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TECHNICAL MEMORANDUM #4

Pendleton IAMPs: Exit 207

Future Baseline Conditions: Transportation System Operations

Date:	January 28, 2020	Project #: 24043
To:	Technical Advisory Committee, Citizen Advisory Committee	
From:	Amy Griffiths, Mark Heisinger, Nick Foster, AICP, and Matt Hughart, AICP; Kittelson & Associates, Inc.	

This memorandum describes future land-use and traffic growth projections and future traffic operations within the vicinity of the I-84 Exit 207 interchange. The information in this memorandum provides a basis for the development and analysis of potential project alternatives. It will inform the identification of various opportunities and constraints for meeting the goals and objectives of the interchange area management plan (IAMP).

FUTURE LAND USE ANALYSIS

The analysis of potential future land use in the Interchange Management Study Area (IMSA) builds off the analysis of vacant and re-developable land presented in the *Existing Conditions: System Inventory* memorandum (Reference 1). Most vacant and re-developable land within the IMSA is located north of the Exit 207 interchange near the Eastern Oregon Regional Airport. This land is primarily zoned for industrial uses (i.e., AA - Airport or M-1 - Light Industrial Zones). Vacant and re-developable land south of the interchange is zoned for a mix of industrial (i.e., M-1 – Light Industrial and M-2 – Heavy Industrial) and commercial (i.e., C-2 – Tourist Commercial) uses; though most vacant properties are zoned M-1.

The project team evaluated the development potential of the vacant and re-developable lands under their current zoning designations. Table 1 summarizes the results of this analysis by zone. Note that this analysis assumes full build-out of the vacant and re-developable properties and does not necessarily reflect 20-year development projections.

Table 1 – Estimated Development Potential

Zoning Designation	Development Potential[1]
Airport Activities (AA)	275,000
Light Industrial (M-1)	1,590,000
Heavy Industrial (M-2)	107,000
Tourist Commercial (C-2)	164,000

[1] sq. ft. of gross leasable area

The land-use analysis is further described in Attachment "A."

FUTURE TRAFFIC VOLUME GROWTH PROJECTIONS

The project team obtained the Pendleton Travel Demand Model for year 2015 and year 2040 from the Oregon Department of Transportation (ODOT) and used it to develop future traffic volumes within the Exit 207 Operations and Access Study Area (OASA). This process included manually redistributing some volumes and then post-processing the volumes using National Cooperative Highway Research Program (NCHRP) Report 765 methodology to develop intersection turning movement and link volumes for the AM and PM peak hours.

Modifications to Travel Demand Model Projections

An initial review of the future travel demand model revealed several roadway links within the Exit 207 OASA that experienced a decline in traffic volumes between year 2015 and year 2040. These declines were inconsistent with the projected growth in employment in the area. Further inspection revealed that the model was routing large amounts of traffic along US 30 to the Barnhart Road interchange with I-84 via a new connection along Old Airport Road (i.e., shifting demand from I-84 to this northerly route). To address this unrealistic shift in volumes, the project team redistributed some traffic volume from the US 30-Old Airport Road-Barnhart Road route to I-84. The project team also redistributed traffic volumes from Old Airport Road onto Airport Road to analyze conditions without this additional connection to the airport area.

Developing Final Projected Volumes

The project team post-processed the redistributed model volumes using the NCHRP Report 765 methodology, as recommended by the ODOT *Analysis Procedures Manual* (Reference 2). This analysis produced year 2040 intersection turning movements and I-84 link volumes for the AM and PM peak hours. These volumes were then balanced between study intersections. The resulting year 2040 traffic volumes are shown in Figures 1 and 2 for the AM and PM peak hour, respectively.

FUTURE BASELINE TRANSPORTATION SYSTEM OPERATIONS

The project team analyzed year 2040 AM and PM peak hour transportation operations for all study intersections within the Exit 207 OASA and for all I-84 merge, diverge, and mainline segments within the vicinity of the Exit 207 interchange. The traffic operations analysis was performed in accordance with the same methodologies used for the existing conditions operations analysis, presented in the *Existing Conditions: Transportation System Operations* memorandum (Reference 3).

ODOT uses volume-to-capacity (V/C) ratios to assess highway segment and intersection operations. The applicable mobility targets at each of the Exit 207 OASA study intersections, intersections along the US 30 corridor, I-84 interchange terminals, and highway segments are summarized in Table 2.

Table 2 – Study Intersection Performance Targets

Intersection	OHP Mobility Target
I-84 Westbound Off Ramp/US 30/Airport Road Connector	0.85[1]
I-84 Westbound On Ramp/US 30	0.90[2]
I-84 Eastbound Off Ramp/US 30	0.85[1]
I-84 Eastbound On Ramp/US 30	0.90[2]
US 30/Airport Road	0.90 US 30 approach / 0.90 Airport Road approach
Rieth Road/NW Pioneer Place[3]	0.90[3]

[1] The I-84 westbound and eastbound off ramps were evaluated with a more conservative v/c of 0.85 per Action 1F.1 of the Oregon Highway Plan.
[2] There are no conflicting movements at the I-84 westbound and eastbound on ramp intersections. As such, the US 30 eastbound and westbound major street through movements were evaluated under the US 30 District Highway mobility target of 0.90.
[3] The City of Pendleton does not have intersection or roadway performance targets – target v/c of 0.90 assumed.
[4] The highway segment mobility target for I-84 is 0.80.

Study Intersections

The results of the year 2040 traffic operations analysis for the study intersections are shown in Figures 1 and 2 for the AM and PM peak hours, respectively. The critical movements at each intersection are forecast to operate below the applicable mobility targets outlined in Table 2. The critical movements are also forecast to operate at level of service (LOS) C or better during the AM and PM peak hours. *Intersection operations worksheets are shown in Attachment "B."*

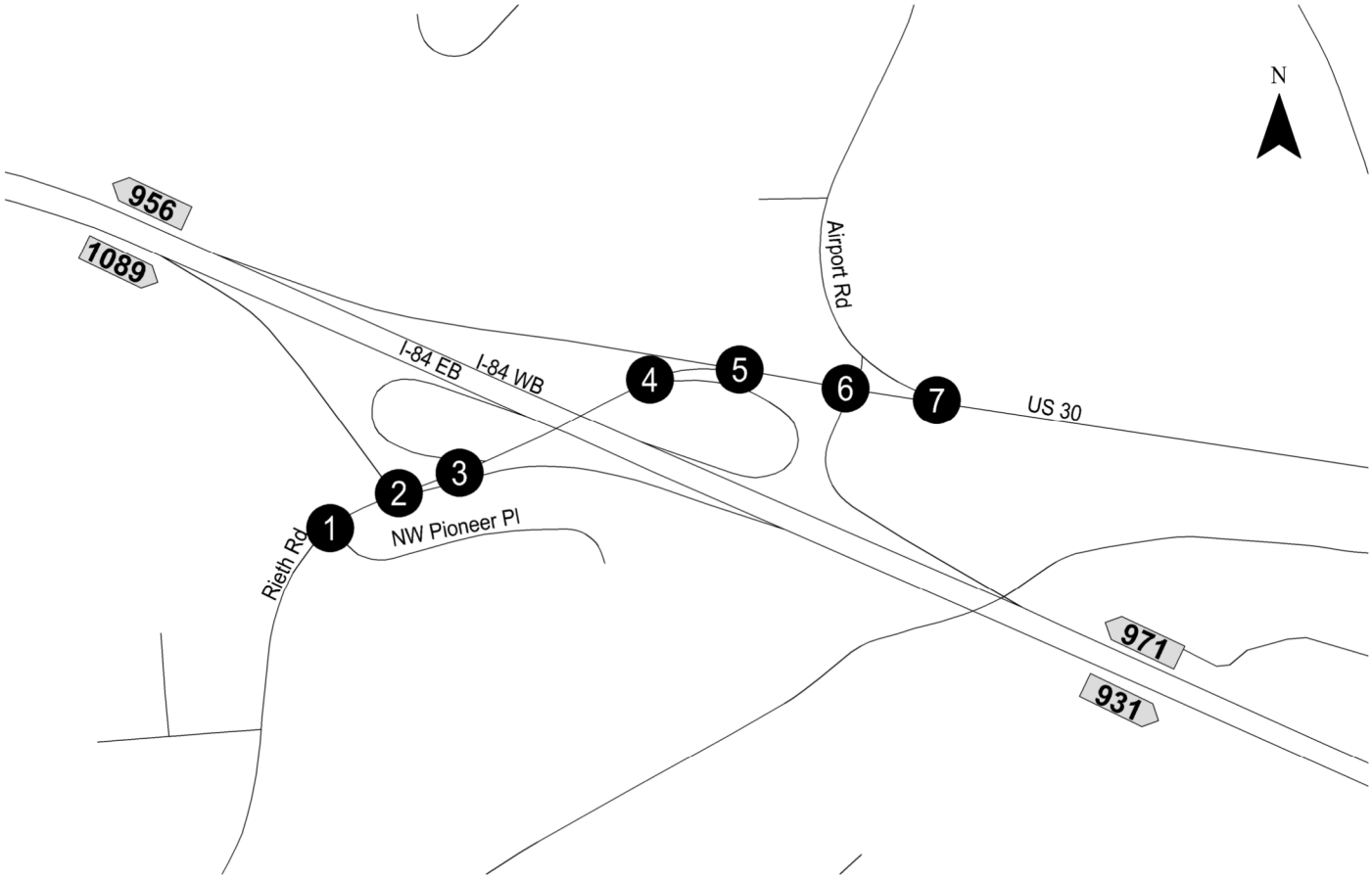
I-84 Merge, Diverge, and Mainline Segments

The results of the year 2040 traffic operations analysis for I-84 merge, diverge, and mainline segments are shown in Table 3. As shown in Table 3, all segment v/c ratios are forecast to operate below the target v/c ratio of 0.80 during the AM and PM peak hours. *Freeway operations worksheets are shown in Attachment "C."*

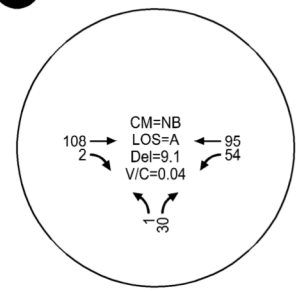
Table 3 I-84 AM and PM Peak Hour Operations

Segment #	Direction	Type	Location	LOS[1]		V/C[2]	
				AM	PM	AM	PM
1	EB	Diverge	W of EB Off-Ramp	B	B	0.34	0.32
2	EB	Main	EB Off-Ramp to EB On-Ramp #1	B	B	0.39	0.34
3	EB	Merge	EB On-Ramp #1	B	B	0.41	0.41
4	EB	Merge	EB On-Ramp #2	B	B	0.31	0.34
5	WB	Diverge	E of WB Off-Ramp	B	B	0.31	0.32
6	WB	Main	WB Off-Ramp to WB On-Ramp #1	A	A	0.27	0.28
7	WB	Merge	WB On-Ramp #1	A	A	0.27	0.29
8	WB	Merge	WB On-Ramp #2	B	B	0.35	0.40

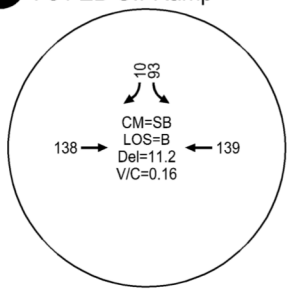
[1]Level-of-service – defined in terms of vehicle density (passenger car/mile/lane).
[2] Volume-to-capacity ratio. For merge/diverge segments, the reported v/c indicates worst-case for either the ramp or mainline facilities.



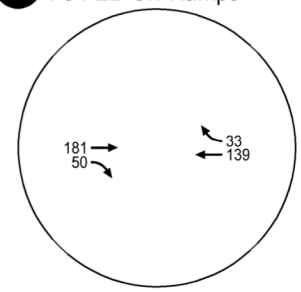
1 Rieth Rd / NW Pioneer Pl



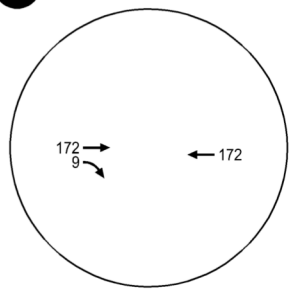
2 US 30 / I-84 EB Off-Ramp



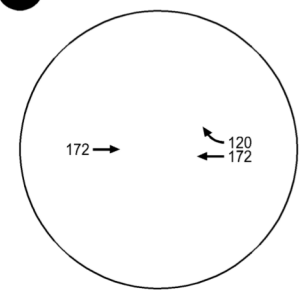
3 US 30 / I-84 EB On-Ramps



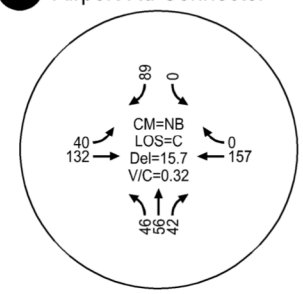
4 US 30 / I-84 WB On-Ramp



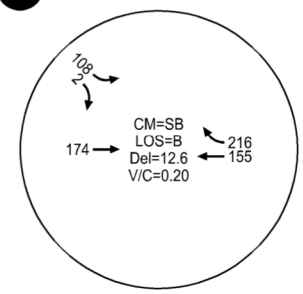
5 US 30 / I-84 WB On-Ramp



6 US 30 / I-84 WB Off-Ramp / Airport Rd Connector



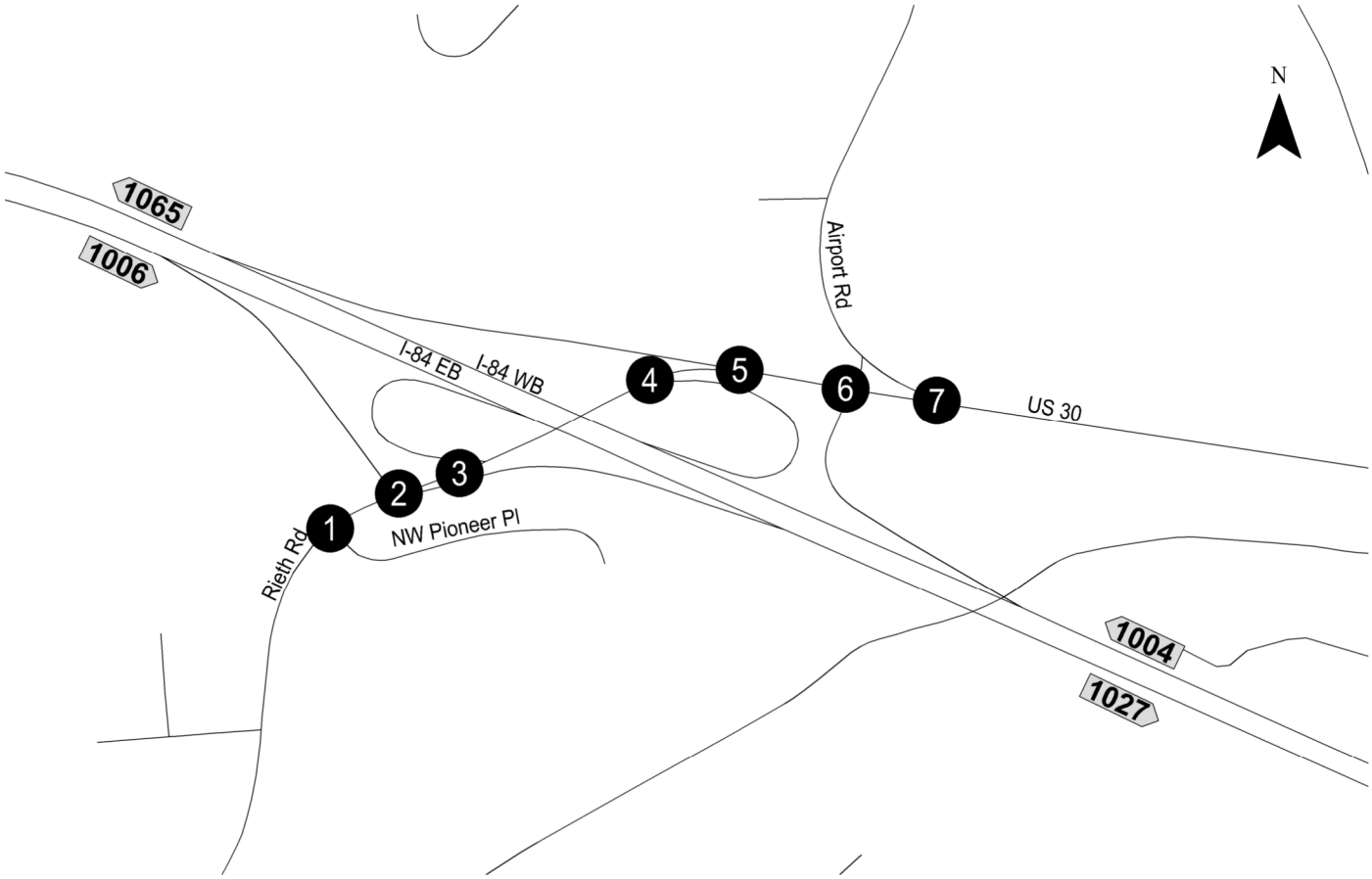
7 Airport Rd / US 30

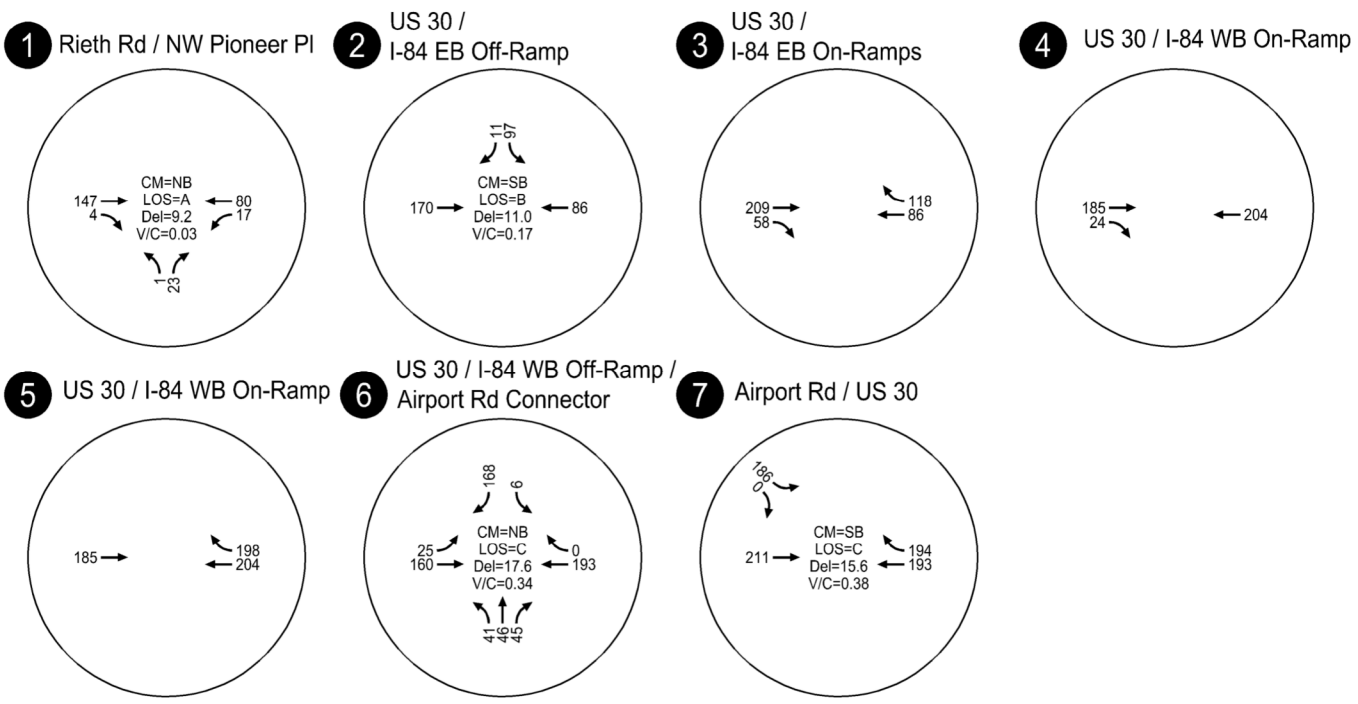


- Study Intersections
CM - Critical Movement
LOS - Level of Service
Del - Vehicle Delay (s)
V/C - Volume-To-Capacity Ratio
- I-84 Peak Hour Volume

Future AM Peak Hour Traffic Operations
Exit 207
Pendleton, OR

Figure
1





- Study Intersections
CM - Critical Movement
LOS - Level of Service
Del - Vehicle Delay (s)
V/C - Volume-To-Capacity Ratio
- I-84 Peak Hour Volume

Future PM Peak Hour Traffic Operations
Exit 207
Pendleton, OR

Figure
2

NEXT STEPS

The project team will review the findings of these analyses with the project Technical and Citizen Advisory Committees (TAC/CAC). The results of these findings will be used to create project alternatives for the Exit 207 interchange area. These alternatives may include modifications related to the Exit 207 interchange, local circulation and/or access, and/or land development requirements/guidelines.

REFERENCES

1. Kittelson and Associates, Inc. *Pendleton IAMPs: Exit 207 – Existing Conditions: System Inventory.* 2019.
2. Oregon Department of Transportation. *Analysis Procedures Manual – Version 2*. 2019.
3. Kittelson and Associates, Inc. *Pendleton IAMPs: Exit 207 – Existing Conditions: Transportation System Operations.* 2019.

Attachment A
Future Land Use Analysis
Memorandum

MEMORANDUM

Future Land Use Analysis

Pendleton Exit 207 IAMP - Task 6.1

DATE	January 28, 2019
TO	Nick Foster and Matt Hughart, KAI
FROM	Darci Rudzinski, and Clinton "CJ" Doxsee, APG

OVERVIEW

This memorandum presents assumptions and analysis for future land uses in the Interchange Management Study Area (IMSA). It addresses Task 6.1 of the Pendleton Interchange Area Management Plan (IAMP) for Exit 207. The following land use assumptions are based on the development potential of vacant parcels in the IMSA, the development patterns demonstrated in Pendleton and other Oregon communities, and anticipated development resulting from extending City services. The assumptions will be used to inform modeling future traffic conditions in the IMSA over the course of the year 2040 planning horizon.

EXISTING CONDITIONS

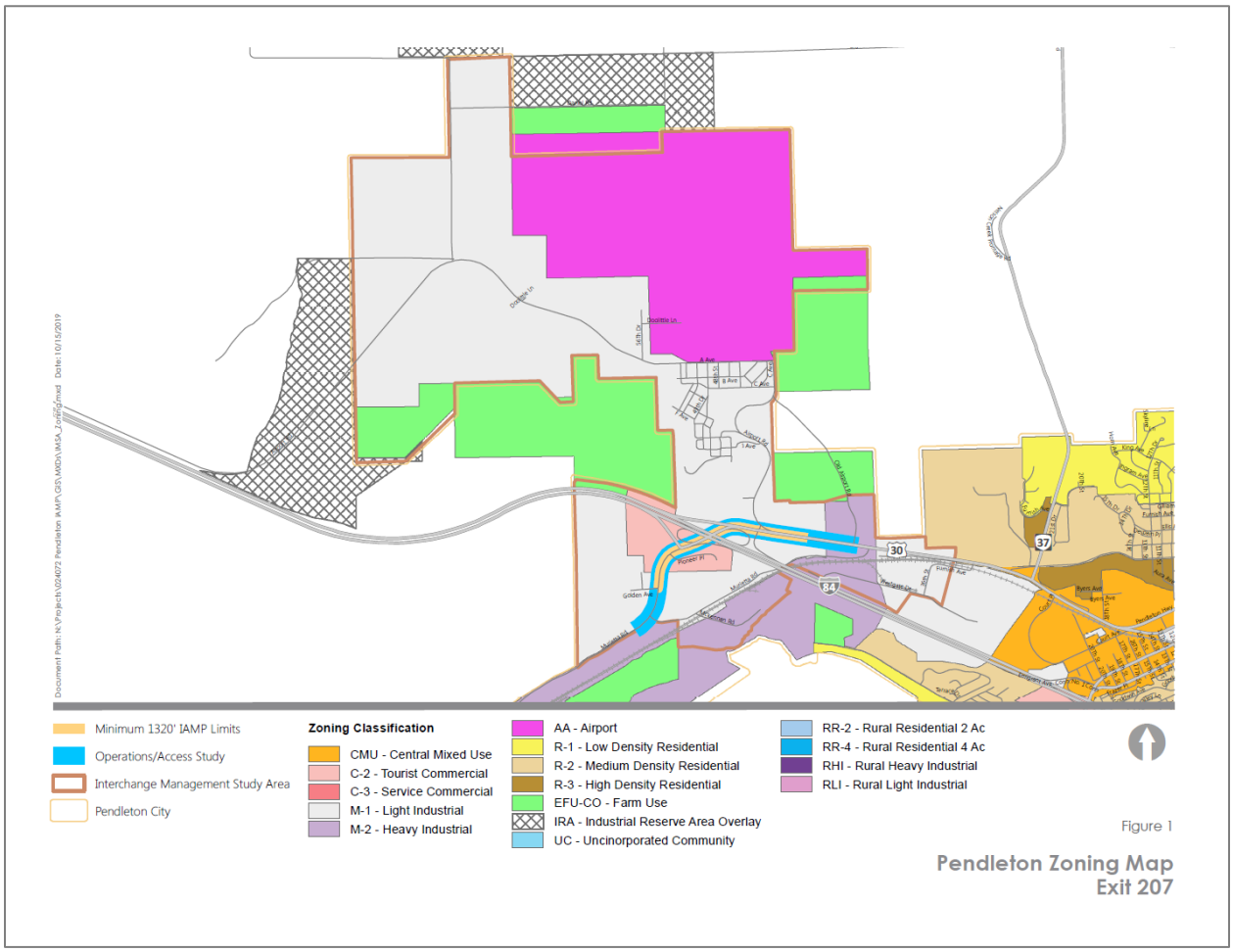
Current Uses and Zoning

As identified in *Technical Memorandum #2: Existing Conditions – Land Use and Demographics Overview*, there are areas of vacant land within the IMSA. These areas represent the most significant development potential in the IMSA.

As shown on Figure 1, parcels within the IMSA all have City of Pendleton zoning applied to them. The City of Pendleton Unified Development Code implements the policy established in the Comprehensive Plan and regulates development through zoning designations and provisions that apply generally to all development and specifically to land divisions. The following zones are found within the IMSA and within the UGB.

- AA - Airport
- C-2 – Tourist Commercial
- EFU-CO – Farm Use
- M-1 – Light Industrial
- M-2 – Heavy Industrial

Figure 1: Zoning



North of the Interchange

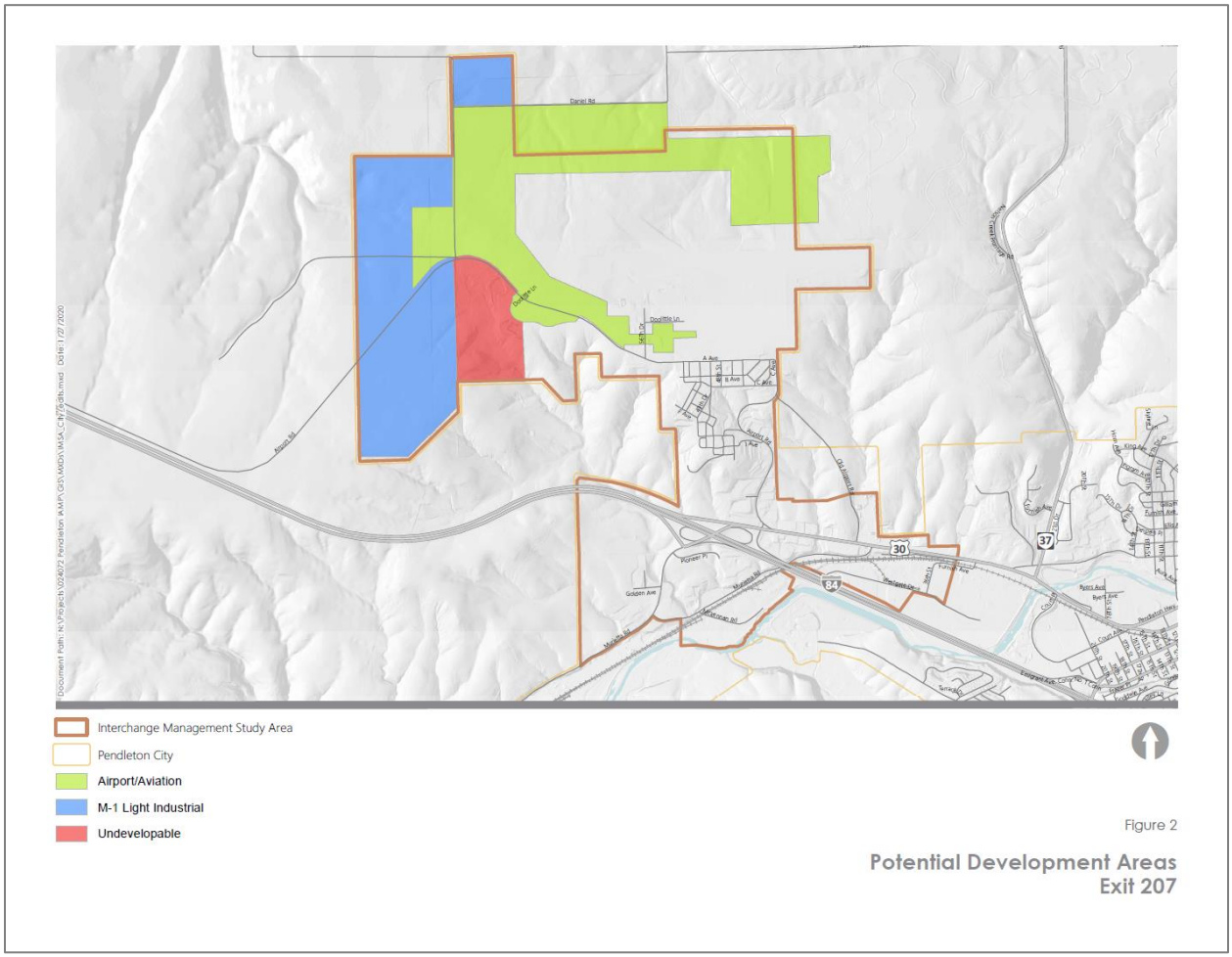
Land north of the interchange is predominantly zoned either AA (Airport) or M-1 (Light Industrial). There are also limited areas within this portion of the IMSA that are zoned EFU-CO (Farm Use) that are located further north and west.

Most of the area north of the interchange to the airport is developed. In the northern portions of the IMSA area current uses predominantly include the airport and airport supportive uses. Other existing uses include airport supportive uses and light industrial development located directly south of the airport on A, B, and C Avenues and directly north of the interchange on Airport Road.

Based on discussions with City staff, the areas located west and north of the airport are currently vacant and there are plans to have city services extended to them. The provision of city services will make these areas more readily developable. These developable areas are generally bounded by Airport Road to the south, city limits to the west, and Daniel Road to the north. In addition, a portion of the area is associated with the closed and capped City landfill and is not developable. See Figure 2.

According to recent County Assessor tax lot information, other vacant and developable areas are located closer to the interchange and west of Airport Road. All vacant or developable areas north of the interchange are zoned either M-1 or AA.

Figure 2: Airport Developable Area



South of the Interchange

Land south of the interchange is predominantly zoned C-2 (Tourist Commercial), M-1 (Light Industrial), and M-2 (Heavy Industrial). The C-2 zoned areas are located closest to the interchange on either side of Murietta Road. The land beyond is primarily zoned M-1. The M-2 zoned areas are located furthest south, across the railroad tracks.

The area has a mix of vacant and developed properties. Most of the vacant properties are zoned M-1.

Land Use Designations and Development Standards

All development in the vicinity of the interchange will have some impact on the facility, so it is important to review the zoning for surrounding parcels and connecting roads. Permitted land uses and the applicable standards associated with the zone designations are an indicator of the potential growth in the area. Recommendations for restricting uses or modifying development standards (e.g. restricting uses with high traffic generation rates or limiting building size) are possible outcomes of the IAMP process.

Residential Uses

There are not residentially zoned areas within the IMSA.

Commercial Uses

Within the IMSA, land zoned for commercial uses – C-2 zoning – is located south of the interchange along Murietta Road. The stated purpose of the C-2 zone is to provide areas suitable for motels, restaurants, service stations, and other similar uses for the accommodation of tourists or travelers. The list of permitted uses is consistent the purpose statement and include eating and drinking establishments, hotels/motels/similar lodging, service stations, and information centers. Conditional uses in the zone include transit facilities, transportation and utility services, and health care services. There are no minimum lot size or maximum lot coverage requirements in the C-2 zone.

Industrial Uses

Land zoned for light industrial uses – M-1 zoning – is located around the interchange, both north and south of I-84. The M-1 zoning extends northward along the west side of the airport. The stated purpose of the M-1 zone is to accommodate a wide range of manufacturing and allied uses that need generally flat topography and easy access to arterials and intermodal shipping facilities.[1] There is a wide range of permitted uses in the zone, including building materials retail, general business services, vehicle/general repair, general light industrial, wholesaling, and transfer stations. Uses that are permitted as conditional uses are either more commercial in nature or more intensive heavy industrial uses. Commercial-oriented uses include restaurants, hotels/motels/other lodging, and recreation. Heavy industrial uses include junk yards, pipeline facilities, landfills, or industrial and agricultural chemicals paint. Minimum lot sizes range from between 0.5 and 5 acres. There are no maximum lot coverage requirements.

The Eastern Oregon Regional Airport and surrounding land is zoned Airport Activities Zone (AA). The purpose of the AA zone is to protect the lands adjacent to the airport runway and terminal areas from incompatible development, while providing lands for airport-related and agricultural uses. The list of permitted uses in the zone are primarily limited to airport-related services or industries or farming and forestry activities. Other similar uses may be permitted as a conditional use by the Pendleton Planning Commission. There are no minimum lot size or maximum lot coverage requirements, however all development in the zone is required to comply with the airport hazard subdistrict standards, which primarily regulate maximum building height.

Land zoned for heavy industrial uses – M-2 zoning – is located south of the interchange. The stated purpose of the M-2 accommodate a wide range of manufacturing and allied establishments that are

[1] Note, the purpose statement also references preservation of industrial sites near the airport by limiting uses to those specified in the Pendleton Economic Opportunities Analysis (EOA), however the EOA document is not available at the time of this analysis.

near major transportation facilities. Similar to the M-1 zone, minimum lot sizes range from between 0.5 and 5 acres. There are not maximum lot coverage requirements.

Agricultural Uses

A limited area within the IMSA are located within the city's UGB and have the EFU zone applied to them. The purpose of the EFU zone is to preserve agricultural lands and scenic resources. However, for the purposes of this analysis, the area is assumed to develop according to the city's Comprehensive Plan designation of Regional Distribution Center. This designation is intended to provide for large distribution center type of developments – a type of industrial use.

FUTURE LAND USES AND ASSUMPTIONS

The IMSA includes a variety of land uses, including commercial, industrial, airport-related, and exclusive farm use. For the purpose of forecasting future development potential, the study area was divided into 12 sub-areas, as illustrated in Figure 3. Each sub-area corresponds to a transportation analysis zone (TAZ) from the Oregon Department of Transportation's travel demand model.

Figure 3: Study Sub-areas

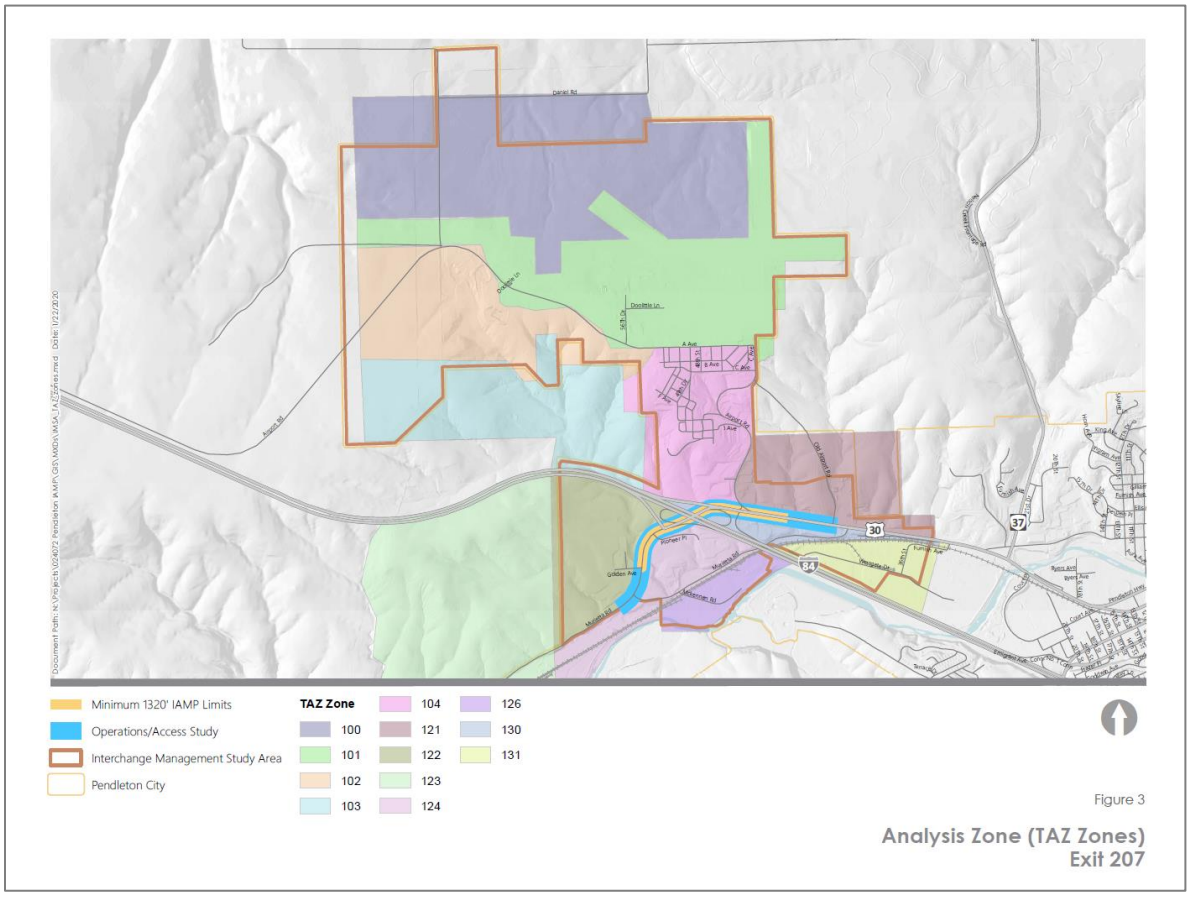
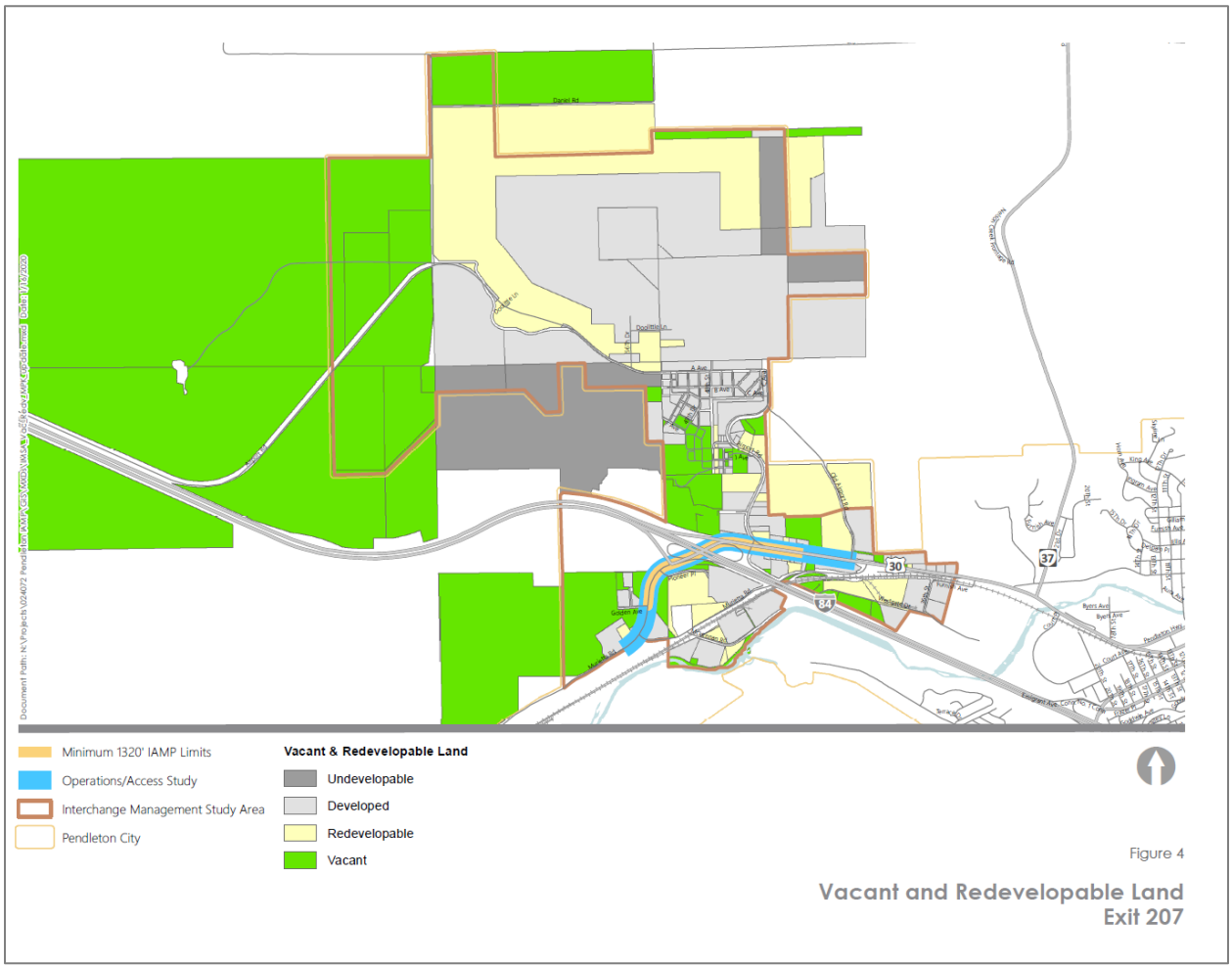


Figure 4: Vacant & Redevelopable Land (note, only land within IMSA considered in forecast)



The analysis of future land uses within the IMSA focused on parcels that are vacant or expected to have redevelopment potential that would generate traffic (see Figure 4). The analysis factored the following assumptions to determine buildout potential growth:

- The net vacant and redevelopable acres were calculated assuming a 20% reduction to account for utilities and right-of-way dedications.
- The floor-area-ratio (FAR) for commercial zones (C-2) is assumed to be 0.20. A FAR of 0.20 reflects a range of typical auto-oriented commercial development types.
- The floor-area-ratio (FAR) for industrial zones (AA, M-1, and M-2) is assumed to be 0.05. A FAR of 0.05 reflects low-density industrial development types.
- Areas zoned EFU-CO are assumed to develop according to their Comprehensive Plan designation as Regional Distribution Center. It is assumed to be an industrial use type with a FAR of 0.05.
- Standard employee per square foot ratios were used to estimate the number of employees associated with the amount of new development. The ratio assumed 400 square feet per employee for commercial development and 2,000 square feet per employee for industrial development.

Table 1: Residential & Commercial/Industrial Full Buildout Forecast

SUB-AREA & ZONE	Gross Vacant/ Redevelopable Acres	Net Vacant/ Redevelopable Acres	Size (1,000 Sq. Ft. GLA)	Employees[2]	Dwellings at Min. Density	Dwellings at Max Density
100	**359**	**287**	**625**	**309**	**0**	**0**
AA	143	114	249	123	0	0
M-1	216	173	376	186	0	0
101	**163**	**130**	**284**	**139**	**0**	**0**
AA	12	10	21	10	0	0
M-1	151	121	263	129	0	0
102	**144**	**115**	**250**	**120**	**0**	**0**
M-1	144	115	250	120	0	0
103	**88**	**70**	**153**	**74**	**0**	**0**
EFU-CO	60	48	105	51	0	0
M-1	28	22	48	23	0	0
104	**115**	**92**	**200**	**92**	**0**	**0**
EFU-CO	0	0	0	0	0	0
M-1	115	92	200	92	0	0
106	**3**	**3**	**6**	**2**	**0**	**0**
AA	3	2	5	2	0	0
M-1	1	1	1	0	0	0
121	**41**	**33**	**71**	**29**	**0**	**0**
EFU-CO	1	1	2	0	0	0
M-1	22	18	39	15	0	0
M-2	18	14	31	14	0	0
122	**90**	**72**	**192**	**188**	**0**	**0**
C-2	7	5	47	117	0	0
M-1	83	67	145	71	0	0
124	**45**	**36**	**165**	**311**	**0**	**0**
C-2	17	13	117	289	0	0
M-1	28	22	49	22	0	0
125	**1**	**1**	**1**	**0**	**0**	**0**
M-2	1	1	1	0	0	0
126	**15**	**12**	**25**	**10**	**0**	**0**
M-2	15	12	25	10	0	0
129	**0**	**0**	**0**	**0**	**0**	**0**
M-2	0	0	0	0	0	0
130	**7**	**6**	**12**	**3**	**0**	**0**
M-1	5	4	9	2	0	0
M-2	2	1	3	1	0	0
131	**40**	**32**	**70**	**30**	**0**	**0**
M-1	13	10	23	11	0	0
M-2	27	22	47	19	0	0
Outside TAZ	**122**	**98**	**213**	**103**	**0**	**0**
EFU-CO	15	12	26	13	0	0
M-1	107	86	187	90	0	0
Grand Total	**1,232**	**986**	**2,270**	**1,410**	**0**	**0**

[2] Employee calculations rounded down to nearest whole number.

As summarized in Table 1, the full buildout of vacant/redevelopable commercial and industrial land within the IMSA would generate over 2.2 million square feet of gross lease area (GLA) and over 1,400 employees. The bulk of the GLA growth (over 600,000 square feet) and new employees (309) would occur in Sub-area 100, located north and west of the airport. Other sub-areas that would see large increases in the amount of commercial and industrial GLA would include Sub-areas 102 and 103 with over 250,000 square feet of development and over 120 new employees each. Sub-area 124 sees a notable increase in employment with over 500 new employees. This is the due to the large amount of vacant or redevelopable land that is zoned for commercial development.

A partial buildout scenario was also generated that used the same assumptions as those listed above. The partial buildout scenario assumes that 65% of the vacant and redevelopable area will be built out over the planning horizon. This scenario assumes a modest pace of growth. The partial buildout scenario is summarized in Table 2.

Table 1: Residential & Commercial/Industrial Partial (65%) Buildout Forecast

SUB-AREA & ZONE	Gross Vacant/ Redevelopable Acres	Net Vacant/ Redevelopable Acres	Size (1,000 Sq. Ft. GLA)	Employees[3]	Dwellings at Min. Density	Dwellings at Max Density
100	**359**	**187**	**406**	**200**	**0**	**0**
AA	143	74	162	80	0	0
M-1	216	112	244	120	0	0
101	**163**	**85**	**184**	**90**	**0**	**0**
AA	12	6	14	6	0	0
M-1	151	78	171	84	0	0
102	**144**	**75**	**163**	**76**	**0**	**0**
M-1	144	75	163	76	0	0
103	**88**	**46**	**99**	**47**	**0**	**0**
EFU-CO	60	31	68	33	0	0
M-1	28	14	31	14	0	0
104	**115**	**60**	**130**	**58**	**0**	**0**
EFU-CO	0	0	0	0	0	0
M-1	115	60	130	58	0	0
106	**3**	**2**	**4**	**1**	**0**	**0**
AA	3	1	3	1	0	0
M-1	1	0	1	0	0	0
121	**41**	**21**	**46**	**18**	**0**	**0**
EFU-CO	1	1	1	0	0	0
M-1	22	12	25	9	0	0
M-2	18	9	20	9	0	0
122	**90**	**47**	**125**	**121**	**0**	**0**
C-2	7	4	31	75	0	0
M-1	83	43	94	46	0	0
124	**45**	**23**	**108**	**202**	**0**	**0**
C-2	17	9	76	187	0	0

[3] Employee calculations rounded down to nearest whole number.

SUB-AREA & ZONE	Gross Vacant/ Redevelopable Acres	Net Vacant/ Redevelopable Acres	Size (1,000 Sq. Ft. GLA)	Employees[3]	Dwellings at Min. Density	Dwellings at Max Density
M-1	28	15	32	15	0	0
125	**1**	**0**	**1**	**0**	**0**	**0**
M-2	1	0	1	0	0	0
126	**15**	**8**	**17**	**5**	**0**	**0**
M-2	15	8	17	5	0	0
129	**0**	**0**	**0**	**0**	**0**	**0**
M-2	0	0	0	0	0	0
130	**7**	**4**	**8**	**1**	**0**	**0**
M-1	5	3	6	1	0	0
M-2	2	1	2	0	0	0
131	**40**	**21**	**45**	**20**	**0**	**0**
M-1	13	7	15	7	0	0
M-2	27	14	31	13	0	0
Outside TAZ	**122**	**64**	**139**	**66**	**0**	**0**
EFU-CO	15	8	17	8	0	0
M-1	107	56	122	58	0	0
Grand Total	1,232	641	1,475	905	0	0

Attachment B
Year 2040 Intersection Operations
Worksheets

Intersection	
Int Delay, s/veh	2.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	108	2	54	95	1	30
Future Vol, veh/h	108	2	54	95	1	30
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	5	-	-	-5	-3	-
Peak Hour Factor	86	86	86	86	86	86
Heavy Vehicles, %	42	0	0	35	0	0
Mvmt Flow	126	2	63	110	1	35

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	128	0	363	127
Stage 1	-	-	-	-	127	-
Stage 2	-	-	-	-	236	-
Critical Hdwy	-	-	4.1	-	5.8	5.9
Critical Hdwy Stg 1	-	-	-	-	4.8	-
Critical Hdwy Stg 2	-	-	-	-	4.8	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1470	-	680	938
Stage 1	-	-	-	-	923	-
Stage 2	-	-	-	-	840	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1470	-	651	938
Mov Cap-2 Maneuver	-	-	-	-	651	-
Stage 1	-	-	-	-	923	-
Stage 2	-	-	-	-	804	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.7	9.1
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	925	-	-	1470	-
HCM Lane V/C Ratio	0.039	-	-	0.043	-
HCM Control Delay (s)	9.1	-	-	7.6	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.1	-

Intersection	
Int Delay, s/veh	3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		⋔	
Traffic Vol, veh/h	0	139	138	0	93	10
Future Vol, veh/h	0	139	138	0	93	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	4	-3	-	-2	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	2	31	19	2	24	8
Mvmt Flow	0	148	147	0	99	11

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	295	147
Stage 1	-	-	-	-	147	-
Stage 2	-	-	-	-	148	-
Critical Hdwy	-	-	-	-	6.24	6.08
Critical Hdwy Stg 1	-	-	-	-	5.24	-
Critical Hdwy Stg 2	-	-	-	-	5.24	-
Follow-up Hdwy	-	-	-	-	3.716	3.372
Pot Cap-1 Maneuver	0	-	-	0	674	892
Stage 1	0	-	-	0	843	-
Stage 2	0	-	-	0	842	-
Platoon blocked, %		-	-			
Mov Cap-1 Maneuver	-	-	-	-	674	892
Mov Cap-2 Maneuver	-	-	-	-	674	-
Stage 1	-	-	-	-	843	-
Stage 2	-	-	-	-	842	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	11.2
HCM LOS			B

Minor Lane/Major Mvmt	EBT	WBT	SBLn1
Capacity (veh/h)	-	-	690
HCM Lane V/C Ratio	-	-	0.159
HCM Control Delay (s)	-	-	11.2
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0.6

Intersection	
Int Delay, s/veh	6.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	40	132	0	0	157	0	46	56	42	0	0	89
Future Vol, veh/h	40	132	0	0	157	0	46	56	42	0	0	89
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	400	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	-2	-	-	3	-	-	5	-	-	-5	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	23	16	0	0	20	0	17	6	10	0	0	32
Mvmt Flow	43	143	0	0	171	0	50	61	46	0	0	97

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	171	0	-	-	-	0	449	400	143	454	400	171
Stage 1	-	-	-	-	-	-	229	229	-	171	171	-
Stage 2	-	-	-	-	-	-	220	171	-	283	229	-
Critical Hdwy	4.33	-	-	-	-	-	8.27	7.56	6.8	6.1	5.5	6.02
Critical Hdwy Stg 1	-	-	-	-	-	-	7.27	6.56	-	5.1	4.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	7.27	6.56	-	5.1	4.5	-
Follow-up Hdwy	2.407	-	-	-	-	-	3.653	4.054	3.39	3.5	4	3.588
Pot Cap-1 Maneuver	1289	-	0	0	-	-	437	476	866	589	605	820
Stage 1	-	-	0	0	-	-	695	664	-	876	798	-
Stage 2	-	-	0	0	-	-	705	715	-	788	766	-
Platoon blocked, %		-			-	-						
Mov Cap-1 Maneuver	1289	-	-	-	-	-	376	460	866	489	585	820
Mov Cap-2 Maneuver	-	-	-	-	-	-	376	460	-	489	585	-
Stage 1	-	-	-	-	-	-	672	642	-	847	798	-
Stage 2	-	-	-	-	-	-	622	715	-	653	741	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.8	0	15.7	10
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	492	1289	-	-	-	820
HCM Lane V/C Ratio	0.318	0.034	-	-	-	0.118
HCM Control Delay (s)	15.7	7.9	-	-	-	10
HCM Lane LOS	C	A	-	-	-	B
HCM 95th %tile Q(veh)	1.4	0.1	-	-	-	0.4

Intersection	
Int Delay, s/veh	2.1

Movement	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations						
Traffic Vol, veh/h	0	174	155	216	108	2
Future Vol, veh/h	0	174	155	216	108	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	-3	3	-	-4	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	15	20	11	12	0
Mvmt Flow	0	189	168	235	117	2

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	475	286
Stage 1	-	-	-	-	286	-
Stage 2	-	-	-	-	189	-
Critical Hdwy	-	-	-	-	5.72	5.8
Critical Hdwy Stg 1	-	-	-	-	4.72	-
Critical Hdwy Stg 2	-	-	-	-	4.72	-
Follow-up Hdwy	-	-	-	-	3.608	3.3
Pot Cap-1 Maneuver	0	-	-	-	590	782
Stage 1	0	-	-	-	789	-
Stage 2	0	-	-	-	855	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	-	-	-	-	590	782
Mov Cap-2 Maneuver	-	-	-	-	590	-
Stage 1	-	-	-	-	789	-
Stage 2	-	-	-	-	855	-

Approach	EB	WB	SE
HCM Control Delay, s	0	0	12.6
HCM LOS			B

Minor Lane/Major Mvmt	EBT	WBT	WBR	SELn1
Capacity (veh/h)	-	-	-	593
HCM Lane V/C Ratio	-	-	-	0.202
HCM Control Delay (s)	-	-	-	12.6
HCM Lane LOS	-	-	-	B
HCM 95th %tile Q(veh)	-	-	-	0.7

Intersection	
Int Delay, s/veh	1.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	147	4	17	80	1	23
Future Vol, veh/h	147	4	17	80	1	23
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	5	-	-	-5	-3	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	7	0	0	17	0	0
Mvmt Flow	162	4	19	88	1	25

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	166	0	290	164
Stage 1	-	-	-	-	164	-
Stage 2	-	-	-	-	126	-
Critical Hdwy	-	-	4.1	-	5.8	5.9
Critical Hdwy Stg 1	-	-	-	-	4.8	-
Critical Hdwy Stg 2	-	-	-	-	4.8	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1424	-	740	898
Stage 1	-	-	-	-	894	-
Stage 2	-	-	-	-	924	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1424	-	730	898
Mov Cap-2 Maneuver	-	-	-	-	730	-
Stage 1	-	-	-	-	894	-
Stage 2	-	-	-	-	912	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.3	9.2
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	889	-	-	1424	-
HCM Lane V/C Ratio	0.03	-	-	0.013	-
HCM Control Delay (s)	9.2	-	-	7.6	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	3.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		Y	
Traffic Vol, veh/h	0	170	86	0	97	11
Future Vol, veh/h	0	170	86	0	97	11
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	4	-3	-	-2	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	11	13	0	13	25
Mvmt Flow	0	189	96	0	108	12

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	285	96
Stage 1	-	-	-	-	96	-
Stage 2	-	-	-	-	189	-
Critical Hdwy	-	-	-	-	6.13	6.25
Critical Hdwy Stg 1	-	-	-	-	5.13	-
Critical Hdwy Stg 2	-	-	-	-	5.13	-
Follow-up Hdwy	-	-	-	-	3.617	3.525
Pot Cap-1 Maneuver	0	-	-	0	705	906
Stage 1	0	-	-	0	911	-
Stage 2	0	-	-	0	835	-
Platoon blocked, %		-	-			
Mov Cap-1 Maneuver	-	-	-	-	705	906
Mov Cap-2 Maneuver	-	-	-	-	705	-
Stage 1	-	-	-	-	911	-
Stage 2	-	-	-	-	835	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	11
HCM LOS			B

Minor Lane/Major Mvmt	EBT	WBT	SBLn1
Capacity (veh/h)	-	-	721
HCM Lane V/C Ratio	-	-	0.166
HCM Control Delay (s)	-	-	11
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	0.6

Intersection	
Int Delay, s/veh	6.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	25	160	0	0	193	0	41	46	45	6	0	168
Future Vol, veh/h	25	160	0	0	193	0	41	46	45	6	0	168
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	400	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	-2	-	-	3	-	-	5	-	-	-5	-
Peak Hour Factor	90	90	90	90	90	90	90	90	90	90	90	90
Heavy Vehicles, %	40	7	0	0	10	0	3	21	15	0	0	9
Mvmt Flow	28	178	0	0	214	0	46	51	50	7	0	187

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	214	0	-	-	-	0	542	448	178	499	448	214
Stage 1	-	-	-	-	-	-	234	234	-	214	214	-
Stage 2	-	-	-	-	-	-	308	214	-	285	234	-
Critical Hdwy	4.5	-	-	-	-	-	8.13	7.71	6.85	6.1	5.5	5.79
Critical Hdwy Stg 1	-	-	-	-	-	-	7.13	6.71	-	5.1	4.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	7.13	6.71	-	5.1	4.5	-
Follow-up Hdwy	2.56	-	-	-	-	-	3.527	4.189	3.435	3.5	4	3.381
Pot Cap-1 Maneuver	1160	-	0	0	-	-	387	422	812	557	576	833
Stage 1	-	-	0	0	-	-	719	635	-	841	774	-
Stage 2	-	-	0	0	-	-	642	652	-	786	763	-
Platoon blocked, %		-			-	-						
Mov Cap-1 Maneuver	1160	-	-	-	-	-	295	412	812	465	562	833
Mov Cap-2 Maneuver	-	-	-	-	-	-	295	412	-	465	562	-
Stage 1	-	-	-	-	-	-	702	620	-	821	774	-
Stage 2	-	-	-	-	-	-	498	652	-	660	745	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.1	0	17.6	10.8
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	431	1160	-	-	-	811
HCM Lane V/C Ratio	0.34	0.024	-	-	-	0.238
HCM Control Delay (s)	17.6	8.2	-	-	-	10.8
HCM Lane LOS	C	A	-	-	-	B
HCM 95th %tile Q(veh)	1.5	0.1	-	-	-	0.9

Intersection	
Int Delay, s/veh	3.7

Movement	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations						
Traffic Vol, veh/h	0	211	193	194	186	0
Future Vol, veh/h	0	211	193	194	186	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	-3	3	-	-4	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	0	8	10	8	8	0
Mvmt Flow	0	234	214	216	207	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	-	0	-	0	556	322
Stage 1	-	-	-	-	322	-
Stage 2	-	-	-	-	234	-
Critical Hdwy	-	-	-	-	5.68	5.8
Critical Hdwy Stg 1	-	-	-	-	4.68	-
Critical Hdwy Stg 2	-	-	-	-	4.68	-
Follow-up Hdwy	-	-	-	-	3.572	3.3
Pot Cap-1 Maneuver	0	-	-	-	545	750
Stage 1	0	-	-	-	775	-
Stage 2	0	-	-	-	833	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	-	-	-	-	545	750
Mov Cap-2 Maneuver	-	-	-	-	545	-
Stage 1	-	-	-	-	775	-
Stage 2	-	-	-	-	833	-

Approach	EB	WB	SE
HCM Control Delay, s	0	0	15.6
HCM LOS			C

Minor Lane/Major Mvmt	EBT	WBT	WBR	SELn1
Capacity (veh/h)	-	-	-	545
HCM Lane V/C Ratio	-	-	-	0.379
HCM Control Delay (s)	-	-	-	15.6
HCM Lane LOS	-	-	-	C
HCM 95th %tile Q(veh)	-	-	-	1.8

Attachment C
Year 2040 Freeway Operations
Worksheets

HCS7 Freeway Diverge Report

Project Information			
Analyst	KAI	Date	1/20/2020
Agency		Analysis Year	2040
Jurisdiction	City of Pendleton	Time Period Analyzed	Future AM
Project Description	Exit 207 IAMP - Segment 1 (EB Off-Ramp)	Unit	United States Customary

Geometric Data		
	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	70.0	45.0
Segment Length (L) / Deceleration Length (LA),ft	1500	200
Terrain Type	Specific Grade	Rolling
Percent Grade, %	-3.10	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors		
Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	0.968	0.950
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity		
Demand Volume (Vi)	1089	103
Peak Hour Factor (PHF)	0.88	0.94
Total Trucks, %	30.00	22.00
Single-Unit Trucks (SUT), %	30	-
Tractor-Trailers (TT), %	70	-
Heavy Vehicle Adjustment Factor (fHV)	0.775	0.694
Flow Rate (vi),pc/h	1597	158
Capacity (c), pc/h	4646	1995
Volume-to-Capacity Ratio (v/c)	0.34	0.08

Speed and Density			
Upstream Equilibrium Distance (LEQ), ft	-	Number of Outer Lanes on Freeway (NO)	0
Distance to Upstream Ramp (LUP), ft	-	Speed Index (DS)	0.312
Downstream Equilibrium Distance (LEQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln	-
Distance to Downstream Ramp (LDOWN), ft	-	Off-Ramp Influence Area Speed (SR), mi/h	61.3
Prop. Freeway Vehicles in Lane 1 and 2 (PFD)	1.000	Outer Lanes Freeway Speed (SO), mi/h	76.8
Flow in Lanes 1 and 2 (v12), pc/h	1597	Ramp Junction Speed (S), mi/h	61.3
Flow Entering Ramp-Infl. Area (vR12), pc/h	-	Average Density (D), pc/mi/ln	13.0
Level of Service (LOS)	B	Density in Ramp Influence Area (DR), pc/mi/ln	16.2

HCS7 Freeway Diverge Report

Project Information			
Analyst	KAI	Date	1/20/2020
Agency		Analysis Year	2040
Jurisdiction	City of Pendleton	Time Period Analyzed	Future PM
Project Description	Exit 207 IAMP - Segment 1 (EB Off-Ramp)	Unit	United States Customary

Geometric Data		
	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	70.0	45.0
Segment Length (L) / Deceleration Length (LA),ft	1500	200
Terrain Type	Specific Grade	Rolling
Percent Grade, %	-3.10	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors		
Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	0.968	0.950
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity		
Demand Volume (Vi)	1006	155
Peak Hour Factor (PHF)	0.88	0.94
Total Trucks, %	30.00	14.00
Single-Unit Trucks (SUT), %	30	-
Tractor-Trailers (TT), %	70	-
Heavy Vehicle Adjustment Factor (fHV)	0.775	0.781
Flow Rate (vi),pc/h	1475	211
Capacity (c), pc/h	4646	1995
Volume-to-Capacity Ratio (v/c)	0.32	0.11

Speed and Density			
Upstream Equilibrium Distance (LEQ), ft	-	Number of Outer Lanes on Freeway (NO)	0
Distance to Upstream Ramp (LUP), ft	-	Speed Index (DS)	0.317
Downstream Equilibrium Distance (LEQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln	-
Distance to Downstream Ramp (LDOWN), ft	-	Off-Ramp Influence Area Speed (SR), mi/h	61.1
Prop. Freeway Vehicles in Lane 1 and 2 (PFD)	1.000	Outer Lanes Freeway Speed (SO), mi/h	76.8
Flow in Lanes 1 and 2 (v12), pc/h	1475	Ramp Junction Speed (S), mi/h	61.1
Flow Entering Ramp-Infl. Area (vR12), pc/h	-	Average Density (D), pc/mi/ln	12.1
Level of Service (LOS)	B	Density in Ramp Influence Area (DR), pc/mi/ln	15.1

HCS7 Basic Freeway Report

Project Information

Analyst	KAI	Date	1/20/2020
Agency		Analysis Year	2040
Jurisdiction	City of Pendleton	Time Period Analyzed	Future AM
Project Description	Exit 207 IAMP - Segment 2 (Between EB On and Off Ramps)	Unit	United States Customary

Geometric Data

Number of Lanes, ln	2	Terrain Type	Rolling
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	70.0	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	67.2
Right-Side Lateral Clearance, ft	10		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

Demand Volume veh/h	986	Heavy Vehicle Adjustment Factor (f_{HV})	0.625
Peak Hour Factor	0.88	Flow Rate (V_p), pc/h/ln	896
Total Trucks, %	30.00	Capacity (c), pc/h/ln	2372
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (c_{adj}), pc/h/ln	2296
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.39
Passenger Car Equivalent (E_T)	3.000		

Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	67.2
Right-Side Lateral Clearance Adj. (f_{RLC})	0.0	Density (D), pc/mi/ln	13.3
Total Ramp Density Adjustment	2.8	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	67.2		

HCS7 Basic Freeway Report

Project Information

Analyst	KAI	Date	1/20/2020
Agency		Analysis Year	2040
Jurisdiction	City of Pendleton	Time Period Analyzed	Future PM
Project Description	Exit 207 IAMP - Segment 2 (Between EB On and Off Ramps)	Unit	United States Customary

Geometric Data

Number of Lanes, ln	2	Terrain Type	Rolling
Segment Length (L), ft	-	Percent Grade, %	-
Measured or Base Free-Flow Speed	Base	Grade Length, mi	-
Base Free-Flow Speed (BFFS), mi/h	70.0	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	67.2
Right-Side Lateral Clearance, ft	10		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

Demand Volume veh/h	851	Heavy Vehicle Adjustment Factor (f_{HV})	0.625
Peak Hour Factor	0.88	Flow Rate (V_p), pc/h/ln	774
Total Trucks, %	30.00	Capacity (c), pc/h/ln	2372
Single-Unit Trucks (SUT), %	-	Adjusted Capacity (c_{adj}), pc/h/ln	2296
Tractor-Trailers (TT), %	-	Volume-to-Capacity Ratio (v/c)	0.34
Passenger Car Equivalent (E_T)	3.000		

Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	67.2
Right-Side Lateral Clearance Adj. (f_{RLC})	0.0	Density (D), pc/mi/ln	11.5
Total Ramp Density Adjustment	2.8	Level of Service (LOS)	B
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	67.2		

HCS7 Freeway Merge Report

Project Information			
Analyst	KAI	Date	1/20/2020
Agency		Analysis Year	2040
Jurisdiction	City of Pendleton	Time Period Analyzed	Future AM
Project Description	Exit 207 IAMP - Segment 3 (EB ON-Ramp #1)	Unit	United States Customary

Geometric Data		
	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	70.0	25.0
Segment Length (L) / Acceleration Length (LA),ft	1500	700
Terrain Type	Rolling	Specific Grade
Percent Grade, %	-	-2.00
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors		
Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	0.968	0.950
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity		
Demand Volume (Vi)	1019	33
Peak Hour Factor (PHF)	0.88	0.94
Total Trucks, %	30.00	41.00
Single-Unit Trucks (SUT), %	-	30
Tractor-Trailers (TT), %	-	70
Heavy Vehicle Adjustment Factor (fHV)	0.625	0.715
Flow Rate (vi),pc/h	1853	49
Capacity (c), pc/h	4646	1805
Volume-to-Capacity Ratio (v/c)	0.41	0.03

Speed and Density			
Upstream Equilibrium Distance (LEQ), ft	-	Number of Outer Lanes on Freeway (NO)	0
Distance to Upstream Ramp (LUP), ft	-	Speed Index (MS)	0.312
Downstream Equilibrium Distance (LEQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln	-
Distance to Downstream Ramp (LDOWN), ft	-	On-Ramp Influence Area Speed (SR), mi/h	61.3
Prop. Freeway Vehicles in Lane 1 and 2 (PFM)	1.000	Outer Lanes Freeway Speed (SO), mi/h	70.0
Flow in Lanes 1 and 2 (v12), pc/h	1853	Ramp Junction Speed (S), mi/h	61.3
Flow Entering Ramp-Infl. Area (vR12), pc/h	1902	Average Density (D), pc/mi/ln	15.5
Level of Service (LOS)	B	Density in Ramp Influence Area (DR), pc/mi/ln	16.0

HCS7 Freeway Merge Report

Project Information			
Analyst	KAI	Date	1/20/2020
Agency		Analysis Year	2040
Jurisdiction	City of Pendleton	Time Period Analyzed	Future PM
Project Description	Exit 207 IAMP - Segment 3 (EB On-Ramp #1)	Unit	United States Customary

Geometric Data		
	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	70.0	25.0
Segment Length (L) / Acceleration Length (LA),ft	1500	700
Terrain Type	Rolling	Specific Grade
Percent Grade, %	-	-2.00
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors		
Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	0.968	0.950
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity		
Demand Volume (Vi)	969	118
Peak Hour Factor (PHF)	0.88	0.94
Total Trucks, %	30.00	21.00
Single-Unit Trucks (SUT), %	-	30
Tractor-Trailers (TT), %	-	70
Heavy Vehicle Adjustment Factor (fHV)	0.625	0.828
Flow Rate (vi),pc/h	1762	152
Capacity (c), pc/h	4646	1805
Volume-to-Capacity Ratio (v/c)	0.41	0.08

Speed and Density			
Upstream Equilibrium Distance (LEQ), ft	-	Number of Outer Lanes on Freeway (NO)	0
Distance to Upstream Ramp (LUP), ft	-	Speed Index (MS)	0.312
Downstream Equilibrium Distance (LEQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln	-
Distance to Downstream Ramp (LDOWN), ft	-	On-Ramp Influence Area Speed (SR), mi/h	61.3
Prop. Freeway Vehicles in Lane 1 and 2 (PFM)	1.000	Outer Lanes Freeway Speed (SO), mi/h	70.0
Flow in Lanes 1 and 2 (v12), pc/h	1762	Ramp Junction Speed (S), mi/h	61.3
Flow Entering Ramp-Infl. Area (vR12), pc/h	1914	Average Density (D), pc/mi/ln	15.6
Level of Service (LOS)	B	Density in Ramp Influence Area (DR), pc/mi/ln	16.0

HCS7 Freeway Merge Report

Project Information			
Analyst	KAI	Date	1/20/2020
Agency		Analysis Year	2040
Jurisdiction	City of Pendleton	Time Period Analyzed	Future AM
Project Description	Exit 207 IAMP - Segment 4 (EB On-Ramp #2)		

Geometric Data		
	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	70.0	35.0
Segment Length (L) / Acceleration Length (LA),ft	1500	600
Terrain Type	Specific Grade	Specific Grade
Percent Grade, %	-4.40	-2.80
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors		
Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	0.968	0.950
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity		
Demand Volume (Vi)	931	50
Peak Hour Factor (PHF)	0.88	0.94
Total Trucks, %	30.00	33.00
Single-Unit Trucks (SUT), %	30	30
Tractor-Trailers (TT), %	70	70
Heavy Vehicle Adjustment Factor (fHV)	0.775	0.758
Flow Rate (vi),pc/h	1365	70
Capacity (c), pc/h	4646	1900
Volume-to-Capacity Ratio (v/c)	0.31	0.04

Speed and Density			
Upstream Equilibrium Distance (LEQ), ft	-	Density in Ramp Influence Area (DR), pc/mi/ln	12.9
Distance to Upstream Ramp (LUP), ft	-	Speed Index (M)	0.295
Downstream Equilibrium Distance (LEQ), ft	-	Flow Outer Lanes (vOA), pc/mi/ln	-
Distance to Downstream Ramp (LDOWN), ft	-	On-Ramp Influenece Area Speed (SR), mi/h	61.7
Prop. Freeway Vehicles in Lane 1 and 2 (PM)	1.000	Outer Lanes Freeway Speed (SO), mi/h	-
Flow in Lanes 1 and 2 (v12), pc/h	1365	Ramp Junction Speed (S), mi/h	61.7
Flow Entering Ramp-Infl. Area (vR12), pc/h	1435	Average Density (D), pc/mi/ln	11.6
Level of Service (LOS)	B		

HCS7 Freeway Merge Report

Project Information			
Analyst	KAI	Date	1/20/2020
Agency		Analysis Year	2040
Jurisdiction	City of Pendleton	Time Period Analyzed	Future PM
Project Description	Exit 207 IAMP - Segment 4 (EB On-Ramp #2)	Unit	United States Customary

Geometric Data		
	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	70.0	35.0
Segment Length (L) / Acceleration Length (LA),ft	1500	600
Terrain Type	Specific Grade	Specific Grade
Percent Grade, %	-4.40	-2.80
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors		
Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	0.968	0.950
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity		
Demand Volume (Vi)	1027	58
Peak Hour Factor (PHF)	0.88	0.92
Total Trucks, %	30.00	9.00
Single-Unit Trucks (SUT), %	30	30
Tractor-Trailers (TT), %	70	70
Heavy Vehicle Adjustment Factor (fHV)	0.775	0.907
Flow Rate (vi),pc/h	1506	70
Capacity (c), pc/h	4646	1900
Volume-to-Capacity Ratio (v/c)	0.34	0.04

Speed and Density			
Upstream Equilibrium Distance (LEQ), ft	-	Number of Outer Lanes on Freeway (NO)	0
Distance to Upstream Ramp (LUP), ft	-	Speed Index (MS)	0.298
Downstream Equilibrium Distance (LEQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln	-
Distance to Downstream Ramp (LDOWN), ft	-	On-Ramp Influence Area Speed (SR), mi/h	61.7
Prop. Freeway Vehicles in Lane 1 and 2 (PFM)	1.000	Outer Lanes Freeway Speed (SO), mi/h	70.0
Flow in Lanes 1 and 2 (v12), pc/h	1506	Ramp Junction Speed (S), mi/h	61.7
Flow Entering Ramp-Infl. Area (vR12), pc/h	1576	Average Density (D), pc/mi/ln	12.8
Level of Service (LOS)	B	Density in Ramp Influence Area (DR), pc/mi/ln	14.0

HCS7 Freeway Diverge Report

Project Information			
Analyst	KAI	Date	1/20/2020
Agency		Analysis Year	2040
Jurisdiction	City of Pendleton	Time Period Analyzed	Future AM
Project Description	Exit 207 IAMP - Segment 5 (WB Off-Ramp)	Unit	United States Customary

Geometric Data		
	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	70.0	25.0
Segment Length (L) / Deceleration Length (LA),ft	1500	300
Terrain Type	Specific Grade	Specific Grade
Percent Grade, %	2.70	5.80
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors		
Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	0.968	0.950
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity		
Demand Volume (Vi)	971	144
Peak Hour Factor (PHF)	0.88	0.94
Total Trucks, %	30.00	12.00
Single-Unit Trucks (SUT), %	30	30
Tractor-Trailers (TT), %	70	70
Heavy Vehicle Adjustment Factor (fHV)	0.759	0.859
Flow Rate (vi),pc/h	1454	178
Capacity (c), pc/h	4646	1805
Volume-to-Capacity Ratio (v/c)	0.31	0.10

Speed and Density			
Upstream Equilibrium Distance (LEQ), ft	-	Number of Outer Lanes on Freeway (NO)	0
Distance to Upstream Ramp (LUP), ft	-	Speed Index (DS)	0.574
Downstream Equilibrium Distance (LEQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln	-
Distance to Downstream Ramp (LDOWN), ft	-	Off-Ramp Influence Area Speed (SR), mi/h	53.9
Prop. Freeway Vehicles in Lane 1 and 2 (PFD)	1.000	Outer Lanes Freeway Speed (SO), mi/h	76.8
Flow in Lanes 1 and 2 (v12), pc/h	1454	Ramp Junction Speed (S), mi/h	53.9
Flow Entering Ramp-Infl. Area (vR12), pc/h	-	Average Density (D), pc/mi/ln	13.5
Level of Service (LOS)	B	Density in Ramp Influence Area (DR), pc/mi/ln	14.1

HCS7 Freeway Diverge Report

Project Information			
Analyst	KAI	Date	1/20/2020
Agency		Analysis Year	2040
Jurisdiction	City of Pendleton	Time Period Analyzed	Future PM
Project Description	Exit 207 IAMP - Segment 5 (WB Off-Ramp)	Unit	United States Customary

Geometric Data		
	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	70.0	25.0
Segment Length (L) / Deceleration Length (LA),ft	1500	300
Terrain Type	Specific Grade	Specific Grade
Percent Grade, %	2.70	5.80
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors		
Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	0.968	0.950
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity		
Demand Volume (Vi)	1004	132
Peak Hour Factor (PHF)	0.88	0.94
Total Trucks, %	30.00	13.00
Single-Unit Trucks (SUT), %	30	30
Tractor-Trailers (TT), %	70	70
Heavy Vehicle Adjustment Factor (fHV)	0.759	0.852
Flow Rate (vi),pc/h	1503	165
Capacity (c), pc/h	4646	1805
Volume-to-Capacity Ratio (v/c)	0.32	0.09

Speed and Density			
Upstream Equilibrium Distance (LEQ), ft	-	Number of Outer Lanes on Freeway (NO)	0
Distance to Upstream Ramp (LUP), ft	-	Speed Index (DS)	0.573
Downstream Equilibrium Distance (LEQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln	-
Distance to Downstream Ramp (LDOWN), ft	-	Off-Ramp Influence Area Speed (SR), mi/h	54.0
Prop. Freeway Vehicles in Lane 1 and 2 (PFD)	1.000	Outer Lanes Freeway Speed (SO), mi/h	76.8
Flow in Lanes 1 and 2 (v12), pc/h	1503	Ramp Junction Speed (S), mi/h	54.0
Flow Entering Ramp-Infl. Area (vR12), pc/h	-	Average Density (D), pc/mi/ln	13.9
Level of Service (LOS)	B	Density in Ramp Influence Area (DR), pc/mi/ln	14.5

HCS7 Basic Freeway Report

Project Information

Analyst	KAI	Date	1/21/2020
Agency		Analysis Year	2040
Jurisdiction	City of Pendleton	Time Period Analyzed	Future AM
Project Description	Exit 207 IAMP - Segment 6 (Between WB Off and On Ramps)	Unit	United States Customary

Geometric Data

Number of Lanes, ln	2	Terrain Type	Specific Grade
Segment Length (L), ft	-	Percent Grade, %	2.80
Measured or Base Free-Flow Speed	Base	Grade Length, mi	0.20
Base Free-Flow Speed (BFFS), mi/h	70.0	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	67.2
Right-Side Lateral Clearance, ft	10		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

Demand Volume veh/h	827	Heavy Vehicle Adjustment Factor (f_{HV})	0.765
Peak Hour Factor	0.88	Flow Rate (V_p), pc/h/ln	614
Total Trucks, %	30.00	Capacity (c), pc/h/ln	2372
Single-Unit Trucks (SUT), %	30	Adjusted Capacity (c_{adj}), pc/h/ln	2296
Tractor-Trailers (TT), %	70	Volume-to-Capacity Ratio (v/c)	0.27
Passenger Car Equivalent (E_T)	2.026		

Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	67.2
Right-Side Lateral Clearance Adj. (f_{RLC})	0.0	Density (D), pc/mi/ln	9.1
Total Ramp Density Adjustment	2.8	Level of Service (LOS)	A
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	67.2		

HCS7 Basic Freeway Report

Project Information

Analyst	KAI	Date	1/21/2020
Agency		Analysis Year	2040
Jurisdiction	City of Pendleton	Time Period Analyzed	Future PM
Project Description	Exit 207 IAMP - Segment 6 (Between WB Off and On Ramps)	Unit	United States Customary

Geometric Data

Number of Lanes, ln	2	Terrain Type	Specific Grade
Segment Length (L), ft	-	Percent Grade, %	2.80
Measured or Base Free-Flow Speed	Base	Grade Length, mi	0.20
Base Free-Flow Speed (BFFS), mi/h	70.0	Total Ramp Density (TRD), ramps/mi	0.83
Lane Width, ft	12	Free-Flow Speed (FFS), mi/h	67.2
Right-Side Lateral Clearance, ft	10		

Adjustment Factors

Driver Population	All Familiar	Final Speed Adjustment Factor (SAF)	1.000
Weather Type	Non-Severe Weather	Final Capacity Adjustment Factor (CAF)	0.968
Incident Type	No Incident	Demand Adjustment Factor (DAF)	1.000

Demand and Capacity

Demand Volume veh/h	872	Heavy Vehicle Adjustment Factor (f_{HV})	0.765
Peak Hour Factor	0.88	Flow Rate (V_p), pc/h/ln	648
Total Trucks, %	30.00	Capacity (c), pc/h/ln	2372
Single-Unit Trucks (SUT), %	30	Adjusted Capacity (c_{adj}), pc/h/ln	2296
Tractor-Trailers (TT), %	70	Volume-to-Capacity Ratio (v/c)	0.28
Passenger Car Equivalent (E_T)	2.026		

Speed and Density

Lane Width Adjustment (f_{LW})	0.0	Average Speed (S), mi/h	67.2
Right-Side Lateral Clearance Adj. (f_{RLC})	0.0	Density (D), pc/mi/ln	9.6
Total Ramp Density Adjustment	2.8	Level of Service (LOS)	A
Adjusted Free-Flow Speed (FFS_{adj}), mi/h	67.2		

HCS7 Freeway Merge Report

Project Information			
Analyst	KAI	Date	1/21/2020
Agency		Analysis Year	2040
Jurisdiction	City of Pendleton	Time Period Analyzed	Future AM
Project Description	Exit 207 IAMP - Segment 7 (WB On-Ramp #1)	Unit	United States Customary

Geometric Data		
	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	70.0	25.0
Segment Length (L) / Acceleration Length (LA),ft	1500	900
Terrain Type	Specific Grade	Specific Grade
Percent Grade, %	2.80	-3.40
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors		
Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	0.968	0.950
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity		
Demand Volume (Vi)	836	9
Peak Hour Factor (PHF)	0.88	0.94
Total Trucks, %	30.00	43.00
Single-Unit Trucks (SUT), %	30	30
Tractor-Trailers (TT), %	70	70
Heavy Vehicle Adjustment Factor (fHV)	0.765	0.706
Flow Rate (vi),pc/h	1242	14
Capacity (c), pc/h	4646	1805
Volume-to-Capacity Ratio (v/c)	0.27	0.01

Speed and Density			
Upstream Equilibrium Distance (LEQ), ft	-	Number of Outer Lanes on Freeway (NO)	0
Distance to Upstream Ramp (LUP), ft	-	Speed Index (MS)	0.290
Downstream Equilibrium Distance (LEQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln	-
Distance to Downstream Ramp (LDOWN), ft	-	On-Ramp Influence Area Speed (SR), mi/h	61.9
Prop. Freeway Vehicles in Lane 1 and 2 (PFM)	1.000	Outer Lanes Freeway Speed (SO), mi/h	70.0
Flow in Lanes 1 and 2 (v12), pc/h	1242	Ramp Junction Speed (S), mi/h	61.9
Flow Entering Ramp-Infl. Area (vR12), pc/h	1256	Average Density (D), pc/mi/ln	10.1
Level of Service (LOS)	A	Density in Ramp Influence Area (DR), pc/mi/ln	9.7

HCS7 Freeway Merge Report

Project Information			
Analyst	KAI	Date	1/21/2020
Agency		Analysis Year	2040
Jurisdiction	City of Pendleton	Time Period Analyzed	Future PM
Project Description	Exit 207 IAMP - Segment 7 (WB On-Ramp #1)		

Geometric Data		
	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	70.0	25.0
Segment Length (L) / Acceleration Length (LA),ft	1500	900
Terrain Type	Specific Grade	Specific Grade
Percent Grade, %	2.80	-3.40
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors		
Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	0.968	0.950
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity		
Demand Volume (Vi)	872	24
Peak Hour Factor (PHF)	0.88	0.88
Total Trucks, %	30.00	20.00
Single-Unit Trucks (SUT), %	30	30
Tractor-Trailers (TT), %	70	70
Heavy Vehicle Adjustment Factor (fHV)	0.765	0.835
Flow Rate (vi),pc/h	1295	33
Capacity (c), pc/h	4646	1805
Volume-to-Capacity Ratio (v/c)	0.29	0.02

Speed and Density			
Upstream Equilibrium Distance (LEQ), ft	-	Density in Ramp Influence Area (DR), pc/mi/ln	10.2
Distance to Upstream Ramp (LUP), ft	-	Speed Index (M)	0.291
Downstream Equilibrium Distance (LEQ), ft	-	Flow Outer Lanes (vOA), pc/mi/ln	-
Distance to Downstream Ramp (LDOWN), ft	-	On-Ramp Influenece Area Speed (SR), mi/h	61.9
Prop. Freeway Vehicles in Lane 1 and 2 (PM)	1.000	Outer Lanes Freeway Speed (SO), mi/h	-
Flow in Lanes 1 and 2 (v12), pc/h	1295	Ramp Junction Speed (S), mi/h	61.9
Flow Entering Ramp-Infl. Area (vR12), pc/h	1328	Average Density (D), pc/mi/ln	10.7
Level of Service (LOS)	B		

HCS7 Freeway Merge Report

Project Information			
Analyst	KAI	Date	1/21/2020
Agency		Analysis Year	2040
Jurisdiction	City of Pendleton	Time Period Analyzed	Future AM
Project Description	Exit 207 IAMP - Segment 8 (WB On-Ramp #2)	Unit	United States Customary

Geometric Data		
	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	70.0	45.0
Segment Length (L) / Acceleration Length (LA),ft	1500	750
Terrain Type	Specific Grade	Rolling
Percent Grade, %	2.40	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors		
Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	0.968	0.950
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity		
Demand Volume (Vi)	956	120
Peak Hour Factor (PHF)	0.88	0.94
Total Trucks, %	30.00	33.00
Single-Unit Trucks (SUT), %	30	-
Tractor-Trailers (TT), %	70	-
Heavy Vehicle Adjustment Factor (fHV)	0.761	0.602
Flow Rate (vi),pc/h	1428	212
Capacity (c), pc/h	4646	1995
Volume-to-Capacity Ratio (v/c)	0.35	0.11

Speed and Density			
Upstream Equilibrium Distance (LEQ), ft	-	Number of Outer Lanes on Freeway (NO)	0
Distance to Upstream Ramp (LUP), ft	-	Speed Index (MS)	0.274
Downstream Equilibrium Distance (LEQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln	-
Distance to Downstream Ramp (LDOWN), ft	-	On-Ramp Influence Area Speed (SR), mi/h	62.3
Prop. Freeway Vehicles in Lane 1 and 2 (PFM)	1.000	Outer Lanes Freeway Speed (SO), mi/h	70.0
Flow in Lanes 1 and 2 (v12), pc/h	1428	Ramp Junction Speed (S), mi/h	62.3
Flow Entering Ramp-Infl. Area (vR12), pc/h	1640	Average Density (D), pc/mi/ln	13.2
Level of Service (LOS)	B	Density in Ramp Influence Area (DR), pc/mi/ln	13.5

HCS7 Freeway Merge Report

Project Information			
Analyst	KAI	Date	1/21/2020
Agency		Analysis Year	2040
Jurisdiction	City of Pendleton	Time Period Analyzed	Future PM
Project Description	Exit 207 IAMP - Segment 8 (WB On-Ramp #2)	Unit	United States Customary

Geometric Data		
	Freeway	Ramp
Number of Lanes (N), ln	2	1
Free-Flow Speed (FFS), mi/h	70.0	45.0
Segment Length (L) / Acceleration Length (LA),ft	1500	750
Terrain Type	Specific Grade	Rolling
Percent Grade, %	2.40	-
Segment Type / Ramp Side	Freeway	Right

Adjustment Factors		
Driver Population	All Familiar	All Familiar
Weather Type	Non-Severe Weather	Non-Severe Weather
Incident Type	No Incident	-
Final Speed Adjustment Factor (SAF)	1.000	1.000
Final Capacity Adjustment Factor (CAF)	0.968	0.950
Demand Adjustment Factor (DAF)	1.000	1.000

Demand and Capacity		
Demand Volume (Vi)	1065	198
Peak Hour Factor (PHF)	0.88	0.88
Total Trucks, %	30.00	10.00
Single-Unit Trucks (SUT), %	30	-
Tractor-Trailers (TT), %	70	-
Heavy Vehicle Adjustment Factor (fHV)	0.761	0.833
Flow Rate (vi),pc/h	1590	270
Capacity (c), pc/h	4646	1995
Volume-to-Capacity Ratio (v/c)	0.40	0.14

Speed and Density			
Upstream Equilibrium Distance (LEQ), ft	-	Number of Outer Lanes on Freeway (NO)	0
Distance to Upstream Ramp (LUP), ft	-	Speed Index (MS)	0.279
Downstream Equilibrium Distance (LEQ), ft	-	Flow Outer Lanes (vOA), pc/h/ln	-
Distance to Downstream Ramp (LDOWN), ft	-	On-Ramp Influence Area Speed (SR), mi/h	62.2
Prop. Freeway Vehicles in Lane 1 and 2 (PFM)	1.000	Outer Lanes Freeway Speed (SO), mi/h	70.0
Flow in Lanes 1 and 2 (v12), pc/h	1590	Ramp Junction Speed (S), mi/h	62.2
Flow Entering Ramp-Infl. Area (vR12), pc/h	1860	Average Density (D), pc/mi/ln	15.0
Level of Service (LOS)	B	Density in Ramp Influence Area (DR), pc/mi/ln	15.2