

**29 ROAD INTERCHANGE AT I-70
PEL STUDY**

Area Conditions Report

Submitted to:



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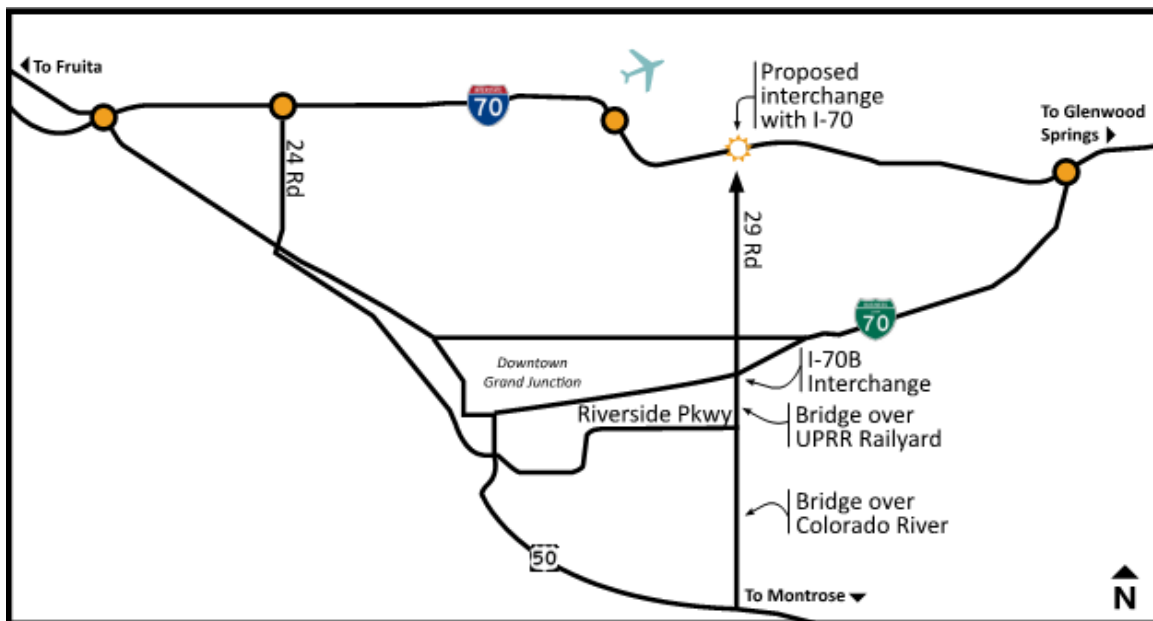
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INTRODUCTION

This Planning and Environmental Linkages (PEL) study to evaluate the feasibility of a new interchange of 29 Road at I-70 represents the next step in a process to complete the long-discussed internal “beltway” in Grand Junction to enhance local and regional connectivity for residential and commercial areas surrounding downtown. Planning efforts for the new roadway connections began in the 1980s and in the early 2000s design and construction began with completion of Riverside Parkway and additional projects to carry 29 Road over I-70 Business Loop (I-70B) and the Union Pacific Railroad (UPRR) railyard.

Figure I. Project Location



The PEL Study will develop a thorough understanding of the existing and future transportation conditions and economic development opportunities within the project area with the intent of defining the need and an overall vision for improved I-70 access. Throughout the study process, Mesa County and the City of Grand Junction will work closely with agency stakeholders, area stakeholders, and members of the public to identify issues and opportunities related to a new I-70 interchange in the vicinity of 29 Road.

This transportation study will be conducted using the PEL process. The PEL process is a study approach used to coordinate transportation planning efforts and to identify potential transportation benefits and impacts and environmental concerns, which can be applied to make planning decisions and for planning analysis. It is generally conducted before overall project construction funding and phasing is identified. The PEL study process can be helpful in discovering project needs and garnering project support for an overall vision when a project involves multiple jurisdictions, and can be used as a project prioritization tool.

PEL studies link planning efforts to future environmental processes and result in valuable information that may ultimately be used to prepare a National Environmental Policy Act (NEPA) study and for further design development. The adoption and use of a PEL study in the NEPA process is subject to determination by the Colorado Department of Transportation (CDOT) and the Federal Highway Administration (FHWA).

This Area Conditions Report documents the current and anticipated future transportation, environmental, and economic development conditions within the study area, developed from readily available data. The information presented in this report will be used in the development of the project Purpose and Need and alternatives, which will be documented separately in a subsequent report.

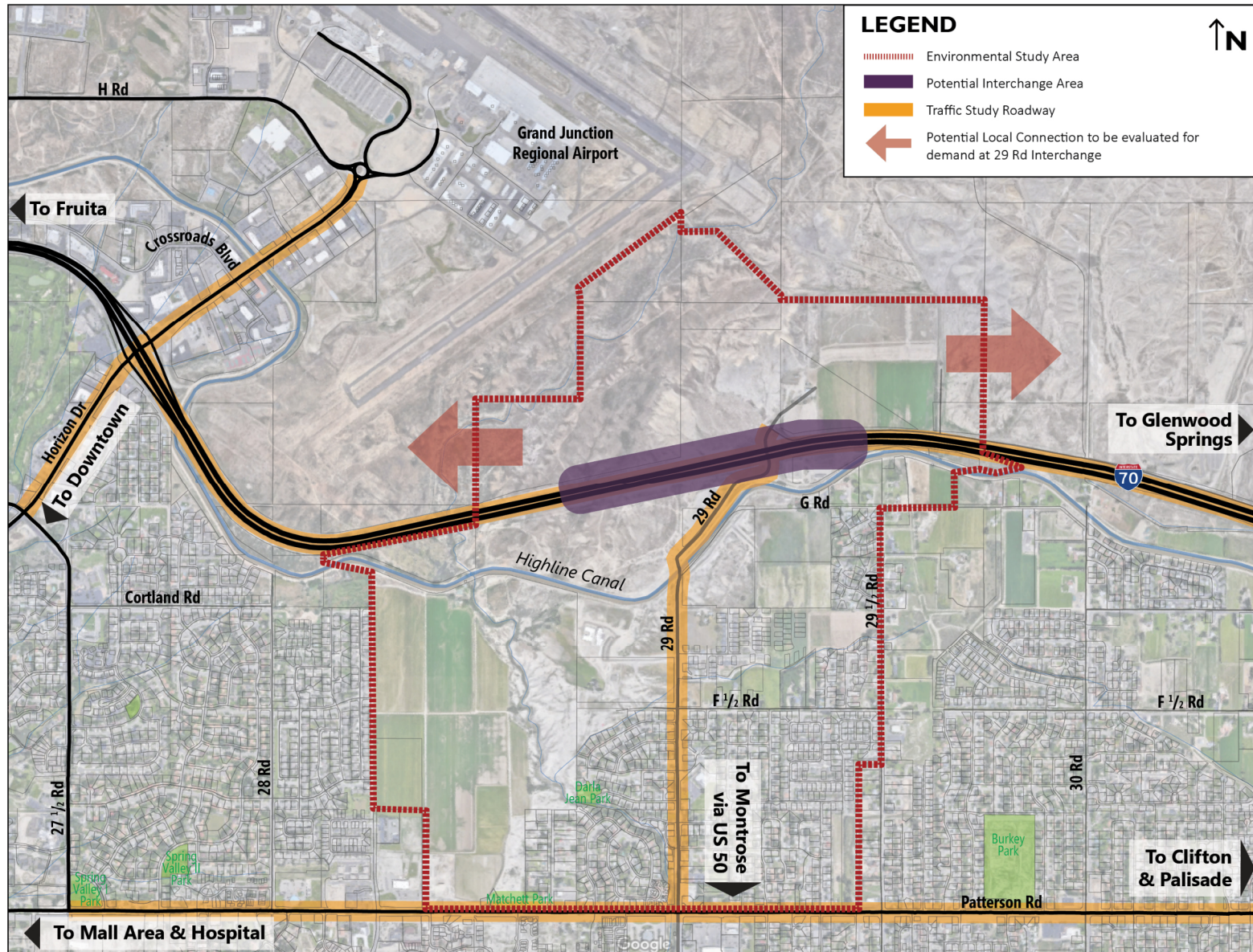
Study Area

The traffic study area and the environmental resource review study area are illustrated in **Figure 2**. Potential traffic and safety benefits will be studied along I-70, 29 Road, Patterson Road, and at the adjacent Horizon Drive and I-70B interchanges. The traffic study roadways lie within the City of Grand Junction and unincorporated Mesa County.

Environmental conditions and potential impacts will be studied for the area surrounding the potential interchange location. The more focused area for a potential new interchange is along I-70 north of the current 29 Road corridor, between CDOT milepost (MP) 32.7 and MP 33.5. This area was chosen based on CDOT's standard one-mile minimum interchange spacing for urban areas (2018 CDOT Roadway Design Guide Section 10.5.3, page 10-12) and area physical constraints, like the Highline Canal.

The environmental study area is focused around the area of most likely physical impacts of a new I-70 interchange. To take into account the potential for indirect or secondary effects to community or environmental resources as a result of the new interchange and 29 Road improvements, the area was extended to incorporate entire neighborhood areas and properties.

Figure 2. Project Study Area



Regional Planning Context

The 29 Road corridor acts as an important north-south travel route connecting people in south Grand Junction to I-70B and US 50. Improvements to 29 Road north of Patterson Road and an interchange at I-70 would create an important connection for residents, visitors, and freight. Many plans have considered a new interchange at 29 Road and I-70. The planning studies and plans reviewed for this PEL study are:

- Grand Junction Circulation Plan (2018), Grand Junction
- Grand Valley Transit Strategic Plan (2018), Mesa County
- Grand Valley Regional Transportation Plan Update (2014), Mesa County
- Mesa County Coordinated Transit and Human Services Transportation Plan (2014), Mesa County
- Grand Junction Regional Airport Master Plan (2009), Grand Junction Regional Airport
- Wildlife Hazard Management Plan (2008), Grand Junction Regional Airport

Relevant pages and maps from the studies and plans are included in **Appendix A**.

Grand Junction Circulation Plan (2018), Grand Junction

The goal of this plan is to create a multimodal transportation system. The plan supports the Grand Valley Regional Transportation Plan's planning principles of: reducing congestion, easing commutes, improving roadway safety, enhancing sidewalks/bike/multiuse trails, and maintaining the system. The plan also supports the transportation goals established in the Grand Junction Comprehensive Plan: designing streets/walkways as attractive public spaces, pedestrian amenities, and creating a well-balanced transportation system. The plan contains maps that represent the future vision for various systems:

- Network Map – Conceptual connections are identified between the following locations: Grand Junction Regional Airport, Horizon Drive Business District, Matchett Park, Mesa County Health and Human Services, and the Clifton Business District.
- Active Transportation Corridors Map – Major corridors important for active transportation are identified. The facility to accommodate pedestrians and bicyclists is not defined (meaning they could be part of the roadway or separated paths). 29 Road north from Patterson Road to Price Ditch is identified as an active transportation corridor.
- Functional Classification Map – Roadway classifications are identified to improve connections as well as provide freight access. A new I-70/29 Road interchange and an extension of 29 Road as a principal arterial north of I-70 are identified in the plan.

Grand Valley Transit Strategic Plan (2018), Mesa County

This plan identifies improvement recommendations for the transit system over the next 10 years. As funding becomes available, the improvements are identified in the plan based on two different scenarios: Scenario B – Existing Fixed-Route Network Enhancements and Scenario C – Service Growth.

Grand Valley Regional Transportation Plan Update (2014), Mesa County

Within the corridor vision section of the plan, 29 Road has two projects identified: 1) widening from two to four lanes between Patterson Road north to I-70 and constructing an interchange on I-70; and 2) widening from three to five lanes between North Avenue and Patterson Road. The first project is also identified as a City of Grand Junction Priority Project.

Recommendations resulting from this plan include non-motorized corridors. These incorporate a wide range of improvements, including: shared lanes, dedicated bike lanes, bike paths and connectors, off-system trails, and pedestrian bridges. There is one project in the immediate vicinity of this project: bike lanes on the existing and extension of F ½ Road.

Mesa County Coordinated Transit and Human Services Transportation Plan (2014), Mesa County

As part of the Regional Transportation Plan, the Coordinated Transit and Human Services Transportation Plan identifies recommendations moving forward for implementation. None of the identified recommendations note transit on 29 Road. There is a medium priority in providing express services or 30 minute frequency on select routes. Low priority is assigned to park and ride lots, in which locations were not identified in the plan.

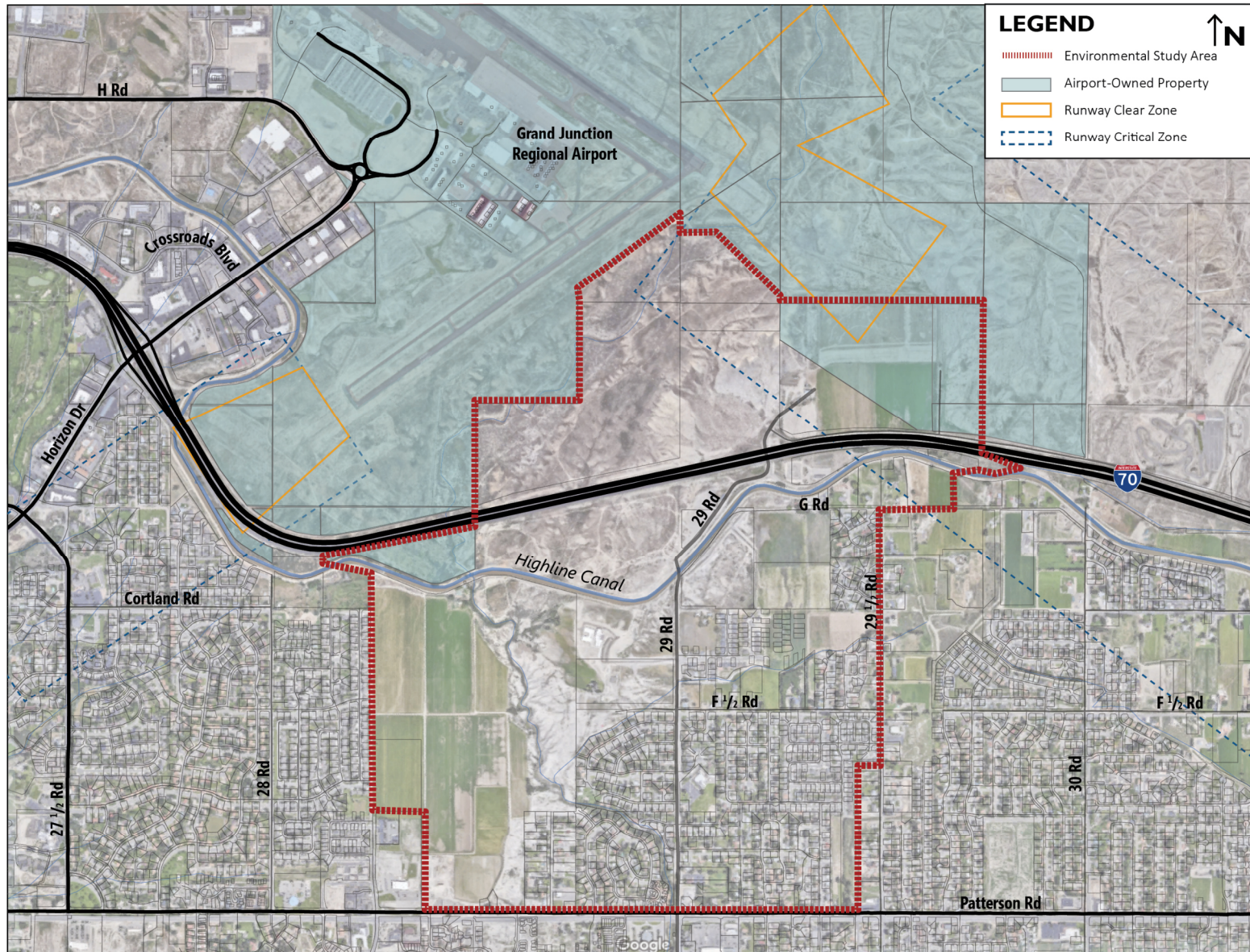
Grand Junction Regional Airport Master Plan (2009), Grand Junction Regional Airport

In the airport master plan, the recommendations include improving the two existing runways and constructing an additional runway parallel to the existing runway (to the northeast).

Figure 3 illustrates the property owned by the Grand Junction Regional Airport and the runway clear zones in relation to the project study area.

The master plan shows the 29 Road interchange at I-70 and the land use plan shows the airport-owned property northeast of the interchange as “Non-Aviation Related Development Area”. The properties north and west of the interchange are designated as “Potential Air Cargo Development Area” and “Aviation Related Development Area”.

Figure 3. Airport Areas



Source: City of Grand Junction GIS Mapping

Land Use

The study area is located on the north side of the City of Grand Junction, along I-70 and between the existing Horizon Drive and I-70B interchanges. The residential community south of I-70 has been transitioning from rural to urban for several decades. Over time, the area has developed under a wide variety of land development and infrastructure plans with a mixed pattern of urban, suburban, and rural environments.

Existing Land Use

South of I-70 along 29 Road, land uses consist primarily of single-family residential with churches and schools. East and west of 29 Road between I-70 and Patterson Road are established residential neighborhoods that rely on access to 29 Road. Matchett Park, located west of 29 Road, has remained undeveloped since it was acquired in 1996, but it is planned as a regional recreational amenity.

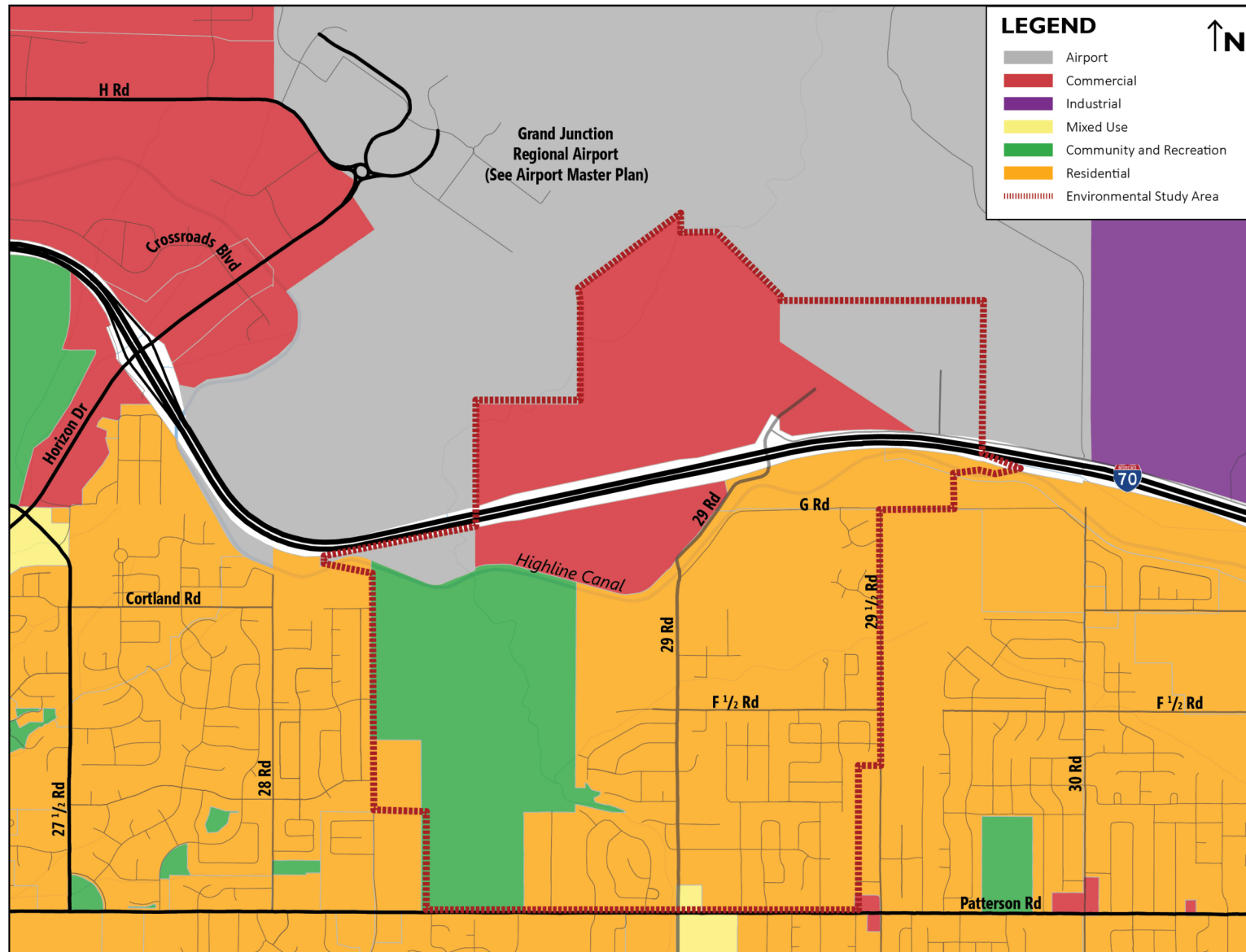
A convenience store/gas station/car wash is located on the northeast corner of the 29 Road and Patterson Road intersection. Land uses in the southeast corner of the intersection are retail and commercial businesses, including a bank, grocery store, and gas station. The west side of the intersection contains a church and the Indian Wash Townhomes.

North of F1/2 Road, properties remain largely undeveloped except for the Independence Academy school and single family homes at the Brodick Way intersection. Two single family residences and an electrical substation are located on 29 Road north of the Highline Canal. The North I-70 Frontage Road ties into 29 Road just north of the 29 Road bridge over I-70, providing access to the Grand Junction Motor Speedway and other recreational opportunities.

Future Land Use

Future planned land uses are depicted in **Figure 4**. The land use represented on this map reflects the City of Grand Junction and Mesa County's land use vision for the study area, as shown in the *Grand Junction Comprehensive Plan*. Residential development will remain between I-70 and Patterson Road with large areas of commercial development in the undeveloped properties north of the Highline Canal and I-70. Details on the development opportunities expected in the undeveloped areas north of I-70 and between the airport and the I-70B interchange are described in the Economic Evaluation chapter of this report.

Figure 4. Future Land Use



Source: City of Grand Junction GIS Mapping

Socioeconomic data from the Grand Valley Metropolitan Planning Organization (GVMPO) current 2010 and 2040 regional travel demand models were compiled for the traffic analysis zones partially or fully located within the study area boundaries. The household and employment totals for the year 2010 and forecasted year 2040 are shown in **Table 1**. As shown, employment in the area is forecasted to increase by almost 580 jobs by year 2040, an increase of 421% over existing year 2010 totals. Population in the area is forecasted to increase by over 600 households, an increase of 79% over existing year 2010 totals.

Table 1. Travel Demand Forecasting Land Use Growth

| YEAR | EMPLOYMENT | HOUSEHOLDS |
|-----------------|------------|------------|
| 2010 | 137 | 798 |
| 2040 | 714 | 1,432 |
| Absolute Growth | + 577 | + 634 |
| Percent Growth | 421% | 79% |

Source: GVMPO 2010 and 2040 regional travel demand models

This land use growth is from the current 2040 regional travel demand model. GVMPO is currently updating the regional travel demand model to extend projections to 2045 and update land use projections. The updated land use projections will consider the economic evaluation completed for this PEL study. Therefore, the socioeconomic data in the 2045 travel demand model will likely show higher land use growth in the study area, particularly for employment in the parcels adjacent to I-70. Details on the development opportunities expected in the undeveloped areas north of I-70 area are described in the Economic Evaluation chapter of this report.

EXISTING TRANSPORTATION SYSTEM

This section summarizes data collected and compiled as part of this study effort from Mesa County, City of Grand Junction, CDOT, and other agencies to describe the physical condition of the transportation system in the study area. The existing and planned roadway classifications and conditions are illustrated in **Figure 5**.

I-70

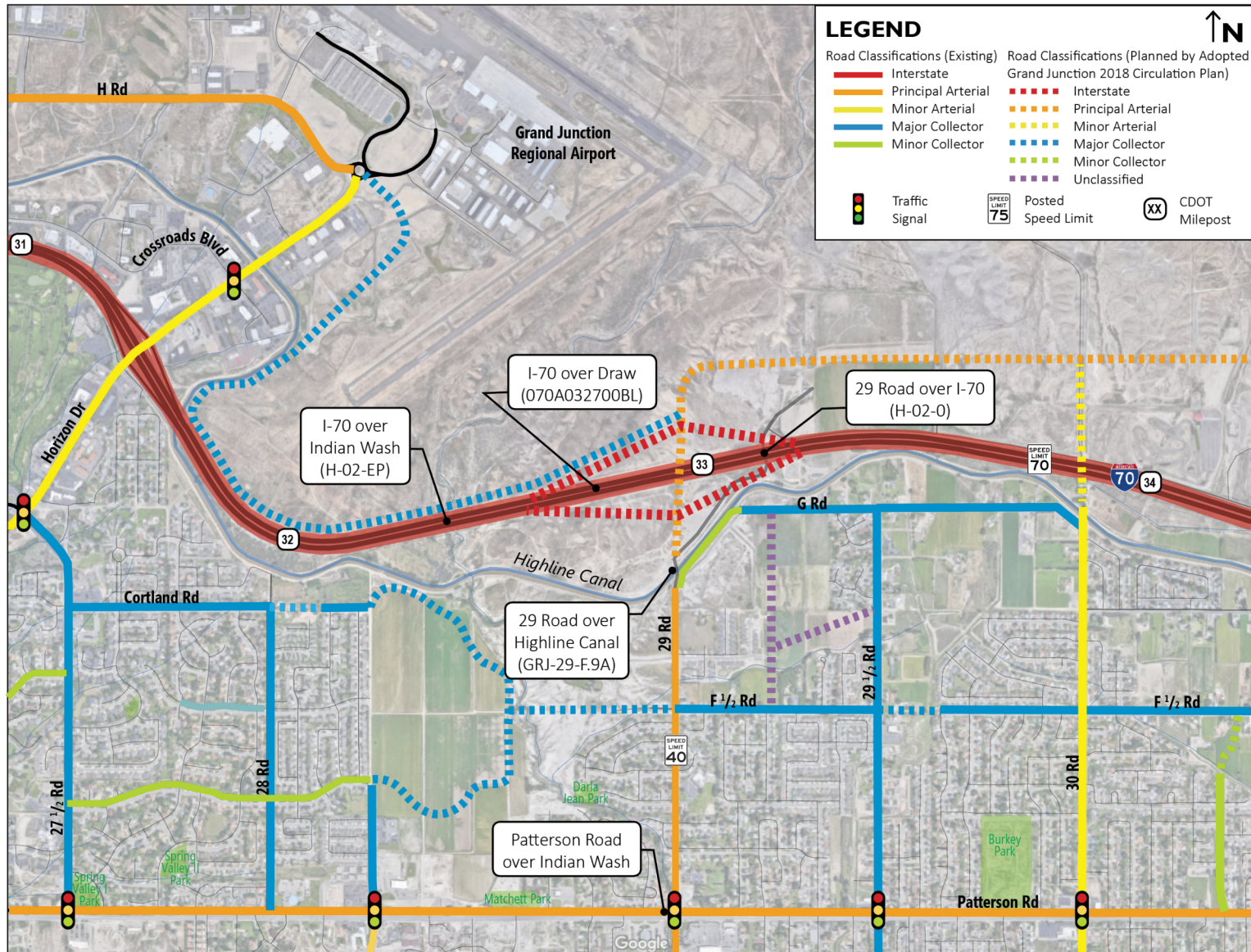
I-70 is a four-lane divided interstate highway through the study area. Through Grand Junction, I-70 generally runs along the north side of the developed urban area. The highway provides regional connectivity to Utah and to the Colorado Front Range as well as to the recreational and mountain communities in the central Colorado Rocky Mountains.

The I-70 speed limit was recently reduced from 75 miles per hour (mph) to 70 mph between MP 24.9 (west of the US 50 interchange) to MP 32.2 (east of the curves east of the Horizon Drive interchange) due to crash history. The speed limit through the rest of the study area remains 75 mph. I-70 has 12-foot through lanes and a depressed median width of 20 feet. CDOT's Online Transportation Information System (OTIS) database lists the widths of the highway's inside shoulder as 2 feet and outside shoulder as 8 feet. However, approximate measurements indicate that the paved shoulders in this area have been improved to 5 feet (inside) and 12 feet (outside). Both inside and outside shoulders have intermittent rumble strips installed as a safety measure.

W-beam guardrail is on the outside of the highway (both north and south sides) near the Indian Wash crossing of I-70 just east of MP 32 and in the center of the highway surrounding the center piers at the existing 29 Road bridge over I-70. The north and south outside piers of the 29 Road over I-70 bridge are protected by a combination of W-beam guardrail and concrete barrier.

A paved and signed crossing through the I-70 median for emergency services is at approximate MP 32.5. There is physical evidence of a former or unauthorized emergency crossing at approximate MP 33. Existing right-of-way (ROW) along I-70 varies through the study area. At approximate MP 33.5, the Government Highline Canal is in close proximity to the highway, and the I-70 ROW narrows to approximately 225 feet. The ROW varies to a maximum width of about 350 feet in areas west of the existing 29 Road bridge over I-70.

Figure 5. Roadway Conditions



Source: City of Grand Junction

29 Road

29 Road is classified as a principal arterial in the Grand Junction Circulation Plan. It provides a regional north-south connection between Patterson Road on the north and US 50 on the south. North of Patterson Road, 29 Road provides local access to neighborhoods and community facilities, as well as access to private properties north of I-70.

29 Road has a speed limit of 40 miles per hour (mph) throughout the study area. However, at and north of the Highline Canal, the roadway is narrow and has tight curves that do not meet a 40 mph design standard. 29 Road through the study area generally has one through lane in each direction, and those lanes are approximately 11 feet wide. The roadway generally has unpaved (gravel) shoulders of varying width.

Between F1/4 Road and F1/2 Road, the roadway is wider to the west with an additional lane width and curb and gutter instead of a soft shoulder. This section also includes a detached sidewalk that is set back from the roadway. Additional setback and sidewalk have also been provided adjacent to the neighborhood at Brodick Way on the east side of 29 Road.

There is a traffic signal at the intersection of 29 Road and Patterson Road, and 29 Road widens to include right and left turn lanes at the intersection. All other intersections along 29 Road within the study area are two-way stops with 29 Road having priority.

Where 29 Road crosses the Highline Canal, it also intersects G Road. Southbound 29 Road over the canal must stop, and traffic on G Road and northbound 29 Road have priority. 29 Road north of the canal has an approximate width of 20 feet and is protected by guardrail on the approaches to both the bridge over the Highline Canal and the bridge over I-70.

Based on City of Grand Junction GIS information, the existing ROW width along 29 Road varies between approximately 60 feet (just north of F1/2 Road) to 110 feet (in several locations where setbacks have been provided). 29 Road ROW at the intersection with Patterson Road expands to approximately 180 feet to accommodate the turn lanes and the Indian Wash crossing of Patterson Road.

Bridge/Structure Conditions

This section describes the basic structural system, structural conditions, and geometric conditions of the existing structures within and adjacent to the study area.

CR 29 over I-70 (H-02-O)

The existing 29 Road bridge over I-70 (Structure Number H-02-O) is a four-span cast-in-place parabolic concrete girder bridge constructed in 1964 at approximate MP 33.2. The existing

structure carries two 10-foot lanes with no shoulders for a total roadway width of 20 feet. The existing structure has an out-to-out width of 24 feet.

The existing structure per the 2018 inspection report has a sufficiency rating of 70.0 (out of 100). The structure is listed as functionally obsolete due to poor existing geometric conditions. The poor geometric conditions are due to insufficient horizontal width on the deck and insufficient lateral clearances to I-70 shoulders. Additionally, the existing structure has inadequate bridge railing per current requirements. Both roadway approaches have tight curved alignments.

Overall, the structure is in satisfactory condition. However, the structure is exhibiting signs of age due to cracking in the concrete deck, soffit, and girders and due to settlement of the approaches and approach slabs. Additionally, the existing structure is rated for 26.4 tons of the standard 32-ton design vehicle and is color-coded 'orange' for the Colorado Permit vehicles.

CR 29 over Highline Canal (GRJ-29-F.9A)

The existing 29 Road bridge over Highline Canal (Structure Number GRJ-29-F.9A) is a single span steel girder bridge constructed in 1988. The existing structure carries two 12-foot lanes with two 4-foot shoulders for a total roadway width of 32 feet. The existing structure has an out-to-out width of 32 feet, 4 inches.

The existing structure per the 2018 inspection report has a sufficiency rating of 82.3 (out of 100). The existing structure has inadequate bridge railing per current requirements. Both roadway approaches have tight curved alignments and the south side has an intersection with G Road immediately to the south of the bridge.

Overall the structure is in satisfactory condition. However, the steel girders and deck are beginning to rust due to age and water leakage through the asphalt and deck. Additionally, the existing structure is rated for 28.8 tons of the standard 32-ton design vehicle and is color coded 'white' for the Colorado Permit vehicles.

I-70 over Draw (070A032700BL)

The existing I-70 over Draw culvert (Structure Number 070A032700BL) is a 4-foot diameter reinforced concrete pipe constructed in 1964 at MP 32.7. The existing structure carries I-70 and has a total length of approximately 218 feet. The structure has approximately 10 feet of fill above the pipe. The existing structure per the 2016 inspection report has a sufficiency rating of 72.1 (out of 100). Overall, the structure is in good condition with some minor cracking.

I-70 over Indian Wash (H-02-EP)

The existing I-70 over Indian Wash culvert (Structure Number H-02-EP) is a two-cell (10-foot by 10-foot cells) concrete box culvert constructed in 1964 at approximate MP 32.4. The culvert carries I-70 and has a total length of approximately 204 feet with a minimum of 16-feet of fill over the top of the box culvert. The structure extends approximately 37 feet beyond the edges of the I-70 shoulders (north and south).

The existing structure per the 2018 inspection report has a sufficiency rating of 71.4 (out of 100). Overall, the structure is in fair condition. The structure is exhibiting signs of age due to cracking in the top slab and walls with efflorescence, leakage, spalling, and exposed reinforcing.

Patterson Road over Indian Wash

The existing Indian Wash under Patterson Road culvert is a corrugated metal elliptical structure. As-built plans from 1982 indicate that the culvert is an 8-foot, 7-inches (high) by 14-foot (wide) aluminum arch. This structure is located immediately west of the intersection of 29 Road and Patterson Road. According to City of Grand Junction GIS data, the culvert is approximately 151 feet long.

This culvert has significant vegetation and sedimentation surrounding the thalweg of the Indian Wash. The metal of the arch shows significant decay, likely due to alkaline soil conditions.

Major Drainage and Irrigation Features

The terrain in the project area generally falls from north to south, with approximately 100 vertical feet of grade differential between I-70 and Patterson Road. Significant areas of fill are present between the Government Highline Canal and I-70, west of 29 Road.

The Indian Wash crossing of I-70 and Indian Wash itself are the most significant drainage features in the project study area. The Indian Wash basin consists of 10,888 acres of contributing land. The basin outfalls at the Colorado River, with the extent of the basin north of the Grand Junction Regional Airport terminating at the top of the mesa. The existing culvert crossing (10-foot by 10-foot 2-cell RCBC) is described in the previous section of the report. Indian Wash generally runs north to south and is only directly adjacent to 29 Road just north of Patterson Road.

The Government High Line Canal crosses 29 Road and has a significant role in irrigating properties within the Grand Valley and the project area with water diverted from the Colorado River. The Government High Line Canal also provides water to an unnamed lateral

ditch which crosses 29 Road in two locations within the study area. There is a reach just north of F 1/2 Rd where the lateral splits and runs along both sides of 29 Rd for a short distance. The Price Ditch is also a primary irrigation facility for the area but it no longer crosses 29 Road and essentially ends about 1.5 miles to the east, outside of the study area. The project area is served primarily by the Mesa County Irrigation District, the Palisade Irrigation District, the Grand Valley Water Users Association, and the Grand Valley Irrigation Company.

Utilities

Utility information in the study area was obtained from on-site field investigations, publicly available GIS data, and information collected from area utility companies. Known utility providers in the area include:

- Xcel Energy (electric and gas)
- Grand Valley Power
- CenturyLink
- Ute Water Conservancy District
- City of Grand Junction Utilities (sanitary sewer)
- Charter/Spectrum Communications
- Grand Valley Drainage District

There are several utilities in close proximity to the existing study roadways and several significant facilities in the area that will require close coordination through the alternatives and design phases of this project. Notable items include:

- Grand Valley Power's substation and solar farm on the southeast corner of the 29 Road bridge over I-70
- Significant overhead power and communication lines along 29 Road

OPERATIONS AND MOBILITY

This section describes the existing traffic operations and multimodal transportation services and infrastructure within and surrounding the study area to identify locations with operational problems, recurring congestion issues, and multimodal opportunities. This information will be used for the determination of the project needs and development of alternatives.

Due to vehicular interactions between intersections, the capacity and operations of an urban arterial corridor, such as 29 Road, Patterson Road, Horizon Drive, and I-70B in northeast Grand Junction, is typically defined by the operations of the intersections. Intersection operational analyses were completed for the intersections along the traffic study corridors utilizing methods outlined in the latest Highway Capacity Manual (HCM) 6th Edition and using Synchro (Version 10) traffic analysis software. The roundabouts at I-70 and Horizon Drive were analyzed using SIDRA (Version 8) traffic analysis software. The existing intersection and corridor lane configurations and peak hour traffic volumes were used to analyze the Levels of Service (LOS) and control delay at each study intersection for the AM and PM peak hours.

LOS is directly related to control delay and is a measure of traffic flow and level of congestion at an intersection measured on a scale of A to F. LOS A describes conditions with essentially uninterrupted flow and minimal delay. Signalized capacity analysis results in an overall LOS representative of all movements through the intersection. Unsignalized capacity analysis produces LOS results for each vehicle movement that yields the right-of-way to conflicting traffic. **Table 2** summarizes the signalized and unsignalized thresholds used in this analysis.

Table 2. Intersection LOS Criteria

| LOS | SIGNALIZED DELAY RANGE (SEC) | TWO-WAY STOP CONTROL DELAY RANGE (SEC) |
|-----|------------------------------|--|
| A | 0 – 10 | 0 – 10 |
| B | 10 – 20 | 10 – 15 |
| C | 20 – 35 | 15 – 25 |
| D | 35 – 55 | 25 – 35 |
| E | 55 – 80 | 35 – 50 |
| F | 80 and above | 50 and above |

Source: HCM 6th Edition

For freeway facilities, LOS is related to the speed and density along the facility, considering mainline segments and ramp merge and diverge areas. Capacity analysis was completed for

the I-70 freeway facility from the Horizon Drive to I-70B interchanges utilizing Highway Capacity Software (HCS7).

Existing Vehicular Traffic Operations

Available traffic counts were obtained from Mesa County, City of Grand Junction, and CDOT. Additional traffic counts were collected within the study area in November 2018. The daily traffic counts collected for the project are shown in **Figure 6**. The daily traffic volumes on 29 Road north of Patterson Road are approximately 4,100 vehicles per day (vpd), while just south of Patterson Road volumes are approximately 11,400 vpd. I-70 between Horizon Drive and I-70B carries approximately 21,000 vpd, which is well within the capacity of a four-lane divided freeway.

West of 29 Road, Patterson Road carries approximately 30,100 vpd. East of 29 Road, Patterson Road carries about 26,000 vpd. The traffic volumes on Horizon Drive south of I-70 are 19,000 vpd and the volumes on I-70B south of I-70 are 16,000 vpd.

Existing intersection traffic operations are illustrated in **Figure 6** and summarized in **Table 3**. As shown, all intersections operate at LOS D or better during both peak hours. Intersection operation reports are included in **Appendix B**.

Table 3. Existing Intersection Performance

| INTERSECTION | CONTROL | EXISTING AM / PM PEAK HOUR | |
|---------------------------------|------------|----------------------------|-------------|
| | | LOS | DELAY (SEC) |
| 29 Road and F ½ Road | Stop Sign | D/B | 25 / 10 |
| 29 Road and Patterson Road | Signal | D/C | 48 / 31 |
| I-70B and Patterson Road | Signal | C/C | 28 / 35 |
| EB I-70 Ramps and Horizon Drive | Roundabout | A/A | 6 / 6 |
| WB I-70 Ramps and Horizon Drive | Roundabout | A/A | 6 / 6 |

Source: Synchro analysis and HCM methodology by DEA

29 Road currently serves the residential areas north of Patterson Road. Localized congestion occurs at the access to the Independence Academy during school ingress and egress periods, making it difficult for residents to access 29 Road, particularly from Brodick Way. Several residential areas rely on a single access point on 29 Road in and out of their neighborhood. With residential commuter and school traffic in the AM peak hour, queues on southbound 29 Road at Patterson Road sometimes extend to Bonito Avenue, making it difficult for residents to turn left on 29 Road.

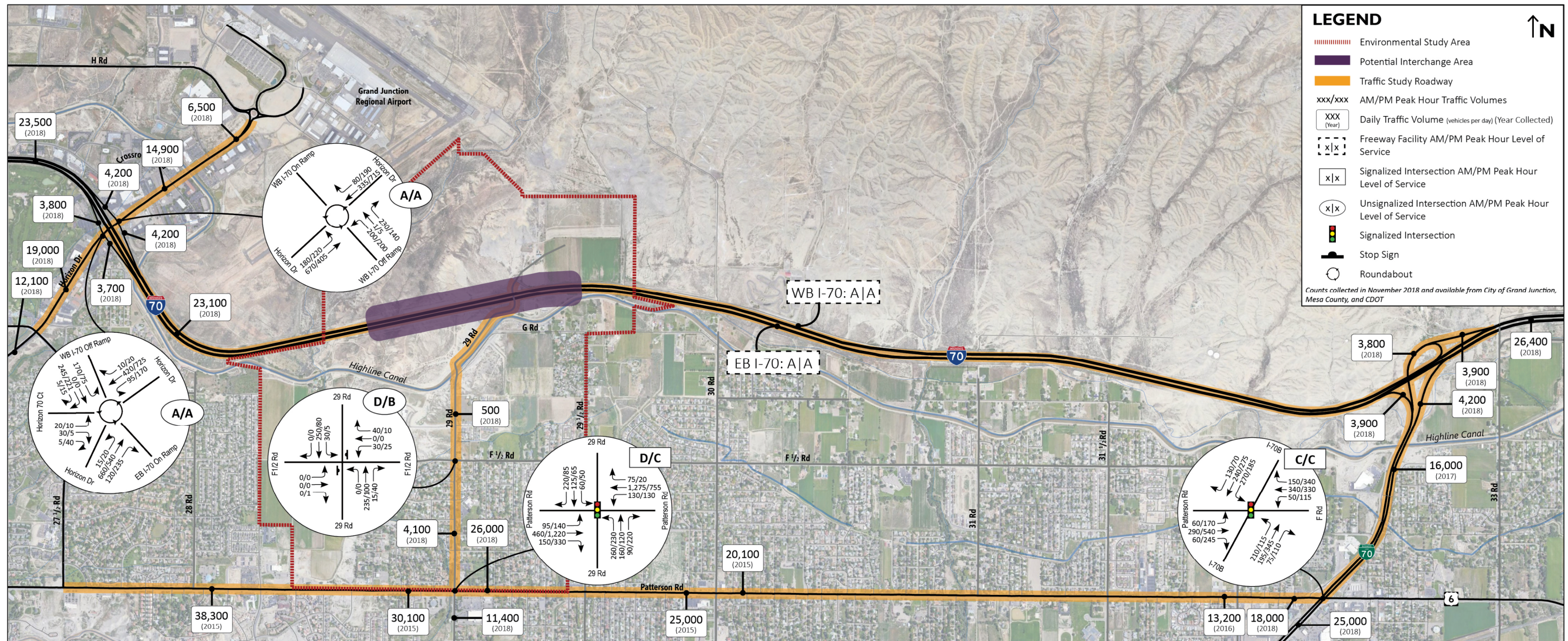
The I-70 freeway corridor carries around 25,000 vpd west, east, and between the Horizon Drive and I-70B interchanges. Existing freeway segment operations are summarized in **Table 4**. As shown, each freeway basic mainline segment and ramp merge and diverge area operates at LOS A during the AM and PM peak hours. The overall freeway facility also operates at LOS A. Freeway operation reports are included in **Appendix B**.

Table 4. Existing I-70 Performance

| I-70 SEGMENT | EXISTING AM / PM PEAK HOUR | |
|---|----------------------------|---------------------------------------|
| | LOS | DENSITY (PC/MI/LN) |
| EASTBOUND I-70 | | |
| EB I-70 – west of Horizon Drive | A/A | 5.2 / 6.2 |
| EB I-70 Off Ramp at Horizon Drive – Diverge | A/A | Freeway: 6.0 / 7.2 Ramp: 5.4 / 6.8 |
| EB I-70 Ramp On Ramp at Horizon Drive - Merge | A/A | Freeway: 3.9 / 7.8 Ramp: 2.7 / 6.7 |
| EB I-70 – Horizon Drive to I-70B | A/A | 3.5 / 7.0 |
| EB I-70 Off Ramp at I-70B – Diverge | A/A | Freeway: 4.1 / 8.3 Ramp: 1.6 / 6.1 |
| EB I-70 On Ramp at I-70B - Merge | A/A | Freeway: 4.2 / 6.0 Ramp: 4.8 / 6.6 |
| EB I-70 – east of I-70B | A/A | 3.8 / 5.3 |
| Overall EB I-70 Facility | A/A | |
| WESTBOUND I-70 | | |
| WB I-70 – east of I-70B | A/A | 2.3 / 6.1 |
| WB I-70 Off Ramp at I-70B – Diverge | A/A | Freeway: 2.7 / 7.1 Ramp: 0.0 / 4.9 |
| WB I-70 On Ramp at I-70B – Merge | A/A | Freeway: 5.1 / 5.6 Ramp: 5.6 / 6.2 |
| WB I-70 I-70B to Horizon Drive | A/A | 4.6 / 5.0 |
| WB I-70 Off Ramp at Horizon Drive – Diverge | A/A | Freeway: 5.4 / 5.8 Ramp: 2.9 / 3.5 |
| WB I-70 On Ramp at Horizon Drive – Merge | A/A | Freeway: 3.8 / 6.1 Ramp: 4.3 / 6.7 |
| WB I-70 – west of Horizon Drive | A/A | 3.3 / 5.4 |
| Overall WB I-70 Facility | A/A | |

Source: HCS7 freeway facilities analysis by DEA

Figure 6. Existing Traffic Volumes and Levels of Service

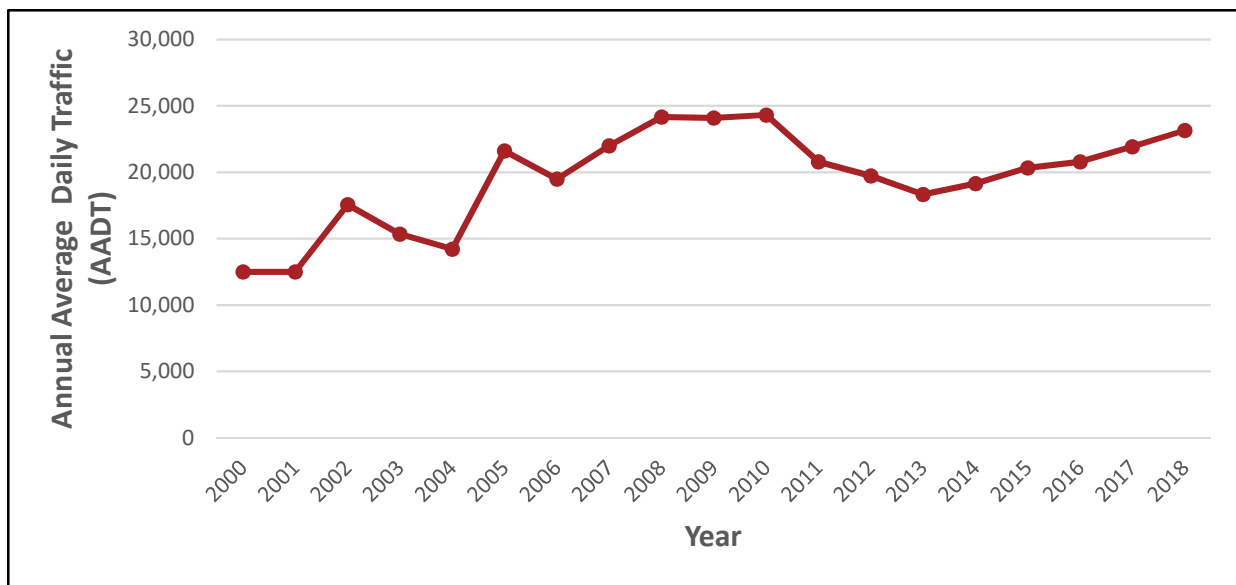


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Travel Patterns

Historical traffic count data were compiled for I-70 east of the Horizon Drive interchange. The Annual Average Daily Traffic (AADT) on I-70 east of the Horizon Drive interchange over the last 18 years is shown in **Figure 7**. As shown, traffic along I-70 has fluctuated with an overall growth trend. The economic downturn of 2011-2014 affected traffic volumes, but travel on I-70 has steadily increased over the last four years and volumes are almost as high as the highest traffic volumes in the last 18 years.

Figure 7. I-70 Annual Average Daily Traffic (2000-2018)



Source: CDOT Transportation Data Management System

Figure 8 shows the hourly variation of the daily counts collected along Horizon Drive, I-70B and 24 Road south of the interchanges with I-70. The counts show increases in traffic volumes during the AM and PM commuting peak periods and there is also a mid-day peak along Horizon Drive, likely due to the restaurants and commercial area surrounding the I-70 interchange.

Along each of the north-south corridors, there is a well-defined spike in the morning and a higher spike in the evening commute period with pronounced peak traffic flows. However, only the I-70B corridor displays strong north/south directionality with a strong travel pattern for drivers traveling north towards the I-70 interchange during the morning commute and away from the I-70 freeway in the evening peak travel periods. The Horizon Drive and 24 Road corridors show only minor directional flow with almost equal peak volumes in the northbound and southbound directions during the peak hours.

Figure 8. Weekday Hourly Traffic Variation – Horizon Drive, I-70B, and 24 Road

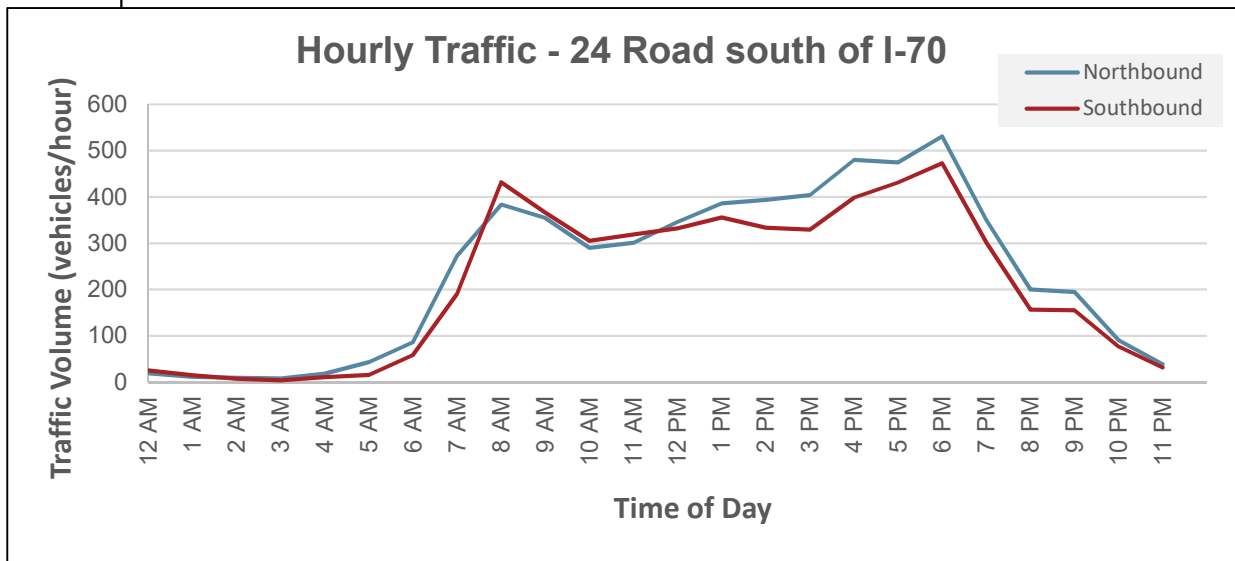
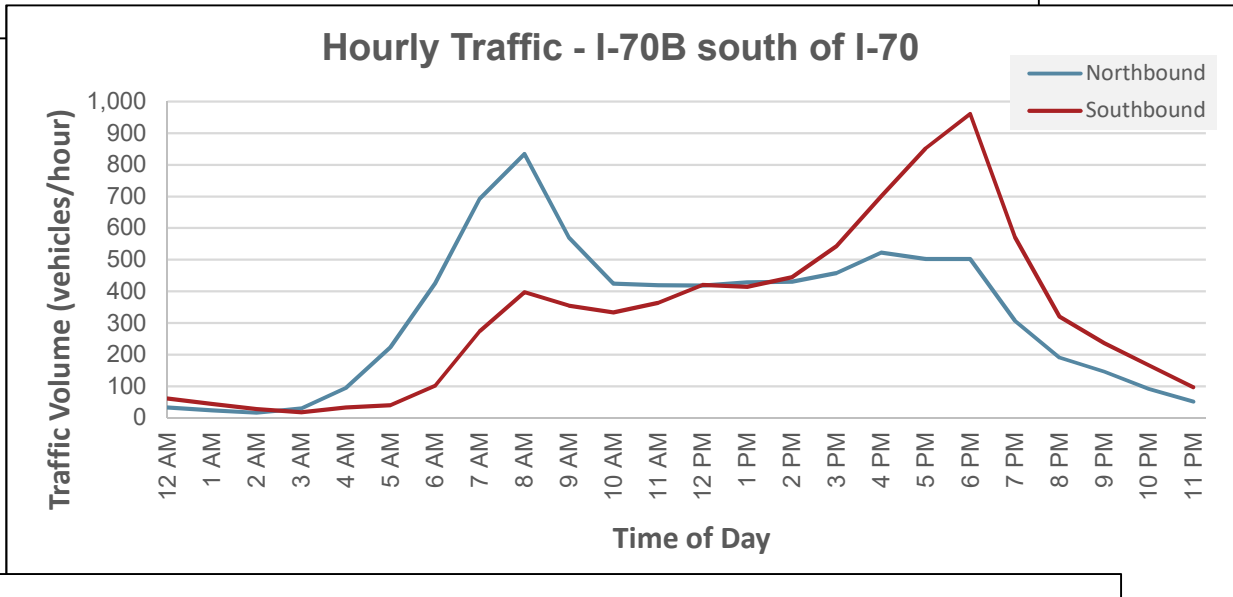
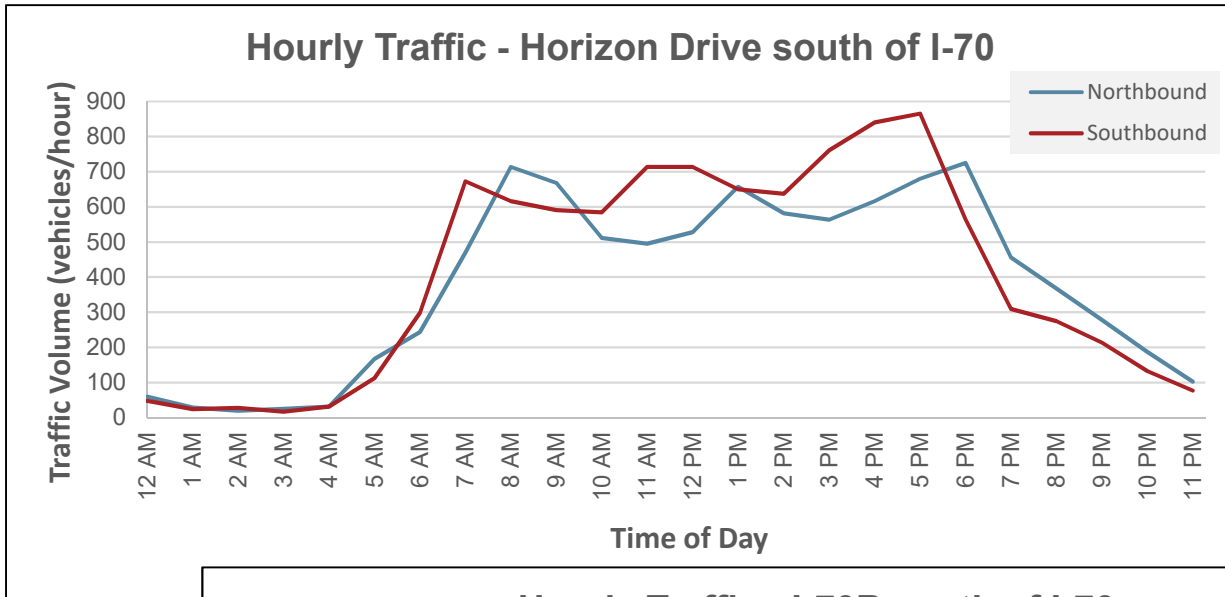
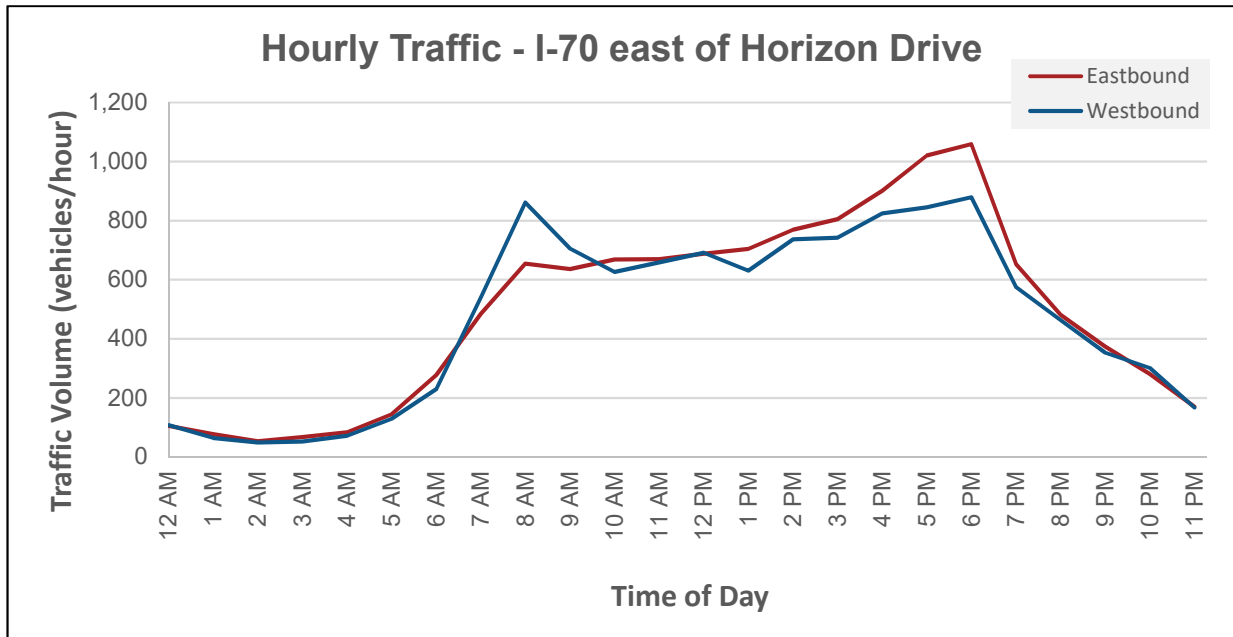


Figure 9 shows the hourly variation of a daily count along I-70 east of the Horizon Drive interchange, collected for CDOT in August 2017. The count shows peak traffic flows in the westbound direction during the AM commuting periods and increased flows in the eastbound direction during the PM peak period.

Figure 9. Weekday Hourly Traffic Variation – I-70 east of Horizon Drive



Source: CDOT Transportation Data Management System

An origin-destination study was conducted to gain an understanding of the existing underlying local and regional travel patterns that would be served by a new I-70 interchange in the vicinity of 29 Road. Vehicle identification data (utilizing cell phone information) was compiled as an average for typical weekdays (Tuesday – Thursday in October 2018). The cell phone/vehicle identification data were matched to identify vehicles traveling between points along area roadways.

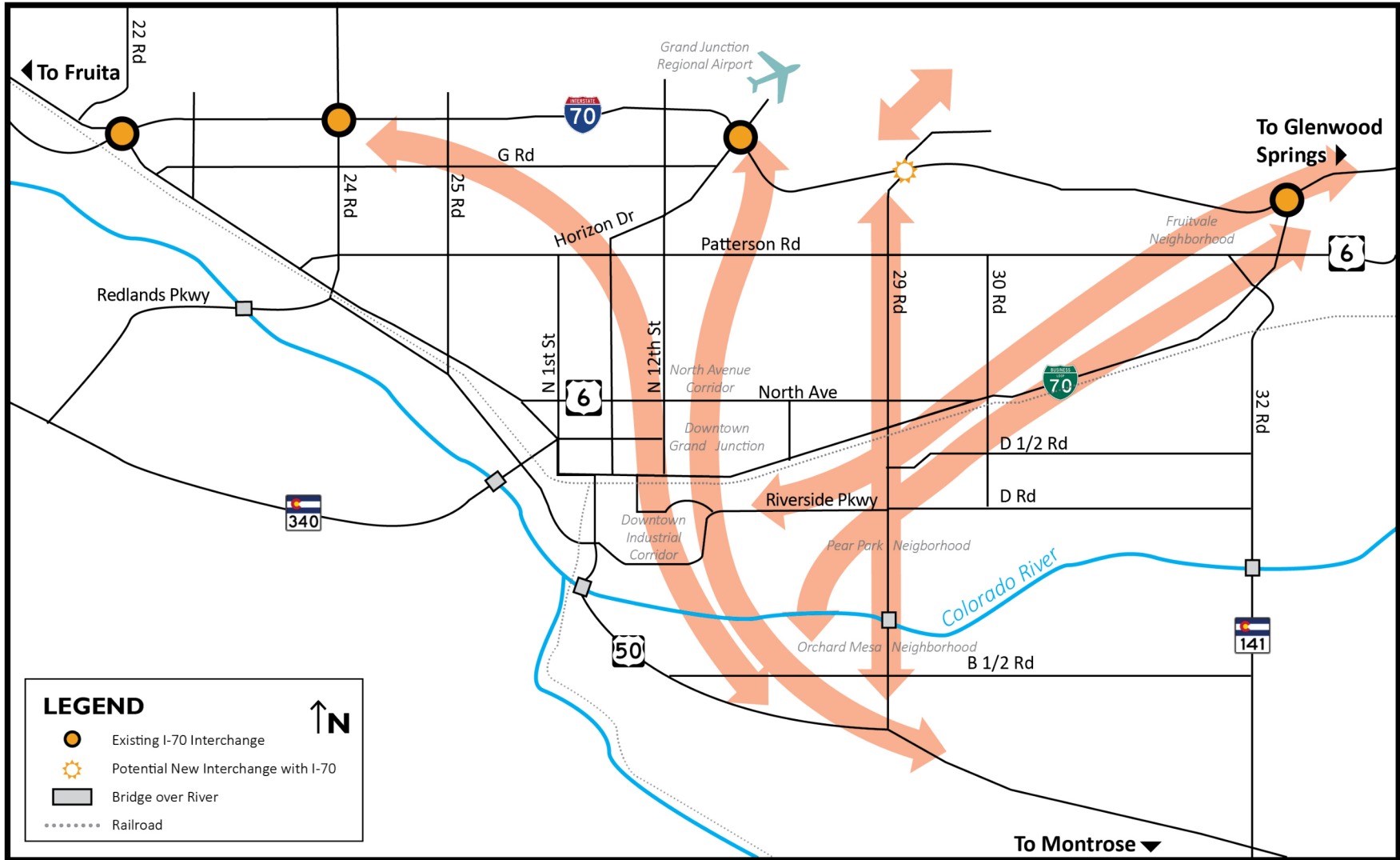
The most significant travel patterns expected to utilize a more direct route to access I-70 at 29 Road are currently traveling between I-70 and:

- Downtown Grand Junction
- Southern neighborhoods like Orchard Mesa and Pear Park
- North Avenue Corridor residential and retail areas
- Fruitvale/Northeast Grand Junction neighborhoods
- Downtown Industrial Corridor

These travel patterns are illustrated in **Figure 10**. A new interchange at I-70 and 29 Road and the associated capacity improvements along 29 Road are also expected to provide access and enhance recreational opportunities at the future Matchett Park facilities planned south of I-70 and west of 29 Road and at the Bureau of Land Management (BLM) areas north of I-70.

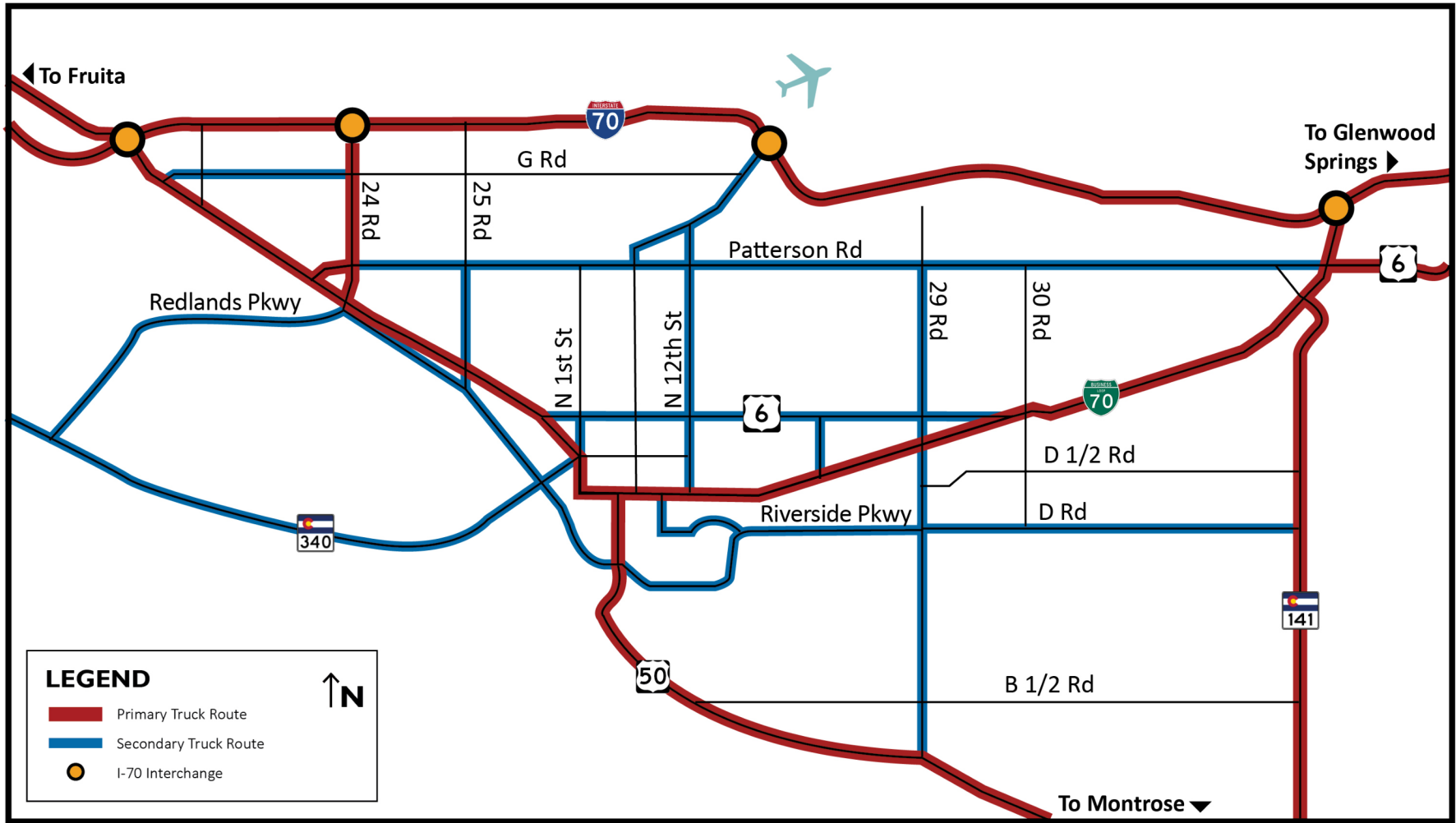
Figure 11 illustrates the current primary and secondary truck routes in the Grand Junction area. As shown, there is currently no designated north-south primary truck route in the central area of Grand Junction between 24 Road and I-70B, which reduces efficiencies for freight travel to/from the Downtown Industrial Corridor, located along Riverside Parkway west of 29 Road.

Figures 10. Travel Patterns to be Served by 29 Road Interchange



Source: StreetLight data with analysis by David Evans and Associates, Inc.

Figure 11. Existing Truck Routes



Source: City of Grand Junction

Future 2040 Traffic Operations

The horizon year for this study is 2040, consistent with the horizon year for the current adopted Grand Valley Transportation Plan. The GVMPO 2040 regional travel demand model was used to develop 2040 traffic forecasts for the study area roadways, with and without a new interchange at I-70/29 Road. Due to the complexity of real-world travel behavior, the travel demand model is not expected to provide precise traffic volume forecasts. To improve the reliability of forecasts, a post-processing adjustment of the 2040 traffic volumes was performed. The adjustment methodology compared the existing year model traffic volumes to actual traffic counts in the study area. The 2040 traffic forecasts were adjusted based on factors and/or differences for model versus actual traffic volumes.

The 2040 GVMPO model includes the transportation network with the “Existing + Committed” projects in the Grand Valley 2040 Regional Transportation Plan, which includes the 29 Road interchange at I-70, widening 29 Road to four through lanes, as well as other area capacity improvements listed in **Table 5**.

Table 5. GVMPO Existing + Committed Travel Demand Model Planned Roads

| CORRIDOR SEGMENT | LANES | FORECAST YEAR |
|---|------------------------|---------------|
| I-70B – Rimrock Avenue to 1st and Grand | Four lanes with median | 2020 |
| 24 Road – Patterson Road to I-70 | Five lanes | 2020 |
| 22 Road – New facility across UPRR and US 6 to River Road | Three lanes | 2030 |
| 29 Road from Patterson Road to new interchange at I-70 | Four lanes with median | 2030 |
| F 1/2 Road Parkway – I-70B east to 25 Road/Patterson Road | Four lanes with median | 2040 |
| 23 ½ Road – F 1/2 to G Road | Three lanes | Post 2040 |

Source: GVMPO

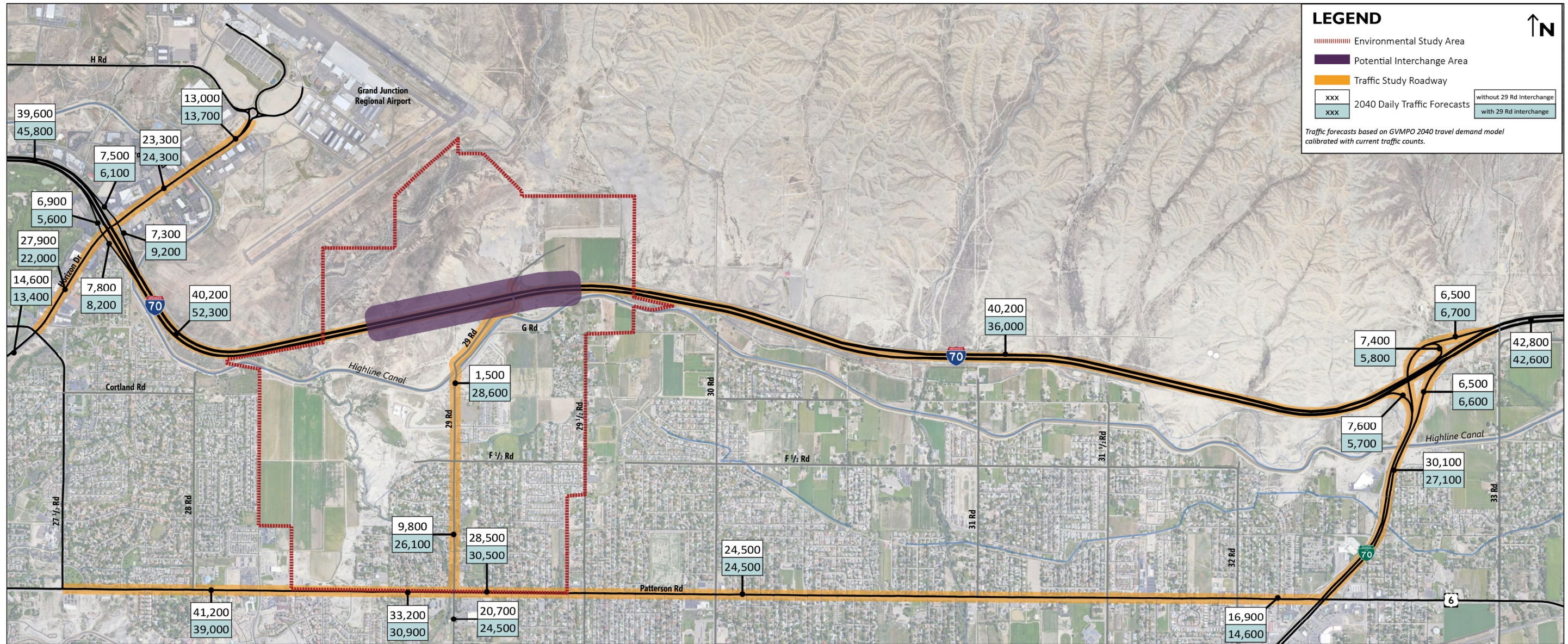
The transportation network in the travel demand model does not include any roadway connection north of I-70 from the 29 Road interchange to the adjacent interchanges at Horizon Drive and at I-70B. The base model for the study did not add those connections, since they are not planned to be part of the interchange project. The base model will be used to assess if those connections are needed to attract adequate volumes to justify a new I-70 interchange in the area of 29 Road. An alternatives analysis with those connections to the new interchange may be used later to evaluate interchange configurations for scenarios with higher travel demands.

In order to evaluate the difference in area traffic volumes and operations with and without the I-70/29 Road interchange, the 2040 GVMPO model was also run with the interchange removed from the transportation network.

Projected traffic forecasts for 2040 with and without the I-70/29 Road interchange are illustrated in **Figure 12**. By 2040, traffic volumes along 29 Road are expected to moderately increase south of F1/2 Road, doubling to almost 10,000 vpd, with continued residential, recreational, and commercial development and the connection of F1/2 Road to the east. Traffic volumes along I-70 increase by over 90% to over 40,000 vpd between Horizon Drive and I-70B. Traffic volumes along Horizon Drive south of I-70 are expected to increase by almost 50% and traffic volumes along I-70B south of I-70 increase by almost 90% by 2040.

With the 29 Road interchange at I-70 connection, the 2040 traffic volume projections along 29 Road increase substantially to over 28,000 vpd between I-70 and F1/2 Road. Traffic volumes on 29 Road south of Patterson Road more than double to 24,500 vpd. With the new interchange, 2040 traffic projections on the Horizon Drive and I-70B corridors south of I-70 decrease by 10-25% from the 2040 projections without the I-70/29 Road interchange. Traffic volumes along I-70 to the east decrease by 10% with the new interchange, while I-70 traffic volumes between 29 Road and Horizon Drive increase by 30%. East and west of Grand Junction (west of US 50 and east of I-70B), 2040 traffic volume projections along I-70 are relatively unchanged with and without the new I-70/29 Road interchange

Figure 12. 2040 Forecasted Traffic Volumes



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The 2040 peak hour traffic operations at area intersections with and without the I-70/29 Road interchange are summarized in **Table 6**, along with the results of the existing operational analysis for comparison. The intersection operation reports are included in **Appendix B**.

Without the construction of the new 29 Road interchange at I-70 connection, no major capacity improvements are planned along 29 Road north of Patterson Road and operations at the 29 Road and Patterson Road intersection would degrade to LOS E and F in the peak hours and drivers would experience large delays at the unsignalized intersection at 29 Road and F 1/2 Road. If these levels of delay are experienced, the City may consider future improvements along 29 Road as separate projects.

With the construction of a new I-70 interchange connection, capacity and operational improvements would be made along 29 Road between I-70 and Patterson Road. This study will evaluate the concepts for those improvements, but it is assumed that 29 Road would be widened to four through lanes, a traffic signal with additional turn lanes would be installed at the 29 Road and F 1/2 Road intersection, and turn lanes would be added at the 29 Road and Patterson Road intersection. With these improvements, the intersections along 29 Road would operate at LOS D or better during the peak hours.

Table 6. Existing and Year 2040 Intersection Performance

| INTERSECTION | EXISTING AM / PM PEAK HOUR | | | 2040 AM / PM PEAK HOUR - NO INTERCHANGE | | | 2040 AM / PM PEAK HOUR - WITH INTERCHANGE | | |
|---------------------------------|----------------------------|-----|-------------|---|-----|-------------|---|-----|-------------|
| | CONTROL | LOS | DELAY (SEC) | CONTROL | LOS | DELAY (SEC) | CONTROL | LOS | DELAY (SEC) |
| 29 Road and F 1/2 Road | Stop Sign | D/B | 25 / 10 | Stop Sign | F/C | >300/20 | Signal | B/A | 12/9 |
| 29 Road and Patterson Road | Signal | D/C | 48 / 31 | Signal | F/E | 117 / 76 | Signal | D/D | 52/54 |
| I-70B and Patterson Road | Signal | C/C | 28 / 35 | Signal | C/D | 26/37 | Signal | C/C | 26/34 |
| EB I-70 Ramps and Horizon Drive | Roundabout | A/A | 6 / 6 | Roundabout | A/A | 7/8 | Roundabout | A/A | 7/7 |
| WB I-70 Ramps and Horizon Drive | Roundabout | A/A | 6 / 6 | Roundabout | A/A | 9/7 | Roundabout | A/A | 8/7 |

Source: Synchro analysis and HCM methodology by DEA

I-70 operations with and without a new I-70 interchange in the area of 29 Road are shown in **Table 7**. Freeway operation reports are included in **Appendix B**. While there is an increase in vehicular density along I-70 with the new 29 Road interchange, this initial analysis shows that each freeway mainline segment and ramp merge and diverge area would operate at LOS A or LOS B during the AM and PM peak hours, with or without a new interchange in the area of 29 Road. The overall freeway facility would continue to operate at LOS A.

Table 7. Existing and Year 2040 I-70 Performance

| I-70 SEGMENT | EXISTING AM / PM PEAK HOUR | | 2040 AM / PM PEAK HOUR - NO INTERCHANGE | | 2040 AM / PM PEAK HOUR - WITH INTERCHANGE | |
|--|----------------------------|---------------------------------------|---|---|---|---|
| | LOS | DENSITY (PC/MI/LN) | LOS | DENSITY (PC/MI/LN) | LOS | DENSITY (PC/MI/LN) |
| EASTBOUND I-70 | | | | | | |
| EB I-70 – west of Horizon Dr | A/A | 5.2 / 6.2 | A/A | 8.2 / 10.4 | A/B | 9.1 / 11.6 |
| EB I-70 Off Ramp at Horizon Dr – Diverge | A/A | Freeway: 6.0 / 7.2 Ramp: 5.4 / 6.8 | A/B | Freeway: 9.6 / 12.3 Ramp: 9.2 / 12.3 | B/B | Freeway: 10.5 / 13.6 Ramp: 10.2 / 13.8 |
| EB I-70 Ramp On Ramp at Horizon Dr - Merge | A/A | Freeway: 3.9 / 7.8 Ramp: 2.7 / 6.7 | A/B | Freeway: 6.8 / 13.6 Ramp: 5.6 / 12.4 | A/B | Freeway: 9.1 / 17.0 Ramp: 8.0 / 15.9 |
| EB I-70 – Horizon Dr to I-70B | A/A | 3.5 / 7.0 | A/B | 6.1 / 12.1 | - | - |
| EB I-70 – Horizon Dr to 29 Rd | - | - | - | - | A/B | 8.2 / 15.1 |
| EB I-70 Off Ramp at 29 Rd – Diverge | - | - | - | - | A/B | Freeway: 9.7 / 18.2 Ramp: 7.6 / 16.5 |
| EB I-70 On Ramp at 29 Rd - Merge | - | - | - | - | A/B | Freeway: 6.7 / 13.1 Ramp: 7.3 / 13.9 |
| EB I-70 – 29 Rd to I-70B | - | - | - | - | A/B | 5.9 / 11.6 |
| EB I-70 Off Ramp at I-70B – Diverge | A/A | Freeway: 4.1 / 8.3 Ramp: 1.6 / 6.1 | A/B | Freeway: 7.2 / 14.6 Ramp: 4.9 / 12.7 | A/B | Freeway: 7.0 / 4.7 Ramp: 4.7 / 12.0 |
| EB I-70 On Ramp at I-70B - Merge | A/A | Freeway: 4.2 / 6.0 Ramp: 4.8 / 6.6 | A/B | Freeway: 6.5 / 9.7 Ramp: 7.1 / 10.4 | A/A | Freeway: 7.0 / 8.4 Ramp: 7.6 / 9.1 |
| EB I-70 – east of I-70B | A/A | 3.8 / 5.3 | A/A | 5.8 / 8.6 | A/A | 6.2 / 7.5 |
| Overall EB I-70 Facility | | A/A | | A/A | | A/A |
| WESTBOUND I-70 | | | | | | |
| WB I-70 – east of I-70B | A/A | 2.3 / 6.1 | A/A | 3.5 / 9.8 | A/A | 3.8 / 10.4 |
| WB I-70 Off Ramp at I-70B – Diverge | A/A | Freeway: 2.7 / 7.1 Ramp: 0.0 / 4.9 | A/A | Freeway: 4.1 / 11.7 Ramp: 1.6 / 9.7 | A/B | Freeway: 4.4 / 12.5 Ramp: 1.9 / 10.5 |
| WB I-70 On Ramp at I-70B – Merge | A/A | Freeway: 5.1 / 5.6 Ramp: 5.6 / 6.2 | A/B | Freeway: 8.5 / 9.7 Ramp: 8.9 / 10.3 | A/B | Freeway: 7.6 / 9.9 Ramp: 8.0 / 10.5 |
| WB I-70 - I-70B to Horizon Dr | A/A | 4.6 / 5.0 | A/A | 7.5 / 8.6 | - | - |
| WB I-70 – I-70B to 29 Rd | - | - | - | - | A/A | 6.7 / 8.8 |
| WB I-70 Off Ramp at 29 Rd - Diverge | - | - | - | - | A/A | Freeway: 8.0 / 10.4 Ramp: 5.7 / 8.4 |
| WB I-70 On Ramp at 29 Rd - Merge | - | - | - | - | B/B | Freeway: 11.5 / 11.4 Ramp: 11.9 / 11.9 |
| WB I-70 – 29 Road to Horizon Dr | - | - | - | - | A/A | 10.1 / 10.1 |
| WB I-70 Off Ramp at Horizon Dr – Diverge | A/A | Freeway: 5.4 / 5.8 Ramp: 2.9 / 3.5 | A/A | Freeway: 9.0 / 10.2 Ramp: 6.8 / 8.1 | B/A | Freeway: 12.2 / 12.0 Ramp: 10.1 / 10.0 |
| WB I-70 On Ramp at Horizon Dr – Merge | A/A | Freeway: 3.8 / 6.1 Ramp: 4.3 / 6.7 | A/B | Freeway: 5.9 / 10.3 Ramp: 6.5 / 10.9 | A/B | Freeway: 6.7 / 10.3 Ramp: 7.3 / 10.9 |
| WB I-70 – west of Horizon Dr | A/A | 3.3 / 5.4 | A/A | 5.3 / 9.1 | A/A | 5.9 / 9.1 |
| Overall WB I-70 Facility | | A/A | | A/A | | A/A |

Source: HCS7 freeway facilities analysis by DEA

Area Multimodal Mobility

The study area is served by Grand Valley Transit (GVT). Pedestrian and bicycle conditions within the study area were inventoried for the study in January 2019. Existing and planned multimodal conditions are illustrated in **Figure 13**.

Current Multimodal

The current conditions on 29 Road are focused on personal vehicles. There are no sidewalks/multiuse paths, bike lanes, or transit routes on 29 Road north of Patterson Road. Patterson Road east and west of 29 Road has bike lanes and transit service. A section of F1/2 Road east of 29 ½ Road has bike lanes.

The recently completed Grand Valley Transit Strategic Plan summarizes operating details for Route 2. Route 2 serves Patterson Road from the Clifton Transfer Station to the West Transfer Facility. This route operates mostly along Patterson Road with the exception of a loop on Hermosa Street at 27 ½ Road and 27 ¼ Road to serve residential and senior living facilities. This route's frequency is 60 minutes from 5:45 AM – 8:35 PM on all days the transit agency operates (Monday-Saturday). When compared to other routes within the transit system, this route is about average for productivity.

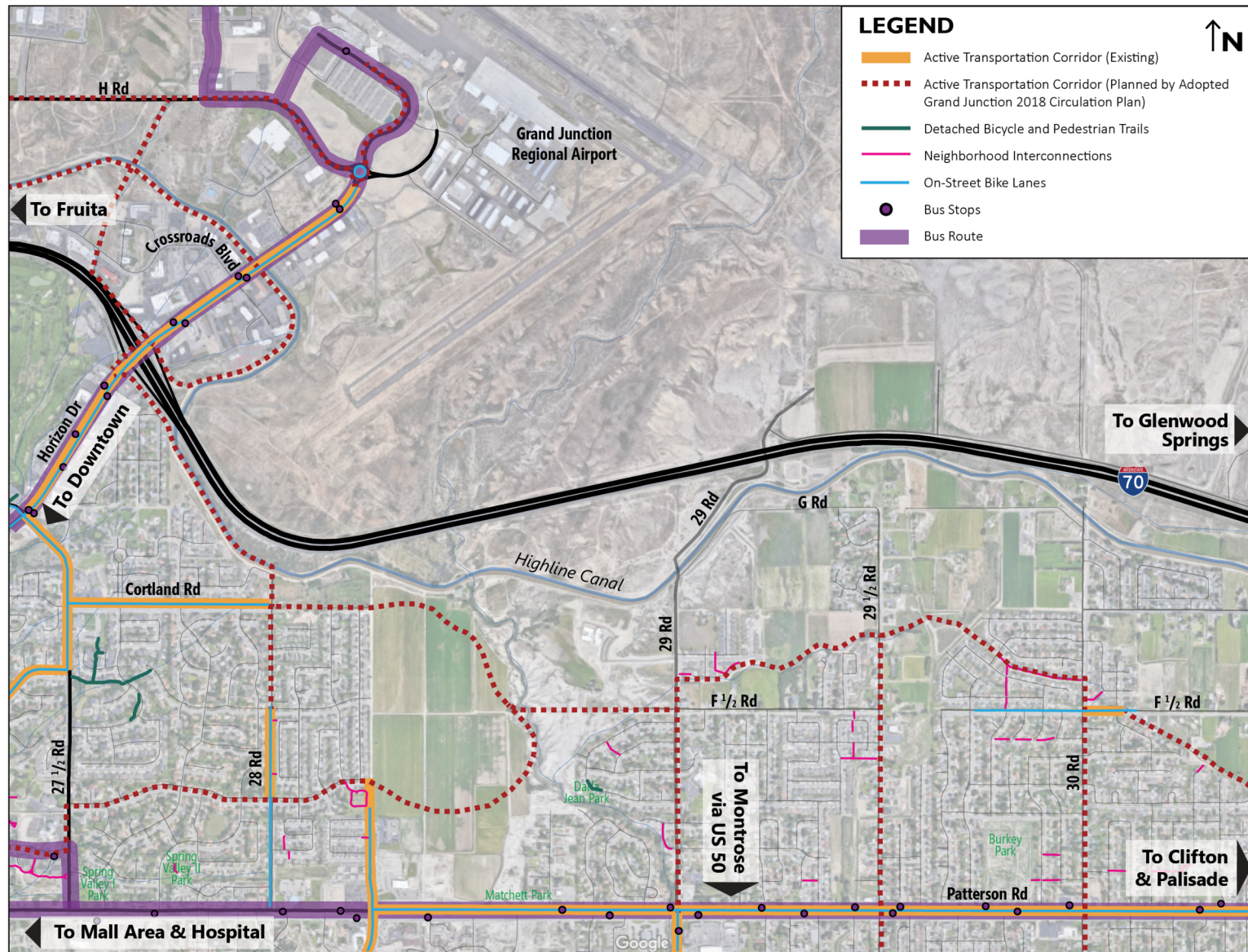
Future Multimodal

A number of future active transportation corridors have been identified for the study area, including 29 Road north of Patterson Road. The 2018 Grand Junction Circulation Plan identifies the following corridors as active transportation corridors: 29 Road north from Patterson Road to Price Ditch, Price Ditch east of 29 Road, west on F1/2 Road, 29 ½ Road south of Price Ditch, Hawthorne Avenue-Cortland Avenue, and north of Ridge Drive on 28 Road. The multimodal corridors along the Price Ditch will require approval from multiple agencies, including but not limited to the Bureau of Reclamation, the Grand Valley Water Users Association, Mesa County Irrigation District, and the Palisade Irrigation District. Although included in the City's circulation plan, the current policy of all these organizations does not allow their facilities to be used for these purposes. Therefore, extensive additional coordination will be needed.

The Grand Valley Regional Transportation Plan Update also identifies non-motorized corridors and F 1/2 Road is named as a corridor.

The recently completed Grand Valley Transit Strategic Plan does not recommend any enhancements to existing transit service or new transit service within the study area.

Figure 13. Existing and Planned Multimodal Conditions



Source: City of Grand Junction

CRASH HISTORY

Crash data was compiled and analyzed for the traffic study roadways for a three-year period from January 2015 to December 2017. The crash data for the corridors were provided by City of Grand Junction, Mesa County, and CDOT. The types of and locations of crashes were evaluated to identify safety issues that may be exacerbated by the new I-70/29 Road interchange connection and to identify mitigation measures for crash reduction that may be included in an interchange project. A summary of the crash history is shown in **Figure 14**.

I-70

Within the study period, there were 75 crashes along I-70 between Horizon Drive and I-70B. Injury crashes were 36% of the total crashes and there was one fatal crash in the westbound direction approaching the Horizon Drive interchange. Within the potential 29 Road interchange area, the majority of the crashes along I-70 were fixed object or overturning crashes. East of the potential interchange, sideswipe crashes were also predominant.

Looking at the location of crashes along the I-70 study corridor, there is a spike in the number of crashes that occurred around MP 32.0. There is a curve at that location with the Horizon Drive ramp merge and diverge immediately west of the curve. Of the 16 crashes that occurred MP 31.9-32.1, half of them (eight crashes) occurred between 7:00 AM and 8:00 AM with most of them occurring in the westbound direction. Four of those eight crashes in the AM peak hour were fixed object and secondary crashes. Three of the remaining four crashes were single-vehicle overturning crashes, theoretically caused by speed at the curve.

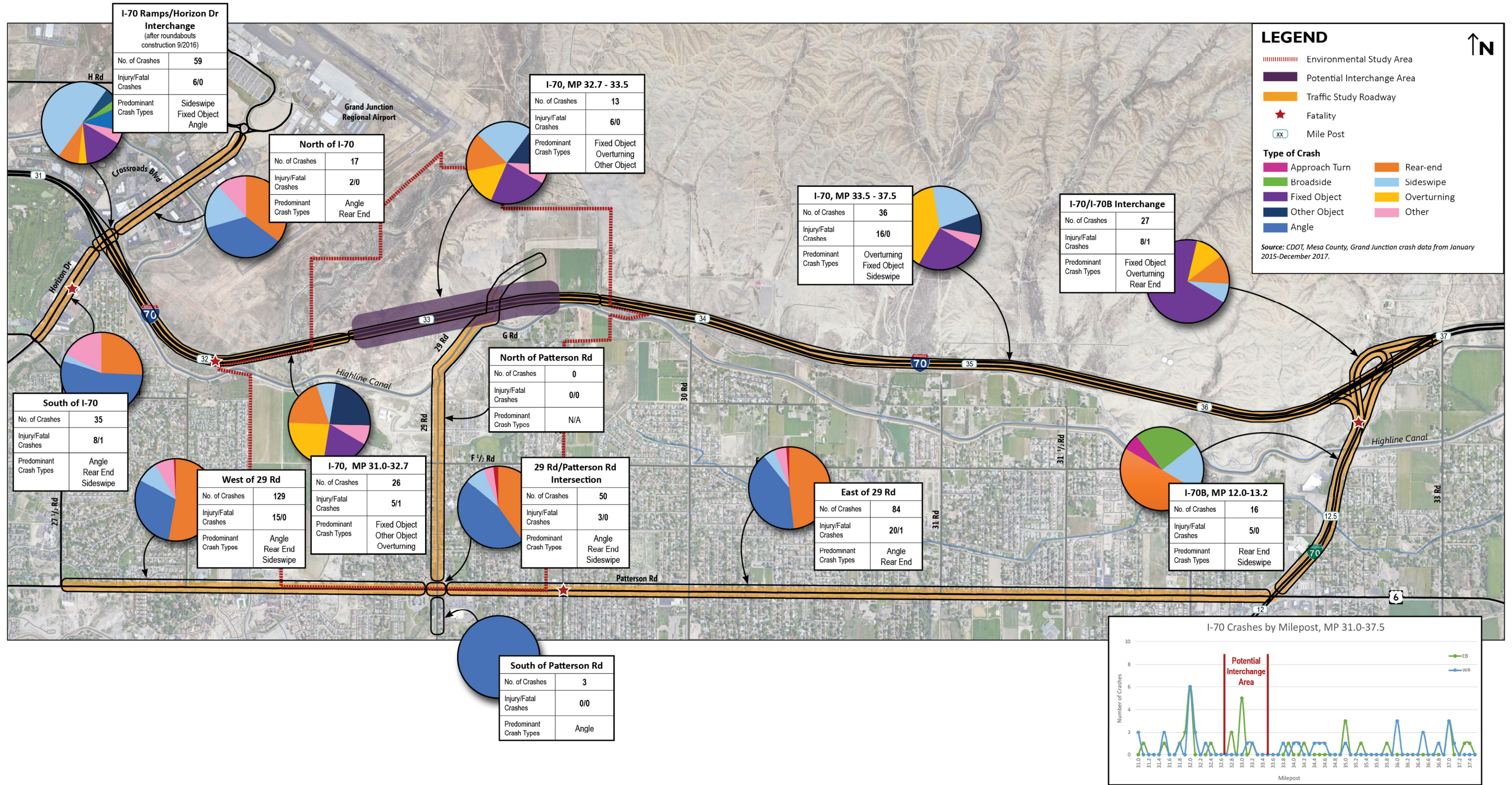
Within the potential interchange area (MP 32.7-33.5), there were 13 crashes during the three-year study period with a large spike in crashes at MP 33. Four of the crashes at MP 33 occurred on December 26, 2016 between 6:00 AM and 7:00 AM in snow/icy conditions. Therefore, most of those crashes can be considered secondary crashes and the spike in crashes at that location goes away.

29 Road

North of Patterson Road, there were no crashes along 29 Road in the three-year study period. At the 29 Road and Patterson Road intersection, there were 50 crashes and three of those were injury crashes. The predominant crash types were angle and rear end crashes, which may be associated with the intersection layout, signal phasing/timing, and congestion.

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Figure 14. Three-year Crash History



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Horizon Drive

At the I-70/Horizon Drive interchange, there were 59 crashes from the opening of the roundabouts at the ramp terminals in September 2016 to December 2017. Injury crashes were 10% of the total crashes and the large majority of crashes were sideswipe crashes. The relatively low number of injury crashes can be attributed to the roundabout intersection control. Since the opening of the Horizon Drive roundabouts, CDOT and the City of Grand Junction have closely monitored the safety of the roundabouts and implemented several minor changes, including striping modifications, additional signing, and enhanced delineation.

Within the three-year study period, Horizon Drive south of I-70 to G Road had 35 crashes with 23% injury crashes and one fatal crash, which involved a pedestrian crossing Horizon Drive mid-block at night. The predominant crash type along Horizon Drive was angle crashes, likely due to the number of driveways and left turn movements along the corridor.

I-70B

At the I-70/I-70B interchange, there were 27 crashes within the three-year study period with eight injury crashes (30%) and one fatal crash that occurred at the ramps just south of I-70. The large majority of crashes were fixed object crashes, which may be caused by the ramp geometry and barrier with the relatively high traffic speeds. Along I-70B south of the interchange, there were 16 crashes with five injury crashes (31%). The predominant crash type was rear end crashes, likely due to congestion at the I-70B/Patterson Road intersection.

ECONOMIC EVALUATION

An economic evaluation was completed for this PEL study to review population and employment trends for Mesa County and City of Grand Junction, estimate future demand for the Grand Junction market based on household and income growth, and evaluate future development opportunities for the study area with the construction of a new interchange on I-70 in the vicinity of 29 Road.

The travel demand forecasts used for this PEL study utilize the approved GVMPO 2040 travel demand model. However, for consideration with the update to the GVMPO travel demand model currently underway, this economic evaluation considered land use projections and economic growth to 2045.

The market study anticipates continued economic development and growth for Mesa County and Grand Junction with a notable shortfall in available land to meet the future demand for office, industrial, and hotel/restaurant development. Mesa County and the City of Grand Junction identified appropriate land north of I-70 east of the Grand Junction Regional Airport and between the Horizon Drive and I-70B interchanges to address the demand. This undeveloped land is particularly suited to meet the development demand because it is centrally and strategically located along I-70 and near the airport, providing an ideal location for an additional business node with the urbanized area of the city.

Although the large properties north of I-70 are planned and zoned for business park and commercial land uses, no direct access to I-70 limits the viability of development. An interchange between the airport and I-70B with access to the north would open up almost 1,400 acres of developable parcels north of I-70, including multiple large parcels zoned for Business Park Mixed Use, Industrial, Commercial/Industrial, and Future Industrial Reserve.

The City of Grand Junction, Grand Junction Economic Partnership (GJEP), and other economic development partners have had success with recruiting new business to Grand Junction from the Colorado Front Range, including Rocky Mount Roof Racks and Bonsai Zip Lines. GJEP is also working on inquiries from Federal land management agencies considering locations for an area regional office. The area north of I-70 and near the airport would provide a differentiated site for economic development recruitment.

The full market study report is provided in **Appendix C**. Below is a summary of the findings.

Summary of Findings

Grand Junction is forecast to continue to grow at a moderate pace over the 2018 to 2045 economic evaluation timeframe.

City of Grand Junction population increased from 48,130 in 2000 to 63,879 in 2018 which is an average of 875 persons per year or a 1.6% annual growth rate. The State Demographer forecasts indicate that Mesa County will grow at an average rate of 2,664 persons per year over the 2018 to 2045 time period which equates to an average annual increase of 1.4%. Holding Grand Junction's share of County growth over the 2000 to 2018 time period constant going forward, the City can expect an average of 1,068 persons per year to reach 92,724 by 2045.

Housing construction in Grand Junction has accelerated over the last three years with growth expected to continue over the near future.

Housing construction has been increasing and is close to pre-recession levels over the last three years. Recent construction has been predominately single family units at an average of 82% of the total for 2011 through 2018. According to the City's planning department, "Planning Clearances" for new development proposals have also been accelerating, growing by 42% from 361 in 2015 to over 500 in 2017 and 2018, which should translate to continued housing construction momentum.

Based on forecasted population growth, Grand Junction is expected to need an additional 12,857 housing units by 2045 which is an average of 643 units per year.

According to Colorado Department of Local Affairs (DOLA), Mesa County's population is forecast to grow by an average of 2,664 persons per year, which is an annual rate of 1.4%, to reach 225,256 by 2045. Holding Grand Junction's share of the County growth constant at 41.2%, the City is estimated to grow by 1,068 persons per year to reach 92,724 by 2045.

After a prolonged period of stagnation, Mesa County employment is also growing at pre-recession levels.

In 2017, total employment in Mesa County reached 61,136 jobs up from 49,948 in 2000—an average increase of 658 jobs per year or 1.2% over the 18-year time period. The annual growth rate was 1.4 between 2000 and 2010 before slowing during the recession. Over the last two years the economy has begun to pick up and has grown by an average of 1,500 jobs per year since 2016 which is 2.6% per year.

Mesa County is expected to experience a moderate increase in employment growth over the 18-year economic evaluation time period.

Mesa County employment is projected to add an average of 894 jobs per year to reach 70,078 jobs by 2027 which is a 1.4% annual growth rate. Projecting this rate forward to 2045, Mesa County is estimated to reach 90,632 jobs by 2045—an average annual gain of 1,142 jobs. Health Care is expected to continue to be the top industry looking forward with an additional 10,594 jobs over the 2018 to 2045 time period, which is an annual growth rate of 2.4%. The next fastest growing industries are expected to be Hotels and Restaurants with 4,346 jobs (1.8%), Construction with 3,185 jobs (2.0%), Retail Trade with 2,322 jobs (0.9%), and Manufacturing with 1,567 jobs (1.5%).

Grand Junction will need additional well-located land for industrial and business park uses over the economic evaluation 2018 to 2045 timeframe.

Based on forecasted employment growth, Grand Junction is expected to need an additional 4.6 million square feet of office, industrial, and hotel/restaurant space by 2045. Additionally, the retail commercial analysis projects a need for additional 2.7 million square feet of space. For long range planning purposes, an additional 25 to 50% allowance should be made for economic development flexibility. Using the more conservative figure, the city would be short by approximately 800 acres of industrial and business park space.

The 29 Road/I-70 interchange area is an important mode of future business park development capacity.

The Horizon Drive area has approximately 187 acres of remaining office or industrial land. The next logical location for business park development is with a new I-70 access between the airport and the I-70B interchange, which would open up a large area of developable parcels north of I-70. The 29 Road interchange would open up about 230 acres on the north side of I-70 that is owned by one property owner and can be master planned for a major business and commercial development that would provide an additional well-located site for economic development marketing and recruitment. The area is suitable for the Hotel/Restaurants industry, which is one of the fastest growing segments for Mesa County.

The proposed Horizon View Business Park would be the largest planned business park in the city and would be capable of marketing larger sites for economic development recruitment purposes if the interchange is completed and the park developed as planned. The property would also be suitable for larger retail developments such as an outlet mall, entertainment center, or membership warehouse store serving a regional trade area and seeking an interstate accessible location.

ENVIRONMENTAL OVERVIEW

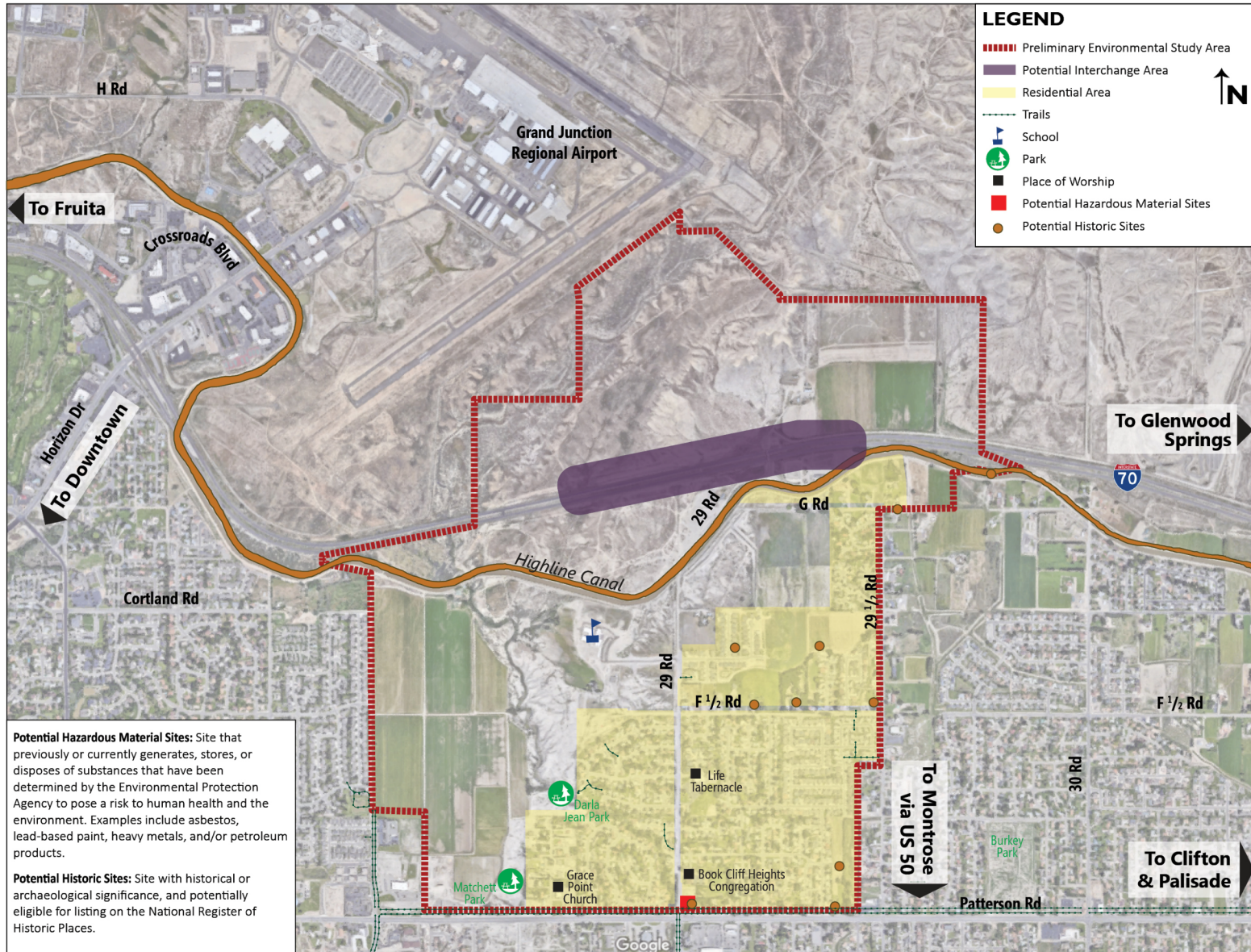
This chapter summarizes the existing environmental conditions in the study area. The described environmental resources were selected based on the characteristics of the study area and input from stakeholders. The resources are generally consistent with NEPA, its implementing regulations, and the FHWA and CDOT guidelines. The following resources were considered and illustrated as part of the built and natural environment within the study area:

- Built Environment:
 - » Air Quality
 - » Community and Social Resources
 - » Floodways and 100-year Floodplains
 - » Hazardous Materials
 - » Historic Resources
 - » Noise
 - » Parks and Recreational Resources
- Natural Environment:
 - » Prime and Unique Farmlands
 - » Water Quality
 - » Threatened and Endangered Species
 - » Wetlands and Waters of the US

Built Environment

The resources for the built environment are illustrated in **Figure 15**.

Figure 15. Environmental Resources – Built Environment



Air Quality

The purposes of an air quality analysis are to evaluate transportation actions to maintain consistency with planning goals in the air quality State Implementation Plan, present relevant air quality issues and information related to the study area, and provide information to support a subsequent analysis under NEPA.

Air quality is regulated at the national level by the Clean Air Act of 1970, as amended in 1977 and 1990. The Clean Air Act regulates emissions through the National Ambient Air Quality Standards (NAAQS) and the Hazardous Air Pollutants (HAP) program, which includes Mobile Source Air Toxics (MSATs). Specific requirements are placed on the transportation planning process in air quality nonattainment areas that do not meet the NAAQS emissions limits and in areas that have been reclassified from nonattainment to attainment/maintenance areas.

The NAAQS regulates six criteria pollutants: Carbon monoxide (CO), ground level ozone (O₃), sulfur dioxide (SO₂), nitrogen dioxide (NO₂), particulate matter, and lead. The Environmental Protection Agency (EPA) has established health- and welfare-based exposure and concentration limits for the NAAQS (EPA, 2016a). Of the six NAAQS pollutants, transportation sources contribute to CO, NO₂, PM₁₀, and ozone. The EPA works with states and local jurisdictions to monitor ambient air levels for these pollutants. In addition, MSATs have been identified as an issue of concern related to transportation projects (EPA, 2016b). Greenhouse gases (GHGs) are currently regulated via the permitting requirements of the Clean Air Act, with large sources such as power plants required to report GHG emissions (EPA, 2016c). Although transportation-related sources are also large contributors to GHG emissions, these sources are not regulated for GHG at present.

The study area is located within the Western Slope monitoring region and is within an attainment status for all NAAQS criteria pollutants; therefore, no quantitative analysis would be required in a subsequent NEPA analysis.

For this PEL study, online resources were used to describe the air quality issues of concern in the study area. EPA websites were consulted to describe the regulatory environment. Ambient air quality data were acquired from Colorado Department of Public Health and Environment (CDPHE) and compared to the NAAQS to characterize the existing conditions within the study area. The existing conditions within the study area for each major category of pollutants are:

Criteria pollutants: All areas in Colorado are currently in attainment of all NAAQS criteria pollutants except for ozone (8-hour) in the Front Range area. Areas that were previously in nonattainment for CO and particulate matter have been re-designated to

attainment/maintenance status (CDPHE, 2018a). CDPHE operates three air quality monitors in Mesa County, measuring CO, O₃, and particulate matters PM₁₀ and PM_{2.5} (CDPHE, 2018a). Two of the monitoring sites are located in Grand Junction at 650 South Avenue and 645 ¼ Pitkin Avenue.

Mobile Source Air Toxics: Tools and techniques for assessing MSATs are limited, and there are no approved exposure-concentration limits. FHWA has issued interim guidance for MSAT analyses associated with NEPA studies based on a tiered approach with no analysis necessary for projects with no potential MSAT effects, a qualitative analysis for projects with low potential MSAT effects, and a quantitative analysis to differentiate alternatives with higher potential MSAT effects (Marchese, A., 2012).

Greenhouse Gases: Recent concerns with climate change have prompted calls for reducing GHGs, of which carbon dioxide (CO₂) is a primary component. FHWA is working nationally with other modal administrations through the DOT Center for Climate Change and Environmental Forecasting to develop strategies to reduce transportation's contribution to greenhouse gases - particularly CO₂ emissions - and to assess the risks to transportation systems and services from climate changes. At the state level, there are also several programs underway in Colorado to address transportation GHGs. Based on guidance from the CEQ, GHG emissions may need to be calculated during future project development.

Community and Social Resources, Including Environmental Justice

Social resources include a variety of factors that may affect quality of life for a population. Transportation projects must consider the following potential social impact concerns: (CDOT 2017):

- Changes in neighborhoods or community cohesion
- Community resources (schools, churches, parks, shopping, emergency services, etc.)
- Community vision and values
- Community transportation resources (alternative modes, etc.)
- Community mixed-use developments, Transit Oriented Development

Information on community composition and community issues should be collected and refined throughout future project development. The study area should at least include communities within and immediately surrounding the study area. CDOT evaluates social resources for several reasons (CDOT 2017):

- To involve communities that will be affected by transportation projects (whether positively or negatively) and should be an important part of the process

- To comply with CDOT’s environmental stewardship guide, which ensures that the statewide transportation system is constructed and maintained in an environmentally responsible, sustainable, and compliant manner
- To comply with several legal mandates that pertain to communities and federally funded projects

Land use in the study area is composed primarily of residential and agricultural, with interspersed commercial development primarily along Patterson Road. Community and social resources within the study area include:

- Independence Academy Charter School (675 29 Road)
- Life Tabernacle Church and Academy Christian School (363 29 Road)
- Grace Point Church (606 28 3/4 Road)
- Bookcliff Heights Congregation (608 29 Road)
- Darla Jean Park (2868 Darla Drive)
- Matchett Park (28 1/4 Road and Patterson Road)

Additional discussion regarding the resources listed above can be found in the Cultural, Parks and Recreation, and Noise sections of this report.

Environmental Justice

Environmental Justice (EJ) is the fair treatment of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws and policies, as defined by Federal law. EJ originates from Title VI of the Civil Rights Act of 1964, which prohibits discrimination based on race, color, or national origin in any activity receiving federal financial assistance” (CDOT 2017). EJ is regulated by Executive Order (EO) 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (1994). Potential adverse impacts to minority and low-income populations could result from:

- Property loss due to right-of-way acquisition;
- A change in air quality and noise impacts;
- Destruction or diminution of aesthetic values;
- Destruction or disruption of community cohesion or a community’s economic vitality;
or
- Destruction or disruption of the availability of public and private facilities.

Low-income is defined as a household income at or below the Department of Human Services' poverty guidelines (CEQ 1997), which are based on the Census Bureau poverty thresholds. An evaluation of household income and minority populations within the study area was performed by comparing American Community Survey Census (2013-2017) five-year estimate data for the study area to the county average (USCB 2017). The study area includes three Census tracts that would be potentially affected: Block Group 2 within Tract 16, Block Group 1 within Tract 11.01, and Block Group 3, within Tract 10.01. Based on review of the census data, the tracts within the study area do not have a higher percentage of low income households or minority populations compared to the county average.

Limited-English proficient (LEP) populations were also evaluated to make sure they can effectively participate in and benefit from federally-assisted projects and that project actions do not violate the Title VI prohibition against national origin discrimination. For purposes of this assessment, individuals who do not speak English as their primary language and have a limited ability to read, write, speak, and understand English are considered to be LEP. Census data for populations 18 years old and older that speak English not at all, not well, and well was collected and compared to Colorado and Mesa County. Based on review of the census data, the tracts within the study area do not have a higher percentage of LEP populations compared to Colorado or the county average.

Floodways and 100-year Floodplains

A "Regulatory Floodway" means the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height. Communities must regulate development in these floodways to ensure that there are no increases in upstream flood elevations. For streams and other watercourses where Federal Emergency Management Agency (FEMA) has provided Base Flood Elevations (BFEs), but no floodway has been designated, the community must review floodplain development on a case-by-case basis to ensure that increases in water surface elevations do not occur, or identify the need to adopt a floodway if adequate information is available.

Executive Order (EO) 11988, Floodplain Management (1977): Requires federal agencies to avoid to the greatest extent possible the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative (FEMA, 2015). A review of FEMA flood insurance rate maps was conducted and no FEMA floodplain designations occur within the study area (FEMA, 2019).

The existing Indian Wash channel runs northwest to southeast through the project area, running adjacent to 29 Road just north of Patterson Road. There is no designated FEMA floodplain north of Patterson Road, but to the south of Patterson Road is a designated Zone AE with base flood elevations determined. Changes to 29 Road may require hydraulic modelling for the channel with future project development due to the proximity to the channel and the downstream floodplain designation. The upstream crossing of I-70 for Indian Wash consists of a two-cell 10-foot by 10-foot reinforced concrete box culvert.

Hazardous Materials

Hazardous materials include substances or materials that have been determined by the EPA to be capable of posing an unreasonable risk to health, safety, or property. Hazardous materials may exist within the study area at facilities that generate, store, or dispose of these substances, or at locations of past releases of these substances. Examples of hazardous materials include asbestos, lead-based paint, heavy metals, dry-cleaning solvents, and petroleum hydrocarbons (e.g., gasoline and diesel fuel), all of which could be harmful to human health and the environment.

Hazardous materials are regulated by various state and federal regulations. NEPA, as amended (42 US Code (USC) 4321 et seq., Public Law 91-190, 83 Stat. 852), mandates that decisions involving federal funds and approvals consider environmental effects from hazardous materials. Other applicable regulations include the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)(42 USC 9601 et seq.), which provides federal authority for the identification, investigation, and cleanup of sites throughout the US that are contaminated with hazardous substances (as specifically designated in the CERCLA) and the Resource Conservation and Recovery Act of 1976 (RCRA) (42 USC 321 et seq.), which establishes a framework for the management of both solid and hazardous waste. The federal Hazardous and Solid Waste Amendments of 1984 established a new comprehensive regulatory program for underground storage tanks containing petroleum products and hazardous chemicals regulated under CERCLA. In 2016, the EPA retired the CERCLA Information System database, and replaced it with a more modern system called the Superfund Enterprise Management System.

An environmental database records search of federal and state environmental resources was conducted for the study area (GeoSearch, 2018). The search was completed in accordance with the search radii specified in ASTM International (ASTM) Designation E 1527-13, "Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process" (ASTM, 2013). For this assessment, ASTM-required databases were reviewed; non-ASTM required databases were not evaluated. Numerous facilities were

identified in the study area and several of these facilities were identified with multiple database listings (GeoSearch, 2018). The non-ASTM databases are not listed in the results. The database information with respect to the status of the listing and its location within the study area boundaries were evaluated. In addition, the compliance history of the study area, and any adjacent sites, as identified by a regulatory database search, was reviewed.

The environmental records search identified the following ASTM-required types of facilities (GeoSearch, 2018):

- Resource Conservation & Recovery Act – Generator (RCRAGR08) facilities
- Resource Conservation & Recovery Act –Corrective Action (RCRAC) Facilities
- Aboveground Storage Tanks (AST)
- Underground Storage Tank (UST) facilities
- Leaking Underground Storage Tank (LST) facilities
- Hazardous Waste Sites – Corrective Action (HWSCA)

Facilities that utilize hazardous materials are primarily located near the southern boundary of the study area and within developed areas. The majority of the facilities identified in the environmental records search have been identified in the UST and LST databases. UST sites and LST sites are typically associated with petroleum hydrocarbon use (e.g., automotive fueling stations, airports, etc.) and potential releases.

The facilities identified in the agency database were ranked as having either a high, medium, or low potential to impact based on the location of these facilities and known releases. Five facilities were identified within or closely adjacent to the study area, as listed in **Table 8**. Only one facility was identified within the environmental study area: Site #3, Lucky Me gas station in the northeast corner of the 29 Road and Patterson Road intersection.

- Two facilities (Sites #3 and #22) were categorized as medium risk to impact due to current fueling station operations or active UST listings, but no current reported releases.
- One facility (Site #24) was considered to be a low risk as the listing is a conditionally exempt small quantity generator and produces less than 100 kilograms (220 pounds) of hazardous waste per month. This hazardous waste is likely related to products sold in the pharmacy.
- One facility (Site #26) was considered to be a medium risk due to a closed LST event. The site is located north of the study area at the Grand Junctional Regional Airport.

- One facility (Site #27) was considered to have a high potential risk based on its listing as a corrective action site with previous violations as well as unknown housekeeping practices. The site is located north of the study area at the Grand Junctional Regional Airport.

Table 8. Potential Hazardous Material Sites

| DATABASE NUMBER | FACILITY NAME | FACILITY ADDRESS | DATABASE | STATUS | POTENTIAL FOR IMPACT |
|-----------------|------------------------|-------------------------------------|------------------------|----------------------------------|----------------------|
| 3 | Lucky Me Premises LLC | 2902 Patterson Road | AST, LST, UST | Closed, Closed, Open | Medium |
| 22 | Safeway Fuel Center | 29 Road Patterson [sic]/2915 F Road | AST, UST | Unknown, Open | Medium |
| 24 | Safeway Store #1533 | 2901 F Road | RCRAGR08 | Open | Low |
| 26 | FAA Grand Junction VOR | Glade Park | LST | Closed | Medium |
| 27 | West Star Aviation LLC | 790 Heritage Way | RCRAC, HWSCA, LST, LST | Unknown, Unknown, Closed, Closed | High |

Source: GeoSearch, 2018

Historic Resources

Section 106 of the National Historic Preservation Act of 1966 requires federal agencies to take into account the effects of their undertakings on historic properties. The Section 106 process involves the identification of historic properties, the evaluation of effects, and resolution of adverse effects. Section 106 is a procedural law that involves consultation with the State Historic Preservation Office (SHPO) and other interested, or consulting parties.

In addition, Section 4(f) of the Department of Transportation Act also applies to historic sites listed on or eligible for the National Register of Historic Places (NRHP). The applicability of Section 4(f) is linked to the determinations of eligibility and effect under Section 106. A file search was conducted in January 2019 on History Colorado's database for the sections of land within the environmental study area. Site files for all previously surveyed properties within the study area were reviewed. Lists of properties on the State and National Registers in Mesa County and Grand Junction were also reviewed. No field assessment was conducted to verify the location and existence of any previously recorded properties.

Included in this report are those properties that have been assessed as eligible for inclusion on the NRHP, and those that are potentially eligible for the NRHP. There are no properties listed on the State and National Registers in the study area. For PEL studies, designated local landmarks are also included; the City of Grand Junction does not have any designated landmarks or historic districts within the study area.

Historical Overview

The earliest known residents of the Western Slope were the Basketmaker people, who lived in the area from approximately 1-450 C.E. Following the Basketmakers, the Fremont and Ancestral Puebloans settled in the region of Western Colorado. Little is known of the Fremont culture, other than that they were semi-nomadic farmers and foragers who resided in the northern and central parts of the Western Slope. Beginning in 750 C.E., the Ancestral Puebloans, also known as the Anasazi, farmed and harvested in what is now known as the Four Corners region, including the southwest corner of Colorado, but left the region by 1300, possibly due to changing weather patterns or conflict with other groups. During this period, the Ute people migrated into the mountains of Colorado from the west and were fully settled in the region by 1600. The Utes learned horsemanship from Spanish explorers and primarily resided in what is now known as the Western Slope region of Colorado and eastern Utah, while often venturing onto the plains to hunt, where they encountered the Cheyenne, Arapahoe, Comanche, and Apache peoples. These were the Native Peoples that European, and later American, explorers encountered as they ventured into Colorado.

Only a few Spanish explorers ventured into Western Colorado, and not until the eighteenth century. Don Juan Maria de Rivera was the first to scout the Western Slope in 1765, venturing into the Gunnison Valley looking for precious metals. In 1776 the Dominguez and Escalante expedition explored deeper into the Colorado Plateau, passing by the future site of Grand Junction at the confluence of the Grand (Colorado) and Gunnison Rivers. Although successful in colonizing the New Mexico region, the Spanish never established a strong settlement north of Santa Fe. The United States began sending their own explorers in the newly acquired Louisiana Purchase in the early nineteenth century. Zebulon Pike was the first American to officially explore Colorado. Although he ventured into South Park looking for the source of the Red River, he was not able to cross the Continental Divide. Decades later John Fremont entered the Rocky Mountains searching for a possible rail route through the mountains but was held back in the San Juan Mountains. In 1853 Captain John Gunnison led the U.S. Topographical Corps over the San Juan Mountains and into the Gunnison Valley, following it to the Grand River. In the early nineteenth century, “mountain man” adventurers learned the mountain passes as they trapped beaver and other furs across Rockies. These fur trappers not only guided Fremont and Gunnison, but also the oncoming miners looking to strike it rich in Colorado’s gold fields.

The gold discoveries along the South Platte River in Colorado’s Front Range in 1859 were quickly followed by the founding of Denver and further mineral exploration into the mountains. The arrival of the railroads in 1870 cemented the Colorado Territory’s importance as a mineral producing region, and the cities along the Front Range grew quickly.

Aside from a handful of small mining communities in the San Juan Mountains, the territory's economic growth and settlement occurred almost exclusively to the east of the Continental Divide prior to the 1880s. In the 1870s the Utes consisted of six separate bands with broad territorial claims, although the U.S. government often treated them as a single group of people. The first Ute reservation was created in 1868, when the Utes made an agreement to leave the central mountains. This large reservation extended roughly from Pagosa Springs north to Steamboat Springs, and west to the Utah line. The 1874 Brunot Treaty further shrunk the reservation as the U.S. claimed the region around the mineral-rich San Juan Mountains for settlement. By the end of the 1870s settlers and politicians alike were calling for the complete removal of the Utes from Colorado. Tensions came to a head in 1879 in response to the "Meeker Massacre," in which a small group of White River Utes attacked and killed the Indian Agent Nathan Meeker, as well as a garrison of troops, who had been attempting to "civilize" the natives by teaching them agriculture. In 1880 nearly all the Utes were forced to leave Colorado, aside from two small reservations in the southwest corner of the state.

Soon after the Utes' removal, the Denver and Rio Grande Railroad (D&RG) began building from Gunnison toward the Grand Valley in 1881. That same year George Crawford, a veteran town-builder from Kansas, led a small group to the confluence of the Gunnison and Grand Rivers and founded the town of Grand Junction. Crawford established the Grand Junction Town Company and sold half of the shares to the D&RG with the promise they would build their shops and a depot in the new town. With this transportation link secured, Grand Junction quickly became the urban commercial center of the Western Slope. Southeast of Grand Junction, Montrose and Delta grew as railroad towns servicing a thriving agricultural community in the river bottoms that fed nearby mining communities. Surrounding Grand Junction, farmers in Mesa County planted large orchards that produced a wide variety of fruits including peaches, apples, cherries, pecans, and walnuts. Livestock raising was also a major aspect of Grand Junction's economy. Ranchers grazed their cattle and sheep on the mesa tops and mountain valleys near the town, utilizing the stockyards in Grand Junction to ship their animals to markets around the country. By the turn of the century, the broad river valleys of the Western Slope had become one of the major agricultural centers of the state.

The key to this agricultural success was a vast network of irrigation canals. Similar to early descriptions of the Eastern Plains, the Grand Valley was described by early explorers as a desolate and inhospitable environment composed of dry alkaline soil that transformed to impenetrable mud when it did happen to rain. Water diverted from the Grand River transformed this landscape into a fertile growing region. The earliest irrigation canals, including the Pioneer Ditch and the Pacific Slope Ditch, were constructed by private

enterprises. Although functional, they were often not well maintained resulting in frequent flooding of both fields and city streets. Following the Newlands Act in 1902, the United States Bureau of Reclamation became involved in the water infrastructure of the region, constructing large-scale projects that further expanded production. Completed in 1915, the Government Highline Canal (5ME.4676), part of the Grand Valley Project, extended for 55 miles from Palisade to Fruita, watering the northern regions of the valley. Even more ambitious, the Uncompahgre Project, or Gunnison Tunnel, consisted of a six-mile tunnel through solid rock directing water from the Black Canyon of the Gunnison to the Uncompahgre Valley surrounding Montrose. These projects significantly increased agricultural production, which in turn fed urban development.

Founded in 1881, Grand Junction grew rapidly as the new city and farms supported each other. The merchants in town could not survive without farmers purchasing goods, and growers and ranchers could not succeed without an urban center to purchase supplies and sell and transport their goods. By 1882, commercial interests in Grand Junction included a meat market, blacksmiths, three hotels, saloons, a newspaper, and a pharmacy. As an urban landscape, the city was modelled after the midwestern towns that produced many of its early inhabitants. The town was built in a straight grid on a large plot of land north of the river, revealing the ambitions of its founders. Colorado Avenue was laid out for commerce, but land was also set aside for parks, churches, and public buildings. Grand Junction was designed as, and became, the largest city between Denver and Salt Lake City. The town faced difficult times in the 1920s when orchards failed to produce due to swarms of codling moths that attacked fruit trees and soil salination resulting from over-irrigation. The Great Depression hit Mesa County as hard as it did most of the country, although the county saw a population increase of Dust Bowl refugees from eastern Colorado.

Following World War II, an economic boom hit Grand Junction as uranium mining exploded in the region. Although there had been interest in oil shale production and small-scale placer mining during the region's early settlement, mineral production had never been a strong part of Mesa County's economy. That changed rapidly in 1948 when the Atomic Energy Commission (AEC) published the findings of their recent explorations. Reminiscent of the gold and silver booms of the nineteenth century, large companies and individual prospectors poured into the Colorado Plateau region seeking a uranium claim. Between the late 1940s and the early 1960s over one hundred uranium companies were based out of Grand Junction. Fueled by Cold War production, the AEC utilized uranium for military projects as well as nuclear energy. However, the AEC was the only authorized purchaser of uranium ore. The presence of a guaranteed buyer set off the mining boom, but eventually production outpaced the government's need and purchasing power. Beginning to decline in 1958, the

uranium boom was finished by the 1970s. While Grand Junction and Mesa County were hit hard economically, the region continued to be productive as a major agricultural center. The construction of I-70 and the Eisenhower and Johnson Tunnels in the 1970s increased the tourism trade in the region that continues to the present.

Historic (Architectural) Resources

All historic resources identified in this study will need to be evaluated once a project is identified and funded to move forward into the NEPA process, in addition to any other resources that are 45 years or older that haven't been previously surveyed. At this time, there are no known historic districts within the project area. It is possible that the eligibility status noted in this report could change once the Section 106 process takes place.

A total of nine historic properties have been previously recorded within the study area, including eight residential properties and one irrigation ditch. The residences (5ME.2668, 5ME.2671, 5ME.2672, 5ME.2673, 5ME.2674, 5ME.2675, 5ME.2676, and 5ME.2677) were constructed between 1900 and 1925. Previous survey of these properties was conducted in 1981 and no assessment was made regarding their eligibility. Two irrigation ditches are listed below.

Government Highline Canal (South of I-70 through Project Area) 5ME.4676

The Government Highline Canal was constructed between 1912 in 1915 and is significant for its association with early Bureau of Reclamation irrigation programs and the economic development of Mesa County. The canal extends for 55 miles through the northern area of Grand Valley. Sections of the canal have been lined with membranes and concrete. The Government Highline Canal was determined Officially Eligible in 1985. This resource extends across the width of the study area south of I-70.

Noise

Noise is generally defined as unwanted or undesirable sound. If federal funding is obtained for future design or construction, the work may require a traffic noise analysis using CDOT methodology, depending on the type of proposed improvements. CDOT categorizes the sensitivity of noise receptors based on a property's land use type. The noise analysis would compare future noise levels to the CDOT Noise Abatement Criteria (NAC) for different types of land uses. Land uses that require serenity are the most sensitive (NAC Category A), while commercial/industrial (NAC F) are the least sensitive. Those land uses and associated NAC decibel (dBA) levels are listed in **Table 9**.

Table 9: Noise Abatement Criteria

| ACTIVITY CATEGORY | ACTIVITY DBA (DECIBEL) | ACTIVITY DESCRIPTION |
|-------------------|---------------------------|--|
| A | 56 (exterior measurement) | Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose. |
| B | 66 (exterior) | Residential |
| C ¹ | 66 (exterior) | Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or non-profit institutional structures, radio studios, recording studios, recreational areas, Section 4(f) sites, schools, television studios, trails, and trail crossings. |
| D | 51 (interior) | Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or non-profit institutional structures, radio studios, recording studios, schools, and television studios. |
| E ¹ | 71 (exterior) | Hotels, motels, time-share resorts, vacation rental properties, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F. |
| F | NA | Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, ship yards, utilities (water resources, water treatment, electrical), and warehousing. |
| G | NA | Undeveloped lands that are not permitted for development. |

¹ Includes undeveloped lands permitted for this activity category.

Source: CDOT, 2015

Noise-sensitive receivers were identified within the study area using online resources including desktop utilities. Locations with noise-sensitive activity for NAC C receivers (all community resources) are shown on **Figure 15**. This activity category requires that a threshold of 66 dBA be reached in order to consider mitigation. NAC A receivers were not identified within the study area. NAC B receivers are residential areas within the study area. NAC B noise receivers were not individually counted; rather, they were grouped together based on land use data. NAC D (interior noise readings) will not need to be considered for this project. NAC E land uses are not prevalent in the study area and only occur at a few locations along Patterson Road. This activity category requires that a threshold of 71 dBA be reached in order to consider mitigation. NAC F receivers are located within the study area, and primarily includes farming operations under a farm lease in the vicinity of Matchett Park. These locations are considered to generate significant on-site noise and are not considered noise-sensitive receivers. Undeveloped lands not permitted for development do not have noise thresholds; however, these lands should be included in noise assessments if noise contour lines depict noise levels of 66 dBA and 71 dBA.

Parks and Recreational Resources

Parks and recreation resources were evaluated within the study area because they are important community facilities that warrant consideration during federally-funded transportation projects. Impacts to public parks and recreational resources are generally under the jurisdiction of Section 4(f) (23 CFR 774) of the US Department of Transportation (DOT) Act. Section 4(f) affords special protection to parks, recreation areas, and wildlife/waterfowl refuges that are open to the public. Section 4(f) stipulates that the FHWA and other agencies under the purview of the US DOT may not approve a “use” of a Section 4(f) property unless there is no feasible and prudent alternative and all efforts to minimize harm to the resource have been implemented (FHWA, 2016). Furthermore, “future” public recreation facilities that are documented in an official planning document are also considered Section 4(f) properties.

Some recreational properties have been purchased or improved with funds from the Land and Water Conservation Fund Act (LWCFA) and are therefore subject to regulation as defined in Section 6(f) of the LWCFA. Section 6(f) protects these properties as public recreation facilities in perpetuity and prohibits a “conversion” of a property from recreational use unless a suitable (size, usefulness, monetary value) property can be found (FHWA, 2013). The LWCF Act is run by the National Park Service and administered locally in Colorado by CPW.

Section 4 (f)

Several sources of data were referenced to identify parks and recreational facilities within the study area, including the 2009 Grand Junction Comprehensive Plan, Grand Junction Bicycle and Pedestrian Routes Map (2016), Grand Valley 2040 Regional Transportation Plan Update (2014), Mesa County GIS Online Viewer, BLM’s Resource Management Plan for the Grand Junction Office (2015), and available aerial photography and mapping.

The study area includes two existing parks: Darla Jean Park located on Darla Drive and Matchett Park located on Patterson Road. Other existing recreational facilities in the study area include several neighborhood interconnection trails that utilize sidewalks and other paved off-road shared paths for pedestrian and bicycle travel. There are also bicycle lanes in both directions of Patterson Road along the southern boundary of the study area.

Matchett Park has remained undeveloped since it was acquired in 1996, but Grand Junction has approved a Master Plan and received grant funding for improvements to the park. Proposed recreational facilities in the Master Plan include a community recreation and aquatic center, sporting fields, festival pavilion, walking trails, bicycle paths, and nature

viewing areas. In addition to the planned improvements to Matchett Park, the 2040 Regional Transportation Plan identifies non-motorized transportation improvements along F1/2 Road. Bike lanes would be added to F1/2 Road, starting at 33 Road and continuing west into the study area to connect with trails at Matchett Park. The F1/2 Road bike lanes were identified as a Tier 2 project representing moderate regional benefit as assessed and scored by a 2040 planning subcommittee. The portion of 29 Road within the study area is also identified as part of the future non-motorized network concept within the 2040 Regional Transportation Plan, but no scoring or tier rating was assigned.

Outside of the study area and approximately 0.5 mile north of I-70, the majority of the land is owned and managed by the BLM. The area is referred to as the Grand Valley Off-Highway Vehicle (OHV) Special Recreation Management Area (SRMA) and encompasses approximately 15 square miles bounded by 27 ¼ Road to the west and 32 Road to the east. The BLM's Resource Management Plan (2015) includes 29 Road as an access point for the Grand Valley SRMA, but according to BLM's online interactive map there are currently no recreational facilities, trails, or other designated points of interest in the area. The Resource Management Plan states that 29 Road offers opportunities for future development of recreation support facilities such as parking/unloading areas, restrooms, campsites, and event venues. Signage and/or fencing could also be installed to clearly define the BLM areas open for OHV recreation.

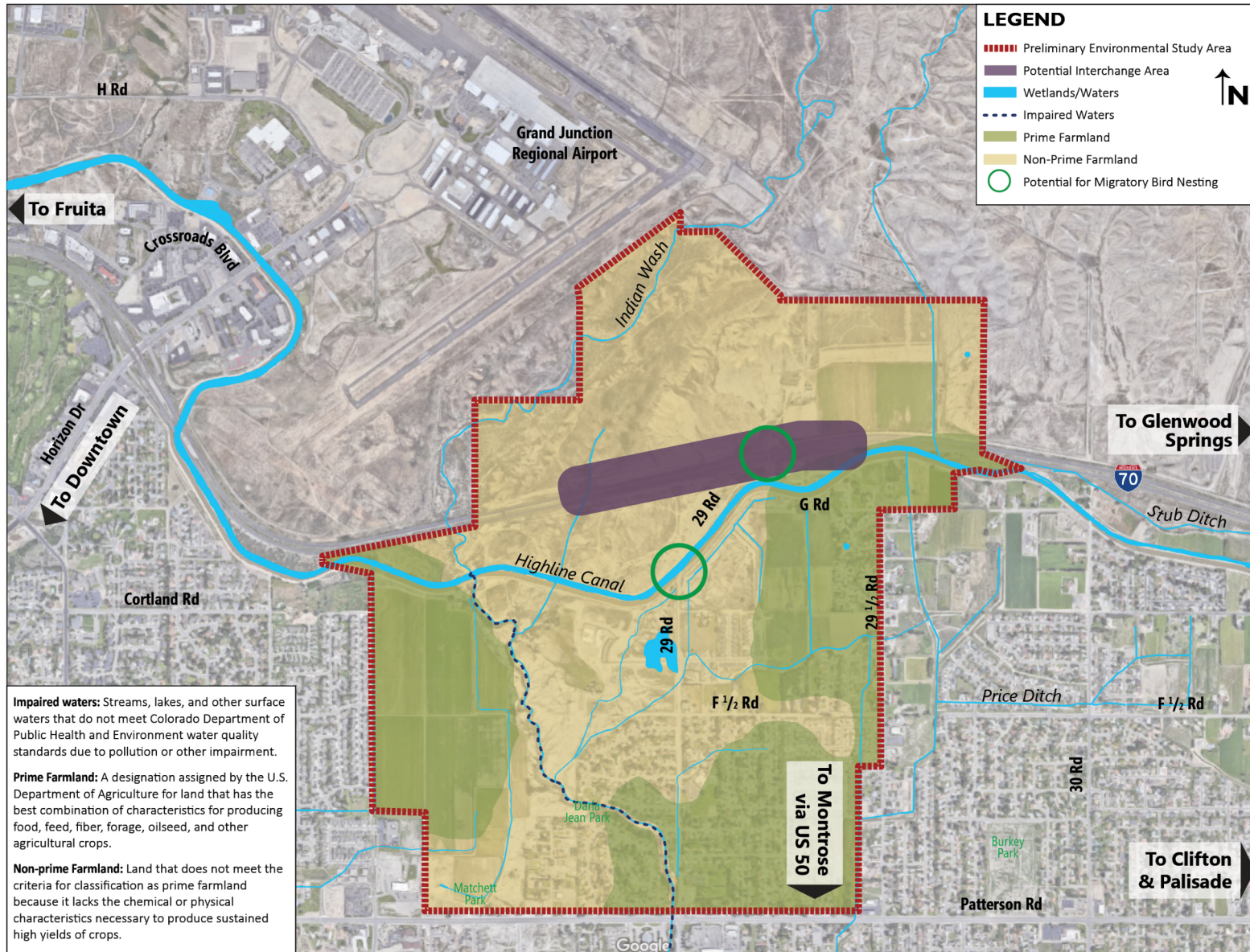
Section 6 (f)

Section 6(f) of the LWCFR is overseen in Colorado by CPW and applies to the outdoor recreational facilities that were acquired or purchased, partially or wholly, with funds from the LWCFR. Section 6(f) requires that these properties be maintained as such in perpetuity and any conversion of the property must be coordinated with the US Department of the Interior. Based on a review of CDOT's OTIS, there are no Section 6(f) properties located within the study area.

Natural Environment

The resources for the natural environment are illustrated in **Figure 16**.

Figure 16. Environmental Resources – Natural Environment



Prime and Unique Farmlands

Farmlands are a valuable economic and cultural resource that is protected by the Farmland Protection Act, which requires federal agencies to consider adverse effects that projects may have on the preservation of farmland (CDOT, 2014). Prime farmland is defined as land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is also available for these uses. It has the soil quality, growing season, and moisture supply needed to produce economically sustained high yields of crops when treated and managed according to acceptable farming methods, including water management (USDA, 2017). In general, prime farmland meets the following criteria:

- adequate and dependable water supply from precipitation or irrigation
- favorable temperatures and growing season
- acceptable acidity or alkalinity, salt and sodium content, and few or no rocks
- permeable to water and air
- not excessively erodible or saturated with water for a long period of time, and it either does not flood frequently or is protected from flooding

Unique farmland is land other than prime farmland that is used for the production of specific high-value food and fiber crops. It has the special combination of soil quality, location, growing season, and moisture supply needed to economically produce sustained high quality and/or high yields of a specific crop when treated and managed according to acceptable farming methods (USDA, 2017).

To evaluate the presence of prime or unique farmland in the study area, data were obtained from the Soil Survey Geographic Database (SSURGO) for Mesa County (NRCS, 2019). Approximately 397 acres (36%) of the study is classified as “prime farmland if irrigated.” These areas occur within Matchett Park and throughout the eastern and southeastern portions of the study area. Much of the land in the southeastern study area is currently residential and would not qualify as prime farmland because it is not available for farming. Further evaluation of other lands identified as “prime farmland if irrigated” would be required to determine if irrigation water is being applied. Those lands that are verified as prime farmland would require analysis of the project design impacts and coordination with the NRCS.

Water Quality

Section 303(d) of the Clean Water Act (CWA) regulates water quality for surface and groundwater in each state. Each state is required to assess and report the water quality status of all surface water bodies and classify the intended uses of each water body in order to develop criteria to protect the designated uses of these water bodies. A list of water bodies that are not meeting their designated uses because of excess pollutants is published and for each water body that is included on the list, Colorado identifies the pollutant causing the impairment and a priority is assigned for development of Total Maximum Daily Loads (TMDL) based on the severity of the pollution and the sensitivity of the uses to be made of the waters.

In addition, Colorado's Monitoring and Evaluation List identifies water bodies where there is reason to suspect water quality challenges, but there is also uncertainty regarding one or more factors. This Monitoring and Evaluation list is a state-only document that is not subject to EPA approval; however, it is included with the list of impaired waters. The annual list is known as "Regulation #93 – Colorado's Section 303(d) List of Impaired Waters and Monitoring and Evaluation List" and is organized by watersheds, which are further divided into stream segments (CDPHE 2018b).

The CWA establishes the National Pollutant Discharge Elimination System (NPDES), which is a permitting system that regulates point sources of pollution that discharge directly to a state water or a sewage treatment plant which includes Municipal Separate Storm Sewer Systems (MS4). The CDPHE Colorado Water Quality Division administers the NPDES program under the Colorado Discharge Permit System (CDPS). Colorado is authorized to issue both individual and general permits to MS4s through the CDPS regulations.

According to Colorado's Section 303(d) List (effective March 2, 2018), all tributaries to the Colorado River, including wetlands, are listed as impaired from the Government Highline Canal Diversion to a point immediately below Salt Creek. Within the study area, this includes Indian Wash (Waterbody ID: COLCLC13b_D) which is listed as impaired for aquatic life use due to selenium and iron. A TMDL for this stream segment has not yet been developed. With a future project, no regulated water may be introduced into the Government Highline Canal system, including drainage facilities.

Threatened and Endangered Species

Federally Listed Species

A review of the USFWS Information for Planning and Consultation (IPaC) system (USFWS, 2019) indicates that there is a potential for nine threatened and endangered species to occur in, or potentially be affected by activities in the study area (see **Table 10**).

Table 10. Federally Listed Species with Potential to Occur in the Study Area

| COMMON NAME | SCIENTIFIC NAME | FEDERAL STATUS | HABITAT | POTENTIAL FOR OCCURRENCE |
|---------------------------|-------------------------------------|----------------|---|---|
| Birds | | | | |
| Mexican Spotted Owl | <i>Strix occidentalis lucida</i> | FT | Old-growth or mature forests with complex structural components. | Unlikely. Suitable habitat does not occur in the study area. |
| Yellow-billed Cuckoo | <i>Coccyzus americanus</i> | FT | Wooded riparian habitat with a dense shrubby understory and cottonwoods | Possible. Suitable habitat exists along portions of Indian Wash, a tributary to the Colorado River which is proposed as critical habitat for the species. |
| Fish | | | | |
| Bonytail Chub | <i>Gila elegans</i> | FE | Backwaters with rocky or muddy bottoms and flowing pools. | Possible. Known to occur in the Colorado River and Upper Colorado River basin. |
| Colorado Pikeminnow | <i>Ptychocheilus lucius</i> | FE | Various habitats or larger rivers, including deep turbid strongly flowing water, eddies, runs, flooded bottoms, or backwaters | Possible. Known to occur in the Colorado River and Upper Colorado River basin. |
| Greenback Cutthroat Trout | <i>Oncorhynchus clarkii stomias</i> | FT | Cold and clear water streams of moderate gradient | Unlikely. Suitable habitat does not occur in the study area. |
| Humpback Chub | <i>Gila cypha</i> | FE | Associated with a variety of habitats ranging from pools with turbulent to little or no current; substrates of silt, sand, boulder, or bedrock; and depth ranging from 1 to 15 meters | Possible. Known to occur in the Colorado River and Upper Colorado River basin. |
| Razorback Sucker | <i>Xyrauchen texanus</i> | FE | Large rivers in areas of strong current and backwaters | Possible. Known to occur in the Colorado River and Upper Colorado River basin. |
| Plants | | | | |
| Colorado Hookless Cactus | <i>Sclerocactus glaucus</i> | FT | Alluvial benches, gravelly or rocky surfaces, on river terrace deposits, and lower mesa slopes along the Colorado River | Possible. Study area is located within the species' element occurrence (CNHP). Suitable habitat is potentially present in the northern portion of the study area. |

Source: USFWS 2019a, USFWS 2019b

Notes:

FE=Federally Endangered

FT=Federally Threatened

No critical habitat exists within the study area for any Federally listed species. However, the Colorado River is designated as critical habitat for the bonytail chub, Colorado pikeminnow, humpback chub, and razorback sucker. The Government Highline Canal extends through the study area and receives water diverted from the Colorado River. The study area is located within the Upper Colorado River Endangered Fish Recovery Program and water depletions in the basin may adversely affect these species. The USFWS has prepared a Programmatic Biological Opinion for Section 7 consultation related to water depletions in the Upper Colorado Basin.

State-Listed Species

According to the CNHP Tracking List, 21 state-listed species were identified with the potential to occur in the study area (see **Table 11**).

Table 11. State-Listed Threatened and Endangered Species with Potential to Occur in the Study Area

| COMMON NAME | SCIENTIFIC NAME | STATE STATUS | HABITAT | POTENTIAL FOR OCCURRENCE |
|-----------------------|---------------------------|--------------|--|---|
| Amphibians | | | | |
| Boreal Toad | <i>Anaxyrus boreas</i> | SE | Ranging from desert springs to mountain wetlands, and upland areas around ponds, lakes, reservoirs, and slow-moving rivers and streams | Unlikely. The study area is outside of the known range for this the species. |
| Northern Leopard Frog | <i>Lithobates pipiens</i> | SC | Springs, slow streams, marshes, bogs, ponds, canals, flood plains, reservoirs, and lakes; usually they are in or near permanent water with rooted aquatic vegetation. In summer, they commonly inhabit wet meadows and fields. | Possible. Suitable habitat occurs in the study area and the species is known to occur in the region. |
| Birds | | | | |
| Burrowing Owl | <i>Athene cunicularia</i> | ST | Open grasslands, especially prairie, plains, and savanna, sometimes other open areas such vacant lots or airports | Possible. Suitable habitat occurs and potential for occurrence increases if prairie dogs are present in the study area. |
| Ferruginous Hawk | <i>Buteo regalis</i> | SC | Open country, primarily prairies, plains and badlands; sagebrush, saltbush-greasewood shrubland, periphery of pinyon-juniper and other woodland, desert. | Possible. Suitable foraging habitat occurs in the study area. |

| COMMON NAME | SCIENTIFIC NAME | STATE STATUS | HABITAT | POTENTIAL FOR OCCURRENCE |
|--------------------------------|---|--------------|---|--|
| Gunnison Sage Grouse | <i>Centrocercus minimus</i> | SC | Use a variety of habitats throughout the year, but the primary component necessary is sagebrush, especially big sagebrush | Unlikely. The study area is outside of the known range for this the species and only limited suitable habitat exists. |
| Mountain Plover | <i>Charadrius montanus</i> | SC | Open, flat, dry tablelands with low, sparse vegetation and occasionally agricultural areas. | Unlikely. The study area is outside of the known range for this the species and only limited suitable habitat exists. |
| American Peregrine Falcon | <i>Falco peregrinus anatum</i> | SC | Canyons, cliffs, and riparian areas. | Possible. Limited suitable nesting habitat occurs in the study area but the species may be present during winter migration and foraging. |
| Greater Sandhill Crane | <i>Grus canadensis tabida</i> | SC | Cropland/hedgerows, Grasslands, riparian areas, and shallow wetlands. | Unlikely. The study area is outside of the known range for this the species. |
| Bald Eagle | <i>Haliaeetus leucocephalus</i> | SC | Fish-bearing coastal areas, bays, rivers, lakes, or reservoirs. | Possible. Limited suitable habitat occurs in the study area but the species may be present during winter migration and foraging. |
| Long-billed Curlew | <i>Numenius americanus</i> | SC | Generally near water and may include prairies, grassy meadows, wetlands, or tidal flats. | Unlikely. The study area is outside of the known range for this the species and only limited suitable habitat exists. |
| Fish | | | | |
| Humpback Chub | <i>Gila cypha</i> | ST | Associated with a variety of habitats ranging from pools with turbulent to little or no current; substrates of silt, sand, boulder, or bedrock; and depth ranging from 1 to 15 meters | Possible. Known to occur in the Colorado River and Upper Colorado River basin. |
| Bonytail Chub | <i>Gila elegans</i> | SE | Backwaters with rocky or muddy bottoms and flowing pools. | Possible. Known to occur in the Colorado River and Upper Colorado River basin. |
| Roundtail Chub | <i>Gila robusta</i> | SC | Rocky runs, rapids, and pools of creeks and small to large rivers preferably with cobble/gravel substrate. | Possible. Known to occur in the Colorado River and Upper Colorado River basin. |
| Colorado River Cutthroat Trout | <i>Oncorhynchus clarkii pleuriticus</i> | SC | Cold and clear water streams of moderate to high gradient. | Unlikely. Suitable habitat does not occur in the study area. |

| COMMON NAME | SCIENTIFIC NAME | STATE STATUS | HABITAT | POTENTIAL FOR OCCURRENCE |
|---------------------------------|---|--------------|---|---|
| Colorado Pikeminnow | <i>Ptychocheilus lucius</i> | ST | Various habitats or larger rivers, including deep turbid strongly flowing water, eddies, runs, flooded bottoms, or backwaters | Possible. Known to occur in the Colorado River and Upper Colorado River basin. |
| Razorback Sucker | <i>Xyrauchen texanus</i> | SE | Large rivers in areas of strong current and backwaters | Possible. Known to occur in the Colorado River and Upper Colorado River basin. |
| Mammals | | | | |
| Townsend's Big-eared Bat Subsp. | <i>Corynorhinus townsendii pallescens</i> | SC | Caves, mines, forested areas | Unlikely. Suitable habitat does not occur in the study area. |
| Black-footed Ferret | <i>Mustela nigripes</i> | SE | The same open habitat used by prairie dogs including grasslands, steppe, and shrub steppe. | Unlikely. Study area is not located near any reintroduction sites. |
| Kit Fox | <i>Vulpes macrotis</i> | SE | Open desert, shrubby or shrub-grass habitat. | Possible. Limited suitable habitat occurs in the study area. Species historic range is 4 miles north of the study area. |
| Reptiles | | | | |
| Midget Faded Rattlesnake | <i>Crotalus oreganus concolor</i> | SC | High elevation, cold desert dominated by sagebrush and with an abundance of rock outcrops and exposed canyon walls. | Unlikely. Suitable habitat does not occur in the study area. |
| Long-nosed Leopard Lizard | <i>Gambelia wislizenii</i> | SC | Desert and semidesert areas with scattered shrubs or other low plants. | Possible. Suitable habitat occurs in the study area and the species is known to occur in the region. |

Source: CNHP 2018a, CNHP 2018b, CPW 2018, NatureServe 2019

Notes:

SC= Species of Concern

SE=State Endangered

ST=State Threatened

Migratory Birds and Raptors

Most migratory birds, including raptors, are protected by the Migratory Bird Treaty Act (MBTA). The MBTA makes it illegal for anyone to “take, possess, import, export, transport, sell, purchase barter, or offer for sale, purchase, or barter, any migratory bird, or the parts, nests, or eggs of such a bird except under the terms of a valid permit issued pursuant to Federal regulations (USFWS, 2016a).” The MBTA is enforced by the USFWS.

In addition, Bald and Golden Eagles are also protected by the Bald and Golden Eagle Protection Act (BGEA). The BGEA prohibits “taking eagles, including their parts, nests, or eggs” without a permit issued by the Secretary of the Interior (USFWS, 2016b). The BGEA also provides criminal penalties for persons who “take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or any manner, any eagle, alive or dead, or any part, nest, or egg thereof.” The BGEA defines “take” to include disturbing the birds, which means “to agitate or bother” to a degree that “causes, or is likely to cause, based on the best scientific information available, 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior.” The BGEA is also enforced by the USFWS.

In order to comply with these Acts, preconstruction and during construction surveys for nesting birds (including eagles and other raptors) should be done if any ground-disturbing activities are planned during the nesting season. The nesting season varies by species, but is generally from April 1 to August 31. If active nests are present, no-work buffers or other restrictions will likely be required around the nest during construction activities. The size of the buffer will be determined in coordination with CPW, USFWS, and CDOT biologists. For raptors, the buffer distances generally adhere to those presented in Recommended Buffer Zones and Seasonal Restrictions for Colorado Raptors (CPW, 2002). If eagles are expected to be present, additional surveys may be required to identify winter roosting sites which may also require no-work buffers or other restrictions. Further guidance on required surveys can be found in Section 240 Protection of Migratory Birds of the CDOT Standard Specifications for Road and Bridge Construction (CDOT, 2016).

Wetlands and Waters of the US

Waters of the US are typically defined as navigable waterways and/or waterways that have a nexus to navigable waters. This definition includes those water features that are adjacent to (considered a “significant nexus”) waters of the US, including canal, irrigation ditches, and wetlands. These resources provide a variety of functions such as wildlife habitat, sediment and pollution filtration, flood protection, agricultural irrigation, and groundwater recharge.

Waters of the US, including wetlands, are protected under Section 404 of the CWA (33 US Code 1344) and Executive Order 11990 Protection of Wetlands (EPA, 1977). The CWA requires coordination with the US Army Corps of Engineers and resource agencies such as the Environmental Protection Agency (EPA) and the United States Fish and Wildlife Service (USFWS) when impacts occur to wetlands that are considered waters of the US. Under Section 404 of the CWA, impacts to WUS, including wetlands and open waters, must be

avoided, minimized, or mitigated (in order of preference) to ensure that there is no net loss of functions and values of jurisdictional wetlands. CDOT regulates wetlands regardless of Section 404 jurisdiction.

According to the USFWS National Wetland Inventory (NWI), the study area contains numerous potential wetlands, including both palustrine emergent (PEM) and palustrine scrub-shrub (PSS) (USFWS 2018). Generally, PEM wetlands are dominated by emergent (herbaceous) vegetation and PSS wetlands are dominated by shrubs. The study area wetlands occur in topographic swales, roadside and irrigation ditches, and/or in association with streams. A detailed field investigation and boundary delineation would be required to verify the presence of hydrology, hydrophytic vegetation, and hydric soils at each potential wetland.

Other potential waters of the US identified in the study area include Indian Wash and Government Highline Canal. Indian Wash is an open channel with intermittent flow. Within the study area Indian Wash meanders adjacent to agricultural land within Matchett Park and continues through residential areas before ultimately discharging to the Colorado River. Government Highline Canal is a manmade open channel with regulated flow and is operated by the Grand Valley Water Users' Association. Any impact from a future project on the Government Highline Canal system that adds to its regulatory obligations will not be permitted. Government Highline Canal is approximately 55 miles long and extends through the study area south of I-70. Government Highline Canal and portions of Indian Creek are classified by NWI as riverine features.

APPENDIX A

Information from Area Plans and Studies

Grand Junction 2018 CIRCULATION PLAN



Comprehensive Plan Grand Junction

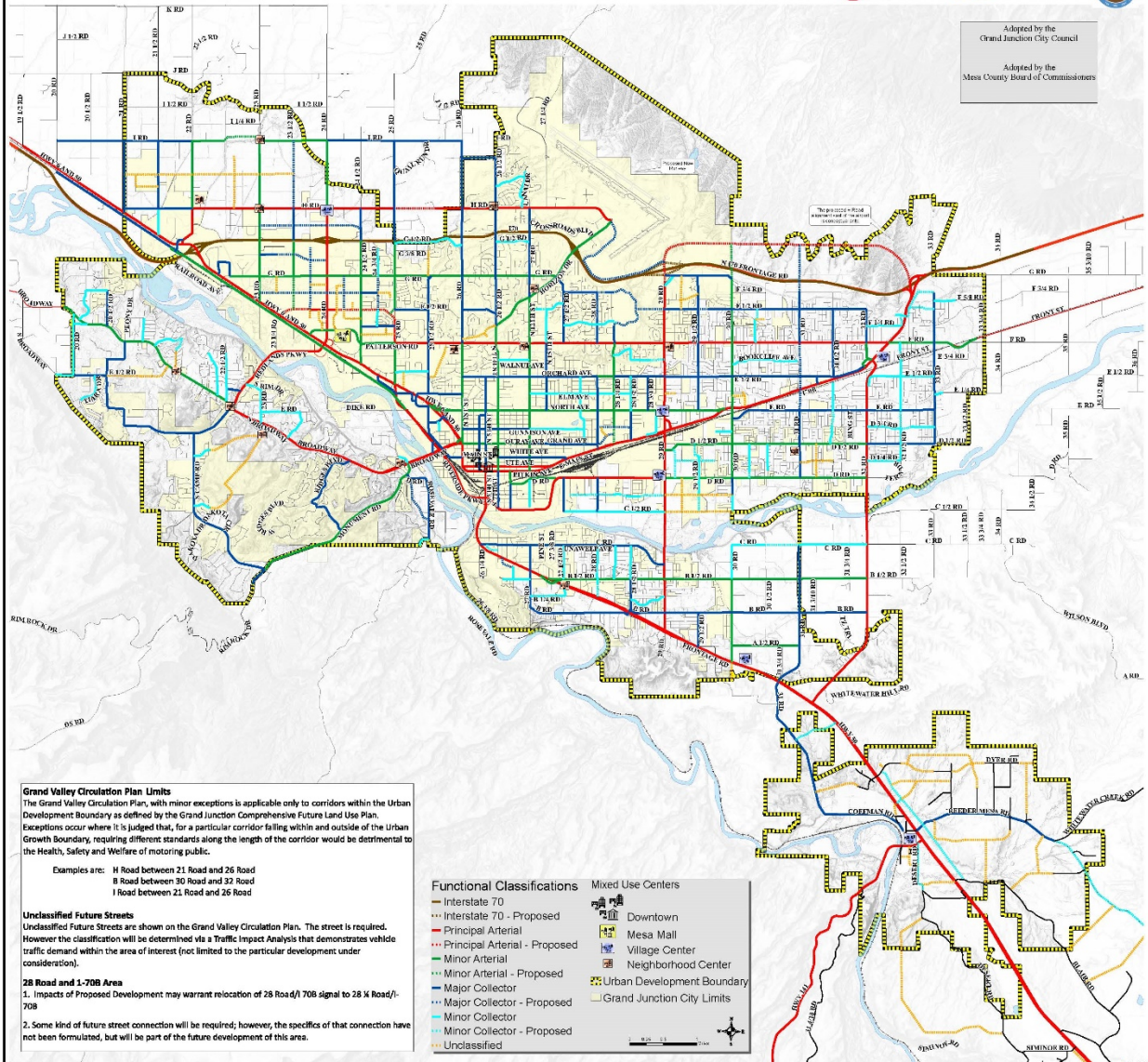


Grand Junction Circulation Plan Street Plan Functional Classification Map



Adopted by the
Grand Junction City Council

Adopted by the
Mesa County Board of Commissioners



Grand Valley Circulation Plan Limits
The Grand Valley Circulation Plan, with minor exceptions is applicable only to corridors within the Urban Development Boundary as defined by the Grand Junction Comprehensive Future Land Use Plan. Exceptions occur where it is judged that, for a particular corridor falling within and outside the Urban Growth Boundary, requiring different standards along the length of the corridor would be detrimental to the Health, Safety and Welfare of motoring public.

Examples are: H Road between 21 Road and 26 Road
B Road between 30 Road and 32 Road
I Road between 21 Road and 26 Road

Unclassified Future Streets
Unclassified Future Streets are shown on the Grand Valley Circulation Plan. The street is required. However the classification will be determined via a Traffic Impact Analysis that demonstrates vehicle traffic demand within the area of interest (not limited to the particular development under consideration).

28 Road and I-70B Area
1. Impacts of Proposed Development may warrant relocation of 28 Road/I 70B signal to 28 X Road/I-70B
2. Some kind of future street connection will be required; however, the specifics of that connection have not been formulated, but will be part of the future development of this area.

| | |
|-----------------------------------|----------------------------|
| Functional Classifications | Mixed Use Centers |
| — Interstate 70 | Downtown |
| --- Interstate 70 - Proposed | Mesa Mall |
| — Principal Arterial | Village Center |
| --- Principal Arterial - Proposed | Neighborhood Center |
| — Minor Arterial | Urban Development Boundary |
| --- Minor Arterial - Proposed | Grand Junction City Limits |
| — Major Collector | |
| --- Major Collector - Proposed | |
| — Minor Collector | |
| --- Minor Collector - Proposed | |
| — Unclassified | |

Figure 3

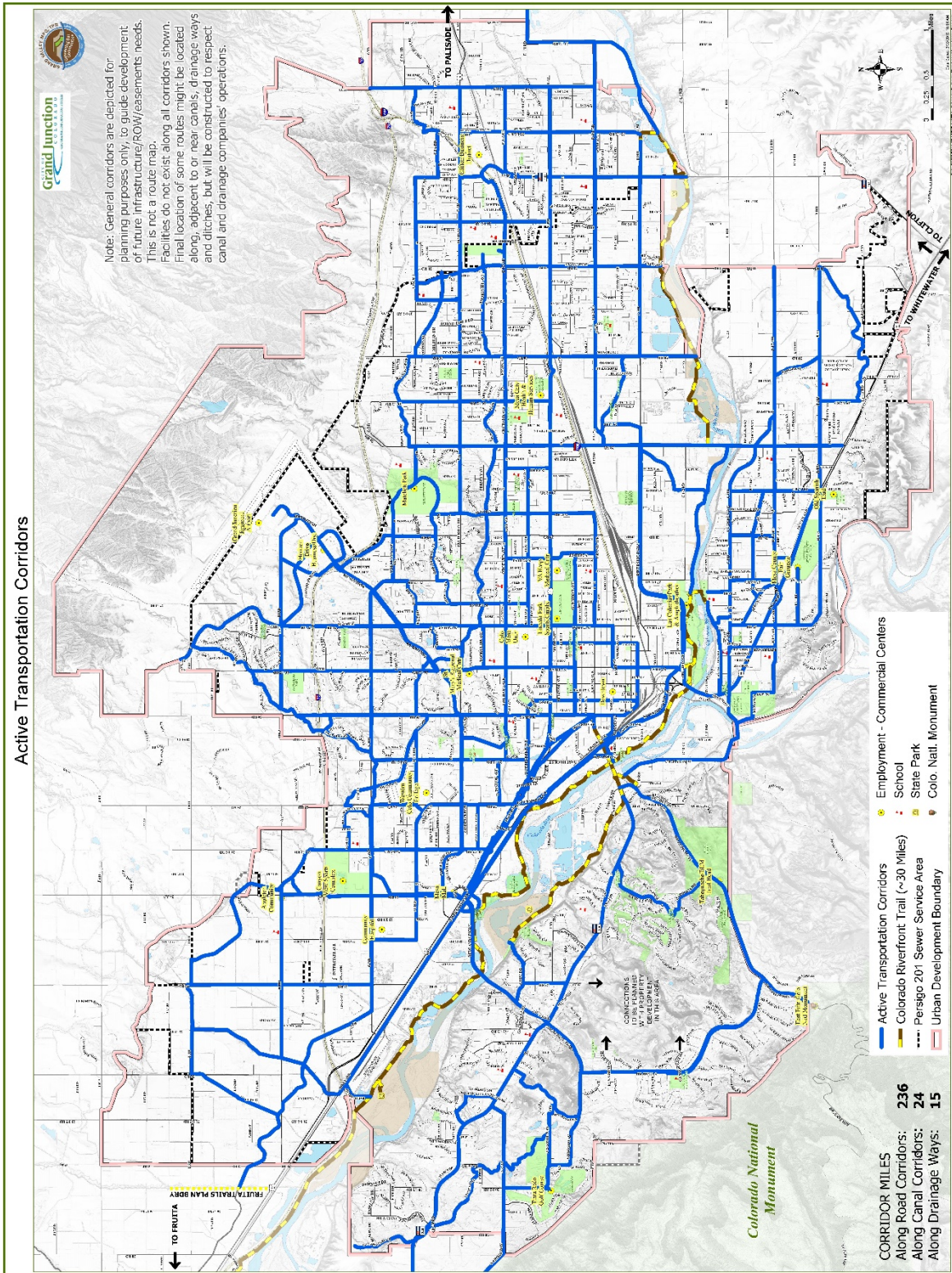


Figure 2

Network Map - Concept Plan

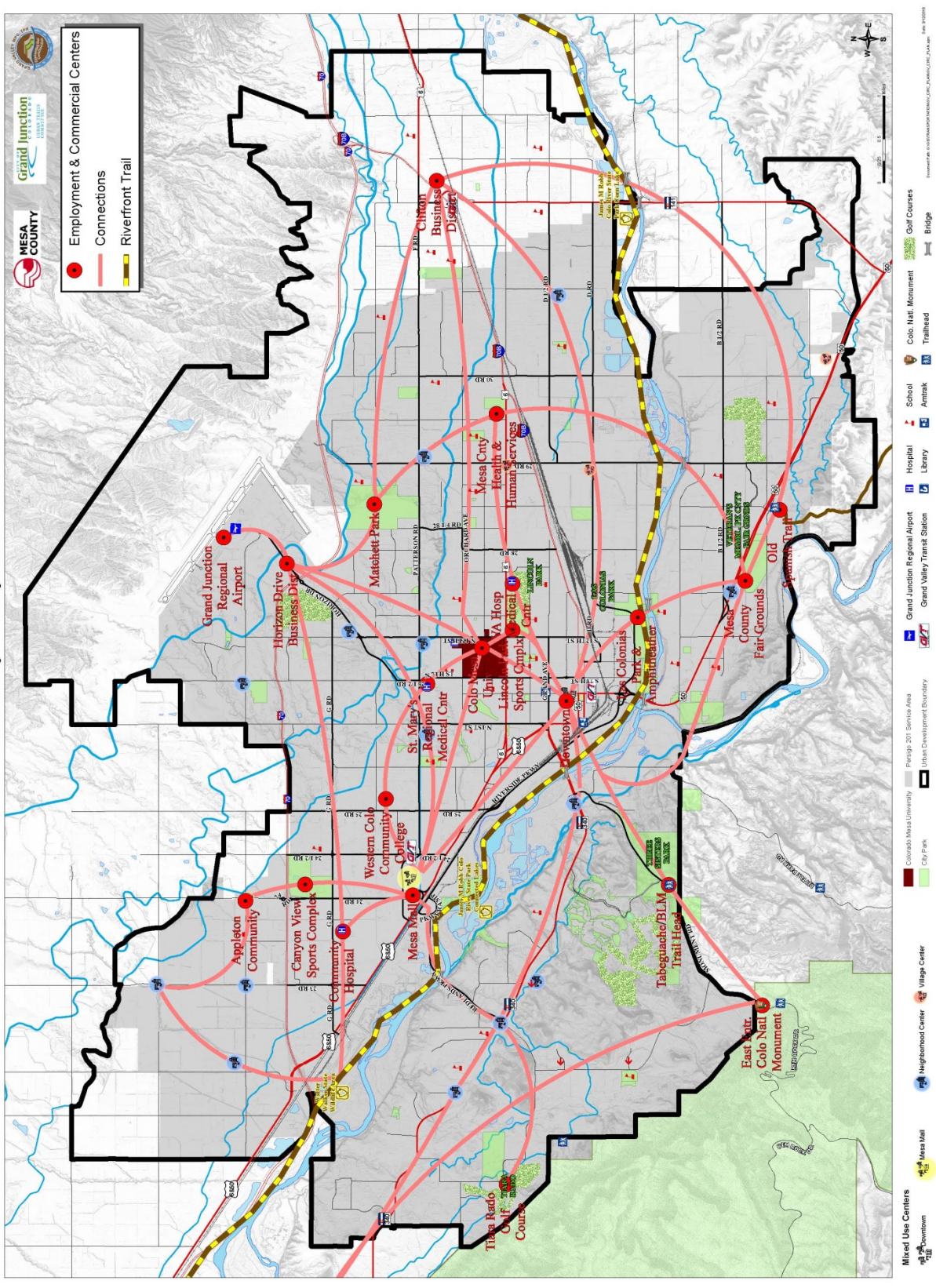


Figure 1



1-10
year

April 2018

Grand Valley Transit strategic plan



Implementation Plan

A Path Forward

This implementation plan provides a path forward for GVT for the next 10 years. Objectives have been identified that can be measured over time and achieved through implementation of the strategies. Short-, mid-, and long-term strategies have been established to help guide change as opportunities arise. Detailed cost projections can be found in **Appendix C**.



Mobility

Goal: An affordable, connected, efficient, and easy to use transit system that attracts all rider types and integrates all modes.

| KEY | \$ \$0 - \$100,000 | \$ \$100,000-\$500,000 | \$ \$500,000+ | Short-term: 2018-2021 | Mid-term: 2022-2025 | Long-term: 2026-2028 |
|-----|--------------------|------------------------|---------------|--------------------------|------------------------|-------------------------|
|-----|--------------------|------------------------|---------------|--------------------------|------------------------|-------------------------|

Objective 1: Increase ridership of transportation disadvantaged and choice riders.

Performance Measure:

- Annual fixed-route boardings

Desired Trend:



Baseline: 770,089

Goal: 1.5% annual increase

| Strategies | | Timeframe | Cost |
|------------|---|-----------|------|
| Strategy 1 | Implement new routes and services as viable identified in Scenario B – Existing Fixed-Route Network Enhancements (page 9) | Short | \$ |
| Strategy 2 | Pursue partnership opportunities with large employers <ul style="list-style-type: none"> Focus on employers that have good service levels (higher frequency service, if applicable, and connections) Participate in local business activities, e.g., Chamber of Commerce activities, etc. | Short | \$ |



Mobility



Goal: An affordable, connected, efficient, and easy to use transit system that attracts all rider types and integrates all modes.

| KEY | \$ \$0 - \$100,000 | \$ \$100,000-\$500,000 | \$ \$500,000+ | Short-term: 2018-2021 | Mid-term: 2022-2025 | Long-term: 2026-2028 |
|------------|---|------------------------|---------------|--------------------------|------------------------|-------------------------|
| Strategies | | | | Timeframe | Cost | |
| Strategy 3 | Expand travel training program: <ul style="list-style-type: none"> Work with active senior living facilities to promote transit and travel training program. Organize a ride to lunch and tour of the transit system for seniors. This can be marketed as a social function for attendees and is a great way to introduce people that are unfamiliar with using transit to the system. Coordinate with human service agencies to identify travel training needs. Utilize travel training program to transition paratransit passengers to fixed-route. Research and evaluate benefit of providing free fixed-route passes to current paratransit passengers. | | | Short | | \$ |
| Strategy 4 | If additional funding becomes available implement Scenario C – Service Growth improvements | | | Mid/Long | | \$ |
| Strategy 5 | Monitor and research emerging technological trends; implement marketing and operational tools as appropriate to support existing and to attract new riders (e.g., Next Bus, mobile ticketing, etc.). | | | Ongoing | | \$ |



Mobility

Goal: An affordable, connected, efficient, and easy to use transit system that attracts all rider types and integrates all modes.

| | | | | | | |
|-----|---|---|--|--------------------------|------------------------|-------------------------|
| KEY |  \$0 - \$100,000 |  \$100,000-\$500,000 |  \$500,000+ | Short-term: 2018-2021 | Mid-term: 2022-2025 | Long-term: 2026-2028 |
|-----|---|---|--|--------------------------|------------------------|-------------------------|

Objective 2: Improve multimodal connectivity.

Performance Measure:





- Number of infrastructure projects completed annually at, or adjacent to, bus stops/transfer facilities

Desired Trend:



Baseline: 3 projects

Goal: Implementation of pedestrian and bicycle infrastructure improvement projects in accordance with the Regional Transportation Plan

| Strategies | | Timeframe | Cost |
|------------|---|-----------|---|
| Strategy 1 | Expand bus stop standards in <i>GVT Policies and Procedures Manual</i> and develop process to prioritize stop improvements. | Short |  |
| Strategy 2 | Update contract for shelter/bench advertising vendor to ensure congruency with updated bus stop standards and improvement priorities. | Short |  |
| Strategy 3 | Apply for grant funding for sidewalk and bicycle infrastructure improvements (in coordination with local partners as appropriate). | Ongoing |  |
| Strategy 4 | Continue coordinating with city and county staff to integrate transit service and facilities in the development review process (e.g., integrate upgrading bus stops and connections to into development standards). | Ongoing |  |

| | | | |
|------------|--|---------------|----|
| Strategy 5 | Research and identify opportunities for implementation of a Transit Overlay District | Long, ongoing | \$ |
|------------|--|---------------|----|



Mobility

Goal: An affordable, connected, efficient, and easy to use transit system that attracts all rider types and integrates all modes.

| | | | | | | |
|-----|--------------------|------------------------|---------------|--------------------------|------------------------|-------------------------|
| KEY | \$ \$0 - \$100,000 | \$ \$100,000-\$500,000 | \$ \$500,000+ | Short-term: 2018-2021 | Mid-term: 2022-2025 | Long-term: 2026-2028 |
|-----|--------------------|------------------------|---------------|--------------------------|------------------------|-------------------------|

Objective 3: Provide efficient and cost-effective transit service.

Performance Measures:

- Fixed-route boardings per revenue hour
- Paratransit/Dial-A-Ride (DAR) boardings per revenue hour

Desired Trend:



Baseline:

Fixed-route – 14 boardings/hour
Paratransit/DAR – 2 boardings/hour

Goal:

Fixed route – 20 boardings/hour
Paratransit/DAR – 3.5 boardings/hour

| Strategies | | Timeframe | Cost |
|------------|---|-----------|------|
| Strategy 1 | Review current GVT <i>Policies and Procedures Manual</i> and make changes as appropriate to provide guidance on service changes, operational standards, infrastructure improvements, etc. | Short | \$ |
| Strategy 2 | Establish regular service change schedule and conduct public review process as identified. | Short | \$ |
| Strategy 3 | Conduct annual evaluation of system and modify service as appropriate to increase efficiency. | Ongoing | \$ |



Collaboration

Goal: A strong community partner that works collaboratively with public, private, and non-governmental organizations.

| | | | | | | |
|-----|---|---|--|--------------------------|------------------------|-------------------------|
| KEY |  \$0 - \$100,000 |  \$100,000-\$500,000 |  \$500,000+ | Short-term: 2018-2021 | Mid-term: 2022-2025 | Long-term: 2026-2028 |
|-----|---|---|--|--------------------------|------------------------|-------------------------|

Objective 1: Increase partnerships to leverage service provision and public and private funds.

Performance Measure:







- **Number of active community partners**

Desired Trend:



Baseline: 62 partners

Goal: 5% annual increase
(3 additional partners/year)

| Strategies | | Timeframe | Cost |
|------------|---|----------------|---|
| Strategy 1 | Work with CDOT to identify opportunities for pass integration and mobile ticketing. | Short |  |
| Strategy 2 | Coordinate with Business Improvement Districts to identify opportunities for service enhancement and funding partnerships. | Short, ongoing |  |
| Strategy 3 | Collaborate with CMU to identify best practices and opportunities for service from the campus to key activity centers (e.g., downtown, mall, etc.). | Ongoing |  |
| Strategy 4 | Work with CDOT to coordinate Bustang (Grand Junction – Glenwood Springs - Denver) and Bustang-Outrider (Grand Junction - Durango) schedules with GVT. | Short, ongoing |  |
| Strategy 5 | Continue reaching out to CMU Sustainability Practices Program to identify potential partnership opportunities (e.g., special project on GVT and how it contributes to sustainability of the region). | Ongoing |  |
| Strategy 6 | Research and identify partnership opportunities to implement pilot projects to test the use of shared-use mobility platforms to augment existing GVT service (e.g., partner with taxi company, Uber or Lyft). | Short, ongoing |  |



Economic & Community Vitality

Goal: A transit system that supports jobs, recreation, and overall community well-being.

KEY  \$0 - \$100,000  \$100,000-\$500,000  \$500,000+

Short-term:
2018-2021

Mid-term:
2022-2025

Long-term:
2026-2028

Objective 1: Improve access to recreational opportunities.

Performance Measures:

- Fixed-route cost per boarding
- Paratransit/Dial-A-Ride (DAR) cost per boarding

Desired Trend:






Baseline:

\$3.92/boarding - Fixed-route
\$27.13/boarding - Paratransit/DAR

Goal:

<\$4.00/boarding - Fixed-route
\$25/boarding - Paratransit/DAR

| Strategies | | Timeframe | Cost |
|------------|--|-----------|---|
| Strategy 1 | Determine viability of implementing special event/charter transit service to Country Jam, JUCO, etc. | Short |  |
| Strategy 2 | Coordinate with partner agencies (e.g., forest service, parks and recreation, Department of Health and Human Services) to determine need/viability of providing transit service to trail heads and recreational amenities. | Long |  |
| Strategy 3 | Work with the Horizon Business Improvement District to identify opportunities for possible recreation-based transportation services. | Long |  |



Economic & Community Vitality

Goal: A transit system that supports jobs, recreation, and overall community well-being.

| | | | | | | |
|-----|---|---|--|--------------------------|------------------------|-------------------------|
| KEY |  \$0 - \$100,000 |  \$100,000-\$500,000 |  \$500,000+ | Short-term: 2018-2021 | Mid-term: 2022-2025 | Long-term: 2026-2028 |
|-----|---|---|--|--------------------------|------------------------|-------------------------|

Objective 2: Increase access to employment and the use of the employer pass program.

Performance Measures:

- Number of employer partners and pass participants
- Number of accessible jobs by GVT

Desired Trend:






Baseline:

45 active pass program participants
34,767 accessible jobs

Goal:

5% annual increase in pass program participants
5% annual increase in accessible jobs

| Strategies | | Timeframe | Cost |
|------------|--|-----------|---|
| Strategy 1 | Allocate resources to additional staffing (e.g., mobility manager) for marketing and outreach to local businesses and partners. | Ongoing |  |
| Strategy 2 | Expand outreach and marketing efforts to large employers and employers that promote a culture that emphasizes active lifestyles and wellness for their employees (e.g., employer transit fairs). | Ongoing |  |
| Strategy 3 | Continue to participate in Colorado Bike to Work month activities in June to initiate conversations with potential choice riders. | Ongoing |  |



Economic & Community Vitality

Goal: A transit system that supports jobs, recreation, and overall community well-being.

KEY  \$0 - \$100,000  \$100,000-\$500,000  \$500,000+

Short-term:
2018-2021

Mid-term:
2022-2025

Long-term:
2026-2028

Objective 3: Increase visitor awareness and use of GVT.

Performance Measures:

- Number of marketing materials distributed annually
- Number GVT website visits from people outside of the Grand Valley annually
- Number of presentations made to groups and/or open houses annually

Desired Trend:






Baseline:

400 maps distributed
12,173 website visits
1 presentation

Goal:

800 maps and marketing materials distributed
2% annual increase in website visits
4 presentations

| Strategies | | Timeframe | Cost |
|------------|---|----------------|---|
| Strategy 1 | Work with Visit Grand Junction to distribute information about GVT services. | Short, ongoing |  |
| Strategy 2 | Develop and implement a promotional campaign to market GVT connectivity to key destinations (hotel lobby flyers, ads in visitor magazines, etc.). | Short, ongoing |  |
| Strategy 3 | Provide reduced-cost transit passes to hotels and visitor center to encourage transit use. | Mid, ongoing |  |



System Preservation & Safety

Goal: A safe, financially sustainable transit system operating in a state of good repair.

| | | | | | | |
|-----|---|---|--|--------------------------|------------------------|-------------------------|
| KEY |  \$0 - \$100,000 |  \$100,000-\$500,000 |  \$500,000+ | Short-term: 2018-2021 | Mid-term: 2022-2025 | Long-term: 2026-2028 |
|-----|---|---|--|--------------------------|------------------------|-------------------------|

Objective 1: Identify and secure additional funding to maintain current service levels.

Performance Measure:

- Farebox recovery

Desired Trend:







Baseline:

13% farebox recovery

Goal:

20% farebox recovery

| Strategies | | Timeframe | Cost |
|------------|---|-----------|---|
| Strategy 1 | Develop outreach approach to Initiate conversations with county/local officials and staff about current and future funding (limitations, sales tax increase, etc.). | Short |  |
| Strategy 2 | Assess pass and fare structure, ensure price points are met (i.e., period pass that costs less than \$45) | Short |  |
| Strategy 3 | Explore the interest and/or viability of creating a regional transit entity, dedicated sales tax, or property tax. | Mid |  |
| Strategy 4 | Identify next steps, if needed, to move forward with potential funding strategy. | Mid/Long |  |



System Preservation & Safety

Goal: A safe, financially sustainable transit system operating in a state of good repair.

| | | | | | | |
|-----|---|---|--|--------------------------|------------------------|-------------------------|
| KEY |  \$0 - \$100,000 |  \$100,000-\$500,000 |  \$500,000+ | Short-term: 2018-2021 | Mid-term: 2022-2025 | Long-term: 2026-2028 |
|-----|---|---|--|--------------------------|------------------------|-------------------------|

Objective 2: Maximize the useful life of capital/rolling stock and secure funding to meet fleet replacement and expansion needs.

Performance Measure:

- Percent of fleet in a minimum of good or fair condition

Desired Trend:






Baseline:

80% of fleet

Goal:

65%* of fleet

*CDOT performance measure target

| Strategies | | Timeframe | Cost |
|------------|---|-----------|---|
| Strategy 1 | Continue prioritizing GVT's vehicle maintenance program. | Ongoing |  |
| Strategy 2 | Continued implementation of Transit Asset Management plan | Ongoing |  |
| Strategy 3 | Pursue grant funds for capital and rolling stock replacement and expansion needs. This includes the identification of local matching funds. (FTA 5339 Bus and Bus Related Equipment Facilities and Low-No Programs) | Ongoing |  |



System Preservation & Safety

Goal: A safe, financially sustainable transit system operating in a state of good repair.

| | | | | | | |
|-----|--------------------|------------------------|---------------|--------------------------|------------------------|-------------------------|
| KEY | \$ \$0 - \$100,000 | \$ \$100,000-\$500,000 | \$ \$500,000+ | Short-term: 2018-2021 | Mid-term: 2022-2025 | Long-term: 2026-2028 |
|-----|--------------------|------------------------|---------------|--------------------------|------------------------|-------------------------|

Objective 3: Provide safe and secure transit service.

Performance Measure:

- Revenue miles between preventable accidents

Desired Trend:



Baseline:
60,000 miles
Goal:
75,000 miles

| Strategies | | Timeframe | Cost |
|------------|---|-----------|------|
| Strategy 1 | Continue safety/security training and drug and alcohol screening to meet or exceed FTA standards. | Ongoing | \$ |
| Strategy 2 | Track incidents and miles between preventable accidents; take corrective action as needed. | Ongoing | \$ |
| Strategy 3 | Utilize existing security cameras at transfer facilities and on buses to inform improvements. | Ongoing | \$ |
| Strategy 4 | Continue partnership with Mesa County sheriff's Office to deter crime and monitor safety and security of vehicles and facilities. | Ongoing | \$ |



Education & Outreach

Goal: A public that is informed and educated about GVT service and the mobility options it provides for all trip types and populations.

| | | | | | | |
|-----|---|---|--|--------------------------|------------------------|-------------------------|
| KEY |  \$0 - \$100,000 |  \$100,000-\$500,000 |  \$500,000+ | Short-term: 2018-2021 | Mid-term: 2022-2025 | Long-term: 2026-2028 |
|-----|---|---|--|--------------------------|------------------------|-------------------------|

Objective 1: Increase the general public's awareness of GVT and the services available.

Performance Measure:

- Choice riders as a percent of total annual boardings

Desired Trend:






Baseline:

9% choice riders

Goal:

13% choice riders

| Strategies | | Timeframe | Cost |
|------------|---|-----------|---|
| Strategy 1 | Determine viability of allocating resources to additional staffing for marketing and outreach (e.g., mobility manager). | Ongoing |  |
| Strategy 2 | Update and implement a strategic annual marketing and outreach strategy (social media, advertising, printed materials, etc.). | Ongoing |  |
| Strategy 3 | Research and monitor emerging technologies; utilize marketing strategies and tools as appropriate. | Ongoing |  |



Education & Outreach

Goal: A public that is informed and educated about GVT service and the mobility options it provides for all trip types and populations.

| | | | | | | |
|-----|---|---|--|--------------------------|------------------------|-------------------------|
| KEY |  \$0 - \$100,000 |  \$100,000-\$500,000 |  \$500,000+ | Short-term: 2018-2021 | Mid-term: 2022-2025 | Long-term: 2026-2028 |
|-----|---|---|--|--------------------------|------------------------|-------------------------|

Objective 2: Increase ease of access and distribution of information to existing and new riders.

Performance Measure:

- Number of annual SPOT and GVT website visits

Desired Trend:



Baseline:





11,583 – SPOT

23,026 – GVT website

Goal:

2% annual increase – SPOT

2% annual increase – GVT website

| Strategies | | Timeframe | Cost |
|------------|--|-----------|---|
| Strategy 1 | Create a systematic approach to updating and distributing service schedules and maps and implement. | Short |  |
| Strategy 2 | Continue to coordinate with Brochure Express to stock brochure racks with GVT materials | Ongoing |  |
| Strategy 3 | Continue advertising GVT services and programs on buses and at transfer facilities (flyers, website, etc.) | Ongoing |  |
| Strategy 4 | Develop an ongoing distribution schedule to provide materials at key human service agencies, medical facilities, employers, etc., and implement. | Ongoing |  |



Grand Valley 2040 Regional Transportation Plan Update

LSC #144180

Final Report

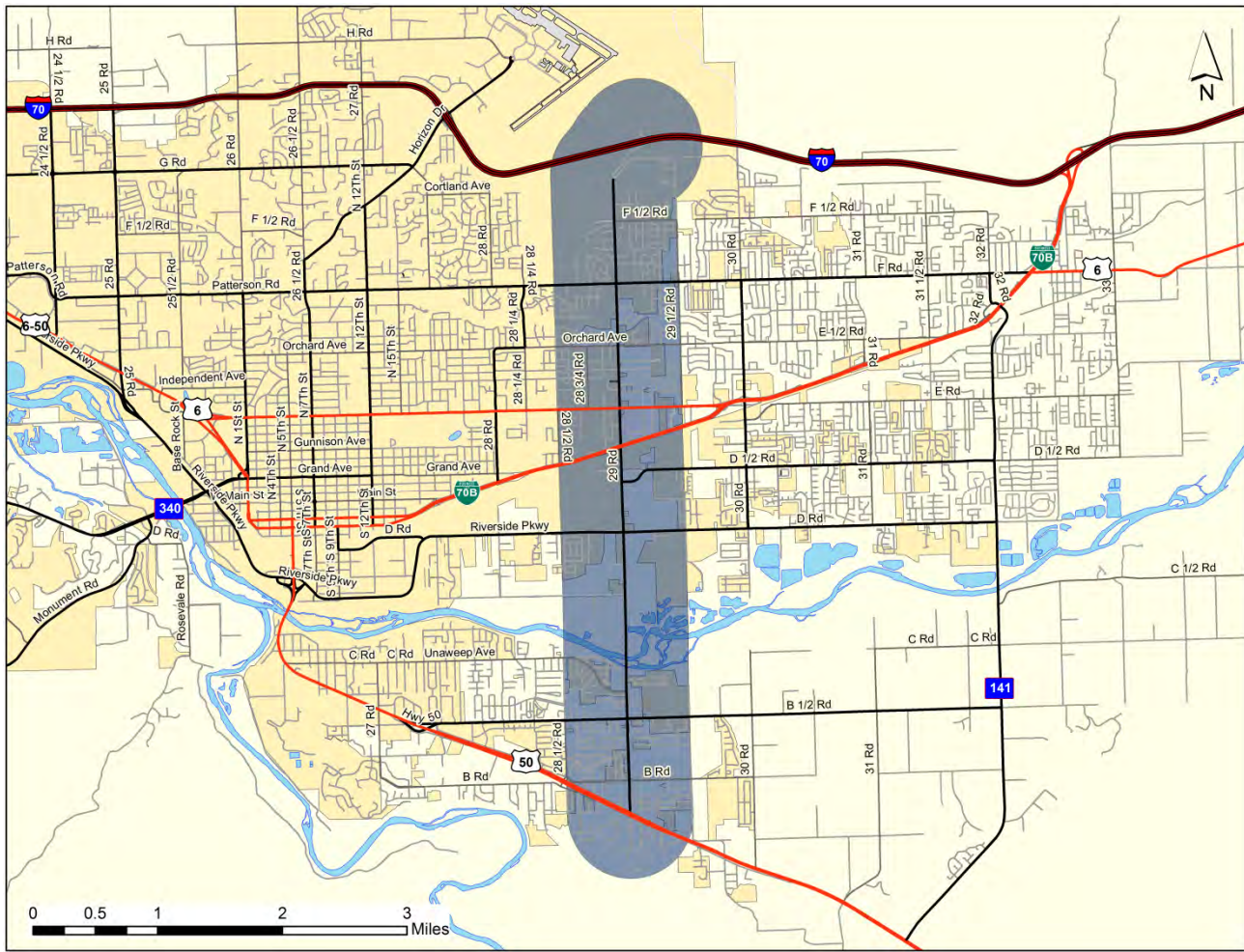


December 15, 2014

Corridor Visions

Corridor 27: 29 Road

Figure 8-28: 29 Road Corridor



Corridor Visions

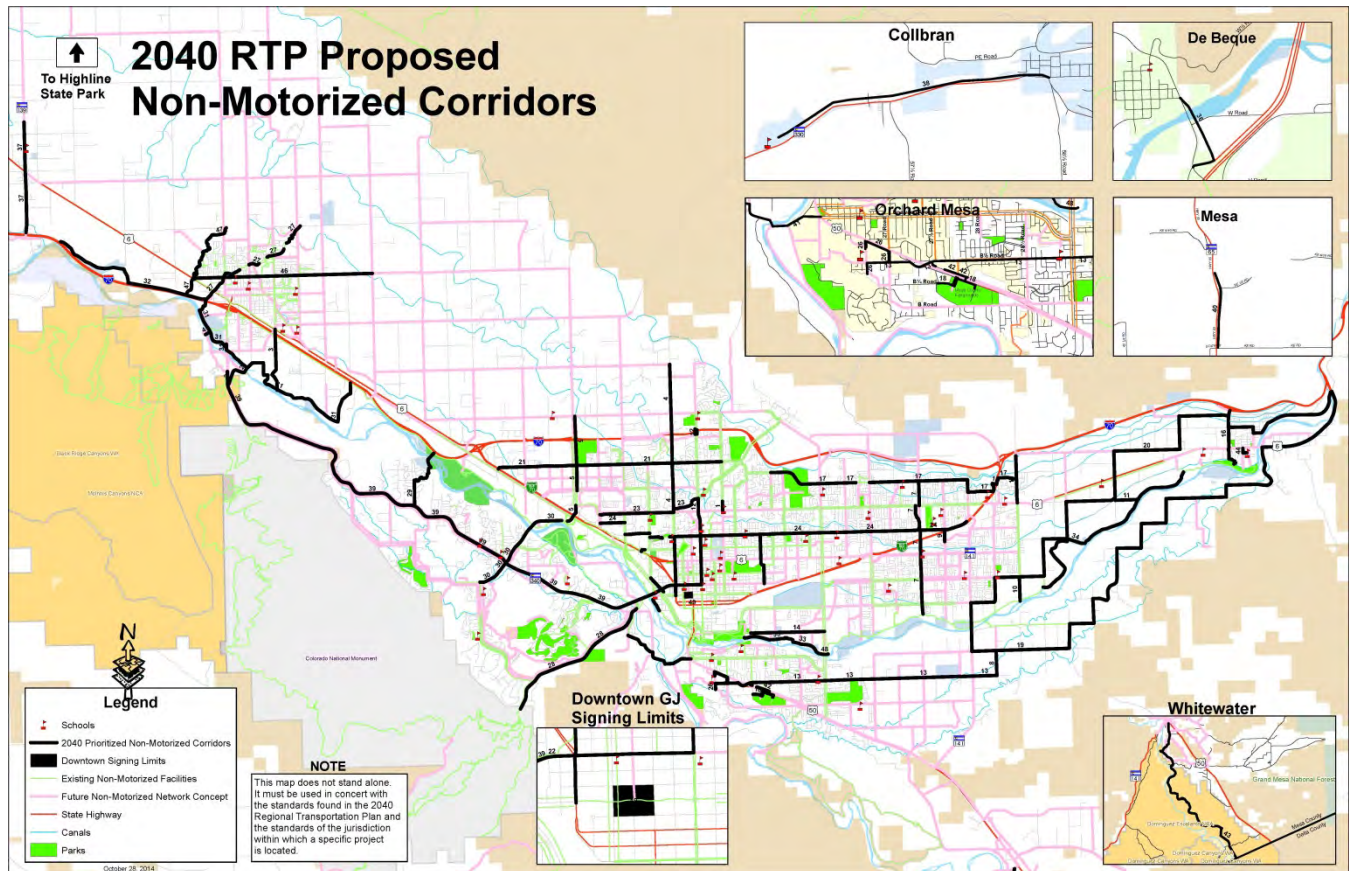
Table 8-28: 29 Road Corridor Characteristics

| 29 Road | |
|------------------------------|--|
| Investment Category | Mobility |
| Vision | The 2010 Grand Junction Comprehensive Plan envisions this as a Multi-use Opportunity Corridor and as part of the Grand Junction Beltway/North- South Corridor connecting I-70 to Riverside Parkway and US 50. Several recent and planned projects will transform this into a complete north/south corridor sometime after 2025. The planned projects are multi-modal, including pedestrian and bicycle facilities. |
| 2040 RTP Improvements | In the 2040 roadway plan, two additional projects are planned for 29 Road. The first project will widen 29 Road from 2 to 4 lanes between F Road North to I-70 and construct an interchange on I-70. The second project will involve widening 29 Road from 3 lanes to 5 lanes between North Avenue and Patterson Road. |

Non-Motorized Transportation

Urban Trails Committee, and those recommended by public supporters. A wide range of improvements ranging from shared lanes, dedicated bike lanes, bike paths and connectors, off-system trails, pedestrian bridges, and other alternatives are addressed. Each proposed alternative supports regional goals for greater cycling and walking connectivity within and between communities, expanded commute options, and access to recreational opportunities.

Figure 5.5: 2040 Proposed Active Transportation Alternatives plus Existing Network



A larger version of this map and accompanying detailed project information and cost estimates for non-motorized projects are included in an appendix to this 2040 RTP.

A subcommittee of the 2040 Steering Committee was convened to consider all proposed active transportation project alternatives. This group included representatives from County and local governments as well as staff of the Grand Valley MPO. A scoring process was undertaken that weighed overall merits of each project and ranked priority projects by total expected benefits. The criteria used to assess projects is described in the framework in Figure 5.6 and provides clear links to regional, state, and national goals. For example, each project alternative was scored based upon: potential for safety improvements; coordination with ongoing maintenance programs; level of connectivity; mobility gains for recreational and commute travelers; access to recreational opportunities; implementation timeframe; and, level of local support and consistency with regional and local visions.

In the absence of regional data at the project level, assessments by Committee members provide the best available information for decision-making. This framework supports the region's transition toward a performance-based planning process by advancing projects that are linked to national goals and state performance targets. The region will continue to measure and assess the performance of active transportation investments by tracking key indicators of safety, commute choices, and recreational access.



Grand Valley 2040 Regional Transportation Plan Update

*Mesa County Coordinated Transit
and Human Services Transportation Plan*

Final Report

prepared for

Mesa County Regional Transportation Planning Office
525 S. 6th Street, 2nd Floor
Department 5093
P.O. Box 20,000
Grand Junction, CO 81501

prepared by:

LSC Transportation Consultants, Inc.
516 North Tejon Street
Colorado Springs, CO 80903
(719) 633-2868

LSC #144180

December 8, 2014

Implementation Plan

Table 7-2: Mesa County 2040 Financially Unconstrained Preferred Transit Plan (constant dollars)

| Project Number | Description | Priority | Capital Operating | Year 2014 Annual Cost | 2014-2019 Cumulative Cost | 2020-2025 Cumulative Cost | 2026-2031 Cumulative Cost | 2032-2037 Cumulative Cost | 2038-2040 Cumulative Cost | 2040 Total Cost (2014 dollars) | 2040 Total Cost (Inflated Dollars) |
|--------------------------------------|---|----------|-------------------|-----------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|--------------------------------|------------------------------------|
| Grand Valley Transit Projects | | | | | | | | | | | |
| 1 | Operating Cost (Maintain Existing Service) | HIGH | Operating | \$3,212,062 | \$19,272,372 | \$19,272,372 | \$19,272,372 | \$19,272,372 | \$9,636,186 | \$86,725,674 | \$152,630,400 |
| 2 | Low-Floor Replacement Buses | HIGH | Capital | \$- | \$1,257,388 | \$3,352,000 | \$1,257,000 | \$3,352,000 | \$419,000 | \$9,637,388 | \$36,497,291 |
| 3 | Mid-Sized Bus Replacement | HIGH | Capital | \$450,000 | \$2,700,000 | \$2,400,000 | \$2,400,000 | \$2,400,000 | \$1,350,000 | \$11,250,000 | \$31,183,643 |
| 4 | Bus Stop/Pedestrian Improvements (Sidewalks/Pullouts) | HIGH | Capital | \$65,000 | \$436,000 | \$571,000 | \$744,000 | \$960,000 | \$579,000 | \$3,290,000 | \$3,290,000 |
| 5 | Coordination - Taxi Voucher Program | HIGH | Operating | | \$1,193,832 | \$1,193,832 | \$1,193,832 | \$1,193,832 | \$596,916 | \$5,372,242 | \$9,368,437 |
| 6 | Coordination - Mobility Manager | HIGH | Capital | \$35,000 | \$232,154 | \$293,749 | \$371,686 | \$470,302 | \$280,056 | \$1,647,948 | \$1,647,948 |
| 7 | Express Service on Select Corridors/30 min Frequency | MEDIUM | Operating | | \$487,177 | \$976,449 | \$976,449 | \$976,449 | \$650,966 | \$4,067,491 | \$7,622,595 |
| 8 | Double Frequency on All Routes (30-minute all day) | MEDIUM | Operating | | | \$7,992,960 | \$7,992,960 | \$7,992,960 | \$7,992,960 | \$31,971,840 | \$41,036,915 |
| 9 | Construction of a Long-Term/Maintenance Facility | MEDIUM | Capital | | \$- | \$10,000,000 | \$- | \$- | \$- | \$10,000,000 | \$10,000,000 |
| 10 | Service Expansion - Pear Park & F1/2 Rd. | MEDIUM | Operating | | \$- | \$150,960 | \$150,960 | \$150,960 | \$150,960 | \$603,840 | \$591,783 |
| 11 | Expanded Low-Floor Buses | MEDIUM | Capital | | \$- | \$838,000 | \$- | \$- | \$- | \$838,000 | \$1,405,410 |
| 12 | Expanded Mid-Sized Bus | MEDIUM | Capital | | \$- | \$317,220 | \$- | \$- | \$- | \$317,220 | \$476,062 |
| 13 | APTS Technology | MEDIUM | Capital | | \$- | | \$500,000 | \$- | \$- | \$500,000 | \$500,000 |
| 14 | Extend Service Until 11:00 P.M. | LOW | Operating | | \$- | \$3,604,972 | \$3,604,972 | \$3,604,972 | \$2,403,315 | \$15,618,879 | \$28,793,283 |
| 15 | Transit/Environmental/Contingency Studies | LOW | Operating | \$35,000 | \$210,000 | \$210,000 | \$210,000 | \$210,000 | \$105,000 | \$945,000 | \$955,500 |

Implementation Plan

| Project Number | Description | Priority | Capital Operating | Year 2014 Annual Cost | 2014-2019 Cumulative Cost | 2020-2025 Cumulative Cost | 2026-2031 Cumulative Cost | 2032-2037 Cumulative Cost | 2038-2040 Cumulative Cost | 2040 Total Cost (2014 dollars) | 2040 Total Cost (Inflated Dollars) |
|----------------------------------|---|----------|-----------------------|-----------------------|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|--------------------------------|------------------------------------|
| 16 | Implement Sunday Service | LOW | Operating | | \$- | \$- | \$- | \$1,567,260 | \$1,567,260 | \$3,134,520 | \$7,405,304 |
| 17 | Park-and-Ride Lots | LOW | Capital | | \$- | \$- | \$- | \$750,000 | \$750,000 | \$1,500,000 | \$1,500,000 |
| 18 | Commuter Service for Park-and-Ride Lots | LOW | Operating/ Capital | | \$- | \$- | \$- | \$588,100 | \$588,100 | \$588,100 | \$1,176,200 |
| 19 | Bus Rapid Transit (BRT) | LOW | Operating/ Capital | | \$- | \$- | \$- | | \$5,000,000 | \$5,000,000 | \$5,000,000 |
| 20 | Shopping/Downtown Circulator | LOW | Operating/ Capital | | \$- | \$- | \$- | | \$3,384,300 | \$3,384,300 | \$3,384,300 |
| 21 | 15 min. Service During Peak Period | LOW | Operating/ Capital | | \$- | \$- | \$- | \$- | \$13,228,740 | \$13,228,740 | \$13,228,740 |
| Other Providers' Projects | | | | | | | | | | | |
| 22 | Family Health West Van Replacement | HIGH | Capital | | \$58,000 | | \$58,000 | | \$58,000 | \$174,000 | \$- |
| 2040 Administration Costs | | | | | | | | | | \$1,647,948 | \$1,647,948 |
| 2040 Capital Costs | | | | | | | | | | \$37,506,608 | \$84,852,406 |
| 2040 Operating Costs | | | | | | | | | | \$170,640,626 | \$271,193,455 |
| Total Costs | | | | | \$25,846,922 | \$51,173,514 | \$38,732,231 | \$43,489,206 | \$48,740,759 | \$209,795,181 | \$357,693,809 |

*Operating cost inflated at 5% annually.

Assumed Large Vehicle cost at \$419,000 in 2014 dollars.

Assumed Mid-Sized Vehicle cost of \$150,000 in 2014 dollars.

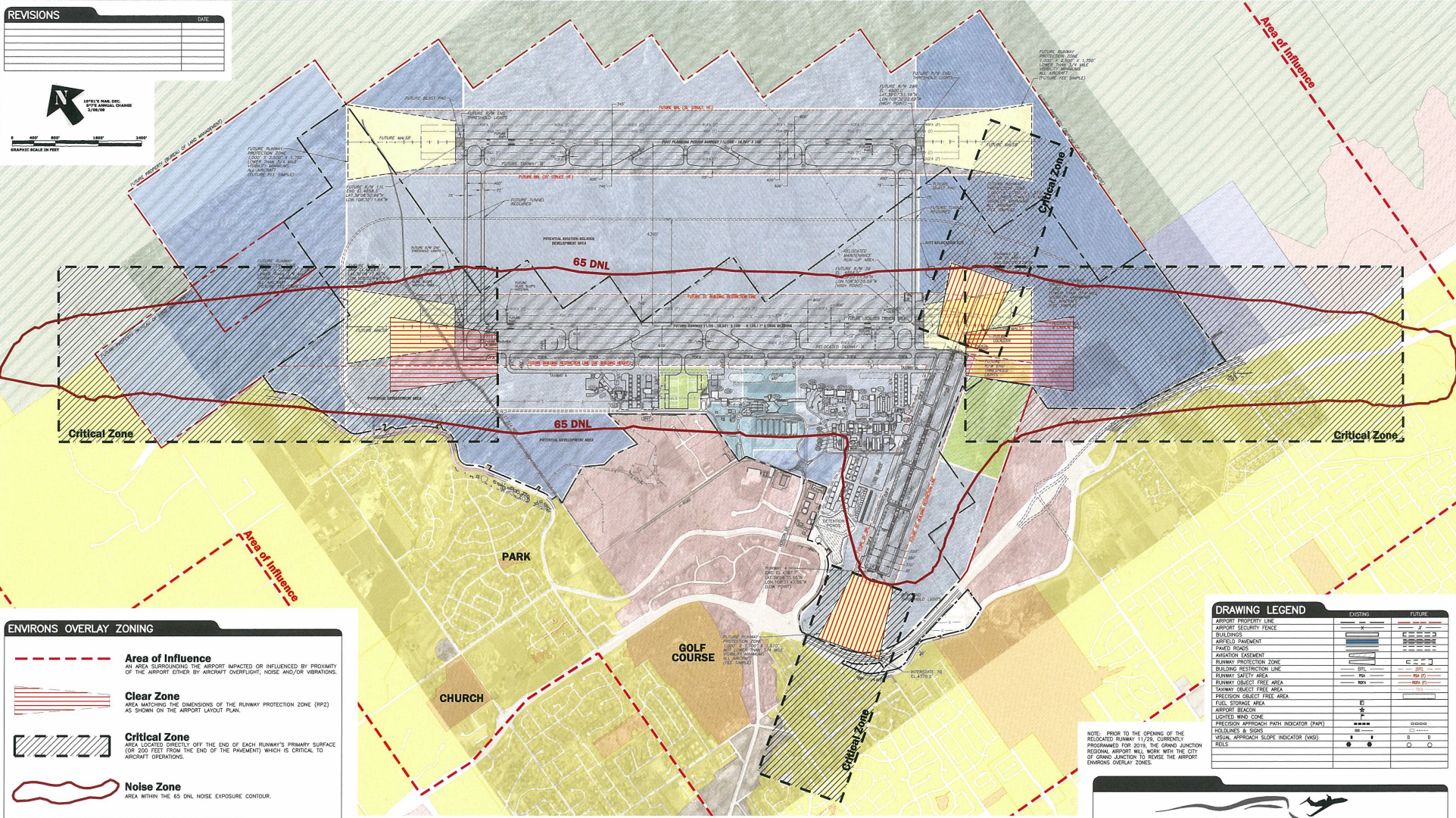
Assumed Small Vehicle cost at \$70,000 in 2014 dollars.

Plans

F. Airport Plans



| REVISIONS | DATE |
|-----------|------|
| | |
| | |
| | |



ENVIRONS OVERLAY ZONING

- Area of Influence**
AN AREA SURROUNDING THE AIRPORT IMPACTED OR INFLUENCED BY PROXIMITY OF THE AIRPORT EITHER BY AIRCRAFT OVERFLIGHT, NOISE AND/OR VIBRATIONS.
- Clear Zone**
AREA MATCHING THE DIMENSIONS OF THE RUNWAY PROTECTION ZONE (RPZ) AS SHOWN ON THE AIRPORT LAYOUT PLAN.
- Critical Zone**
AREA LOCATED DIRECTLY OFF THE END OF EACH RUNWAY'S PRIMARY SURFACE (OR 200 FEET FROM THE END OF THE PAVEMENT) WHICH IS CRITICAL TO AIRCRAFT OPERATIONS.
- Noise Zone**
AREA WITHIN THE 65 DNL NOISE EXPOSURE CONTOUR.

SOURCE: CITY OF GRAND JUNCTION ZONING AND DEVELOPMENT CODE ADOPTED PURSUANT TO ORDINANCE NO. 3246.

GENERALIZED OFF-AIRPORT LAND USE

- Residential
- Business/Commercial
- Public Facilities

GENERALIZED OFF-AIRPORT LAND USE

- Industrial
- Agriculture/Open Space
- Mixed Use

ON-AIRPORT LAND USE

- Airport Operations Area
- Runway Protection Zone
- Air Carrier Development Area

ON-AIRPORT LAND USE

- Potential Air Cargo Development Area
- Aviation Related Development Area
- Non-Aviation Related Development Area

DRAWING LEGEND

| | EXISTING | FUTURE |
|---|----------|--------|
| AIRPORT PROPERTY LINE | --- | --- |
| AIRPORT SECURITY FENCE | --- | --- |
| AIRFIELD DRIVE | --- | --- |
| AIRFIELD PAVEMENT | --- | --- |
| PAVED ROADS | --- | --- |
| AVIATION EXEMPT | --- | --- |
| RUNWAY PROTECTION ZONE | --- | --- |
| BUILDING RESTRICTION LINE | --- | --- |
| RUNWAY SAFETY AREA | --- | --- |
| RUNWAY OBJECT FREE AREA | --- | --- |
| TAXIWAY OBJECT FREE AREA | --- | --- |
| FUEL STORAGE AREA | --- | --- |
| AIRPORT BEACON | --- | --- |
| LIGHTED WIND CONE | --- | --- |
| FREELIGHT APPROACH PAIN INDICATOR (FAP) | --- | --- |
| HOLDLINES & SOBS | --- | --- |
| VISUAL APPROACH SLOPE INDICATOR (VASI) | --- | --- |
| FEELS | --- | --- |

NOTE: PRIOR TO THE OPENING OF THE RELOCATED RUNWAY 11/29, CURRENTLY PROGRAMMED FOR 2016, THE GRAND JUNCTION REGIONAL AIRPORT WILL WORK WITH THE CITY OF GRAND JUNCTION TO REVISE THE AIRPORT ENVIRONS OVERLAY ZONES.



Figure F22 **LAND USE PLAN**



TULSA
1818 East 15th Street
Tulsa, Oklahoma 74120
918.585.8844

DENVER
1745 Wazee Street, Suite 400
Denver, Colorado 80202
303.625.8844

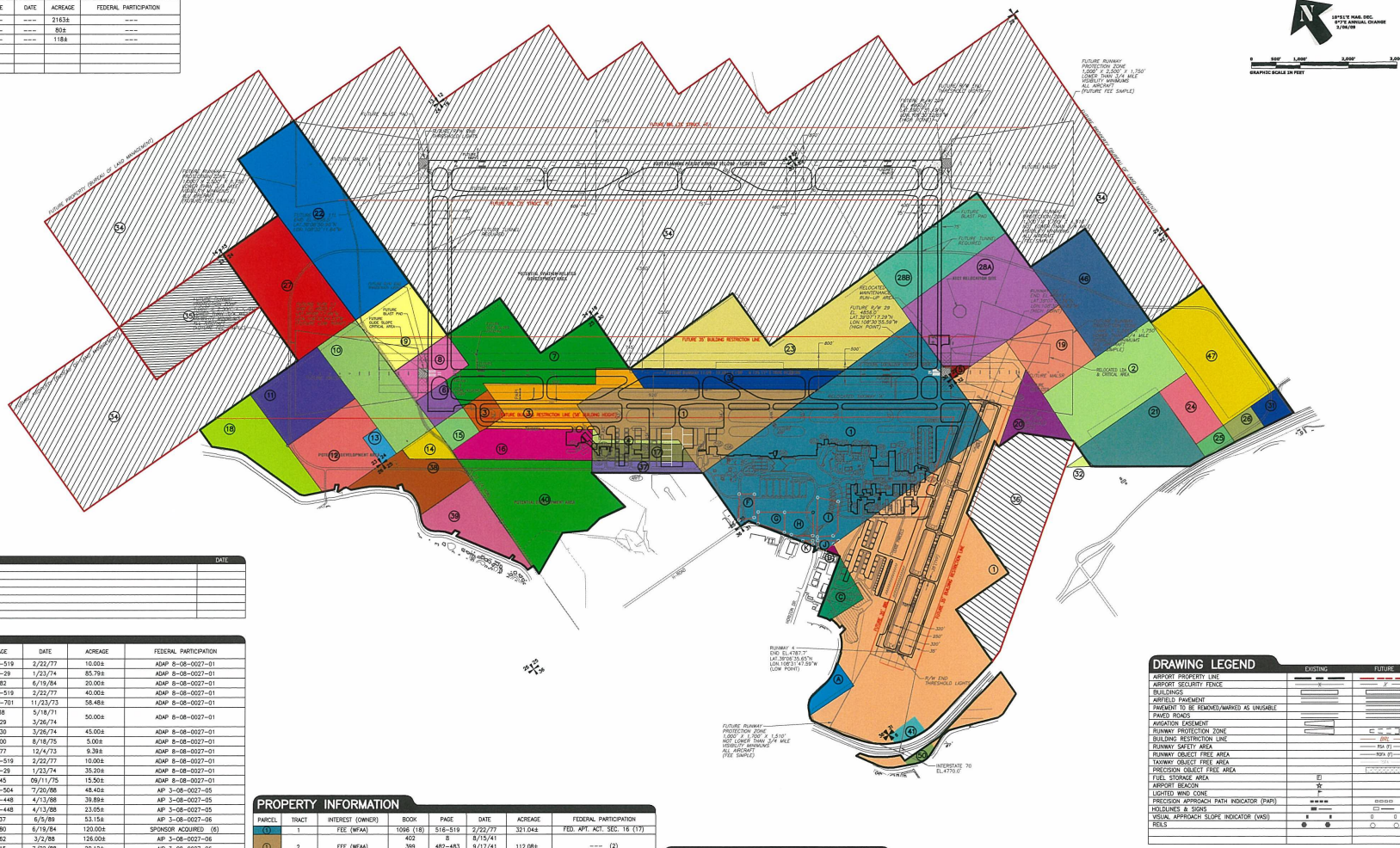
DATE
Nov 2009

SCALE
1" = 1,000'

SHEET NO.
F-30

FUTURE PROPERTY INFORMATION

| PARCEL | TRACT | INTEREST (OWNER) | BOOK | PAGE | DATE | ACREAGE | FEDERAL PARTICIPATION |
|--------|-------|----------------------|------|------|------|---------|-----------------------|
| --- | --- | FUTURE FEE (BLM) | --- | --- | --- | 2163± | --- |
| --- | --- | FUTURE FEE (PRIVATE) | --- | --- | --- | 80± | --- |
| --- | --- | FUTURE FEE (PRIVATE) | --- | --- | --- | 118± | --- |



REVISIONS

| NO. | DATE | DESCRIPTION |
|-----|------|-------------|
| | | |
| | | |

PROPERTY INFORMATION

| PARCEL | TRACT | INTEREST (OWNER) | BOOK | PAGE | DATE | ACREAGE | FEDERAL PARTICIPATION |
|--------|-------|---------------------|------|---------|----------|---------|-----------------------|
| (1) | --- | FEE (WFA) | 1096 | 516-519 | 2/22/77 | 10.00± | ADAP 8-08-0027-01 |
| (2) | --- | FEE (WFA) | 1009 | 28-29 | 1/23/74 | 85.79± | ADAP 8-08-0027-01 |
| (3) | --- | FEE (WFA) | 1501 | 282 | 6/19/84 | 20.00± | ADAP 8-08-0027-01 |
| (4) | --- | FEE (WFA) | 1096 | 516-519 | 2/22/77 | 40.00± | ADAP 8-08-0027-01 |
| (5) | --- | FEE (WFA) | 1005 | 700-701 | 11/23/73 | 58.48± | ADAP 8-08-0027-01 |
| (6) | --- | FEE (WFA) | 859 | 38 | 5/18/71 | 50.00± | ADAP 8-08-0027-01 |
| (7) | --- | FEE (WFA) | 1013 | 629 | 3/28/74 | 50.00± | ADAP 8-08-0027-01 |
| (8) | --- | FEE (WFA) (16) | 1013 | 630 | 3/28/74 | 43.00± | ADAP 8-08-0027-01 |
| (9) | --- | FEE (WFA) | 1048 | 800 | 6/18/75 | 5.00± | ADAP 8-08-0027-01 |
| (10) | --- | FEE (WFA) | 1086 | 777 | 12/4/73 | 9.39± | ADAP 8-08-0027-01 |
| (11) | --- | FEE (WFA) | 1096 | 516-519 | 2/22/77 | 10.00± | ADAP 8-08-0027-01 |
| (12) | --- | FEE (WFA) | 1009 | 28-29 | 1/23/74 | 35.20± | ADAP 8-08-0027-01 |
| (13) | --- | FEE (WFA) | 1039 | 245 | 09/11/75 | 15.50± | ADAP 8-08-0027-01 |
| (14) | --- | FEE (WFA) (16) | 1792 | 503-504 | 7/28/88 | 48.40± | AP 3-08-0027-05 |
| (15) | --- | FEE (WFA) | 1688 | 447-448 | 4/13/88 | 39.85± | AP 3-08-0027-05 |
| (16) | --- | FEE (WFA) | 1688 | 447-448 | 4/13/88 | 23.05± | AP 3-08-0027-05 |
| (17) | --- | FEE (WFA) | 1747 | 137 | 6/6/89 | 33.18± | AP 3-08-0027-05 |
| (18) | --- | FEE (WFA) | 1501 | 280 | 6/19/84 | 100.00± | SPONSOR ACQUIRED (8) |
| (19) | --- | FEE (WFA) | 1682 | 862 | 3/2/88 | 128.00± | AP 3-08-0027-06 |
| (20) | --- | FEE (WFA) | 1703 | 815 | 7/22/88 | 20.12± | AP 3-08-0027-06 |
| (21) | --- | FEE (WFA) | 1687 | 741 | 4/8/88 | 6.60± | AP 3-08-0027-06 |
| (22) | --- | FEE (WFA) | 1728 | 767 | 1/25/89 | 7.53± | AP 3-08-0027-06 |
| (23) | --- | FEE (WFA) | 2402 | 145 | 2/2/88 | 80.00± | SPONSOR ACQUIRED (8) |
| (24) | --- | FEE (WFA) | 1688 | 447-448 | 4/13/88 | 105.95± | AP 3-08-0027-05 |
| (25) | --- | FEE (WFA) | 1688 | 447-448 | 4/13/88 | 52.98± | AP 3-08-0027-05 |
| (26) | 1 | FEE (WFA) | 1703 | 815 | 7/22/88 | 9.20± | SPONSOR ACQUIRED (8) |
| (27) | --- | AVIGATION EASEMENT | --- | --- | 11/21/89 | 3.82± | SPONSOR ACQUIRED (8) |
| (28) | --- | FEE (WFA) | 3494 | 998 | 5/29/03 | 15.31± | AP 3-08-0027-28 |
| (29) | --- | FEE (WFA) (15) (16) | 1826 | 923 | 3/6/81 | 18.50± | SPONSOR ACQUIRED (8) |
| (30) | --- | FEE (WFA) (16) | 1910 | 527 | 8/7/92 | 15.91± | SPONSOR ACQUIRED (8) |
| (31) | --- | FEE (WFA) | 2050 | 411-422 | 2/17/84 | 96.5± | SPONSOR ACQUIRED (8) |
| (32) | --- | FEE (WFA) | 4063 | 383-385 | 12/22/05 | 4.75± | SPONSOR ACQUIRED (8) |
| (33) | --- | FEE | 4367 | 319 | 03/04/07 | 70± | SPONSOR ACQUIRED (8) |
| (34) | --- | FEE (WFA) | 4753 | 931 | 11/17/08 | 80± | SPONSOR ACQUIRED (8) |
| (35) | --- | FEE (WFA) | 4723 | 433 | 09/04/08 | 2.76± | SPONSOR ACQUIRED (8) |
| (36) | --- | FEE (CITY/COUNTY) | 972 | 901 | 1/19/70 | 6.91± | --- |
| (37) | --- | FEE (WFA) | 972 | 901 | 1/19/70 | 11.65± | --- |
| (38) | --- | FEE (WFA) | 972 | 901 | 1/19/70 | 1.10± | --- |
| (39) | --- | FEE (WFA) | 1096 | 516-519 | 2/22/77 | 1.00± | --- |

PROPERTY INFORMATION

| PARCEL | TRACT | INTEREST (OWNER) | BOOK | PAGE | DATE | ACREAGE | FEDERAL PARTICIPATION |
|--------|-------|---------------------|---------|---------|----------|---------|-----------------------|
| (1) | 1 | FEE (WFA) | 1096 | 516-519 | 2/22/77 | 331.04± | --- |
| (2) | 2 | FEE (WFA) | 402 | 8 | 8/15/41 | --- | (2) |
| (3) | 3 | FEE (WFA) | 309 | 483-483 | 9/11/41 | --- | (2) |
| (4) | 3 | FEE (WFA) | 1096 | 516-519 | 2/22/77 | 112.08± | --- |
| (5) | 3 | FEE (WFA) | 375 | 284 | 10/31/38 | --- | (2) |
| (6) | 3 | FEE (WFA) | 325 | 143 | 5/19/30 | --- | (2) |
| (7) | 3 | FEE (WFA) | 335 | 78 | 5/12/30 | --- | (2) |
| (8) | 3 | FEE (WFA) | 313 | 214 | 3/7/30 | --- | (2) |
| (9) | 3 | FEE (WFA) | 313 | 235 | 4/21/30 | 415.00± | --- |
| (10) | 3 | FEE (WFA) | 307 | 90 | 9/5/35 | --- | (2) |
| (11) | 3 | FEE (WFA) | 310 | 49 | 6/14/98 | --- | (2) |
| (12) | 3 | FEE (WFA) | 373 | 145 | 7/19/38 | --- | (2) |
| (13) | 3 | FEE (WFA) | 399 | 161 | 9/11/41 | --- | (2) |
| (14) | 3 | FEE (WFA) | 1096 | 516-519 | 2/22/77 | 102.44± | 9-05-004-5802 |
| (15) | 1 | FEE (WFA) (8,10,11) | 1096 | 516-519 | 2/22/77 | 102.44± | 9-05-004-5802 |
| (16) | 1 | FEE (WFA) | 776 | 280 | 4/20/60 | 37.85± | 9-05-004-5802 |
| (17) | 1 | FEE (WFA) | 516-519 | 2/22/77 | --- | --- | 9-05-004-5802 |
| (18) | 2 | FEE (WFA) | 776 | 289-290 | 4/20/60 | 112.08± | 9-05-004-5802 |
| (19) | 3 | FEE (WFA) | 1096 | 516-519 | 2/22/77 | 102.00± | 9-05-004-5802 |
| (20) | 3 | FEE (WFA) | 1096 | 516-519 | 2/22/77 | 102.00± | 9-05-004-5802 |
| (21) | 3 | FEE (WFA) | 776 | 289 | 4/20/60 | 2.18± | 9-05-004-5802 |
| (22) | 3 | FEE (WFA) | 1096 | 516-519 | 2/22/77 | 1.08± | 9-05-004-5802 |
| (23) | 3 | FEE (WFA) | 1096 | 516-519 | 2/22/77 | 1.08± | 9-05-004-5802 |

PROPERTY INFORMATION FOOTNOTES

- INFORMATION OBTAINED FROM NEWA COUNTY CLERK AND RECORDER'S OFFICE.
- PROPERTY OWNED BY CITY OF GRAND JUNCTION AT TIME OF FAP-01.
- PARCELS B AND E TRADED FOR PARCELS A, C, AND D.
- PARCEL B (3.00 +/- ACRES) REMOVED FROM PARCEL 1 TRACT 3.
- PARCEL E (18.50 +/- ACRES) REMOVED FROM PARCEL 1 TRACT 1.
- NO FEDERAL PARTICIPATION.
- NO PROPERTY ACQUIRED UNDER THE SURPLUS PROPERTY ACT.
- PARCEL 1 TRACT 2, PARCEL 1 TRACT 3, A PORTION OF PARCEL 2, PARCEL 3 TRACT 1, PARCEL 3 TRACT 2, PARCEL 3 TRACT 3, PARCEL 4, PARCEL 8 TRANSFERRED FROM OWNERSHIP BY CITY OF GRAND JUNCTION AND COUNTY OF MEA TO GRAND FIELDS COLORADO, PUBLIC AIRPORT AUTHORITY IN BOOK 1096, PAGES 516-519.
- EASEMENTS IN PARCEL 2 SUBSEQUENTLY ACQUIRED IN FEE AS PORTIONS OF PARCELS 19, 20 & 21.
- EASEMENTS IN PARCEL 3 SUBSEQUENTLY ACQUIRED IN FEE AS PORTIONS OF PARCELS 19, 20 & 21.
- EASEMENTS IN PARCEL 2 SUBSEQUENTLY ACQUIRED IN FEE AS PORTIONS OF PARCELS 19, 20 & 21.
- PARCELS F, G, H, J, AND K ARE PART OF PARCEL 1, PARCELS F, G, I, J, AND K WERE RELEASED FROM REQUIRED INFORMATION USE ON 2/1/79.
- PARCELS A AND C EXCLUDE ROAD AS DESCRIBED IN BOOK 714 PAGE 521.
- PARCEL 1 TRACT 3 EXCLUDES 3.00 ACRES DESCRIBED IN BOOK 962 PAGE 720.
- PARCEL 3B EXCLUDES TRACT OF LAND CONVEYED TO COLORADO-ILE ELECTRIC ASSOCIATION, INC. AS DESCRIBED IN BOOK 748 PAGE 278.
- PARCEL 1 TRACT 1, 18, 19, 20 AND 21 ARE EITHER BORDER THE RIGHT-OF-WAY OF THE GOVERNMENT INCLUDE CANAL OR ARE OFFSET FROM IT.
- FEE APP. ACT IS FEDERAL AIRPORT ACT OF 1946.
- PER PREVIOUSLY APPROVED EXHIBIT A, DATED 5/28/97.

DRAWING LEGEND

| | EXISTING | FUTURE |
|--|----------|--------|
| AIRPORT PROPERTY LINE | --- | --- |
| AIRPORT SECURITY FENCE | --- | --- |
| BUILDINGS | --- | --- |
| AIRFIELD PAVEMENT | --- | --- |
| PAVEMENT TO BE TRACKED/MARKED AS DESIRABLE | --- | --- |
| PAVED ROADS | --- | --- |
| AGRICULTURE EASEMENT | --- | --- |
| RUNWAY PROTECTION ZONE | --- | --- |
| BUILDING RESTRICTION LINE | --- | --- |
| RUNWAY SAFETY AREA | --- | --- |
| RUNWAY OBJECT FREE AREA | --- | --- |
| TAXIWAY OBJECT FREE AREA | --- | --- |
| PRECISION OBJECT FREE AREA | --- | --- |
| FILE STORAGE AREA | --- | --- |
| AIRPORT BEACON | --- | --- |
| PRECISION APPROACH PATH INDICATOR (PAPI) | --- | --- |
| LIGHTED WIND CONE | --- | --- |
| HIGHLIGHTS & SIGNS | --- | --- |
| VISUAL APPROACH SLOPE INDICATOR (VASI) | --- | --- |
| REELS | --- | --- |



Figure F23 AIRPORT PROPERTY MAP

Barnard Dunkelberg & Company

TULSA
1818 East 15th Street
Tulsa, Oklahoma 74120
918.585.8844

DENVER
2745 Wazee Street, Suite 400
Denver, Colorado 80202
303.825.8944

DATE
Nov 2009

SCALE
1" = 1,000'

SHEET NO.
F.31

APPENDIX B

Traffic Operations Reports

| Intersection | | | | | | | | | | | | |
|--------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Int Delay, s/veh | 3.3 | | | | | | | | | | | |
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | | ↕ | | | ↕ | | | ↕ | | | ↕ | |
| Traffic Vol, veh/h | 0 | 0 | 0 | 30 | 0 | 40 | 0 | 235 | 15 | 30 | 250 | 0 |
| Future Vol, veh/h | 0 | 0 | 0 | 30 | 0 | 40 | 0 | 235 | 15 | 30 | 250 | 0 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | - | - | None | - | - | None | - | - | None | - | - | None |
| Storage Length | - | - | - | - | - | - | - | - | - | - | - | - |
| Veh in Median Storage, # | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Grade, % | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 52 | 52 | 52 | 52 | 52 | 52 | 52 | 52 | 52 | 52 | 52 | 52 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 0 | 0 | 0 | 58 | 0 | 77 | 0 | 452 | 29 | 58 | 481 | 0 |

| Major/Minor | Minor2 | | Minor1 | | Major1 | | Major2 | | | | | |
|----------------------|--------|-------|--------|-------|--------|-------|--------|---|---|-------|---|---|
| Conflicting Flow All | 1102 | 1078 | 481 | 1064 | 1064 | 467 | 481 | 0 | 0 | 481 | 0 | 0 |
| Stage 1 | 597 | 597 | - | 467 | 467 | - | - | - | - | - | - | - |
| Stage 2 | 505 | 481 | - | 597 | 597 | - | - | - | - | - | - | - |
| Critical Hdwy | 7.12 | 6.52 | 6.22 | 7.12 | 6.52 | 6.22 | 4.12 | - | - | 4.12 | - | - |
| Critical Hdwy Stg 1 | 6.12 | 5.52 | - | 6.12 | 5.52 | - | - | - | - | - | - | - |
| Critical Hdwy Stg 2 | 6.12 | 5.52 | - | 6.12 | 5.52 | - | - | - | - | - | - | - |
| Follow-up Hdwy | 3.518 | 4.018 | 3.318 | 3.518 | 4.018 | 3.318 | 2.218 | - | - | 2.218 | - | - |
| Pot Cap-1 Maneuver | 189 | 219 | 585 | 201 | 223 | 596 | 1082 | - | - | 1082 | - | - |
| Stage 1 | 490 | 491 | - | 576 | 562 | - | - | - | - | - | - | - |
| Stage 2 | 549 | 554 | - | 490 | 491 | - | - | - | - | - | - | - |
| Platoon blocked, % | | | | | | | | - | - | - | - | - |
| Mov Cap-1 Maneuver | 155 | 203 | 585 | 190 | 207 | 596 | 1082 | - | - | 1082 | - | - |
| Mov Cap-2 Maneuver | 155 | 203 | - | 190 | 207 | - | - | - | - | - | - | - |
| Stage 1 | 490 | 455 | - | 576 | 562 | - | - | - | - | - | - | - |
| Stage 2 | 478 | 554 | - | 454 | 455 | - | - | - | - | - | - | - |

| Approach | EB | | WB | | NB | | SB | |
|----------------------|----|--|------|--|----|--|-----|--|
| HCM Control Delay, s | 0 | | 25.1 | | 0 | | 0.9 | |
| HCM LOS | A | | D | | | | | |

| Minor Lane/Major Mvmt | NBL | NBT | NBR | EBLn1WBLn1 | SBL | SBT | SBR |
|-----------------------|------|-----|-----|------------|-------|-------|-----|
| Capacity (veh/h) | 1082 | - | - | - | 311 | 1082 | - |
| HCM Lane V/C Ratio | - | - | - | - | 0.433 | 0.053 | - |
| HCM Control Delay (s) | 0 | - | - | 0 | 25.1 | 8.5 | 0 |
| HCM Lane LOS | A | - | - | A | D | A | A |
| HCM 95th %tile Q(veh) | 0 | - | - | - | 2.1 | 0.2 | - |

HCM 6th Signalized Intersection Summary
6: 29 Road & Patterson Road

2018 Existing
AM Peak



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|--------------------------------|------|------|------|------|------|------|------|------|------|------|-------|-------|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 95 | 460 | 150 | 130 | 1275 | 75 | 260 | 160 | 90 | 60 | 125 | 220 |
| Future Volume (veh/h) | 95 | 460 | 150 | 130 | 1275 | 75 | 260 | 160 | 90 | 60 | 125 | 220 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | No | | No | | No | | No | | No |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 116 | 561 | 183 | 159 | 1555 | 91 | 317 | 195 | 110 | 73 | 152 | 268 |
| Peak Hour Factor | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 184 | 1266 | 412 | 431 | 1685 | 98 | 333 | 374 | 317 | 273 | 246 | 208 |
| Arrive On Green | 0.05 | 0.48 | 0.48 | 0.06 | 0.49 | 0.49 | 0.12 | 0.20 | 0.20 | 0.05 | 0.13 | 0.13 |
| Sat Flow, veh/h | 1781 | 2636 | 857 | 1781 | 3413 | 199 | 1781 | 1870 | 1585 | 1781 | 1870 | 1585 |
| Grp Volume(v), veh/h | 116 | 378 | 366 | 159 | 806 | 840 | 317 | 195 | 110 | 73 | 152 | 268 |
| Grp Sat Flow(s),veh/h/ln | 1781 | 1777 | 1716 | 1781 | 1777 | 1835 | 1781 | 1870 | 1585 | 1781 | 1870 | 1585 |
| Q Serve(g_s), s | 3.2 | 13.9 | 13.9 | 4.4 | 41.6 | 42.3 | 11.5 | 9.2 | 5.9 | 3.5 | 7.6 | 13.0 |
| Cycle Q Clear(g_c), s | 3.2 | 13.9 | 13.9 | 4.4 | 41.6 | 42.3 | 11.5 | 9.2 | 5.9 | 3.5 | 7.6 | 13.0 |
| Prop In Lane | 1.00 | | 0.50 | 1.00 | | 0.11 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 184 | 854 | 824 | 431 | 877 | 906 | 333 | 374 | 317 | 273 | 246 | 208 |
| V/C Ratio(X) | 0.63 | 0.44 | 0.44 | 0.37 | 0.92 | 0.93 | 0.95 | 0.52 | 0.35 | 0.27 | 0.62 | 1.29 |
| Avail Cap(c_a), veh/h | 228 | 854 | 824 | 451 | 877 | 906 | 333 | 374 | 317 | 322 | 246 | 208 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 22.4 | 16.9 | 17.0 | 12.5 | 23.2 | 23.4 | 35.4 | 35.3 | 34.0 | 34.7 | 40.6 | 42.9 |
| Incr Delay (d2), s/veh | 3.7 | 1.7 | 1.7 | 0.5 | 16.1 | 16.8 | 36.8 | 1.3 | 0.7 | 0.5 | 4.6 | 159.9 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 1.3 | 5.5 | 5.4 | 1.6 | 19.2 | 20.2 | 5.4 | 4.2 | 2.3 | 1.5 | 3.7 | 14.2 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 26.2 | 18.6 | 18.7 | 13.0 | 39.3 | 40.1 | 72.2 | 36.7 | 34.7 | 35.3 | 45.2 | 202.8 |
| LnGrp LOS | C | B | B | B | D | D | E | D | C | D | D | F |
| Approach Vol, veh/h | | 860 | | | 1805 | | | 622 | | | 493 | |
| Approach Delay, s/veh | | 19.7 | | | 37.4 | | | 54.4 | | | 129.4 | |
| Approach LOS | | B | | | D | | | D | | | F | |
| Timer - Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | | | |
| Phs Duration (G+Y+Rc), s | 9.6 | 55.3 | 9.2 | 24.8 | 10.9 | 54.0 | 16.0 | 18.0 | | | | |
| Change Period (Y+Rc), s | 4.5 | 6.5 | 4.5 | 5.0 | 4.5 | 6.5 | 4.5 | 5.0 | | | | |
| Max Green Setting (Gmax), s | 7.5 | 47.5 | 7.5 | 17.0 | 7.5 | 47.5 | 11.5 | 13.0 | | | | |
| Max Q Clear Time (g_c+1.5I), s | 44.3 | 44.3 | 5.5 | 11.2 | 6.4 | 15.9 | 13.5 | 15.0 | | | | |
| Green Ext Time (p_c), s | 0.1 | 2.6 | 0.0 | 0.7 | 0.0 | 4.6 | 0.0 | 0.0 | | | | |

Intersection Summary

| | |
|--------------------|------|
| HCM 6th Ctrl Delay | 48.2 |
| HCM 6th LOS | D |

Notes

User approved pedestrian interval to be less than phase max green.

HCM 6th Signalized Intersection Summary
 11: I-70 Business & F Road

2018 Existing
 AM Peak



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Lane Configurations | ↖ | ↖↗ | | ↖ | ↖↗ | | ↖ | ↖↗ | ↖ | ↖ | ↖↗ | ↖ |
| Traffic Volume (veh/h) | 60 | 290 | 60 | 50 | 340 | 150 | 210 | 195 | 75 | 270 | 240 | 130 |
| Future Volume (veh/h) | 60 | 290 | 60 | 50 | 340 | 150 | 210 | 195 | 75 | 270 | 240 | 130 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 63 | 305 | 0 | 53 | 358 | 0 | 221 | 205 | 0 | 284 | 253 | 137 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 185 | 473 | | 202 | 463 | | 729 | 1939 | | 829 | 2039 | 909 |
| Arrive On Green | 0.05 | 0.13 | 0.00 | 0.05 | 0.13 | 0.00 | 0.07 | 0.55 | 0.00 | 0.09 | 0.57 | 0.57 |
| Sat Flow, veh/h | 1781 | 3647 | 0 | 1781 | 3647 | 0 | 1781 | 3554 | 1585 | 1781 | 3554 | 1585 |
| Grp Volume(v), veh/h | 63 | 305 | 0 | 53 | 358 | 0 | 221 | 205 | 0 | 284 | 253 | 137 |
| Grp Sat Flow(s),veh/h/ln | 1781 | 1777 | 0 | 1781 | 1777 | 0 | 1781 | 1777 | 1585 | 1781 | 1777 | 1585 |
| Q Serve(g_s), s | 3.6 | 9.8 | 0.0 | 3.0 | 11.7 | 0.0 | 6.5 | 3.3 | 0.0 | 8.3 | 3.9 | 4.8 |
| Cycle Q Clear(g_c), s | 3.6 | 9.8 | 0.0 | 3.0 | 11.7 | 0.0 | 6.5 | 3.3 | 0.0 | 8.3 | 3.9 | 4.8 |
| Prop In Lane | 1.00 | | 0.00 | 1.00 | | 0.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 185 | 473 | | 202 | 463 | | 729 | 1939 | | 829 | 2039 | 909 |
| V/C Ratio(X) | 0.34 | 0.64 | | 0.26 | 0.77 | | 0.30 | 0.11 | | 0.34 | 0.12 | 0.15 |
| Avail Cap(c_a), veh/h | 316 | 829 | | 413 | 977 | | 872 | 1939 | | 922 | 2039 | 909 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 42.3 | 49.3 | 0.0 | 42.1 | 50.5 | 0.0 | 9.9 | 13.2 | 0.0 | 9.6 | 11.7 | 11.9 |
| Incr Delay (d2), s/veh | 1.1 | 1.5 | 0.0 | 0.7 | 2.8 | 0.0 | 0.2 | 0.1 | 0.0 | 0.2 | 0.1 | 0.4 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 1.6 | 4.3 | 0.0 | 1.3 | 5.2 | 0.0 | 2.3 | 1.3 | 0.0 | 3.0 | 1.5 | 1.7 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 43.4 | 50.8 | 0.0 | 42.8 | 53.2 | 0.0 | 10.2 | 13.3 | 0.0 | 9.8 | 11.9 | 12.3 |
| LnGrp LOS | D | D | | D | D | | B | B | | A | B | B |
| Approach Vol, veh/h | | 368 | A | | 411 | A | | 426 | A | | 674 | |
| Approach Delay, s/veh | | 49.5 | | | 51.9 | | | 11.6 | | | 11.1 | |
| Approach LOS | | D | | | D | | | B | | | B | |
| Timer - Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | | | |
| Phs Duration (G+Y+Rc), s | 6.8 | 71.5 | 9.8 | 22.0 | 13.4 | 74.8 | 10.1 | 21.6 | | | | |
| Change Period (Y+Rc), s | 6.0 | 6.0 | 4.0 | 6.0 | 4.5 | 6.0 | 4.0 | 6.0 | | | | |
| Max Green Setting (Gmax), s | 7.0 | 33.0 | 20.0 | 28.0 | 18.5 | 33.0 | 15.0 | 33.0 | | | | |
| Max Q Clear Time (g_c+I1), s | 10.3 | 5.3 | 5.0 | 11.8 | 8.5 | 6.8 | 5.6 | 13.7 | | | | |
| Green Ext Time (p_c), s | 0.5 | 1.1 | 0.1 | 1.5 | 0.4 | 1.9 | 0.1 | 1.9 | | | | |

Intersection Summary

| | |
|--------------------|------|
| HCM 6th Ctrl Delay | 27.7 |
| HCM 6th LOS | C |

Notes

User approved pedestrian interval to be less than phase max green.
 Unsignalized Delay for [NBR, EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

DELAY (CONTROL)

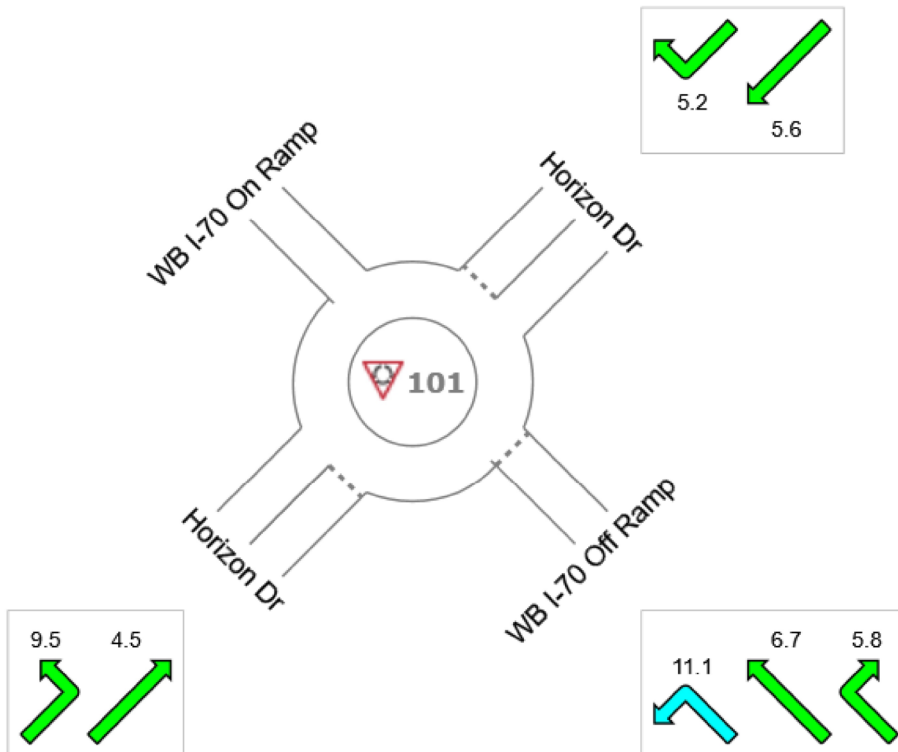
Average control delay per vehicle, or average pedestrian delay (seconds)

 Site: 101 [I-70 WB Ramps at Horizon Dr_Existing_AM]

Site Category: -
Roundabout

All Movement Classes

| | Approaches | | | Intersection |
|-----------------|------------|-----------|-----------|--------------|
| | Southeast | Northeast | Southwest | |
| Delay (Control) | 8.3 | 5.5 | 5.6 | 6.2 |
| LOS | A | A | A | A |



Colour code based on Level of Service



Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab). LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Roundabout Level of Service Method: Same as Signalised Intersections

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

DELAY (CONTROL)

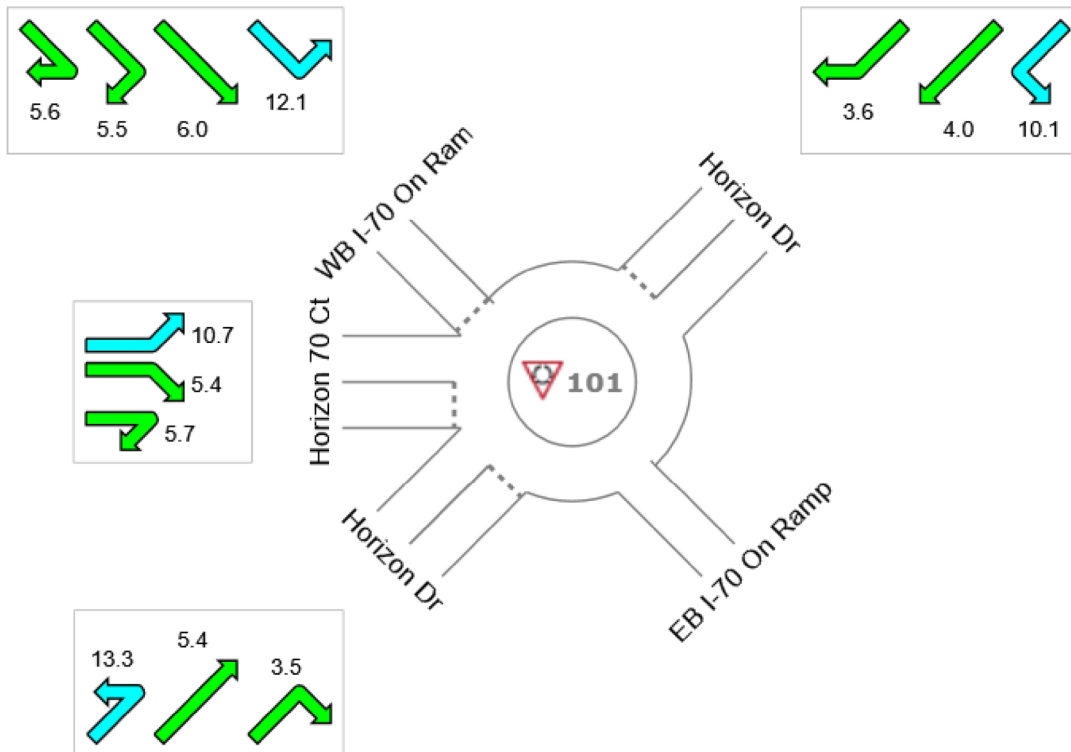
Average control delay per vehicle, or average pedestrian delay (seconds)

 Site: 101 [I-70 EB Ramps at Horizon Dr_Existing_AM]

Site Category: -
Roundabout

All Movement Classes

| | Approaches | | | | Intersection |
|-----------------|------------|-----------|------|-----------|--------------|
| | Northeast | Northwest | West | Southwest | |
| Delay (Control) | 5.2 | 8.2 | 7.4 | 5.3 | 6.0 |
| LOS | A | A | A | A | A |



Colour code based on Level of Service



Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab). LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Roundabout Level of Service Method: Same as Signalised Intersections

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

| Intersection | | | | | | | | | | | | |
|--------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Int Delay, s/veh | 1.6 | | | | | | | | | | | |
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | | ↕ | | | ↕ | | | ↕ | | | ↕ | |
| Traffic Vol, veh/h | 0 | 0 | 1 | 25 | 0 | 10 | 0 | 100 | 40 | 5 | 80 | 0 |
| Future Vol, veh/h | 0 | 0 | 1 | 25 | 0 | 10 | 0 | 100 | 40 | 5 | 80 | 0 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | - | - | None | - | - | None | - | - | None | - | - | None |
| Storage Length | - | - | - | - | - | - | - | - | - | - | - | - |
| Veh in Median Storage, # | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Grade, % | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 0 | 0 | 1 | 33 | 0 | 13 | 0 | 133 | 53 | 7 | 107 | 0 |

| Major/Minor | Minor2 | | Minor1 | | Major1 | | Major2 | | | | | |
|----------------------|--------|-------|--------|-------|--------|-------|--------|---|---|-------|---|---|
| Conflicting Flow All | 287 | 307 | 107 | 282 | 281 | 160 | 107 | 0 | 0 | 186 | 0 | 0 |
| Stage 1 | 121 | 121 | - | 160 | 160 | - | - | - | - | - | - | - |
| Stage 2 | 166 | 186 | - | 122 | 121 | - | - | - | - | - | - | - |
| Critical Hdwy | 7.12 | 6.52 | 6.22 | 7.12 | 6.52 | 6.22 | 4.12 | - | - | 4.12 | - | - |
| Critical Hdwy Stg 1 | 6.12 | 5.52 | - | 6.12 | 5.52 | - | - | - | - | - | - | - |
| Critical Hdwy Stg 2 | 6.12 | 5.52 | - | 6.12 | 5.52 | - | - | - | - | - | - | - |
| Follow-up Hdwy | 3.518 | 4.018 | 3.318 | 3.518 | 4.018 | 3.318 | 2.218 | - | - | 2.218 | - | - |
| Pot Cap-1 Maneuver | 665 | 607 | 947 | 670 | 627 | 885 | 1484 | - | - | 1388 | - | - |
| Stage 1 | 883 | 796 | - | 842 | 766 | - | - | - | - | - | - | - |
| Stage 2 | 836 | 746 | - | 882 | 796 | - | - | - | - | - | - | - |
| Platoon blocked, % | | | | | | | | - | - | - | - | - |
| Mov Cap-1 Maneuver | 652 | 604 | 947 | 667 | 624 | 885 | 1484 | - | - | 1388 | - | - |
| Mov Cap-2 Maneuver | 652 | 604 | - | 667 | 624 | - | - | - | - | - | - | - |
| Stage 1 | 883 | 792 | - | 842 | 766 | - | - | - | - | - | - | - |
| Stage 2 | 823 | 746 | - | 876 | 792 | - | - | - | - | - | - | - |

| Approach | EB | | WB | | NB | | SB | |
|----------------------|-----|--|------|--|----|--|-----|--|
| HCM Control Delay, s | 8.8 | | 10.4 | | 0 | | 0.4 | |
| HCM LOS | A | | B | | | | | |

| Minor Lane/Major Mvmt | NBL | NBT | NBR | EBLn1 | WBLn1 | SBL | SBT | SBR |
|-----------------------|------|-----|-----|-------|-------|-------|-----|-----|
| Capacity (veh/h) | 1484 | - | - | 947 | 717 | 1388 | - | - |
| HCM Lane V/C Ratio | - | - | - | 0.001 | 0.065 | 0.005 | - | - |
| HCM Control Delay (s) | 0 | - | - | 8.8 | 10.4 | 7.6 | 0 | - |
| HCM Lane LOS | A | - | - | A | B | A | A | - |
| HCM 95th %tile Q(veh) | 0 | - | - | 0 | 0.2 | 0 | - | - |

HCM 6th Signalized Intersection Summary
6: 29 Road & Patterson Road

2018 Existing
PM Peak



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|-------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (veh/h) | 140 | 1220 | 330 | 130 | 755 | 20 | 230 | 120 | 220 | 50 | 65 | 85 |
| Future Volume (veh/h) | 140 | 1220 | 330 | 130 | 755 | 20 | 230 | 120 | 220 | 50 | 65 | 85 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 147 | 1284 | 347 | 137 | 795 | 21 | 242 | 126 | 232 | 53 | 68 | 89 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 435 | 1439 | 381 | 206 | 1821 | 48 | 354 | 312 | 264 | 223 | 147 | 124 |
| Arrive On Green | 0.06 | 0.52 | 0.52 | 0.06 | 0.51 | 0.51 | 0.12 | 0.17 | 0.17 | 0.04 | 0.08 | 0.08 |
| Sat Flow, veh/h | 1781 | 2779 | 736 | 1781 | 3537 | 93 | 1781 | 1870 | 1585 | 1781 | 1870 | 1585 |
| Grp Volume(v), veh/h | 147 | 811 | 820 | 137 | 399 | 417 | 242 | 126 | 232 | 53 | 68 | 89 |
| Grp Sat Flow(s),veh/h/ln | 1781 | 1777 | 1738 | 1781 | 1777 | 1854 | 1781 | 1870 | 1585 | 1781 | 1870 | 1585 |
| Q Serve(g_s), s | 3.5 | 37.4 | 39.7 | 3.3 | 13.0 | 13.0 | 11.2 | 5.6 | 13.2 | 2.5 | 3.2 | 5.1 |
| Cycle Q Clear(g_c), s | 3.5 | 37.4 | 39.7 | 3.3 | 13.0 | 13.0 | 11.2 | 5.6 | 13.2 | 2.5 | 3.2 | 5.1 |
| Prop In Lane | 1.00 | | 0.42 | 1.00 | | 0.05 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 435 | 920 | 900 | 206 | 915 | 954 | 354 | 312 | 264 | 223 | 147 | 124 |
| V/C Ratio(X) | 0.34 | 0.88 | 0.91 | 0.66 | 0.44 | 0.44 | 0.68 | 0.40 | 0.88 | 0.24 | 0.46 | 0.72 |
| Avail Cap(c_a), veh/h | 512 | 920 | 900 | 288 | 915 | 954 | 354 | 312 | 264 | 342 | 223 | 189 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 10.3 | 19.7 | 20.3 | 20.6 | 14.0 | 14.0 | 32.3 | 34.4 | 37.5 | 37.2 | 40.7 | 41.5 |
| Incr Delay (d2), s/veh | 0.5 | 11.9 | 14.9 | 3.6 | 1.5 | 1.5 | 5.4 | 0.8 | 26.8 | 0.5 | 2.3 | 7.4 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 1.2 | 16.2 | 17.4 | 1.5 | 4.9 | 5.1 | 5.1 | 2.5 | 6.9 | 1.1 | 1.5 | 2.2 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 10.7 | 31.6 | 35.2 | 24.3 | 15.5 | 15.5 | 37.6 | 35.2 | 64.3 | 37.8 | 42.9 | 48.9 |
| LnGrp LOS | B | C | D | C | B | B | D | D | E | D | D | D |
| Approach Vol, veh/h | | 1778 | | | 953 | | | 600 | | | 210 | |
| Approach Delay, s/veh | | 31.5 | | | 16.7 | | | 47.4 | | | 44.2 | |
| Approach LOS | | C | | | B | | | D | | | D | |
| Timer - Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | | | |
| Phs Duration (G+Y+Rc), s | 40.0 | 54.0 | 7.9 | 20.4 | 9.7 | 54.3 | 16.0 | 12.2 | | | | |
| Change Period (Y+Rc), s | 4.5 | 6.5 | 4.5 | 5.0 | 4.5 | 6.5 | 4.5 | 5.0 | | | | |
| Max Green Setting (Gmax), s | 47.5 | 47.5 | 9.5 | 13.0 | 9.5 | 47.5 | 11.5 | 11.0 | | | | |
| Max Q Clear Time (g_c+1/5), s | 15.0 | 15.0 | 4.5 | 15.2 | 5.3 | 41.7 | 13.2 | 7.1 | | | | |
| Green Ext Time (p_c), s | 0.1 | 5.1 | 0.0 | 0.0 | 0.1 | 4.4 | 0.0 | 0.2 | | | | |

Intersection Summary

| | |
|--------------------|------|
| HCM 6th Ctrl Delay | 31.0 |
| HCM 6th LOS | C |

Notes

User approved pedestrian interval to be less than phase max green.

HCM 6th Signalized Intersection Summary
 11: I-70 Business & F Road

2018 Existing
 PM Peak



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Lane Configurations | ↖ | ↖↗ | | ↖ | ↖↗ | | ↖ | ↖↗ | ↖ | ↖ | ↖↗ | ↖ |
| Traffic Volume (veh/h) | 170 | 540 | 245 | 115 | 330 | 340 | 115 | 345 | 110 | 185 | 275 | 70 |
| Future Volume (veh/h) | 170 | 540 | 245 | 115 | 330 | 340 | 115 | 345 | 110 | 185 | 275 | 70 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 181 | 574 | 0 | 122 | 351 | 0 | 122 | 367 | 0 | 197 | 293 | 74 |
| Peak Hour Factor | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 297 | 657 | | 215 | 534 | | 648 | 1752 | | 632 | 1853 | 826 |
| Arrive On Green | 0.10 | 0.18 | 0.00 | 0.07 | 0.15 | 0.00 | 0.06 | 0.49 | 0.00 | 0.07 | 0.52 | 0.52 |
| Sat Flow, veh/h | 1781 | 3647 | 0 | 1781 | 3647 | 0 | 1781 | 3554 | 1585 | 1781 | 3554 | 1585 |
| Grp Volume(v), veh/h | 181 | 574 | 0 | 122 | 351 | 0 | 122 | 367 | 0 | 197 | 293 | 74 |
| Grp Sat Flow(s),veh/h/ln | 1781 | 1777 | 0 | 1781 | 1777 | 0 | 1781 | 1777 | 1585 | 1781 | 1777 | 1585 |
| Q Serve(g_s), s | 9.9 | 18.8 | 0.0 | 6.8 | 11.2 | 0.0 | 4.0 | 7.0 | 0.0 | 6.5 | 5.2 | 2.8 |
| Cycle Q Clear(g_c), s | 9.9 | 18.8 | 0.0 | 6.8 | 11.2 | 0.0 | 4.0 | 7.0 | 0.0 | 6.5 | 5.2 | 2.8 |
| Prop In Lane | 1.00 | | 0.00 | 1.00 | | 0.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 297 | 657 | | 215 | 534 | | 648 | 1752 | | 632 | 1853 | 826 |
| V/C Ratio(X) | 0.61 | 0.87 | | 0.57 | 0.66 | | 0.19 | 0.21 | | 0.31 | 0.16 | 0.09 |
| Avail Cap(c_a), veh/h | 327 | 740 | | 380 | 888 | | 835 | 1752 | | 768 | 1853 | 826 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 36.7 | 47.6 | 0.0 | 39.8 | 48.1 | 0.0 | 13.0 | 17.2 | 0.0 | 12.9 | 15.0 | 14.4 |
| Incr Delay (d2), s/veh | 2.8 | 10.4 | 0.0 | 2.3 | 1.4 | 0.0 | 0.1 | 0.3 | 0.0 | 0.3 | 0.2 | 0.2 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 4.4 | 9.0 | 0.0 | 3.1 | 4.9 | 0.0 | 1.5 | 2.8 | 0.0 | 2.5 | 2.0 | 1.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 39.5 | 58.0 | 0.0 | 42.1 | 49.4 | 0.0 | 13.2 | 17.5 | 0.0 | 13.2 | 15.2 | 14.6 |
| LnGrp LOS | D | E | | D | D | | B | B | | B | B | B |
| Approach Vol, veh/h | | 755 | A | | 473 | A | | 489 | A | | 564 | |
| Approach Delay, s/veh | | 53.6 | | | 47.6 | | | 16.4 | | | 14.4 | |
| Approach LOS | | D | | | D | | | B | | | B | |
| Timer - Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | | | |
| Phs Duration (G+Y+Rc), s | 4.8 | 65.1 | 11.9 | 28.2 | 11.4 | 68.6 | 16.0 | 24.0 | | | | |
| Change Period (Y+Rc), s | 6.0 | 6.0 | 3.0 | 6.0 | 4.5 | 6.0 | 4.0 | 6.0 | | | | |
| Max Green Setting (Gmax), s | 30.0 | 36.0 | 20.0 | 25.0 | 19.5 | 36.0 | 14.0 | 30.0 | | | | |
| Max Q Clear Time (g_c+1), s | 10.5 | 9.0 | 8.8 | 20.8 | 6.0 | 7.2 | 11.9 | 13.2 | | | | |
| Green Ext Time (p_c), s | 0.3 | 2.2 | 0.2 | 1.3 | 0.2 | 2.0 | 0.1 | 1.8 | | | | |

Intersection Summary

| | |
|--------------------|------|
| HCM 6th Ctrl Delay | 34.7 |
| HCM 6th LOS | C |

Notes

User approved pedestrian interval to be less than phase max green.
 Unsignalized Delay for [NBR, EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

DELAY (CONTROL)

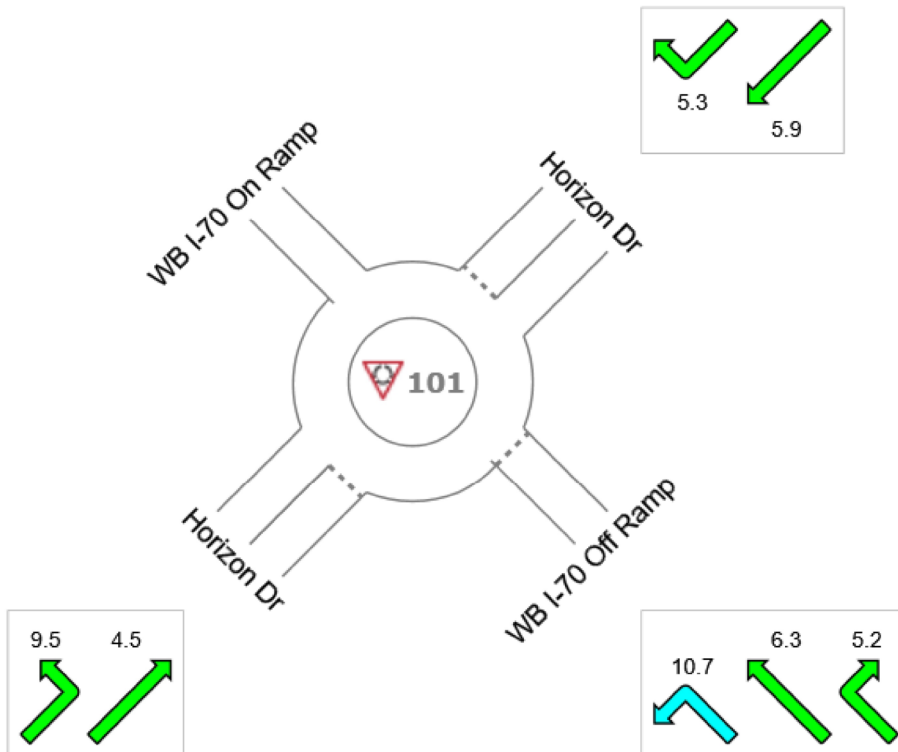
Average control delay per vehicle, or average pedestrian delay (seconds)

 Site: 101 [I-70 WB Ramps at Horizon Dr_Existing_PM]

Site Category: -
Roundabout

All Movement Classes

| | Approaches | | | Intersection |
|-----------------|------------|-----------|-----------|--------------|
| | Southeast | Northeast | Southwest | |
| Delay (Control) | 8.4 | 5.8 | 6.3 | 6.4 |
| LOS | A | A | A | A |



Colour code based on Level of Service



Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab). LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Roundabout Level of Service Method: Same as Signalised Intersections

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

DELAY (CONTROL)

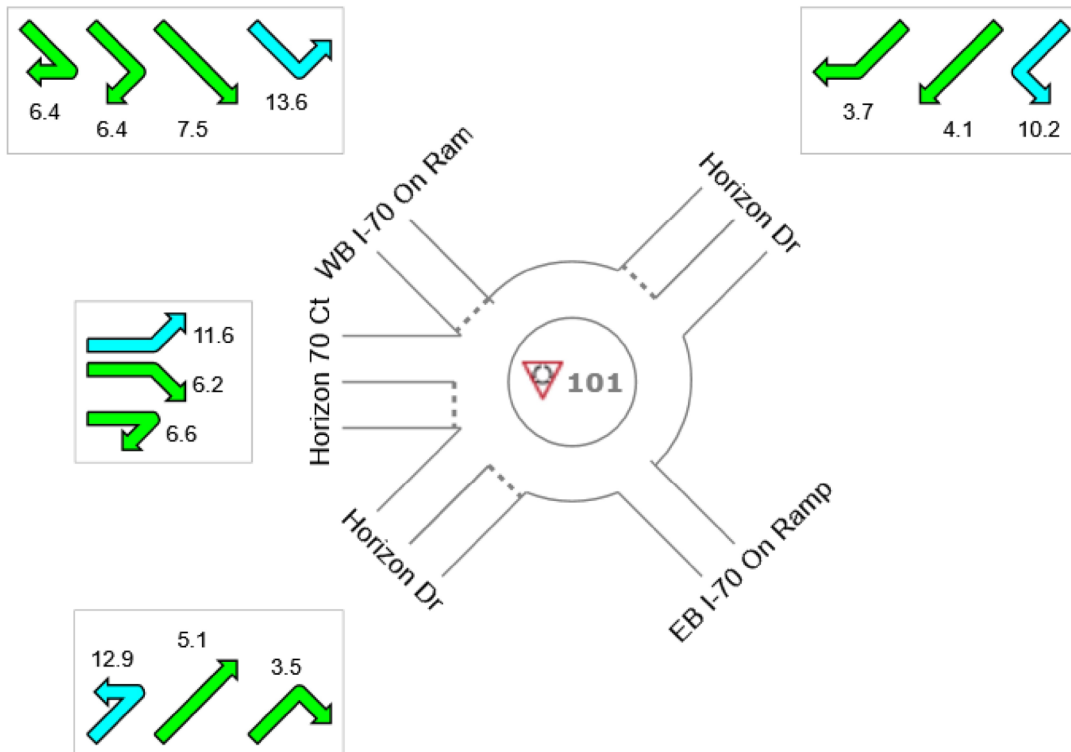
Average control delay per vehicle, or average pedestrian delay (seconds)

 Site: 101 [I-70 EB Ramps at Horizon Dr_Existing_PM]

Site Category: -
Roundabout

All Movement Classes

| | Approaches | | | | Intersection |
|-----------------|------------|-----------|------|-----------|--------------|
| | Northeast | Northwest | West | Southwest | |
| Delay (Control) | 5.3 | 8.2 | 7.5 | 4.8 | 5.6 |
| LOS | A | A | A | A | A |



Colour code based on Level of Service



Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab). LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Roundabout Level of Service Method: Same as Signalised Intersections
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

| Intersection | | | | | | | | | | | | |
|--------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Int Delay, s/veh | 1.2 | | | | | | | | | | | |
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | | ↕ | | | ↕ | | | ↕ | | | ↕ | |
| Traffic Vol, veh/h | 5 | 0 | 0 | 95 | 0 | 125 | 0 | 580 | 50 | 130 | 650 | 5 |
| Future Vol, veh/h | 5 | 0 | 0 | 95 | 0 | 125 | 0 | 580 | 50 | 130 | 650 | 5 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | - | - | None | - | - | None | - | - | None | - | - | None |
| Storage Length | - | - | - | - | - | - | - | - | - | - | - | - |
| Veh in Median Storage, # | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Grade, % | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 52 | 52 | 52 | 52 | 52 | 52 | 52 | 52 | 52 | 52 | 52 | 52 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 10 | 0 | 0 | 183 | 0 | 240 | 0 | 1115 | 96 | 250 | 1250 | 10 |

| Major/Minor | Minor2 | | Minor1 | | Major1 | | Major2 | | | | | |
|----------------------|--------|-------|--------|-------|--------|-------|--------|---|---|-------|---|---|
| Conflicting Flow All | 3038 | 2966 | 1255 | 2918 | 2923 | 1163 | 1260 | 0 | 0 | 1211 | 0 | 0 |
| Stage 1 | 1755 | 1755 | - | 1163 | 1163 | - | - | - | - | - | - | - |
| Stage 2 | 1283 | 1211 | - | 1755 | 1760 | - | - | - | - | - | - | - |
| Critical Hdwy | 7.12 | 6.52 | 6.22 | 7.12 | 6.52 | 6.22 | 4.12 | - | - | 4.12 | - | - |
| Critical Hdwy Stg 1 | 6.12 | 5.52 | - | 6.12 | 5.52 | - | - | - | - | - | - | - |
| Critical Hdwy Stg 2 | 6.12 | 5.52 | - | 6.12 | 5.52 | - | - | - | - | - | - | - |
| Follow-up Hdwy | 3.518 | 4.018 | 3.318 | 3.518 | 4.018 | 3.318 | 2.218 | - | - | 2.218 | - | - |
| Pot Cap-1 Maneuver | ~ 8 | 14 | 209 | ~ 10 | 15 | ~ 237 | 552 | - | - | 576 | - | - |
| Stage 1 | 108 | 139 | - | 237 | 269 | - | - | - | - | - | - | - |
| Stage 2 | 203 | 255 | - | ~ 108 | 138 | - | - | - | - | - | - | - |
| Platoon blocked, % | | | | | | | | - | - | - | - | - |
| Mov Cap-1 Maneuver | - | 0 | 209 | - | 0 | ~ 237 | 552 | - | - | 576 | - | - |
| Mov Cap-2 Maneuver | - | 0 | - | - | 0 | - | - | - | - | - | - | - |
| Stage 1 | 108 | 0 | - | 237 | 269 | - | - | - | - | - | - | - |
| Stage 2 | - | 255 | - | - | 0 | - | - | - | - | - | - | - |























| Approach | EB | WB | NB | SB |
|----------------------|----|----|----|-----|
| HCM Control Delay, s | | | 0 | 2.6 |
| HCM LOS | - | - | | |

| Minor Lane/Major Mvmt | NBL | NBT | NBR | EBLn1WBLn1 | SBL | SBT | SBR |
|-----------------------|-----|-----|-----|------------|-------|-----|-----|
| Capacity (veh/h) | 552 | - | - | - | 576 | - | - |
| HCM Lane V/C Ratio | - | - | - | - | 0.434 | - | - |
| HCM Control Delay (s) | 0 | - | - | - | 16 | 0 | - |
| HCM Lane LOS | A | - | - | - | C | A | - |
| HCM 95th %tile Q(veh) | 0 | - | - | - | 2.2 | - | - |

Notes
 ~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

HCM 6th Signalized Intersection Summary
6: 29 Road & Patterson Road

2040 Without Interchange
Timing Plan: AM Peak

| |  |  |  |  |  |  |  |  |  |  |  |  |
|------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations |  |  | |  |  | |  |  |  |  |  |  |
| Traffic Volume (veh/h) | 170 | 405 | 175 | 190 | 1200 | 168 | 310 | 455 | 130 | 140 | 370 | 425 |
| Future Volume (veh/h) | 170 | 405 | 175 | 190 | 1200 | 168 | 310 | 455 | 130 | 140 | 370 | 425 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 207 | 494 | 213 | 232 | 1463 | 205 | 378 | 555 | 159 | 171 | 451 | 518 |
| Peak Hour Factor | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 171 | 940 | 403 | 400 | 1319 | 183 | 290 | 530 | 449 | 171 | 405 | 343 |
| Arrive On Green | 0.06 | 0.39 | 0.39 | 0.10 | 0.42 | 0.42 | 0.13 | 0.28 | 0.28 | 0.06 | 0.22 | 0.22 |
| Sat Flow, veh/h | 1781 | 2422 | 1038 | 1781 | 3135 | 434 | 1781 | 1870 | 1585 | 1781 | 1870 | 1585 |
| Grp Volume(v), veh/h | 207 | 362 | 345 | 232 | 821 | 847 | 378 | 555 | 159 | 171 | 451 | 518 |
| Grp Sat Flow(s),veh/h/ln | 1781 | 1777 | 1683 | 1781 | 1777 | 1792 | 1781 | 1870 | 1585 | 1781 | 1870 | 1585 |
| Q Serve(g_s), s | 7.5 | 18.8 | 18.9 | 9.1 | 50.5 | 50.5 | 15.5 | 34.0 | 9.6 | 7.5 | 26.0 | 26.0 |
| Cycle Q Clear(g_c), s | 7.5 | 18.8 | 18.9 | 9.1 | 50.5 | 50.5 | 15.5 | 34.0 | 9.6 | 7.5 | 26.0 | 26.0 |
| Prop In Lane | 1.00 | | 0.62 | 1.00 | | 0.24 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 171 | 690 | 653 | 400 | 748 | 754 | 290 | 530 | 449 | 171 | 405 | 343 |
| V/C Ratio(X) | 1.21 | 0.52 | 0.53 | 0.58 | 1.10 | 1.12 | 1.30 | 1.05 | 0.35 | 1.00 | 1.11 | 1.51 |
| Avail Cap(c_a), veh/h | 171 | 690 | 653 | 502 | 748 | 754 | 290 | 530 | 449 | 171 | 405 | 343 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 31.8 | 28.2 | 28.3 | 20.1 | 34.8 | 34.8 | 34.8 | 43.0 | 34.3 | 40.6 | 47.0 | 47.0 |
| Incr Delay (d2), s/veh | 135.8 | 2.8 | 3.0 | 1.3 | 63.2 | 71.9 | 159.2 | 52.0 | 0.5 | 68.2 | 79.0 | 243.4 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 9.5 | 8.2 | 7.9 | 3.7 | 33.5 | 35.5 | 19.4 | 23.0 | 3.7 | 4.7 | 20.7 | 33.2 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 167.6 | 31.0 | 31.3 | 21.4 | 97.9 | 106.6 | 194.1 | 95.0 | 34.7 | 108.8 | 126.0 | 290.4 |
| LnGrp LOS | F | C | C | C | F | F | F | F | C | F | F | F |
| Approach Vol, veh/h | | 914 | | | 1900 | | | 1092 | | | 1140 | |
| Approach Delay, s/veh | | 62.1 | | | 92.5 | | | 120.5 | | | 198.1 | |
| Approach LOS | | E | | | F | | | F | | | F | |
| Timer - Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | | | |
| Phs Duration (G+Y+Rc), s | 12.0 | 57.0 | 12.0 | 39.0 | 15.9 | 53.1 | 20.0 | 31.0 | | | | |
| Change Period (Y+Rc), s | 4.5 | 6.5 | 4.5 | 5.0 | 4.5 | 6.5 | 4.5 | 5.0 | | | | |
| Max Green Setting (Gmax), s | 7.5 | 50.5 | 7.5 | 34.0 | 18.3 | 39.7 | 15.5 | 26.0 | | | | |
| Max Q Clear Time (g_c+I1), s | 9.5 | 52.5 | 9.5 | 36.0 | 11.1 | 20.9 | 17.5 | 28.0 | | | | |
| Green Ext Time (p_c), s | 0.0 | 0.0 | 0.0 | 0.0 | 0.4 | 3.9 | 0.0 | 0.0 | | | | |

Intersection Summary























| | |
|--------------------|-------|
| HCM 6th Ctrl Delay | 116.9 |
| HCM 6th LOS | F |

Notes

User approved pedestrian interval to be less than phase max green.

HCM 6th Signalized Intersection Summary
 11: I-70 Business & F Road

2040 Without Interchange
 Timing Plan: AM Peak

| |  |  |  |  |  |  |  |  |  |  |  |  |
|------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations |  |  | |  |  | |  |  |  |  |  |  |
| Traffic Volume (veh/h) | 150 | 285 | 65 | 35 | 330 | 250 | 235 | 365 | 55 | 425 | 410 | 310 |
| Future Volume (veh/h) | 150 | 285 | 65 | 35 | 330 | 250 | 235 | 365 | 55 | 425 | 410 | 310 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 158 | 300 | 0 | 37 | 347 | 0 | 247 | 384 | 0 | 447 | 432 | 326 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 223 | 400 | | 259 | 437 | | 562 | 1738 | | 736 | 1969 | 878 |
| Arrive On Green | 0.06 | 0.11 | 0.00 | 0.07 | 0.12 | 0.00 | 0.09 | 0.49 | 0.00 | 0.14 | 0.55 | 0.55 |
| Sat Flow, veh/h | 3456 | 3647 | 0 | 3456 | 3647 | 0 | 1781 | 3554 | 1585 | 1781 | 3554 | 1585 |
| Grp Volume(v), veh/h | 158 | 300 | 0 | 37 | 347 | 0 | 247 | 384 | 0 | 447 | 432 | 326 |
| Grp Sat Flow(s),veh/h/ln | 1728 | 1777 | 0 | 1728 | 1777 | 0 | 1781 | 1777 | 1585 | 1781 | 1777 | 1585 |
| Q Serve(g_s), s | 5.4 | 9.8 | 0.0 | 1.2 | 11.4 | 0.0 | 8.2 | 7.4 | 0.0 | 14.2 | 7.4 | 9.3 |
| Cycle Q Clear(g_c), s | 5.4 | 9.8 | 0.0 | 1.2 | 11.4 | 0.0 | 8.2 | 7.4 | 0.0 | 14.2 | 7.4 | 9.3 |
| Prop In Lane | 1.00 | | 0.00 | 1.00 | | 0.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 223 | 400 | | 259 | 437 | | 562 | 1738 | | 736 | 1969 | 878 |
| V/C Ratio(X) | 0.71 | 0.75 | | 0.14 | 0.79 | | 0.44 | 0.22 | | 0.61 | 0.22 | 0.37 |
| Avail Cap(c_a), veh/h | 720 | 1051 | | 366 | 687 | | 648 | 1738 | | 784 | 1969 | 878 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 55.0 | 51.6 | 0.0 | 51.9 | 51.2 | 0.0 | 12.5 | 17.6 | 0.0 | 10.7 | 13.6 | 6.7 |
| Incr Delay (d2), s/veh | 4.1 | 2.8 | 0.0 | 0.3 | 3.4 | 0.0 | 0.5 | 0.3 | 0.0 | 1.2 | 0.3 | 1.2 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 2.4 | 4.4 | 0.0 | 0.5 | 5.1 | 0.0 | 3.1 | 3.0 | 0.0 | 5.2 | 2.9 | 4.5 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 59.1 | 54.4 | 0.0 | 52.2 | 54.6 | 0.0 | 13.0 | 17.8 | 0.0 | 11.9 | 13.8 | 7.9 |
| LnGrp LOS | E | D | | D | D | | B | B | | B | B | A |
| Approach Vol, veh/h | | 458 | A | | 384 | A | | 631 | A | | 1205 | |
| Approach Delay, s/veh | | 56.0 | | | 54.4 | | | 16.0 | | | 11.5 | |
| Approach LOS | | E | | | D | | | B | | | B | |
| Timer - Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | | | |
| Phs Duration (G+Y+Rc), s | 22.8 | 64.7 | 13.0 | 19.5 | 15.0 | 72.5 | 11.8 | 20.8 | | | | |
| Change Period (Y+Rc), s | 6.0 | 6.0 | 4.0 | 6.0 | 4.5 | 6.0 | 4.0 | 6.0 | | | | |
| Max Green Setting (Gmax), s | 20.0 | 29.8 | 12.7 | 35.5 | 16.3 | 35.0 | 25.0 | 23.2 | | | | |
| Max Q Clear Time (g_c+I1), s | 16.2 | 9.4 | 3.2 | 11.8 | 10.2 | 11.3 | 7.4 | 13.4 | | | | |
| Green Ext Time (p_c), s | 0.6 | 2.1 | 0.0 | 1.7 | 0.4 | 3.8 | 0.4 | 1.4 | | | | |

Intersection Summary

| | |
|--------------------|------|
| HCM 6th Ctrl Delay | 26.3 |
| HCM 6th LOS | C |

Notes

User approved pedestrian interval to be less than phase max green.
 Unsignalized Delay for [NBR, EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

DELAY (CONTROL)

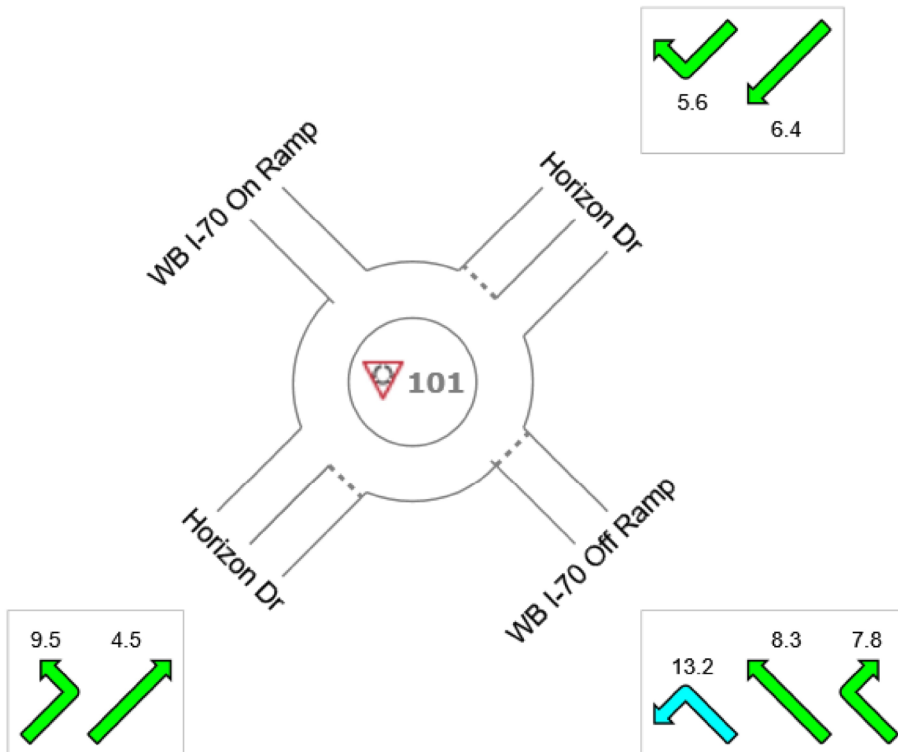
Average control delay per vehicle, or average pedestrian delay (seconds)

 Site: 101 [I-70 WB Ramps at Horizon Dr_2040 wo IC_NB_AM]

Site Category: -
Roundabout

All Movement Classes

| | Approaches | | | Intersection |
|-----------------|------------|-----------|-----------|--------------|
| | Southeast | Northeast | Southwest | |
| Delay (Control) | 10.0 | 6.2 | 5.5 | 6.9 |
| LOS | B | A | A | A |



Colour code based on Level of Service



Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Roundabout Level of Service Method: Same as Signalised Intersections
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

DELAY (CONTROL)

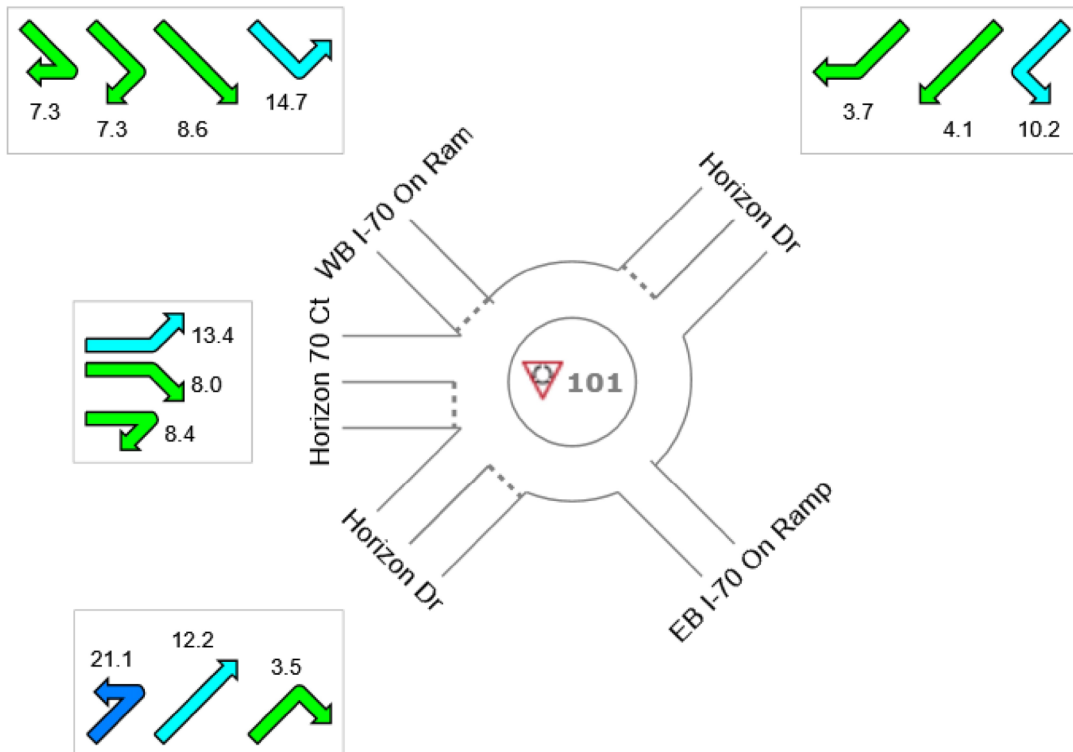
Average control delay per vehicle, or average pedestrian delay (seconds)

 Site: 101 [I-70 EB Ramps at Horizon Dr_2040 wo IC_NB_AM]

Site Category: -
Roundabout

All Movement Classes

| | Approaches | | | | Intersection |
|-----------------|------------|-----------|------|-----------|--------------|
| | Northeast | Northwest | West | Southwest | |
| Delay (Control) | 5.4 | 10.7 | 10.1 | 11.0 | 9.2 |
| LOS | A | B | B | B | A |



Colour code based on Level of Service



Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab). LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Roundabout Level of Service Method: Same as Signalised Intersections

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

| Intersection | | | | | | | | | | | | |
|--------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Int Delay, s/veh | 3.3 | | | | | | | | | | | |
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations | | ↕ | | | ↕ | | | ↕ | | | ↕ | |
| Traffic Vol, veh/h | 1 | 1 | 0 | 40 | 1 | 70 | 0 | 260 | 90 | 50 | 215 | 2 |
| Future Vol, veh/h | 1 | 1 | 0 | 40 | 1 | 70 | 0 | 260 | 90 | 50 | 215 | 2 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | - | - | None | - | - | None | - | - | None | - | - | None |
| Storage Length | - | - | - | - | - | - | - | - | - | - | - | - |
| Veh in Median Storage, # | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Grade, % | - | 0 | - | - | 0 | - | - | 0 | - | - | 0 | - |
| Peak Hour Factor | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 1 | 1 | 0 | 53 | 1 | 93 | 0 | 347 | 120 | 67 | 287 | 3 |

| Major/Minor | Minor2 | | Minor1 | | Major1 | | Major2 | | | | | |
|----------------------|--------|-------|--------|-------|--------|-------|--------|---|---|-------|---|---|
| Conflicting Flow All | 877 | 890 | 289 | 830 | 831 | 407 | 290 | 0 | 0 | 467 | 0 | 0 |
| Stage 1 | 423 | 423 | - | 407 | 407 | - | - | - | - | - | - | - |
| Stage 2 | 454 | 467 | - | 423 | 424 | - | - | - | - | - | - | - |
| Critical Hdwy | 7.12 | 6.52 | 6.22 | 7.12 | 6.52 | 6.22 | 4.12 | - | - | 4.12 | - | - |
| Critical Hdwy Stg 1 | 6.12 | 5.52 | - | 6.12 | 5.52 | - | - | - | - | - | - | - |
| Critical Hdwy Stg 2 | 6.12 | 5.52 | - | 6.12 | 5.52 | - | - | - | - | - | - | - |
| Follow-up Hdwy | 3.518 | 4.018 | 3.318 | 3.518 | 4.018 | 3.318 | 2.218 | - | - | 2.218 | - | - |
| Pot Cap-1 Maneuver | 269 | 282 | 750 | 289 | 305 | 644 | 1272 | - | - | 1094 | - | - |
| Stage 1 | 609 | 588 | - | 621 | 597 | - | - | - | - | - | - | - |
| Stage 2 | 586 | 562 | - | 609 | 587 | - | - | - | - | - | - | - |
| Platoon blocked, % | | | | | | | | - | - | - | - | - |
| Mov Cap-1 Maneuver | 216 | 261 | 750 | 272 | 283 | 644 | 1272 | - | - | 1094 | - | - |
| Mov Cap-2 Maneuver | 216 | 261 | - | 272 | 283 | - | - | - | - | - | - | - |
| Stage 1 | 609 | 545 | - | 621 | 597 | - | - | - | - | - | - | - |
| Stage 2 | 500 | 562 | - | 563 | 544 | - | - | - | - | - | - | - |

| Approach | EB | | WB | | NB | | SB | |
|----------------------|------|--|------|--|----|--|-----|--|
| HCM Control Delay, s | 20.4 | | 17.8 | | 0 | | 1.6 | |
| HCM LOS | C | | C | | | | | |

| Minor Lane/Major Mvmt | NBL | NBT | NBR | EBLn1WBLn1 | SBL | SBT | SBR |
|-----------------------|------|-----|-----|------------|-------|-------|-----|
| Capacity (veh/h) | 1272 | - | - | 236 | 428 | 1094 | - |
| HCM Lane V/C Ratio | - | - | - | 0.011 | 0.346 | 0.061 | - |
| HCM Control Delay (s) | 0 | - | - | 20.4 | 17.8 | 8.5 | 0 |
| HCM Lane LOS | A | - | - | C | C | A | A |
| HCM 95th %tile Q(veh) | 0 | - | - | 0 | 1.5 | 0.2 | - |

HCM 6th Signalized Intersection Summary
6: 29 Road & Patterson Road

2040 Without Interchange
Timing Plan: PM Peak



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|------------------------------|------|------|-------|-------|------|------|-------|------|------|------|------|------|
| Lane Configurations | ↖ | ↕ | | ↖ | ↕ | | ↖ | ↕ | ↖ | ↖ | ↕ | ↖ |
| Traffic Volume (veh/h) | 250 | 1155 | 490 | 240 | 720 | 45 | 310 | 375 | 370 | 110 | 225 | 150 |
| Future Volume (veh/h) | 250 | 1155 | 490 | 240 | 720 | 45 | 310 | 375 | 370 | 110 | 225 | 150 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 263 | 1216 | 516 | 253 | 758 | 47 | 326 | 395 | 389 | 116 | 237 | 158 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 435 | 1136 | 462 | 236 | 1596 | 99 | 303 | 464 | 393 | 157 | 347 | 294 |
| Arrive On Green | 0.09 | 0.46 | 0.46 | 0.10 | 0.47 | 0.47 | 0.10 | 0.25 | 0.25 | 0.04 | 0.19 | 0.19 |
| Sat Flow, veh/h | 1781 | 2465 | 1002 | 1781 | 3399 | 211 | 1781 | 1870 | 1585 | 1781 | 1870 | 1585 |
| Grp Volume(v), veh/h | 263 | 862 | 870 | 253 | 396 | 409 | 326 | 395 | 389 | 116 | 237 | 158 |
| Grp Sat Flow(s),veh/h/ln | 1781 | 1777 | 1690 | 1781 | 1777 | 1832 | 1781 | 1870 | 1585 | 1781 | 1870 | 1585 |
| Q Serve(g_s), s | 10.8 | 64.5 | 64.5 | 14.5 | 21.3 | 21.3 | 14.5 | 28.2 | 34.2 | 5.8 | 16.5 | 12.6 |
| Cycle Q Clear(g_c), s | 10.8 | 64.5 | 64.5 | 14.5 | 21.3 | 21.3 | 14.5 | 28.2 | 34.2 | 5.8 | 16.5 | 12.6 |
| Prop In Lane | 1.00 | | 0.59 | 1.00 | | 0.11 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 435 | 819 | 779 | 236 | 834 | 861 | 303 | 464 | 393 | 157 | 347 | 294 |
| V/C Ratio(X) | 0.60 | 1.05 | 1.12 | 1.07 | 0.47 | 0.48 | 1.08 | 0.85 | 0.99 | 0.74 | 0.68 | 0.54 |
| Avail Cap(c_a), veh/h | 537 | 819 | 779 | 236 | 834 | 861 | 303 | 464 | 393 | 157 | 347 | 294 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 18.6 | 37.8 | 37.8 | 47.9 | 25.3 | 25.3 | 47.5 | 50.2 | 52.5 | 50.7 | 53.1 | 51.6 |
| Incr Delay (d2), s/veh | 1.4 | 46.1 | 69.8 | 79.1 | 1.9 | 1.9 | 73.7 | 14.2 | 42.7 | 16.6 | 5.4 | 1.9 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 4.4 | 36.9 | 40.2 | 9.1 | 9.2 | 9.4 | 9.8 | 14.8 | 18.0 | 2.0 | 8.2 | 5.1 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 19.9 | 83.9 | 107.5 | 127.0 | 27.3 | 27.2 | 121.1 | 64.4 | 95.2 | 67.3 | 58.5 | 53.5 |
| LnGrp LOS | B | F | F | F | C | C | F | E | F | E | E | D |
| Approach Vol, veh/h | | 1995 | | | 1058 | | | 1110 | | | 511 | |
| Approach Delay, s/veh | | 85.8 | | | 51.1 | | | 91.8 | | | 59.0 | |
| Approach LOS | | F | | | D | | | F | | | E | |
| Timer - Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | | | |
| Phs Duration (G+Y+Rc), s | 17.8 | 72.2 | 10.3 | 39.7 | 19.0 | 71.0 | 19.0 | 31.0 | | | | |
| Change Period (Y+Rc), s | 4.5 | 6.5 | 4.5 | 5.0 | 4.5 | 6.5 | 4.5 | 5.0 | | | | |
| Max Green Setting (Gmax), s | 21.3 | 57.7 | 5.8 | 34.7 | 14.5 | 64.5 | 14.5 | 26.0 | | | | |
| Max Q Clear Time (g_c+I1), s | 12.8 | 23.3 | 7.8 | 36.2 | 16.5 | 66.5 | 16.5 | 18.5 | | | | |
| Green Ext Time (p_c), s | 0.5 | 5.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 1.1 | | | | |

Intersection Summary





























| | |
|--------------------|------|
| HCM 6th Ctrl Delay | 76.4 |
| HCM 6th LOS | E |

Notes

User approved pedestrian interval to be less than phase max green.

HCM 6th Signalized Intersection Summary
 11: I-70 Business & F Road

2040 Without Interchange
 Timing Plan: PM Peak

| |  |  |  |  |  |  |  |  |  |  |  |  |
|------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations |   |   | |   |   | |  |   |  |  |   |  |
| Traffic Volume (veh/h) | 415 | 580 | 290 | 90 | 345 | 555 | 135 | 640 | 90 | 330 | 535 | 180 |
| Future Volume (veh/h) | 415 | 580 | 290 | 90 | 345 | 555 | 135 | 640 | 90 | 330 | 535 | 180 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 441 | 617 | 0 | 96 | 367 | 0 | 144 | 681 | 0 | 351 | 569 | 191 |
| Peak Hour Factor | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 481 | 800 | | 193 | 475 | | 452 | 1478 | | 499 | 1755 | 783 |
| Arrive On Green | 0.14 | 0.23 | 0.00 | 0.06 | 0.13 | 0.00 | 0.06 | 0.42 | 0.00 | 0.13 | 0.49 | 0.49 |
| Sat Flow, veh/h | 3456 | 3647 | 0 | 3456 | 3647 | 0 | 1781 | 3554 | 1585 | 1781 | 3554 | 1585 |
| Grp Volume(v), veh/h | 441 | 617 | 0 | 96 | 367 | 0 | 144 | 681 | 0 | 351 | 569 | 191 |
| Grp Sat Flow(s),veh/h/ln | 1728 | 1777 | 0 | 1728 | 1777 | 0 | 1781 | 1777 | 1585 | 1781 | 1777 | 1585 |
| Q Serve(g_s), s | 15.1 | 19.5 | 0.0 | 3.2 | 12.0 | 0.0 | 5.5 | 16.6 | 0.0 | 12.9 | 11.6 | 8.3 |
| Cycle Q Clear(g_c), s | 15.1 | 19.5 | 0.0 | 3.2 | 12.0 | 0.0 | 5.5 | 16.6 | 0.0 | 12.9 | 11.6 | 8.3 |
| Prop In Lane | 1.00 | | 0.00 | 1.00 | | 0.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 481 | 800 | | 193 | 475 | | 452 | 1478 | | 499 | 1755 | 783 |
| V/C Ratio(X) | 0.92 | 0.77 | | 0.50 | 0.77 | | 0.32 | 0.46 | | 0.70 | 0.32 | 0.24 |
| Avail Cap(c_a), veh/h | 481 | 1309 | | 245 | 1036 | | 486 | 1478 | | 553 | 1755 | 783 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 51.0 | 43.6 | 0.0 | 55.0 | 50.2 | 0.0 | 17.8 | 25.3 | 0.0 | 17.1 | 18.3 | 17.5 |
| Incr Delay (d2), s/veh | 22.5 | 1.6 | 0.0 | 2.0 | 2.7 | 0.0 | 0.4 | 1.0 | 0.0 | 3.6 | 0.5 | 0.7 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 7.8 | 8.5 | 0.0 | 1.4 | 5.4 | 0.0 | 2.2 | 6.9 | 0.0 | 5.3 | 4.6 | 3.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 73.4 | 45.2 | 0.0 | 57.0 | 52.9 | 0.0 | 18.2 | 26.4 | 0.0 | 20.7 | 18.8 | 18.2 |
| LnGrp LOS | E | D | | E | D | | B | C | | C | B | B |
| Approach Vol, veh/h | | 1058 | A | | 463 | A | | 825 | A | | 1111 | |
| Approach Delay, s/veh | | 57.0 | | | 53.8 | | | 24.9 | | | 19.3 | |
| Approach LOS | | E | | | D | | | C | | | B | |
| Timer - Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | | | |
| Phs Duration (G+Y+Rc), s | 21.4 | 55.9 | 9.7 | 33.0 | 12.0 | 65.3 | 20.7 | 22.0 | | | | |
| Change Period (Y+Rc), s | 6.0 | 6.0 | 3.0 | 6.0 | 4.5 | 6.0 | 4.0 | 6.0 | | | | |
| Max Green Setting (Gmax), s | 19.0 | 27.3 | 8.5 | 44.2 | 9.8 | 38.0 | 16.7 | 35.0 | | | | |
| Max Q Clear Time (g_c+I1), s | 14.9 | 18.6 | 5.2 | 21.5 | 7.5 | 13.6 | 17.1 | 14.0 | | | | |
| Green Ext Time (p_c), s | 0.4 | 2.7 | 0.1 | 3.8 | 0.1 | 4.2 | 0.0 | 2.1 | | | | |

Intersection Summary

| | |
|--------------------|------|
| HCM 6th Ctrl Delay | 36.8 |
| HCM 6th LOS | D |

Notes

User approved pedestrian interval to be less than phase max green.
 Unsignalized Delay for [NBR, EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

DELAY (CONTROL)

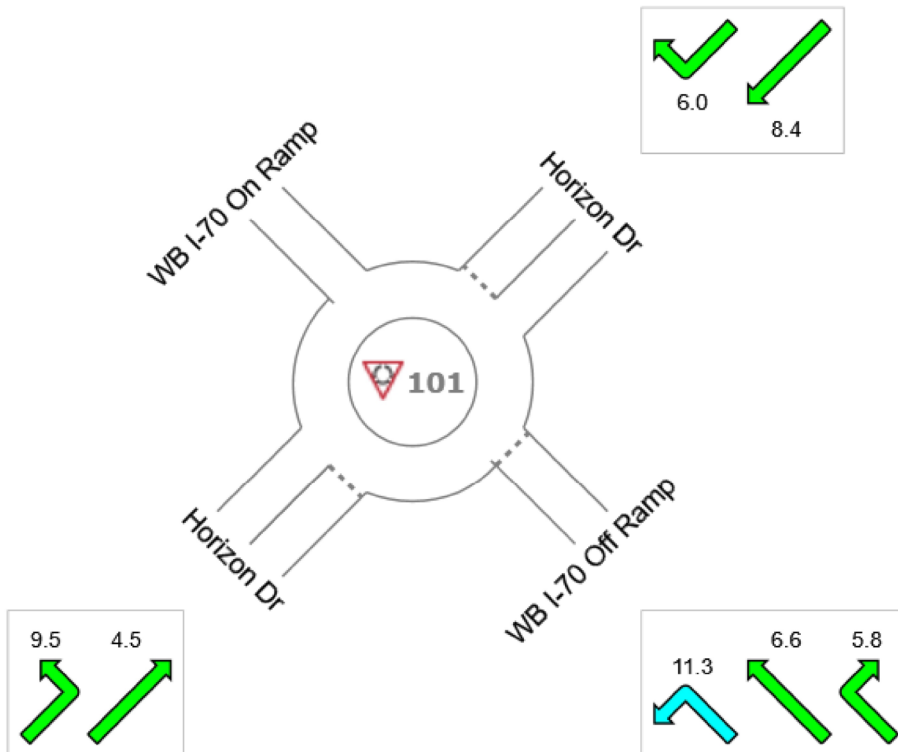
Average control delay per vehicle, or average pedestrian delay (seconds)

 Site: 101 [I-70 WB Ramps at Horizon Dr_2040 wo IC_NB_PM]

Site Category: -
Roundabout

All Movement Classes

| | Approaches | | | Intersection |
|-----------------|------------|-----------|-----------|--------------|
| | Southeast | Northeast | Southwest | |
| Delay (Control) | 8.8 | 7.9 | 6.5 | 7.7 |
| LOS | A | A | A | A |



Colour code based on Level of Service



Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab). LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Roundabout Level of Service Method: Same as Signalised Intersections

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

DELAY (CONTROL)

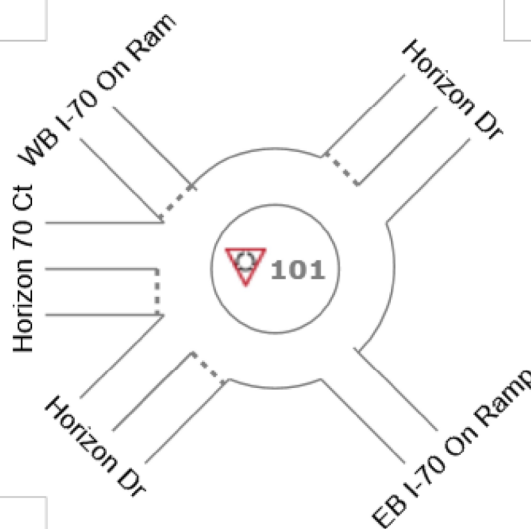
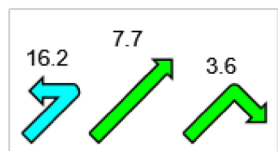
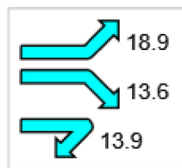
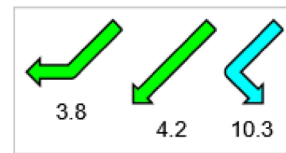
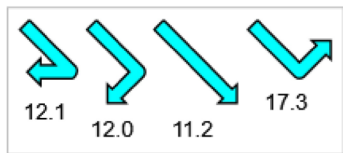
Average control delay per vehicle, or average pedestrian delay (seconds)

 Site: 101 [I-70 EB Ramps at Horizon Dr_2040 wo IC_NB_PM]

Site Category: -
Roundabout

All Movement Classes

| | Approaches | | | | Intersection |
|-----------------|------------|-----------|------|-----------|--------------|
| | Northeast | Northwest | West | Southwest | |
| Delay (Control) | 5.6 | 13.5 | 14.7 | 6.6 | 7.3 |
| LOS | A | B | B | A | A |



Colour code based on Level of Service



Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab). LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Roundabout Level of Service Method: Same as Signalised Intersections

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

HCM 6th Signalized Intersection Summary
3: 29 Road & F 1/2 Road

2040 With Interchange
Timing Plan: AM Peak



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Lane Configurations | | ↔ | | | ↔ | ↔ | ↔ | ↕↔ | | ↔ | ↕↔ | |
| Traffic Volume (veh/h) | 5 | 0 | 0 | 95 | 1 | 375 | 0 | 1500 | 50 | 195 | 1350 | 5 |
| Future Volume (veh/h) | 5 | 0 | 0 | 95 | 1 | 375 | 0 | 1500 | 50 | 195 | 1350 | 5 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 6 | 0 | 0 | 106 | 1 | 0 | 0 | 1667 | 56 | 217 | 1500 | 6 |
| Peak Hour Factor | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 275 | 0 | 0 | 249 | 2 | | 65 | 2417 | 81 | 277 | 2847 | 11 |
| Arrive On Green | 0.13 | 0.00 | 0.00 | 0.13 | 0.13 | 0.00 | 0.00 | 0.69 | 0.69 | 0.05 | 0.78 | 0.78 |
| Sat Flow, veh/h | 1613 | 0 | 0 | 1416 | 13 | 1585 | 348 | 3509 | 117 | 1781 | 3630 | 15 |
| Grp Volume(v), veh/h | 6 | 0 | 0 | 107 | 0 | 0 | 0 | 841 | 882 | 217 | 734 | 772 |
| Grp Sat Flow(s),veh/h/ln | 1613 | 0 | 0 | 1429 | 0 | 1585 | 348 | 1777 | 1849 | 1781 | 1777 | 1868 |
| Q Serve(g_s), s | 0.0 | 0.0 | 0.0 | 7.4 | 0.0 | 0.0 | 0.0 | 31.1 | 31.5 | 3.7 | 16.9 | 16.9 |
| Cycle Q Clear(g_c), s | 0.3 | 0.0 | 0.0 | 7.8 | 0.0 | 0.0 | 0.0 | 31.1 | 31.5 | 3.7 | 16.9 | 16.9 |
| Prop In Lane | 1.00 | | 0.00 | 0.99 | | 1.00 | 1.00 | | 0.06 | 1.00 | | 0.01 |
| Lane Grp Cap(c), veh/h | 275 | 0 | 0 | 251 | 0 | | 65 | 1224 | 1274 | 277 | 1393 | 1465 |
| V/C Ratio(X) | 0.02 | 0.00 | 0.00 | 0.43 | 0.00 | | 0.00 | 0.69 | 0.69 | 0.78 | 0.53 | 0.53 |
| Avail Cap(c_a), veh/h | 390 | 0 | 0 | 367 | 0 | | 65 | 1224 | 1274 | 444 | 1393 | 1465 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 42.1 | 0.0 | 0.0 | 45.3 | 0.0 | 0.0 | 0.0 | 10.2 | 10.3 | 19.5 | 4.4 | 4.4 |
| Incr Delay (d2), s/veh | 0.0 | 0.0 | 0.0 | 1.2 | 0.0 | 0.0 | 0.0 | 3.2 | 3.1 | 4.8 | 1.4 | 1.4 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.1 | 0.0 | 0.0 | 2.8 | 0.0 | 0.0 | 0.0 | 11.1 | 11.6 | 4.4 | 4.7 | 4.9 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 42.1 | 0.0 | 0.0 | 46.5 | 0.0 | 0.0 | 0.0 | 13.4 | 13.4 | 24.3 | 5.8 | 5.8 |
| LnGrp LOS | D | A | A | D | A | | A | B | B | C | A | A |
| Approach Vol, veh/h | | 6 | | | 107 | A | | 1723 | | | 1723 | |
| Approach Delay, s/veh | | 42.1 | | | 46.5 | | | 13.4 | | | 8.1 | |
| Approach LOS | | D | | | D | | | B | | | A | |
| Timer - Assigned Phs | 1 | 2 | | 4 | | 6 | | 8 | | | | |
| Phs Duration (G+Y+Rc), s | 10.6 | 81.4 | | 18.9 | | 92.0 | | 18.9 | | | | |
| Change Period (Y+Rc), s | 4.5 | 5.0 | | 4.5 | | 5.0 | | 4.5 | | | | |
| Max Green Setting (Gmax), s | 16.5 | 66.0 | | 23.5 | | 87.0 | | 23.5 | | | | |
| Max Q Clear Time (g_c+I1), s | 5.7 | 33.5 | | 2.3 | | 18.9 | | 9.8 | | | | |
| Green Ext Time (p_c), s | 0.4 | 16.3 | | 0.0 | | 15.5 | | 0.4 | | | | |

Intersection Summary






























| | |
|--------------------|------|
| HCM 6th Ctrl Delay | 11.9 |
| HCM 6th LOS | B |

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary
6: 29 Road & Patterson Road

2040 With Interchange
Timing Plan: AM Peak

| |  |  |  |  |  |  |  |  |  |  |  |  |
|------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations |   |   |  |   |   |  |  |  |  |   |  |  |
| Traffic Volume (veh/h) | 200 | 450 | 175 | 190 | 1000 | 625 | 70 | 520 | 45 | 250 | 600 | 720 |
| Future Volume (veh/h) | 200 | 450 | 175 | 190 | 1000 | 625 | 70 | 520 | 45 | 250 | 600 | 720 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 244 | 549 | 0 | 232 | 1220 | 0 | 85 | 634 | 0 | 305 | 732 | 0 |
| Peak Hour Factor | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 | 0.82 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 302 | 1262 | | 685 | 1267 | | 120 | 675 | | 393 | 733 | |
| Arrive On Green | 0.05 | 0.35 | 0.00 | 0.05 | 0.36 | 0.00 | 0.03 | 0.36 | 0.00 | 0.06 | 0.39 | 0.00 |
| Sat Flow, veh/h | 3456 | 3554 | 1585 | 3456 | 3554 | 1585 | 1781 | 1870 | 1585 | 3456 | 1870 | 1585 |
| Grp Volume(v), veh/h | 244 | 549 | 0 | 232 | 1220 | 0 | 85 | 634 | 0 | 305 | 732 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1728 | 1777 | 1585 | 1728 | 1777 | 1585 | 1781 | 1870 | 1585 | 1728 | 1870 | 1585 |
| Q Serve(g_s), s | 5.4 | 14.1 | 0.0 | 5.1 | 40.4 | 0.0 | 3.6 | 39.3 | 0.0 | 6.6 | 46.9 | 0.0 |
| Cycle Q Clear(g_c), s | 5.4 | 14.1 | 0.0 | 5.1 | 40.4 | 0.0 | 3.6 | 39.3 | 0.0 | 6.6 | 46.9 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 302 | 1262 | | 685 | 1267 | | 120 | 675 | | 393 | 733 | |
| V/C Ratio(X) | 0.81 | 0.44 | | 0.34 | 0.96 | | 0.71 | 0.94 | | 0.78 | 1.00 | |
| Avail Cap(c_a), veh/h | 302 | 1262 | | 685 | 1267 | | 120 | 675 | | 393 | 733 | |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 30.5 | 29.5 | 0.0 | 23.8 | 37.8 | 0.0 | 30.9 | 37.1 | 0.0 | 28.9 | 36.5 | 0.0 |
| Incr Delay (d2), s/veh | 14.9 | 1.1 | 0.0 | 0.3 | 17.8 | 0.0 | 17.7 | 22.6 | 0.0 | 9.5 | 33.1 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 2.8 | 6.0 | 0.0 | 2.1 | 19.7 | 0.0 | 2.1 | 21.7 | 0.0 | 3.1 | 27.1 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 45.4 | 30.6 | 0.0 | 24.1 | 55.6 | 0.0 | 48.6 | 59.7 | 0.0 | 38.4 | 69.6 | 0.0 |
| LnGrp LOS | D | C | | C | E | | D | E | | D | E | |
| Approach Vol, veh/h | | 793 | A | | 1452 | A | | 719 | A | | 1037 | A |
| Approach Delay, s/veh | | 35.2 | | | 50.5 | | | 58.4 | | | 60.4 | |
| Approach LOS | | D | | | D | | | E | | | E | |
| Timer - Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | | | |
| Phs Duration (G+Y+Rc), s | 10.2 | 49.3 | 12.2 | 48.3 | 10.4 | 49.1 | 8.5 | 52.0 | | | | |
| Change Period (Y+Rc), s | 4.5 | 6.5 | 4.5 | 5.0 | 4.5 | 6.5 | 4.5 | 5.0 | | | | |
| Max Green Setting (Gmax), s | 5.7 | 42.8 | 7.7 | 43.3 | 5.9 | 42.6 | 4.0 | 47.0 | | | | |
| Max Q Clear Time (g_c+I1), s | 7.4 | 42.4 | 8.6 | 41.3 | 7.1 | 16.1 | 5.6 | 48.9 | | | | |
| Green Ext Time (p_c), s | 0.0 | 0.3 | 0.0 | 0.8 | 0.0 | 3.5 | 0.0 | 0.0 | | | | |

Intersection Summary






























| | |
|--------------------|------|
| HCM 6th Ctrl Delay | 51.5 |
| HCM 6th LOS | D |

Notes

User approved pedestrian interval to be less than phase max green.
Unsignalized Delay for [NBR, EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary
 11: I-70 Business & F Road

2040 With Interchange
 Timing Plan: AM Peak

| |  |  |  |  |  |  |  |  |  |  |  |  |
|--|---|---|---|---|---|---|---|---|---|---|---|---|
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations |   |   | |   |   | |  |   |  |   |   |  |
| Traffic Volume (veh/h) | 100 | 270 | 60 | 35 | 335 | 245 | 215 | 340 | 55 | 420 | 385 | 215 |
| Future Volume (veh/h) | 100 | 270 | 60 | 35 | 335 | 245 | 215 | 340 | 55 | 420 | 385 | 215 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 105 | 284 | 0 | 37 | 353 | 0 | 226 | 358 | 0 | 442 | 405 | 226 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 195 | 572 | | 143 | 459 | | 585 | 1676 | | 736 | 1928 | 860 |
| Arrive On Green | 0.06 | 0.16 | 0.00 | 0.04 | 0.13 | 0.00 | 0.08 | 0.47 | 0.00 | 0.14 | 0.54 | 0.54 |
| Sat Flow, veh/h | 3456 | 3647 | 0 | 3456 | 3647 | 0 | 1781 | 3554 | 1585 | 1781 | 3554 | 1585 |
| Grp Volume(v), veh/h | 105 | 284 | 0 | 37 | 353 | 0 | 226 | 358 | 0 | 442 | 405 | 226 |
| Grp Sat Flow(s),veh/h/ln | 1728 | 1777 | 0 | 1728 | 1777 | 0 | 1781 | 1777 | 1585 | 1781 | 1777 | 1585 |
| Q Serve(g_s), s | 3.5 | 8.7 | 0.0 | 1.2 | 11.5 | 0.0 | 7.7 | 7.1 | 0.0 | 14.6 | 7.1 | 6.0 |
| Cycle Q Clear(g_c), s | 3.5 | 8.7 | 0.0 | 1.2 | 11.5 | 0.0 | 7.7 | 7.1 | 0.0 | 14.6 | 7.1 | 6.0 |
| Prop In Lane | 1.00 | | 0.00 | 1.00 | | 0.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 195 | 572 | | 143 | 459 | | 585 | 1676 | | 736 | 1928 | 860 |
| V/C Ratio(X) | 0.54 | 0.50 | | 0.26 | 0.77 | | 0.39 | 0.21 | | 0.60 | 0.21 | 0.26 |
| Avail Cap(c_a), veh/h | 389 | 1066 | | 346 | 1022 | | 695 | 1676 | | 779 | 1928 | 860 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 55.1 | 45.9 | 0.0 | 55.7 | 50.5 | 0.0 | 13.6 | 18.6 | 0.0 | 11.5 | 14.2 | 6.3 |
| Incr Delay (d2), s/veh | 2.3 | 0.7 | 0.0 | 0.9 | 2.8 | 0.0 | 0.4 | 0.3 | 0.0 | 1.2 | 0.2 | 0.7 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 1.6 | 3.8 | 0.0 | 0.6 | 5.2 | 0.0 | 3.0 | 2.9 | 0.0 | 5.3 | 2.7 | 3.1 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 57.4 | 46.6 | 0.0 | 56.7 | 53.3 | 0.0 | 14.0 | 18.9 | 0.0 | 12.6 | 14.4 | 7.1 |
| LnGrp LOS | E | D | | E | D | | B | B | | B | B | A |
| Approach Vol, veh/h | | 389 | A | | 390 | A | | 584 | A | | 1073 | |
| Approach Delay, s/veh | | 49.5 | | | 53.6 | | | 17.0 | | | 12.1 | |
| Approach LOS | | D | | | D | | | B | | | B | |
| Timer - Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | | | |
| Phs Duration (G+Y+Rc), s | 23.1 | 62.6 | 9.0 | 25.3 | 14.6 | 71.1 | 12.8 | 21.5 | | | | |
| Change Period (Y+Rc), s | 6.0 | 6.0 | 4.0 | 6.0 | 4.5 | 6.0 | 6.0 | * 6 | | | | |
| Max Green Setting (Gmax), s | 20.0 | 30.0 | 12.0 | 36.0 | 17.5 | 34.0 | 13.5 | * 35 | | | | |
| Max Q Clear Time (g_c+I1), s | 16.6 | 9.1 | 3.2 | 10.7 | 9.7 | 9.1 | 5.5 | 13.5 | | | | |
| Green Ext Time (p_c), s | 0.5 | 2.0 | 0.0 | 1.6 | 0.4 | 3.2 | 0.1 | 2.0 | | | | |
| Intersection Summary | | | | | | | | | | | | |
| HCM 6th Ctrl Delay | 25.9 | | | | | | | | | | | |
| HCM 6th LOS | C | | | | | | | | | | | |
| Notes | | | | | | | | | | | | |
| User approved pedestrian interval to be less than phase max green. | | | | | | | | | | | | |
| * HCM 6th computational engine requires equal clearance times for the phases crossing the barrier. | | | | | | | | | | | | |
| Unsignalized Delay for [NBR, EBR, WBR] is excluded from calculations of the approach delay and intersection delay. | | | | | | | | | | | | |

DELAY (CONTROL)

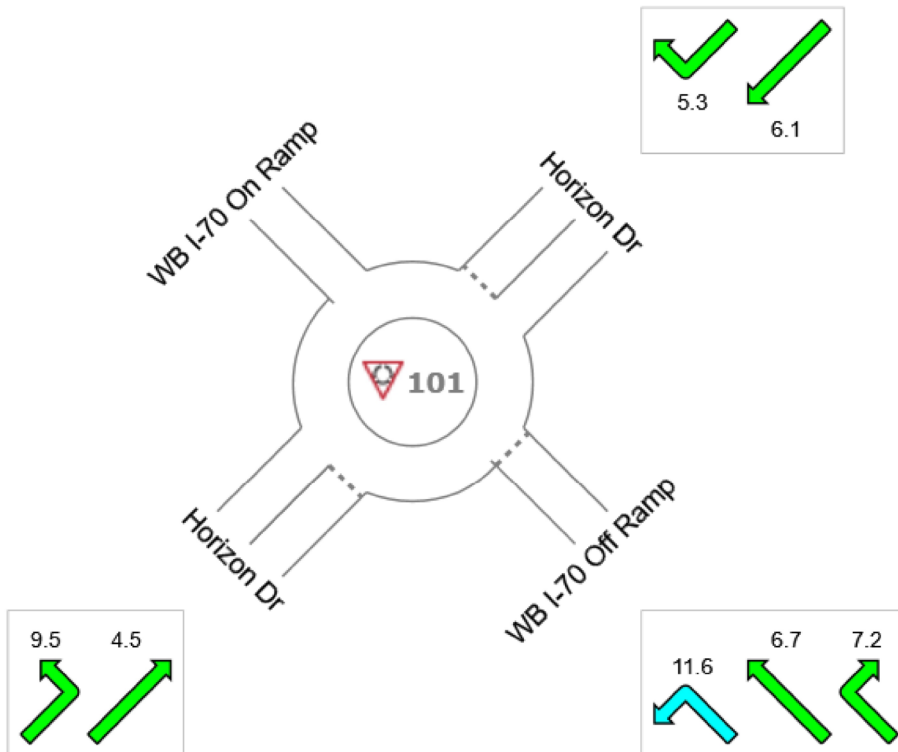
Average control delay per vehicle, or average pedestrian delay (seconds)

 Site: 101 [I-70 WB Ramps at Horizon Dr_2040 w IC_NB_AM]

Site Category: -
Roundabout

All Movement Classes

| | Approaches | | | Intersection |
|-----------------|------------|-----------|-----------|--------------|
| | Southeast | Northeast | Southwest | |
| Delay (Control) | 8.6 | 6.0 | 5.4 | 6.6 |
| LOS | A | A | A | A |



Colour code based on Level of Service



Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab). LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Roundabout Level of Service Method: Same as Signalised Intersections

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

DELAY (CONTROL)

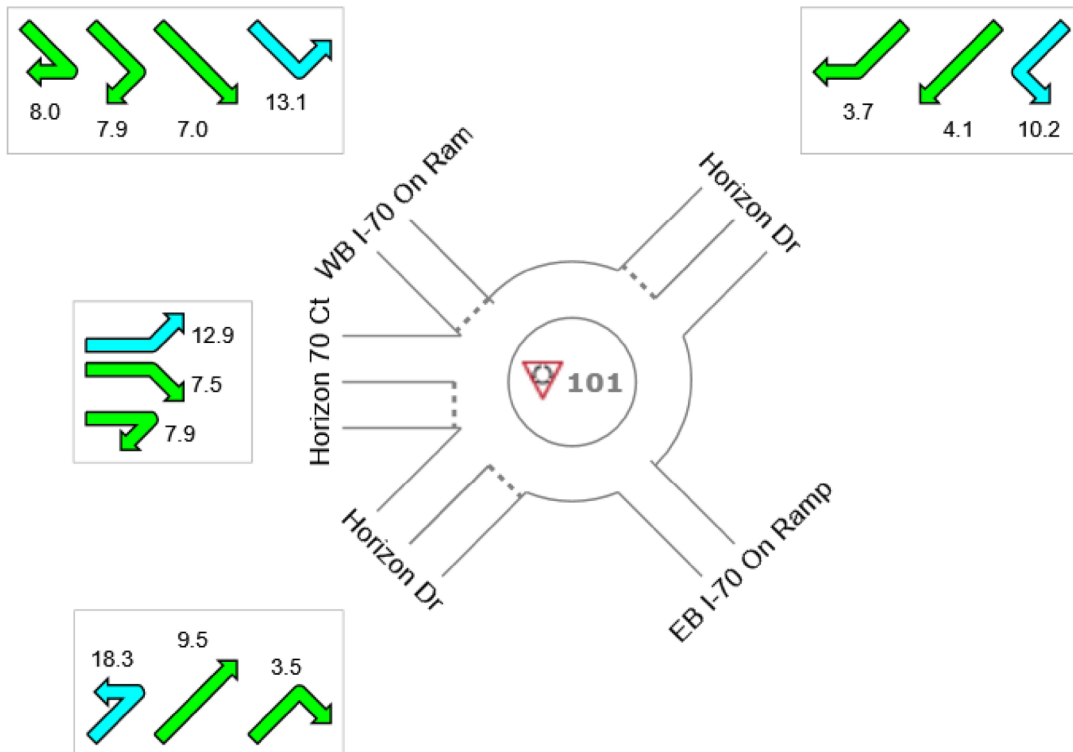
Average control delay per vehicle, or average pedestrian delay (seconds)

 Site: 101 [I-70 EB Ramps at Horizon Dr_2040 w IC_NB_AM]

Site Category: -
Roundabout

All Movement Classes

| | Approaches | | | | Intersection |
|-----------------|------------|-----------|------|-----------|--------------|
| | Northeast | Northwest | West | Southwest | |
| Delay (Control) | 6.0 | 10.9 | 9.6 | 8.5 | 8.2 |
| LOS | A | B | A | A | A |



Colour code based on Level of Service



Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab). LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Roundabout Level of Service Method: Same as Signalised Intersections

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

HCM 6th Signalized Intersection Summary
3: 29 Road & F 1/2 Road

2040 With Interchange
PM Peak



| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|------------------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Lane Configurations | | ↕ | | | ↕ | ↕ | ↕ | ↕↔ | | ↕ | ↕↔ | |
| Traffic Volume (veh/h) | 5 | 5 | 0 | 40 | 1 | 210 | 0 | 1310 | 90 | 230 | 1450 | 5 |
| Future Volume (veh/h) | 5 | 5 | 0 | 40 | 1 | 210 | 0 | 1310 | 90 | 230 | 1450 | 5 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 7 | 7 | 0 | 53 | 1 | 0 | 0 | 1747 | 120 | 307 | 1933 | 7 |
| Peak Hour Factor | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 104 | 54 | 0 | 164 | 1 | | 95 | 2222 | 151 | 358 | 3000 | 11 |
| Arrive On Green | 0.05 | 0.05 | 0.00 | 0.05 | 0.05 | 0.00 | 0.00 | 0.66 | 0.66 | 0.11 | 0.83 | 0.83 |
| Sat Flow, veh/h | 670 | 1109 | 0 | 1442 | 27 | 1585 | 228 | 3376 | 230 | 1781 | 3632 | 13 |
| Grp Volume(v), veh/h | 14 | 0 | 0 | 54 | 0 | 0 | 0 | 911 | 956 | 307 | 945 | 995 |
| Grp Sat Flow(s),veh/h/ln | 1778 | 0 | 0 | 1469 | 0 | 1585 | 228 | 1777 | 1829 | 1781 | 1777 | 1868 |
| Q Serve(g_s), s | 0.0 | 0.0 | 0.0 | 2.2 | 0.0 | 0.0 | 0.0 | 27.4 | 28.4 | 5.6 | 15.0 | 15.1 |
| Cycle Q Clear(g_c), s | 0.5 | 0.0 | 0.0 | 2.7 | 0.0 | 0.0 | 0.0 | 27.4 | 28.4 | 5.6 | 15.0 | 15.1 |
| Prop In Lane | 0.50 | | 0.00 | 0.98 | | 1.00 | 1.00 | | 0.13 | 1.00 | | 0.01 |
| Lane Grp Cap(c), veh/h | 158 | 0 | 0 | 166 | 0 | | 95 | 1169 | 1204 | 358 | 1468 | 1543 |
| V/C Ratio(X) | 0.09 | 0.00 | 0.00 | 0.33 | 0.00 | | 0.00 | 0.78 | 0.79 | 0.86 | 0.64 | 0.64 |
| Avail Cap(c_a), veh/h | 552 | 0 | 0 | 512 | 0 | | 143 | 1543 | 1588 | 579 | 2062 | 2167 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 0.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 34.6 | 0.0 | 0.0 | 35.6 | 0.0 | 0.0 | 0.0 | 9.1 | 9.3 | 20.3 | 2.5 | 2.5 |
| Incr Delay (d2), s/veh | 0.2 | 0.0 | 0.0 | 1.1 | 0.0 | 0.0 | 0.0 | 1.9 | 2.1 | 7.2 | 0.5 | 0.5 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 0.2 | 0.0 | 0.0 | 1.0 | 0.0 | 0.0 | 0.0 | 7.9 | 8.5 | 4.1 | 0.9 | 0.9 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 34.9 | 0.0 | 0.0 | 36.8 | 0.0 | 0.0 | 0.0 | 11.0 | 11.4 | 27.5 | 2.9 | 2.9 |
| LnGrp LOS | C | A | A | D | A | | A | B | B | C | A | A |
| Approach Vol, veh/h | | 14 | | | 54 | A | | 1867 | | | 2247 | |
| Approach Delay, s/veh | | 34.9 | | | 36.8 | | | 11.2 | | | 6.3 | |
| Approach LOS | | C | | | D | | | B | | | A | |
| Timer - Assigned Phs | 1 | 2 | | 4 | | 6 | | 8 | | | | |
| Phs Duration (G+Y+Rc), s | 12.8 | 55.0 | | 8.2 | | 67.8 | | 8.2 | | | | |
| Change Period (Y+Rc), s | 4.5 | 5.0 | | 4.5 | | 5.0 | | 4.5 | | | | |
| Max Green Setting (Gmax), s | 17.7 | 66.0 | | 22.3 | | 88.2 | | 22.3 | | | | |
| Max Q Clear Time (g_c+I1), s | 7.6 | 30.4 | | 2.5 | | 17.1 | | 4.7 | | | | |
| Green Ext Time (p_c), s | 0.6 | 19.6 | | 0.0 | | 28.3 | | 0.2 | | | | |

Intersection Summary






























| | |
|--------------------|-----|
| HCM 6th Ctrl Delay | 9.0 |
| HCM 6th LOS | A |

Notes

Unsignalized Delay for [WBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary
6: 29 Road & Patterson Road

2040 With Interchange
PM Peak

| |  |  |  |  |  |  |  |  |  |  |  |  |
|------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations |   |   |  |   |   |  |  |  |  |   |  |  |
| Traffic Volume (veh/h) | 500 | 990 | 340 | 140 | 775 | 350 | 125 | 625 | 295 | 475 | 550 | 250 |
| Future Volume (veh/h) | 500 | 990 | 340 | 140 | 775 | 350 | 125 | 625 | 295 | 475 | 550 | 250 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 526 | 1042 | 0 | 147 | 816 | 0 | 132 | 658 | 0 | 500 | 579 | 0 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 570 | 1214 | | 307 | 921 | | 265 | 639 | | 509 | 750 | |
| Arrive On Green | 0.12 | 0.34 | 0.00 | 0.03 | 0.26 | 0.00 | 0.05 | 0.34 | 0.00 | 0.11 | 0.40 | 0.00 |
| Sat Flow, veh/h | 3456 | 3554 | 1585 | 3456 | 3554 | 1585 | 1781 | 1870 | 1585 | 3456 | 1870 | 1585 |
| Grp Volume(v), veh/h | 526 | 1042 | 0 | 147 | 816 | 0 | 132 | 658 | 0 | 500 | 579 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1728 | 1777 | 1585 | 1728 | 1777 | 1585 | 1781 | 1870 | 1585 | 1728 | 1870 | 1585 |
| Q Serve(g_s), s | 13.1 | 32.8 | 0.0 | 3.8 | 26.5 | 0.0 | 5.8 | 41.0 | 0.0 | 13.1 | 32.2 | 0.0 |
| Cycle Q Clear(g_c), s | 13.1 | 32.8 | 0.0 | 3.8 | 26.5 | 0.0 | 5.8 | 41.0 | 0.0 | 13.1 | 32.2 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 570 | 1214 | | 307 | 921 | | 265 | 639 | | 509 | 750 | |
| V/C Ratio(X) | 0.92 | 0.86 | | 0.48 | 0.89 | | 0.50 | 1.03 | | 0.98 | 0.77 | |
| Avail Cap(c_a), veh/h | 570 | 1214 | | 307 | 921 | | 265 | 639 | | 509 | 750 | |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 30.5 | 36.8 | 0.0 | 33.9 | 42.7 | 0.0 | 26.8 | 39.5 | 0.0 | 36.3 | 31.2 | 0.0 |
| Incr Delay (d2), s/veh | 20.7 | 8.0 | 0.0 | 1.2 | 12.3 | 0.0 | 1.4 | 43.4 | 0.0 | 35.3 | 5.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 6.8 | 14.9 | 0.0 | 1.6 | 12.8 | 0.0 | 2.5 | 26.0 | 0.0 | 6.7 | 15.0 | 0.0 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 51.3 | 44.8 | 0.0 | 35.1 | 55.0 | 0.0 | 28.3 | 82.9 | 0.0 | 71.6 | 36.2 | 0.0 |
| LnGrp LOS | D | D | | D | E | | C | F | | E | D | |
| Approach Vol, veh/h | | 1568 | A | | 963 | A | | 790 | A | | 1079 | A |
| Approach Delay, s/veh | | 46.9 | | | 52.0 | | | 73.8 | | | 52.6 | |
| Approach LOS | | D | | | D | | | E | | | D | |
| Timer - Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | | | |
| Phs Duration (G+Y+Rc), s | 18.4 | 37.6 | 18.0 | 46.0 | 8.5 | 47.5 | 10.9 | 53.1 | | | | |
| Change Period (Y+Rc), s | 4.5 | 6.5 | 4.5 | 5.0 | 4.5 | 6.5 | 4.5 | 5.0 | | | | |
| Max Green Setting (Gmax), s | 13.9 | 31.1 | 13.5 | 41.0 | 4.0 | 41.0 | 6.4 | 48.1 | | | | |
| Max Q Clear Time (g_c+I1), s | 15.1 | 28.5 | 15.1 | 43.0 | 5.8 | 34.8 | 7.8 | 34.2 | | | | |
| Green Ext Time (p_c), s | 0.0 | 1.3 | 0.0 | 0.0 | 0.0 | 3.3 | 0.0 | 3.0 | | | | |

Intersection Summary






























| | |
|--------------------|------|
| HCM 6th Ctrl Delay | 54.3 |
| HCM 6th LOS | D |

Notes

User approved pedestrian interval to be less than phase max green.
Unsignalized Delay for [NBR, EBR, WBR, SBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th Signalized Intersection Summary
 11: I-70 Business & F Road

2040 With Interchange
 PM Peak

| |  |  |  |  |  |  |  |  |  |  |  |  |
|------------------------------|---|---|---|---|---|---|--|---|---|---|---|---|
| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
| Lane Configurations |   |   | |   |   | |  |   |  |  |   |   |
| Traffic Volume (veh/h) | 290 | 560 | 265 | 90 | 325 | 555 | 120 | 600 | 90 | 325 | 500 | 125 |
| Future Volume (veh/h) | 290 | 560 | 265 | 90 | 325 | 555 | 120 | 600 | 90 | 325 | 500 | 125 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus, Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Work Zone On Approach | | No | | | No | | | No | | | No | |
| Adj Sat Flow, veh/h/ln | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 | 1870 |
| Adj Flow Rate, veh/h | 309 | 596 | 0 | 96 | 346 | 0 | 128 | 638 | 0 | 346 | 532 | 133 |
| Peak Hour Factor | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Percent Heavy Veh, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Cap, veh/h | 366 | 733 | | 193 | 526 | | 496 | 1562 | | 530 | 1840 | 821 |
| Arrive On Green | 0.11 | 0.21 | 0.00 | 0.06 | 0.15 | 0.00 | 0.06 | 0.44 | 0.00 | 0.12 | 0.52 | 0.52 |
| Sat Flow, veh/h | 3456 | 3647 | 0 | 3456 | 3647 | 0 | 1781 | 3554 | 1585 | 1781 | 3554 | 1585 |
| Grp Volume(v), veh/h | 309 | 596 | 0 | 96 | 346 | 0 | 128 | 638 | 0 | 346 | 532 | 133 |
| Grp Sat Flow(s),veh/h/ln | 1728 | 1777 | 0 | 1728 | 1777 | 0 | 1781 | 1777 | 1585 | 1781 | 1777 | 1585 |
| Q Serve(g_s), s | 10.5 | 19.2 | 0.0 | 3.2 | 11.0 | 0.0 | 4.7 | 14.7 | 0.0 | 12.2 | 10.2 | 5.3 |
| Cycle Q Clear(g_c), s | 10.5 | 19.2 | 0.0 | 3.2 | 11.0 | 0.0 | 4.7 | 14.7 | 0.0 | 12.2 | 10.2 | 5.3 |
| Prop In Lane | 1.00 | | 0.00 | 1.00 | | 0.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 366 | 733 | | 193 | 526 | | 496 | 1562 | | 530 | 1840 | 821 |
| V/C Ratio(X) | 0.85 | 0.81 | | 0.50 | 0.66 | | 0.26 | 0.41 | | 0.65 | 0.29 | 0.16 |
| Avail Cap(c_a), veh/h | 400 | 1226 | | 245 | 1036 | | 526 | 1562 | | 637 | 1840 | 821 |
| HCM Platoon Ratio | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 |
| Uniform Delay (d), s/veh | 52.7 | 45.4 | 0.0 | 55.0 | 48.2 | 0.0 | 16.4 | 23.0 | 0.0 | 15.2 | 16.4 | 15.2 |
| Incr Delay (d2), s/veh | 14.3 | 2.3 | 0.0 | 2.0 | 1.4 | 0.0 | 0.3 | 0.8 | 0.0 | 1.8 | 0.4 | 0.4 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile BackOfQ(50%),veh/ln | 5.2 | 8.4 | 0.0 | 1.4 | 4.9 | 0.0 | 1.9 | 6.1 | 0.0 | 4.7 | 4.0 | 1.9 |
| Unsig. Movement Delay, s/veh | | | | | | | | | | | | |
| LnGrp Delay(d),s/veh | 67.0 | 47.7 | 0.0 | 57.0 | 49.7 | 0.0 | 16.6 | 23.8 | 0.0 | 17.0 | 16.8 | 15.7 |
| LnGrp LOS | E | D | | E | D | | B | C | | B | B | B |
| Approach Vol, veh/h | | 905 | A | | 442 | A | | 766 | A | | 1011 | |
| Approach Delay, s/veh | | 54.3 | | | 51.2 | | | 22.6 | | | 16.7 | |
| Approach LOS | | D | | | D | | | C | | | B | |
| Timer - Assigned Phs | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | | | |
| Phs Duration (G+Y+Rc), s | 20.8 | 58.7 | 9.7 | 30.7 | 11.4 | 68.1 | 16.7 | 23.8 | | | | |
| Change Period (Y+Rc), s | 6.0 | 6.0 | 3.0 | 6.0 | 4.5 | 6.0 | 4.0 | 6.0 | | | | |
| Max Green Setting (Gmax), s | 22.0 | 27.1 | 8.5 | 41.4 | 8.9 | 41.7 | 13.9 | 35.0 | | | | |
| Max Q Clear Time (g_c+I1), s | 14.2 | 16.7 | 5.2 | 21.2 | 6.7 | 12.2 | 12.5 | 13.0 | | | | |
| Green Ext Time (p_c), s | 0.6 | 2.8 | 0.1 | 3.6 | 0.1 | 3.9 | 0.2 | 2.0 | | | | |

Intersection Summary

| | |
|--------------------|------|
| HCM 6th Ctrl Delay | 33.9 |
| HCM 6th LOS | C |

Notes

User approved pedestrian interval to be less than phase max green.
 Unsignalized Delay for [NBR, EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

DELAY (CONTROL)

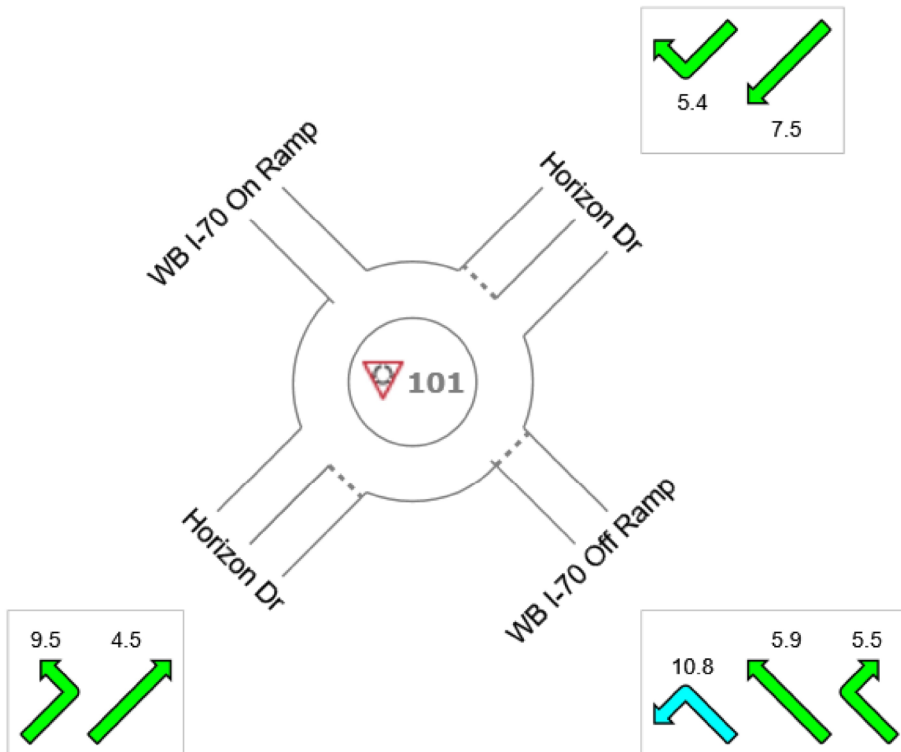
Average control delay per vehicle, or average pedestrian delay (seconds)

 Site: 101 [I-70 WB Ramps at Horizon Dr_2040 w IC_NB_PM]

Site Category: -
Roundabout

All Movement Classes

| | Approaches | | | Intersection |
|-----------------|------------|-----------|-----------|--------------|
| | Southeast | Northeast | Southwest | |
| Delay (Control) | 7.7 | 7.0 | 6.3 | 7.0 |
| LOS | A | A | A | A |



Colour code based on Level of Service



Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Roundabout Level of Service Method: Same as Signalised Intersections
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

DELAY (CONTROL)

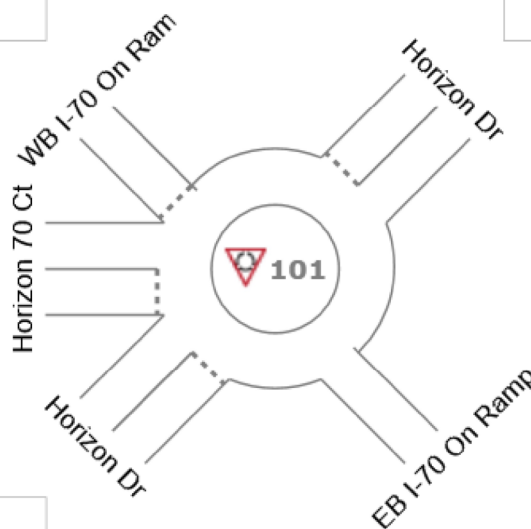
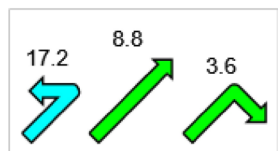
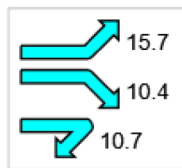
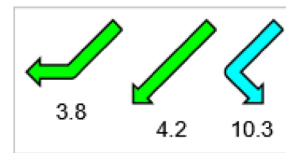
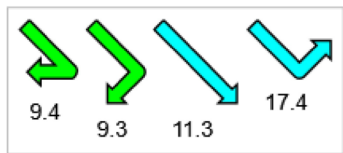
Average control delay per vehicle, or average pedestrian delay (seconds)

 Site: 101 [I-70 EB Ramps at Horizon Dr_2040 w IC_NB_PM]

Site Category: -
Roundabout

All Movement Classes

| | Approaches | | | | Intersection |
|-----------------|------------|-----------|------|-----------|--------------|
| | Northeast | Northwest | West | Southwest | |
| Delay (Control) | 6.3 | 12.5 | 11.5 | 6.7 | 7.5 |
| LOS | A | B | B | A | A |



Colour code based on Level of Service



Site Level of Service (LOS) Method: Delay & v/c (HCM 2010). Site LOS Method is specified in the Parameter Settings dialog (Site tab). LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

NA (TWSC): Level of Service is not defined for major road approaches or the intersection as a whole for Two-Way Sign Control (HCM LOS rule).

Roundabout Level of Service Method: Same as Signalised Intersections

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

HCS7 Freeway Facilities Report

Project Information

| | | | |
|---------------------|--------------------|----------------------|------------------------|
| Analyst | DEA | Agency | City of GJ/Mesa County |
| Jurisdiction | Grand Junction, CO | Time Period Analyzed | 1=AM & 2=PM |
| Analysis Year | 2018 | Date | May 2019 |
| Project Description | Existing EB I-70 | | |

Facility Global Input

| | | | |
|----------------------------------|-------|-------------------------------|------|
| Jam Density, pc/mi/ln | 190.0 | Density at Capacity, pc/mi/ln | 45.0 |
| Queue Discharge Capacity Drop, % | 7 | Total Segments | 9 |
| Total Time Periods | 2 | Time Period Duration, min | 15 |

Segment Geometric Data

| No. | Coded | Analyzed | Name | Length, ft | Lanes |
|-----|---------|----------|----------------------------|------------|-------|
| 1 | Basic | Basic | EB I-70 - W of Horizon | 18400 | 2 |
| 2 | Diverge | Diverge | EB Off Ramp - Horizon | 600 | 2 |
| 3 | Basic | Basic | EB I-70 - at Horizon | 1900 | 2 |
| 4 | Merge | Merge | EB On Ramp - Horizon | 1000 | 2 |
| 5 | Basic | Basic | EB I-70 - Horizon to I-70B | 24300 | 2 |
| 6 | Diverge | Diverge | EB Off Ramp - I-70B | 1100 | 2 |
| 7 | Basic | Basic | EB I-70 - at I-70B | 1500 | 2 |
| 8 | Merge | Merge | EB On Ramp - I-70B | 1500 | 2 |
| 9 | Basic | Basic | EB I-70 - E of I-70B | 21600 | 2 |

Facility Segment Data

Segment 1: Basic

| Time Period | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|-------------|------|-------|------------------|-----------------|-----------|--------------|--------------------|-----|
| 1 | 1.00 | 0.980 | 760 | 4646 | 0.16 | 73.1 | 5.2 | A |
| 2 | 1.00 | 0.980 | 929 | 4800 | 0.19 | 75.0 | 6.2 | A |

Segment 2: Diverge

| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|-------------|------|------|-------|-------|------------------|------|-----------------|------|-----------|------|--------------|------|--------------------|------|-----|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 1.00 | 1.00 | 0.980 | 0.980 | 760 | 499 | 4800 | 2100 | 0.16 | 0.24 | 63.7 | 63.7 | 6.0 | 5.4 | A |
| 2 | 1.00 | 1.00 | 0.980 | 0.980 | 929 | 296 | 4800 | 2100 | 0.19 | 0.14 | 64.3 | 64.3 | 7.2 | 6.8 | A |

Segment 3: Basic

| Time Period | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|-------------|------|-------|------------------|-----------------|-----------|--------------|--------------------|-----|
| 1 | 1.00 | 0.980 | 260 | 4800 | 0.05 | 75.0 | 1.7 | A |
| 2 | 1.00 | 0.980 | 633 | 4800 | 0.13 | 75.0 | 4.2 | A |

Segment 4: Merge

| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|-------------|------|------|-------|-------|------------------|------|-----------------|------|-----------|------|--------------|------|--------------------|------|-----|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 1.00 | 1.00 | 0.980 | 0.980 | 531 | 271 | 4800 | 2100 | 0.11 | 0.13 | 67.4 | 67.4 | 3.9 | 2.7 | A |
| 2 | 1.00 | 1.00 | 0.980 | 0.980 | 1051 | 418 | 4800 | 2100 | 0.22 | 0.20 | 67.3 | 67.3 | 7.8 | 6.7 | A |

Segment 5: Basic

| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|-------------|------|---|-------|---|------------------|------|-----------------|------|-----------|---|--------------|---|--------------------|------|-----|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 1.00 | | 0.980 | | 532 | | 4800 | | 0.11 | | 75.0 | | 3.5 | | A |
| 2 | 1.00 | | 0.980 | | 1051 | | 4800 | | 0.22 | | 75.0 | | 7.0 | | A |

Segment 6: Diverge

| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|-------------|------|------|-------|-------|------------------|------|-----------------|------|-----------|------|--------------|------|--------------------|------|-----|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 1.00 | 1.00 | 0.980 | 0.980 | 532 | 260 | 4800 | 2100 | 0.11 | 0.12 | 64.4 | 64.4 | 4.1 | 1.6 | A |
| 2 | 1.00 | 1.00 | 0.980 | 0.980 | 1051 | 520 | 4800 | 2100 | 0.22 | 0.25 | 63.6 | 63.6 | 8.3 | 6.1 | A |

Segment 7: Basic

| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|-------------|------|---|-------|---|------------------|------|-----------------|------|-----------|---|--------------|---|--------------------|------|-----|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 1.00 | | 0.980 | | 271 | | 4800 | | 0.06 | | 75.0 | | 1.8 | | A |
| 2 | 1.00 | | 0.980 | | 531 | | 4800 | | 0.11 | | 75.0 | | 3.5 | | A |

Segment 8: Merge

| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|-------------|------|------|-------|-------|------------------|------|-----------------|------|-----------|------|--------------|------|--------------------|------|-----|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 1.00 | 1.00 | 0.980 | 0.980 | 564 | 293 | 4800 | 2100 | 0.12 | 0.14 | 66.6 | 66.6 | 4.2 | 4.8 | A |
| 2 | 1.00 | 1.00 | 0.980 | 0.980 | 796 | 265 | 4800 | 2100 | 0.17 | 0.13 | 66.5 | 66.5 | 6.0 | 6.6 | A |

Segment 9: Basic

| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|-------------|------|---|-------|---|------------------|------|-----------------|------|-----------|---|--------------|---|--------------------|------|-----|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 1.00 | | 0.980 | | 564 | | 4800 | | 0.12 | | 75.0 | | 3.8 | | A |
| 2 | 1.00 | | 0.980 | | 796 | | 4800 | | 0.17 | | 75.0 | | 5.3 | | A |

Facility Time Period Results

| T | Speed, mi/h | Density, pc/mi/ln | Density, veh/mi/ln | Travel Time, min | LOS |
|---|-------------|-------------------|--------------------|------------------|-----|
| 1 | 73.9 | 4.0 | 3.9 | 11.1 | A |
| 2 | 74.5 | 6.2 | 6.1 | 11.0 | A |

Facility Overall Results

| | | | |
|--------------------------|------|--------------------|-----|
| Space Mean Speed, mi/h | 74.3 | Density, veh/mi/ln | 5.0 |
| Average Travel Time, min | 11.0 | Density, pc/mi/ln | 5.1 |

HCS7 Freeway Facilities Report

Project Information

| | | | |
|---------------------|--------------------|----------------------|------------------------|
| Analyst | DEA | Agency | City of GJ/Mesa County |
| Jurisdiction | Grand Junction, CO | Time Period Analyzed | 1=AM & 2=PM |
| Analysis Year | 2019 | Date | May 2019 |
| Project Description | Existing WB I-70 | | |

Facility Global Input

| | | | |
|----------------------------------|-------|-------------------------------|------|
| Jam Density, pc/mi/ln | 190.0 | Density at Capacity, pc/mi/ln | 45.0 |
| Queue Discharge Capacity Drop, % | 7 | Total Segments | 9 |
| Total Time Periods | 2 | Time Period Duration, min | 15 |

Segment Geometric Data

| No. | Coded | Analyzed | Name | Length, ft | Lanes |
|-----|---------|----------|----------------------------|------------|-------|
| 1 | Basic | Basic | WB I-70 - E of I-70B | 21600 | 2 |
| 2 | Diverge | Diverge | WB Off Ramp - I-70B | 500 | 2 |
| 3 | Basic | Basic | WB I-70 - at I-70B | 1300 | 2 |
| 4 | Merge | Merge | WB On Ramp - I-70B | 1500 | 2 |
| 5 | Basic | Basic | WB I-70 - I-70B to Horizon | 24300 | 2 |
| 6 | Diverge | Diverge | WB Off Ramp - Horizon | 900 | 2 |
| 7 | Basic | Basic | WB I-70 - at Horizon | 1900 | 2 |
| 8 | Merge | Merge | WB On Ramp - Horizon | 1400 | 2 |
| 9 | Basic | Basic | WB I-70 - W of Horizon | 18400 | 2 |

Facility Segment Data

Segment 1: Basic

| Time Period | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|-------------|------|-------|------------------|-----------------|-----------|--------------|--------------------|-----|
| 1 | 1.00 | 0.980 | 347 | 4800 | 0.07 | 75.0 | 2.3 | A |
| 2 | 1.00 | 0.980 | 908 | 4800 | 0.19 | 75.0 | 6.1 | A |

Segment 2: Diverge

| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|-------------|------|------|-------|-------|------------------|------|-----------------|------|-----------|------|--------------|------|--------------------|------|-----|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 1.00 | 1.00 | 0.980 | 0.980 | 347 | 239 | 4800 | 2100 | 0.07 | 0.11 | 64.4 | 64.4 | 2.7 | 0.0 | A |
| 2 | 1.00 | 1.00 | 0.980 | 0.980 | 908 | 480 | 4800 | 2100 | 0.19 | 0.23 | 63.7 | 63.7 | 7.1 | 4.9 | A |

Segment 3: Basic

| Time Period | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|-------------|------|-------|------------------|-----------------|-----------|--------------|--------------------|-----|
| 1 | 1.00 | 0.980 | 108 | 4800 | 0.02 | 75.0 | 0.7 | A |
| 2 | 1.00 | 0.980 | 429 | 4800 | 0.09 | 75.0 | 2.9 | A |

Segment 4: Merge

| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|-------------|------|------|-------|-------|------------------|------|-----------------|------|-----------|------|--------------|------|--------------------|------|-----|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 1.00 | 1.00 | 0.980 | 0.980 | 684 | 576 | 4800 | 2100 | 0.14 | 0.27 | 66.5 | 66.5 | 5.1 | 5.6 | A |
| 2 | 1.00 | 1.00 | 0.980 | 0.980 | 745 | 316 | 4800 | 2100 | 0.16 | 0.15 | 66.5 | 66.5 | 5.6 | 6.2 | A |

Segment 5: Basic

| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|-------------|------|---|-------|---|------------------|------|-----------------|------|-----------|---|--------------|---|--------------------|------|-----|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 1.00 | | 0.980 | | 684 | | 4800 | | 0.14 | | 75.0 | | 4.6 | | A |
| 2 | 1.00 | | 0.980 | | 745 | | 4800 | | 0.16 | | 75.0 | | 5.0 | | A |

Segment 6: Diverge

| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|-------------|------|------|-------|-------|------------------|------|-----------------|------|-----------|------|--------------|------|--------------------|------|-----|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 1.00 | 1.00 | 0.980 | 0.980 | 684 | 466 | 4800 | 2100 | 0.14 | 0.22 | 63.8 | 63.8 | 5.4 | 2.9 | A |
| 2 | 1.00 | 1.00 | 0.980 | 0.980 | 745 | 316 | 4800 | 2100 | 0.16 | 0.15 | 64.2 | 64.2 | 5.8 | 3.5 | A |

Segment 7: Basic

| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|-------------|------|---|-------|---|------------------|------|-----------------|------|-----------|---|--------------|---|--------------------|------|-----|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 1.00 | | 0.980 | | 217 | | 4800 | | 0.05 | | 75.0 | | 1.4 | | A |
| 2 | 1.00 | | 0.980 | | 429 | | 4800 | | 0.09 | | 75.0 | | 2.9 | | A |

Segment 8: Merge

| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|-------------|------|------|-------|-------|------------------|------|-----------------|------|-----------|------|--------------|------|--------------------|------|-----|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 1.00 | 1.00 | 0.980 | 0.980 | 500 | 283 | 4800 | 2100 | 0.10 | 0.13 | 66.6 | 66.6 | 3.8 | 4.3 | A |
| 2 | 1.00 | 1.00 | 0.980 | 0.980 | 817 | 388 | 4800 | 2100 | 0.17 | 0.18 | 66.5 | 66.5 | 6.1 | 6.7 | A |

Segment 9: Basic

| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|-------------|------|---|-------|---|------------------|------|-----------------|------|-----------|---|--------------|---|--------------------|------|-----|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 1.00 | | 0.980 | | 499 | | 4800 | | 0.10 | | 75.0 | | 3.3 | | A |
| 2 | 1.00 | | 0.980 | | 816 | | 4800 | | 0.17 | | 75.0 | | 5.4 | | A |

Facility Time Period Results

| T | Speed, mi/h | Density, pc/mi/ln | Density, veh/mi/ln | Travel Time, min | LOS |
|---|-------------|-------------------|--------------------|------------------|-----|
| 1 | 74.5 | 3.4 | 3.4 | 11.0 | A |
| 2 | 74.5 | 5.4 | 5.3 | 11.0 | A |

Facility Overall Results

| | | | |
|--------------------------|------|--------------------|-----|
| Space Mean Speed, mi/h | 74.5 | Density, veh/mi/ln | 4.3 |
| Average Travel Time, min | 11.0 | Density, pc/mi/ln | 4.4 |

HCS7 Freeway Facilities Report

Project Information

| | | | |
|---------------------|-------------------------------|----------------------|------------------------|
| Analyst | DEA | Agency | City of GJ/Mesa County |
| Jurisdiction | Grand Junction, CO | Time Period Analyzed | 1=AM & 2=PM |
| Analysis Year | 2040 | Date | May 2019 |
| Project Description | 2040 EB I-70 - No Interchange | | |

Facility Global Input

| | | | |
|----------------------------------|-------|-------------------------------|------|
| Jam Density, pc/mi/ln | 190.0 | Density at Capacity, pc/mi/ln | 45.0 |
| Queue Discharge Capacity Drop, % | 7 | Total Segments | 9 |
| Total Time Periods | 2 | Time Period Duration, min | 15 |

Segment Geometric Data

| No. | Coded | Analyzed | Name | Length, ft | Lanes |
|-----|---------|----------|----------------------------|------------|-------|
| 1 | Basic | Basic | EB I-70 - W of Horizon | 18400 | 2 |
| 2 | Diverge | Diverge | EB Off Ramp - Horizon | 600 | 2 |
| 3 | Basic | Basic | EB I-70 - at Horizon | 1900 | 2 |
| 4 | Merge | Merge | EB On Ramp - Horizon | 1000 | 2 |
| 5 | Basic | Basic | EB I-70 - Horizon to I-70B | 24300 | 2 |
| 6 | Diverge | Diverge | EB Off Ramp - I-70B | 1100 | 2 |
| 7 | Basic | Basic | EB I-70 - at I-70B | 1500 | 2 |
| 8 | Merge | Merge | EB On Ramp - I-70B | 1500 | 2 |
| 9 | Basic | Basic | EB I-70 - E of I-70B | 21600 | 2 |

Facility Segment Data

Segment 1: Basic

| Time Period | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|-------------|------|-------|------------------|-----------------|-----------|--------------|--------------------|-----|
| 1 | 1.00 | 0.980 | 1204 | 4646 | 0.26 | 73.1 | 8.2 | A |
| 2 | 1.00 | 0.980 | 1561 | 4800 | 0.33 | 75.0 | 10.4 | A |

Segment 2: Diverge

| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|-------------|------|------|-------|-------|------------------|------|-----------------|------|-----------|------|--------------|------|--------------------|------|-----|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 1.00 | 1.00 | 0.980 | 0.980 | 1204 | 750 | 4800 | 2100 | 0.25 | 0.36 | 62.9 | 62.9 | 9.6 | 9.2 | A |
| 2 | 1.00 | 1.00 | 0.980 | 0.980 | 1561 | 561 | 4800 | 2100 | 0.33 | 0.27 | 63.5 | 63.5 | 12.3 | 12.3 | B |

Segment 3: Basic

| Time Period | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|-------------|------|-------|------------------|-----------------|-----------|--------------|--------------------|-----|
| 1 | 1.00 | 0.980 | 454 | 4800 | 0.09 | 75.0 | 3.0 | A |
| 2 | 1.00 | 0.980 | 1000 | 4800 | 0.21 | 75.0 | 6.7 | A |

Segment 4: Merge

| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|-------------|------|------|-------|-------|------------------|------|-----------------|------|-----------|------|--------------|------|--------------------|------|-----|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 1.00 | 1.00 | 0.980 | 0.980 | 918 | 464 | 4800 | 2100 | 0.19 | 0.22 | 67.3 | 67.3 | 6.8 | 5.6 | A |
| 2 | 1.00 | 1.00 | 0.980 | 0.980 | 1816 | 816 | 4800 | 2100 | 0.38 | 0.39 | 66.9 | 66.9 | 13.6 | 12.4 | B |

Segment 5: Basic

| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|-------------|------|---|-------|---|------------------|------|-----------------|------|-----------|---|--------------|---|--------------------|------|-----|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 1.00 | | 0.980 | | 918 | | 4800 | | 0.19 | | 75.0 | | 6.1 | | A |
| 2 | 1.00 | | 0.980 | | 1816 | | 4800 | | 0.38 | | 75.0 | | 12.1 | | B |

Segment 6: Diverge

| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|-------------|------|------|-------|-------|------------------|------|-----------------|------|-----------|------|--------------|------|--------------------|------|-----|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 1.00 | 1.00 | 0.980 | 0.980 | 918 | 480 | 4800 | 2100 | 0.19 | 0.23 | 63.7 | 63.7 | 7.2 | 4.9 | A |
| 2 | 1.00 | 1.00 | 0.980 | 0.980 | 1816 | 939 | 4800 | 2100 | 0.38 | 0.45 | 62.4 | 62.4 | 14.6 | 12.7 | B |

Segment 7: Basic

| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|-------------|------|---|-------|---|------------------|------|-----------------|------|-----------|---|--------------|---|--------------------|------|-----|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 1.00 | | 0.980 | | 439 | | 4800 | | 0.09 | | 75.0 | | 2.9 | | A |
| 2 | 1.00 | | 0.980 | | 878 | | 4800 | | 0.18 | | 75.0 | | 5.9 | | A |

Segment 8: Merge

| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|-------------|------|------|-------|-------|------------------|------|-----------------|------|-----------|------|--------------|------|--------------------|------|-----|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 1.00 | 1.00 | 0.980 | 0.980 | 868 | 429 | 4800 | 2100 | 0.18 | 0.20 | 66.5 | 66.5 | 6.5 | 7.1 | A |
| 2 | 1.00 | 1.00 | 0.980 | 0.980 | 1286 | 408 | 4800 | 2100 | 0.27 | 0.19 | 66.3 | 66.3 | 9.7 | 10.4 | B |

Segment 9: Basic

| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|-------------|------|---|-------|---|------------------|------|-----------------|------|-----------|---|--------------|---|--------------------|------|-----|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 1.00 | | 0.980 | | 867 | | 4800 | | 0.18 | | 75.0 | | 5.8 | | A |
| 2 | 1.00 | | 0.980 | | 1286 | | 4800 | | 0.27 | | 75.0 | | 8.6 | | A |

Facility Time Period Results

| T | Speed, mi/h | Density, pc/mi/ln | Density, veh/mi/ln | Travel Time, min | LOS |
|---|-------------|-------------------|--------------------|------------------|-----|
| 1 | 73.9 | 6.5 | 6.3 | 11.1 | A |
| 2 | 74.5 | 10.4 | 10.2 | 11.0 | A |

Facility Overall Results

| | | | |
|--------------------------|------|--------------------|-----|
| Space Mean Speed, mi/h | 74.3 | Density, veh/mi/ln | 8.3 |
| Average Travel Time, min | 11.0 | Density, pc/mi/ln | 8.4 |

HCS7 Freeway Facilities Report

Project Information

| | | | |
|---------------------|-------------------------------|----------------------|------------------------|
| Analyst | DEA | Agency | City of GJ/Mesa County |
| Jurisdiction | Grand Junction, CO | Time Period Analyzed | 1=AM & 2=PM |
| Analysis Year | 2040 | Date | May 2019 |
| Project Description | 2040 WB I-70 - No Interchange | | |

Facility Global Input

| | | | |
|----------------------------------|-------|-------------------------------|------|
| Jam Density, pc/mi/ln | 190.0 | Density at Capacity, pc/mi/ln | 45.0 |
| Queue Discharge Capacity Drop, % | 7 | Total Segments | 9 |
| Total Time Periods | 2 | Time Period Duration, min | 15 |

Segment Geometric Data

| No. | Coded | Analyzed | Name | Length, ft | Lanes |
|-----|---------|----------|----------------------------|------------|-------|
| 1 | Basic | Basic | WB I-70 - E of I-70B | 21600 | 2 |
| 2 | Diverge | Diverge | WB Off Ramp - I-70B | 500 | 2 |
| 3 | Basic | Basic | WB I-70 - at I-70B | 1300 | 2 |
| 4 | Merge | Merge | WB On Ramp - I-70B | 1500 | 2 |
| 5 | Basic | Basic | WB I-70 - I-70B to Horizon | 24300 | 2 |
| 6 | Diverge | Diverge | WB Off Ramp - Horizon | 900 | 2 |
| 7 | Basic | Basic | WB I-70 - at Horizon | 1900 | 2 |
| 8 | Merge | Merge | WB On Ramp - Horizon | 1400 | 2 |
| 9 | Basic | Basic | WB I-70 - W of Horizon | 18400 | 2 |

Facility Segment Data

Segment 1: Basic

| Time Period | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|-------------|------|-------|------------------|-----------------|-----------|--------------|--------------------|-----|
| 1 | 1.00 | 0.980 | 531 | 4800 | 0.11 | 75.0 | 3.5 | A |
| 2 | 1.00 | 0.980 | 1469 | 4800 | 0.31 | 75.0 | 9.8 | A |

Segment 2: Diverge

| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|-------------|------|------|-------|-------|------------------|------|-----------------|------|-----------|------|--------------|------|--------------------|------|-----|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 1.00 | 1.00 | 0.980 | 0.980 | 531 | 378 | 4800 | 2100 | 0.11 | 0.18 | 64.0 | 64.0 | 4.1 | 1.6 | A |
| 2 | 1.00 | 1.00 | 0.980 | 0.980 | 1469 | 796 | 4800 | 2100 | 0.31 | 0.38 | 62.8 | 62.8 | 11.7 | 9.7 | A |

Segment 3: Basic

| Time Period | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|-------------|------|-------|------------------|-----------------|-----------|--------------|--------------------|-----|
| 1 | 1.00 | 0.980 | 153 | 4800 | 0.03 | 75.0 | 1.0 | A |
| 2 | 1.00 | 0.980 | 673 | 4800 | 0.14 | 75.0 | 4.5 | A |

Segment 4: Merge

| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|-------------|------|------|-------|-------|------------------|------|-----------------|------|-----------|------|--------------|------|--------------------|------|-----|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 1.00 | 1.00 | 0.980 | 0.980 | 1127 | 974 | 4800 | 2100 | 0.23 | 0.46 | 66.4 | 66.4 | 8.5 | 8.9 | A |
| 2 | 1.00 | 1.00 | 0.980 | 0.980 | 1285 | 612 | 4800 | 2100 | 0.27 | 0.29 | 66.3 | 66.3 | 9.7 | 10.3 | B |

Segment 5: Basic

| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|-------------|------|---|-------|---|------------------|------|-----------------|------|-----------|---|--------------|---|--------------------|------|-----|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 1.00 | | 0.980 | | 1128 | | 4800 | | 0.24 | | 75.0 | | 7.5 | | A |
| 2 | 1.00 | | 0.980 | | 1286 | | 4800 | | 0.27 | | 75.0 | | 8.6 | | A |

Segment 6: Diverge

| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|-------------|------|------|-------|-------|------------------|------|-----------------|------|-----------|------|--------------|------|--------------------|------|-----|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 1.00 | 1.00 | 0.980 | 0.980 | 1128 | 821 | 4800 | 2100 | 0.24 | 0.39 | 62.7 | 62.7 | 9.0 | 6.8 | A |
| 2 | 1.00 | 1.00 | 0.980 | 0.980 | 1286 | 668 | 4800 | 2100 | 0.27 | 0.32 | 63.2 | 63.2 | 10.2 | 8.1 | A |

Segment 7: Basic

| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|-------------|------|---|-------|---|------------------|------|-----------------|------|-----------|---|--------------|---|--------------------|------|-----|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 1.00 | | 0.980 | | 306 | | 4800 | | 0.06 | | 75.0 | | 2.0 | | A |
| 2 | 1.00 | | 0.980 | | 617 | | 4800 | | 0.13 | | 75.0 | | 4.1 | | A |

Segment 8: Merge

| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|-------------|------|------|-------|-------|------------------|------|-----------------|------|-----------|------|--------------|------|--------------------|------|-----|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 1.00 | 1.00 | 0.980 | 0.980 | 791 | 485 | 4800 | 2100 | 0.16 | 0.23 | 66.5 | 66.5 | 5.9 | 6.5 | A |
| 2 | 1.00 | 1.00 | 0.980 | 0.980 | 1372 | 755 | 4800 | 2100 | 0.29 | 0.36 | 66.3 | 66.3 | 10.3 | 10.9 | B |

Segment 9: Basic

| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|-------------|------|---|-------|---|------------------|------|-----------------|------|-----------|---|--------------|---|--------------------|------|-----|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 1.00 | | 0.980 | | 791 | | 4800 | | 0.16 | | 75.0 | | 5.3 | | A |
| 2 | 1.00 | | 0.980 | | 1372 | | 4800 | | 0.29 | | 75.0 | | 9.1 | | A |

Facility Time Period Results

| T | Speed, mi/h | Density, pc/mi/ln | Density, veh/mi/ln | Travel Time, min | LOS |
|---|-------------|-------------------|--------------------|------------------|-----|
| 1 | 74.4 | 5.5 | 5.4 | 11.0 | A |
| 2 | 74.5 | 9.0 | 8.8 | 11.0 | A |

Facility Overall Results

| | | | |
|--------------------------|------|--------------------|-----|
| Space Mean Speed, mi/h | 74.5 | Density, veh/mi/ln | 7.1 |
| Average Travel Time, min | 11.0 | Density, pc/mi/ln | 7.2 |

HCS7 Freeway Facilities Report

Project Information

| | | | |
|---------------------|---------------------------------|----------------------|------------------------|
| Analyst | DEA | Agency | City of GJ/Mesa County |
| Jurisdiction | Grand Junction, CO | Time Period Analyzed | 1=AM & 2=PM |
| Analysis Year | 2040 | Date | May 2019 |
| Project Description | 2040 EB I-70 - With Interchange | | |

Facility Global Input

| | | | |
|----------------------------------|-------|-------------------------------|------|
| Jam Density, pc/mi/ln | 190.0 | Density at Capacity, pc/mi/ln | 45.0 |
| Queue Discharge Capacity Drop, % | 7 | Total Segments | 13 |
| Total Time Periods | 2 | Time Period Duration, min | 15 |

Segment Geometric Data

| No. | Coded | Analyzed | Name | Length, ft | Lanes |
|-----|---------|----------|------------------------------|------------|-------|
| 1 | Basic | Basic | EB I-70 - W of Horizon | 18400 | 2 |
| 2 | Diverge | Diverge | EB Off Ramp - Horizon | 600 | 2 |
| 3 | Basic | Basic | EB I-70 - at Horizon | 1900 | 2 |
| 4 | Merge | Merge | EB On Ramp - Horizon | 1000 | 2 |
| 5 | Basic | Basic | EB I-70 - Horizon to 29 Road | 2500 | 2 |
| 6 | Diverge | Diverge | EB Off Ramp - 29 Road | 600 | 2 |
| 7 | Basic | Basic | EB I-70 - at 29 Road | 4500 | 2 |
| 8 | Merge | Merge | EB On Ramp - 29 Road | 1000 | 2 |
| 9 | Basic | Basic | EB I-70 - 29 Road to I-70B | 15700 | 2 |
| 10 | Diverge | Diverge | EB Off Ramp - I-70B | 1100 | 2 |
| 11 | Basic | Basic | EB I-70 - at I-70B | 1500 | 2 |
| 12 | Merge | Merge | EB On Ramp - I-70B | 1500 | 2 |
| 13 | Basic | Basic | EB I-70 - E of I-70B | 21600 | 2 |

Facility Segment Data

Segment 1: Basic

| Time Period | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|-------------|------|-------|------------------|-----------------|-----------|--------------|--------------------|-----|
| 1 | 0.94 | 0.980 | 1324 | 4646 | 0.28 | 73.1 | 9.1 | A |
| 2 | 0.94 | 0.980 | 1737 | 4800 | 0.36 | 75.0 | 11.6 | B |

Segment 2: Diverge

| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|-------------|------|------|-------|-------|------------------|------|-----------------|------|-----------|------|--------------|------|--------------------|------|-----|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 0.94 | 0.94 | 0.980 | 0.980 | 1324 | 662 | 4800 | 2100 | 0.28 | 0.32 | 63.2 | 63.2 | 10.5 | 10.2 | B |
| 2 | 0.94 | 0.94 | 0.980 | 0.980 | 1737 | 472 | 4800 | 2100 | 0.36 | 0.22 | 63.8 | 63.8 | 13.6 | 13.8 | B |

Segment 3: Basic

| Time | PHF | fHV | Flow Rate | Capacity | d/c | Speed | Density | LOS |
|------|-----|-----|-----------|----------|-----|-------|---------|-----|
|------|-----|-----|-----------|----------|-----|-------|---------|-----|

| Period | | | (pc/h) | | (pc/h) | | Ratio | | (mi/h) | | (pc/mi/ln) | | | | |
|---------------------|------|-------|--------|-------|------------------|------|-----------------|------|-----------|------|--------------|------|--------------------|------|-----|
| 1 | 0.94 | 0.980 | 662 | | 4800 | | 0.14 | | 75.0 | | 4.4 | | A | | |
| 2 | 0.94 | 0.980 | 1265 | | 4800 | | 0.26 | | 75.0 | | 8.4 | | A | | |
| Segment 4: Merge | | | | | | | | | | | | | | | |
| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 0.94 | 0.94 | 0.980 | 0.980 | 1226 | 564 | 4800 | 2100 | 0.26 | 0.27 | 67.2 | 67.2 | 9.1 | 8.0 | A |
| 2 | 0.94 | 0.94 | 0.980 | 0.980 | 2264 | 999 | 4800 | 2100 | 0.47 | 0.48 | 66.4 | 66.4 | 17.0 | 15.9 | B |
| Segment 5: Basic | | | | | | | | | | | | | | | |
| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
| 1 | 0.94 | | 0.980 | | 1227 | | 4800 | | 0.26 | | 75.0 | | 8.2 | | A |
| 2 | 0.94 | | 0.980 | | 2263 | | 4800 | | 0.47 | | 74.8 | | 15.1 | | B |
| Segment 6: Diverge | | | | | | | | | | | | | | | |
| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 0.94 | 0.94 | 0.980 | 0.980 | 1227 | 738 | 4800 | 2100 | 0.26 | 0.35 | 63.0 | 63.0 | 9.7 | 7.6 | A |
| 2 | 0.94 | 0.94 | 0.980 | 0.980 | 2263 | 999 | 4800 | 2100 | 0.47 | 0.48 | 62.2 | 62.2 | 18.2 | 16.5 | B |
| Segment 7: Basic | | | | | | | | | | | | | | | |
| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
| 1 | 0.94 | | 0.980 | | 488 | | 4800 | | 0.10 | | 75.0 | | 3.3 | | A |
| 2 | 0.94 | | 0.980 | | 1265 | | 4800 | | 0.26 | | 75.0 | | 8.4 | | A |
| Segment 8: Merge | | | | | | | | | | | | | | | |
| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 0.94 | 0.94 | 0.980 | 0.980 | 890 | 402 | 4800 | 2100 | 0.19 | 0.19 | 66.5 | 66.5 | 6.7 | 7.3 | A |
| 2 | 0.94 | 0.94 | 0.980 | 0.980 | 1737 | 472 | 4800 | 2100 | 0.36 | 0.22 | 66.1 | 66.1 | 13.1 | 13.9 | B |
| Segment 9: Basic | | | | | | | | | | | | | | | |
| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
| 1 | 0.94 | | 0.980 | | 890 | | 4800 | | 0.19 | | 75.0 | | 5.9 | | A |
| 2 | 0.94 | | 0.980 | | 1737 | | 4800 | | 0.36 | | 75.0 | | 11.6 | | B |
| Segment 10: Diverge | | | | | | | | | | | | | | | |
| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 0.94 | 0.94 | 0.980 | 0.980 | 890 | 413 | 4800 | 2100 | 0.19 | 0.20 | 63.9 | 63.9 | 7.0 | 4.7 | A |

| 2 | 0.94 | 0.94 | 0.980 | 0.980 | 1737 | 1053 | 4800 | 2100 | 0.36 | 0.50 | 62.0 | 62.0 | 14.0 | 12.0 | B |
|------------------------------|-------------|------|-------------------|-------|--------------------|------|------------------|--------------------|-----------|------|--------------|------|--------------------|------|-----|
| Segment 11: Basic | | | | | | | | | | | | | | | |
| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
| 1 | 0.94 | | 0.980 | | 478 | | 4800 | | 0.10 | | 75.0 | | 3.2 | | A |
| 2 | 0.94 | | 0.980 | | 684 | | 4800 | | 0.14 | | 75.0 | | 4.6 | | A |
| Segment 12: Merge | | | | | | | | | | | | | | | |
| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 0.94 | 0.94 | 0.980 | 0.980 | 934 | 456 | 4800 | 2100 | 0.19 | 0.22 | 66.5 | 66.5 | 7.0 | 7.6 | A |
| 2 | 0.94 | 0.94 | 0.980 | 0.980 | 1118 | 434 | 4800 | 2100 | 0.23 | 0.21 | 66.4 | 66.4 | 8.4 | 9.1 | A |
| Segment 13: Basic | | | | | | | | | | | | | | | |
| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
| 1 | 0.94 | | 0.980 | | 934 | | 4800 | | 0.19 | | 75.0 | | 6.2 | | A |
| 2 | 0.94 | | 0.980 | | 1118 | | 4800 | | 0.23 | | 75.0 | | 7.5 | | A |
| Facility Time Period Results | | | | | | | | | | | | | | | |
| T | Speed, mi/h | | Density, pc/mi/ln | | Density, veh/mi/ln | | Travel Time, min | | LOS | | | | | | |
| 1 | 73.7 | | 6.8 | | 6.7 | | 11.1 | | A | | | | | | |
| 2 | 74.2 | | 10.2 | | 10.0 | | 11.0 | | A | | | | | | |
| Facility Overall Results | | | | | | | | | | | | | | | |
| Space Mean Speed, mi/h | | | | | 74.0 | | | Density, veh/mi/ln | | | 8.3 | | | | |
| Average Travel Time, min | | | | | 11.0 | | | Density, pc/mi/ln | | | 8.5 | | | | |

HCS7 Freeway Facilities Report

Project Information

| | | | |
|---------------------|---------------------------------|----------------------|------------------------|
| Analyst | DEA | Agency | City of GJ/Mesa County |
| Jurisdiction | Grand Junction, CO | Time Period Analyzed | 1=AM & 2=PM |
| Analysis Year | 2040 | Date | May 2019 |
| Project Description | 2040 WB I-70 - With Interchange | | |

Facility Global Input

| | | | |
|----------------------------------|-------|-------------------------------|------|
| Jam Density, pc/mi/ln | 190.0 | Density at Capacity, pc/mi/ln | 45.0 |
| Queue Discharge Capacity Drop, % | 7 | Total Segments | 13 |
| Total Time Periods | 2 | Time Period Duration, min | 15 |

Segment Geometric Data

| No. | Coded | Analyzed | Name | Length, ft | Lanes |
|-----|---------|----------|------------------------------|------------|-------|
| 1 | Basic | Basic | WB I-70 - E of I-70B | 21600 | 2 |
| 2 | Diverge | Diverge | WB Off Ramp - I-70B | 500 | 2 |
| 3 | Basic | Basic | WB I-70 - at I-70B | 1300 | 2 |
| 4 | Merge | Merge | WB On Ramp - I-70B | 1500 | 2 |
| 5 | Basic | Basic | WB I-70 - I-70B to 29 Road | 15000 | 2 |
| 6 | Diverge | Diverge | WB Off Ramp - 29 Road | 900 | 2 |
| 7 | Basic | Basic | WB I-70 - at 29 Road | 4500 | 2 |
| 8 | Merge | Merge | WB On Ramp - 29 Road | 1400 | 2 |
| 9 | Basic | Basic | WB I-70 - 29 Road to Horizon | 2500 | 2 |
| 10 | Diverge | Diverge | WB Off Ramp - Horizon | 900 | 2 |
| 11 | Basic | Basic | WB I-70 - at Horizon | 1900 | 2 |
| 12 | Merge | Merge | WB On Ramp - Horizon | 1400 | 2 |
| 13 | Basic | Basic | WB I-70 - W of Horizon | 18400 | 2 |

Facility Segment Data

Segment 1: Basic

| Time Period | PHF | fHV | Flow Rate (pc/h) | Capacity (pc/h) | d/c Ratio | Speed (mi/h) | Density (pc/mi/ln) | LOS |
|-------------|------|-------|------------------|-----------------|-----------|--------------|--------------------|-----|
| 1 | 0.94 | 0.980 | 564 | 4800 | 0.12 | 75.0 | 3.8 | A |
| 2 | 0.94 | 0.980 | 1563 | 4800 | 0.33 | 75.0 | 10.4 | A |

Segment 2: Diverge

| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
|-------------|------|------|-------|-------|------------------|------|-----------------|------|-----------|------|--------------|------|--------------------|------|-----|
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 0.94 | 0.94 | 0.980 | 0.980 | 564 | 402 | 4800 | 2100 | 0.12 | 0.19 | 64.0 | 64.0 | 4.4 | 1.9 | A |
| 2 | 0.94 | 0.94 | 0.980 | 0.980 | 1563 | 847 | 4800 | 2100 | 0.33 | 0.40 | 62.7 | 62.7 | 12.5 | 10.5 | B |

Segment 3: Basic

| Time | PHF | fHV | Flow Rate | Capacity | d/c | Speed | Density | LOS |
|------|-----|-----|-----------|----------|-----|-------|---------|-----|
|------|-----|-----|-----------|----------|-----|-------|---------|-----|

| Period | | | (pc/h) | | (pc/h) | | Ratio | | (mi/h) | | (pc/mi/ln) | | | | |
|---------------------|------|-------|--------|-------|------------------|------|-----------------|------|-----------|------|--------------|------|--------------------|------|-----|
| 1 | 0.94 | 0.980 | 163 | | 4800 | | 0.03 | | 75.0 | | 1.1 | | A | | |
| 2 | 0.94 | 0.980 | 716 | | 4800 | | 0.15 | | 75.0 | | 4.8 | | A | | |
| Segment 4: Merge | | | | | | | | | | | | | | | |
| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 0.94 | 0.94 | 0.980 | 0.980 | 1010 | 847 | 4800 | 2100 | 0.21 | 0.40 | 66.4 | 66.4 | 7.6 | 8.0 | A |
| 2 | 0.94 | 0.94 | 0.980 | 0.980 | 1313 | 597 | 4800 | 2100 | 0.27 | 0.28 | 66.3 | 66.3 | 9.9 | 10.5 | B |
| Segment 5: Basic | | | | | | | | | | | | | | | |
| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
| 1 | 0.94 | 0.980 | 1010 | | 4800 | | 0.21 | | 75.0 | | 6.7 | | A | | |
| 2 | 0.94 | 0.980 | 1314 | | 4800 | | 0.27 | | 75.0 | | 8.8 | | A | | |
| Segment 6: Diverge | | | | | | | | | | | | | | | |
| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 0.94 | 0.94 | 0.980 | 0.980 | 1010 | 543 | 4800 | 2100 | 0.21 | 0.26 | 63.5 | 63.5 | 8.0 | 5.7 | A |
| 2 | 0.94 | 0.94 | 0.980 | 0.980 | 1314 | 760 | 4800 | 2100 | 0.27 | 0.36 | 62.9 | 62.9 | 10.4 | 8.4 | A |
| Segment 7: Basic | | | | | | | | | | | | | | | |
| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
| 1 | 0.94 | 0.980 | 467 | | 4800 | | 0.10 | | 75.0 | | 3.1 | | A | | |
| 2 | 0.94 | 0.980 | 554 | | 4800 | | 0.12 | | 75.0 | | 3.7 | | A | | |
| Segment 8: Merge | | | | | | | | | | | | | | | |
| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 0.94 | 0.94 | 0.980 | 0.980 | 1520 | 1053 | 4800 | 2100 | 0.32 | 0.50 | 66.2 | 66.2 | 11.5 | 11.9 | B |
| 2 | 0.94 | 0.94 | 0.980 | 0.980 | 1509 | 955 | 4800 | 2100 | 0.31 | 0.45 | 66.2 | 66.2 | 11.4 | 11.9 | B |
| Segment 9: Basic | | | | | | | | | | | | | | | |
| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
| 1 | 0.94 | 0.980 | 1520 | | 4800 | | 0.32 | | 75.0 | | 10.1 | | A | | |
| 2 | 0.94 | 0.980 | 1509 | | 4800 | | 0.31 | | 75.0 | | 10.1 | | A | | |
| Segment 10: Diverge | | | | | | | | | | | | | | | |
| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 0.94 | 0.94 | 0.980 | 0.980 | 1520 | 1031 | 4800 | 2100 | 0.32 | 0.49 | 62.1 | 62.1 | 12.2 | 10.1 | B |

| 2 | 0.94 | 0.94 | 0.980 | 0.980 | 1509 | 792 | 4800 | 2100 | 0.31 | 0.38 | 62.8 | 62.8 | 12.0 | 10.0 | A |
|------------------------------|-------------|------|-------------------|-------|--------------------|------|------------------|--------------------|-----------|------|--------------|------|--------------------|------|-----|
| Segment 11: Basic | | | | | | | | | | | | | | | |
| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
| 1 | 0.94 | | 0.980 | | 488 | | 4800 | | 0.10 | | 75.0 | | 3.3 | | A |
| 2 | 0.94 | | 0.980 | | 716 | | 4800 | | 0.15 | | 75.0 | | 4.8 | | A |
| Segment 12: Merge | | | | | | | | | | | | | | | |
| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
| | F | R | F | R | Freeway | Ramp | Freeway | Ramp | F | R | F | R | Freeway | Ramp | |
| 1 | 0.94 | 0.94 | 0.980 | 0.980 | 890 | 402 | 4800 | 2100 | 0.19 | 0.19 | 66.5 | 66.5 | 6.7 | 7.3 | A |
| 2 | 0.94 | 0.94 | 0.980 | 0.980 | 1367 | 651 | 4800 | 2100 | 0.28 | 0.31 | 66.3 | 66.3 | 10.3 | 10.9 | B |
| Segment 13: Basic | | | | | | | | | | | | | | | |
| Time Period | PHF | | fHV | | Flow Rate (pc/h) | | Capacity (pc/h) | | d/c Ratio | | Speed (mi/h) | | Density (pc/mi/ln) | | LOS |
| 1 | 0.94 | | 0.980 | | 890 | | 4800 | | 0.19 | | 75.0 | | 5.9 | | A |
| 2 | 0.94 | | 0.980 | | 1368 | | 4800 | | 0.29 | | 75.0 | | 9.1 | | A |
| Facility Time Period Results | | | | | | | | | | | | | | | |
| T | Speed, mi/h | | Density, pc/mi/ln | | Density, veh/mi/ln | | Travel Time, min | | LOS | | | | | | |
| 1 | 73.9 | | 5.5 | | 5.4 | | 11.0 | | A | | | | | | |
| 2 | 74.2 | | 9.1 | | 8.9 | | 11.0 | | A | | | | | | |
| Facility Overall Results | | | | | | | | | | | | | | | |
| Space Mean Speed, mi/h | | | | | 74.1 | | | Density, veh/mi/ln | | | | 7.2 | | | |
| Average Travel Time, min | | | | | 11.0 | | | Density, pc/mi/ln | | | | 7.3 | | | |

APPENDIX C

Market and Economic Impact Study

Report

Mesa County 29 Road Interchange PEL Market and Economic Impact Study

The Economics of Land Use



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April 22, 2019

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1. Executive Summary

Mesa County and the City of Grand Junction (Study Partners) are completing a Planning and Environmental Linkage (PEL) Study for a proposed 29 Road interchange on I-70 for the Colorado Department of Transportation (CDOT) and Federal Highway Administration (FHWA). A PEL is an early stage evaluation of the transportation, environmental, community and economic goals and impacts of a proposed transportation investment that is consistent with the National Environmental Policy Act (NEPA) studies that will be required if the project should move ahead.

This report presents the analysis and conclusions of Economic & Planning Systems (EPS) regarding the economic development benefits that may occur to the City and region if the proposed transportation project is determined to be needed and is therefore completed. The economic study was completed by EPS under a subcontract to David Evans and Associates who is the prime consultant for preparing the PEL.

Scope of Work

The report is presented in four chapters following this Executive Summary as summarized below.

- **Economic and Demographic Framework** – This chapter summarizes population and employment trends and conditions over the 2000 to 2018 timeframe for Mesa County and the City of Grand Junction. Current population characteristics and related data on housing units and occupancy are included. Employment data is compiled by industry sector over a similar timeframe. Household and employment forecasts are provided for the 2018 to 2045 time period as a basis for forecasting future development space demand.
- **Business and Industrial Development** – This chapter reviews office and industrial trends and conditions for the 2000 to 2018 time period for the City and for a defined Horizon Study Area including the total space inventory, annual construction, and lease rates and occupancy characteristics. Future space demand is forecast through 2045 based on the employment forecasts and compared to the inventory of future development capacity.
- **Retail Development Potentials** – This chapter presents retail/commercial trends and conditions for the 2000 to 2018 time period. It also includes an estimate of future demand for the Grand Junction market based on household and income growth from 2018 through 2045.
- **29 RD/I-70 Development Opportunities** – This chapter of the report evaluates future development opportunities for the City and for the Study Area after the interchange is completed. The economic impacts to the larger regional economy are also qualitatively assessed.

Summary of Findings

The market study anticipates continued economic development and growth for Mesa County and Grand Junction. The study identifies a notable shortfall in available land to meet the future demand for business, industrial, and retail development. Therefore, Mesa County and the City of Grand Junction must identify land to make up that shortfall.

1. Grand Junction is forecast to continue to grow at a moderate pace over the 2018 to 2045 PEL Study timeframe.

City of Grand Junction population increased from 48,130 in 2000 to 63,879 in 2018 which is an average of 875 persons per year or a 1.6 percent annual growth rate. The State Demographer forecasts indicate that Mesa County will grow at an average rate of 2,664 persons per year over the 2018 to 2045 time period which equates to an average annual increase of 1.4 percent. Holding Grand Junction's share of County growth over the 2000 to 2018 time period constant going forward, the City can expect an average of 1,068 persons per year to reach 92,724 by 2045.

2. Housing construction in Grand Junction has accelerated over the last three years with growth expected to continue over the near future.

Housing construction has been increasing and is close to pre-recession levels over the last three years at approximately 500 units per year on average. Recent construction has been predominately single family units at an average of 82 percent of the total for 2011 through 2018. According to the City's planning department, "Planning Clearances" for new development proposals have also been accelerating, growing by 42 percent from 361 in 2015 to over 500 in 2017 and 2018, which should translate to continued housing construction momentum.

3. Based on forecasted population growth, Grand Junction is expected to need an additional 12,857 housing units by 2045 which is an average of 643 units per year.

According to Colorado Department of Local Affairs (DOLA), Mesa County's population is forecast to grow by an average of 2,664 persons per year, which is an annual rate of 1.4 percent, to reach 225,256 by 2045. Holding Grand Junction's share of the County growth constant at 41.2 percent, the City is estimated to grow by 1,068 persons per year to reach 92,724 by 2045. To estimate housing production demand, the portion of the population in households (excluding group quarters) is converted to household based on an average household size of 2.31 and an allowance is added for a vacancy rate to estimate the resultant demand.

4. After a prolonged period of stagnation, Mesa County employment is also growing at pre-recession levels.

In 2017, total employment in Mesa County reached 61,136 jobs up from 49,948 in 2000—an average increase of 658 jobs per year or 1.2 percent over the 18-year time period. The annual growth rate was 1.4 between 2000 and 2010 before slowing during the recession. Over the last two years the economy has begun to pick up and has grown by an average of 1,500 jobs per year since 2016 which is 2.6 percent per year.

5. Mesa County and the City of Grand Junction are expected to experience a moderate increase in employment growth over the 27-year PEL Study time period.

Based on BLS 10-year forecasts (modified by EPS to adjust for growth over the last two years), Mesa County employment is projected to add an average of 894 jobs per year to reach 70,078 jobs by 2027 which is a 1.4 percent annual growth rate. Projecting this rate forward to 2045, Mesa County is estimated to reach 90,632 jobs by 2045—an average annual gain of 1,142 jobs. Health Care is expected to continue to be the top industry looking forward with an additional 10,594 jobs over the 2017 to 2045 time period, which is an annual growth rate of 2.4 percent. The next fastest growing industries are expected to be Hotels and Restaurants with 4,346 jobs (1.8%), Construction with 3,185 jobs (2.0%), Retail Trade with 2,322 jobs (0.9%), and Manufacturing with 1,567 jobs (1.5%).

6. Grand Junction will likely need additional well-located land for industrial and business park uses over the PEL Study 2018 to 2045 timeframe.

Based on forecasted employment growth, Grand Junction is estimated to need an additional 4.6 million square feet of office, industrial, and hotel/restaurant space by 2045, which is an average of 163,000 square feet per year. Additionally, the retail commercial analysis projects a need for additional 2.7 million square feet of space. The building size demand (square footage) is converted to land size demand (acres). For long range planning purposes, an additional 25 to 50 percent allowance should be made for economic development flexibility. Using the more conservative figure, the city would be short by approximately 800 acres.

- 7. The 29 Road interchange at I-70 would help address the shortfall of business park and industrial land by improving I-70 access and making the large area of vacant land surrounding the freeway viable. This undeveloped area is particularly suited to meet the economic demand because it is centrally and strategically located along I-70, providing an additional business employment node in the city.**

The Horizon Drive area has approximately 187 acres of remaining office or industrial land. The next logical location for business park development is the 29 Road interchange, which currently has 280 acres of additional land in the Horizon View and Matchett land holdings. There is also an economic development perspective for creating an additional business employment node in the city. The 29 Road interchange would open up about 230 acres on the north side of I-70 that is owned by one property owner and proposed as a master plan for a major business and commercial development that would provide an additional well-located site for economic development marketing and recruitment. The proposed Horizon View Business Park would be the largest planned business park in the city and would be capable of marketing larger sites for economic development recruitment purposes if the interchange is completed and the park developed as planned. The property would also be suitable for larger retail developments such as an outlet mall, entertainment center, or membership warehouse store serving a regional trade area and seeking an interstate accessible location.

2. Economic and Demographic Framework

Demographic Trends

Population and Households

Grand Junction and Mesa County are growing at a similar moderate pace. The City's population in 2018 was 63,879 and Mesa County was 156,429. Since 2000, the City has grown by 15,749 residents which equates to a 1.6 percent annual growth rate. The County grew by 40,174 residents over the same time period which equates to a 1.7 percent annual growth rate. In percentage terms, Fruita is the fastest growing part of the County with a 3.8 percent annual growth rate which equals an average growth of 364 persons per year, as shown in **Table 1**.

Table 1. Population and Households, 2000-2018

| Description | 2000 | 2010 | 2018 | 2000-2018 | | |
|----------------------------|---------|---------|---------|-----------|--------|--------|
| | | | | Total | Ann. # | Ann. % |
| Population | | | | | | |
| Grand Junction | 48,130 | 59,320 | 63,879 | 15,749 | 875 | 1.6% |
| Fruita | 6,781 | 12,587 | 13,329 | 6,548 | 364 | 3.8% |
| Palisade | 2,627 | 2,694 | 2,902 | 275 | 15 | 0.6% |
| Mesa County | 116,255 | 146,723 | 156,429 | 40,174 | 2,232 | 1.7% |
| Households | | | | | | |
| Grand Junction | 20,128 | 24,612 | 26,147 | 6,019 | 334 | 1.5% |
| Fruita | 2,576 | 4,702 | 4,903 | 2,327 | 129 | 3.6% |
| Palisade | 1,062 | 1,185 | 1,272 | 210 | 12 | 1.0% |
| Mesa County | 45,823 | 58,095 | 61,337 | 15,514 | 862 | 1.6% |
| Avg. Household Size | | | | | | |
| Grand Junction | 2.23 | 2.29 | 2.31 | 0.08 | 0.00 | 0.2% |
| Fruita | 2.55 | 2.63 | 2.67 | 0.12 | 0.01 | 0.3% |
| Palisade | 2.35 | 2.21 | 2.22 | -0.13 | -0.01 | -0.3% |
| Mesa County | 2.47 | 2.46 | 2.48 | 0.01 | 0.00 | 0.0% |

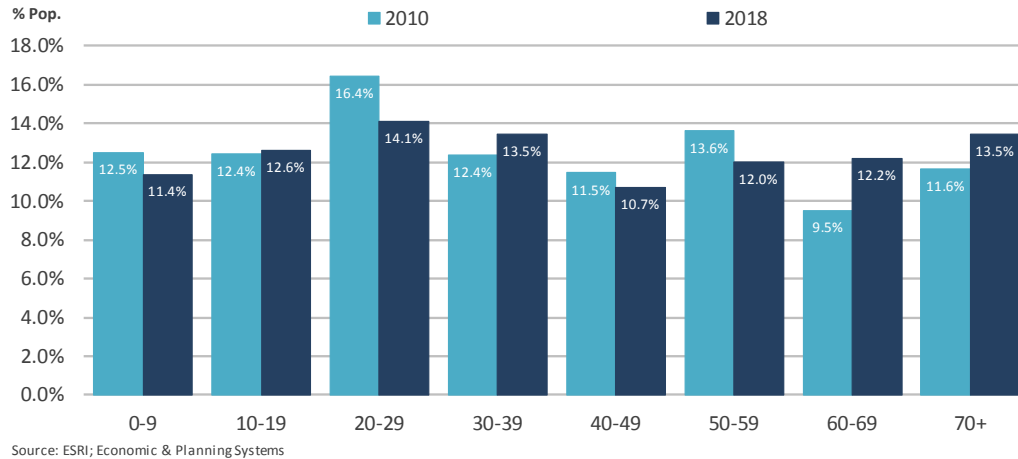
Source: ESRI; Economic & Planning Systems

Household growth is the driver for residential housing demand. Over the 2000 to 2018 time period Grand Junction grew by an average of 334 units per year which is 39 percent of Mesa County's average growth of 862 units per year.

Population Characteristics

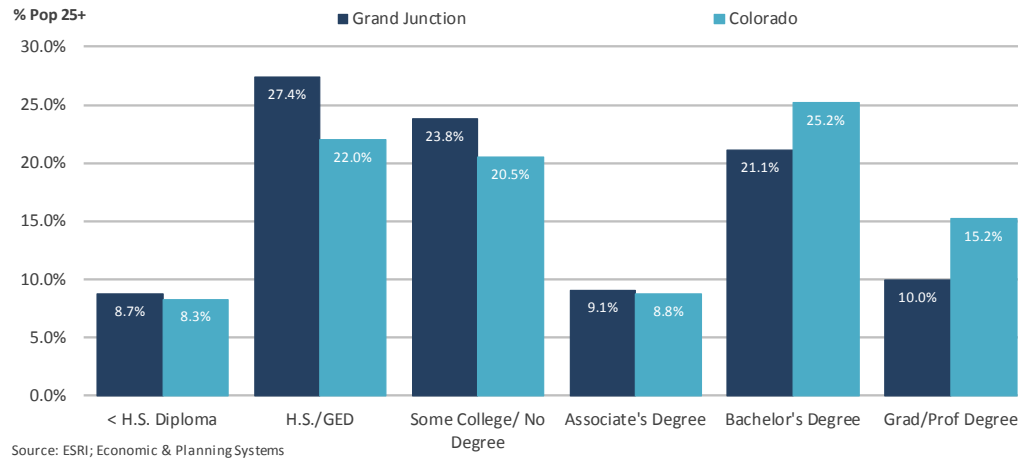
The median age of the City’s population is 39 years old compared to 37 years old for the state as a whole. This is largely influenced by a growth in retirees (60 years plus) as well as out migration of millennials (20 to 29 years old), as shown in **Figure 1**.

Figure 1. Grand Junction Age Distribution Trend, 2010-2018



Grand Junction’s educational profile is comparable to the state as a whole, as shown in **Figure 2**. There are moderately fewer residents with a college bachelor’s degree or greater at 31 percent compared to 40 percent in Colorado.

Figure 2. Educational Attainment, 2018



Per capita income in 2018 was \$31,578 and average household income was \$73,124. This is 12 percent and 20 percent, respectively, below the state average. Income levels with the City and County are increasing, but like most regions, are not keeping up with inflation. The average household income of

\$73,124 is up by nearly \$9,000 in nominal dollars since 2010. However, the annual growth rate is 1.7 percent—well below average inflation of 2.5 percent. County incomes are growing slightly faster having increased by \$10,742 to reach a current level of \$77,865 as shown in **Table 2**.

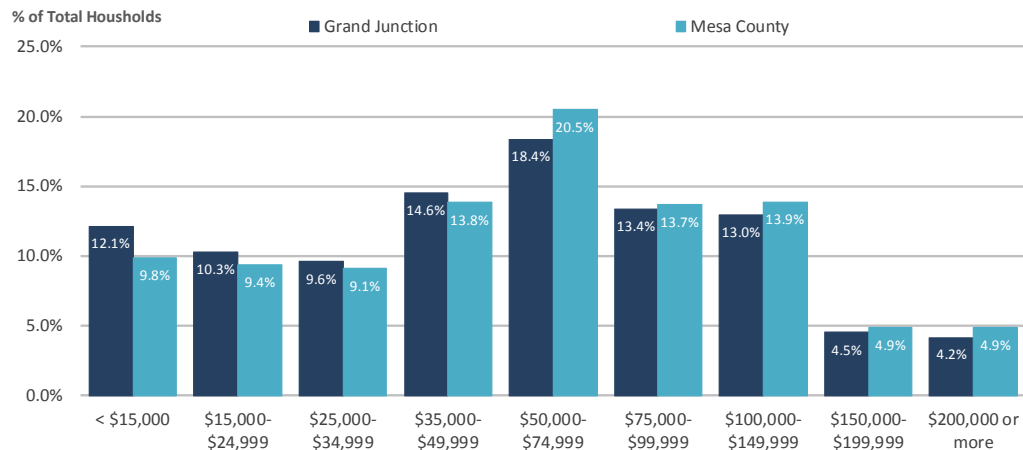
Table 2. Household Income and Per Capita Income, 2010-2018

| Description | 2010 | 2018 | 2010-2018 | |
|--------------------------|----------|----------|-----------|--------|
| | | | Total | Ann. % |
| Avg. HH Income | | | | |
| Grand Junction | \$64,139 | \$73,124 | \$8,985 | 1.7% |
| Fruita | \$68,849 | \$79,190 | \$10,341 | 1.8% |
| Palisade | \$67,982 | \$66,666 | -\$1,316 | -0.2% |
| Mesa County | \$67,123 | \$77,865 | \$10,742 | 1.9% |
| Median HH Income | | | | |
| Grand Junction | \$48,417 | \$53,312 | \$4,895 | 1.2% |
| Fruita | \$60,000 | \$63,819 | \$3,819 | 0.8% |
| Palisade | \$46,667 | \$49,008 | \$2,341 | 0.6% |
| Mesa County | \$52,067 | \$57,191 | \$5,124 | 1.2% |
| Per Capita Income | | | | |
| Grand Junction | \$27,500 | \$31,568 | \$4,068 | 1.7% |
| Fruita | \$26,277 | \$29,776 | \$3,499 | 1.6% |
| Palisade | \$30,835 | \$30,456 | -\$379 | -0.2% |
| Mesa County | \$27,067 | \$31,384 | \$4,317 | 1.9% |

Source: ESRI; Economic & Planning Systems

The Grand Junction and Mesa County Region is solidly middle class with relatively low poverty levels and relatively few high-income households. The majority of households have incomes between \$50,000 and \$150,000 in both jurisdictions as shown in **Figure 3**.

Figure 3. Household Income Distribution, 2018



Source: ESRI; Economic & Planning Systems

Housing Trends

As would be expected, housing unit growth closely parallels household growth, but is slightly higher due to the inclusion of vacant units. Two trends stand out in the data. The first is that the slower growth in income has resulted in rise of rental housing and declining levels of homeownership. The second trend is that housing growth has been distinctively slower post-recession than it was previously, as shown in **Table 3**.

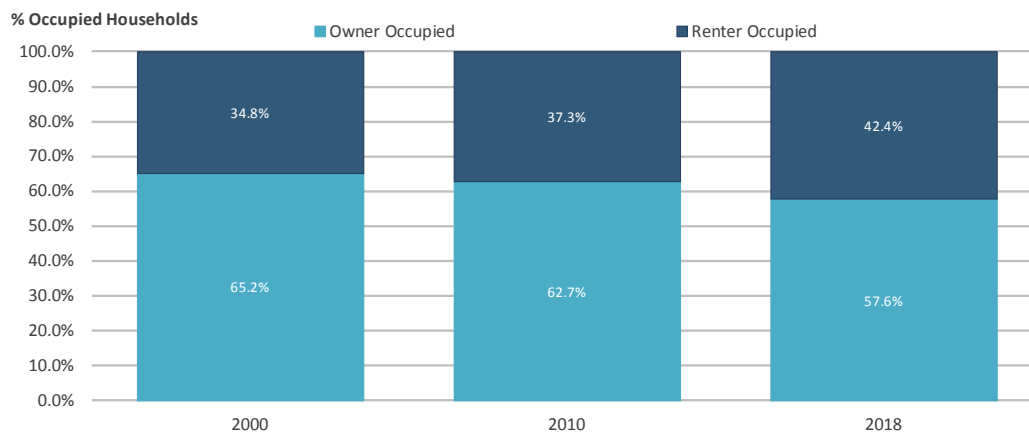
Table 3. Housing Occupancy, 2000-2018

| Description | 2000 | 2010 | 2018 | 2000-2010 | | | 2010-2018 | | |
|-----------------------|---------------|---------------|---------------|---------------|--------------|-------------|--------------|------------|--------------|
| | | | | Total | Ann. # | Ann. % | Total | Ann. # | Ann. % |
| Grand Junction | | | | | | | | | |
| Owner Occupied | 13,133 | 15,442 | 15,069 | 2,309 | 231 | 1.6% | -373 | -47 | -0.3% |
| Renter Occupied | 6,995 | 9,170 | 11,078 | 2,175 | 218 | 2.7% | 1,908 | 239 | 2.4% |
| Vacant | <u>1,005</u> | <u>1,864</u> | <u>1,843</u> | <u>859</u> | <u>86</u> | <u>6.4%</u> | <u>-21</u> | <u>-3</u> | <u>-0.1%</u> |
| Total | 21,133 | 26,476 | 27,990 | 5,343 | 534 | 2.3% | 1,514 | 189 | 0.7% |
| Mesa County | | | | | | | | | |
| Owner Occupied | 33,313 | 41,506 | 40,529 | 8,193 | 819 | 2.2% | -977 | -122 | -0.3% |
| Renter Occupied | 12,510 | 16,589 | 20,808 | 4,079 | 408 | 2.9% | 4,219 | 527 | 2.9% |
| Vacant | <u>2,604</u> | <u>4,549</u> | <u>4,273</u> | <u>1,945</u> | <u>195</u> | <u>5.7%</u> | <u>-276</u> | <u>-35</u> | <u>-0.8%</u> |
| Total | 48,427 | 62,644 | 65,610 | 14,217 | 1,422 | 2.6% | 2,966 | 371 | 0.6% |

Source: ESRI; Economic & Planning Systems

Housing units in Grand Junction grew at an annual pace of 534 units from 2000 to 2010 but declined to 189 units per year from 2010 to 2018. Similarly, Mesa County grew by 1,422 units a year prior to 2010 and by just 371 units per year thereafter. The number of owner-occupied units has actually declined in both jurisdictions over the last eight years. Renter occupied housing in Grand Junction has increased to 42.4 percent of the total housing inventory as shown in **Figure 4**.

Figure 4. Housing Tenure Grand Junction, 2000-2018



Source: Economic & Planning Systems

Housing construction has been increasing and is close to pre-recession levels over the last two years at over 500 units per year on average, as shown in **Table 4**. Recent construction has been predominately single family units at an average of 82 percent of the total for 2011 through 2018.

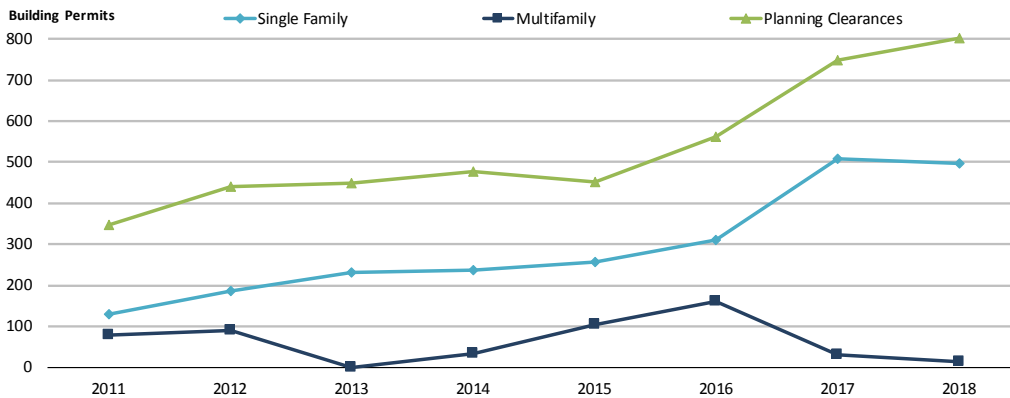
Table 4. Grand Junction Building Permits, 2011-2018

| Building Permits | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2011-2018 | | |
|------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|--------------|---------------|
| | | | | | | | | | Avg. | Total | % Total |
| Single Family | 129 | 187 | 231 | 237 | 257 | 309 | 508 | 498 | 295 | 2,356 | 82.1% |
| Multifamily | <u>80</u> | <u>90</u> | <u>1</u> | <u>33</u> | <u>104</u> | <u>162</u> | <u>31</u> | <u>13</u> | <u>64</u> | <u>514</u> | <u>17.9%</u> |
| Total | 209 | 277 | 232 | 270 | 361 | 471 | 539 | 511 | 359 | 2,870 | 100.0% |

Source: City of Grand Junction; Economic & Planning Systems

According to the City’s planning department, “Planning Clearances” for new development proposals has been accelerating since 2015 which should indicate continued housing construction momentum, as shown above in **Figure 5**.

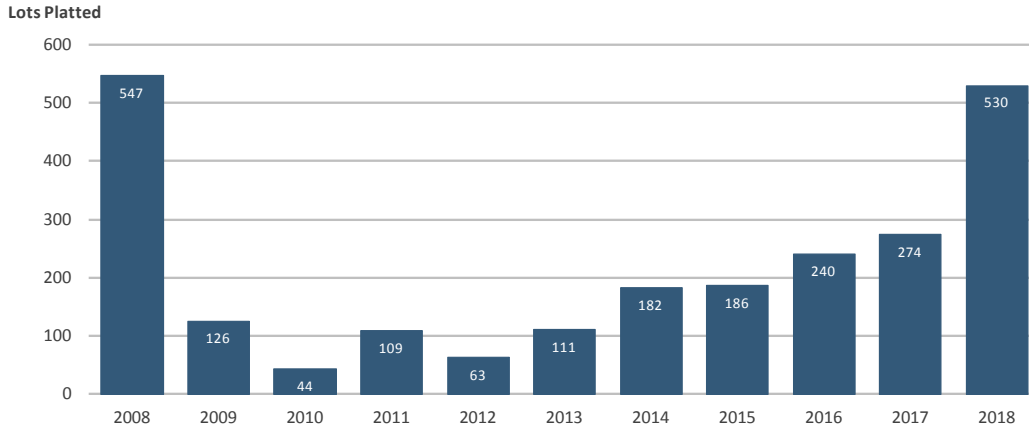
Figure 5. Grand Junction Building Permits, 2011-2018



Source: City of Grand Junction; Economic & Planning Systems

From 2017 to 2018, the number of lots platted nearly doubled from 274 to 530 plats annually, as shown in **Figure 6**. As of 2018, the number of plats is back to pre-recession levels of 2008 with about 500 plats per year. From 2009 to 2017, the amount of lots platted per year decreased significantly, dropping as low as 44 plats in 2010.

Figure 6. Grand Junction Lots Platted, 2008-2018



Source: City of Grand Junction; Economic & Planning Systems

Population Forecasts

Mesa County and Grand Junction are forecast to continue to grow at a moderate 1.4 percent annual rate over the next 27 years, as shown in **Table 5**. This equals an average growth of 1,068 persons per year in the city. The population forecasts for Mesa County are from Colorado State Demographer’s Office of the Department of Labor Affairs (DOLA). The estimates were produced in 2017 based on survival rates, fertility rates of females 15 to 49 years old, and net migration. This information is not available at the city level. Therefore, an average rate as a proportion of Mesa County is applied to determine Grand Junction’s share of the growth. The average percentage of 41.2 percent is determined based on the actual proportion of the county in 2000, 2010, and 2018 of 41.4, 40.4, and 41.7 percent, respectively. This assumes Grand Junction will continue to grow at the same proportion of Mesa County in future years. Assuming the current average household size of 2.31 and a 7 percent vacancy rate, there is an estimated demand for 643 units per year in Grand Junction, as shown in **Table 5**.

Table 5. Population Forecasts, 2025-2045

| Description | Factor | 2000 | 2010 | 2018 | 2025 | 2035 | 2045 | 2018-2045 | | |
|-----------------------|---------------------|---------|---------|---------|---------|---------|---------|-----------|--------|--------|
| | | | | | | | | Total | Ann. # | Ann. % |
| Population | | | | | | | | | | |
| Mesa County | | 116,255 | 146,723 | 153,328 | 165,166 | 194,972 | 225,256 | 71,928 | 2,664 | 1.4% |
| Grand Junction | | 48,130 | 59,320 | 63,879 | 67,989 | 80,258 | 92,724 | 28,845 | 1,068 | 1.4% |
| as a % of Mesa | | 41.4% | 40.4% | 41.7% | 41.2% | 41.2% | 41.2% | | | |
| Group Quarters | | | | | | | | | | |
| Grand Junction | | 2,180 | 2,892 | 3,435 | 3,350 | 3,955 | 4,569 | 1,219 | 61 | 1.6% |
| % of Total Pop. | | 4.5% | 4.9% | 5.4% | 4.9% | 4.9% | 4.9% | | | |
| Households | | | | | | | | | | |
| | <i>Avg. HH Size</i> | | | | | | | | | |
| Grand Junction | 2.31 | 20,128 | 24,612 | 26,147 | 27,982 | 33,032 | 38,163 | 12,016 | 445 | 1.4% |
| Housing Demand | | | | | | | | | | |
| | <i>Vacancy</i> | | | | | | | | | |
| Grand Junction | 7.0% | | | | 1,964 | 5,403 | 5,490 | 12,857 | 643 | 5.3% |

Source: DOLA; ESRI; Economic & Planning Systems

Employment Trends

Employment by Industry

DOLA also tracks employment based on Bureau of Labor Statistics (BLS) data on wage and salary employment supplemented with estimates of sole proprietors from other data sources. In 2017, total employment in Mesa County reached 61,136 jobs up from 49,948 in 2000 which is an average increase of 658 jobs per year or 1.2 percent over the 18-year time period as shown in **Table 6**.

Table 6. Mesa County Employment by Industry, 2000-2017

| Description | 2000 | 2010 | 2017 | 2000-2017 | | |
|-----------------------|---------------|---------------|---------------|---------------|------------|-------------|
| | | | | Total | Ann. # | Ann. % |
| Ag./Forest/Hunting | 475 | 372 | 382 | -93 | -5 | -1.3% |
| Mining | 317 | 2,762 | 2,314 | 1,997 | 117 | 12.4% |
| Utilities | 355 | 375 | 346 | -9 | -1 | -0.2% |
| Construction | 4,031 | 3,763 | 4,298 | 267 | 16 | 0.4% |
| Manufacturing | 3,976 | 2,547 | 3,029 | -947 | -56 | -1.6% |
| Wholesale Trade | 1,958 | 2,245 | 2,384 | 426 | 25 | 1.2% |
| Retail Trade | 7,243 | 7,764 | 8,142 | 899 | 53 | 0.7% |
| Transport/Warehousing | 2,141 | 2,486 | 2,451 | 310 | 18 | 0.8% |
| Information | 1,014 | 956 | 754 | -260 | -15 | -1.7% |
| Finance | 1,718 | 1,910 | 2,016 | 298 | 18 | 0.9% |
| Real Estate | 957 | 1,016 | 1,028 | 71 | 4 | 0.4% |
| Prof. & Tech Services | 1,599 | 2,260 | 2,125 | 526 | 31 | 1.7% |
| Mgmt | 209 | 153 | 155 | -54 | -3 | -1.7% |
| Admin/Waste Mgmt | 3,252 | 2,934 | 3,021 | -231 | -14 | -0.4% |
| Education | 3,603 | 4,435 | 4,682 | 1,079 | 63 | 1.6% |
| Health Care | 7,478 | 9,504 | 11,238 | 3,760 | 221 | 2.4% |
| Arts/Rec | 629 | 954 | 990 | 361 | 21 | 2.7% |
| Hotel/Restaurants | 4,947 | 5,879 | 6,707 | 1,760 | 104 | 1.8% |
| Other | 1,483 | 1,678 | 1,805 | 322 | 19 | 1.2% |
| Public Admin | <u>2,563</u> | <u>3,339</u> | <u>3,269</u> | <u>706</u> | <u>42</u> | <u>1.4%</u> |
| Total | 49,948 | 57,332 | 61,136 | 11,188 | 658 | 1.2% |

Source: QCEW; Economic & Planning Systems

U.S. Census LEHD data shows total employment in Grand Junction accounts for 80 percent of the countywide totals, as shown in **Figure 7**. There are job classification differences from the two data sources, so the employment figures by sector are not fully comparable.

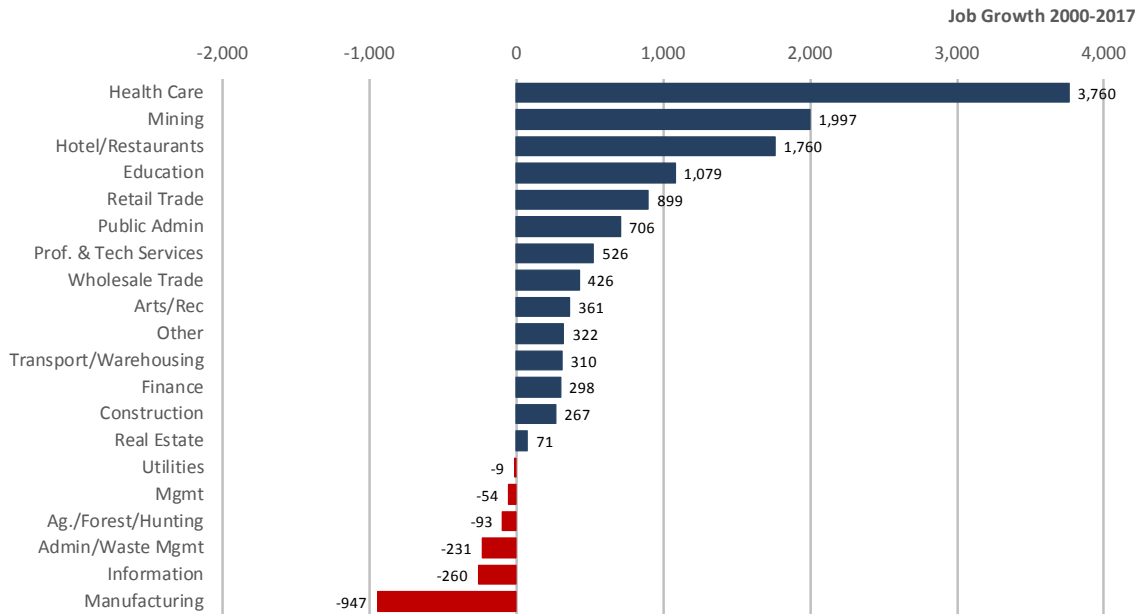
Figure 7. Grand Junction Employment by Industry, 2002-2015

| Description | 2002 | 2010 | 2015 | 2002-2015 | | |
|-----------------------|---------------|---------------|---------------|--------------|------------|-------------|
| | | | | Total | Ann. # | Ann. % |
| Ag./Forest/Hunting | 66 | 22 | 118 | 52 | 4 | 4.6% |
| Mining | 191 | 1,552 | 1,669 | 1,478 | 114 | 18.1% |
| Utilities | 262 | 252 | 280 | 18 | 1 | 0.5% |
| Construction | 2,442 | 2,226 | 2,421 | -21 | -2 | -0.1% |
| Manufacturing | 2,661 | 1,977 | 2,259 | -402 | -31 | -1.3% |
| Wholesale Trade | 1,495 | 1,761 | 1,868 | 373 | 29 | 1.7% |
| Retail Trade | 6,712 | 8,070 | 6,468 | -244 | -19 | -0.3% |
| Transport/Warehousing | 1,501 | 2,015 | 1,781 | 280 | 22 | 1.3% |
| Information | 1,041 | 1,031 | 716 | -325 | -25 | -2.8% |
| Finance | 1,842 | 2,088 | 1,816 | -26 | -2 | -0.1% |
| Real Estate | 770 | 896 | 809 | 39 | 3 | 0.4% |
| Prof. & Tech Services | 1,442 | 2,060 | 1,877 | 435 | 33 | 2.0% |
| Mgmt | 131 | 247 | 133 | 2 | 0 | 0.1% |
| Admin/Waste Mgmt | 2,691 | 2,341 | 2,297 | -394 | -30 | -1.2% |
| Education | 3,941 | 1,221 | 1,620 | -2,321 | -179 | -6.6% |
| Health Care | 6,630 | 8,273 | 9,281 | 2,651 | 204 | 2.6% |
| Arts/Rec | 584 | 609 | 617 | 33 | 3 | 0.4% |
| Hotel/Restaurants | 3,852 | 5,098 | 5,237 | 1,385 | 107 | 2.4% |
| Other | 1,240 | 1,359 | 1,317 | 77 | 6 | 0.5% |
| Public Admin | <u>2,000</u> | <u>2,925</u> | <u>2,586</u> | <u>586</u> | <u>45</u> | <u>2.0%</u> |
| Total | 41,494 | 46,023 | 45,170 | 3,676 | 283 | 0.7% |

Source: LEHD; Economic & Planning Systems

The fastest growth sectors in Mesa County over the past two decades have been Health Care and Mining followed by Hotel/Restaurants and Education. The greatest job losses have been in the Manufacturing sector as shown in **Figure 8**.

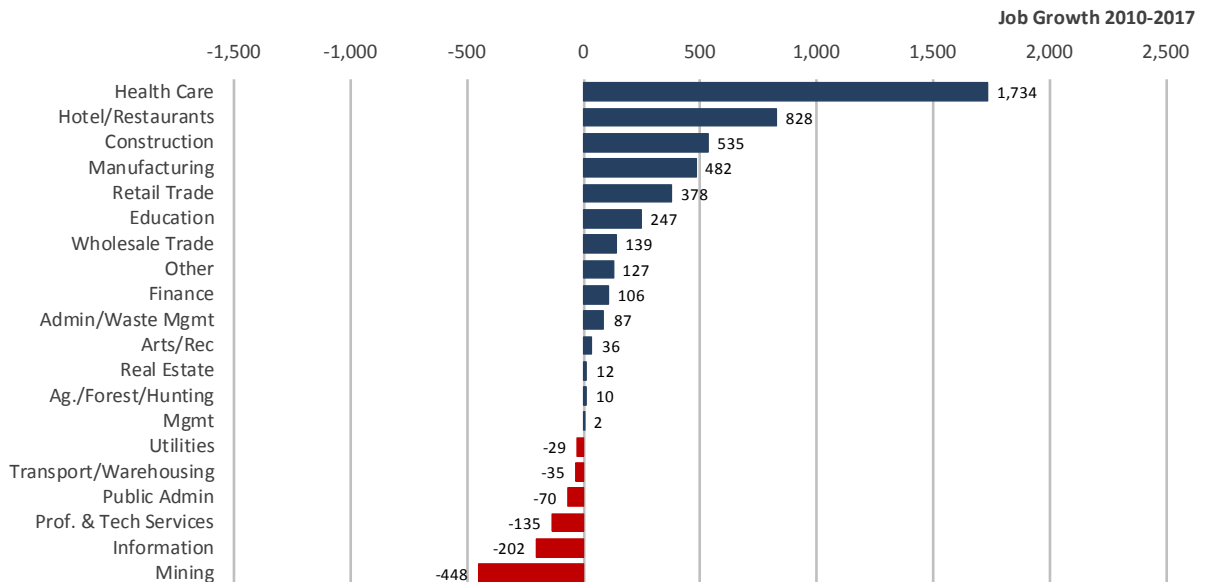
Figure 8. Mesa County Job Growth by Industry, 2000-2017



Source: QCEW; Economic & Planning Systems

There have been some shifts since 2010. Although Mining was the second fastest growing sector from 2000 to 2017, all that growth was prior to 2010. Since 2010 Mining (principally oil and gas) has lost 448 jobs. Construction, which lost 268 jobs prior to 2010, has added 535 jobs since, as shown in **Figure 9**. Manufacturing, which lost nearly 1,500 jobs from 2000 to 2010, has gained back almost 500 jobs in the last seven years.

Figure 9. Mesa County Job Growth by Industry, 2010-2017



Source: QCEW; Economic & Planning Systems

Largest Employers

Nine of the top 10 employers in Mesa County are public institutions, as shown in **Table 7**. The largest employer is Mesa County Valley School District 51 with over 2,700 employees. St. Mary's Hospital is the second largest employer with 2,300 employees followed by Mesa County with 1,025 employees. The majority of the major employers are in the Health Care industry, which corresponds to Health Care being the largest industry in the County with over 11,000 employees total.

Table 7. Mesa County Largest Employers, 2018

| # | Employer | Industry | Employees |
|----|---------------------------------------|------------------------|-----------|
| 1 | Mesa County Valley School District 51 | Education | 2,715 |
| 2 | St. Mary's Hospital | Health Care | 2,300 |
| 3 | Mesa County | Public Admin | 1,025 |
| 4 | State of Colorado | Public Admin | 1,012 |
| 5 | Colorado Mesa University | Education | 1,006 |
| 6 | Community Hospital | Health Care | 800 |
| 7 | VA Medical Center - Grand Junction | Health Care | 720 |
| 8 | Star Tek Inc. | Prof. & Tech Services | 700 |
| 9 | City of Grand Junction | Public Admin | 629 |
| 10 | Hilltop Community Resources | Health Care | 600 |
| 11 | West Star Aviation | Prof. & Tech Services | 413 |
| 12 | Rocky Mountain Health Plans | Health Care | 370 |
| 13 | HopeWest | Health Care | 350 |
| 14 | STRiVE | Health Care | 350 |
| 15 | Primary Care Partners | Health Care | 304 |
| 16 | Mind Springs Health | Health Care | 272 |
| 17 | Capco Inc. | Manufacturing | 254 |
| 18 | United Companies | Manufacturing | 232 |
| 19 | Navarro | Prof. & Tech Services | 186 |
| 20 | Coors Tek Inc. | Manufacturing | 150 |
| 21 | The Daily Sentinel | Information | 146 |
| 22 | Union Pacific Railroad | Transport./Warehousing | 136 |
| 23 | Reynolds Polymer Technology | Manufacturing | 130 |
| 24 | Mantey Heights Rehab & Care | Health Care | 130 |

Excludes Hotel/Restaurant related businesses

Source: Grand Junction Economic Partnership; Economic & Planning Systems

Employment Forecasts

Employment forecasts for 2027 are compiled by Colorado Department of Labor and Employment using Quarterly Census of Employment and Wages (QCEW) data from the Bureau of Labor Statistics (BLS) in the U.S. Department of Labor. The employment data is only available at the Mesa County level and uses the 6-digit NAICs industry categories. BLS provides 10 year industry and employment projections for 2017 to 2027, which EPS used as a basis in determining estimated employment by industry for 2027. The employment projections for 2027 to 2045 were calculated based on the annual percentage growth of 1.4 percent from 2017 to 2027. This assumes that each industry will continue to grow at the estimated average growth rate.

By 2027, Mesa County employment is projected to add an average of 894 jobs per year to reach 70,078 jobs total. By 2045, Mesa County employment is projected to reach 90,632 jobs which is an average annual gain of 1,142 jobs. Health Care continues to be the top industry looking forward with annual growth of 2.4 percent.

Table 8. Mesa County Employment Forecasts, 2021-2045

| Description | 2000 | 2010 | 2017 | 2000-2017 | | | 2027 | 2017-2027 | | | 2045 | 2027-2045 | | | 2017-2045 | | |
|---|---------------|---------------|---------------|---------------|------------|-------------|---------------|--------------|------------|-------------|---------------|---------------|--------------|-------------|---------------|--------------|-------------|
| | | | | Total | Ann. # | Ann. % | | Total | Ann. # | Ann. % | | Total | Ann. # | Ann. % | Total | Ann. # | Ann. % |
| Ag./Forest/Hunting ^[1] | 475 | 372 | 382 | -93 | -5 | -1.3% | 382 | 0 | 0 | 0.0% | 382 | 0 | 0 | 0.0% | 0 | 0 | 0.0% |
| Mining ^[1] | 317 | 2,762 | 2,314 | 1,997 | 117 | 12.4% | 2,314 | 0 | 0 | 0.0% | 2,314 | 0 | 0 | 0.0% | 0 | 0 | 0.0% |
| Utilities | 355 | 375 | 346 | -9 | -1 | -0.2% | 364 | 18 | 2 | 0.5% | 398 | 34 | 2 | 0.5% | 52 | 2 | 0.5% |
| Construction | 4,031 | 3,763 | 4,298 | 267 | 16 | 0.4% | 5,239 | 941 | 94 | 2.0% | 7,483 | 2,244 | 125 | 2.0% | 3,185 | 114 | 2.0% |
| Manufacturing | 3,976 | 2,547 | 3,029 | -947 | -56 | -1.6% | 3,515 | 486 | 49 | 1.5% | 4,596 | 1,080 | 60 | 1.5% | 1,567 | 56 | 1.5% |
| Wholesale Trade | 1,958 | 2,245 | 2,384 | 426 | 25 | 1.2% | 2,633 | 249 | 25 | 1.0% | 3,150 | 517 | 29 | 1.0% | 766 | 27 | 1.0% |
| Retail Trade | 7,243 | 7,764 | 8,142 | 899 | 53 | 0.7% | 8,905 | 763 | 76 | 0.9% | 10,464 | 1,558 | 87 | 0.9% | 2,322 | 83 | 0.9% |
| Transport/Warehousing | 2,141 | 2,486 | 2,451 | 310 | 18 | 0.8% | 2,681 | 230 | 23 | 0.9% | 3,150 | 469 | 26 | 0.9% | 699 | 25 | 0.9% |
| Information | 1,014 | 956 | 754 | -260 | -15 | -1.7% | 793 | 39 | 4 | 0.5% | 867 | 74 | 4 | 0.5% | 113 | 4 | 0.5% |
| Finance | 1,718 | 1,910 | 2,016 | 298 | 18 | 0.9% | 2,227 | 211 | 21 | 1.0% | 2,664 | 437 | 24 | 1.0% | 648 | 23 | 1.0% |
| Real Estate | 957 | 1,016 | 1,028 | 71 | 4 | 0.4% | 1,113 | 85 | 9 | 0.8% | 1,285 | 172 | 10 | 0.8% | 257 | 9 | 0.8% |
| Prof. & Tech Services/Mgmt ^[1] | 1,808 | 2,413 | 2,280 | 472 | 28 | 1.4% | 2,569 | 289 | 29 | 1.2% | 3,184 | 615 | 34 | 1.2% | 904 | 32 | 1.2% |
| Admin/Waste Mgmt | 3,252 | 2,934 | 3,021 | -231 | -14 | -0.4% | 3,175 | 154 | 15 | 0.5% | 3,474 | 298 | 17 | 0.5% | 453 | 16 | 0.5% |
| Education | 3,603 | 4,435 | 4,682 | 1,079 | 63 | 1.6% | 5,172 | 490 | 49 | 1.0% | 6,186 | 1,014 | 56 | 1.0% | 1,504 | 54 | 1.0% |
| Health Care | 7,478 | 9,504 | 11,238 | 3,760 | 221 | 2.4% | 14,246 | 3,008 | 301 | 2.4% | 21,832 | 7,586 | 421 | 2.4% | 10,594 | 378 | 2.4% |
| Arts/Rec | 629 | 954 | 990 | 361 | 21 | 2.7% | 1,183 | 193 | 19 | 1.8% | 1,631 | 448 | 25 | 1.8% | 641 | 23 | 1.8% |
| Hotel/Restaurants | 4,947 | 5,879 | 6,707 | 1,760 | 104 | 1.8% | 8,017 | 1,310 | 131 | 1.8% | 11,053 | 3,036 | 169 | 1.8% | 4,346 | 155 | 1.8% |
| Public Admin/Other ^[2] | <u>4,046</u> | <u>5,017</u> | <u>5,074</u> | <u>1,028</u> | <u>60</u> | <u>1.3%</u> | <u>5,550</u> | <u>476</u> | <u>48</u> | <u>0.9%</u> | <u>6,521</u> | <u>971</u> | <u>54</u> | <u>0.9%</u> | <u>1,447</u> | <u>52</u> | <u>0.9%</u> |
| Total | 49,948 | 57,332 | 61,136 | 11,188 | 658 | 1.2% | 70,078 | 8,942 | 894 | 1.4% | 90,632 | 20,554 | 1,142 | 1.4% | 29,496 | 1,053 | 1.4% |

^[1]Suppressed Data for 2027^[2]EPS Estimated

Source: QCEW; Economic & Planning Systems

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3. Business and Industrial Development

The City of Grand Junction is the largest metropolitan area between Denver, Colorado and Salt Lake City, Utah. Situated along Interstate 70 and U.S. Highway 50, the location offers easy connections to the surrounding region. Additional accessibility is available through the Grand Junction Regional Airport, Union Pacific Railroad, and Amtrak. The location and lower cost of doing business than in the Denver Metro area is making Grand Junction more attractive for business attraction.

Office Development Trends

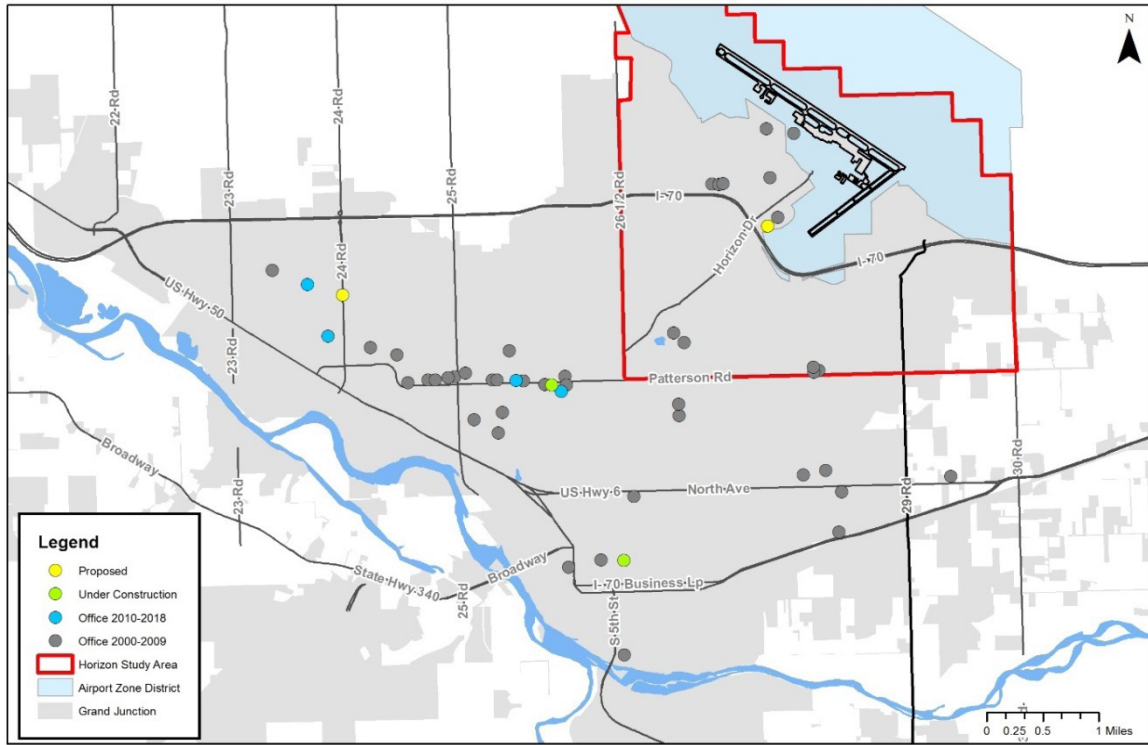
About 96 percent of Mesa County’s office development is located in Grand Junction. Since 2010 Grand Junction has gained 87,000 square feet of office space and currently has an inventory of over 3 million square feet as tracked by CoStar, as shown in **Table 9**. There is a cluster of this older office space along Patterson Road leading to the Mesa Mall consisting of older strip centers and multitenant buildings, as shown in **Figure 10**. There have been only a few new office developments since 2010, the newest being the Grand Junction Medical Center in 2013.

Table 9. Office Inventory Trend, 2010-2018

| Inventory (Sq. Ft.) | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2010-2018 | | |
|---------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|--------|--------|
| | | | | | | | | | | Total | Ann. # | Ann. % |
| Grand Junction | 2,955,855 | 2,955,855 | 2,983,426 | 3,066,012 | 3,066,012 | 3,058,812 | 3,058,812 | 3,058,812 | 3,042,983 | 87,128 | 10,891 | 0.4% |
| Mesa County | 3,082,401 | 3,082,401 | 3,109,972 | 3,192,558 | 3,192,558 | 3,185,358 | 3,185,358 | 3,185,358 | 3,169,529 | 87,128 | 10,891 | 0.3% |

Source: CoStar; Economic & Planning Systems

Figure 10. Grand Junction Office Development, 2000-2018



Lease and Vacancy Rates

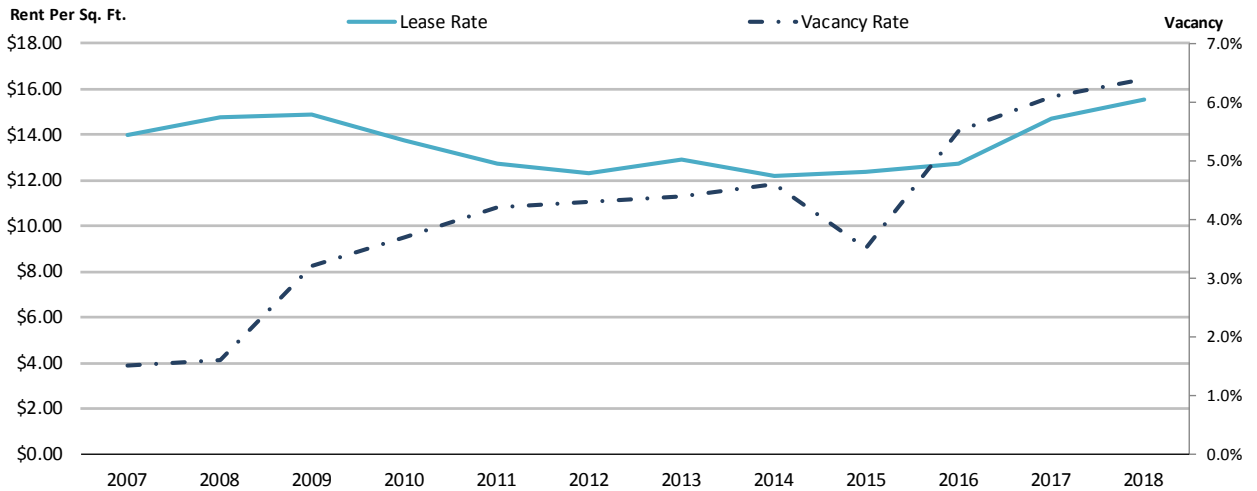
Office lease rates in Grand Junction have increased at a rate of 1.5 percent since 2010 to reach an average of \$15.52 per square foot in 2018, as shown in **Table 10**. The average office vacancy rate in Grand Junction is the highest it has been in the past 10 years at 6.4 percent, as shown in **Figure 11**.

Table 10. Grand Junction Office Avg. Lease and Vacancy Rates, 2010-2018

| Description | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2010-2018 | | |
|--------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|-----------|--------|--------|
| | | | | | | | | | | Total | Ann. # | Ann. % |
| Lease Rate | \$13.75 | \$12.74 | \$12.30 | \$12.91 | \$12.17 | \$12.35 | \$12.72 | \$14.73 | \$15.52 | \$1.77 | \$0.22 | 1.5% |
| Vacancy Rate | 3.7% | 4.2% | 4.3% | 4.4% | 4.6% | 3.5% | 5.5% | 6.1% | 6.4% | 2.7% | 0.3% | 7.1% |

Source: CoStar; Economic & Planning Systems

Figure 11. Grand Junction Office Avg. Lease and Rental Rates, 2007-2018



Source: CoStar; Economic & Planning Systems

Horizon Study Area Office Conditions

The Horizon Study Area is defined as extending from 26 ½ Road on the west to 30 Road on the east and north of Patterson Road. The Study Area has approximately 740,000 square feet of office space, as tracked by CoStar, most of which is clustered north of the Horizon Road and I-70 interchange and south of Grand Junction Regional Airport. Locations of office development are identified in **Figure 12** and the inventory is described in **Table 11**. Many of the buildings are multitenant and include medical offices, insurance agencies, law firms, and financial consultants. The most recent office building in the Horizon Study Area was built in 2008 as shown.

Figure 12. Horizon Study Area Office Development Locations

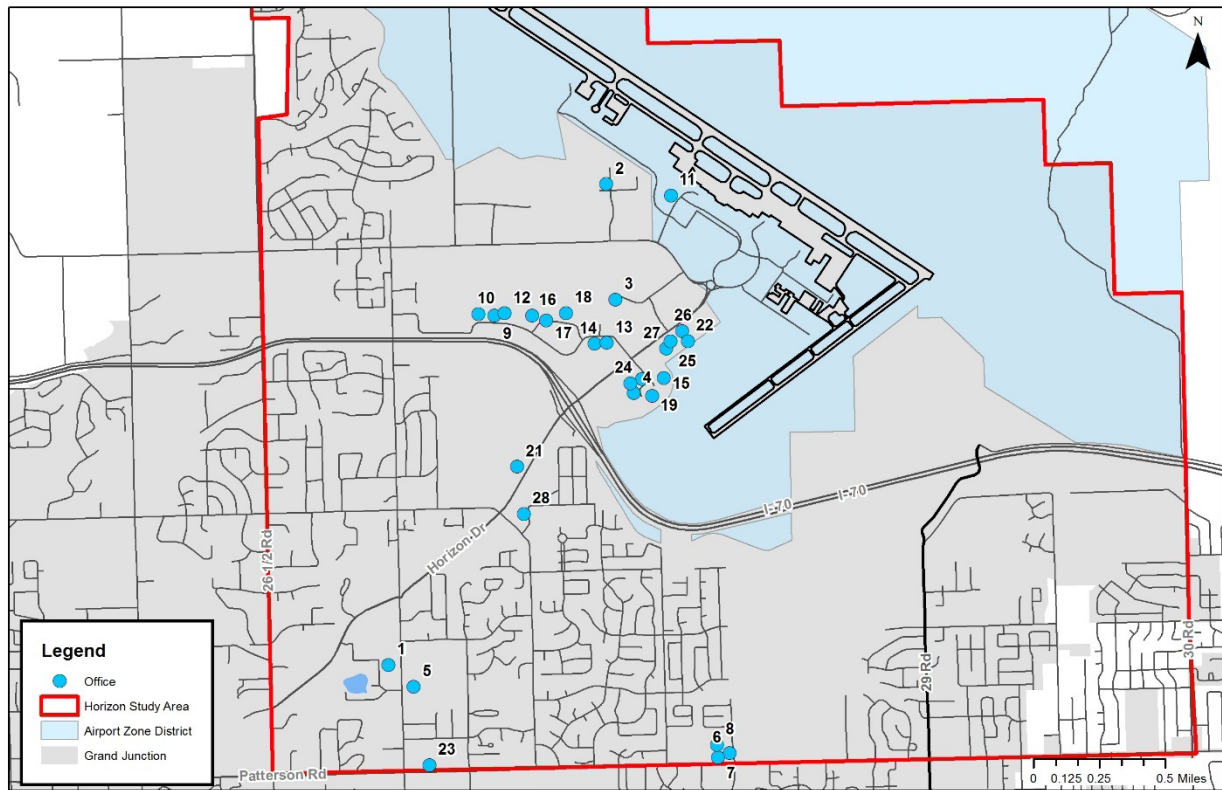


Table 11. Horizon Study Area Office Development Inventory

| ID | Description | Address | Class | Year | Sq. Ft. | Vacancy % | Example Tenants |
|----|--------------------------|----------------------|-------|------|----------------|-----------|--|
| 1 | Multi-tenant | 3154 Lakeside Dr | C | 2008 | 8,800 | 0.0% | Insurance agency |
| 2 | Social Security Office | 825 North Crest Dr | B | 2007 | 7,872 | 0.0% | Social security office |
| 3 | Office | 2788 Printers Ct | B | 2007 | 11,947 | 0.0% | N/A |
| 4 | Multi-tenant | 2793 Skyline Ct | B | 2006 | 10,000 | 0.0% | Business consultant |
| 5 | Multi-tenant | 3150 N 12th St | B | 2004 | 111,619 | 0.0% | Medical offices |
| 6 | Multi-tenant | 601 28 1/4 Rd | B | 2004 | 10,215 | 0.0% | Financial consultant, dentist |
| 7 | Multi-tenant | 603 28 1/4 Rd | B | 2003 | 9,797 | 0.0% | Pediatrics, real estate agent |
| 8 | Multi-tenant | 605 28 1/4 Rd | B | 2003 | 5,304 | 0.0% | Medical offices |
| 9 | Government | 2738 Crossroads Blvd | B | 2003 | 11,068 | 0.0% | Conservation Department |
| 10 | Government | 2734 Crossroads Blvd | B | 2002 | 9,793 | 0.0% | US Drug Enforcement Admin |
| 11 | Multi-tenant | 817 Falcon Way | B | 2002 | 15,318 | 0.0% | Aviation office, development office |
| 12 | Hub International | 2742 Crossroads Blvd | B | 2001 | 5,913 | 0.0% | Insurance agency |
| 13 | Office | 2779 Crossroads Blvd | B | 1990 | 6,384 | 0.0% | N/A |
| 14 | Multi-tenant | 2777 Crossroads Blvd | B | 1985 | 25,730 | 0.0% | Health care, U.S. Forest Service, USDA |
| 15 | Multi-tenant | 744 Horizon Ct | A | 1983 | 63,542 | 9.2% | Law firm, marketing consultants, health care |
| 16 | Multi-tenant | 2754 Compass Dr | B | 1982 | 72,000 | 0.0% | Farm service agency, tax prep |
| 17 | Office | 2738 Compass Dr | C | 1981 | 42,313 | 0.0% | N/A |
| 18 | Multi-tenant | 2764 Compass Dr | B | 1981 | 44,000 | 9.9% | Health care, real estate, attorney |
| 19 | Multi-tenant | 743 Horizon Ct | B | 1981 | 68,131 | 0.0% | Real estate appraisal, law office, engineering firm |
| 20 | Multi-tenant | 751 Horizon Ct | B | 1978 | 33,118 | 0.0% | Travel agency, insurance, medical offices |
| 21 | Multi-tenant | 715 Horizon Dr | B | 1978 | 34,044 | 5.6% | Collection agency, accounting, health care |
| 22 | US Fish & Wildlife Dept. | 764 Horizon Dr | C | 1977 | 26,000 | 0.0% | Grand Mesa National Forest, CO River fishery project |
| 23 | Multi-tenant | 2710 Patterson Rd | C | 1977 | 2,048 | 0.0% | Real estate, insurance agency |
| 24 | Farm Bureau | 2795 Skyline Ct | C | 1976 | 2,946 | 0.0% | Mesa County Farm Bureau |
| 25 | Multi-tenant | 762 Horizon Dr | B | 1972 | 4,000 | 0.0% | Funeral home, janitorial services |
| 26 | US Fish & Wildlife Dept. | 764 Horizon Dr | C | 1972 | 39,726 | 0.0% | Federal Bureau Investigation |
| 27 | Multi-tenant | 760 Horizon Dr | B | 1970 | 56,807 | 33.5% | Oil & gas offices, construction company |
| 28 | Office | 697 27 1/2 Rd | C | 1948 | <u>2,600</u> | 0.0% | N/A |
| | Total | | | | 741,035 | | |

Source: CoStar; Grand Junction Economic Partnership; Economic & Planning Systems

Industrial Development Trends

Industrial development in Mesa County is concentrated in Grand Junction with about 91 percent of the total inventory. Grand Junction has gained about 120,000 square feet of industrial space since 2010, resulting in an average of 15,000 square feet annually or an annual growth rate of 0.2 percent, shown in **Table 12**. As of 2018, the City has an inventory of about 6.3 million square feet, as tracked by CoStar.

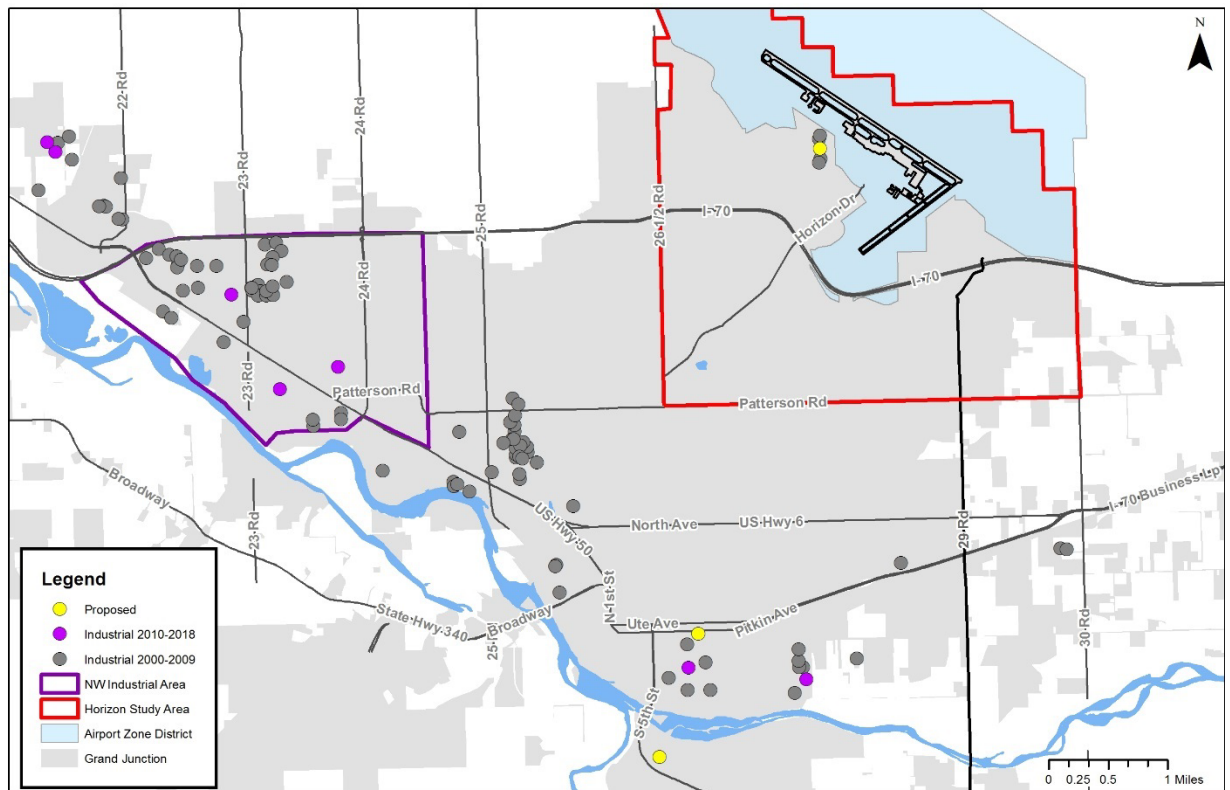
Table 12. Industrial Inventory Trend, 2010-2018

| Inventory (Sq. Ft.) | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2010-2018 | | |
|---------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|--------|--------|
| | | | | | | | | | | Total | Ann. # | Ann. % |
| Grand Junction | 6,165,016 | 6,247,798 | 6,247,798 | 6,247,798 | 6,304,195 | 6,320,645 | 6,284,645 | 6,284,645 | 6,284,645 | 119,629 | 14,954 | 0.2% |
| Mesa County | 6,780,508 | 6,863,290 | 6,863,290 | 6,863,290 | 6,919,687 | 6,936,137 | 6,900,137 | 6,900,137 | 6,900,137 | 119,629 | 14,954 | 0.2% |

Source: CoStar, Economic & Planning Systems

Grand Junction’s industrial development built since 2000 is shown in **Figure 13**. There is a large cluster in northwestern Grand Junction, near the intersection of Interstate 70 and U.S. Highway 50 and leading into Fruita. There is also a dense cluster near the intersection of 25 Road and Patterson Road. Overall, most of the industrial development was built between 2000 and 2009.

Figure 13. Grand Junction Industrial Development, 2000-2018



Lease and Vacancy Rates

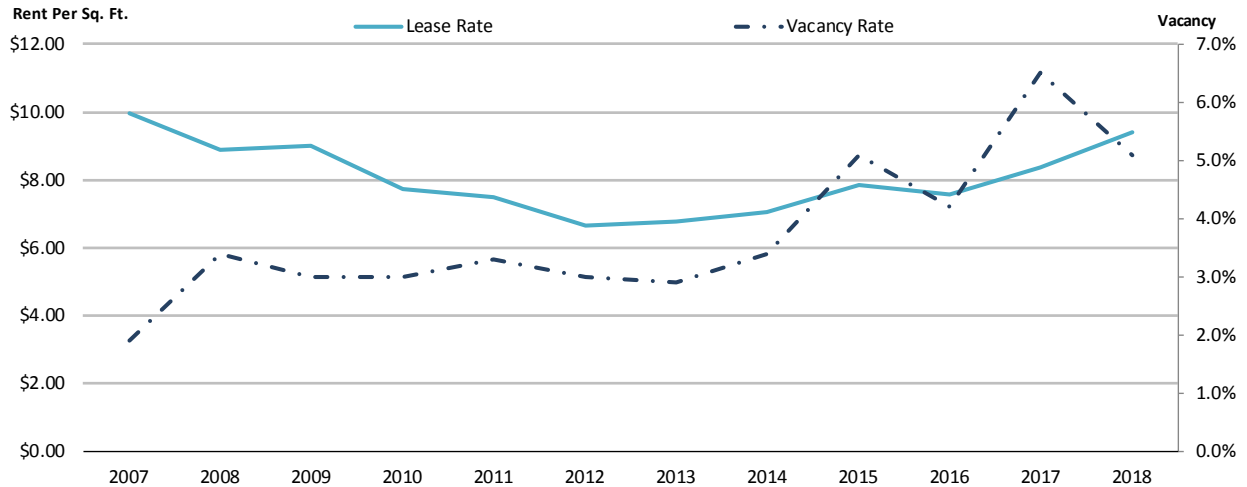
Grand Junction’s average industrial lease rate has grown at a rate of 2.5 percent annually to \$9.42 per square foot in 2018, shown in **Table 13**. Since 2010, this rate has increased by \$1.70 per square foot. Industrial rental rates dipped following the recession in 2007 and are almost back to \$10 per square foot, shown in **Figure 14**. In 2018, the average industrial vacancy rate was 5.1 percent, a decrease from 6.5 percent the year prior. Between 2010 and 2014 the vacancy rate was steady around 3 percent before increasing to 5 percent in 2015.

Table 13. Grand Junction Industrial Avg. Lease and Vacancy Rates, 2010-2018

| Description | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2010-2018 | | |
|--------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-----------|--------|--------|
| | | | | | | | | | | Total | Ann. # | Ann. % |
| Lease Rate | \$7.72 | \$7.51 | \$6.66 | \$6.77 | \$7.07 | \$7.86 | \$7.58 | \$8.35 | \$9.42 | \$1.70 | \$0.21 | 2.5% |
| Vacancy Rate | 3.0% | 3.3% | 3.0% | 2.9% | 3.4% | 5.1% | 4.2% | 6.5% | 5.1% | 2.1% | 0.3% | 6.9% |

Source: CoStar; Economic & Planning Systems

Figure 14. Grand Junction Industrial Avg. Lease and Vacancy Rates, 2007-2018



Source: CoStar; Economic & Planning Systems

Horizon Study Area Industrial Conditions

Industrial developments located within the Horizon Study Area are shown below on **Figure 15** and **Table 14** using CoStar. This cluster is in the Horizon Drive Industrial-Office Area in front of the Grand Junction Regional Airport and includes a total of 400,000 square feet of industrial space. The most recent development was built in 2008 and includes construction, manufacturing, and equipment supplier tenants.

Figure 15. Horizon Study Area Industrial Locations

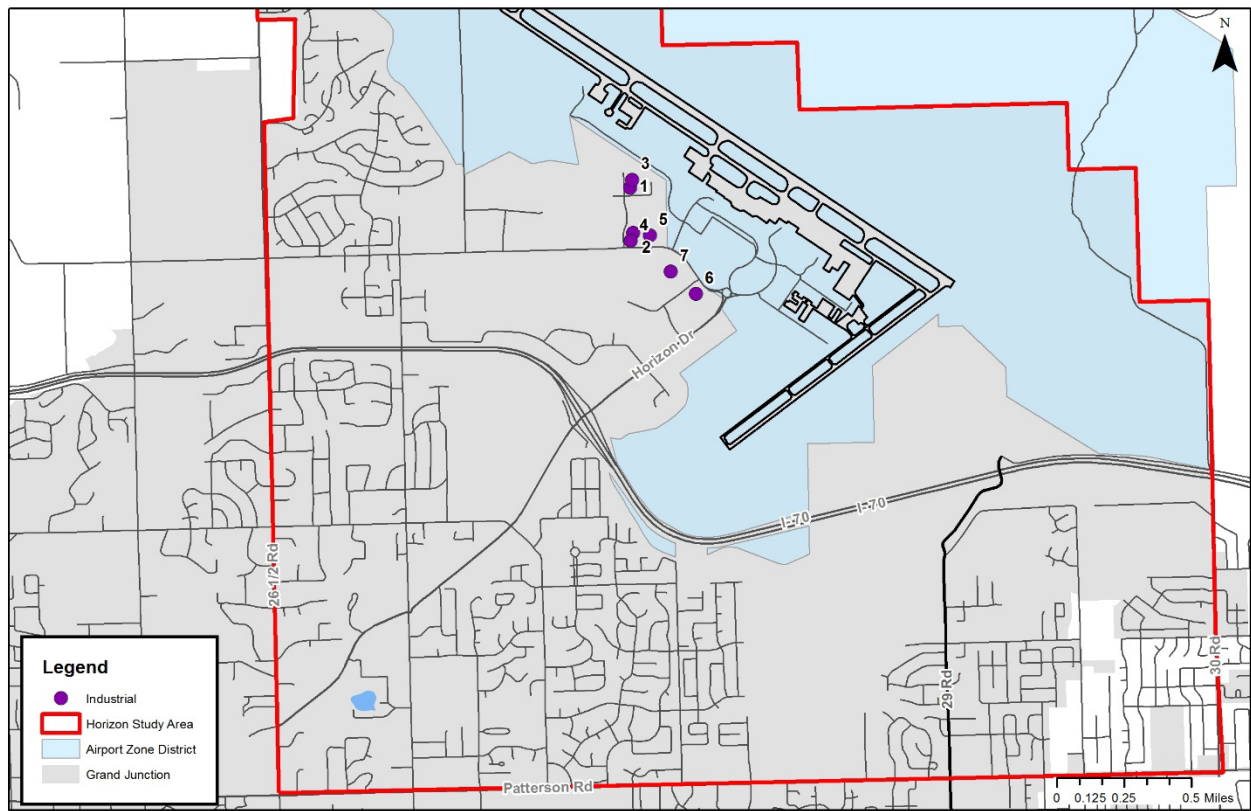


Table 14. Horizon Study Area Industrial Inventory

| ID | Address | Year | Sq. Ft. | Vacancy | Example Tenants |
|--------------|--------------------|------|----------------|---------|--|
| 1 | 826 North Crest Dr | 2008 | 16,000 | 0.0% | Equipment supplier, manufacturer |
| 2 | 810 North Crest Dr | 2006 | 10,500 | 13.6% | Sign shop, sheet metal contractor |
| 3 | 832 North Crest Dr | 2006 | 16,000 | 0.0% | Mining company, medical supplier |
| 4 | 806 North Crest Dr | 2005 | 10,500 | 0.0% | Manufacturer, well drilling contractor, construction |
| 5 | 2790 H Rd | 1995 | 66,348 | 0.0% | Engineering services |
| 6 | 2815 H Rd | 1991 | 134,880 | 0.0% | Federal government offices |
| 7 | 2800 Printers Way | 1985 | 145,042 | 10.3% | Machine shop, printer, trucking school |
| Total | | | 399,270 | | |

Source: CoStar; Grand Junction Economic Partnership; Economic & Planning Systems

Industrial and Office Land Supply

Existing Industrial and Office Land Supply

The existing and planned business parks and industrial clusters are shown in **Figure 16**. The numbers on the map corresponds to **Table 15**, which identifies the amount of vacant land for each area and the percent developed. Currently, there is about 1,365 acres of industrial and business park land under development, of which 582 acres are vacant. Additionally, there are three planned business parks with a total of 323 acres as shown.

Four of the clusters are in the Horizon View Study Area and surround the Grand Junction Regional Airport. The business parks under development are projects or clusters of office and industrial properties with established businesses. These areas include vacant parcels with the corresponding zoning that can be developed to complete the business park or cluster. The business parks that are planned include Las Colonias Business Park, which is currently under construction and Riverfront at Dos Rios Business Park, which has a site plan. Horizon View Business Park is an area with the proper zoning and future land use designation for a business park.

The County has also noted the potential for additional industrial uses to be located in Orchard Mesa which is located along Highway 50 east of 29 Road in the unincorporated area. The City has extended sewer to this area in anticipation of future more urbanized development that could potentially be annexed to the City. However, at this time, the area is primarily agricultural and rural residential with no specific zoned plans for business or industrial development so it is not included in the vacant land supply.

Figure 16. Existing and Planned Business Parks and Industrial Clusters

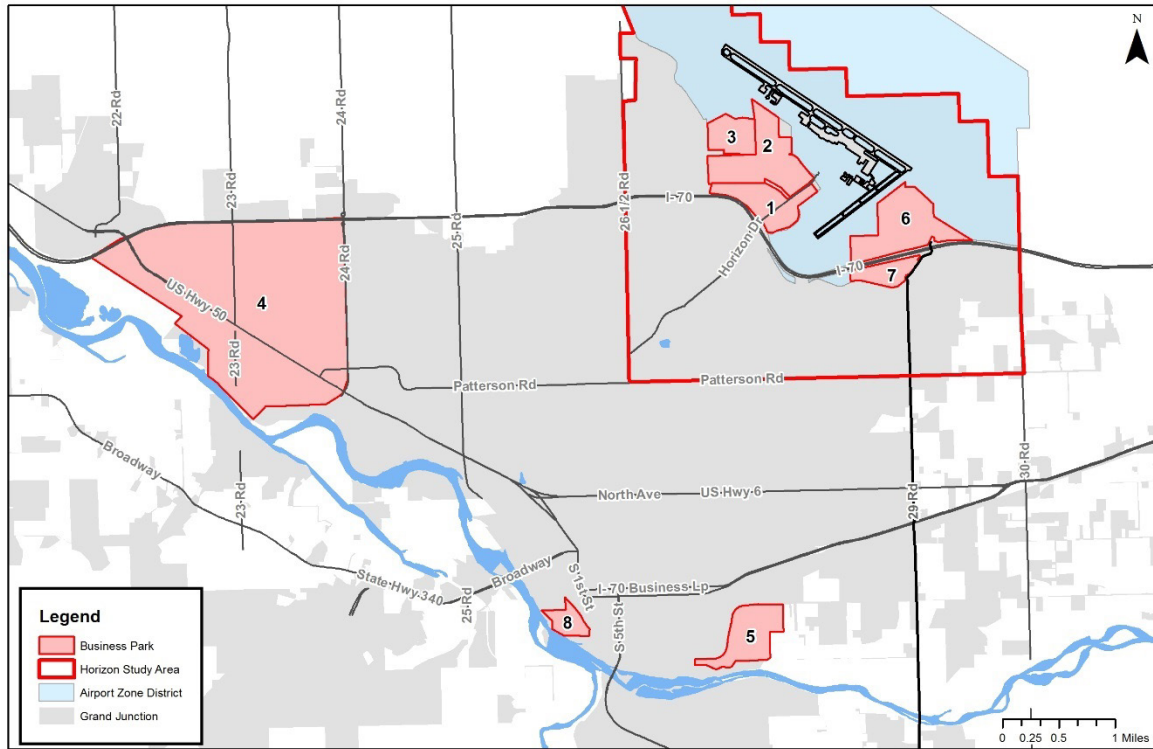


Table 15. Existing and Planned Business Parks and Industrial Clusters

| # | Business Park/Clusters | Acres | | | Developed % |
|--------------------------|--------------------------------------|--------------|--------------|----------------|--------------|
| | | Developed | Vacant | Total | |
| Under Development | | | | | |
| 1 | Horizon Drive Office Cluster | 35.4 | 13.4 | 48.8 | 72.5% |
| 2 | Horizon Drive Industrial-Office Area | 34.5 | 147.5 | 182.0 | 19.0% |
| 3 | Bookcliff Tech Park | 17.7 | 25.6 | 43.3 | 40.9% |
| 4 | NW Grand Junction Industrial Area | 599.8 | 355.2 | 955.0 | 62.8% |
| 5 | Las Colonias Business Park | <u>95.4</u> | <u>40.1</u> | <u>135.5</u> | <u>70.4%</u> |
| | Subtotal | 782.8 | 581.8 | 1,364.6 | 57.4% |
| Planned | | | | | |
| 6 | Horizon View Business Park | 0.0 | 227.0 | 227.0 | 0.0% |
| 7 | Matchett LLLP/Alvir Holdings Inc | 0.0 | 52.3 | 52.3 | 0.0% |
| 8 | Riverfront at Dos Rios Business Park | <u>0.0</u> | <u>43.8</u> | <u>43.8</u> | <u>0.0%</u> |
| | Subtotal | 0.0 | 323.1 | 323.1 | 0.0% |
| | Total | 782.8 | 904.9 | 1,687.7 | 46.4% |

Source: City of Grand Junction; Mesa County Assessor; CoStar; Economic & Planning Systems

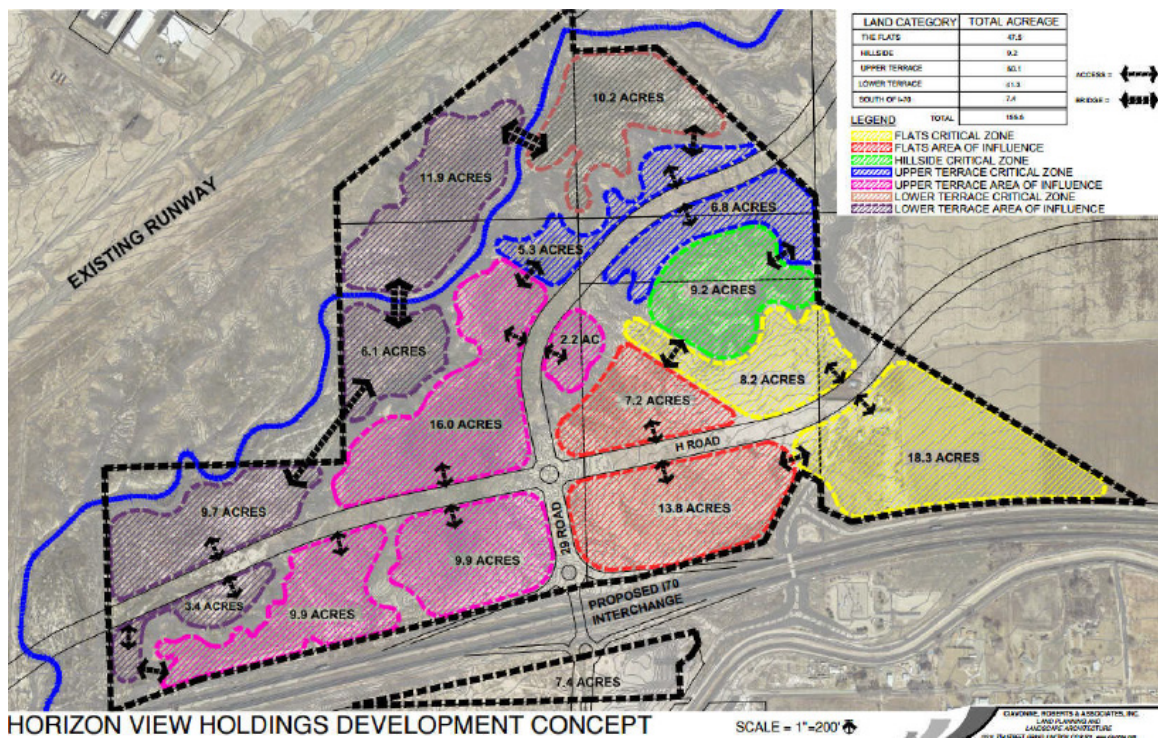
Existing Business Parks

1. Horizon Drive Office Cluster is an area with concentrated office development along Horizon Drive immediately north of I-70. The area consists of about 49 acres with 73 percent of the area developed. There are about 13 acres vacant, which are zoned commercial.
2. Horizon Drive Industrial-Office Area is located adjacent to the airport between Horizon Drive Office Cluster and Bookcliff Tech Park. This area has a concentration of properties zoned for industrial-office development. Only about 19 percent of the area is developed, leaving about 147 acres vacant.
3. Bookcliff Tech Park has 43 acres zoned for industrial/office development. Existing businesses include Leitner Poma, a ski lift manufacturer, and Prinoth, a manufacturer of snow groomers. There are about 14 acres of undeveloped land for sale.
4. NW Grand Junction Industrial Area is a large concentration of older industrial businesses near the intersection of Interstate 70, 22 Road, and U.S. Highway 50. Existing uses include a concentration of oil and gas related companies with extensive outdoor storage. There are large parcels of undeveloped land zoned for industrial and planned development. This area allows for heavier industrial uses, but also has the potential for a business park.
5. Las Colonias Business Park is a 15 acre business park development currently under construction and anticipated to open in May 2019. It is located within the 140 acre Las Colonias Park. The business park is envisioned to generate revenues to help support the large regional riverfront park. The business park is being marketed toward outdoor recreational businesses, offering industrial and office space. Bonsai Design, an outdoor adventure course business, is currently leasing space and RockMount, a bike and ski roof rack manufacturer, is committed for fall 2019. East of Las Colonias Business Park is an existing area of smaller industrial development, most of which is less than an acre. Additionally, there is vacant land in Mesa County that can be annexed into Grand Junction to add to the industrial concentration in this area (not currently included).

Planned Developments

6. Horizon View Business Park includes 227 undeveloped acres planned for business park and regional retail development adjacent to the Grand Junction Airport, north of Interstate 70, and surrounding the proposed 29 Road interchange, as shown in **Figure 17**. Horizon View Holdings LLC led by local businessman Glenn McClelland has long held the property. The viability of the business park is tied to completion of the proposed I-70/29 Road interchange as all but 7 acres are located north of I-70 and lack access without it.

Figure 17. Horizon View Holdings Development Concept



7. Matchett LLLP/Alvir Holdings Inc. is comprised of two parcels south of Horizon View Business Park, I-70, and the proposed 29 Road interchange. The larger parcel of the two is owned by Matchett Family Partnership LLLP and is about 50 acres. This parcel is zoned as a planned development and will likely develop into commercial, office, or industrial uses. Alvir Holdings LLC owns the second parcel of about 3 acres. This parcel is directly between 29 Road and I-70 and is zoned as a business park.
8. Riverfront at Dos Rios Business Park is a City owned redevelopment project of 44 acres along the Riverside Parkway and fronting on the Colorado River in southwestern Grand Junction. Plans for the site include a mix of industrial, office, and commercial uses along each side of Riverside Parkway and mixed-use residential and open space near the river. The City received a grant of \$75,000 from Great Outdoors Colorado for the park and open space.

Industrial and Business Park Land

The undeveloped land opportunities within the existing business parks and industrial clusters are illustrated in **Figure 18**. There are about 1,149 acres of vacant land zoned for business, office, and industrial development within the city, shown in **Table 16**. The 1,149 acres of vacant business land exceeds the 905 acres shown previously in existing and planned business parks due to scattered industrial land, particularly in the rail yard district south of downtown.

Figure 18. Vacant Industrial/Business Park Inventory

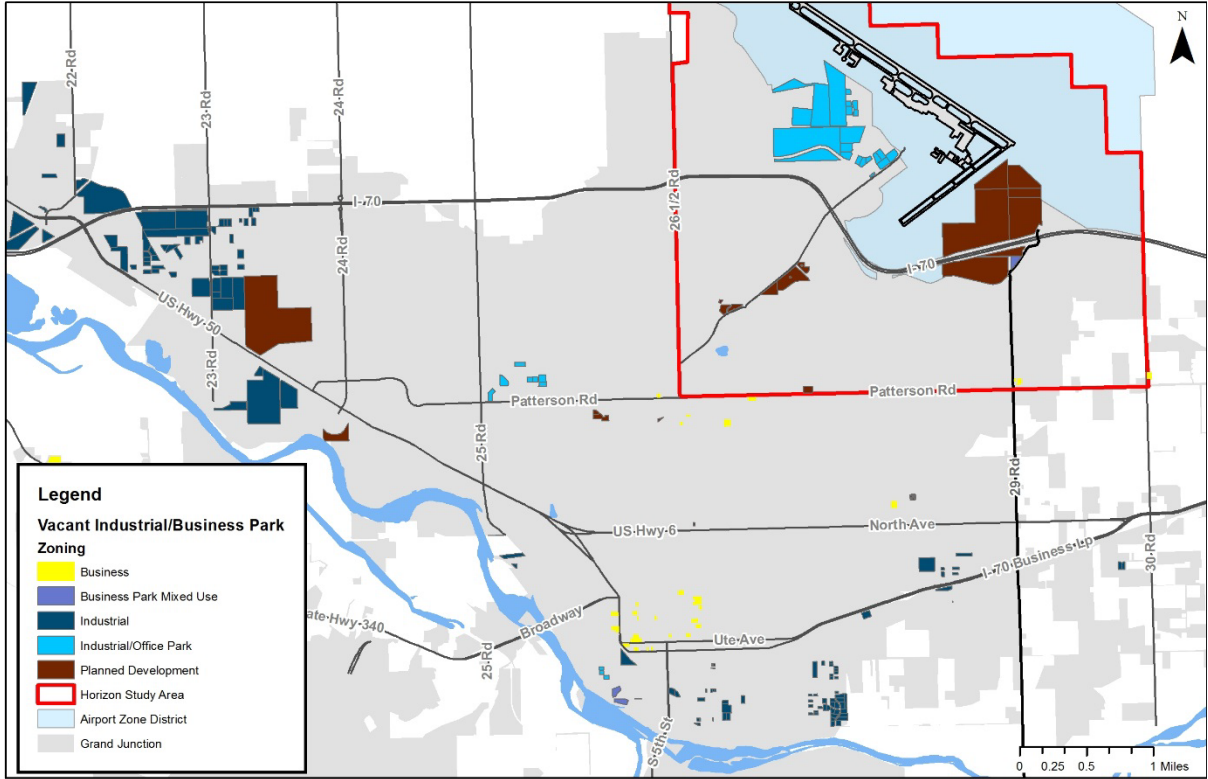


Table 16. Vacant Industrial/Business Park Inventory

| Description | Parcels | Acres | % Total |
|-------------------------|------------|----------------|---------------|
| Business | 60 | 18.8 | 1.6% |
| Business Park Mixed Use | 4 | 6.9 | 0.6% |
| Industrial | 147 | 570.5 | 49.7% |
| Industrial/Office Park | 29 | 207.0 | 18.0% |
| Planned Development | 30 | 345.6 | 30.1% |
| Total | 270 | 1,148.9 | 100.0% |

Source: City of Grand Junction Planning Dept; Mesa County Assessor; Economic & Planning Systems

Office and Industrial Land Demand

The Mesa County employment demand forecasts from **Table 8** are converted to demand by type of space based on the estimated portion of employment using office, industrial, and hotel/restaurant space by employment category, as shown in **Table 17**. Grand Junction space demand is then estimated based on the share of total county space currently captured by the city. There is an estimated demand for 4.6 million square feet of commercial space as shown.

Table 17. Employment Space Demand by Industry, 2017-2045

| Description | 2017-2045 Employees by Type | Sq. Ft. per Employee | 2017-2045 | | | |
|-----------------------|-----------------------------------|-------------------------|------------------|------------------|----------------|-------------|
| | | | Total | Ann. # | Ann. % | |
| Mesa County | | | | | | |
| Office | 5,566 | 250 | 1,391,570 | 49,699 | 1.5% | |
| Industrial | 3,735 | 750 | 2,801,585 | 100,057 | 1.2% | |
| Hotel/Restaurant | <u>3,477</u> | 300 | <u>1,042,954</u> | <u>37,248</u> | <u>1.8%</u> | |
| Total | 12,778 | | 5,236,109 | 187,004 | 1.3% | |
| Grand Junction | | | | | | |
| | <i>City Capture</i> | | | | | |
| Office | 95% | 5,288 | 250 | 1,321,991 | 47,214 | 1.5% |
| Industrial | 90% | 3,362 | 750 | 2,521,427 | 90,051 | 1.2% |
| Hotel/Restaurant | 70% | <u>2,434</u> | 300 | <u>730,068</u> | <u>26,074</u> | <u>1.8%</u> |
| Total | | 11,083 | | 4,573,486 | 163,339 | 1.3% |

Source: QCEW; Economic & Planning Systems

4. Retail Development Potentials

Retail Development Trends

Inventory

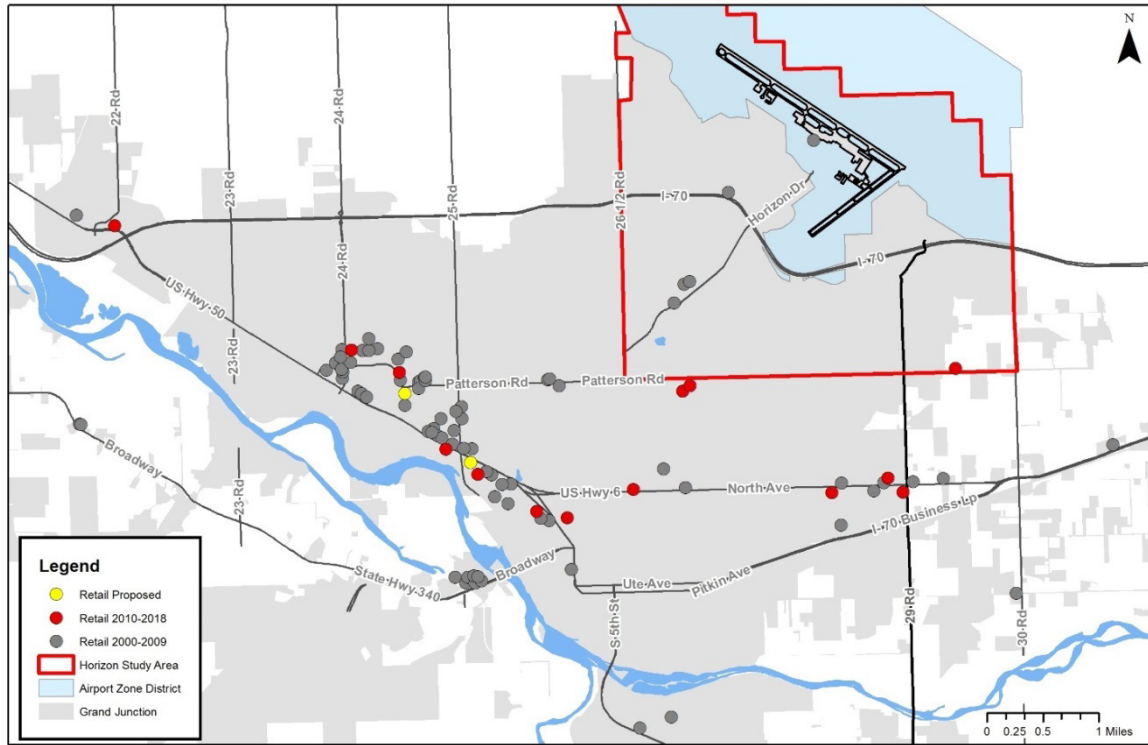
Grand Junction contains about 88 percent of the total retail space in Mesa County. Since 2010, Grand Junction has gained about 207,000 square feet of retail space, resulting in a growth rate of 0.4 percent annually, shown in **Table 18**. In 2018, the City had 7.2 million square feet of retail development, as tracked by CoStar. Retail stores and services are clustered around U.S. Highway 50 leading into Downtown Grand Junction, shown in **Figure 19**. The concentration around 24 Road and Patterson Road is the Mesa Mall. There is some newer development along North Avenue near 29 Road in response to the 2011 North Avenue Commercial Catalyst Grant Program provided by the City. This grant program matches up to \$10,000 to private property owners and businesses to make building frontage improvements and pedestrian amenities in an effort to revitalize North Avenue as a commercial corridor.

Table 18. Retail Inventory Trend, 2010-2018

| Inventory (Sq. Ft.) | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2010-2018 | | |
|---------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|--------|--------|
| | | | | | | | | | | Total | Ann. # | Ann. % |
| Grand Junction | 7,006,904 | 7,125,332 | 7,125,332 | 7,126,869 | 7,104,963 | 7,104,963 | 7,184,392 | 7,201,672 | 7,214,272 | 207,368 | 25,921 | 0.4% |
| Mesa County | 7,945,914 | 8,064,342 | 8,064,342 | 8,094,305 | 8,072,399 | 8,072,399 | 8,155,088 | 8,172,368 | 8,190,300 | 244,386 | 30,548 | 0.4% |

Source: CoStar, Economic & Planning Systems

Figure 19. Grand Junction Retail Development, 2000-2018



Lease and Vacancy Rates

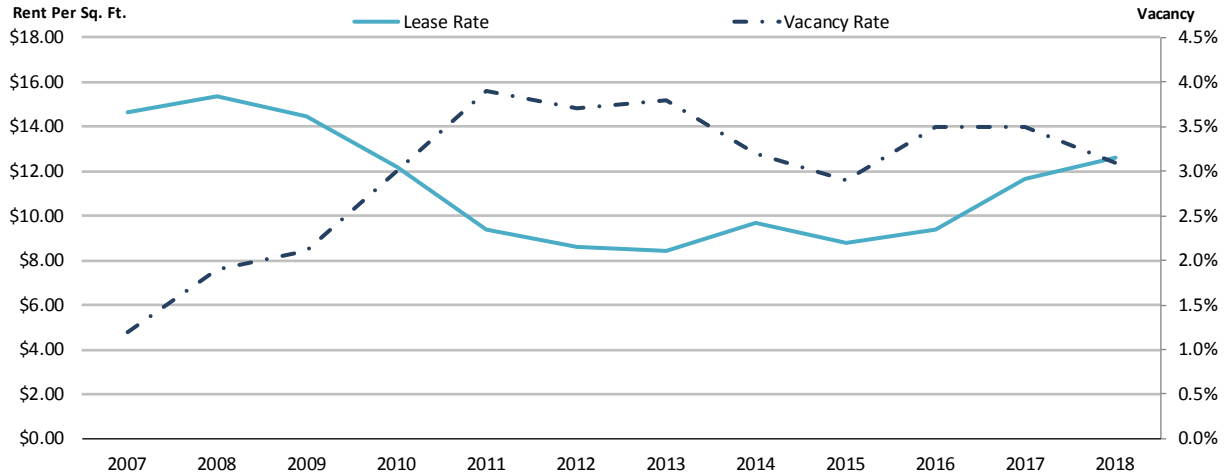
In 2018, retail lease rates in Grand Junction averaged \$12.61 per square foot, shown in **Table 19**. Lease rates exceed pre-recession levels for the first time in 2018. Between 2007 and 2010 retail vacancy rates were steadily increasing before dropping to below \$10.00 per square foot from 2011 to 2016, as shown in **Figure 20**. Since 2010 the average vacancy rate has stayed around 3 percent.

Table 19. Grand Junction Retail Average Lease and Vacancy Rates, 2010-2018

| Description | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2010-2018 | | |
|--------------|---------|--------|--------|--------|--------|--------|--------|---------|---------|-----------|--------|--------|
| | | | | | | | | | | Total | Ann. # | Ann. % |
| Lease Rate | \$12.22 | \$9.41 | \$8.63 | \$8.44 | \$9.68 | \$8.77 | \$9.38 | \$11.65 | \$12.61 | \$0.39 | \$0.05 | 0.4% |
| Vacancy Rate | 3.0% | 3.9% | 3.7% | 3.8% | 3.2% | 2.9% | 3.5% | 3.5% | 3.1% | 0.1% | 0.0% | 0.4% |

Source: CoStar; Economic & Planning Systems

Figure 20. Grand Junction Retail Avg. Lease and Vacancy Rates, 2007-2018



Source: CoStar; Economic & Planning Systems

Horizon Study Area Retail Conditions

Horizon Study Area retail development is concentrated along Horizon Drive to the south of I-70 and north leading to the Grand Junction Regional Airport, as shown in **Figure 21**. According to CoStar, there is approximately 250,000 square feet of space, as shown in **Table 20**. There are also a large number of hotels along Horizon Drive to provide accommodations for visitors. The majority of the retail in this area is sit-down or fast food restaurants.

Figure 21. Horizon Study Area Retail Development Locations

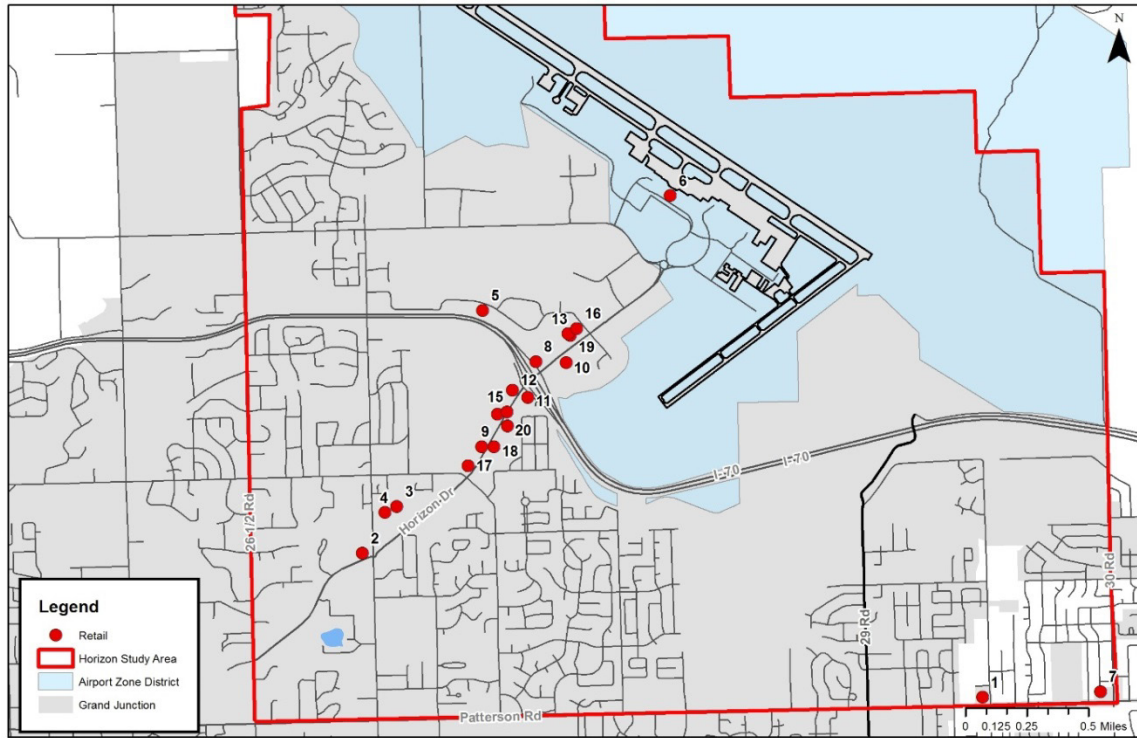


Table 20. Horizon Study Area Retail Development Inventory

| ID | Description | Address | Year | Sq. Ft. | Vacancy % | Example Tenants |
|----|-------------------------|----------------------|------|----------------|-----------|----------------------------------|
| 1 | Maverik Country Stores | 2948 F Rd | 2010 | 4,318 | 0.0% | Gas station |
| 2 | Multi-tenant | 687 Horizon Dr | 2007 | 13,600 | 0.0% | Auto service, Chinese restaurant |
| 3 | Shoppes at Horizon Park | 683 Horizon Dr | 2005 | 16,171 | 63.4% | Salon, liquor store, restaurant |
| 4 | Safeway | 681 Horizon Dr | 2004 | 56,604 | 0.0% | Safeway, starbucks |
| 5 | Harley-Davidson Dealer | 2747 Crossroads Blvd | 2000 | 20,335 | 0.0% | Harley-Davidson |
| 6 | Multi-tenant | 2828 Walker Field Dr | 2000 | 60,561 | 0.0% | Car rentals |
| 7 | Rite Aid | 2922 Patterson Rd | 1999 | 13,860 | 0.0% | Pharmacy |
| 8 | Shell | 745 Horizon Dr | 1998 | 2,162 | 0.0% | Gas station |
| 9 | Applebee's | 711 Horizon Dr | 1995 | 4,900 | 0.0% | Restaurant |
| 10 | Wendy's | 750 1/2 Horizon Dr | 1993 | 3,968 | 0.0% | Fastfood restuarant |
| 11 | Taco Bell | 736 Horizon Dr | 1992 | 2,516 | 0.0% | Fastfood restuarant |
| 12 | Burger King | 739 Horizon Dr | 1992 | 3,687 | 0.0% | Fastfood restuarant |
| 13 | Village Inn | 757 Horizon Dr | 1986 | 4,756 | 0.0% | Restaurant |
| 14 | Shell | 723 Horizon Dr | 1984 | 2,391 | 0.0% | Gas station |
| 15 | Restaurant | 733 Horizon Dr | 1981 | 6,531 | 0.0% | Restaurant |
| 16 | Multi-tenant | 759 Horizon Dr | 1979 | 18,455 | 0.0% | Barber, restaurant |
| 17 | Restaurant | 705 Horizon Dr | 1976 | 2,500 | 0.0% | Mexican restaurant |
| 18 | Denny's | 710 Horizon Dr | 1974 | 3,894 | 0.0% | Restaurant |
| 19 | Restaurant | 752 1/2 Horizon Dr | 1973 | 4,728 | 0.0% | Restaurant |
| 20 | Conoco | 722 Horizon Dr | N/A | 3,206 | 0.0% | Gas station, restaurant |
| | | Total | | 245,937 | | |

Source: CoStar; Grand Junction Economic Partnership; Economic & Planning Systems

Vacant Commercial Land Inventory

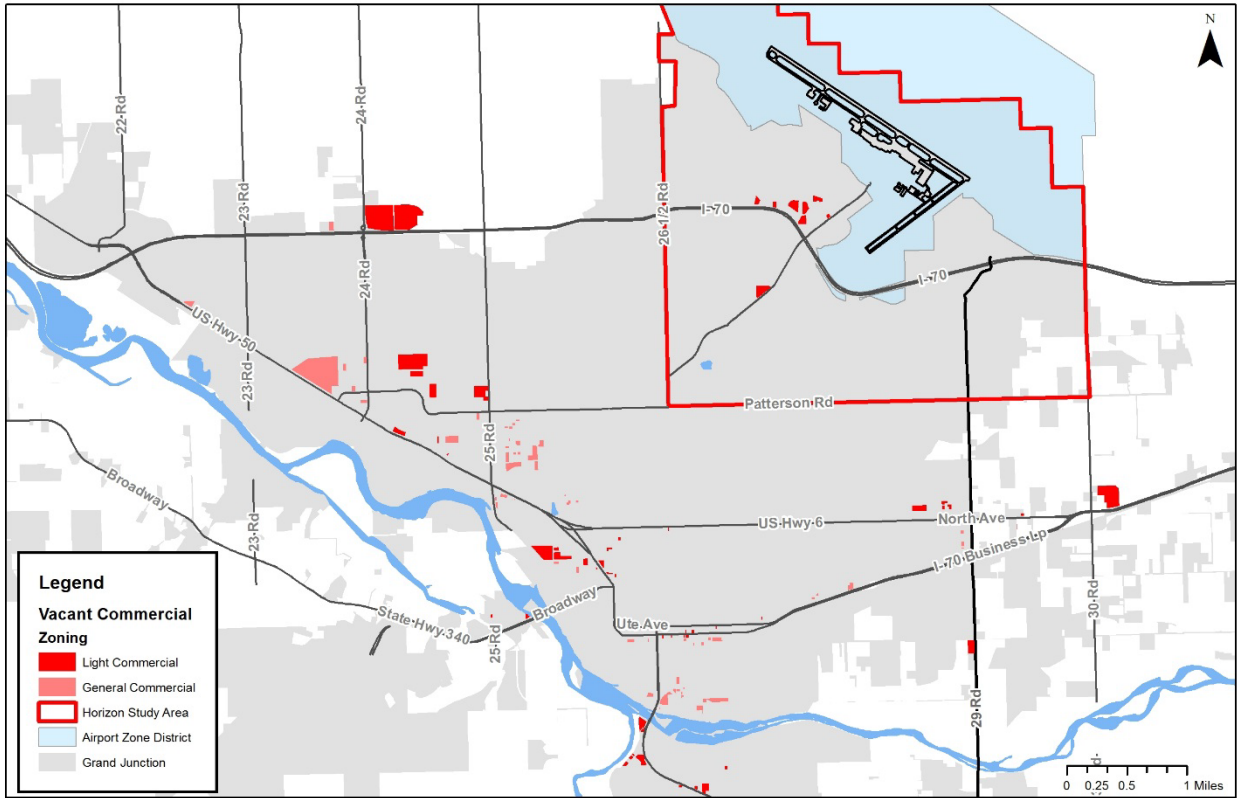
Grand Junction has about 310 acres of vacant commercial property, shown in **Table 21**. The largest site is on the northeast corner of the I-70 and 24 Road interchange with approximately 56 acres that was originally planned to be a lifestyle mall prior to the recession. This parcel is likely to develop as a commercial hub with hotels and restaurants to accommodate spill over development from Horizon Drive. The Horizon Study Area has 11 parcels totaling approximately 18 acres and range from 0.5 to 4.7 acres in size, as shown in **Figure 22**.

Table 21. Vacant Commercial Inventory

| Description | Parcels | Acres |
|--------------------|------------|--------------|
| Light Commercial | 99 | 198.8 |
| General Commercial | <u>103</u> | <u>111.6</u> |
| Total | 202 | 310.3 |

Source: City of Grand Junction Planning Dept; Mesa County Assessor; Economic & Planning Systems

Figure 22. Vacant Commercial Inventory



Retail Demand

Retail demand is estimated based on the expenditures of Grand Junction households. The existing demand from households in Grand Junction is compared to the existing retail inventory and stores within the City. Future demand is estimated based on estimated household growth.

- Retail expenditure potentials can be estimated based on the percent of income spent on average by store category as outlined in the steps below.
- Based on the ESRI Retail Marketplace Profile, the percent of Total Personal Income (TPI) spent by store category is determined using retail expenditure potential by retail NAICS categories that correspond with retail store categories. This calculation estimates expected resident spending patterns.
- The growth in trade area expenditure potential is estimated by the same calculation applied to the estimated growth in TPI by time period. TPI calculations are made in constant dollars (no inflation).
- The amount of retail space supported by the growth in trade area expenditures is estimated by dividing expenditure potential by average annual sales per square foot estimates for each store category.
- The estimated sales by store category provided by ESRI were also analyzed to assess gaps in retail demand or supply.

Retail demand expenditure potential for Grand Junction households is estimated by multiplying the number of households (26,147) by the average household income (\$73,124) to calculate total personal income (TPI) in Grand Junction, as shown in **Table 22**. The TPI for Grand Junction in 2018 was \$1.9 billion. The City is estimated to grow by 12,016 households (an annual rate of growth of 1.4 percent) between 2018 and 2045. This increase in households will generate additional TPI of \$878 million by 2045.

Table 22. Total Personal Income, 2018-20145

| Description | 2018 | 2028 | 2045 | Change 2018-2028 |
|------------------------------|------------------------|------------------------|------------------------|----------------------|
| Grand Junction | | | | |
| Households | 26,147 | 29,332 | 38,163 | 12,016 |
| Avg. Household Income | <u>\$73,124</u> | <u>\$73,124</u> | <u>\$73,124</u> | --- |
| Total Personal Income | \$1,911,973,228 | \$2,144,873,168 | \$2,790,631,212 | \$878,657,984 |

Source: US Census; ESRI; DOLA; Economic & Planning Systems

Retail Store Categories

For purposes of analysis, retail stores are categorized based on shopping and trade area characteristics listed below. Each is described with examples to clarify the types of retail stores included in each of the categories.

- **Convenience Goods** – This category includes supermarkets and other grocery stores, convenience stores, as well as liquor, drug, other specialty food stores, and coffee shops. In addition, this category includes convenience services such as laundry, mail, hair/barber, and copies. These stores generally sell frequently purchased, low cost items with little product differentiation. The primary locations for convenience goods stores are the supermarket-anchored neighborhood shopping centers and smaller convenience centers, as these items are most often bought close to home.
- **Shoppers' Goods** – This category includes general merchandise, apparel, furniture, appliance, and specialty goods stores. General merchandise stores include traditional department stores (such as Macy and JCPenney) as well as discount department stores (Walmart and Target). The product lines of these stores are generally more expensive, less frequently purchased items. However, this is changing in terms of grocery items purchased at discount department stores. In general, people are more likely to comparison shop for shoppers' goods and are often more willing to travel farther to buy them. The primary locations for regional shoppers' goods are traditional downtown shopping districts, regional shopping centers, free-standing discount department and membership warehouse stores, and power centers.
- **Eating and Drinking Establishments** – This category covers restaurants including conventional sit-down and fast food, and bars. Businesses in this category exhibit some of the characteristics of convenience stores in that many restaurant expenditures are made at establishments close to home and on a frequent basis. However, some higher quality restaurants, unique in the marketplace, can have a regional draw.
- **Building Materials/Nurseries** – This category is made up of stores selling lumber, paint, glass, hardware, plants and garden supplies, and other retail items related to home improvement. Home improvement centers such as Home Depot and Lowe's are the largest stores in this category. These stores generally serve a larger regional trade area.

Based on the ESRI Retail Marketplace Profile, the average retail trade area household spends on average 35 percent of its income on retail goods annually (excluding sales to automobile stores and non-store retailers). The estimated percent of income spend by store category is shown in **Table 23**.

In 2018, Grand Junction households are estimated to spend \$671 million on retail goods (expenditure potential). By 2045, this expenditure potential grows to \$980 million, which is an increase of \$308 million.

Table 23. Grand Junction Expenditure Potential, 2018-2045

| Grand Junction | Retail Sales %TPI | 2018 (\$000s) | 2028 (\$000s) | 2045 (\$000s) | Total Change 2018-2045 (\$000s) |
|--|----------------------|--------------------|--------------------|--------------------|--|
| Total Personal Income (TPI) | 100% | \$1,911,973 | \$2,144,873 | \$2,790,631 | \$878,658 |
| Convenience Goods | | | | | |
| Supermarkets and Other Grocery Stores | 6.9% | \$132,293 | \$148,408 | \$193,090 | \$60,796 |
| Convenience Stores (incl. Gas Stations) ¹ | 2.0% | \$37,843 | \$42,453 | \$55,234 | \$17,391 |
| Beer, Wine, & Liquor Stores | 1.1% | \$20,587 | \$23,094 | \$30,047 | \$9,461 |
| Health and Personal Care | 1.7% | <u>\$31,846</u> | <u>\$35,725</u> | <u>\$46,480</u> | <u>\$14,635</u> |
| Total Convenience Goods | 11.6% | \$222,569 | \$249,680 | \$324,852 | \$102,283 |
| Shopper's Goods | | | | | |
| General Merchandise | | | | | |
| Traditional Department Stores | 0.5% | \$9,697 | \$10,878 | \$14,153 | \$4,456 |
| Discount Department Stores and Other | 0.9% | \$16,779 | \$18,823 | \$24,490 | \$7,711 |
| Warehouse Clubs & Supercenters | 5.8% | <u>\$110,894</u> | <u>\$124,403</u> | <u>\$161,857</u> | <u>\$50,962</u> |
| Subtotal | 7.2% | \$137,023 | \$153,714 | \$199,993 | \$62,970 |
| Other Shopper's Goods | | | | | |
| Clothing & Accessories | 2.2% | \$41,161 | \$46,175 | \$60,076 | \$18,916 |
| Furniture & Home Furnishings | 1.2% | \$22,524 | \$25,267 | \$32,875 | \$10,351 |
| Electronics & Appliances | 1.1% | \$20,390 | \$22,874 | \$29,761 | \$9,371 |
| Sporting Goods, Hobby, Book, & Music Stores | 1.3% | \$24,109 | \$27,045 | \$35,188 | \$11,079 |
| Miscellaneous Retail | 1.3% | <u>\$24,673</u> | <u>\$27,679</u> | <u>\$36,012</u> | <u>\$11,339</u> |
| Subtotal | 6.9% | \$132,857 | \$149,040 | \$193,912 | \$61,055 |
| Total Shopper's Goods | 14.1% | \$269,880 | \$302,754 | \$393,905 | \$124,025 |
| Eating and Drinking | 6.1% | \$116,432 | \$130,615 | \$169,940 | \$53,507 |
| Building Material & Garden | | | | | |
| Total Building Material & Garden | 3.3% | \$62,432 | \$70,037 | \$91,123 | \$28,691 |
| Total Retail Goods | 35.1% | \$671,313 | \$753,087 | \$979,819 | \$308,506 |

¹Convenience Stores w/Gas (44711) are multiplied by 50% to exclude gas sales, Health and Person Care sales reduced 50% to reflect non-taxable prescription sales

Source: 2012 Census of Retail Trade; Economic & Planning Systems

The estimated expenditure potential by store category is divided by average sales per square foot to estimate demand for square feet. There is a current estimated demand for 1.87 million square feet of retail generated by Grand Junction, as shown in **Table 24**. Demand from new growth will increase demand for retail space by 860,000 square feet by 2045 to result in a total of 2.7 million square feet of retail space.

Table 24. Retail Space (Sq. Ft.) Demand, 2018-2045

| Grand Junction | Avg. Sales Per Sq. Ft. | Local Factor | Regional Factor | 2018 | First 10 years 2019 - 2028 | | | Next 17 years 2029-2045 | | | All 27 years 2019 - 2045 | | | Total 2045 |
|---|------------------------|--------------|-----------------|-------------------|-------------------------------|----------------|----------------|----------------------------|----------------|----------------|-----------------------------|----------------|----------------|-------------------|
| | | | | Supportable Space | New Demand | Local | Regional | New Demand | Local | Regional | Total New Demand | Local | Regional | Supportable Space |
| Convenience Goods | | | | | | | | | | | | | | |
| Supermarkets and Other Grocery Stores | \$400 | 100% | 0% | 331,000 | 40,000 | 40,000 | 0 | 112,000 | 112,000 | 0 | 152,000 | 152,000 | 0 | 483,000 |
| Convenience Stores (incl. Gas Stations) | \$400 | 100% | 0% | 95,000 | 12,000 | 12,000 | 0 | 32,000 | 32,000 | 0 | 43,000 | 43,000 | 0 | 138,000 |
| Beer, Wine, & Liquor Stores | \$400 | 100% | 0% | 51,000 | 6,000 | 6,000 | 0 | 17,000 | 17,000 | 0 | 24,000 | 24,000 | 0 | 75,000 |
| Health and Personal Care | \$400 | 100% | 0% | 80,000 | 10,000 | 10,000 | 0 | 27,000 | 27,000 | 0 | 37,000 | 37,000 | 0 | 117,000 |
| Total Convenience Goods | | 100% | 0% | 557,000 | 68,000 | 68,000 | 0 | 188,000 | 188,000 | 0 | 256,000 | 256,000 | 0 | 813,000 |
| Shopper's Goods | | | | | | | | | | | | | | |
| General Merchandise | | | | | | | | | | | | | | |
| Traditional Department Stores | \$250 | 0% | 100% | 39,000 | 5,000 | 0 | 5,000 | 13,000 | 0 | 13,000 | 18,000 | 0 | 18,000 | 57,000 |
| Discount Department Stores | \$350 | 0% | 100% | 48,000 | 6,000 | 0 | 6,000 | 16,000 | 0 | 16,000 | 22,000 | 0 | 22,000 | 70,000 |
| Warehouse Clubs & Supercenters | \$500 | 0% | 100% | 222,000 | 27,000 | 0 | 27,000 | 75,000 | 0 | 75,000 | 102,000 | 0 | 102,000 | 324,000 |
| Subtotal | | 0% | 100% | 309,000 | 38,000 | 0 | 38,000 | 104,000 | 0 | 104,000 | 142,000 | 0 | 142,000 | 451,000 |
| Other Shopper's Goods | | | | | | | | | | | | | | |
| Clothing & Accessories | \$250 | 25% | 75% | 165,000 | 20,000 | 5,000 | 15,000 | 56,000 | 14,000 | 42,000 | 76,000 | 19,000 | 57,000 | 241,000 |
| Furniture & Home Furnishings | \$250 | 25% | 75% | 90,000 | 11,000 | 2,750 | 8,250 | 30,000 | 7,500 | 22,500 | 41,000 | 10,250 | 30,750 | 131,000 |
| Electronics & Appliances | \$500 | 25% | 75% | 41,000 | 5,000 | 1,250 | 3,750 | 14,000 | 3,500 | 10,500 | 19,000 | 4,750 | 14,250 | 60,000 |
| Sporting Goods, Hobby, Book, & Music Stores | \$350 | 25% | 75% | 69,000 | 8,000 | 2,000 | 6,000 | 23,000 | 5,750 | 17,250 | 32,000 | 8,000 | 24,000 | 101,000 |
| Miscellaneous Retail | \$250 | 25% | 75% | 99,000 | 12,000 | 3,000 | 9,000 | 33,000 | 8,250 | 24,750 | 45,000 | 11,250 | 33,750 | 144,000 |
| Subtotal | | 25% | 75% | 464,000 | 56,000 | 14,000 | 42,000 | 156,000 | 39,000 | 117,000 | 213,000 | 53,250 | 159,750 | 677,000 |
| Total Shopper's Goods | | | | 773,000 | 94,000 | 14,000 | 80,000 | 260,000 | 39,000 | 221,000 | 355,000 | 53,250 | 301,750 | 1,128,000 |
| Eating and Drinking | \$350 | 50% | 50% | 333,000 | 41,000 | 20,500 | 20,500 | 112,000 | 56,000 | 56,000 | 153,000 | 76,500 | 76,500 | 486,000 |
| Building Material & Garden | \$300 | 0% | 100% | 208,000 | 3,000 | 0 | 3,000 | 9,000 | 0 | 9,000 | 96,000 | 0 | 96,000 | 304,000 |
| Total Retail Goods | | | | 1,871,000 | 206,000 | 102,500 | 103,500 | 569,000 | 283,000 | 286,000 | 860,000 | 385,750 | 474,250 | 2,731,000 |

Source: 2012 Census of Retail Trade; Economic & Planning Systems

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5. 29 RD/I-70 Development Opportunities

Summary of Demand

The above market analysis forecasts a demand for 4.6 million square feet of office, industrial, and hotel/restaurant space over the 2018 to 2045 time period. This equates to an annual average of 163,000 square feet per year. Additionally, the retail commercial analysis projects a need for additional 2.7 million square feet of space. At an average density of 0.20 floor area ratio, the office, industrial, hotel, and commercial growth will require approximately 1,806 acres of additional land. The City’s Community Development Department inventory of existing vacant land inventory includes approximately 1,460 acres of vacant space. In aggregate, there would appear to be a shortfall of about 350 acres to meet future demand.

Figure 23. Grand Junction Space (acres) Demand Summary

| Description | 2018 Supply | 2045 Demand | Planning Factor | Demand | Total Additional Demand |
|-----------------------|--------------|--------------|-----------------|--------------|-------------------------|
| Grand Junction | | | | | |
| Industrial/Office | 1,149 | 1,493 | 1.25 | 1,866 | 717 |
| Commercial | <u>310</u> | <u>313</u> | 1.25 | <u>392</u> | <u>82</u> |
| Total | 1,459 | 1,806 | 1.25 | 2,258 | 799 |

Source: QCEW; 2012 Census of Retail Trade; Mesa County Assessor; Economic & Planning Systems

Not all of the existing supply of land will be suitable to accommodate the range of future economic development opportunities. For long range plans, the needed land supply is typically increased by 25 to 50 percent to allow for competitive flexibility. Using the more conservative figure, Grand Junction is estimated to need an additional 800 acres of land for non-residential industrial, office, and commercial uses over the 2018 to 2045 time period.

The 29 Road/I-70 interchange area would potentially provide a logical location for business park development now occurring along Horizon Drive. The Horizon Drive area has approximately 187 acres of remaining office or industrial land. The next logical location is the 29 Road interchange, which currently has 280 acres of additional land in the Horizon View and Matchett land holdings.

There is also an economic development perspective for creating an additional business employment node in the city. The 29 Road interchange would open up about 230 acres on the north side of I-70 that is owned by one property owner and can be master-planned for a major business and commercial development

that would provide an additional well-located site for economic development marketing and recruitment. The proposed Horizon View Business Park would be the largest planned business park in the city and would be capable of marketing larger sites for economic development recruitment purposes if the interchange is completed and the park developed as planned. The property would also be suitable for larger retail developments such as an outlet mall, entertainment center, or membership warehouse store serving a regional trade area and seeking an interstate accessible location.

The City, GJEP, and other economic development partners have had initial success with marketing Las Colonias Business Park to recruit new business to Grand Junction from the Front Range including Rocky Mount Roof Racks and Bonsai Zip Lines. The GJEP is also working on inquiries from Federal Government land agencies looking for an area regional office location. A new business park location with I-70 access and proximity to the Grand Junction Airport would provide an alternative and differentiated site for economic development recruitment.

APPENDIX D

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