Highway 34 & N High Plains Blvd intersection to meet existing demands.
     - CDOT recommends construction of High Plains Blvd intersection in the location of the future High Plain Blvd interchange.
     - Add eastbound thru lane to have a total of 3 lanes. The third lane will be an acceleration/deceleration lane in 2025.

   Mitigated analysis shows acceptable LOS, the mitigated intersection with the highest delay is Highway 34 & Colorado Blvd with LOS C and a delay of 29.0 seconds in the AM.

   New Auxiliary lanes – Horrocks completed analysis to determine if auxiliary lanes are required per the Colorado's State Highway Access Code.

   - Intersection Highway 34 & Project Access
     - Deceleration lane on Highway 34 for westbound right-turn
     - Acceleration lane on Highway 34 for southbound right-turn

5. 2033 Background Conditions: - Using the CDOT OTIS site and the PEL study, a growth factor of 1.27 for Highway 34 and 1.24 for other study area roads was used to project 2021 traffic volumes to 2033. All study intersections operate at an acceptable LOS. The study intersection with the highest delay is Highway 34 & Colorado Blvd with LOS D and a delay of 43.4 sec/veh in the AM. This scenario includes all previous mitigations.

6. 2033 Background plus Project Conditions: – All intersections function at an acceptable LOS except study intersections, Highway 34 & Colorado Blvd with LOS F and a delay of 90.6 sec/veh in the AM. This scenario includes all previous mitigations.

   Recommended Mitigations:

   - Intersection Highway 34 & Colorado Blvd
     - Add second eastbound left-turn lane.
     - Add second southbound left-turn lane.

   Mitigated analysis shows acceptable LOS, the mitigated intersection with the highest delay is Highway 34 & Colorado Blvd with a delay of 37.8 sec/veh in the PM.

   New Auxiliary lanes – Horrocks completed analysis to determine if auxiliary lanes are required per the Colorado's State Highway Access Code.

- Intersection Highway 34 & High Plains Blvd
    - Acceleration lane on Highway 34 for northbound right-turn (to be implemented when the southern portion or High Plains Blvd is relocated to the new intersection location).
    - Acceleration lane on Highway 34 for southbound right-turn.
    - Deceleration lane on Highway 34 for westbound right-turn.

7. 2041 Background Condition: - Using the CDOT OTIS site and the US34 Planning and Environmental Linkage (PEL) Study, a growth factor of 1.61 was used for Highway 34 and 1.55 for the other roads in the study area. All study intersections operate at an unacceptable LOS. The intersection with the highest delay is Highway 34 & Colorado Blvd, with a LOS F and a delay of 123.1 sec/veh in the AM. All other study intersections function at acceptable LOS. This scenario includes all previous mitigations.

   Recommended Mitigations:
   - Intersection Highway 34 & Colorado Blvd
       - Install interchange.
   - Intersection Highway 34 & High Plains Blvd
       - Install interchange.

   Recommended Outside Base Assumptions Mitigations:
   - Intersection Highway 34 & Colorado Blvd
       - Add eastbound thru lane to have a total of 4 lanes at the intersection.
       - Add westbound thru lane to have a total of 4 lanes at the intersection.
   - Intersection Highway 34 & High Plains Blvd
       - Add eastbound thru lane to have a total of 4 lanes at the intersection.

   The outside base assumptions mitigated analysis shows acceptable LOS, the intersection with the highest delay is Highway 34 & High Plains Blvd (new intersection) with LOS C and a delay of 25.7 seconds in the PM.

8. 2041 Background plus Project Conditions: – All intersections function at an acceptable LOS except study intersections Highway 34 & Colorado Blvd, and Highway 34 & High Plains Blvd (new intersection). The intersection with the highest delay is Highway 34 & High Plains Blvd with LOS F and a delay of 193.8 sec/veh in the PM. This scenario includes all previous mitigations.

   Recommended Mitigations:
   - Intersection Highway 34 & Colorado Blvd
       - Install interchanges.
   - Intersection Highway 34 & Project Access (RIRO)
       - Install interchanges.

   Recommended Outside Base Assumptions Mitigations:
   - Intersection Highway 34 & Colorado Blvd
       - Add westbound thru lanes to have a total of 5 lanes.
       - Add eastbound thru lane to have a total of 4 lanes.
   - Intersection Highway 34 & High Plains Blvd (new intersection)
       - Add two westbound thru lanes to have a total of 5 lanes.
       - Add eastbound thru lane to have a total of 4 lanes.

The outside base assumptions mitigated analysis shows acceptable LOS, the intersection with the highest delay is Highway 34 & High Plains Blvd with LOS C and a delay of 32.9 sec/veh in the AM.

9. Safety History – There was a total of 367 crashes on Highway 34 between mile markers 97 and 100 from 2015 and 2020. The types of crashes are as follows:

    - Four Fatal crashes
    - 120 Serious/injury crashes
    - 243 Property damage only crashes

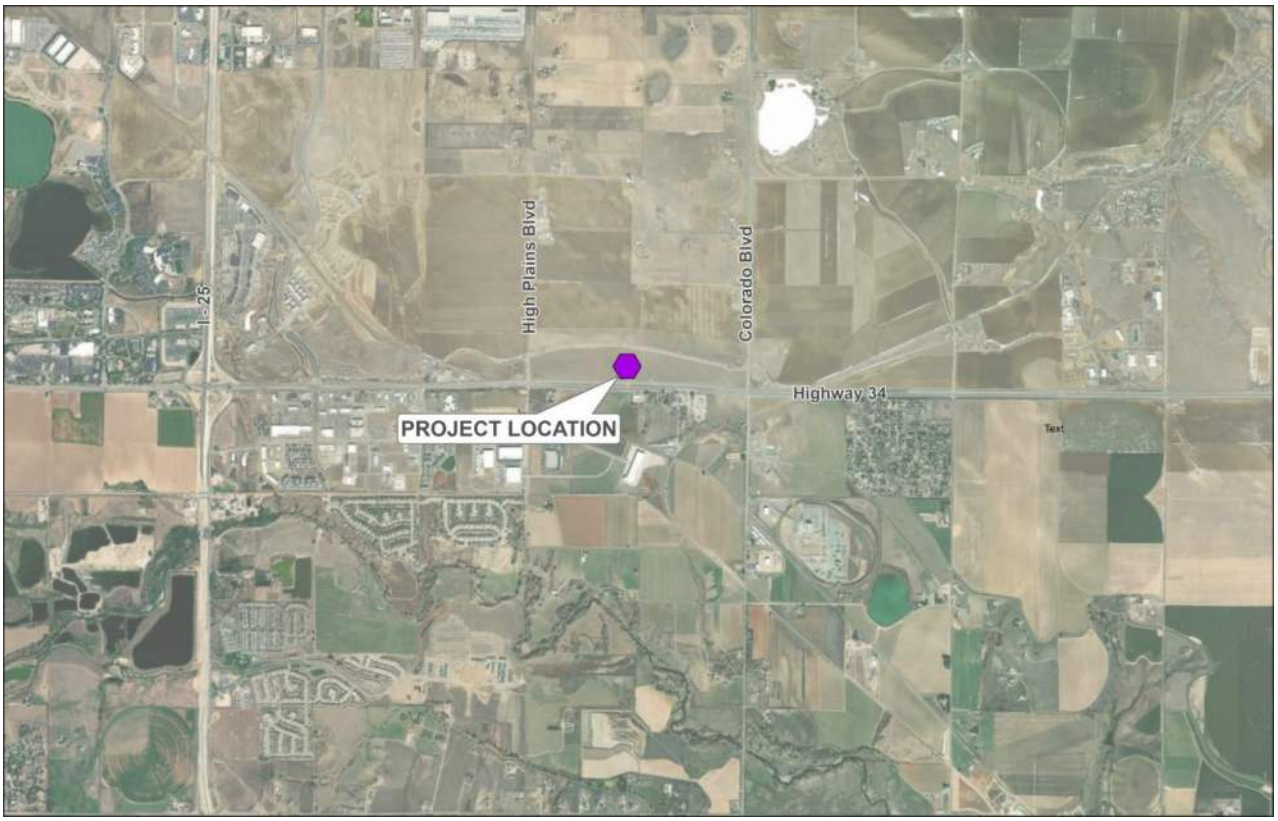
    The installation of a signal will increase rear-end crashes but decrease angle crashes. In the urban scenario, there's no statistical significance that overall, the number of crashes will change. However, in a rural setting there is confidence that total crashes will decrease approximately 44%.

Proposed Development

SITE LOCATION

The site for the Encore at Johnstown development is located located on the north side of US-34 in between High Plains Blvd and Colorado Blvd (see **Figure 1**).

Figure 1: Project Location



SITE PLAN AND PREFERRED ACCESS

The site will have four accesses, one on Highway 34, two on High Plains Blvd, and two on Colorado Blvd. The Highway 34 & Project Access is a right in/right out access intersection, the other accesses are roundabouts, as shown in **Figure 2**.

Figure 2: Site Plan

Study Area Conditions

STUDY AREA

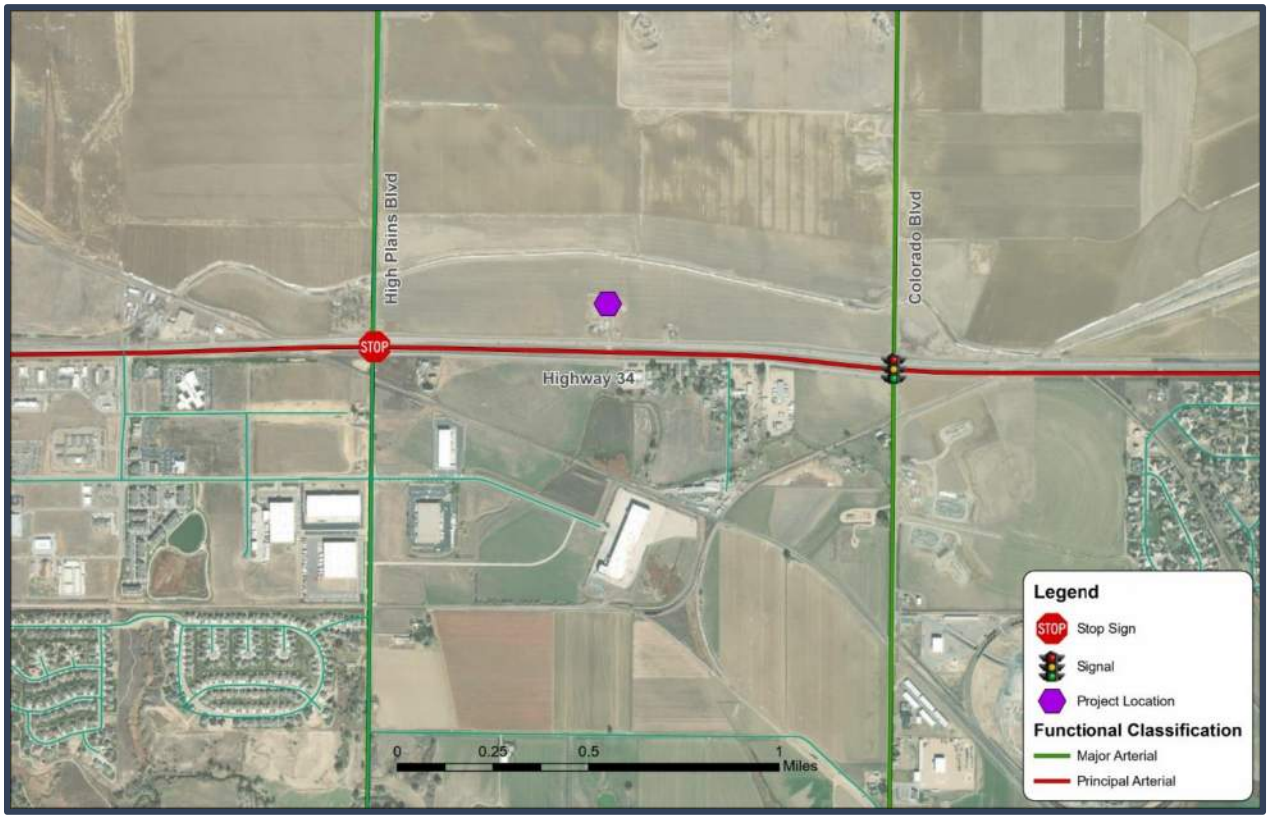
The major streets potentially impacted by the Encore development are Highway 34, High Plains Blvd, and Colorado Blvd. The functional classification map, seen in **Figure 3**, shows the functional classification of roadways and stop-control devices of the intersections surrounding the project area. The speed limits listed in the description are the currently posted speed limits.

Highway 34: An east/west running road classified as a principal arterial (State Highway Code – NR-A) with a speed limit of 65 mph, this Principal arterial is a four-lane roadway with two dedicated thru lanes for each direction separated by a median.

County Road 3 (High Plains Blvd): A north/south running road classified as a major arterial (State Highway Code – NR-B) with a speed limit of 50 mph, this major arterial is a two-lane roadway with a single dedicated thru lane for each direction separated by a double yellow line.

County Road 1 (Colorado Blvd): north/south running road classified as a major arterial (State Highway Code – NR-B) with a speed limit of 50 mph, this major arterial is a two-lane roadway with a single dedicated thru lane for each direction separated by a double yellow line.

Figure 3: Roadway Classification Map



Project Traffic Volumes

Project traffic volumes were estimated and distributed using the industry-standard trip generation literature and using existing traffic counts and engineering judgment to distribute project traffic to the existing road network.

TRIP GENERATION

The trip generation was estimated using the *ITE Trip Generation Manual 10th Edition*. The following land use was used:

- *Single-Family Detached Housing (ITE 210)* – Single-family detached housing includes all single-family detached homes on individual lots. A typical site surveyed is a suburban subdivision.
- *Multifamily Housing (Mid-Rise) (ITE 221)* – Mid-rise multifamily housing includes apartments, townhouses, and condominiums located within the same building with at least three other dwelling units and that have three and 10 levels (floors). Multifamily housing (low-rise) (Land Use 220), multifamily housing high-rise (land Use 222), off-campus student apartment (Land Use 225), and mid-rise residential with 1st floor commercial (Land Use 231) are related land uses.
- *High School* (ITE 530) – A high school serves students who have completed middle or junior high school. Both public and private schools are included in this land use. Elementary school (Land Use 520), middle school/junior high school (Land Use 522), private school (K-8) (Land Use 534), private school (K-12) (Land Use 536), and charter elementary school (Land Use 537) are related uses.
- *Shopping Center (ITE 820)* – A shopping center is an integrated group of commercial establishments that is planned, developed, owned, and managed as a unit. A shopping center's composition is related to its market area in terms of size, location, and type of store. A shopping center also provides on-site parking facilities sufficient to serve its own parking demands. Factory outlet center (Land Use 823) is a related use.
- *General Light Industrial (ITE 110)* – A light industrial facility is a free-standing facility devoted to a single use. The facility has an emphasis on activities other than manufacturing and typically has minimal office space. Typical light industrial activities include painting material testing and assembly of data processing equipment. Industrial Park (Land Use 130) and manufacturing (Land Use 140) are related uses.

Based on the ITE methodology, the development within the study area is estimated to generate approximately 19,451 new external trips, with 1,542 trips and 1,842 trips occurring during the AM peak and PM peak hours, respectively. Copies of the ITE Trip Generation 10th Edition land use descriptions and rates used in this project are in the APPENDIX.

BASE ASSUMPTIONS FOR US-34

The study assumptions were developed from the PEL study and input from CDOT staff. The following base assumptions will be used throughout the study:

- Lane configuration
  - 2025 scenario – Existing Lane geometry
  - 2033 scenario – 6 lanes with no interchanges
  - 2041 scenario – 6 lanes with no interchanges
- RIRO removed when interchanges are installed.
- As the project continues to develop and signal improvements are needed, the developer will coordinate with CDOT and the City on signal coordination and signal maintenance responsibilities.

PROJECT PHASING

The project will be divided into three phases, 2025, 2033, and 2041, every phase will include a combination of the land uses explained in the previous section. The following is the amount of development to be completed for each scenario:

- 2025 Scenario
  - 285 multifamily homes
  - 800 student high school
  - Approximately 15,000 Sq. Ft. of retail/mixed use space
  - Approximately 200,000 Sq. Ft. of general light industrial

See **Figure 5** for development locations and **Table 1** for the summary of calculated trip generation for the 2025 phase of the project.

- 2033 Scenario
  - 464 single family homes
  - 656 multifamily homes
  - Approximately 23,000 Sq. Ft. of retail/mixed use space
  - Approximately 66,000 Sq. Ft. of general light industrial

See **Figure 6** for development locations and **Table 2** for the summary of calculated trip generation for the 2033 phase of the project.

- 2041 Scenario
  - Approximately 162,000 Sq. Ft. of retail/mixed use space
  - Approximately 111,000 Sq. Ft. of general light industrial

See **Figure 7** for development locations and **Table 3** for the summary of calculated trip generation for the 2041 phase of the project.

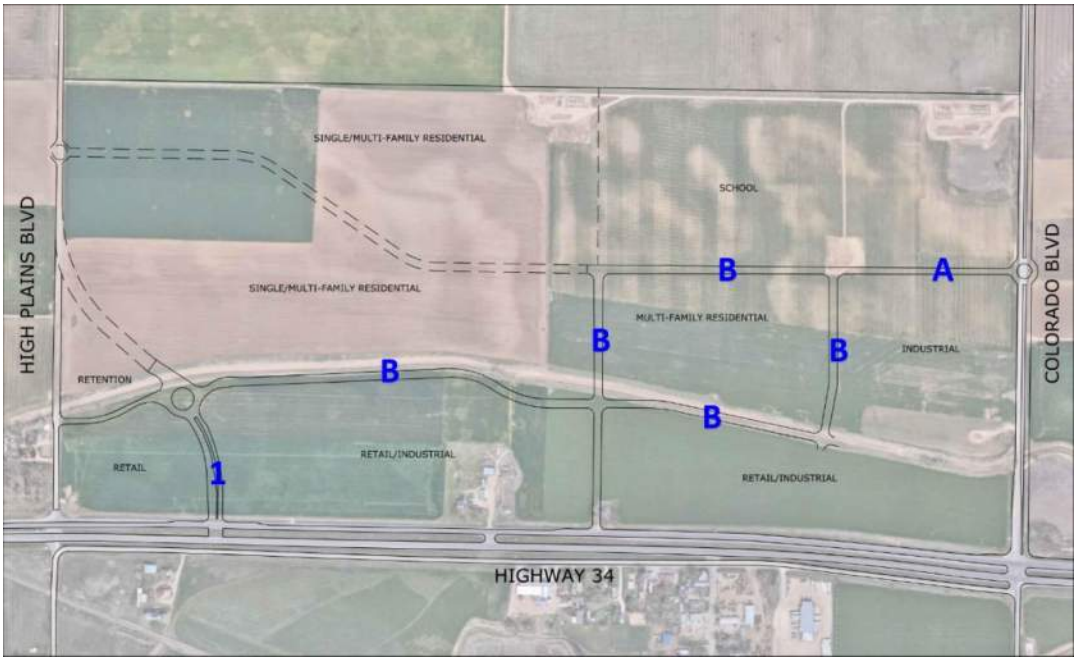
HIGHWAY 34

In the Johnstown Transportation Master Plan (TMP). Highway 34 will have a significant increase in traffic volume in the future. These future forecasted volumes will exceed the roadway capacity as designed in Johnstown TMP. For this study, the designation of Highway 34 is an expressway; it will have six thru lanes with auxiliary lanes at intersections as cited in the Johnstown TMP. For this study, Horrocks will analyze Highway 34 as a principal arterial in all scenarios. The PEL study recommends a planned future interchange east of the existing Highway 34 & High Plains Blvd intersection to accommodate the forecasted volumes. The developer will construct the northern section of the intersection at the location of the future highway interchange when building the project, as shown in **Figure 14.**

RECOMMENDED NUMBER OF TRAVEL LANES ON-SITE

Horrocks reviewed the total daily traffic based in the trip generation and trip distribution used in this report to determine the recommended number of travel lanes for the interior roadway on-site. **Figure 4** includes four recommended cross-sections and locations to provide adequate traffic flow for each roadway on-site.

Figure 4: Recommended Number of Travel Lanes



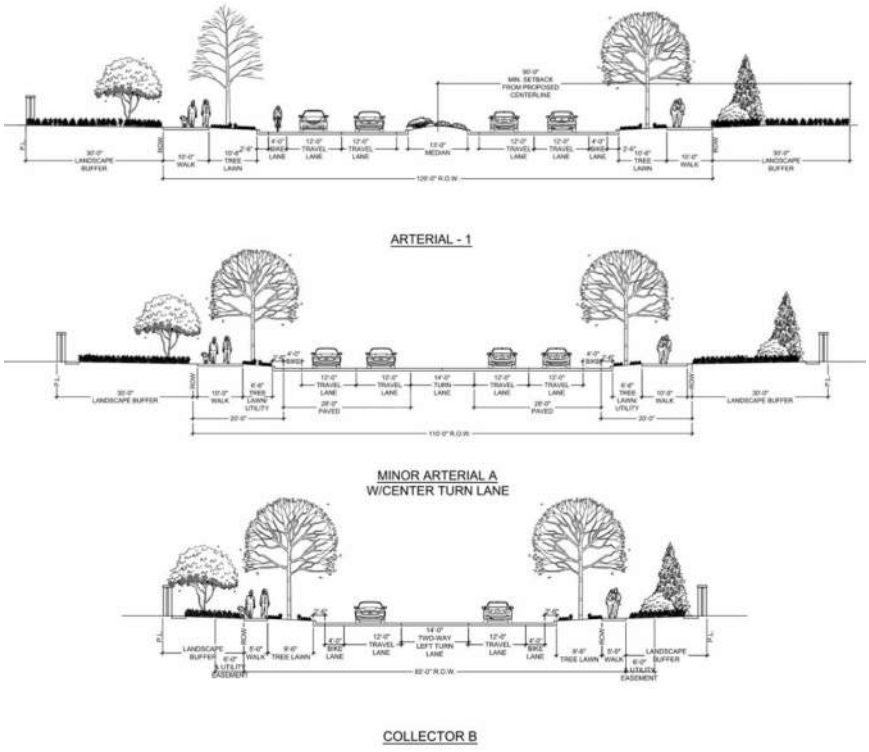
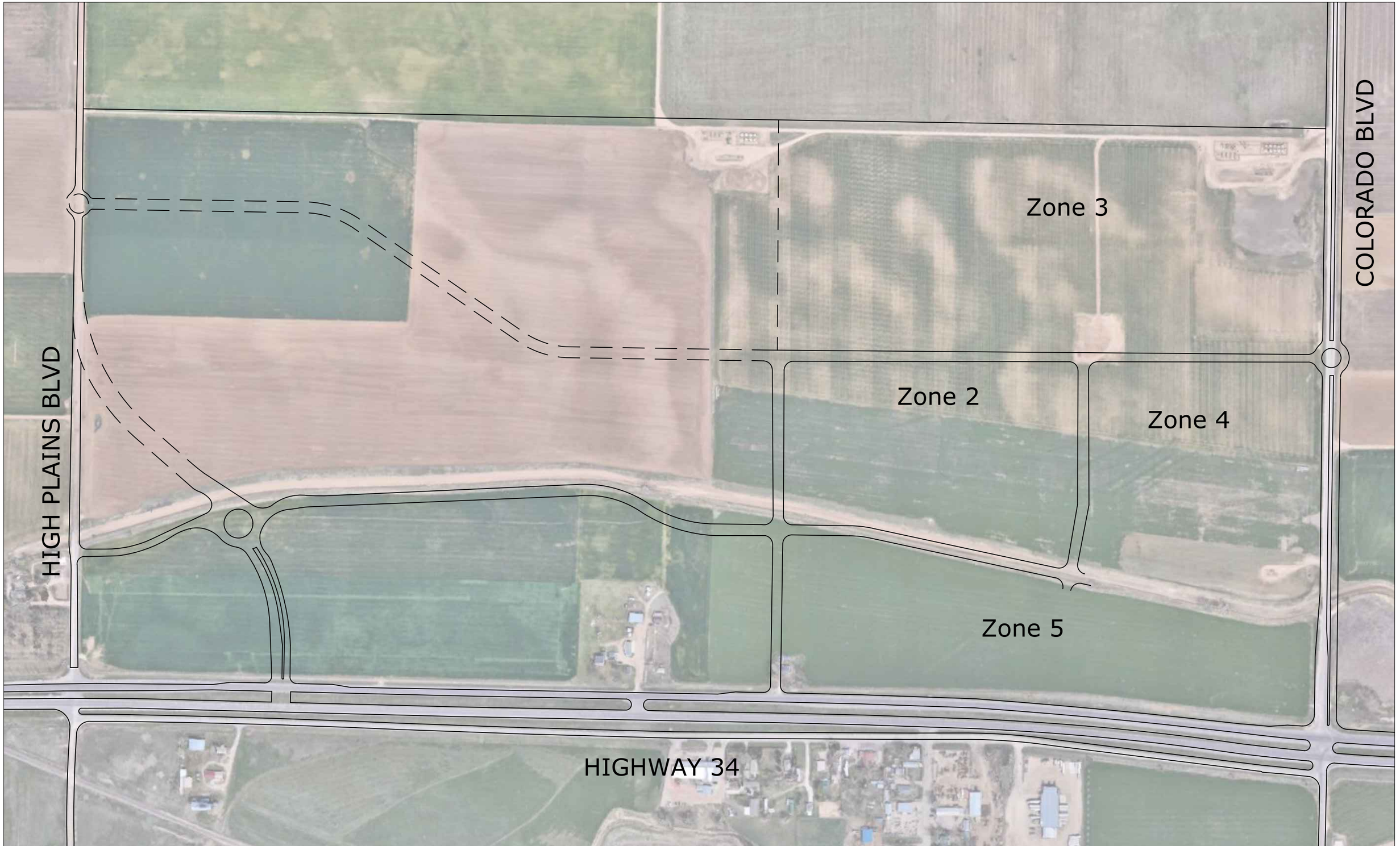


Table 1: ITE Trip Generation – Opening Day

Encore at Johnstown - Opening Day												
			Daily			AM Peak Hour			PM Peak Hour			
Zone 2 *63% Buildout*	Variable	Quantity	Total	In	Out	Total	In	Out	Total	In	Out	
	Multifamily Housing (Mid-Rise) (ITE 221)		**4.54**	50%	50%	**0.37**	23%	77%	**0.39**	61%	39%	
	Dwelling Units	285	1,294	647	647	105	24	81	111	68	43	
	Total New Trips		**1,294**	**647**	**647**	**105**	**24**	**81**	**111**	**68**	**43**	
Zone 3 *100% Buildout*	Variable	Quantity	Daily			AM Peak Hour			PM Peak Hour			
			Total	In	Out	Total	In	Out	Total	In	Out	
	High School (ITE 530)		**1.94**	50%	50%	**0.52**	68%	32%	**0.14**	48%	52%	
	Students	800	1,552	776	776	416	283	133	112	54	58	
	Total New Trips		**1,552**	**776**	**776**	**416**	**283**	**133**	**112**	**54**	**58**	
Zone 4 *100% Buildout*	Variable	Quantity	Daily			AM Peak Hour			PM Peak Hour			
			Total	In	Out	Total	In	Out	Total	In	Out	
	General Light Industrial (ITE 110)		**4.87**	50%	50%	**0.74**	88%	12%	**0.65**	14%	86%	
	1000 Sq. Ft. GFA	114	555	278	278	84	74	10	74	10	64	
	Total New Trips		**555**	**278**	**278**	**84**	**74**	**10**	**74**	**10**	**64**	
Zone 5 *56% Buildout*	Variable	Quantity	Daily			AM Peak Hour			PM Peak Hour			
			Total	In	Out	Total	In	Out	Total	In	Out	
	General Light Industrial (ITE 110)		**4.87**	50%	50%	**0.74**	88%	12%	**0.65**	14%	86%	
	1000 Sq. Ft. GFA	86	419	209	209	64	56	8	**56**	8	48	
	Shopping Center (ITE 820)		**37.01**	50%	50%	**0.84**	62%	38%	**3.40**	48%	52%	
	1000 Sq. Ft. GFA	15	555	278	278	13	8	5	51	24	27	
	Internal Capture						2	1		2	7	
	Total New Trips		**974**	**487**	**487**	**74**	**62**	**12**	**97**	**30**	**68**	
Total Phase 1 Trips			**4,375**	**2,187**	**2.188**	**679**	**443**	**236**	**394**	**162**	**233**	



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5670 GREENWOOD PLAZA BLVD.
SUITE 100W
GREENWOOD VILLAGE, CO 80111

ENCORE AT JOHNSTOWN
OPENING DAY BUILDING PLAN

FIGURE 5

SCALE:
N/A

DATE:
6/2023

Table 2: ITE Trip Generation – 2033

Encore at Johnstown - 2033												
	Variable	Quantity	Daily			AM Peak Hour			PM Peak Hour		
			Total	In	Out	Total	In	Out	Total	In	Out
Zone 1 *100% Buildout*	**Single-Family Detached Housing (ITE 210)**		**9.43**	50%	50%	**0.70**	26%	74%	**0.94**	63%	37%
	Dwelling Units	464	4,374	2,187	2,187	325	84	240	436	275	161
	Multifamily Housing (Mid-Rise) (ITE 221)		**4.54**	50%	50%	**0.37**	23%	77%	**0.39**	61%	39%
	Dwelling Units	491	2,230	1,115	1,115	182	42	140	192	117	75
	Internal Capture							4		27	9
	Total New Trips		**6,604**	**3,302**	**3,302**	**506**	**124**	**376**	**628**	**364**	**227**
Zone 2 *100% Buildout*	Variable	Quantity	Daily			AM Peak Hour			PM Peak Hour		
			Total	In	Out	Total	In	Out	Total	In	Out
	Multifamily Housing (Mid-Rise) (ITE 221)		**4.54**	50%	50%	**0.37**	23%	77%	**0.39**	61%	39%
	Dwelling Units	450	2,043	1,022	1,022	167	38	128	176	107	68
	Total New Trips		**2,043**	**1,022**	**1,022**	**167**	**38**	**128**	**176**	**107**	**68**
Zone 3 100% Buildout	Variable	Quantity	Daily			AM Peak Hour			PM Peak Hour		
			Total	In	Out	Total	In	Out	Total	In	Out
	High School (ITE 530)		**1.94**	50%	50%	**0.52**	68%	32%	**0.14**	48%	52%
	Students	800	1,552	776	776	416	283	133	112	54	58
	Total New Trips		**1,552**	**776**	**776**	**416**	**283**	**133**	**112**	**54**	**58**
Zone 4 *100% Buildout*	Variable	Quantity	Daily			AM Peak Hour			PM Peak Hour		
			Total	In	Out	Total	In	Out	Total	In	Out
	General Industrial (ITE 110)		**4.87**	50%	50%	**0.74**	88%	12%	**0.65**	14%	86%
	1000 Sq. Ft. GFA	114	555	278	278	84	74	10	74	10	64
	Total New Trips		**555**	**278**	**278**	**84**	**74**	**10**	**74**	**10**	**64**
Zone 5 *100% Buildout*	Variable	Quantity	Daily			AM Peak Hour			PM Peak Hour		
			Total	In	Out	Total	In	Out	Total	In	Out
	General Industrial (ITE 110)		**4.87**	50%	50%	**0.74**	88%	12%	**0.65**	14%	86%
	1000 Sq. Ft. GFA	152	740	370	370	112	99	13	99	14	85
	Shopping Center (ITE 820)		**37.01**	50%	50%	**0.84**	62%	38%	**3.40**	48%	52%
	1000 Sq. Ft. GFA	38	1,406	703	703	32	20	12	129	62	67
	Internal Capture						3	2		8	9
	Total New Trips		**2,147**	**1,073**	**1,073**	**144**	**116**	**24**	**228**	**68**	**143**
Total Phase 2 Trips			**12,901**	**6,450**	**6,450**	**1,318**	**635**	**671**	**1,217**	**596**	**558**

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ENCORE AT JOHNSTOWN

2033 BUILDING PLAN

FIGURE 6

SCALE:
N/A

DATE:
06/2023

Table 3: ITE Trip Generation – 2041

Encore at Johnstown - 2033												
	Variable	Quantity	Daily			AM Peak Hour			PM Peak Hour		
			Total	In	Out	Total	In	Out	Total	In	Out
Zone 1 *100% Buildout*	**Single-Family Detached Housing (ITE 210)**		**9.43**	50%	50%	**0.70**	26%	74%	**0.94**	63%	37%
	Dwelling Units	464	4,374	2,187	2,187	325	84	240	436	275	161
	Multifamily Housing (Mid-Rise) (ITE 221)		**4.54**	50%	50%	**0.37**	23%	77%	**0.39**	61%	39%
	Dwelling Units	491	2,230	1,115	1,115	182	42	140	192	117	75
	Internal Capture						3	4		86	31
	Total New Trips		**6,604**	**3,302**	**3,302**	**506**	**124**	**376**	**628**	**305**	**205**
Zone 2 *100% Buildout*	Variable	Quantity	Daily			AM Peak Hour			PM Peak Hour		
			Total	In	Out	Total	In	Out	Total	In	Out
	Multifamily Housing (Mid-Rise) (ITE 221)		**4.54**	50%	50%	**0.37**	23%	77%	**0.39**	61%	39%
	Dwelling Units	450	2,043	1,022	1,022	167	38	128	176	107	68
	Internal Capture						1	1		24	9
	Total New Trips		**2,043**	**1,022**	**1,022**	**167**	**38**	**127**	**176**	**84**	**60**
Zone 3 *100% Buildout*	Variable	Quantity	Daily			AM Peak Hour			PM Peak Hour		
			Total	In	Out	Total	In	Out	Total	In	Out
	High School (ITE 530)		**1.94**	50%	50%	**0.52**	68%	32%	**0.14**	48%	52%
	Students	800	1,552	776	776	416	283	133	112	54	58
	Total New Trips		**1,552**	**776**	**776**	**416**	**283**	**133**	**112**	**54**	**58**
Zone 4 *100% Buildout*	Variable	Quantity	Daily			AM Peak Hour			PM Peak Hour		
			Total	In	Out	Total	In	Out	Total	In	Out
	General Industrial (ITE 110)		**4.87**	50%	50%	**0.74**	88%	12%	**0.65**	14%	86%
	1000 Sq. Ft. GFA	114	555	278	278	84	74	10	74	10	64
	Total New Trips		**555**	**278**	**278**	**84**	**74**	**10**	**74**	**10**	**64**
Zone 5 *100% Buildout*	Variable	Quantity	Daily			AM Peak Hour			PM Peak Hour		
			Total	In	Out	Total	In	Out	Total	In	Out
	General Industrial (ITE 110)		**4.87**	50%	50%	**0.74**	88%	12%	**0.65**	14%	86%
	1000 Sq. Ft. GFA	152	740	370	370	112	99	13	99	14	85
	Shopping Center (ITE 820)		**37.01**	50%	50%	**0.84**	62%	38%	**3.40**	48%	52%
	1000 Sq. Ft. GFA	38	1,406	703	703	32	20	12	129	62	67
	Internal Capture						1	0		6	17
	Total New Trips		**2,147**	**1,073**	**1,073**	**144**	**118**	**25**	**228**	**70**	**135**
Zone 6 *100% Buildout*	Variable	Quantity	Daily			AM Peak Hour			PM Peak Hour		
			Total	In	Out	Total	In	Out	Total	In	Out
	General Industrial (ITE 110)		**4.87**	50%	50%	**0.74**	88%	12%	**0.65**	14%	86%
	1000 Sq. Ft. GFA	111	542	271	271	82	73	10	72	10	62
	Shopping Center (ITE 820)		**37.01**	50%	50%	**0.94**	62%	38%	**3.40**	48%	52%
	1000 Sq. Ft. GFA	111	4,121	2,060	2,061	94	58	36	379	182	197
	Internal Capture						2	1		18	51
	Total New Trips		**4,663**	**2,331**	**2,332**	**176**	**128**	**44**	**451**	**174**	**208**
Zone 7 *100% Buildout*	Variable	Quantity	Daily			AM Peak Hour			PM Peak Hour		
			Total	In	Out	Total	In	Out	Total	In	Out
	Shopping Center (ITE 820)		**37.01**	50%	50%	**0.84**	62%	38%	**3.40**	48%	52%
	1000 Sq. Ft. GFA	51	1,888	944	944	48	30	18	173	83	90
	Internal Capture						**6**	**3**		**15**	**25**
	Total New Trips		**1,888**	**944**	**944**	**48**	**24**	**15**	**173**	**68**	**65**
Total Phase 3 Trips			**19,451**	**9,725**	**9,726**	**1,542**	**793**	**733**	**1,842**	**771**	**796**

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2041 BUILDING PLAN

FIGURE 7

SCALE:
N/A

DATE:
06/2023

TRIP DISTRIBUTION

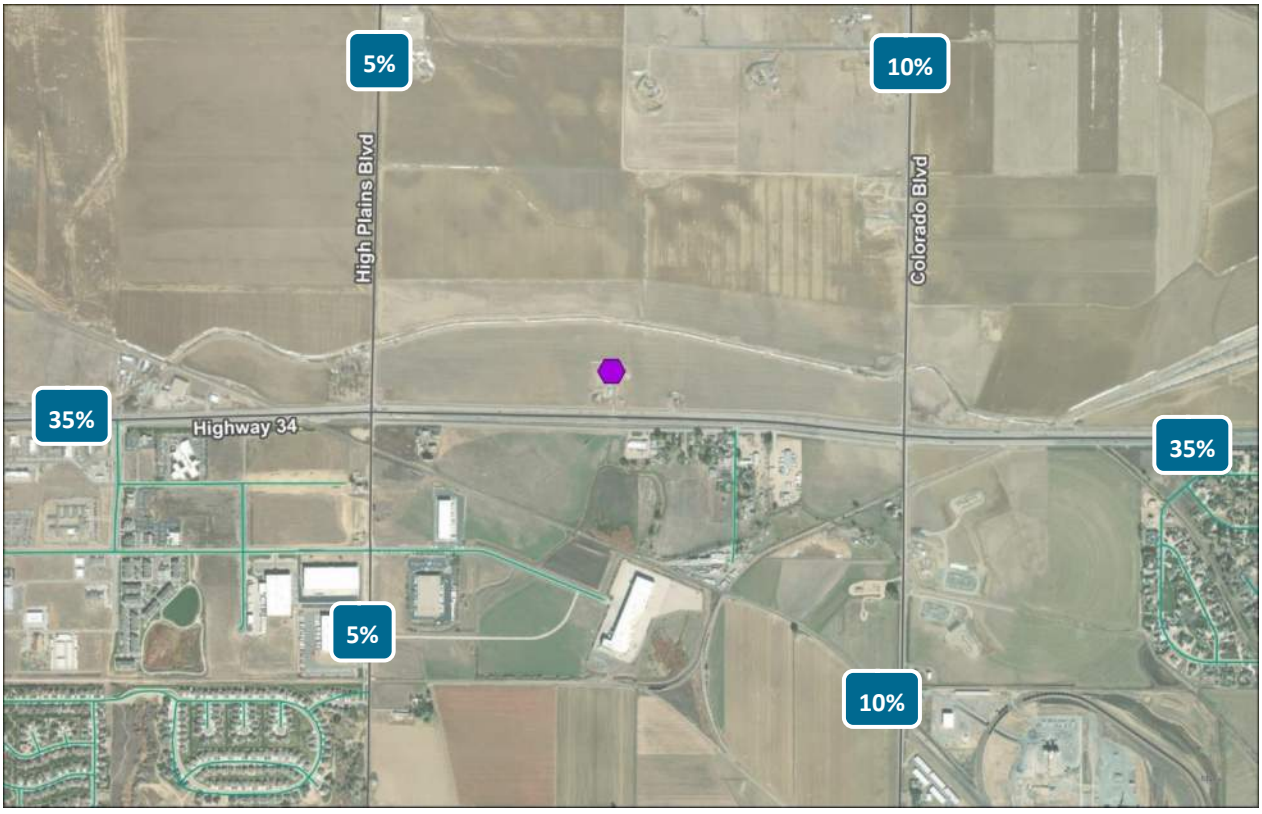
The estimated new trips from the proposed development were distributed onto the roadway network based on the proposed site access locations, existing turning movements, traffic patterns, and proximity to major roadways, as shown in **Figure 8**.

This distribution was based on an origin/destination approach. Horrocks traffic counts at the study intersections was used to determine the existing trip distribution. Using the count data to distribute project trips to and from the project access.

- 45% to/from eastbound on Highway 34
  - 5% to/from southbound High Plains Blvd
  - 5% to/from northbound High Plains Blvd
  - 35% to/from Highway 34 west of High Plains Blvd
- 55% to/from westbound on Highway 34
  - 10% to/from southbound Colorado Blvd
  - 10% to/from northbound Colorado Blvd
  - 35% to/from Highway 34 east of Colorado Blvd

Horrocks assumed that all trips will be made by non-transit vehicles so modal split was not necessary.

Figure 8: Trip Distribution



TRIP ASSIGNMENT

The development has four accesses, one on Highway 34, two on High Plains Blvd, and one on Colorado Blvd. The trip assignment involves assigning traffic to a selection of routes in a transportation network, how project trips travel through the transportation network to leave the study area. The Trip Assignment is in direct correlation to the trip distribution of project trips only. This development has multiple routes for the traffic from the six different areas to the site for each access. Therefore, the trip assignment volumes for this study area are shown in **Figure 9**.

Figure 9: Trip Assignment

Analysis of Existing Conditions

STUDY INTERSECTION LEVEL OF SERVICE

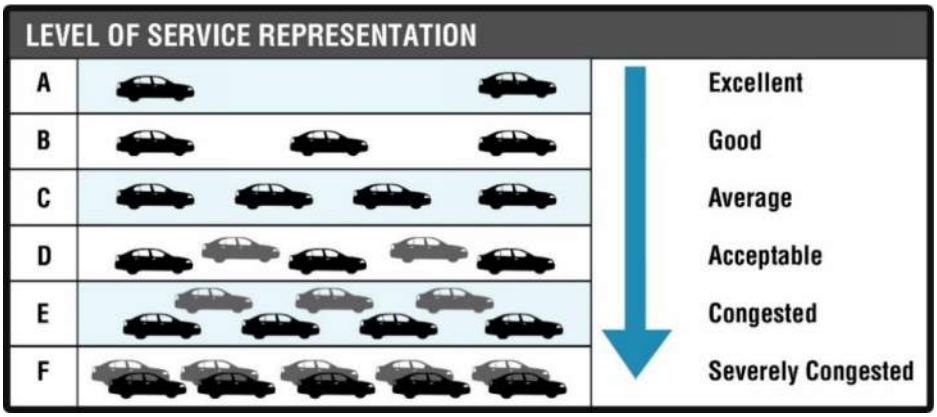
Level of Service (LOS) is a term used by the *Highway Capacity Manual* (HCM) to describe the traffic operations of an intersection, based on congestion and delay. It ranges from LOS A (almost no congestion or delay) to LOS F (traffic demand is above capacity and the intersection experiences long queues and delay). LOS C is generally considered acceptable for rural intersections, while LOS D is acceptable for urbanized intersections and is the acceptable standard for CDOT. LOS E is the threshold when the intersection reaches capacity. For two-way stop-controlled intersections, average intersection-wide delay and LOS are not defined by the HCM. **Table 4** summarizes LOS delay criteria for stop-controlled movements at unsignalized and signalized intersections. A visual representation of this is shown in **Figure 10.**

Table 4: Level of Service Criteria

Level of Service	Average Control Delay (sec/veh)	
	Signalized	Unsignalized
A	≤ 10	≤ 10
B	> 10 - 20	> 10 - 15
C	> 20 - 35	> 15 - 25
D	> 35 - 55	> 25 - 35
E	> 55 - 80	> 35 - 50
F	> 80	> 50

Source: *Highway Capacity Manual (HCM) 2010*

Figure 10: LOS Representation



EXISTING INTERSECTION OPERATIONS

COVID-19 ADJUSTMENT/GROWTH FACTOR

The AM and PM peak hour traffic counts for the study intersections were obtained from the Encore Master Traffic Impact Study located in the APPENDIX. The counts were taken before March 2020, no COVID -19 adjustment needed. Horrocks has established that the Growth rate on Highway 34 should be 2.4% each year with a total increase of 48% for 20 years. This was established from CDOT OTIS website. Horrocks also reviewed the "US34 Planning and Environmental Linkage (PEL) Study" completed in January 2019 by CDOT. This study claims a growth Rate of 2.2% each year with a total increase of 45% for 20 years. Horrocks assumption is to use the growth rate of 2.4 % each year on Highway 34 and the surrounding roads will include a growth rate of 2.2% each year. **Table 5** shows the growth factor for each phase.

Table 5: Growth Rate

Study	Growth Rate % Per Year	2025 Growth Factor	2033 Growth Factor	2041 Growth Factor
OTIS	**2.4**	**1.13**	**1.27**	**1.61**
PEL	**2.2**	**1.12**	**1.24**	**1.55**

Analysis of Existing Conditions

All study intersections perform at an unacceptable LOS. The intersection with the highest delay is Highway 34 & High Plains Blvd with the northbound thru lane with the highest delay causing a LOS F and a delay of 159.0 seconds per vehicle in the AM, as shown in **Table 6**. Horrocks obtained the AADT for the Existing scenario from the "Encore Master Traffic Impact Study" completed in February of 2020 and is shown in **Figure 11**. The balanced traffic turning movements are shown in **Figure 12**. All study intersections perform at an unacceptable LOS, as shown in **Table 6**.

Figure 11: Existing AADT

Table 6: Existing Peak Hour Traffic Analysis

Intersection Number	Intersection	AM Peak Hour		PM Peak Hour	
		Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service
Existing Peak Hour Conditions					
1	Highway 34 & Colorado Blvd	118.0	F	63.9	E
2	Highway 34 & High Plains Blvd	111.2	F	159.0	F

Source: HCM Methodologies using PTV Vistro Software

Control delay for unsignalized intersections shown for the worst approach only per the HCM.

Vistro intersection LOS reports are in the **APPENDIX**.

MITIGATIONS (EXISTING SCENARIO)

Highway 34 & High Plains Blvd (old intersection location)

- CDOT recommends constructing High Plains Blvd intersection in the location of the future High Plains Blvd interchange. One left-turning car causes the unacceptable LOS. CDOT is planning to shift High Plains Blvd east and construct a new interchange for the Highway 34 & N High Plains Blvd intersection to meet existing demands, no recommended mitigations currently.

Highway 34 & Colorado Blvd

- Modify southbound lane geometry.
    - Shared left-thru lane with a dedicated right-turn lane changes to a dedicated left-turn lane with a shared thru-right lane.

The mitigations above were implemented and analyzed to represent an Existing mitigation scenario. The following delay and LOS after mitigation are shown in **Table 7**. See **Figure 12** for intersection configuration, and **Figure 13** for roadway and signal improvements.

Table 7: Existing with Mitigation Peak Hour Traffic Analysis

Intersection Number	Intersection	AM Peak Hour		PM Peak Hour	
		Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service
Existing with Mitigation Peak Hour Conditions					
1	Highway 34 & Colorado Blvd	50.3	D	49.5	D
2	Highway 34 & High Plains Blvd	111.2	F	159.0	F

AUXILIARY LANES

Traffic was analyzed to check for required auxiliary turn lanes. All previous required auxiliary turn lanes are included in this scenario. Additional auxiliary turn lanes are not required per criteria supplied by the State Highway Access Code located in the **APPENDIX**.

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Existing with Mitigation AM & PM Traffic Volumes

FIGURE 12

SCALE:
N/A

DATE:
06/2023

Figure 13: Existing Roadway Improvement

Analysis of 2025 Background Conditions

HIGHWAY 34 & HIGH PLAINS BLVD INTERSECTION

During the 2025 scenario, a new intersection will replace part of the existing Highway 34 and High Plains Blvd intersection. The new intersection will be moved east on Highway 34. High Plains Blvd north of Highway 34 will be realigned to connect with the new intersection on Highway 34. This will be a signalized 3/4 intersection, the existing northbound approach of High Plains Blvd will remain, and will be realigned to the new intersection at a later time. The old southbound approach will be elliminated. The Highway 34 & High Plains Blvd intersection was initially reviewed a a stop controlled intersection, but the large number of east/west traffic causes delays significantly over 100 sec/veh. Therefore, we recommend a traffic signal to improve traffic flow and safety. **Figure 14** shows the updated lane geometry.

Figure 14: New Intersection

GROWTH FACTORS

For the 2025 Background condition, using the growth rates from the CDOT Online Transportation Information System (OTIS) and the PEL Study, a background growth factor of 1.13 for Highway 34 and 1.12 for the other study roads will be used for the analysis, as shown in **Table 8**. The Appendix contains the OTIS traffic data and PEL study for the growth rates. The AADT for the 2025 Background scenario uses the existing AADT multiplied by the growth factor. **Figure 15** shows the AADT for the 2025 scenario.

Table 8: 2025 Growth Factor

Station ID	5 Year Growth Factor
Highway 34	1.13
Other Study Roads	1.12

Figure 15: 2025 Background AADT

2025 BACKGROUND CONDITIONS

Existing traffic was grown annually using the growth Factors of 1.13 for Highway 34 and 1.12 for other study roads, shown in **Table 8** to create the 2025 Background traffic scenario, which is shown in **Figure 17**. All Intersections perform at unacceptable LOS. The intersection with the highest delay is Highway 34 & High Plains Blvd with a LOS F and a delay of 191.2 sec/veh in the AM, as shown in **Table 9**. This scenario includes all previous mitigations.

2025 PLUS PROJECT INTERSECTION OPERATIONS

Project traffic was added to the 2025 Background traffic using the same distribution as the existing conditions, as shown in **Figure 8**, to create the 2025 plus Project Scenario, shown in **Figure 17.** The AADT for the 2025 plus Project scenario is shown in **Figure 16.** Traffic generated by the project site is shown **Figure 19**. All study intersections function at an acceptable LOS except intersections Highway 34 & Colorado Blvd, Highway 34 & High Plains Blvd (old intersection), and Highway 34 & High Plains Blvd (new intersection). The intersection with the highest delay is Highway 34 & High Plains Blvd (old intersection)

with LOS F and a delay of 189.6 sec/veh in the AM, as shown in **Table 10**. This scenario includes all previous mitigations.

Figure 16: 2025 plus Project AADT

Table 9: 2025 Background Hour Traffic Analysis

Intersection Number	Intersection	AM Peak Hour		PM Peak Hour	
		Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service
2025 Background Peak Hour Conditions					
1	Highway 34 & Colorado Blvd	134.5	F	104.1	F
2	Highway 34 & High Plains Blvd	191.2	F	136.8	F

Source: HCM Methodologies using PTV Vistro Software
Control delay for unsignalized intersections shown for the worst approach only per the HCM.

Vistro intersection LOS reports are in the **APPENDIX**.

Table 10: 2025 plus Project Peak Hour Traffic Analysis

Intersection Number	Intersection	AM Peak Hour		PM Peak Hour	
		Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service
2025 plus Project Peak Hour Conditions					
1	Highway 34 & Project Access	13.6	**B**	14.7	**B**
2	Highway 34 & Colorado Blvd	77.5	**E**	19.5	**B**
3	Colorado Blvd & Northeast Access	4.7	**A**	3.6	**A**
4	High Plains Blvd & Northwest Access	8.9	**A**	8.7	**A**
5	Highway 34 & High Plains Blvd (New Intersection)	37.2	**D**	70.7	**E**
6	High Plains Blvd & Southwest Access	2.8	**A**	2.8	**A**
7	Highway 34 & High Plains Blvd (Old Intersection)	189.6	**F**	132.5	**F**

Source: HCM Methodologies using Vistro Software

Control delay for unsignalized intersections shown for the worst approach only per the HCM.

Vistro intersection LOS reports are in the **APPENDIX.**

MITIGATIONS

Highway 34 & High Plains Blvd (Old Intersection)

- CDOT is planning to shift High Plains Blvd east and construct a new interchange for the Highway 34 & N High Plains Blvd intersection to meet existing demands. One left-turning car causes the unacceptable LOS, no mitigations currently.

Highway 34 & Colorado Blvd

- Add westbound thru lane to have a total of 3 thru lanes at intersection.
- Add eastbound thru lane to have a total of 3 thru lanes at intersection. The third lane will be an acceleration/deceleration lane in 2025.
- Modify lane geometry to two (2) northbound lanes north of Highway 34.

Highway 34 & High Plains Blvd (new Intersection)

- Add eastbound thru lane to have a total of 3 lanes at intersection. The third lane will be an acceleration/deceleration lane in 2025.

The mitigations above were implemented in model to represent a 2025 background plus project mitigation scenario. The following delay and LOS after mitigation are shown in **Table 12**.

See **Figure 18** for intersection configuration, and **Figure 20** for roadway and signal improvements.

Table 11: 2025 Background Mitigation Peak Hour Traffic Analysis

Intersection Number	Intersection	AM Peak Hour		PM Peak Hour	
		Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service
2025 Background Peak Hour Conditions					
1	Highway 34 & Colorado Blvd	19.1	**B**	14.3	**B**
2	Highway 34 & High Plains Blvd	191.2	**F**	136.8	**F**

Table 12: 2025 plus Project Mitigation Peak Hour Traffic Analysis

Intersection Number	Intersection	AM Peak Hour		PM Peak Hour	
		Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service
2025 plus Project Mitigations Peak Hour Conditions					
1	Highway 34 & Project Access	13.9	**B**	14.4	**B**
2	Highway 34 & Colorado Blvd	29.6	**C**	18.1	**B**
3	Colorado Blvd & Northeast Access	4.6	**A**	4.0	**A**
4	High Plains Blvd & Northwest Access	8.4	**A**	8.4	**A**
5	Highway 34 & High Plains Blvd (New Intersection)	11.8	**B**	21.9	**C**
6	High Plains Blvd & Southwest Access	2.7	**A**	2.7	**A**
7	Highway 34 & High Plains Blvd (Old Intersection)	189.6	**F**	147.7	**F**

AUXILIARY LANES

Construction traffic was analyzed to check for required auxiliary turn lanes. Auxiliary turn lanes shall be installed according to the criteria supplied by the State Highway Access Code located in the **APPENDIX**. As per code, the following intersections requires additional auxiliary lanes, as shown in **Table 13**. The length of the acceleration lane will follow the criteria supplied by the State Highway Access Code to allow for adequate room for weaving and merging of project traffic.

Highway 34 & Project Access

- The right-turn lane from Highway 34 to Project Access Road requires a deceleration lane (section 3.10.7b). The length of the deceleration lane will follow the criteria supplied by the State Highway Access Code or extend past the PM peak queue length, whichever is greater.
    - Deceleration to be installed same time as the project.
- The right-turn lane from Project Access to Highway 34 requires an acceleration lane (section 3.5.2c).
    - Acceleration lane to be installed same time as the project. The length of the acceleration lane will follow the criteria supplied by the State Highway Access Code.

Table 13: 2025 Plus Project Auxiliary Lane Summary

Highway 34 & Project Access				
Auxiliary Lane	Turning Volume (vph)	State Highway Access Code Requirements	State Highway Access Code Design Requirements	Lane Required Based on Turning Volume
SB-WB Right Turn Acceleration Lane (outbound)	68	More than 50 vph	Acceleration lane with taper	Yes
SB-EB Left Turn Acceleration Lane (outbound)	N/A	More than 25 vph. Does not interfere with other auxiliary lanes	Acceleration lane	No
WB Right Turn Deceleration Lane (inbound)	62	More than 25 vph	Deceleration lane with taper	Yes
EB Left Turn Deceleration Lane (inbound)	N/A	More than 10 vph	Deceleration lane with taper	No

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2025 Background with Mitigation AM & PM Traffic Volumes

FIGURE 17

SCALE:
N/A

DATE:
06/2023

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2025 Background plus Project with Mitigation AM & PM Traffic Volumes

FIGURE 18

SCALE: N/A

DATE: 06/2023

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2025 Project Only AM & PM Traffic Volumes

FIGURE 19

SCALE:
N/A

DATE:
06/2023

Figure 20: 2025 Plus Project Roadway and Signal Improvements

QUEUE LENGTH

In the 2003 US 34 Access Control Plan, the restricted distance between intersections is ¼ mile minimum. The plan states, "Shorter distances (not less than 700') would be allowed pending the findings of a traffic impact study. A copy of the access control plan is in the **APPENDIX**.

The project access intersection is approximately 1,100' from the future interchange on/off-ramp and approximately 1,500' from the Highway 34 & Colorado Blvd intersection. The queue length for the southeast project access intersection north of Highway 34 & Colorado Blvd is 202 ft.; traffic queuing will not be an issue.

Analysis of 2033 Background Conditions

GROWTH FACTORS

For the 2033 condition, using the growth Factors from the CDOT Online Transportation Information System (OTIS) and the PEL Study, a background growth factor of 1.33 for Highway 34 and 1.30 for the other study roads will be used for the analysis, as shown in **Table 14**. The Appendix contains the OTIS traffic data and PEL study for the growth Factors. The AADT for the 2033 Background scenario uses the existing AADT multiplied by the growth factor. **Figure 21** shows the AADT for the 2033 Background scenario.

Table 14: 2033 Growth Factor

Station ID	5 Year Growth Factor
Highway 34	1.33
Other Study Roads	1.30

Figure 21: 2033 Background AADT

2033 BACKGROUND CONDITIONS

Existing traffic was grown annually using the growth Factors of 1.30 for Highway 34 and 1.33 for other study roads, shown in **Table 14** to create the 2033 background traffic scenario, which is shown in **Figure 24.** All study Intersections perform at acceptable LOS. The intersection with the highest delay is Highway 34 & High Plains Blvd with LOS D and a delay of 43.4 seconds during the AM, as shown in **Table 15**. The old Highway 34 & High Plains Blvd intersection will be fully removed during this scenario and High Plains Blvd south of Highway 34 will be realigned and connect to the new intersection as shown in **Figure 22**. This scenario includes all previous mitigations.

Figure 22: New Full Movement Intersection

2033 BACKGROUND PLUS PROJECT INTERSECTION OPERATIONS

Project traffic was added to the 2033 background traffic using the same distribution as the existing conditions, as shown in **Figure 25.** Traffic generated by the project site is shown **Figure 26**. All study intersections function at an acceptable LOS except Highway 34 & Colorado Blvd, as shown in **Table 16**. The westbound left-turn lane has the highest delay causing a LOS F and a delay of 90.6 seconds in the AM. The AADT for the 2033 Background plus Project scenario is shown in **Figure 23**. This scenario includes all previous mitigations.

Figure 23: 2033 Background plus Project AADT

Table 15: 2033 Background Peak Hour Traffic Analysis

Intersection Number	Intersection	AM Peak Hour		PM Peak Hour	
		Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service
2033 Background Peak Hour Conditions					
1	Highway 34 & Colorado Blvd	43.4	**D**	33.3	**C**
2	Highway 34 & High Plains Blvd	9.5	**A**	10.0	**B**

Source: HCM Methodologies using PTV Vistro Software
Control delay for unsignalized intersections shown for the worst approach only per the HCM.

Table 16: 2033 Background plus Project Peak Hour Traffic Analysis

Intersection Number	Intersection	AM Peak Hour		PM Peak Hour	
		Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service
2033 Background plus Project Peak Hour Conditions					
1	Highway 34 & Project Access	16.1	**C**	16.0	**C**
2	Highway 34 & Colorado Blvd	90.6	**F**	37.4	**D**
3	Colorado Blvd & Northeast Access	18.5	**C**	23.2	**C**
4	High Plains Blvd & Northwest Access	9.4	**A**	9.3	**A**
5	Highway 34 & High Plains Blvd (New Intersection)	16.0	**B**	17.2	**B**
6	High Plains Blvd & Southwest Access	3.4	**A**	3.3	**A**

Source: HCM Methodologies using Vistro Software
Control delay for unsignalized intersections shown for the worst approach only per the HCM.

Vistro intersection LOS reports are in the **APPENDIX**.

MITIGATIONS

Highway 34 & Colorado Blvd

- Add second eastbound left-turn lane.
- Add second southbound left-turn lane.

The mitigations above were implemented in model to represent a 2033 background plus project. All study intersections operate at an acceptable LOS. See **Figure 25** for intersection configuration, and **Figure 27** for roadway and signal improvements.

Table 17: 2033 Background plus Project with Mitigation Peak Hour Traffic Analysis

Intersection Number	Intersection	AM Peak Hour		PM Peak Hour	
		Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service
2033 Background plus Project with Mitigations Peak Hour Conditions					
1	Highway 34 & Project Access	16.1	**C**	16.0	**C**
2	Highway 34 & Colorado Blvd	35.1	**D**	47.8	**D**
3	Colorado Blvd & Northeast Access	4.8	**A**	3.9	**A**
4	High Plains Blvd & Northwest Access	9.4	**A**	9.3	**A**
5	Highway 34 & High Plains Blvd (New Intersection)	15.9	**B**	17.0	**B**
6	High Plains Blvd & Southwest Access	3.4	**A**	3.3	**A**

AUXILIARY LANES

Traffic was analyzed to check for required auxiliary turn lanes. Auxiliary turn lanes shall be installed according to the criteria supplied by the State Highway Access Code located in the **APPENDIX**. As per code, the following intersections require additional auxiliary lanes, as shown in **Table 18**. The length of the acceleration lane will follow the criteria supplied by the State Highway Access Code to allow for adequate room for weaving and merging of project traffic.

Highway 34 & High Plains Blvd

- The westbound right-turn lane from Highway 34 to High Plains Blvd requires a deceleration lane (section 3.10.7b).
- The right-turn lane from southbound High Plains Blvd to Highway 34 requires an acceleration lane (section 3.10.7c).
- The right-turn lane from northbound High Plains Blvd to Highway 34 requires an acceleration lane (section 3.10.7c). To be implemented when the southern portion of High Plains Blvd is relocated to the new intersection location.

Table 18: 2033 Auxiliary Lane Summary

Highway 34 & High Plains Blvd				
Auxiliary Lane	Turning Volume (vph)	County Requirements	County Design Requirements	Lane Required Based on Turning Volume
SB-WB Right Turn Acceleration Lane (outbound)	123	More than 50 vph	Acceleration lane with taper	Yes
NB-EB Right Turn Acceleration Lane (outbound)	60	More than 50 vph	Acceleration lane with taper	Yes
WB-NB Right Turn Deceleration Lane (inbound)	74	More than 25 vph	Deceleration lane with taper	Yes

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2033 Background with Mitigation AM & PM Traffic Volumes

FIGURE 24

SCALE:
N/A

DATE:
06/2023

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2033 Background plus Project with Mitigation AM & PM Traffic Volumes

FIGURE 25

SCALE: N/A

DATE: 06/2023

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ENCORE AT JOHNSTOWN

2033 Project Only AM & PM Traffic Volumes

FIGURE 26

SCALE:
N/A

DATE:
06/2023

Figure 27: 2033 Plus Project Roadway and Signal Analysis

QUEUE LENGTH

In the 2003 US 34 Access Control Plan, the restricted distance between intersections is ¼ mile minimum. The plan states, "Shorter distances (not less than 700') would be allowed pending the findings of a traffic impact study. A copy of the access control plan is in the **APPENDIX**.

The project access intersection is approximately 1,100' from the future interchange on/off-ramp and approximately 1,500' from the Highway 34 & Colorado Blvd intersection. The queue length for the southeast project access intersection north of Highway 34 & Colorado Blvd is 304 ft.; traffic queuing will not be an issue.

Analysis of 2041 Background Conditions

GROWTH FACTORS

For the 2041 condition, using the growth Factors from the CDOT Online Transportation Information System (OTIS) and the PEL Study, a background growth factor of 1.61 for Highway 34 and 1.55 for the other study roads will be used for the analysis, as shown in **Table 19**. The Appendix contains the OTIS traffic data and PEL study for the growth Factors. The AADT for the 2041 Background scenario uses the existing AADT multiplied by the growth factor. **Figure 28** shows the AADT for the 2041 Background scenario.

Table 19: 2041 Growth Factor

Station ID	5 Year Growth Factor
Highway 34	1.61
Other Study Roads	1.55

Figure 28: 2041 Background AADT

2041 BACKGROUND CONDITIONS

Existing traffic was grown annually using the growth Factors of 1.61 for Highway 34 and 1.55 for other study roads from **Table 19** to create the 2041 background traffic scenario, which is shown in **Figure 30.** All Intersections perform at unacceptable LOS The intersection with the highest delay is Highway 34 &

Colorado Blvd with LOS F and a delay of 123.1 seconds during the AM, as shown in **Table 20**. This scenario includes all previous mitigations.

2041 BACKGROUND PLUS PROJECT INTERSECTION OPERATIONS

Project traffic was added to the 2041 background traffic using the same distribution as the 2033 conditions to create the 2041 background plus Project scenario, which is shown in **Figure 30.** Traffic generated by the project site is shown **Figure 32.** Study intersections were analyzed, all function at an acceptable LOS except intersection Highway 34 & Project Access, Highway 34 & Colorado Blvd, and Highway 34 & High Plains Blvd, as shown in **Figure 30**. The intersection with the highest delay is Highway 34 & High Plains Blvd, as shown in **Table 21.** The westbound lane has the highest delay causing a LOS F and a delay of 193.8 sec/veh in the PM. The AADT for the 2041 Background plus Project scenario is shown in **Figure 29**. This scenario includes all previous mitigations.

Figure 29: 2041 Background plus Project AADT

Table 20: 2041 Background Peak Hour Traffic Analysis

Intersection Number	Intersection	AM Peak Hour		PM Peak Hour	
		Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service
2041 Background Peak Hour Conditions					
1	Highway 34 & Colorado Blvd	123.1	F	103.9	F
2	Highway 34 & High Plains Blvd	34.0	C	75.3	E

Source: HCM Methodologies using PTV Vistro Software

Control delay for unsignalized intersections shown for the worst approach only per the HCM.

Vistro intersection LOS reports are in the **APPENDIX**.

Table 21: 2041 Background plus Project Peak Hour Traffic Analysis

Intersection Number	Intersection	AM Peak Hour		PM Peak Hour	
		Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service
2041 Background plus Project Peak Hour Conditions					
1	Highway 34 & Project Access	20.9	C	21.9	C
2	Highway 34 & Colorado Blvd	154.1	F	165.3	F
3	Colorado Blvd & Northeast Access	5.9	A	13.5	B
4	High Plains Blvd & Northwest Access	9.5	A	9.3	A
5	Highway 34 & High Plains Blvd (New Intersection)	129.6	F	193.8	F
6	High Plains Blvd & Southwest Access	3.5	A	3.4	A

Source: HCM Methodologies using Vistro Software

Control delay for unsignalized intersections shown for the worst approach only per the HCM.

Vistro intersection LOS reports are in the **APPENDIX**.

MITIGATIONS

There are no PEL approved mitigations that will decrease the LOS to an acceptable level for these scenarios. The eastbound and westbound thru movements on Highway 34 are causing the delay in the AM & PM.

MITIGATIONS OUTSIDE BASE ASSUMPTIONS

Highway 34 & Colorado Blvd

- Add two westbound thru lanes at intersection to have a total of 5 thru lanes.
- Add an eastbound thru lane at intersection to have a total of 4 thru lanes.

Highway 34 & High Plains Blvd

- Add two westbound thru lanes at intersection to have a total of 5 thru lanes.

Table 22: 2041 Background with Non PEL Mitigation Peak Hour Traffic Analysis

Intersection Number	Intersection	AM Peak Hour		PM Peak Hour	
		Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service
2041 Background with Non PEL Mitigations Peak Hour Conditions					
1	Highway 34 & Colorado Blvd	16.6	**B**	14.1	**B**
2	Highway 34 & High Plains Blvd	13.8	**B**	25.7	**C**

Table 23: 2041 Background with Project Non PEL Mitigation Peak Hour Traffic Analysis

Intersection Number	Intersection	AM Peak Hour		PM Peak Hour	
		Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service
2041 Background with Project Non PEL Mitigations Peak Hour Conditions					
1	Highway 34 & Project Access	20.9	**C**	21.9	**C**
2	Highway 34 & Colorado Blvd	21.1	**C**	20.5	**C**
3	Colorado Blvd & Northeast Access	4.9	**A**	4.0	**A**
4	High Plains Blvd & Northwest Access	9.5	**A**	9.3	**A**
5	Highway 34 & High Plains Blvd (New Intersection)	16.0	**B**	32.9	**C**
6	High Plains Blvd & Southwest Access	3.5	**A**	3.4	**A**

The mitigations above were implemented in model to represent the 2041 Background mitigation and 2041 Background project with mitigations outside base assumptions scenario. See **Figure 31** for intersection configuration and **Figure 33** for roadway and signal improvements.

AUXILIARY LANES

Traffic was analyzed to check for required auxiliary turn lanes. All previous required auxiliary turn lanes are included in this scenario. Additional auxiliary turn lanes are not required per criteria supplied by the State Highway Access Code located in the **APPENDIX**.

QUEUE LENGTH

In the 2003 US 34 Access Control Plan, the restricted distance between intersections is ¼ mile minimum. The plan states, “Shorter distances (not less than 700’) would be allowed pending the findings of a traffic impact study. A copy of the access control plan is in the **APPENDIX**.

The project access intersection is approximately 1,100’ from the future interchange on/off-ramp and approximately 1,500’ from the Highway 34 & Colorado Blvd intersection. The queue length for the southeast project access intersection north of Highway 34 & Colorado Blvd is 450 ft.; traffic queuing will not be an issue.

Horrocks.

5670 GREENWOOD PLAZA BLVD.
SUITE 100W
GREENWOOD VILLAGE, CO 80111

ENCORE AT JOHNSTOWN

2041 Background with Mitigation AM & PM Traffic Volumes

FIGURE 30

SCALE:
N/A

DATE:
06/2023

Horrocks.

5670 GREENWOOD PLAZA BLVD.
SUITE 100W
GREENWOOD VILLAGE, CO 80111

ENCORE AT JOHNSTOWN

2041 Background plus Project with Non PEL Mitigation AM & PM Traffic Volumes

FIGURE 31

SCALE: N/A

DATE: 06/2023

Horrocks. 5670 GREENWOOD PLAZA BLVD. SUITE 100W GREENWOOD VILLAGE, CO 80111	ENCORE AT JOHNSTOWN 2041 Project Only AM & PM Traffic Volumes	FIGURE 32	SCALE: N/A DATE: 06/2023

Figure 33: 2041 Plus Project Non PEL Roadway and Signal Improvements

Highway Improvements

AUXILIARY LANE REQUIREMENTS

Auxiliary turn lanes shall be installed according to the criteria supplied by the State Highway Access Code located in the **APPENDIX**. Auxiliary lanes are required during the following scenarios: - 2025 plus Project scenario, and 2033 Background plus Project. As per code, the Highway 34 & Project Access intersection requires additional auxiliary lanes.

CAPACITY AND LOS ANALYSIS

A summary of the capacity and LOS analysis is provided below. The complete capacity and LOS analysis reports are supplied in the **APPENDIX** provided.

Intersection	AM Peak Hour		PM Peak Hour	
	Average Control Delay (sec/veh)	Level of Service	Average Control Delay (sec/veh)	Level of Service
Existing Peak Hour Conditions				
Highway 34 & Colorado Blvd	118.0	F	63.9	E
Highway 34 & High Plains Blvd	111.2	F	159.0	F
Existing with Mitigation Peak Hour Conditions				
Highway 34 & Colorado Blvd	50.3	D	49.5	D
Highway 34 & High Plains Blvd	111.2	F	159.0	F
2025 Background Peak Hour Conditions				
Highway 34 & Colorado Blvd	134.5	F	104.1	F
Highway 34 & High Plains Blvd	191.2	F	136.8	F
2025 Background with Mitigation Peak Hour Conditions				
Highway 34 & Colorado Blvd	19.1	B	14.3	B
Highway 34 & High Plains Blvd	191.2	F	136.8	F
2025 Background + Project Peak Hour Conditions				
Highway 34 & Colorado Blvd	77.5	E	19.5	B
Highway 34 & High Plains Blvd	189.6	F	132.5	F
Highway 34 & High Plains Blvd (new)	37.2	D	70.7	E
Highway 34 & Project Access	13.6	B	14.7	B
2025 Background + Project with Mitigation Peak Hour Conditions				
Highway 34 & Colorado Blvd	29.0	C	14.9	B
Highway 34 & High Plains Blvd	189.6	F	136.8	F
Highway 34 & High Plains Blvd (new)	14.1	B	27.8	C
Highway 34 & Project Access	13.6	B	14.7	B
2033 Background Peak Hour Conditions				
Highway 34 & Colorado Blvd	43.4	D	33.3	C
Highway 34 & High Plains Blvd	9.5	A	10.0	B
2033 Background + Project Peak Hour Conditions				
Highway 34 & Colorado Blvd	90.6	F	37.4	D

Highway 34 & High Plains Blvd (new)	16.0	B	17.2	B
Highway 34 & Project Access	16.1	C	16.0	C
2033 Background + Project with Mitigation Peak Hour Conditions				
Highway 34 & Colorado Blvd	35.1	D	37.8	D
Highway 34 & High Plains Blvd (new)	15.9	B	17.0	B
Highway 34 & Project Access	16.1	C	16.0	C
2041 Background Peak Hour Conditions				
Highway 34 & Colorado Blvd	123.1	F	103.9	F
Highway 34 & High Plains Blvd	34.0	C	75.3	E
2041 Background with Outside Base Assumptions Mitigations Peak Hour Conditions				
Highway 34 & Colorado Blvd	16.6	B	14.1	B
Highway 34 & High Plains Blvd	13.8	B	25.7	C
2041 Background + Project Peak Hour Conditions				
Highway 34 & Colorado Blvd	154.1	F	165.3	F
Highway 34 & High Plains Blvd (new)	129.6	F	193.8	F
Highway 34 & Project Access	20.9	C	21.9	C
2041 Background + Project with Outside Base Assumptions Mitigations Peak Hour Conditions				
Highway 34 & Colorado Blvd	21.1	C	20.5	C
Highway 34 & High Plains Blvd (new)	16.0	B	32.9	C
Highway 34 & Project Access	20.9	C	21.9	C

TRAFFIC SIGNAL ANALYSIS

With the future expansion of Highway 34, a traffic signal analysis was not completed for the Highway 34 & High Plains Blvd intersection. It is Horrocks assumption that a signal warrant will be done with future improvements to Highway 34.

CONCLUSIONS AND RECOMMENDATIONS

1. Existing Conditions: - All study intersections operate at an unacceptable LOS. The study intersection with the highest delay is High Plains Blvd and Highway 34 with LOS F and a delay of 159.0 sec/veh in the PM.

   Recommended Mitigations

   - Intersection Highway 34 & Colorado Blvd
     - Modify southbound lane geometry.
       - Shared left-thru with a right to left with shared thru-right.
   - Intersection Highway 34 & High Plains Blvd (old intersection location)
     - CDOT is planning to shift High Plains Blvd east and construct a new interchange for the Highway 34 & N High Plains Blvd intersection to meet existing demands. No recommended mitigations currently
     - CDOT recommends construction High Plains Blvd intersection in the location of the future High Plains Blvd interchange.

   Mitigated analysis shows acceptable LOS, the mitigated intersection with the highest delay is Highway 34 & Colorado Blvd with LOS D and a delay of 50.3 seconds in the AM.

2. 2025 Background Conditions: - Using the CDOT OTIS site and the US34 Planning and Environmental Linkage (PEL) Study, a growth factor of 1.13 was used for Highway 34 and 1.12 for the other roads in the study area. All study intersections operate at an unacceptable LOS. The intersection with the highest delay is intersection Highway 34 & High Plains Blvd with a LOS F and a delay of 191.2 sec/veh in the AM. This scenario includes all previous mitigations.

   Recommended Mitigations:

   - Intersection Highway 34 & Colorado Blvd
     - Add westbound thru lane to have a total of 3 lanes at the intersection.
     - Add eastbound thru lane to have a total of 3 lanes at the intersection.
   - Intersection Highway 34 & High Plains Blvd (old intersection location)
     - CDOT is planning to shift High Plains Blvd east and construct a new interchange for the Highway 34 & N High Plains Blvd intersection to meet existing demands. No recommended mitigations currently
     - CDOT recommends construction of the High Plains Blvd intersection in the location of the future High Plains Blvd interchange.

   Mitigated analysis shows acceptable LOS, the mitigated intersection with the highest delay is Highway 34 & Colorado Blvd with LOS B and a delay of 19.1 sec/veh in the AM.

3. Site development- The proposed development will be completed in three phases. The project phases are estimated to generate the following number of trips.
   - Phase One (2025) – 4,375 new external daily trips with 679 during the AM peak and 394 during the PM peak.

- Phase Two (2033) – 12,901 new external daily trips with 1,318 during the AM peak and 1,217 during the PM peak.
- Phase Three (2041) – 19,451 new external daily trips with 1,542 during the AM peak and 1,842 during the PM peak.

4. 2025 plus Project Conditions: - All study intersections function at an acceptable LOS except for intersections Highway 34 & Colorado Blvd, Highway 34 & High Plains Blvd (old intersection), and Highway 34 & High Plains Blvd (new intersection). The intersection with the highest delay is Highway 34 & High Plains Blvd (old intersection) with LOS F and a delay of 189.6 sec/veh in the PM. All other study intersections function at acceptable LOS. This scenario includes all previous mitigations.

   Recommended Mitigations:

   - Intersection Highway 34 & Colorado Blvd
     - Modify lane geometry to two (2) northbound lanes north of Highway 34.
   - Intersection Highway 34 & High Plains Blvd (new intersection)
     - CDOT is planning to shift High Plains Blvd east and construct a new interchange for the Highway 34 & N High Plains Blvd intersection to meet existing demands.
     - CDOT recommends construction of High Plains Blvd intersection in the location of the future High Plain Blvd interchange.
     - Add eastbound thru lane to have a total of 3 lanes. The third lane will be an acceleration/deceleration lane in 2025.

   Mitigated analysis shows acceptable LOS, the mitigated intersection with the highest delay is Highway 34 & Colorado Blvd with LOS C and a delay of 29.0 seconds in the AM.

   New Auxiliary lanes – Horrocks completed analysis to determine if auxiliary lanes are required per the Colorado's State Highway Access Code.

   - Intersection Highway 34 & Project Access
     - Deceleration lane on Highway 34 for westbound right-turn
     - Acceleration lane on Highway 34 for southbound right-turn

5. 2033 Background Conditions: - Using the CDOT OTIS site and the PEL study, a growth factor of 1.27 for Highway 34 and 1.24 for other study area roads was used to project 2021 traffic volumes to 2033. All study intersections operate at an acceptable LOS. The study intersection with the highest delay is Highway 34 & Colorado Blvd with LOS D and a delay of 43.4 sec/veh in the AM. This scenario includes all previous mitigations.

6. 2033 Background plus Project Conditions: – All intersections function at an acceptable LOS except study intersections, Highway 34 & Colorado Blvd with LOS F and a delay of 90.6 sec/veh in the AM. This scenario includes all previous mitigations.

   Recommended Mitigations:

   - Intersection Highway 34 & Colorado Blvd
     - Add second eastbound left-turn lane.
     - Add second southbound left-turn lane.

Mitigated analysis shows acceptable LOS, the mitigated intersection with the highest delay is Highway 34 & Colorado Blvd with a delay of 37.8 sec/veh in the PM.

New Auxiliary lanes – Horrocks completed analysis to determine if auxiliary lanes are required per the Colorado's State Highway Access Code.

- Intersection Highway 34 & High Plains Blvd
  - Acceleration lane on Highway 34 for northbound right-turn (to be implemented when the southern portion or High Plains Blvd is relocated to the new intersection location).
  - Acceleration lane on Highway 34 for southbound right-turn.
  - Deceleration lane on Highway 34 for westbound right-turn.

7. 2041 Background Condition: - Using the CDOT OTIS site and the US34 Planning and Environmental Linkage (PEL) Study, a growth factor of 1.61 was used for Highway 34 and 1.55 for the other roads in the study area. All study intersections operate at an unacceptable LOS. The intersection with the highest delay is Highway 34 & Colorado Blvd, with a LOS F and a delay of 123.1 sec/veh in the AM. All other study intersections function at acceptable LOS. This scenario includes all previous mitigations.

   Recommended Mitigations:

   - Intersection Highway 34 & Colorado Blvd
     - Install interchange.
   - Intersection Highway 34 & High Plains Blvd
     - Install interchange.

   Recommended Outside Base Assumptions Mitigations:

   - Intersection Highway 34 & Colorado Blvd
     - Add eastbound thru lane to have a total of 4 lanes at the intersection.
     - Add westbound thru lane to have a total of 4 lanes at the intersection.
   - Intersection Highway 34 & High Plains Blvd
     - Add eastbound thru lane to have a total of 4 lanes at the intersection.

   The outside base assumptions mitigated analysis shows acceptable LOS, the intersection with the highest delay is Highway 34 & High Plains Blvd (new intersection) with LOS C and a delay of 25.7 seconds in the PM.

8. 2041 Background plus Project Conditions: – All intersections function at an acceptable LOS except study intersections Highway 34 & Colorado Blvd, and Highway 34 & High Plains Blvd (new intersection). The intersection with the highest delay is Highway 34 & High Plains Blvd with LOS F and a delay of 193.8 sec/veh in the PM. This scenario includes all previous mitigations.

   Recommended Mitigations:

   - Intersection Highway 34 & Colorado Blvd
     - Install interchanges.
   - Intersection Highway 34 & Project Access (RIRO)
     - Install interchanges.

   Recommended Outside Base Assumptions Mitigations:

   - Intersection Highway 34 & Colorado Blvd

  - Add westbound thru lanes to have a total of 5 lanes.
  - Add eastbound thru lane to have a total of 4 lanes.
- Intersection Highway 34 & High Plains Blvd (new intersection)
  - Add two westbound thru lanes to have a total of 5 lanes.
  - Add eastbound thru lane to have a total of 4 lanes.

The outside base assumptions mitigated analysis shows acceptable LOS, the intersection with the highest delay is Highway 34 & High Plains Blvd with LOS C and a delay of 32.9 sec/veh in the AM.

9. Safety History – There was a total of 367 crashes on Highway 34 between mile markers 97 and 100 from 2015 and 2020. The types of crashes are as follows:

   - Four Fatal crashes
   - 120 Serious/injury crashes
   - 243 Property damage only crashes

   The installation of a signal will increase rear-end crashes but decrease angle crashes. In the urban scenario, there's no statistical significance that overall, the number of crashes will change. However, in a rural setting there is confidence that total crashes will decrease approximately 44%.