ADDENDUM TO THE INTERCHANGE JUSTIFICATION STUDY



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FOR THE TENNESSEE DEPARTMENT OF TRANSPORTATION PROJECT PLANNING DIVISION

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TABLE OF CONTENTS

CHAPTER 1	INTRODUCTION	
	A. Purpose of Addendum	1
	B. Description of Project Location	1
	C. Relationship to Other Transportation Improvement Plans and Classifications	5
CHAPTER 2	CHANGES IN PRELIMINARY PLANNING DATA	
	A. Land Use	7
	B. Updated Traffic Projections	7
	C. Modifications in Proposed Improvements	10
CHAPTER 3	ENGINEERING INVESTIGATIONS	
	A. Traffic Operations	12
	B. Cost Update	16
	C. Environmental Concerns	16
	D. Access Analysis Update	16
CHAPTER 4	SUMMARY AND CONCLUSIONS	20
	A. Local Commitment	21

TABLE OF CONTENTS (CON'T.)

FIGURES AND TABLES

Figure 1	Project Area Map	3
Figure 2	Project Location Map	4
Figure 3	Proposed Alignment of North-South Connector	6
Figure 4	Base and Future Annual Average Daily Traffic, Existing System	8
Figure 5	Base and Future Annual Average Daily Traffic, Proposed System	9
Table 1	Operational Analysis Summary	13-14

APPENDIX

Traffic Projections	2
Level of Service Analysis, Existing System	10
Base Year 2013, Interstate 40 Mainline	13
Base Year 2013, Interstate 40 at State Route 56 (Baxter Road)	34
Base Year 2013, Interstate 40 at State Route 135 (S. Willow Avenue)	53
Future Year 2033, Interstate 40 Mainline	78
Future Year 2033, Interstate 40 at State Route 56 (Baxter Road)	99
Future Year 2033, Interstate 40 at State Route 135 (S. Willow Avenue)	118
Level of Service Analysis, Proposed System	143
Base Year 2013, Interstate 40 Mainline	146
Base Year 2013, Interstate 40 at State Route 56 (Baxter Road)	175
Base Year 2013, Interstate 40 at Mine Lick Creek Road	194
Base Year 2013, Interstate 40 at State Route 135 (S. Willow Avenue)	219
Base Year 2013, Bennett Road at Lee Seminary Road	244
Future Year 2033, Interstate 40 Mainline	249
Future Year 2033, Interstate 40 at State Route 56 (Baxter Road)	278
Future Year 2033, Interstate 40 at Mine Lick Creek Road	297
Future Year 2033, Interstate 40 at State Route 135 (S. Willow Avenue)	322
Future Year 2033, Bennett Road at Lee Seminary Road	347
Cost Estimate Data	352
Functional Drawings	356

<u>Page</u>

CHAPTER 1

INTRODUCTION

A. Purpose of Addendum

The purpose of this addendum is to update the information provided in the Interchange Justification Study (IJS) for Interstate 40 (I-40) at Mine Lick Creek Road just west of the City of Cookeville in Putnam County (see Figure 1).

An Interchange Justification Study was developed by TDOT in August 2000 for this location and was subsequently approved by FHWA. Since that time, some changes have occurred in both the existing conditions and in the planned conditions of the proposed interchange location. Specifically these are:

- Selection of an alternative Appalachian Route "J"
- Planning for a new 367-acre business park at the interchange location

These two changes have initiated the development of this addendum to the previously approved IJS. Major aspects of the previous justification study including planned future northern and southern routes connecting State Route (SR) 111 in White County, south of I-40 to SR 24 (US 70N) north of I-40 remain valid and are therefore not addressed in detail in this addendum. One exception is that, while still considered a part of the interchange proposal, the proposed northern connector from I-40 to SR 24 may not be constructed concurrently with the interchange due to funding considerations. This will be addressed further within this addendum.

The updated conditions and plans in the area have been deemed significant enough to warrant updated traffic projections. These updated traffic projections have, in turn, resulted in some modification to the geometrics of the interchange configuration. These traffic and geometric updates are addressed in this addendum.

This addendum considers changes in the current and future needs of the area, and re-analyzes traffic operational features for the approved I-40 access point at Mine Lick Creek Road. Estimated costs for the proposed interchange have been updated and functional plans have been modified.

B. Description of Project Location

For the purposes of this addendum, only one location has been investigated for this proposed interchange site¹ (See Figure 2). Alternate "A" is located at the existing Mine Lick Creek Road overpass and is approximately 2.80 miles east of the State Route (SR) 56 (Baxter Road)

¹ The 2000 IJS investigated a second site, Alternate "B", located approximately 0.57 miles west of existing Mine Lick Creek Road. Both alternatives were found to meet the objectives of the study. Subsequent discussions with the City of Cookeville concerning other road and development plans in the area have resulted in Alternate "A" being selected as the preferred location.

interchange and 2.82 miles west of the SR 135 (Burgess Falls Road/S. Willow Avenue) interchange.





Figure 1. Project Area Map



Figure 2. Project Location Map

C. <u>Relationship to Other Transportation Improvement Plans & Classifications</u>

In the 2000 IJS, it was assumed that a connector would be constructed north from the proposed interchange to a proposed Appalachian Route "J" alignment on the north side of Cookeville. Since then, an alternative route for Corridor "J" has been selected east of the interchange location and out of range of a connection with I-40 via the Mine Lick Creek Road interchange.

While this northern connector is no longer planned to be extended to Corridor "J", this road is still planned to be extended from the proposed interchange to SR 24 (US 70N), as shown in Figure 3. This northern roadway extension remains in the Cookeville Major Street Plan.

Aside from the selection of an alternate Corridor "J" alignment, the other change to the 2000 IJS is the proposed Highlands Business Park to be constructed just east of the proposed interchange location, and bordered by I-40 to the north, Holladay Road to the east, Lee Seminary Road to the south, and Mine Lick Creek Road to the west. This business park is a joint effort by the City of Cookeville and Putnam County and is being planned to take advantage of regional economic development opportunities. The location of this proposed business park has been determined in part by the location of the Alternate "A" interchange in the previously approved Interchange Justification Study. The business park is 367-acres in size and is expected to generate over 20,000 new vehicle trips in this area per day².

The construction of the Mine Lick Creek Road interchange is currently programmed in the 2008-2011 State Transportation Improvement Program (STIP). The STIP includes programming of right-of-way and construction of the interchange as STIP ID# 71015. The northern connector is currently not included in the STIP.

² Data from "Traffic Analysis for Gould Drive Extension Environmental Assessment". Barge Waggoner Sumner & Cannon, Inc. October 2008. The traffic study used a combination of land uses to estimate that over 30,000 new trips per day would be generated. However, a review of the data shows that the traffic was likely overestimated (For example: The average size of a business park per ITE Trip Generation data is 28 acres. The Highlands Business Park has 250 acres of developable area. Using trip generation data for a site almost 10 times the average size of the site from which data were collected yields higher than expected traffic volumes.) Data from the traffic study were reduced by 30% to obtain just over 21,000 new daily trips to the site.



Figure 3. Proposed Alignment of North-South Connector (Not to scale) (Source: TDOT APR, 2000)

CHAPTER 2

CHANGES IN PRELIMINARY PLANNING DATA

A. <u>Land Use</u>

Land use at the proposed interchange location has changed very little since completion of the 2000 IJS. One difference is that this area is now included within the City Limits of Cookeville. This has had no significant impact on the land use of the area.

With the development of the proposed Highlands Business Park in this area, the surrounding land use, particularly south of I-40 will change. Land use in the business park area will convert from agricultural and low-density residential to a mixture of office, general commercial, light industrial, and manufacturing uses.

B. <u>Updated Traffic Projections</u>

Updates to traffic data for this addendum were developed by RPM Transportation Consultants (RPM) and approved by The Tennessee Department of Transportation (TDOT). The traffic projections used in this analysis include new trips that will be generated by the Highland Business Park located just east of the proposed interchange location³. Traffic developed for the existing system shows 2013 AADT volumes of 52,500 on I-40 between the SR 56 (Baxter Road) interchange and the SR 135 (Burgess Falls Road/S. Willow Avenue) interchange. Design year (2033) volumes on this section are expected to reach 71,500 vehicles per day. Traffic on existing Mine Lick Creek Road shows a daily volume of 7,100 vehicles in the base year (2013) and 7,600 by the 2033 design year. These volumes are shown in Figure 4.

With the proposed interchange in place, 2013 Annual Average Daily Traffic (AADT) volumes on I-40 are expected to be 55,000 vehicles west of, and 59,000 vehicles east of the proposed interchange site. These volumes are expected to increase by 2033 to 73,000 vehicles and 77,500 vehicles, respectively. Daily traffic volumes on Mine Lick Creek Road will be heavily influenced by the business park construction and will increase to 29,500 vehicles by the year 2033 south of I-40 and 13,500 vehicles north of I-40 (see Figure 5).

Projected AADT volumes, along with Design Hour Volumes (DHV) are shown in the Appendix.

³ Traffic projections from the Barge Waggoner Sumner & Cannon study were used to account for the impacts of the business park.





C. <u>Modifications in Proposed Improvements</u>

Based on the analysis conducted for this addendum, it is proposed that the interchange configuration be changed from a partial cloverleaf to a typical diamond-type interchange at the Mine Lick Creek Road (Alternate "A") location. The scale of the diamond interchange is the most fitting for this setting – currently rural but with the potential for significant growth originating from the proposed Highland Business Park and associated development. The diamond as proposed will include single lane on and off ramps. The intersections of the ramp terminals and Mine Lick Creek Road will be constructed in accordance with AASHTO guidelines with the following lane configurations:

Intersection of westbound I-40 ramps and Mine Lick Creek Road

- Two westbound left turn lanes (minimum 400 feet each of storage)
- One westbound right turn lane (minimum 300 feet of storage)
- Two southbound through lanes
- One southbound right turn lane (minimum 200 feet of storage)
- Two northbound through lanes
- Two northbound left turn lanes (minimum 400 feet each of storage)
- The westbound on ramp will be constructed with two lanes for approximately 550 feet, then will taper to a single lane ramp before merging onto I-40

Intersection of eastbound I-40 ramps and Mine Lick Creek Road

- One eastbound left turn lane (minimum 400 feet of storage)
- Two eastbound right turn lanes (minimum 400 feet each of storage)
- Two southbound through lanes
- One southbound left turn lane (minimum 200 feet of storage)
- Two northbound through lanes
- Two northbound right turn lanes (minimum 250 feet each of storage)
- The eastbound on ramp will be constructed with two lanes for approximately 550 feet, then will taper to a single lane ramp before merging onto I-40

These ramp intersection configurations will accommodate future year projections, but can also be expanded if needed in the future. These expansions could include ramp widening and additional turn lanes at the ramp terminal intersections.

After an evaluation of the proposed interchange site, coordinated local and regional plans, and operational requirements, it is proposed that a typical diamond-type interchange will provide the required level of traffic service and should be planned for this location.

Specific recommendations for the proposed diamond interchange layout are discussed below and are shown on the attached functional plans.

1. Two six-lane interchange structures will be constructed over I-40 for the cross-street. These new structures will have sufficient width for 4 @ 12' traffic lanes, a 24 foot wide median including turn lanes, and 12' outside shoulders. These structures will be approximately 140 feet long and in basically the same location as the existing structures over I-40.

2. The proposed lane configuration for each turning movement is as follows:

- Intersection of I-40 westbound ramps and Mine Lick Creek Road
 - Two northbound left turn lanes, two northbound through lanes
 - \circ $\;$ Two southbound through lanes, one southbound right turn lane

- Two westbound left turn lanes, one westbound right turn lane
- Intersection of I-40 eastbound ramps and Mine Lick Creek Road
 - Two northbound through lanes, two northbound right turn lanes
 - o One southbound left turn lane, two southbound through lanes
 - One eastbound left turn lane, two eastbound right turn lanes

3. The relocation of adjacent local roads is proposed so that access control along the connector can be extended a minimum of 300' beyond ramp terminals.

4. Traffic signals will be required on the proposed connector at both the westbound ramp terminal intersection north of the interstate and the eastbound ramp terminal intersection south of the interstate.

5. Due to the distance between the proposed and existing interchanges, no auxiliary lanes along I-40 are proposed. Capacity analyses were performed for the proposed ramps without these lanes and no operational deficiencies have been noted.

Several related projects exist that may not have a significant operational impact on the proposed interchange, but that would ensure a cohesive network of public roads in this area. These related projects, which should be constructed prior to or concurrently with the proposed Mine Lick Creek Road interchange, are as follow:

- Realign approximately 0.38 miles of Mine Lick Creek Road southwest of the proposed interchange to align with the existing intersection of Lee Seminary Road and Bennett Road.
- Improve Lee Seminary Road from Bennett Road to SR 135 (Burgess Falls Road). Because the Highlands Business Park is expected to generate over 20,000 new trips per day and because Lee Seminary Road will serve as the exclusive route to access the business park, improvements to Lee Seminary Road will be required. The planning and design of these improvements are being completed by the City of Cookeville and Putnam County.
- Realign 0.50± miles of Hawkins Crawford Road and Mine Lick Creek Road north of I-40 to create a continuous east-west route north of the proposed interchange. The intersection of this realigned road with the proposed interchange cross-street should be at least 300 feet north of the westbound I-40 ramp terminals. North of the intersection of Mine Lick Creek Road/Hawkins Crawford Road and the interchange cross-street, the North-South Connector will be fully access controlled.
- Construct the proposed North-South Connector from I-40 to SR 24 (US 70N). As detailed in the Advance Planning Report completed by TDOT in 2000, this 2.87± mile roadway would be a four lane access controlled divided highway with a minimum 250 foot right-of-way. Programming and funding considerations for a project of this magnitude may require its construction to follow after the interchange project. If so, the cross street should be constructed at least to the intersection of Mine Lick Creek Road and Hawkins Crawford Road.

CHAPTER 3

ENGINEERING INVESTIGATIONS

A. Traffic Operations

An update to the interchange analysis was conducted to determine what impacts the proposed interchange would have on the interstate system. The traffic operation analyses contained in the appendix include basic freeway segments, ramps, and ramp intersections with and without the proposed I-40 interchange at Mine Lick Creek Road.

Without the proposed interchange, the analysis shows the westbound lanes of the existing interstate highway between the SR 135 (Burgess Falls Road/S. Willow Avenue) interchange and the SR 56 (Baxter Road) interchange operating at a Level of Service (LOS) B during the AM peak and LOS C during the PM peak with base year (2013) traffic. The eastbound lanes, through this same area, will operate at a LOS C during the AM peak and LOS B during the PM peak. Using projected design year (2033) traffic, the westbound lanes are expected to operate at a LOS C during both peak periods. The eastbound lanes will operate with a LOS D during the AM peak and LOS C during the PM peak.

Capacity analyses were also conducted assuming the completion of the proposed Mine Lick Creek Road interchange. Under these conditions during the base year, all mainline sections in both directions will be characterized by a LOS C or better. During the design year, all mainline sections in both directions will be characterized by a LOS D or better.

Analysis of the proposed interchange shows the signalized intersection of the eastbound I-40 ramps with Mine Lick Creek Road is expected to operate at a LOS C during the AM peak and LOS B during the PM peak through base and design years. The signalized westbound ramp intersection will experience a LOS C during the AM Peak and a LOS B during the PM peak through base and design years.

Overall, the construction of the Mine Lick Creek Road interchange will substantially mitigate the traffic impacts of the proposed business park on the interstate system. Without the proposed interchange at Mine Lick Creek Road, most of the business park traffic will utilize the SR 135 interchange. This will increase delays and worsen operations at the SR 135 interchange and on SR 135, particularly south of I-40. With the proposed interchange at Mine Lick Creek Road, traffic volumes will be heavier on the mainline segment of I-40 between SR 135 and Mine Lick Creek Road, but traffic volumes using the SR 135 interchange will not be substantially increased over baseline conditions.

Under the projected traffic volumes, all ramps at the proposed interchange have a minimum 20year service life. Table 1 summarizes the results of the operational analysis. Traffic volumes and level of service analyses for both base year volumes (2013) and design year volumes (2033) are presented in the Appendix.

		LOS							
Analysis Point	Analysis Type	2013 Existing System		2013 Proposed System		2033 Existing System		2033 Proposed System	
		AM Book	PM Book	AM	PM Book	AM	PM Book	AM Book	PM Book
		1-40 M	ainline	геак	reak	reak	reak	reak	Feak
Eastbound Mainline I-40, west of SR 56	Freeway	C	В	С	В	D	С	D	С
Eastbound Mainline I-40, between SR 56 interchange ramps	Freeway	В	В	С	В	с	С	С	С
Eastbound Mainline I-40, SR 56 to Mine Lick Creek Rd	Freeway	С	В	С	В	D	С	D	С
Eastbound Mainline I-40, between Mine Lick Creek Rd interchange ramps	Freeway			В	В			С	С
Eastbound Mainline I-40, Mine Lick Creek Rd to SR 135	Freeway	С	В	В	С	D	С	С	D
Eastbound Mainline I-40, between SR 135 interchange ramps	Freeway	В	В	В	С	с	В	С	D
Eastbound Mainline I-40, east of SR 135	Freeway	В	С	В	С	С	D	С	D
Westbound Mainline I-40, east of SR 135	Freeway	С	В	С	В	D	С	D	С
Westbound Mainline I-40, between SR 135 interchange ramps	Freeway	А	А	С	В	В	В	D	с
Westbound Mainline I-40, SR 135 to Mine Lick Creek Rd	Freeway	В	С	С	В	С	С	D	С
Westbound Mainline I-40, between Mine Lick Creek Rd interchange ramps	Freeway			В	В			В	В
Westbound Mainline I-40, Mine Lick Creek Rd to SR 56	Freeway	В	С	В	С	С	С	С	С
Westbound Mainline I-40, between SR 56 interchange ramps	Freeway	В	В	В	В	В	с	В	с
Westbound Mainline I-40, west of SR 56	Freeway	В	С	В	С	С	С	С	С
	SR	56 Interc	hange a	t I-40					
Eastbound off ramp to SR 56	Ramp Diverge	С	С	С	С	D	D	D	D
Eastbound on ramp from SR 56	Ramp Merge	С	В	С	В	D	С	D	С
Westbound off ramp to SR 56	Ramp Diverge	В	С	В	С	С	D	С	D
Westbound on ramp from SR 56	Ramp Merge	В	В	В	В	С	С	С	С
Eastbound ramps and SR 56 intersection	Unsignalized Intersection	F	F	E	С	F	F	F	F
Westbound ramps and SR 56 intersection	Unsignalized Intersection	С	С	В	В	E	F	С	С
Mainline SR 56, south of eastbound ramps	I wo-Lane Highway	С	С	С	В	D	С	С	С
Mainline SR 56, between interchange ramps	I wo-Lane Highway	D	С	С	С	D	D	D	С
Mainline SR 56, north of westbound ramps	Two-Lane Highway	D	D	D	С	D	D	D	D

Table 1. Operational Analysis Summary (1 of 2)

		LOS							
Analysis Point	Analysis Type	2013 Existing System		2013 Proposed System		2033 Existing System		2033 Proposed System	
		AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
	Mine Lick C	reek Ro:	ad interc	hange af	1 Car	Teak	I Cak	TCar	TCak
Eastbound off ramp to Mine	Ramp Diverge			C	С			D	С
Eastbound on ramp from Mine	Ramp Merge			В	С			С	D
Westbound off ramp to Mine	Ramp Diverge			С	С			D	С
Westbound on ramp from Mine Lick Creek Rd	Ramp Merge			В	С			С	С
Eastbound ramps and Mine Lick Creek Rd intersection	Signalized Intersection			С	В			С	В
Westbound ramps and Mine Lick Creek Rd intersection	Signalized Intersection			С	В			С	В
Mainline southbound Mine Lick Creek Rd, south of eastbound ramps	Multi-Lane Highway			D	А			D	A
Mainline northbound Mine Lick Creek Rd, south of eastbound ramps	Multi-Lane Highway			А	с			С	A
Mainline southbound Mine Lick Creek Rd, between interchange ramps	Multi-Lane Highway			С	A			С	A
Mainline northbound Mine Lick Creek Rd, between interchange ramps	Multi-Lane Highway			А	В			А	В
Mainline southbound Mine Lick Creek Rd, north of westbound ramps	Multi-Lane Highway			А	A			А	A
Mainline northbound Mine Lick Creek Rd, north of westbound ramps	Multi-Lane Highway			А	А			А	А
	SR 1	35 Inter	change a	nt I-40	-	_	_	-	
Eastbound off ramp to SR 135 Eastbound on ramp from SR	Ramp Diverge	C B	B	C B	C C			D	
135 Westbound off ramp to SR 135	Ramp Diverge	D	C C	D	C	F	C	E	C
Westbound on ramp from SR 135	Ramp Merge	В	В	C	B	С	C	D	C
Eastbound ramps and SR 135 intersection	Signalized Intersection	E	F	С	С	F	F	D	В
Westbound ramps and SR 135 intersection	Signalized Intersection	F	F	D	F	F	F	F	В
Mainline southbound SR 135, south of eastbound ramps	Multi-Lane Highway	D	В	А	A	D	В	А	В
Mainline northbound SR 135, south of eastbound ramps	Multi-Lane Highway	В	D	В	A	С	D	В	В
Mainline southbound SR 135, between interchange ramps	Multi-Lane Highwav	С	В	А	В	С	С	В	В
Mainline northbound SR 135, between interchange ramps	Multi-Lane Highwav	В	В	В	А	С	С	В	В
Mainline southbound SR 135, north of westbound ramps	Multi-Lane Highway	A	В	А	В	В	С	А	В
Mainline northbound SR 135, north of westbound ramps	Multi-Lane Highway	В	В	В	А	С	В	С	В

Table 1. Operational Analysis Summary (2 of 2)

As mentioned previously, the construction of the northern connector from I-40 to SR 24 is not currently in the STIP; consequently, this project may not be constructed concurrently with the interchange. Between the time that the interchange is constructed and the time that the northern connector is constructed, the rural roads in the vicinity of the interchange location north of I-40 may be expected to experience increased traffic volumes. This aspect of traffic operations and impacts was investigated as part of this addendum.

It was assumed that, if the northern connector is not constructed concurrently with the interchange, it would be constructed by the year 2018, five years after the assumed base year of the previous analyses. With the northern connector, base year AADT estimates for its use are 11,700 vehicles per day. While a significant reduction of this traffic is expected if the northern connector is not constructed concurrently, the proposed interchange would still introduce improved access to this rural area. This, in turn, may introduce some new land uses into the area, resulting in additional traffic demands.

These considerations result in a 2018 projected traffic volume north of I-40 of approximately 4,900 vehicles per day assuming the northern connector is not constructed concurrently with the interchange. This traffic volume would disperse throughout the area, primarily on Mine Lick Creek Road, Hawkins-Crawford Road, and Buffalo Valley Road. The most significant impacts will occur on Mine Lick Creek Road and Hawkins-Crawford Road near the interchange location.

Both of these roads are typical two-lane rural roadways with 10 foot wide lanes and one foot wide paved shoulders. An AADT volume of 4,900 vehicles will not exceed the capacity for these two lane roads (the HCS methods yield a peak hour LOS C for these roads carrying this daily volume of traffic).

B. Cost Update

The total estimated cost for the diamond-type interchange given as Alternate "A" is \$13,588,000 and is detailed at the end of this chapter. Worksheets used in developing these cost estimates are contained in the Appendix of this report.

C. Environmental Concerns

No concerns beyond those specified in the IJS were found.

D. <u>Access Analysis Update</u>

Both the approved IJS and this addendum have been undertaken in accordance with the Federal Highway Administration's (FHWA) policy for granting new or modified interstate access. The FHWA policy, as described in FHWA Docket No. 89-23, "Additional Interchanges to the Interstate System" (Federal Register 55, No. 204, October 22, 1990), is provided in the following paragraphs along with comments for consideration. Comments are only provided where modifications discussed in this addendum alter TDOT's response to these FHWA policy provisions.

It is in the national interest to maintain the Interstate System to provide the highest level of service in terms of safety and mobility. Adequate control of access is critical to providing such service. Therefore, new or revised access points to the existing Interstate System will be considered for approval only if:

1. The existing interchanges and/or local roads and streets in the corridor can neither provide the necessary access nor be improved to satisfactorily accommodate the design year traffic demands while at the same time providing the access intended by the proposal.

In addition to the previous justification, the publicly owned Highlands Business Park has been planned in conjunction with the proposed interchange at Mine Lick Creek Road. This facility is projected to generate over 20,000 trips per day. Traffic analyses assuming that the business park is constructed with the existing transportation network (no new interchange) show that several movements of both the SR 56 interchange and the SR 135 interchange will experience significant delay. Also, using the existing network, the business park site is located approximately 4.9 miles from the SR 56 interchange and approximately 2.6 miles from the SR 135 interchange. These distances result in less than desirable access for this type of development.

Implementation of the proposed new I-40 interchange will provide improved transportation access in keeping with local immediate and long-range planning efforts that improvement of existing roadways cannot. Local leaders believe that this, in turn, will enhance continued development of business and industry within this area of Cookeville and Putnam County.

2. All reasonable alternatives for design options, location and transportation system management type improvements (such as ramp metering, mass transit, and HOV facilities) have been assessed and provided for if currently justified, or provisions are included for accommodating such facilities if a future need is identified.

In the approved study for this proposed I-40 access point, alternate locations were investigated for the proposed interchange. These alternates were reviewed and evaluated in field investigations and meetings with representatives from TDOT's Planning and Design Divisions and FHWA's Division Office. Since that time, local planning efforts have anticipated and been based on the proposal named Alternate "A" in the previous study and this addendum.

Given the capacity and operational needs of the proposed interchange, it is proposed that a standard diamond interchange design configuration be utilized. This is in keeping with local planning objectives to avoid other interchange forms which require more land for construction. Other interchange forms (urban tight diamond, single-point urban, etc.) were considered, but were not found to be appropriate for this location, given the additional cost and operational needs. These alternative design options were therefore not given further study.

Ramp metering and other ITS applications should be considered for this area in the future. These applications may improve operations at the existing interchanges at SR 56 and at SR 135 under projected conditions. However, by themselves, ITS applications will not provide reasonable access to the proposed North-South connector from I-40 to SR 24 nor will they provide appropriate access to the planned business park location. Nothing proposed in this addendum will preclude ITS applications from being implemented in the future.

3. The proposed access point does not have a significant adverse impact on the safety and operation of the Interstate facility based on analysis of current and future traffic. The operational analysis for existing conditions shall, particularly in urbanized areas, include an analysis of sections of Interstate to and including at least the first adjacent existing or proposed interchange on either side. Crossroads and other roads and streets shall be included in the analysis to the extent necessary to assure their ability to collect and distribute traffic to and from the interchange with new or revised access points.

An updated operational analysis of current and future traffic was made for mainline sections of the interstate, all ramps, and ramp termini within the limits of the interchange area. The proposed interchange will have no significant adverse affect on the interstate mainline and will improve operation of the adjacent interchanges.

If the northern connector is not constructed concurrently with the interchange, the possibility exists of significantly increased traffic volumes on existing local roads north of I-40. These impacts have been investigated and projected traffic volumes were found to remain well within the capacity constraints of these roads. The improved and existing local road network will allow the collection and distribution of traffic to and from the proposed interchange.

4. The proposed access connects to a public road only and will provide for all turning movements. Less than "full interchanges" for special purpose access for transit vehicles, for HOV's or into park and ride lots may be considered on a case-by-case basis. The proposed access will be designed to meet or exceed current standards for Federal-Aid projects on the Interstate system.

The proposed interchange is a typical diamond-type interchange and will provide for all traffic movements. All roads in this area are public roads. The recommended interchange design will meet or exceed all American Association of State Highway and Transportation Officials (AASHTO) criteria.

5. The proposal considers and is consistent with local and regional land use and transportation plans. Prior to final approval, all requests for new or revised access must be consistent with the

metropolitan and/or statewide transportation plan, as appropriate, the applicable provisions of 23 CFR part 450 and the transportation conformity requirements of 40 CFR parts 51 and 93.

The proposed interchange remains consistent with the adopted Cookeville Major Street Plan (a component of the Cookeville Comprehensive Future Land Use Plan) and with statewide transportation planning objectives. Local development plans by the City of Cookeville and Putnam County for the municipal Highlands Business Park have also been prepared in anticipation of the proposed I-40 access at Mine Lick Creek Road. Resolutions in support of the proposed I-40 access and its consistency with local planning objectives are included in Chapter 4 of this addendum.

6. In areas where the potential exists for future multiple interchange additions all requests for new or revised access are supported by a comprehensive Interstate network study with recommendations that address all proposed and desired access within the context of a long term plan.

No changes to this policy point are introduced by this addendum.

7. The request for a new or revised access generated by new or expanded development demonstrates appropriate coordination between the development and related or otherwise required transportation system improvements.

One new objective of the proposed interchange is to provide safe and adequate interstate access for traffic generated by the City and County planned Highland Business Park. The viability of this public venture is likely to be significantly hindered without the proposed interstate access. The interchange facility proposed in this study will meet the objectives of this planned development.

The traffic study prepared separately for this business park assumed that the interchange would provide the major point of access to the development. Other roadway improvements, such as the improvement to Lee Seminary Road from Bennett Road to SR 135, will require local commitment for construction prior to or concurrent with construction of the interchange. The planning and design of these improvements are being completed by TDOT, the City of Cookeville, and Putnam County. Resolutions in support of the proposed I-40 access and related street network improvements are included in Chapter 4 of this addendum.

8. The request for new or revised access contains information relative to the planning requirements and the status of the environmental processing of the proposal.

No changes to this policy point are introduced by this addendum.

Project: I-40 Interchange at Mine Lick Creek Rd Length: N/A	Cross Section: Varial	ble
Right-of-Way		
Land, Improvements and Damages (Acres)	54.0±	\$588,000.00
Incidentals (8 Tracts)		\$26,000.00
Relocation Payments (Residentials)	1	\$13,000.00
(Businesses)	0	
(Non-Profit)	0	
Total Right-of-Way Cost		\$627,000.00
Utility Relocation		
Reimbursable		\$17,000.00
Non-Reimbursable		\$200,000.00
Total Adjustment Cost		\$217,000.00
Construction Cost		
Clearing and Grubbing		\$108,000.00
Earthwork		\$1,492,000.00
Pavement Removal		\$97,000.00
Drainage		\$1,843,000.00
Major Items	\$1,507,000.00	
Other Drainage	\$101,000.00	
Erosion Control	\$235,000.00	
Structures		\$1,800,000.00
Railroad Crossing or Separation Structure		\$0.00
Paving		\$2,537,000.00
Retaining Walls		\$0.00
Maintenance of Traffic		\$110,000.00
		\$48,000.00
Seeding		\$31,000.00
Sodding		\$51,000.00
Signing		\$114,000.00
Signalization		\$224,000.00
		\$221,000.00
Rip-Rap or Slope Protection.		\$180,000.00 \$0.00
Other Const. Items (15%)		\$1.328.000.00
Sub-Total Construction		\$10,184,000.00
Mobilization		\$436.000.00
Sub-Total Construction		\$10.620.000.00
10% Engineering and Contingencies		\$1,062,000.00
Total Construction Cost		\$11,682,000.00
Preliminary Engineering (10%)		
		\$1,062,000.00

CHAPTER 4

SUMMARY AND CONCLUSIONS

This addendum addresses changes to the proposed I-40 access at Mine Lick Creek Road in Putnam County. This location for a new access was originally approved by the FHWA in 2000. The initiation of this addendum is twofold:

- 1. A connection to Appalachian Route "J" is no longer a consideration for this interchange due to the selection of a route east of Cookeville. However, the connection north to SR 24 (US 70N) remains a part of this interchange proposal.
- 2. A municipal development project, the Highlands Business Park, is expected to bring significant new traffic to this area and has been planned in anticipation of this interstate access.

The preceding addendum was conducted to re-evaluate current and future traffic operations on I-40 within the proposed interchange area. The analysis indicates that a diamond-type interchange at the existing Mine Lick Creek Road overpass location will meet established transportation objectives of the area.

Specific recommendations for the proposed diamond interchange layout are as follow.

1. Two six-lane interchange structures will be constructed over I-40 for the cross-street. These new structures will have sufficient width for 4 @ 12' traffic lanes, a 24 foot wide median including turn lanes, and 12' outside shoulders. These structures will be approximately 140 feet long and in basically the same location as the existing structures over I-40.

- 2. The proposed lane configuration for each turning movement is as follows:
 - Intersection of I-40 westbound ramps and Mine Lick Creek Road
 - Two northbound left turn lanes, two northbound through lanes
 - Two southbound through lanes, one southbound right turn lane
 - o Two westbound left turn lanes, one westbound right turn lane
 - Intersection of I-40 eastbound ramps and Mine Lick Creek Road
 - Two northbound through lanes, two northbound right turn lanes
 - One southbound left turn lane, two southbound through lanes
 - One eastbound left turn lane, two eastbound right turn lanes

3. The relocation of adjacent local roads is proposed so that access control along the connector can be extended a minimum of 300' beyond ramp terminals.

4. Traffic signals will be required on the proposed connector at both the westbound ramp terminal intersection north of the interstate and the eastbound ramp terminal intersection south of the interstate.

5. Due to the distance between the proposed and existing interchanges, no auxiliary lanes along I-40 are proposed. Capacity analyses were performed for the proposed ramps without these lanes and no operational deficiencies have been noted.

Several related projects exist that may not have a significant operational impact on the proposed interchange, but that would ensure a cohesive network of public roads in this area.

These related projects, which should be constructed prior to or concurrently with the proposed Mine Lick Creek Road interchange, are as follow:

- Realign approximately 0.38 miles of Mine Lick Creek Road southwest of the proposed interchange to align with the existing intersection of Lee Seminary Road and Bennett Road.
- Improve Lee Seminary Road from Bennett Road to SR 135 (Burgess Falls Road). Because the Highlands Business Park is expected to generate over 20,000 new trips per day and because Lee Seminary Road will serve as the exclusive route to access the business park, improvements to Lee Seminary Road will be required. The planning and design of these improvements are being completed by the City of Cookeville and Putnam County.
- Realign 0.50± miles of Hawkins Crawford Road and Mine Lick Creek Road north of I-40 to create a continuous east-west route north of the proposed interchange. The intersection of this realigned road with the proposed interchange cross-street should be at least 300 feet north of the westbound I-40 ramp terminals. North of the intersection of Mine Lick Creek Road/Hawkins Crawford Road and the interchange cross-street, the North-South Connector will be fully access controlled.
- Construct the proposed North-South Connector from I-40 to SR 24 (US 70N). As detailed in the Advance Planning Report completed by TDOT in 2000, this 2.87± mile roadway would be a four lane access controlled divided highway with a minimum 250 foot right-of-way. Programming and funding considerations for a project of this magnitude may require its construction to follow after the interchange project. If so, the cross street should be constructed at least to the intersection of Mine Lick Creek Road and Hawkins Crawford Road.

A. Local Commitment

Attached and made a part of this Interchange Justification Study addendum are official resolutions from both the City of Cookeville and Putnam County demonstrating support for the proposed I-40 interstate access at Mine Lick Creek Road.



Office of the City Manager

STATE OI

#24971

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FEB 2 3 2010

COMINGSIONER

DEPT. OF TRANSPORTATION

February 17, 2010

Gerald F. Nicely, Commissioner State of Tennessee Department of Transportation Suite 700, James K. Polk Building Nashville, TN 37243-0349

RE: I-40 Interchange at Mine Lick Creek Road PIN: 101577.00 Putnam County

Dear Commissioner Nicely:

Enclosed please find resolutions adopted by the Cookeville City Council and the Putnam County Commission officially pledging the commitment of the city and county to partner with TDOT to fund the cost of the northern connector road. These resolutions, along with the letter dated January 28, 2010, signed by County Executive Kim Blaylock and myself, should serve as additional assurance to TDOT and FHWA that both governing bodies are willing to step up to the plate, if necessary, to see the completion of the interchange and the northern connector.

Thank you for your continued support of this project. I'm sure you have been as frustrated as we have with the many problems we've encountered over the years.

Sincerely Jim Shipley

City Manager

cc: Cookeville City Council State Senator Charlotte Burks State Representative Henry Fincher George Halford, President Cookeville Chamber of Commerce Kim Blaylock, Putnam County Executive

enclosures

CEIVED

FEB 2 3 2010 CONSTITUENT SERVICES 931-520-5241

45 E. Broad Street

Cookeville, Tennessee 38501

22

STATE OF TENNESSEE) COUNTY OF PUTNAM) CITY OF COOKEVILLE)

I, ______, City Clerk, being the legal custodian of Ordinances and Codes of Cookeville, Tennessee, and as such do further certify that the attached hereto is a true and exact copy of Resolution Number R10-02-02 adopted by the City Council on

FEBRUARY 15 , 2<u>010</u>.

S E A Witness my official signature and official seal of said Municipality

this <u>17TH</u> day of <u>FEBRUARY</u>, 2010.

RESOLUTION

A RESOLUTION SUPPORTING THE 5TH INTERCHANGE AT MINE LICK CREEK ROAD AND COMMITTING TO CONSTRUCT A CONNECTOR ROAD FROM SAID INTERCHANGE NORTH TO HIGHWAY 70

RESOLUTION NO. R10-02-02
REQUESTED BY: JIM SHIPLEY
PREPARED BY: JIM SHIPLEY
APPROVED AS TO FORM &
CORRECTNESS:
ADOPTED: $(City \text{ Attorney})$ $\rightarrow /5 - /0$
MINUTE BOOK PAGE

WHEREAS, the Tennessee Department of Transportation plans to construct an interchange on Interstate 40 at Mine Lick Creek Road (referred to herein as the 5th interchange); and

WHEREAS, the Tennessee Department of Transportation believes that the Federal Highway Administration may require that the new interchange connect north to Highway 70; and

WHEREAS, Putnam County and the City of Cookeville have invested approximately \$20 million in a Business Park to secure a future for economic development in our region; and

WHEREAS, Putnam County is the job center for the entire Upper Cumberland Region, and currently there is double digit unemployment in all fourteen counties; and

WHEREAS, the completion of the fifth interchange at Mine Lick Creek is critical to the success of the Business Park.

NOW, THEREFORE, BE IT RESOLVED, that if a local road connecting the interchange to State Highway 70 is required by the Federal Highway Administration, Putnam County and the City of Cookeville will partner with the Tennessee Department of Transportation to fund the cost of building the connector road.

Adopted this the	15+2	day of	Jebruary	, 2010.
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Ŧ			Ally	Alle

(Mayor)

ATTEST:



WAYNE NABORS COUNTY CLERK - PUTNAM COUNTY

CERTIFICATION

STATE OF TENNESSEE)

COUNTY OF PUTNAM)

I, WAYNE NABORS, duly elected County Clerk in and for said County and

State, do hereby certify that the attached and foregoing is a true, correct

and complete copy of:

RESOLUTION OF THE GOVERNING BODY OF PUTNAM COUNTY, TENNESSEE, SUPPORTING POTENTIAL REQUIREMENTS OF THE FIFTH INTERCHANGE

As was presented, approved and adopted by the Putnam County Board of Commissioners at the February 16, 2010 regular monthly meeting, as the same appears of record and on file of which records and files I am present and legal custodian.

WITNESS my hand and official seal of office on this the 174 day of

Sebernary, 20	10
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AGRICOLTUNE	COUNTY CLERK
AND AND OD THE MAN	

P. O. BOX 220 • COOKEVILLE, TN 38503 • (931) 526-7106 • FAX (931) 372-8201



RESOLUTION SUPPORTING POTENTIAL REQUIREMENTS OF THE FIFTH INTERCHANGE

WHEREAS, the Tennessee Department of Transportation plans to construct an interchange on Interstate 40 at Mine Lick Creek Road (referred to herein as the 5th interchange); and,

WHEREAS, the Tennessee Department of Transportation believes that the Federal Highway Administration may require that the new interchange connect north to Highway 70; and,

WHEREAS, Putnam County and the City of Cookeville have invested approximately \$20 million in a Business Park to secure a future for economic development in our region; and,

WHEREAS, Putnam County is the job center for the entire Upper Cumberland Region, and currently there is double digit unemployment in all fourteen counties; and,

WHEREAS, the completion of the fifth interchange at Mine Lick Creek is critical to the success of the Business Park.

NOW THEREFORE BE IT RESOLVED, that if a local road connecting the interchange to State Highway 70 is required by the Federal Highway Administration, Putnam County and the City of Cookeville will partner with the Tennessee Department of Transportation to fund the cost of building the connector road.

Adopted this the 16th day of EBRUARY 2	010
--	-----

ATTES County lerk)



Chairman, Putnam County Commission

Jim MARTIN



Office of the City Manager P.O. Box 1998 Cookeville, TN 38503 931-520-5240



300 E. Spring St. - Rm. B Cookeville, TN 38501 (931) 526-2161 Ph. 528-1300 Fex



January 28, 2010

Gerald F. Nicely, Commissioner State of Tennessee Department of Transportation Suite 700, James K. Polk Building Nashville, TN 37243-0349

RE: I-40 Interchange at Mine Lick Creek Road PIN: 101577.00 Putnam County

Dear Commissioner Nicely:

We are in receipt of your letter dated 1/13/10, and thank you for the update on this important project. As you know, the City of Cookeville and Putnam County have expended significant funding for a long term commitment to the citizens of this community to develop and grow the area for current and future generations. In a long line of events that began in 1998, we have worked diligently to move this project along. The proposed access points for this interchange have been considered operationally acceptable and were initially approved by the FHWA in 2000.

A dual purpose Certificate of Public Purpose and Necessity was granted in 2009, for the development of the Highlands Business Park to promote economic growth and create jobs for the residents of this region, which was the impetus for requesting the interchange. The City of Cookeville has confirmed its intent to utilize post rescission level STP funds in the amount of \$1,123,861.78 to improve Lee Seminary Road to serve as an entrance to the Highlands Business Park. The Park itself represents a \$20 million commitment by these two governments. The City of Cookeville expects the Lee Seminary Road project and preliminary road and infrastructure work on the park to be bid in the spring of this year.

The road that we are building through the new Highlands Business Park will connect the interchange to State Highway 135, and we feel that this will satisfy the connectivity requirement by the FHWA. However, if other road requirements become apparent, we as City Manager and County Executive will do what is necessary to fund and satisfy your requirements. We also want to officially request to be a participant in your Local Interstate Connector (LIC) program and want to maximize potential for the multiple projects you indicate may be eligible.

Commissioner Gerald Nicely January 28, 2010 Page Two

With double digit unemployment in every county in the Upper Cumberland, we cannot stress enough the importance of the Business Park to the whole region, and the critical part the interchange project plays in making the Park a success. We are sending this letter to meet TDOT's deadline of 1/29/2010. However, we would like to request another meeting of City, County, State and Federal officials in the future to further discuss the project, and its progress.

Sincerely. Jim Shipley City Manager

K- Br

• •

Kim Blaylock County Executive

cc: Mr. Paul Degges, Chief Engineer Mr. Bob Brown, Region 2 Director

28

APPENDIX

TRAFFIC PROJECTIONS












AADT PROPOSED SYSTEM (COMPARISON WITH AND WITHOUT NORTHERN CONNECTOR)





LEVEL OF SERVICE ANALYSIS EXISTING SYSTEM





BASE YEAR 2013 INTERSTATE 40 MAINLINE

	BASIC F	REEWAY SE	GMENTS W	ORKSHEET		
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	1300 1450 B. C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (M) Planning (v _p)	Input FFS, N, vp FFS, LOS, vp FFS, LOS, N FFS, N, AADT FFS, LOS, AA FFS, LOS, N	<u>Output</u> LOS, S, D N, S, D v _p , S, D LOS, S, D DT N, S, D v _p , S, D
General Information			Site Inform	nation		
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Eastbe	ound)
Agency or Company	RPM Transport	ation	From/To		west of SR-	-56
Date Performed	Consultants 5/22/2009		Jurisdiction		Putnam Co	
Analysis Time Period	AM Peak Hour		Analysis Yea	ır	2013 Existi	ng w/ Business Park
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning			
Oper.(LOS)			Des.(N)		🗖 Planni	ng Data
Flow Inputs						
Volume, V	2186	veh/h	Peak-Hour F	actor, PHF	0.90	
		ven/day		i Buses, P _T	22	
Peak-Hr Prop. of AAD1, K			%RVS, P _R General Terr	ain:	U	
$DDHV = AADT \times K \times D$		veh/h	Grade %	Length	mi	
Driver type adjustment	1.00			Up/Down %		
Calculate Flow Adjustm	nents					
f _p	1.00		E _R		1.2	
E _T	1.5		$f_{HV} = 1/[1+P_T(E)]$	_T - 1) + P _R (E _R - 1)]	0.901	
Speed Inputs			Calc Speed Adj and FFS			
Lane Width	12.0	ft	f		0.0	mi/h
Rt-Shoulder Lat. Clearance	6.0	ft	f		0.0	mi/h
Interchange Density	0.50	I/mi	LC		0.0	····/·
Number of Lanes, N	2		'ID		0.0	mi/n
FFS (measured)		mi/h	† _N		4.5	mi/h
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h
LOS and Performance	Measures		Design (N)		
			Design (N)	-		
Operational (LOS)			Design LOS			
$v_p = (V \text{ or DDHV}) / (PHF x N x)$	(f _{HV} x f _p) <i>1348</i>	pc/h/ln	$v_{p} = (V \text{ or } DE)$	DHV) / (PHF x N x i	f _{HV} x f _n)	pc/h
S	65.5	mi/h	S		nv p	mi/h
$D = v_p / S$	20.6	pc/mi/ln	$D = v_p / S$			pc/mi/ln
LOS	С		Required Nu	mber of Lanes, N		,
Glossary			Factor Lo	cation		
N - Number of lanes	S - Speed					
V - Hourly volume	D - Density			23-8, 23-10	f _L	W - Exhibit 23-4
v _p - Flow rate	FFS - Free-flow s	speed	E _T - Exhibits	23-8, 23-10, 23-11	ı f _l	_{-C} - Exhibit 23-5
LOS - Level of service	BFFS - Base free	e-flow speed	t _p - Page 23-	12	f _h	v - Exhibit 23-6
DDHV - Directional design hou	ur volume	-	LOS, S, FFS	, v_p - Exhibits 23-2	2, 23-3 f _l	_D - Exhibit 23-7

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BASIC FREEWAY SEGMENTS WORKSHEET								
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	B C		2400	<u>Application</u> Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	<u>Input</u> FFS, N, v _p FFS, LOS, v FFS, LOS, N FFS, N, AAC FFS, LOS, N	Output LOS, S, D p N, S, D Vp, S, D DT LOS, S, D ADT N, S, D I vp, S, D		
General Information	· · · · · · · · · · · · · · · · · · ·		Site Infor	mation				
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (East	bound)		
Agency or Company	RPM Transport	ation	From/To		Between S	SR-56 Ramps		
Data Parformad	Consultants		lurisdiction		Dutnom C	0		
Analysis Time Period	AM Peak Hour		Analysis Yea	ar	2013 Exis	ting w/ Business Park		
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning					
Oper.(LOS)			es.(N)		🗖 Planı	ning Data		
Flow Inputs								
Volume, V	1911	veh/h	Peak-Hour F	actor, PHF	0.90			
AADT		veh/day	%Trucks and	d Buses, P _T	22			
Peak-Hr Prop. of AADT, K			%RVs, P _R		0			
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terr	rain: Length	Levei mi			
Driver type adjustment	1.00		0.000 /0	Up/Down %				
Calculate Flow Adjustm	nents							
f _p	1.00		E _R		1.2			
Ε _T	1.5		$f_{HV} = 1/[1+P_T(B)]$	E _T - 1) + P _R (E _R - 1)]	0.901			
Speed Inputs			Calc Spee	ed Adj and FFS	;			
Lane Width	12.0	ft	f	•	0.0	mi/h		
Rt-Shoulder Lat. Clearance	6.0	ft	LW		0.0	1111/11 		
Interchange Density	0.50	I/mi	LC		0.0	mi/n		
Number of Lanes, N	2		† _{ID}		0.0	mi/h		
FFS (measured)		mi/h	f _N		4.5	mi/h		
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h		
LOS and Performance	Measures		Design (N	1)				
			Design (N)	/				
Operational (LOS)			Design LOS					
$v_p = (V \text{ or DDHV}) / (PHF x N x)$	k f _{HV} x f _p) <i>1178</i>	pc/h/ln	v = (V or D)	OHV) / (PHF x N x t	fxf)	nc/h		
S	65.5	mi/h	IS		.нvр,	po/h		
$D = v_p / S$	18.0	pc/mi/ln	D = v / S			nc/mi/ln		
LOS	В		Required Nu	Imber of Lanes N		P0/111/11		
Glossary			Factor Lo	cation				
N - Number of lanes	S - Sneed							
V - Hourly volume	D - Density		E _R - Exhibits	23-8, 23-10		f _{LW} - Exhibit 23-4		
v - Flow rate	FFS - Free-flow s	speed	E _T - Exhibits	23-8, 23-10, 23-17	1	f _{LC} - Exhibit 23-5		
LOS - Level of service	BEES - Base from	a-flow speed	f _p - Page 23	-12		f _N - Exhibit 23-6		
DDHV - Directional design bo		now speed	LOS, S, FFS	8, v _p - Exhibits 23-2	2, 23-3	f _{ID} - Exhibit 23-7		
DDHV - Directional design no	ur volume							

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	BASIC FF		GMENTS W	ORKSHEET		
80 Free-Flow Speed FIS = 75 milh 70 65 milh 70 milh 70 65 milh 60 milh 50 10 55 milh 10 10 10 10 10 10 10 10 10 10 10 10 10 1	1300 1300 1450 8 C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, vp FFS, LOS, Vp FFS, LOS, N FFS, N, AAD FFS, LOS, AA FFS, LOS, N	Output LOS, S, D N, S, D v _p , S, D T LOS, S, D ADT N, S, D v _p , S, D
General Information			Site Infor	mation		
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Eastb	ound)
Agency or Company	RPM Transport	ation	From/To		Between S	R-135 & SR-56
Date Performed	Consultants 5/22/2009		Jurisdiction		Putnam Co)
Analysis Time Period	AM Peak Hour		Analysis Yea	ar	2013 Existi	ing w/ Business Park
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning			
Oper.(LOS)			Des.(N)		Plann	ing Data
Flow Inputs			De al Illaur D		0.00	
Volume, V	2282	ven/n veb/dav	%Trucks and	actor, PHF Buses P_	0.90 22	
Peak-Hr Prop. of AADT. K		Ven/day	%RVs. Pa	20000, 1	0	
Peak-Hr Direction Prop, D			General Terr	ain:	Level	
DDHV = AADT x K x D		veh/h	Grade %	Length	mi	
Driver type adjustment	1.00			Up/Down %		
					10	
'p F	1.00		⊢ _R		1.2	
	1.5		$I_{HV} = 1/[1+P_T(E_T)]$	$(E_{\rm T} - 1) + P_{\rm R}(E_{\rm R} - 1)]$	0.901	
Speed inputs	40.0	0	Calc Spee	ed Adj and FFS		
	12.0	π	f _{LW}		0.0	mi/h
Rt-Shoulder Lat. Clearance	6.U	II L/mi	f _{LC}		0.0	mi/h
Number of Longe N	0.50	1/1111	f _{ID}		0.0	mi/h
FES (mossured)	2	mi/b	f _N		4.5	mi/h
Pass from flow Spood REES	70.0	mi/h	FFS		65.5	mi/h
LOS and Performance	Moasures	1111/11	Design (N	1		
	vicasules)		
Operational (LOS)			Design LOS			
$v_p = (V \text{ or DDHV}) / (PHF x N x)$	f _{HV} x f _p) <i>140</i> 7	pc/h/ln	$V = (V \text{ or } D\Gamma)$)H\/) / (PHF x N x f	fxf)	nc/h
S	65.5	mi/h			'HV ^ 'p'	pc/n mi/h
$D = v_p / S$	21.5	pc/mi/ln	D = v / S			pc/mi/ln
LOS	С		Required Nu	mber of Lanes N		Po/111/111
Glossarv			Factor Lo	cation		
N - Number of lanes	S - Speed					
V - Hourly volume	D - Density		E _R - Exhibits	23-8, 23-10	f	_{LW} - Exhibit 23-4
v _n - Flow rate	FFS - Free-flow s	peed	E _T - Exhibits	23-8, 23-10, 23-11	1 f	_{LC} - Exhibit 23-5
LOS - Level of service	BFFS - Base free	e-flow speed	t _p - Page 23-	-12	f	N - Exhibit 23-6
DDHV - Directional design hou	ur volume	-	LOS, S, FFS	, v_p - Exhibits 23-2	, 23-3 f	ID - Exhibit 23-7

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BASIC FREEWAY SEGMENTS WORKSHEET								
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	B C		2400	<u>Application</u> Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, v _p FFS, LOS, v FFS, LOS, N FFS, N, AAD FFS, LOS, N	Output LOS, S, D N, S, D v _p , S, D T LOS, S, D ADT v _p , S, D V _p , S, D		
General Information	-		Site Inform	mation				
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Eastl	bound)		
Agency or Company	RPM Transport	ation	From/To		Between S	SR-135 Ramps		
Date Performed	Consultants 5/22/2009		Jurisdiction		Putnam C	0		
Analysis Time Period	AM Peak Hour		Analysis Yea	ar	2013 Exist	- ting w∕ Business Park		
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning					
Oper.(LOS)			es.(N)		🗖 Planı	ning Data		
Flow Inputs								
Volume, V	1326	veh/h	Peak-Hour F	actor, PHF	0.90			
		ven/day		Duses, P _T	22			
Peak-Hr Prop. of AAD1, K			%RVS, P _R General Terr	ain.	U			
$DDHV = AADT \times K \times D$		veh/h	Grade %	Length	mi			
Driver type adjustment	1.00			Up/Down %				
Calculate Flow Adjustm	nents							
f _p	1.00		E _R		1.2			
E _T	1.5		$f_{HV} = 1/[1+P_T(B)]$	E _T - 1) + P _R (E _R - 1)]	0.901			
Speed Inputs			Calc Spee	ed Adj and FFS				
Lane Width	12.0	ft	f		0.0	mi/h		
Rt-Shoulder Lat. Clearance	6.0	ft	f		0.0	mi/h		
Interchange Density	0.50	I/mi	LC		0.0	····/·		
Number of Lanes, N	2		'ID		0.0	mi/n		
FFS (measured)		mi/h	^t N		4.5	mi/h		
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h		
LOS and Performance I	Measures		Design (N)				
			Design (N)	-				
Operational (LOS)	() - (-		Design LOS					
$v_p = (V \text{ or DDHV}) / (PHF x N x)$	(f _{HV} x f _p) 818	pc/h/ln	$v_{p} = (V \text{ or } DE)$	DHV) / (PHF x N x i	f _{HV} x f _n)	pc/h		
S	65.5	mi/h	S		int p	mi/h		
$D = v_p / S$	12.5	pc/mi/ln	$D = v_n / S$			pc/mi/ln		
LOS	В		Required Nu	mber of Lanes, N		,		
Glossary			Factor Lo	cation				
N - Number of lanes	S - Speed							
V - Hourly volume	D - Densitv		E _R - Exhibits	23-8, 23-10		t _{LW} - Exhibit 23-4		
v, - Flow rate	FFS - Free-flow s	speed	E _T - Exhibits	23-8, 23-10, 23-11	1	f _{LC} - Exhibit 23-5		
LOS - Level of service	BFFS - Base free	e-flow speed	f _p - Page 23-	-12		f _N - Exhibit 23-6		
DDHV - Directional design ho	ur volume		LOS, S, FFS	5, v _p - Exhibits 23-2	2, 23-3	t _{ID} - Exhibit 23-7		

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	BASIC FF	REEWAY SE	GMENTS W	ORKSHEET		
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	B C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, vp FFS, LOS, vp FFS, LOS, N FFS, N, AAD FFS, LOS, AA FFS, LOS, N	<u>Output</u> LOS, S, D N, S, D v _p , S, D I LOS, S, D LDT N, S, D v _p , S, D
General Information			Site Inform	mation		
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Eastb	ound)
Agency or Company	RPM Transport	ation	From/To		East of SR	-135
Date Performed	5/22/2009		Jurisdiction		Putnam Co)
Analysis Time Period	AM Peak Hour		Analysis Yea	ar	2013 Existi	ing w/ Business Park
Project Description 09-0402	Mine Lick Creek I	JS - TDOT OC I	Planning			
Oper.(LOS)			Des.(N)		Plann	ing Data
Flow Inputs			<u> </u>			
Volume, V	1867	veh/h	Peak-Hour F	actor, PHF	0.90	
AADT Book Hr Bron of AADT K		ven/day		Duses, r _T	22	
Peak-Hr Direction Prop. D			General Terr	ain.	u Level	
$DDHV = AADT \times K \times D$		veh/h	Grade %	Length	mi	
Driver type adjustment	1.00			Up/Down %		
Calculate Flow Adjustn	nents		_			
f _p	1.00		E _R		1.2	
E _T	1.5		$f_{HV} = 1/[1+P_T(E)]$	E _T - 1) + P _R (E _R - 1)]	0.901	
Speed Inputs			Calc Spee	ed Adj and FFS	1	
Lane Width	12.0	ft	f _{LW}		0.0	mi/h
Rt-Shoulder Lat. Clearance	6.0	ft	fue		0.0	mi/h
Interchange Density	0.50	I/mi	f		0.0	mi/h
Number of Lanes, N	2		f.		4.5	mi/h
FFS (measured)		mi/h	'N		4.0	1111/11
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h
LOS and Performance	Measures		Design (N			
Operational (LOS)			<u>Design (N)</u>			
v = (V or DDH)/) / (PHE x N x)	(f x f) 1151	nc/h/ln	Design LOS			
$v_p = (v \text{ or } D D H v) / (r H x H x)$	(1 _{HV} × 1 _p) 1151	pc/11/111	$v_p = (V \text{ or } DE)$	DHV) / (PHF x N x i	f _{HV} x f _p)	pc/h
	00.0		S			mi/h
$D = v_p / S$	17.0	pc/m/m	$D = v_p / S$			pc/mi/ln
100	В		Required Nu	imber of Lanes, N		
Glossary			Factor Lo	cation		
N - Number of lanes	S - Speed		E - Exhibito	23-8 23-10	f	- Exhibit 23-4
V - Hourly volume	D - Density			$22^{-0}, 22^{-10}$	ا ۲	- Exhibit 22.5
v _p - Flow rate	FFS - Free-flow s	peed		23-0, 23-10, 23-1° 10	۱ آ ۲	LC - EXHIDIL 23-D
LOS - Level of service	BFFS - Base free	e-flow speed	I OS S EFC	$\cdot 1 Z$	1 1 1 1 1 1 1 1 1	N - EXHIDIL 23-0
DDHV - Directional design ho	ur volume		103, 5, FFS	$v_p = Exhibits 23-2$., ∠ ა- ა ⊺	

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BASIC FREEWAY SEGMENTS WORKSHEET							
(iiii) 980 Froe-Flow Speed FLS = 75 milh 70 60 60 60 60 60 60 60 60 60 6	1300 1450 C C 1450		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (M) Planning (v _p)	Input FFS, N, v _p FFS, LOS, v _f FFS, LOS, N FFS, N, AAD FFS, LOS, N	Output LOS, S, D N, S, D v _p , S, D T LOS, S, D ADT N, S, D v _p , S, D	
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (West	bound)	
Agency or Company	RPM Transport	ation	From/To		Approachi	na SR-135	
Data Darformad	Consultants		luriadiation				
Analysis Time Period	5/22/2009 AM Peak Hour		Analysis Yea	ır	2013 Exist) fing w/ Business Park	
Project Description 09-0402	Mine Lick Creek I	JS - TDOT OC F	Planning	u	2010 Exiot	ing w Business rank	
Oper.(LOS)			Des.(N)		🔲 Planr	ning Data	
Flow Inputs							
Volume, V	2616	veh/h	Peak-Hour F	actor, PHF	0.90		
AADT		veh/day	%Trucks and	l Buses, P _T	22		
Peak-Hr Prop. of AADT, K			%RVs, P _R		0		
Peak-Hr Direction Prop, D		veh/h	General Terr	ain:	Level mi		
Driver type adjustment	1.00	Ven/II	Orace 70	Up/Down %			
Calculate Flow Adjustm	ents			· ·			
f	1.00		E _R		1.2		
É _T	1.5		f _{ыv} = 1/[1+Р _т (Е	_T - 1) + P _R (E _R - 1)]	0.901		
Speed Inputs				d Adi and FFS			
Lane Width	12.0	ft	4		0.0	mai /h	
Rt-Shoulder Lat. Clearance	6.0	ft	T _{LW}		0.0	mi/n	
Interchange Density	0.50	I/mi	[†] LC		0.0	mi/h	
Number of Lanes. N	2		f _{ID}		0.0	mi/h	
FFS (measured)		mi/h	f _N		4.5	mi/h	
Base free-flow Speed BEES	70.0	mi/h	FFS		65.5	mi/h	
LOS and Performance	Measures		Design (N)			
			Design (N)	/			
Operational (LOS)			Design LOS				
$v_p = (V \text{ or DDHV}) / (PHF x N x)$	f _{HV} x f _p) <i>1613</i>	pc/h/ln	$v = (V \text{ or } D\Gamma)$)H\/) / (PHF x N x f	fxf)	nc/h	
S	65.3	mi/h			HV ^ 'p'	pc/n mi/b	
$D = v_p / S$	24.7	pc/mi/ln	$D = \sqrt{2}$				
LOS	С		Required Nu	mber of Lanes, N		pe/m/m	
Glossary			Factor Lo	cation			
N - Number of lanes	S - Speed		E Evkikita	22 0 22 40			
V - Hourly volume	D - Density			23-0, 23-10	1		
v _p - Flow rate	FFS - Free-flow s	speed		23-8, 23-10, 23-11	1		
LOS - Level of service	BFFS - Base free	e-flow speed	Inp - Page 23-			N - EXNIDIT 23-6	
DDHV - Directional design hou	ur volume		LUS, S, FFS	$v_p - Exhibits 23-2$., ∠3-3		

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	BASIC F	REEWAY SE	GMENTS W	ORKSHEET			
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	B C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	<u>Input</u> FFS, N, v _p FFS, LOS, V FFS, LOS, N FFS, N, AAD FFS, LOS, N	Output LOS, S, D N, S, D V _p , S, D T LOS, S, D ADT N, S, D V _p , S, D	
General Information			Site Infor	mation			
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (West	tbound)	
Agency or Company	RPM Transport	ation	From/To		Between S	SR-135 Ramps	
Date Performed	Consultants 5/22/2009		Jurisdiction		Putnam C	0	
Analysis Time Period	AM Peak Hour		Analysis Yea	ar	2013 Exist	- ting w∕ Business Park	
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning				
Oper.(LOS)			Des.(N)		🗖 Planı	ning Data	
Flow Inputs							
Volume, V	1166	veh/h	Peak-Hour F	actor, PHF	0.90		
		ven/day		i Buses, P _T	22		
Peak-Hr Prop. of AAD1, K Peak-Hr Direction Prop. D			%RVS, P _R General Terr	ain.	U Lovol		
$DDHV = AADT \times K \times D$		veh/h	Grade %	Length	mi		
Driver type adjustment	1.00			Up/Down %			
Calculate Flow Adjustm	nents						
f _p	1.00		E _R		1.2		
E _T	1.5		$f_{HV} = 1/[1+P_T(E)]$	E _T - 1) + P _R (E _R - 1)]	0.901		
Speed Inputs			Calc Speed Adj and FFS				
Lane Width	12.0	ft	f		0.0	mi/h	
Rt-Shoulder Lat. Clearance	6.0	ft	f		0.0	mi/h	
Interchange Density	0.50	I/mi	LC		0.0	····/·	
Number of Lanes, N	2		'ID		0.0	mi/n	
FFS (measured)		mi/h	† _N		4.5	mi/h	
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h	
LOS and Performance I	Measures		Design (N)			
			Design (N)	-			
Operational (LOS)			Design LOS				
$v_p = (V \text{ or DDHV}) / (PHF x N x)$	(f _{HV} x f _p) 719	pc/h/ln	$v_p = (V \text{ or } DE)$	DHV) / (PHF x N x i	f _{HV} x f _n)	pc/h	
S	65.5	mi/h	S		ni p	mi/h	
$D = v_p / S$	11.0	pc/mi/ln	$D = v_p / S$			pc/mi/ln	
LOS	A		Required Nu	mber of Lanes, N		P	
Glossarv			Factor Lo	cation			
N - Number of lanes	S - Speed						
V - Hourly volume	D - Densitv		E _R - Exhibits	23-8, 23-10		t _{LW} - Exhibit 23-4	
v, - Flow rate	FFS - Free-flow s	speed	E _T - Exhibits	23-8, 23-10, 23-1	1	f _{LC} - Exhibit 23-5	
LOS - Level of service	BFFS - Base free	e-flow speed	f _p - Page 23-	.12		f _N - Exhibit 23-6	
DDHV - Directional design ho	ur volume		LOS, S, FFS	5, v _p - Exhibits 23-2	2, 23-3	t _{ID} - Exhibit 23-7	

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BASIC FREEWAY SEGMENTS WORKSHEET								
80 Free-Flow Spzed FFS = 75 mith 70 60 60 mith 60 60 mith 60 mith 50 10 s A 55 mith 30 0 400 800 General Information	1200 Flow Rate (pc/h/ln)		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (M) Planning (v _p)	Input FFS, Ν, ν _p FFS, LOS, ν _f FFS, LOS, Ν FFS, N, AAD FFS, LOS, Ν	Output LOS, S, D N, S, D v _p , S, D T LOS, S, D ADT N, S, D v _p , S, D		
Analyst	ALB RPM Transport	ation	Highway/Dire	ection of Travel	I-40 (West	bound)		
Agency or Company	Consultants	allon	From/To		Between S	SR-135 & SR-56		
Date Performed	5/22/2009		Jurisdiction		Putnam C	0		
Analysis Time Period	AM Peak Hour		Analysis Yea	r	2013 Exist	ting w/ Business Park		
Project Description 09-0402	WINE LICK Creek -		ning los (NI)		- Plan	aing Data		
Flow Inputs		, - L	763.(IN)		Fian			
Volume, V AADT Peak-Hr Prop. of AADT, K	1453	veh/h veh/day	Peak-Hour F %Trucks and %RVs, P _R	actor, PHF I Buses, P _T	0.90 22 0			
Peak-Hr Direction Prop, D DDHV = AADT x K x D Driver type adjustment	1.00	veh/h	General Terr Grade %	ain: Length Up/Down %	Level mi			
	ients				4.0			
	1.00		E _R		1.2			
E _T	1.5		$f_{HV} = 1/[1+P_T(E_T)]$	T - 1) + P _R (E _R - 1)]	0.901			
Speed Inputs			Calc Spee	d Adj and FFS	1			
Lane Width	12.0	ft	f _{LW}		0.0	mi/h		
Rt-Shoulder Lat. Clearance	6.0	ft	f _{LC}		0.0	mi/h		
Interchange Density	0.50	I/mi	f _{ID}		0.0	mi/h		
Number of Lanes, N	2	mai /ha	f _N		4.5	mi/h		
Providence (Investigation of the second seco	70.0	mi/n	FFS		65.5	mi/h		
Base free-flow Speed, BFFS	70.0	mi/n	Decign (N	١				
Operational (LOS)	weasures		Design (N))				
$v_p = (V \text{ or DDHV}) / (PHF x N x)$	c f _{HV} x f _p) 896	pc/h/ln	$V = (V \text{ or } D\Gamma)$)H\/) / (PHF x N x f	fxf)	nc/h		
S	65.5	mi/h	IS		нү ү 'р/	mi/h		
$D = v_p / S$	13.7	pc/mi/ln	$D = v_{\rm o} / S$			pc/mi/ln		
LOS	В		Required Nu	mber of Lanes, N		Portuitin		
Glossary			Factor Lo	cation				
N - Number of lanes	S - Speed			22 8 22 40				
V - Hourly volume	D - Density			23-8, 23-10		I _{LW} - EXNIDIT 23-4		
v _p - Flow rate	FFS - Free-flow s	speed		23-8, 23-10, 23-11	l i	ILC - EXNIDIT 23-5		
LOS - Level of service	BFFS - Base free	e-flow speed	ILOS S EFS	Z		IN - EXNIDIT 23-6		
DDHV - Directional design ho	ur volume		103, 5, FFS	$v_p = Exhibits 23-2$, 23-3			

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	BASIC FF		GMENTS W	ORKSHEET		
80 Free-Flow Speed FIS = 75 milh 70 65 milh 70 milh 70 65 milh 60 milh 60 55 milh 10 10 55 milh 10 10 400 200	1300 1300 1450		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, vp FFS, LOS, vp FFS, LOS, N FFS, N, AAD FFS, LOS, N FFS, LOS, N	Output LOS, S, D N, S, D v _p , S, D T LOS, S, D ADT v _p , S, D v _p , S, D
General Information	•		Site Infor	mation		
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (West	bound)
Agency or Company	RPM Transport	ation	From/To		Between S	R-56 Ramps
Date Performed	Consultants		lurisdiction		Putnam Co	
Analysis Time Period	AM Peak Hour		Analysis Yea	ır	2013 Exist	, ing w/ Business Park
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning			
Moper.(LOS)			Des.(N)		🔲 Planr	ning Data
Flow Inputs						
Volume, V	1226	veh/h	Peak-Hour F	actor, PHF	0.90	
AADT		veh/day	% I rucks and	l Buses, P _T	22	
Peak-Hr Prop. of AADT, K			%RVs, P _R		0	
$DDHV = AADT \times K \times D$		veh/h	General Terr Grade %	Length	Levei mi	
Driver type adjustment	1.00			Up/Down %		
Calculate Flow Adjustm	ients					
f _p	1.00		E _R		1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E	E _T - 1) + P _R (E _R - 1)]	0.901	
Speed Inputs			Calc Spee	d Adj and FFS	i	
Lane Width	12.0	ft	f		0.0	mi/h
Rt-Shoulder Lat. Clearance	6.0	ft	LW f		0.0	
Interchange Density	0.50	I/mi	LC		0.0	rni/n
Number of Lanes, N	2		t _{ID}		0.0	mi/h
FFS (measured)		mi/h	f _N		4.5	mi/h
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h
LOS and Performance	Measures		Design (N)		
			Design (N)	/		
Operational (LOS)			Design LOS			
v _p = (V or DDHV) / (PHF x N x	f _{HV} x f _p) 756	pc/h/ln	$v_n = (V \text{ or } DE)$	DHV) / (PHF x N x t	f _{uv} x f_)	pc/h
S	65.5	mi/h	s		ну р	mi/h
$D = v_p / S$	11.5	pc/mi/ln	$D = v_{\rm L} / S$			pc/mi/ln
LOS	В		Required Nu	mber of Lanes N		Po/111/111
Glossary			Factor Lo	cation		
N - Number of lanes	S - Speed					
V - Hourly volume	D - Density		E _R - Exhibits	23-8, 23-10	f	r _{LW} - Exhibit 23-4
v - Flow rate	FFS - Free-flow s	peed	E _T - Exhibits	23-8, 23-10, 23-11	1 f	r _{LC} - Exhibit 23-5
I OS - Level of service	BFFS - Base free	-flow speed	f _p - Page 23-	12	f	_N - Exhibit 23-6
DDHV - Directional design hou	ur volume		LOS, S, FFS	, v _p - Exhibits 23-2	, 23-3 f	f _{ID} - Exhibit 23-7

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	BASIC F	REEWAY SE	GMENTS W	ORKSHEET		
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	B C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, v _p FFS, LOS, v _p FFS, LOS, N FFS, N, AAD FFS, LOS, N	Output LOS, S, D N, S, D v _p , S, D T LOS, S, D ADT N, S, D v _p , S, D
General Information			Site Infor	mation		
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (West	bound)
Agency or Company	RPM Transport	ation	From/To		West of SF	R-56
Date Performed	Consultants		Jurisdiction		Putnam Co	2
Analysis Time Period	AM Peak Hour		Analysis Yea	ar	2013 Exist	ing w/ Business Park
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning			
Oper.(LOS)			Des.(N)		🗖 Planr	ning Data
Flow Inputs						
Volume, V	1437	veh/h	Peak-Hour F	actor, PHF	0.90	
		veh/day		Buses, P _T	22	
Peak-Hr Prop. of AAD1, K			%RVS, P _R Conoral Torr	oin:	U	
$DDHV = AADT \times K \times D$		veh/h	Grade %	Length	mi	
Driver type adjustment	1.00			Up/Down %		
Calculate Flow Adjustn	nents					
f _p	1.00		E _R		1.2	
Ε _T	1.5		$f_{HV} = 1/[1+P_T(E)]$	E _T - 1) + P _R (E _R - 1)]	0.901	
Speed Inputs			Calc Speed Adj and FFS			
Lane Width	12.0	ft	f		0.0	mi/h
Rt-Shoulder Lat. Clearance	6.0	ft	'LW f		0.0	mi/h
Interchange Density	0.50	I/mi	LC		0.0	111/11
Number of Lanes, N	2		ID		0.0	mi/n
FFS (measured)		mi/h	† _N		4.5	mi/h
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h
LOS and Performance	Measures		Design (N			
			Design (N)	/		
Operational (LOS)			Design LOS			
v _p = (V or DDHV) / (PHF x N >	k f _{HV} x f _p) 886	pc/h/ln	$v_n = (V \text{ or } DE)$	DHV) / (PHF x N x t	f _{uv} x f _a)	pc/h
S	65.5	mi/h	s		ну р⁄	mi/h
$D = v_p / S$	13.5	pc/mi/ln	D = v / S			nc/mi/ln
LOS	В		Required Nu	mber of Lanes. N		P0/111/11
Glossarv			Factor	cation		
N - Number of lanes	S - Speed					
V - Hourly volume	D - Density		E _R - Exhibits	23-8, 23-10	f	_{LW} - Exhibit 23-4
v Flow rate	FFS - Free-flow s	peed	E _T - Exhibits	23-8, 23-10, 23-17	1 1	L _C - Exhibit 23-5
I OS - Level of service	BFES - Base free	-flow speed	f _p - Page 23-	·12	t	_N - Exhibit 23-6
DDHV - Directional design bo		non opecu	LOS, S, FFS	5, v _p - Exhibits 23-2	2, 23-3	f _{ID} - Exhibit 23-7

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	BASIC FF		GMENTS W	ORKSHEET		
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	1300 1300 1450 B C 		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, vp FFS, LOS, vp FFS, LOS, N FFS, N, AADT FFS, LOS, AAI FFS, LOS, N	Output LOS, S, D N, S, D v _p , S, D LOS, S, D DT N, S, D v _p , S, D
General Information			Site Inform	mation		
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Eastbo	ound)
Agency or Company	RPM Transport	ation	From/To		west of SR-	56
Date Performed	Consultants		Jurisdiction		Putnam Co	
Analysis Time Period	PM Peak Hour		Analysis Yea	ır	2013 Existir	ng w/ Business Park
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning			
Oper.(LOS)			es.(N)		🔲 Planni	ng Data
Flow Inputs						
Volume, V	1830	veh/h	Peak-Hour F	actor, PHF	0.90	
AADI		veh/day	% I rucks and	i Buses, P _T	22	
Peak-Hr Prop. of AAD1, K			%RVS, P _R Conoral Torr	ain:	0 Lovol	
DDHV = AADT x K x D		veh/h	Grade %	Length	mi	
Driver type adjustment	1.00			Up/Down %		
Calculate Flow Adjustm	nents					
f _p	1.00		E _R		1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E	_T - 1) + P _R (E _R - 1)]	0.901	
Speed Inputs			Calc Spee	d Adj and FFS	i	
Lane Width	12.0	ft	f		0.0	mi/h
Rt-Shoulder Lat. Clearance	6.0	ft	'LW f		0.0	mi/h
Interchange Density	0.50	I/mi	LC		0.0	1111/11
Number of Lanes, N	2		^I ID		0.0	mi/n
FFS (measured)		mi/h	† _N		4.5	mi/h
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h
LOS and Performance	Measures		Design (N)		
			Design (N)	•		
Operational (LOS)			Design LOS			
$v_p = (V \text{ or DDHV}) / (PHF x N x)$: t _{HV} x f _p) <i>11</i> 29	pc/h/ln	$v_{p} = (V \text{ or } DE)$	DHV) / (PHF x N x i	f _{HV} x f _n)	pc/h
S	65.5	mi/h	S	, , , , , , , , , , , , , , , , , , ,	nv p	mi/h
$D = v_p / S$	17.2	pc/mi/ln	$D = v_{p} / S$			pc/mi/ln
LOS	В		Required Nu	mber of Lanes, N		1
Glossary			Factor Lo	cation		
N - Number of lanes	S - Speed					
V - Hourly volume	D - Densitv		E _R - Exhibits	23-8, 23-10	f _L	W - Exhibit 23-4
v _n - Flow rate	FFS - Free-flow s	peed	E _T - Exhibits	23-8, 23-10, 23-11	1 f _L	_C - Exhibit 23-5
LOS - Level of service	BFFS - Base free	-flow speed	f _p - Page 23-	-12	f _N	- Exhibit 23-6
DDHV - Directional design hou	ur volume		LOS, S, FFS	i, v _p - Exhibits 23-2	., 23-3 f _{il}	_D - Exhibit 23-7

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	BASIC FF		GMENTS W	ORKSHEET		
80 Free-Flow Speed FIS = 75 milh 70 65 milh 70 milh 70 65 milh 60 milh 50 55 milh 70 milh 80 60 milh 80 milh 80 10 milh 10 milh	1300 1450 C S S S S S S S S S S S S S		2400	<u>Application</u> Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, vp FFS, LOS, vp FFS, LOS, N FFS, N, AADT FFS, LOS, AA FFS, LOS, N	<u>Output</u> LOS, S, D N, S, D v _p , S, D LOS, S, D DT N, S, D v _p , S, D
General Information	<u> </u>		Site Infor	mation		
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Eastb	ound)
Agency or Company	RPM Transport	ation	From/To		Between S	R-56 Ramps
Date Performed	Consultants		Jurisdiction		Putnam Co	
Analysis Time Period	PM Peak Hour		Analysis Yea	ar	2013 Existi	ng w/ Business Park
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning			
Oper.(LOS)			es.(N)		🔲 Plann	ing Data
Flow Inputs						
Volume, V	1539	veh/h	Peak-Hour F	actor, PHF	0.90	
AADI		veh/day	% I rucks and	d Buses, P _T	22	
Peak-Hr Prop. of AAD1, K			%RVS, P _R Conoral Torr	oin.	0 Lovol	
$DDHV = AADT \times K \times D$		veh/h	Grade %	Length	mi	
Driver type adjustment	1.00			Up/Down %		
Calculate Flow Adjustm	ents					
f _p	1.00		E _R		1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E	E _T - 1) + P _R (E _R - 1)]	0.901	
Speed Inputs			Calc Spee	ed Adj and FFS	i	
Lane Width	12.0	ft	f		0.0	mi/h
Rt-Shoulder Lat. Clearance	6.0	ft	'LW f		0.0	mi/h
Interchange Density	0.50	I/mi	LC		0.0	1111/11
Number of Lanes, N	2		TID		0.0	mi/n
FFS (measured)		mi/h	f _N		4.5	mi/h
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h
LOS and Performance M	leasures		Design (N			
			Design (N)	/		
Operational (LOS)			Design LOS			
$v_p = (V \text{ or DDHV}) / (PHF x N x)$	f _{HV} x f _p) <i>949</i>	pc/h/ln	$v_{r} = (V \text{ or } DE)$	DHV) / (PHF x N x i	fuy x f_)	pc/h
S	65.5	mi/h	s (* * * * *	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	нитр	mi/h
$D = v_p / S$	14.5	pc/mi/ln	D = v / S			nc/mi/ln
LOS	В		Required Nu	mber of Lanes N		Portini
Glossary			Factor Lo	cation		
N - Number of lanes	S - Speed					
V - Hourly volume	D - Density		E _R - Exhibits	23-8, 23-10	f	_{_W} - Exhibit 23-4
v - Flow rate	FFS - Free-flow s	peed	E _T - Exhibits	23-8, 23-10, 23-17	1 f _l	_{_C} - Exhibit 23-5
I OS - Level of service	BFFS - Base free	-flow speed	f _p - Page 23-	·12	f	_N - Exhibit 23-6
			LOS, S, FFS	5, v _p - Exhibits 23-2	, 23-3 f	_D - Exhibit 23-7

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	BASIC F		GMENTS W	ORKSHEET		
80 Free-Flow Speed FIS = 75 milh 70 65 milh 70 milh 70 65 milh 60 milh 50 10 A 55 milh 10 55 milh 10 A 80 10 A 10 A 10 10 A 10 A	11300 11450 11	0 1/500 1/750	2400	<u>Application</u> Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (M) Planning (v _p)	<u>Input</u> FFS, N, v _p FFS, LOS, v _p FFS, LOS, N FFS, N, AADT FFS, LOS, AA FFS, LOS, N	<u>Output</u> LOS, S, D N, S, D v _p , S, D LOS, S, D DT N, S, D v _p , S, D
General Information	· · · · · · · · · · · · · · · · · · ·		Site Infor	mation		
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Eastbe	ound)
Agency or Company	RPM Transport	ation	From/To		Between SI	R-135 & SR-56
Data Barfarmad	Consultants		lurisdiction		Dutnom Co	
Analysis Time Period	5/22/2009 PM Peak Hour		Analysis Yea	ar	2013 Existi	ng w/ Business Park
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning			.g
Coper.(LOS)			es.(N)		🔲 Planni	ing Data
Flow Inputs						
Volume, V	1719	veh/h	Peak-Hour F	actor, PHF	0.90	
AADT		veh/day	%Trucks and	l Buses, P _T	22	
Peak-Hr Prop. of AADT, K			%RVs, P _R		0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terr Grade %	ain: Length	Levei mi	
Driver type adjustment	1.00	Volum		Up/Down %		
Calculate Flow Adjustm	ents					
f _p	1.00		E _R		1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E	E _T - 1) + P _R (E _R - 1)]	0.901	
Speed Inputs			Calc Spee	d Adj and FFS		
Lane Width	12.0	ft	4		0.0	mi/b
Rt-Shoulder Lat. Clearance	6.0	ft	LW		0.0	1111/11
Interchange Density	0.50	I/mi	LC		0.0	mi/n
Number of Lanes, N	2		† _{ID}		0.0	mi/h
FFS (measured)		mi/h	f _N		4.5	mi/h
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h
LOS and Performance	leasures		Desian (N)		
			Design (N)	/		
Operational (LOS)			Design LOS			
$v_p = (V \text{ or DDHV}) / (PHF x N x)$	f _{HV} x f _p) <i>1060</i>	pc/h/ln	$v_{r} = (V \text{ or } DE)$	DHV) / (PHF x N x f	fuv x f_)	pc/h
S	65.5	mi/h	s (* * * * *	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	нуттр	mi/h
$D = v_p / S$	16.2	pc/mi/ln	$D = v_a / S$			nc/mi/ln
LOS	В		Required Nu	mber of Lanes N		P0/111/11
Glossary			Factor Lo	cation		
N - Number of lanes	S - Speed					
V - Hourly volume	D - Density		E _R - Exhibits	23-8, 23-10	fL	_{-W} - Exhibit 23-4
v Flow rate	FFS - Free-flow s	speed	E _T - Exhibits	23-8, 23-10, 23-11	l f _l	_{-C} - Exhibit 23-5
IOS - Level of service	BFFS - Base free	-flow speed	f _p - Page 23-	·12	f,	_N - Exhibit 23-6
DDHV - Directional design hou	ur volume		LOS, S, FFS	5, v _p - Exhibits 23-2	, 23-3 f _l	_D - Exhibit 23-7

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	BASIC FF		GMENTS W	ORKSHEET		
80 Free-Flow Speed FIS = 75 milh 70 65 milh 70 milh 70 65 milh 60 milh 60 55 milh 10 10 55 milh 10 10 400 200	1300 1300 1450 8 C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, vp FFS, LOS, vp FFS, LOS, N FFS, N, AAD FFS, LOS, N FFS, LOS, N	Output LOS, S, D N, S, D v _p , S, D T LOS, S, D ADT v _p , S, D v _p , S, D
General Information	•		Site Infor	nation		
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Eastb	oound)
Agency or Company	RPM Transport	ation	From/To		Between S	R-135 Ramps
Date Performed	Consultants		lurisdiction		Putnam Co	
Analysis Time Period	PM Peak Hour		Analysis Yea	ır	2013 Exist	, ing w/ Business Park
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning			
Moper.(LOS)			Des.(N)		🔲 Planr	ning Data
Flow Inputs						
Volume, V	1275	veh/h	Peak-Hour F	actor, PHF	0.90	
AADT		veh/day	% I rucks and	l Buses, P _T	22	
Peak-Hr Prop. of AADT, K			%RVs, P _R	olo	0	
$DDHV = AADT \times K \times D$		veh/h	General Terr Grade %	Length	Levei mi	
Driver type adjustment	1.00			Up/Down %		
Calculate Flow Adjustm	nents					
f _p	1.00		E _R		1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E	- T - 1) + P _R (E _R - 1)]	0.901	
Speed Inputs			Calc Spee	d Adj and FFS	i	
Lane Width	12.0	ft	f	t	0.0	mi/h
Rt-Shoulder Lat. Clearance	6.0	ft	LW f		0.0	
Interchange Density	0.50	I/mi	LC		0.0	rni/n
Number of Lanes, N	2		t _{ID}		0.0	mi/h
FFS (measured)		mi/h	f _N		4.5	mi/h
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h
LOS and Performance	Measures		Design (N)		
			Design (N)			
Operational (LOS)			Design LOS			
v _p = (V or DDHV) / (PHF x N x	: f _{HV} x f _p) 786	pc/h/ln	$v_n = (V \text{ or } DE)$) (PHF x N x f	f _{uv} x f_)	pc/h
S	65.5	mi/h	s		ну р	mi/h
$D = v_p / S$	12.0	pc/mi/ln	$D = v_{\rm L} / S$			pc/mi/ln
LOS	В		Required Nu	mber of Lanes N		Po/111/111
Glossary			Factor Lo	cation		
N - Number of lanes	S - Speed					
V - Hourly volume	D - Densitv		E _R - Exhibits	23-8, 23-10	f	r _{LW} - Exhibit 23-4
v - Flow rate	FFS - Free-flow s	peed	E _T - Exhibits	23-8, 23-10, 23-11	1 f	r _{LC} - Exhibit 23-5
I OS - Level of service	BFFS - Base free	-flow speed	f _p - Page 23-	12	f	_N - Exhibit 23-6
DDHV - Directional design hou	ur volume		LOS, S, FFS	, v _p - Exhibits 23-2	l, 23-3 f	f _{ID} - Exhibit 23-7

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	BASIC F	REEWAY SE	GMENTS W	ORKSHEET		
80 Free-Flow Spzed FIS = 75 milh 70 65 milh 70 milh 70 65 milh 60 milh 50 55 milh 10 milh 80 60 milh 10 milh 90 10 S A 10 milh 90 40 200	1300 1450 C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (M) Planning (v _p)	Input FFS, N, vp FFS, LOS, vp FFS, LOS, N FFS, N, AADT FFS, LOS, AAI FFS, LOS, N	Output LOS, S, D N, S, D v _p , S, D LOS, S, D DT N, S, D v _p , S, D
General Information			Site Inform	mation		
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Eastbo	ound)
Agency or Company	RPM Transport	ation	From/To		East of SR-	135
Date Performed	Consultants 5/22/2009		Jurisdiction		Putnam Co	
Analysis Time Period	PM Peak Hour		Analysis Yea	ar	2013 Existin	ng w/ Business Park
Project Description 09-0402	Mine Lick Creek I	JS - TDOT OC F	Planning			-
Oper.(LOS)			es.(N)		🔲 Planni	ng Data
Flow Inputs						
Volume, V	2628	veh/h	Peak-Hour F	actor, PHF	0.90	
		ven/day		i Buses, P _T	22	
Peak-Hr Prop. of AAD1, K			%RVS, P _R General Terr	ain.	U	
$DDHV = AADT \times K \times D$		veh/h	Grade %	Length	mi	
Driver type adjustment	1.00			Up/Down %		
Calculate Flow Adjustm	ients					
f _p	1.00		E _R		1.2	
E _T	1.5		$f_{HV} = 1/[1+P_T(B_T)]$	E _T - 1) + P _R (E _R - 1)]	0.901	
Speed Inputs			Calc Spee	ed Adj and FFS		
Lane Width	12.0	ft	f		0.0	mi/h
Rt-Shoulder Lat. Clearance	6.0	ft	f.		0.0	mi/h
Interchange Density	0.50	l/mi	LC		0.0	1111/11
Number of Lanes, N	2		^I ID		0.0	mi/n
FFS (measured)		mi/h	† _N		4.5	mi/h
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h
LOS and Performance M	Measures		Design (N)		
			Design (N)	-		
Operational (LOS)			Design LOS			
$v_p = (V \text{ or DDHV}) / (PHF x N x)$	f _{HV} x f _p) <i>1621</i>	pc/h/ln	$v_{p} = (V \text{ or } DE)$	DHV) / (PHF x N x i	f _{uv} x f _n)	pc/h
S	65.3	mi/h	S		nv p.	mi/h
$D = v_p / S$	24.8	pc/mi/ln	$D = v_p / S$			pc/mi/ln
LOS	С		Required Nu	mber of Lanes, N		1
Glossary			Factor Lo	cation		
N - Number of lanes	S - Speed					
V - Hourly volume	D - Densitv		E _R - Exhibits	23-8, 23-10	fL	_W - Exhibit 23-4
v, - Flow rate	FFS - Free-flow s	speed	E _T - Exhibits	23-8, 23-10, 23-11	1 f _L	_{.C} - Exhibit 23-5
LOS - Level of service	BFFS - Base free	e-flow speed	f _p - Page 23-	·12	f _N	_v - Exhibit 23-6
DDHV - Directional design hou	ur volume		LOS, S, FFS	5, v _p - Exhibits 23-2	, 23-3 f _{II}	_D - Exhibit 23-7

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BASIC FREEWAY SEGMENTS WORKSHEET										
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	B C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, vp FFS, LOS, vp FFS, LOS, N FFS, N, AAD FFS, LOS, AA FFS, LOS, N	Output LOS, S, D N, S, D v _p , S, D T LOS, S, D ADT v _p , S, D v _p , S, D				
General Information			Site Inform	mation						
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (West	bound)				
Agency or Company	RPM Transport	ation	From/To		East of SR	-135				
Date Performed	Consultants		Jurisdiction		Putnam Co					
Analysis Time Period	PM Peak Hour		Analysis Yea	ar	2013 Exist	, ing w/ Business Park				
Project Description 09-0402	Mine Lick Creek I	JS - TDOT OC F	Planning							
Oper.(LOS)			es.(N)		🗖 Planr	ning Data				
Flow Inputs										
Volume, V	1807	veh/h	Peak-Hour F	actor, PHF	0.90					
		veh/day		d Buses, P _T	22					
Peak-Hr Prop. of AAD1, K			%RVS, P _R General Terr	oin.	U					
DDHV = AADT x K x D		veh/h	Grade %	Length	mi					
Driver type adjustment	1.00			Up/Down %						
Calculate Flow Adjustm	nents									
f _p	1.00		E _R		1.2					
E _T	1.5		$f_{HV} = 1/[1+P_T(E)]$	E _T - 1) + P _R (E _R - 1)]	0.901					
Speed Inputs			Calc Spee	ed Adj and FFS	i.					
Lane Width	12.0	ft	f		0.0	mi/h				
Rt-Shoulder Lat. Clearance	6.0	ft	'LW f		0.0	mi/h				
Interchange Density	0.50	I/mi	LC		0.0					
Number of Lanes, N	2		^I ID		0.0	mi/n				
FFS (measured)		mi/h	† _N		4.5	mi/h				
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h				
LOS and Performance	Measures		Design (N	()						
			Design (N)	/						
Operational (LOS)			Design LOS							
$v_p = (V \text{ or DDHV}) / (PHF x N x)$	c t _{HV} x t _p) <i>1114</i>	pc/h/ln	$v_{p} = (V \text{ or } DE)$	DHV) / (PHF x N x i	f _{HV} x f _n)	pc/h				
S	65.5	mi/h	S	, , ,	nv p	mi/h				
$D = v_p / S$	17.0	pc/mi/ln	$D = v_r / S$			pc/mi/ln				
LOS	В		Required Nu	mber of Lanes. N		p 0//				
Glossarv			Factor Lo	cation						
N - Number of lanes	S - Speed									
V - Hourly volume	D - Densitv		E _R - Exhibits	23-8, 23-10	f	_{LW} - Exhibit 23-4				
v, - Flow rate	FFS - Free-flow s	speed	E _T - Exhibits	23-8, 23-10, 23-11	l f	L _C - Exhibit 23-5				
LOS - Level of service	BFFS - Base free	- flow speed	f _p - Page 23-	-12	f	_N - Exhibit 23-6				
DDHV - Directional design hou	ur volume		LOS, S, FFS	5, v _p - Exhibits 23-2	, 23-3 f	_{ID} - Exhibit 23-7				

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	BASIC FF		GMENTS W	ORKSHEET		
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	B C 45 M2 1300		2400	<u>Application</u> Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, v _p FFS, LOS, v _p FFS, LOS, N FFS, N, AAD FFS, LOS, A/ FFS, LOS, N	Output LOS, S, D N, S, D v _p , S, D T LOS, S, D ADT N, S, D v _p , S, D
General Information	riose roce (permit)		Site Infor	mation		
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (West	bound)
Agency or Company	RPM Transport	ation	From/To		Retween S	R-135 Ramos
Data Data mad	Consultants				Detween Or	1 100 Namps
Date Performed Analysis Time Period	5/22/2009 PM Peak Hour		Jurisdiction	ar	2013 Exist) ing w/ Rusiness Park
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning	41	2010 2013	ing w Dusiness Funk
Oper.(LOS)			Des.(N)		Planr	ing Data
Flow Inputs			. ,			5
Volume, V	1146	veh/h	Peak-Hour F	actor, PHF	0.90	
AADT		veh/day	%Trucks and	l Buses, P _T	22	
Peak-Hr Prop. of AADT, K			%RVs, P _R		0	
Peak-Hr Direction Prop, D		voh/h	General Terr	ain:	Level mi	
Driver type adjustment	1.00	Ven/m	Graue //	Up/Down %	1111	
Calculate Flow Adjustm	nents			•		
f	1.00		E _R		1.2	
Ē,	1.5		f _{LIV} = 1/[1+P _T (E	E _T - 1) + P _P (E _P - 1)]	0.901	
Speed Inputs				d Adi and FFS		
Lane Width	12.0	ft			0.0	
Rt-Shoulder Lat Clearance	60	ft	t _{LW}		0.0	mi/h
Interchange Density	0.50	l/mi	f _{LC}		0.0	mi/h
Number of Lanes N	2	.,	f _{ID}		0.0	mi/h
FFS (measured)	-	mi/h	f _N		4.5	mi/h
Base free-flow Speed BEES	70.0	mi/h	FFS		65.5	mi/h
LOS and Porformance I	Moasuros	1111/11	Docian (N	١		
LOS and Performance	wiedsuies			/		
Operational (LOS)						
$v_p = (V \text{ or DDHV}) / (PHF x N x)$	(f _{HV} x f _p) 707	pc/h/ln	Design LOS		f v f)	n o /h
S	. 65.5	mi/h	$v_p = (v \text{ or } DL)$		HV [∧] 'p)	pc/n
$D = v_p / S$	10.8	pc/mi/ln				rni/n
LOS	А		$D = v_p / S$	where of the state		pc/mi/in
01			Required Nu	mber of Lanes, N		
Glossary	0 0 1		Factor Lo	cation		
N - Number of lanes	S - Speed		E _R - Exhibits	23-8, 23-10	f	LW - Exhibit 23-4
v - Hourly volume	D - Density		E _T - Exhibits	23-8, 23-10, 23-1 ²	1 f	LC - Exhibit 23-5
v _p - Flow rate	FFS - Free-flow s	peed	f, - Page 23-	-12	f	N - Exhibit 23-6
LOS - Level of service	BFFS - Base free	e-flow speed	LOS, S, FFS	5, v _p - Exhibits 23-2	., 23-3 f	- Exhibit 23-7
DDHV - Directional design hor	ur volume		, =,	. р		י <u>ט</u> ו

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	BASIC F		GMENTS W	ORKSHEET		
80 Free-Flow Speed FFS = 75 min 70 65 min 70 min 70 60 min 70 min 70 70 min 70 min 70	1300 1450 B. C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, vp FFS, LOS, vp FFS, LOS, N FFS, N, AAD FFS, LOS, A/ FFS, LOS, N	Output LOS, S, D N, S, D v _p , S, D T LOS, S, D ADT N, S, D v _p , S, D
General Information	4		Site Infor	mation		
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (West	bound)
Agency or Company	RPM Transport	ation	From/To		Between S	R-135 & SR-56
Dete Derformed	Consultants		luriadiction		Dutnom C	
Analysis Time Period	5/22/2009 PM Peak Hour		Analysis Yea	ır	2013 Exist) ing w/ Business Park
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning	··	2010 2000	
Moper.(LOS)			es.(N)		🔲 Planr	ning Data
Flow Inputs						
Volume, V	1964	veh/h	Peak-Hour F	actor, PHF	0.90	
AADT		veh/day	%Trucks and	l Buses, P _T	22	
Peak-Hr Prop. of AADT, K			%RVs, P _R		0	
DDHV = AADT $x K x D$		veh/h	General Terr Grade %	Length	Levei mi	
Driver type adjustment	1.00			Up/Down %		
Calculate Flow Adjustm	nents					
f _p	1.00		E _R		1.2	
E _T	1.5		$f_{HV} = 1/[1+P_T(E)]$	_T - 1) + P _R (E _R - 1)]	0.901	
Speed Inputs			Calc Spee	d Adj and FFS		
Lane Width	12.0	ft	f		0.0	mi/h
Rt-Shoulder Lat. Clearance	6.0	ft	f		0.0	mi/h
Interchange Density	0.50	I/mi	'LC f		0.0	mi/h
Number of Lanes, N	2		'ID		0.0	111/11
FFS (measured)		mi/h	т _N		4.5	mi/h
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h
LOS and Performance I	Measures		Design (N)		
Operational (LOS)			Design (N)			
	(f		Design LOS			
$v_p = (V \text{ or } D D H V) / (PHF X N X)$	(1211) (1271)	pc/h/ln	$v_p = (V \text{ or } DE)$	DHV) / (PHF x N x t	HV x f _p)	pc/h
S (C	65.5	mi/h	s		·	mi/h
$D = v_p / S$	18.5	pc/mi/ln	$D = v_p / S$			pc/mi/ln
LOS	С		Required Nu	mber of Lanes, N		
Glossary			Factor Lo	cation		
N - Number of lanes	S - Speed			00 0 00 10		
V - Hourly volume	D - Density			23-8, 23-10	1	LW - EXNIDIT 23-4
v _p - Flow rate	FFS - Free-flow s	speed		23-8, 23-10, 23-11	1	LC - EXhibit 23-5
LOS - Level of service	BFFS - Base free	e-flow speed	т _р - Раде 23-		1	N - EXNIDIT 23-6
DDHV - Directional design hou	ur volume			, v_p - Exhibits 23-2	, 23-3 1	ID - Exhidit 23-7

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	BASIC FF		GMENTS W	ORKSHEET		
80 Free-Flow Speed FIS = 75 milh 70 65 milh 70 milh 70 65 milh 60 milh 50 10 S A 10 Flow 80 10 S A 10 Flow 90 400 200	1300 1300 14500 1450 1450 1450 1450 14500 1450 1450 1450 1450 1450		2400	<u>Application</u> Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (M) Planning (v _p)	Input FFS, N, v _p FFS, LOS, v _p FFS, LOS, N FFS, N, AADI FFS, LOS, AA FFS, LOS, N	<u>Output</u> LOS, S, D N, S, D v _p , S, D I LOS, S, D DT N, S, D v _p , S, D
General Information	· · · · · · · · · · · · · · · · · · ·		Site Infor	mation		
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Westl	oound)
Agency or Company	RPM Transport	ation	From/To		Between S	R-56 Ramps
Date Performed	Consultants		lurisdiction		Putnam Co	
Analysis Time Period	5/22/2009 PM Peak Hour		Analysis Yea	ar	2013 Existi	, na w/ Business Park
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning			
Coper.(LOS)			Des.(N)		🔲 Plann	ing Data
Flow Inputs						
Volume, V	1666	veh/h	Peak-Hour F	actor, PHF	0.90	
AADT		veh/day	%Trucks and	l Buses, P _T	22	
Peak-Hr Prop. of AADT, K			%RVs, P _R		0	
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terr Grade %	ain: Length	Level mi	
Driver type adjustment	1.00		Ciddo /	Up/Down %		
Calculate Flow Adjustm	ents					
f _p	1.00		E _R		1.2	
E _T	1.5		f _{HV} = 1/[1+P _T (E	E _T - 1) + P _R (E _R - 1)]	0.901	
Speed Inputs			Calc Spee	d Adj and FFS	5	
Lane Width	12.0	ft	4		0.0	mi/h
Rt-Shoulder Lat. Clearance	6.0	ft	LW		0.0	1111/11
Interchange Density	0.50	I/mi	LC		0.0	mi/n
Number of Lanes, N	2		[†] ID		0.0	mi/h
FFS (measured)		mi/h	f _N		4.5	mi/h
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h
LOS and Performance	leasures		Desian (N)		
			Design (N)	/		
Operational (LOS)			Design LOS			
$v_p = (V \text{ or DDHV}) / (PHF x N x)$	f _{HV} x f _p) <i>10</i> 27	pc/h/ln	$v_{r} = (V \text{ or } DE)$	DHV) / (PHF x N x f	funz X f_)	pc/h
S	65.5	mi/h	s s	/	пур/	mi/h
$D = v_p / S$	15.7	pc/mi/ln	$D = v_a / S$			nc/mi/ln
LOS	В		Required Nu	mber of Lanes N		P0/11/11
Glossarv			Factor	cation		
N - Number of lanes	S - Speed					
V - Hourly volume	D - Density		E _R - Exhibits	23-8, 23-10	f	_{LW} - Exhibit 23-4
v - Flow rate	FFS - Free-flow s	peed	E _T - Exhibits	23-8, 23-10, 23-11	1 f	_{LC} - Exhibit 23-5
I OS - Level of service	BFFS - Base free	-flow speed	f _p - Page 23-	·12	f	_N - Exhibit 23-6
DDHV - Directional design hou	ur volume		LOS, S, FFS	5, v _p - Exhibits 23-2	2, 23-3 f	_{ID} - Exhibit 23-7

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	BASIC FI	REEWAY SE	GMENTS V	VORKSHEET		
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	B C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, v _p FFS, LOS, v _p FFS, LOS, N FFS, N, AAD FFS, LOS, AA FFS, LOS, N	<u>Output</u> LOS, S, D N, S, D v _p , S, D T LOS, S, D ADT N, S, D v _p , S, D
General Information	-		Site Infor	mation		
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Westl	bound)
Agency or Company	RPM Transport	ation	From/To		West of SF	R-56
Date Performed	5/22/2009		Jurisdiction		Putnam Co	0
Analysis Time Period	PM Peak Hour		Analysis Yea	ar	2013 Existi	ing w/ Business Park
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning			
Oper.(LOS)			es.(N)		Plann	ning Data
Flow Inputs	1001		De al Illaur D		0.00	
Volume, V	1934	ven/n veh/dav	Peak-Hour F	ACTOR, PHF	0.90	
Peak-Hr Prop. of AADT K		ven/uay	%RVs P	Duses, 1 T	0	
Peak-Hr Direction Prop. D			General Teri	rain:	Level	
$DDHV = AADT \times K \times D$		veh/h	Grade %	Length	mi	
Driver type adjustment	1.00			Up/Down %		
	ients		_			
	1.00		⊨ _R		1.2	
E _T	1.5		$f_{\rm HV} = 1/[1+P_{\rm T}(E_{\rm HV})]$	E _T - 1) + P _R (E _R - 1)]	0.901	
Speed Inputs			Calc Spee	ed Adj and FFS		
Lane Width	12.0	ft	f _{LW}		0.0	mi/h
Rt-Shoulder Lat. Clearance	6.0	ft	f _{LC}		0.0	mi/h
Interchange Density	0.50	l/mi	f		0.0	mi/h
Number of Lanes, N	2		f.		4.5	mi/h
FFS (measured)		mi/h			65 F	mi/h
Base free-flow Speed, BFFS	70.0	mi/h	гго		05.5	1111/11
LOS and Performance I	Measures		Design (N	()		
Operational (LOS)			<u>Design (N)</u>			
v = (V or DDHV) / (PHF x N x)	(f, x f.) 1193	nc/h/ln	Design LOS			
	65 5	po/h/m	$v_p = (V \text{ or } DI)$	DHV) / (PHF x N x i	f _{HV} x f _p)	pc/h
D = y / S	18.2	nc/mi/ln	S			mi/h
los	10.2 C	pormin	$D = v_p / S$			pc/mi/ln
			Required Nu	mber of Lanes, N		
Glossary			Factor Lo	cation		
N - Number of lanes	S - Speed		F Exhibite	23-8 23-10	f	Exhibit 23-4
V - Hourly volume	D - Density		F Exhibite	23-8 23-10 22-11	י 1 f	LW Exhibit 23-4
v _p - Flow rate	FFS - Free-flow s	speed		- 20-0, 20-10, 20-1 -12	י I f	LC - Exhibit 23-6
LOS - Level of service	BFFS - Base free	e-flow speed	$ _p = 1$ age 23	V - Exhibite 22-2	י 23-3 f	N Exhibit 23-7
DDHV - Directional design hor	ur volume			$v_p = L \times 10003 \times 20^{-2}$., ∠J-J I	

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BASE YEAR 2013 INTERSTATE 40 AT STATE ROUTE 56 (BAXTER ROAD)

	RAMPS AND RAMP JUNCTIONS WORKSHEET									
General Infor	mation			Site Infor	rmation					
Analyst	ALB			Freeway/Dir of Tr	ravel I-40 (Eastbound)					
Agency or Company	RPM	Transportatio	n Consultants	Junction	E	Exit Ramp to SR-56				
Date Performed	5/22/2	2009		Jurisdiction	Putnam Co					
Analysis Time Period	AM P	eak Hour		Analysis Year	20	013 Ex	kisting w/ B	usiness Park		
Project Description	09-0402 Mine L	Lick Creek - I	DOT OC Planni	ng						
Inputs		Torrain: Low							. .	
Upstream Adj Ramp		Terrain. Lev							Downstrea Ramp	m Adj
	۱ د								Yes	On On
									MNO	ft
-up I			$S_{FF} = 70.0 \text{ mp}$	h	S _{EP} = 35	i.0 mpl	า		down	
V _u = veh/h	veh/h Sketch (show lanes, L				L_{D}, V_{R}, V_{f}				V _D =	veh/h
Conversion to	o pc/h Und	der Base	Condition	s	1	1	1			
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	1	f _{HV}	f _p	v = V/PHF	x f _{HV} x f _p
Freeway	2186	0.90	Level	22	0	0.9	901	1.00	269	96
Ramp	275	0.90	Level	22	0	0.9	901	1.00	33	9
UpStream										
DownStream	<u> </u>	Merge Areas					 	iverge Areas		
Estimation of	F V 40	norge meus			Estimatio	on o	f V ₄₀	iverge nicus		
	- 1 Z	(D)					1 <u>2</u>			
1	$v_{12} = v_F$	(r _{FM})	- 05 0)				v ₁₂ =	$v_{R} + (v_{F} - v_{f})$		
L _{EQ} =	(⊏qua		[20-3)		L _{EQ} =		(1	equation 25-8	3 OF 25-9)	1 11 05 40)
P _{FM} =	using	Equation (EXNIDIL 25-5)		P _{FD} =		1.0	00 using Eq	luation (Exh	DIT 25-12)
V ₁₂ =	pc/n	-	- ($V_{12} =$		26	96 pc/h		
V_3 or V_{av34}	pc/h (Equation 2	5-4 or 25-5)		V ₃ or V _{av34}	0.7	0	pc/h (Equatio	on 25-15 or	25-16)
IS V_3 or $V_{av34} > 2,70$	u pc/n? 📔 Yes	s 🔲 No			IS V ₃ or V _{av34}	> 2,70	JU pc/n ?	Yes Mo		
Is V_3 or $V_{av34} > 1.5$	V ₁₂ /2 Yes	s 📕 No			Is V ₃ or V _{av34}	> 1.5	^ V ₁₂ /2	Yes 🗹 No		
If Yes,V _{12a} =	pc/h (Equation 2	5-8)		If Yes,V _{12a} =		р	c/h (Equation	25-18)	
Capacity Che	ecks			1	Capacity	Che	ecks	1		
-	Actual	(Capacity	LOS F?			Actual	Ca	pacity	LOS F?
					V _F		2696	Exhibit 25-1	4 4800	No
V _{FO}		Exhibit 25-7			$V_{FO} = V_{F}$ -	V_{R}	2357	Exhibit 25-1	4 4800	No
					V _R		339	Exhibit 25-3	3 2000	No
Flow Entering	g Merge In	fluence A	Area		Flow Ent	erin	g Merg	e Influence	e Area	
	Actual	Max	Desirable	Violation?		A	ctual	Max Desirat	ole	Violation?
V _{R12}		Exhibit 25-7			V ₁₂	2	696	Exhibit 25-14	4400:All	No
Level of Serv	ice Detern	nination ((if not F)		Level of	Serv	vice De	terminatio	n (if not l	F)
D _R = 5.475 + 0.	00734 v _R + (0.0078 V ₁₂	- 0.00627 L _A		D _F	_R = 4.	252 + 0.0	0086 V ₁₂ - 0.0	0009 L _D	
D _R = (pc/mi/	ln)				$D_{R} = 24.5$	5 (pc/	mi/ln)			
LOS = (Exhibi	t 25-4)				LOS = C (Exhib	, oit 25-4)			
Speed Deterr	nination				Speed D	eteri	minatio	n		
M _S = (Exibit 2	5-19)				$D_{s} = 0.45$	59 (Ex	khibit 25-	19)		
S _R = mph (Exh	ibit 25-19)				$S_{R}^{=}$ 57.2	2 mph	(Exhibit 2	25-19)		
$S_0 = mph (Exh$	ibit 25-19)				S ₀ = N/A	mph	(Exhibit 2	25-19)		
S = mph (Exh	ibit 25-14)				S = 57.2	2 mph	(Exhibit 2	25-15)		

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RAMPS AND RAMP JUNCTIONS WORKSHEET											
General Infor	mation			Site Infor	mation						
Analyst Agency or Company Date Performed Analysis Time Perioc Project Description	ALB RPM 5/22/2 M P 09-0402 Mine I	Transportation 2009 Peak Hour Lick Creek - TD	rtation Consultants Junction Entrance Ramp from SR-56 Jurisdiction Putnam Co r Analysis Year 2013 Existing w/ Business Park								
Inputs				5							
Upstream Adj Ramp		Terrain: Leve	l						Downstrea Ramp	am Adj	
Yes Or	1								Tes 🗐	Cn On	
Mo Of	f								🗹 No	Cff Off	
L _{up} = ft		S	= 70.0 mp	h	S = 3	5 0 m	oh		L _{down} =	ft	
V _u = veh/h	/eh/h Sketch (show lanes, L _A , L _L					0.0 m	511		V _D =	veh/h	
Conversion t	o pc/h Und	der Base (Condition	s					-		
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f _{HV}	f _p	v = V/PHF	x f _{HV} x f _p	
Freeway	1911	0.90	Level	22	0	0	901	1.00	2	357	
Ramp	371	0.90	Level	22	0	0	901	1.00		458	
UpStream					ļ						
DownStream	<u> </u>								<u> </u>		
Estimation of	FV	werge Areas			Fstimat	ion i	of V	Diverge Areas	>		
Loundton of	• 12	(D)			Lotinat		12		() D		
	$v_{12} = v_F$	(P _{FM})	05.0				v ₁₂ =	• v _R + (v _F - v	R ^{PFD}	N	
L _{EQ} =	(Equa	ation 25-2 or	25-3))	L _{EQ} =			(Equation 2	5-8 01 25-9) 25 12)	
F _{FM} =	1.000	using Equation	ion (Exhibit 23	D-5)	$F_{\text{FD}} =$			using Equa			
$v_{12} - v_{12} - v$	2357	DC/N			$v_{12} = 12$			pc/n	n DE 1E or DE	1/)	
$v_3 \text{ or } v_{av34}$	0 pc/r 0 nc/h2 🗔 Ver		25-4 01 25-5)		$V_3 \cup V_{av34}$	< 2°	700 nc/h2		11 20-10 UI 20	-10)	
$13V_3 \text{ or } V_{av34} > 2,70$					Is V or V	34 ^{~ 2,} \ 1 \	5 * V /2				
$13 v_3 01 v_{av34} > 1.3$	v ₁₂ /2 i re:	5 MINU	0)			34 - 1	⁵ ¹² / ²	no/h (Equat	10 ion 25 19)		
$\frac{1}{12a}$			-0)			v Ch	ocks	pc/ii (Equal	1011 25-16)		
Capacity Che		C	anacity		Capaci	y Ch	Actua		`apacity	1.0S E2	
	Actual		apacity		V		Actua	Exhibit 25	5-14	LUJT:	
V	2815	Evhibit 25-7		No	V - V	- V		Exhibit 2	5-14		
°FO	2010				V_{-}	• R		Evhibit 2	5-3		
Elow Entoring	Morgo In	fluonoo A	*~~~			tori	na Mar				
FIOW Entering	Actual	Max	Tea Desirable	Violation?	FIOW EI		Actual	ge innuer Max De	sirahle	Violation?	
V _{R12}	2815	Exhibit 25-7	4600:All	No	V ₁₂	<u>'</u>	lotudi	Exhibit 25-14		violation.	
Level of Serv	ice Detern	nination (i	f not F)	I	Level of	Ser	vice D	eterminat	ion (if no	ot F)	
D _R = 5.475 +	0.00734 v _R + 0).0078 V ₁₂ - 0.0	0627 L _A			$D_R = 4$	1.252 + ().0086 V ₁₂ -	0.0009 L _D		
D _R = 22.9 (pc	/mi/ln)				D _R = (p	oc/mi/	ln)		_		
LOS = C (Exhib	oit 25-4)				LOS = (E	xhibi	t 25-4)				
Speed Determ	nination				Speed L	Dete	rminat	ion			
M _S = 0.338 (Exi	bit 25-19)				D _s = (E	xhibit	25-19)				
S _R = 60.5 mph	(Exhibit 25-19)				S _R = m	ph (Ex	hibit 25-19))			
$S_0 = N/A mph ($	V/A mph (Exhibit 25-19) $S_0 = mph$ (Exhibit 25-19)										
S = 60.5 mph	(Exhibit 25-14)				S = m	ph (Ex	hibit 25-15	5)			

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	RAMPS AND RAMP JUNCTIONS WORKSHEET									
General Infor	mation			Site Infor	mation					
Analyst	ALB			Freeway/Dir of Tr	ravel I-40 (Westbound)					
Agency or Company	RPM	Transportatio	n Consultants	Junction	E	Exit Ramp to SR-56				
Date Performed	5/22/2	2009		Jurisdiction	P	Putnam	n Co			
Analysis Time Period	AM P	eak Hour		Analysis Year	2	013 E	xisting w/ B	usiness Park		
Project Description	09-0402 Mine I	Lick Creek - I	DOT OC Planni	ng						
Inputs		Torrain: Low						(-	
Upstream Adj Ramp			5 1						Downstrea Ramp	m Adj
	f								Yes	□ On
									MNO L _{down} =	ft Off
up			S _{FF} = 70.0 mp	h	S _{FR} = 35	5.0 mp	h		down	
V _u = veh/h	/h Sketch (show lanes, L				L_{D}, V_{R}, V_{f}				V _D =	veh/h
Conversion to	o pc/h Und	der Base	Condition	s	1	1	1	1		
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f _{HV}	fp	v = V/PHF	x f _{HV} x f _p
Freeway	1453	0.90	Level	22	0	0.	901	1.00	179	92
Ramp	227	0.90	Level	22	0	0.	901	1.00	28	0
UpStream					1					
DownStream	<u> </u>	Merge Areas					I	iverne Areas		
Estimation of	· Vaa	norgornous			Estimation of v ₁₂					
	1 2	(D)					12			
	v ₁₂ – v _F	(^r FM)	- 05 0)				v ₁₂ =	$v_R + (v_F - v_F)$	R ^{IF} FD	
L _{EQ} =	(⊏qua		[20-3)		L _{EQ} =		(E	equation 25-8	or 25-9)	
P _{FM} =	using	Equation (Exhidit 25-5)		P _{FD} =		1.0	00 using Eq	uation (Exhi	bit 25-12)
V ₁₂ =	pc/h				V ₁₂ =		17	92 pc/h		
V ₃ or V _{av34}	pc/h (Equation 2	5-4 or 25-5)		V ₃ or V _{av34}		0	pc/h (Equatio	on 25-15 or	25-16)
Is V_3 or $V_{av34} > 2,/0$	0 pc/h? 🔲 Yes	s 🔲 No			Is V_3 or V_{av34}	₁ > 2,7	00 pc/h?	Yes 🗹 No		
Is V_3 or $V_{av34} > 1.5$	[•] V ₁₂ /2 [Yes	s 🔲 No			Is V_3 or V_{av34}	₁ > 1.5	* V ₁₂ /2	Yes 🗹 No		
If Yes,V _{12a} =	pc/h (Equation 2	5-8)		If Yes, V _{12a} =		р	c/h (Equation	25-18)	
Capacity Che	ecks				Capacity	Ch	ecks			
	Actual	(Capacity	LOS F?			Actual	Ca	pacity	LOS F?
					V _F		1792	Exhibit 25-14	4 4800	No
V _{FO}		Exhibit 25-7			$V_{FO} = V_{F}$ -	· V _R	1512	Exhibit 25-14	4 4800	No
					V _R	[280	Exhibit 25-3	2000	No
Flow Entering	g Merge In	fluence A	Area	i	Flow Ent	terin	g Merg	e Influence	e Area	
	Actual	Мах	Desirable	Violation?			Actual	Max Desirab	le	Violation?
V _{R12}		Exhibit 25-7			V ₁₂	1	792	Exhibit 25-14	4400:All	No
Level of Serv	ice Detern	nination ((if not F)		Level of	Serv	vice De	terminatio	n (if not l	5)
D _R = 5.475 + 0.	00734 v _R + (0.0078 V ₁₂	- 0.00627 L _A			_R = 4.	.252 + 0.0	0086 V ₁₂ - 0.0	0009 L _D	
D _R = (pc/mi/	ln)				D _R = 16.	3 (pc/	/mi/ln)			
LOS = (Exhibi	t 25-4)				LOS = B (Exhit	oit 25-4)			
Speed Determ	nination				Speed D	eter	minatio	n		
M _S = (Exibit 2	5-19)				$D_{s} = 0.4$	53 (E	xhibit 25-	19)		
S _R = mph (Exh	ibit 25-19)				S _R = 57.	3 mph	(Exhibit 2	25-19)		
$ S_0 = mph (Exh$	ibit 25-19)				S ₀ = N/A	\ mph	(Exhibit 2	25-19)		
S = mph (Exh	ibit 25-14)				S = 57.	3 mph	(Exhibit 2	25-15)		

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RAMPS AND RAMP JUNCTIONS WORKSHEET										
General Infor	mation			Site Infor	mation					
Analyst Agency or Company Date Performed Analysis Time Period Project Description	ALB RPM 5/22/2 A AM P 09-0402 Mine	Transportatior 2009 'eak Hour ick Creek - TE	Consultants	Freeway/Dir of Travel I-40 (Westbound) onsultants Junction Entrance Ramp from SR-56 Jurisdiction Putnam Co Analysis Year 2013 Existing w/ Business Park						
Inputs	07 0402 1011101			ing						
Upstream Adj Ramp		Terrain: Leve	I						Downstre	am Adj
🗖 Yes 🗖 Or	ו								Tes 1	🗖 On
🗹 No 🔽 Of	f								🗹 No	C Off
L _{up} = ft		S	$r_{r} = 70.0 \text{ mp}$	h	S-n = .3	5.0 mpł	1		L _{down} =	ft
V _u = veh/h	I	$S_{FF} = 70.0$ mpm $S_{FR} = 35.0$ Sketch (show lanes, L_A, L_D, V_R, V_P)							V _D =	veh/h
Conversion to	o pc/h Und	der Base	Condition	s					-	
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f	ΗV	f _p	v = V/PHF	^F x f _{HV} x f _p
Freeway	1226	0.90	Level	22	0	0.9	01	1.00	1	512
Ramp	211	0.90	Level	22	0	0.9	01	1.00		260
UpStream										
DownStream	<u> </u>	Morgo Aroas						Divorgo Aroas		
Estimation of	f v ₁₂	vierge Areas			Estimation of v ₁₂					
	$V_{12} = V_{\Gamma}$	(P _{EM})					V ₁₀ =	= V _P + (V _F - \		
L _{EO} =	(Equa	ation 25-2 or	25-3)		L _{EO} =		12	(Equation 2	5-8 or 25-9))
P _{EM} =	1.000	usina Eauat	ion (Exhibit 2	5-5)	$P_{ED} =$			using Equat	tion (Exhibit	, 25-12)
V ₁₂ =	1512 g	oc/h	,		V ₁₂ =			pc/h	,	
V_{3} or $V_{3\sqrt{3}4}$, 0 pc/ł	n (Equation 2	25-4 or 25-5)	V_{3}^{12} or V_{3}^{12}			pc/h (Equation	n 25-15 or 25	-16)
Is V ₃ or V _{av34} > 2,70	0 pc/h? 🔲 Yes	s 🔽 No		, ,	Is V ₂ or V _{2V2}	2,70	0 pc/h?	Yes N	lo	,
Is V ₃ or V _{av34} > 1.5 ³	* V ₁₂ /2 🔲 Yes	s 🗹 No			Is V ₃ or V _{av3}	24 24 > 1.5	* V ₁₂ /2	Yes N	lo	
If Yes, $V_{12a} =$	pc/h (Equation 25	5-8)		If Yes, V _{12a} =	:	12	pc/h (Equat	ion 25-18)	
Capacity Che	cks	<u> </u>	,			v Che	cks	<u> </u>	,	
	Actual	C	apacity	LOS F?	<u> </u>		Actua		Capacity	LOS F?
				Í	V _F			Exhibit 25	5-14	
V _{FO}	1772	Exhibit 25-7		No	$V_{EO} = V_{E}$	- V _R		Exhibit 25	5-14	
					V _P			Exhibit 2	5-3	
Flow Entering	a Merge In	fluence A	rea	I	Flow Fn	terin	a Mer	ae Influen	ice Area	
<u> </u>	Actual	Max	Desirable	Violation?		Ac	tual	Max Des	sirable	Violation?
V _{R12}	1772	Exhibit 25-7	4600:All	No	V ₁₂			Exhibit 25-14		
Level of Serv	ice Detern	nination (if not F)		Level of	Serv	ice D	eterminat	ion (if no	ot F)
D _R = 5.475 +	0.00734 v _R + 0).0078 V ₁₂ - 0.0	0627 L _A			0 _R = 4.2	252 + (0.0086 V ₁₂ -	0.0009 L _D	
D _R = 14.9 (pc	:/mi/ln)				D _R = (p	c/mi/In)			
LOS = B (Exhib	oit 25-4)				LOS = (E	xhibit	25-4)			
Speed Determ	nination				Speed L	Deterr	ninat	ion		
M _S = 0.297 (Exi	bit 25-19)				D _s = (E	xhibit 25	5-19)			
S _R = 61.7 mph	(Exhibit 25-19)				S _R = m	ph (Exhi	bit 25-19))		
S ₀ = N/A mph (Exhibit 25-19)				S ₀ = m	ph (Exhi	bit 25-19	9)		
S = 61.7 mph	(Exhibit 25-14)				S = m	ph (Exhi	bit 25-15	5)		

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	TW	O-WAY STOP	CONTR	OLS	UMN	/ IARY					
General Information	า		Site I	nform	natio	on					
Analyst	ALB		Interse	Intersection			SR-56 & EB I-40 Ramps				
Agency/Co.	RPM Trai	RPM Transportation		Jurisdiction			Putnam Co				
Data Darformad	Consultar	Consultants		Analysis Year		2013 Existing w/ Business			ess		
Analysis Time Period	5/22/2003 ΔΜ Peak					Faik					
Project Description 00	-0402 Mine Lick	Creek - TDOT O	C Planning	N Planning							
Fast/West Street: 1-40 I	-0402 Mille Licr -B Fxit Ramp	Cleek - IDOT O	North/S	r South S	Street	t: SR-56					
Intersection Orientation:	North-South		Study F	Period	(hrs)	: 0.25					
Vehicle Volumes ar	nd Adiustme	nts			<u>, ,</u>						
Major Street	_	Northbound					Southbou	nd			
Movement	1	2	3			4	5		6		
	L	Т	R			L	Т		R		
Volume (veh/h)		346	43			328	150				
Peak-Hour Factor, PHF	0.90	0.90	0.90	<u> </u>		0.90	0.90		0.90		
Hourly Flow Rate, HFR (veh/h)	0	384	47			364	166		0	0	
Percent Heavy Vehicles	0					22					
Median Type		l	•	Undi	videa	1					
RT Channelized			0						0		
Lanes	0	1	0			0	1		0		
Configuration			TR			LT					
Upstream Signal		0					0				
Minor Street		Eastbound					Westbound				
Movement	7	8	9			10	11		12		
	L	Т	R			L	Т		R		
Volume (veh/h)	100		175								
Peak-Hour Factor, PHF	0.90	0.90	0.90)		0.90	0.90		0.90)	
Hourly Flow Rate, HFR (veh/h)	111	0	194			0	0 0		0		
Percent Heavy Vehicles	22	0	22			0	0		0		
Percent Grade (%)		0					0				
Flared Approach		Y					N				
Storage		1					0				
RT Channelized			0						0		
Lanes	0	0	0			0	0		0		
Configuration		LR				-			-		
Delay, Queue Length, a	nd Level of Se	rvice	J.				l				
Approach	Northbound	Southbound		Westb	ound		E	Eastbour	nd		
Movement	1	4	7	8		9	10	11		12	
Lane Configuration		LT						LR			
v (veh/h)		364						305			
C (m) (veh/h)		1030	<u> </u>					241			
v/c		0.35						1.27			
95% queue lenath		1.61	<u> </u>					15.42			
Control Delay (s/veh)		10.4	<u> </u>					189.6			
		R	<u> </u>					-100.0 E			
Approach Doloy (a/yah)			ļ	<u> </u>							
Approach LOC							189.0				
Approach LOS								F			

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	TW	O-WAY STOP	CONTR	DL SU	JMN	IARY					
General Information	า		Site II	nform	atic	on					
Analyst	ALB RPM Transportation		Interse Jurisdi	Intersection Jurisdiction			SR-56 & WB I-40 Ramps Putnam Co				
Agency/00.	Consultar	Consultants		Analysis Year		2013 Existing w/ Business			siness		
Date Performed	5/22/2009	Hour		, maryolo i our			Park				
Analysis Time Fellou											
Project Description 09	-0402 Mine Lick Nostbound Evit	Creek - IDOI O	Unit North/S	Couth S	troot	· CD 56					
East/West Street. 1-40 I	North-South	Ramp	Study E	Poriod ((hre)	. <u>38-30</u>					
		nto	Joluuy I	enou	(113)	. 0.25					
Venicle Volumes al	la Adjustine	Northbound		1			Southbou	Ind			
Major Street	1		3			4	5			6	
Movement		<u>Z</u>	R				<u> </u>			R	
Volume (veh/h)	55	391				-	461			156	
Peak-Hour Factor, PHF	0.90	0.90	0.90			0.90	0.90		0.90		
Hourly Flow Rate, HFR (veh/h)	61	434	0			0	512			173	
Percent Heavy Vehicles	22					0					
Median Type		tt	-	Undiv	vided	1					
RT Channelized			0							0	
Lanes	0	1	0			0	1			0	
Configuration	LT									TR	
Upstream Signal		0					0				
Minor Street		Eastbound					Westbound				
Movement	7	8	9			10	11	1		12	
	L	Т	R			L	Т			R	
Volume (veh/h)			1			17				210	
Peak-Hour Factor, PHF	0.90	0.90	0.90			0.90	0.90		(0.90	
Hourly Flow Rate, HFR (veh/h)	0	0	0			18	0		233		
Percent Heavy Vehicles	0	0	0			22	0			22	
Percent Grade (%)		0					0				
Flared Approach		N					0 Y				
Storage		0					1				
RT Channelized			0							0	
Lanes	0	0	0			0	0			0	
Configuration							IR			<u> </u>	
Delay Queue Length a	nd Level of Se	rvice	<u> </u>								
Approach	Northbound	Southbound	,	Nestbo	ound			Eastbo	und		
Movement	1	4	7	8		9	10	1	1	12	
	17		•	IR			10			12	
	£1			254	,						
$v (v \in I/II)$	01			201							
	ŏ22			500)		<u> </u>				
V/C	0.07			0.44	7					ļļ	
95% queue length	0.24			2.26	с С					ļ	
Control Delay (s/veh)	9.7			16.3	3					ļ	
LOS	A			C							
Approach Delay (s/veh)				16.3	3						
Approach LOS				С							

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	TWO-WAY TWO-LANE H	HIGHWAY SEGMEI	NT WORKSHEET					
General Information		Site Information						
Analyst Agency or Company Date Performed Analysis Time Period	ALB RPM Transportation Consultants 5/22/2009 AM Peak Hour	Highway s From/To Jurisdiction Analysis Year	SR-56 north of WB I-40 Rai Putnam Co 2013 Existing w/ Bu:	mps siness Park				
Project Description: 09-0402 M	ine Lick Creek - TDOT OC Planning							
Input Data	Shoulder width Lane width Lane width Shoulder width t length, L _t mi	tt tt Show North Arrow	Class I highway Class II Terrain Level Rol Two-way hourly volume 1218 Directional split 51/4 Peak-hour factor, PHF 0.90 No-passing zone 45 % Trucks and Buses , P _T 3% % Recreational vehicles, P _R 4%	highway ling veh/h 9				
			Access points/ mi 4					
Average Travel Speed								
Grade adjustment factor, f _G (Exh	nibit 20-7)		1.00					
Passenger-car equivalents for R	$V_{\rm CKS}, E_{\rm T}$ (Exhibit 20-9)		1.1					
Heavy-vehicle adjustment factor	$f_{\rm eff} = \frac{1}{(1 + P_{\rm eff} = -1) + P_{\rm eff} = -1)}$		0.997					
Two-way flow rate ¹ , v _p (pc/h)=V/	/ (PHF * f _o * f _{uv})		1357					
v, * highest directional split prop	ortion ² (pc/h)		692					
Free-Flow S	peed from Field Measurement		Estimated Free-Flow Speed					
Field Measured speed, S _{FM} Observed volume, V _f Free-flow speed, FFS FFS=S _{FN}	<i>mi/h</i> veh/h 1+0.00776(V _f / f _{HV}) <i>mi/h</i>	Base free-flow speed Adj. for lane width an Adj. for access points Free-flow speed FFS	I, BFFS _{FM} Id shoulder width ³ , f _{LS} (Exhibit 20-5) s, f _A (Exhibit 20-6) S. (FSS=BFFS-f,f,)	55.0 mi/h 2.6 mi/h 1.0 mi/h 51.4 mi/h				
Adj. for no-passing zones, fpg (r	<i>ni/h</i>) (Exhibit 20-11)		1.0					
Average travel speed, ATS (mi/	h) ATS=FFS-0.00776vp-fpp		39.8					
Percent Time-Spent-Following	p np							
Grade Adjustment factor, f _G (Ext	nibit 20-8)		1.00					
Passenger-car equivalents for tre	ucks, E _T (Exhibit 20-10)		1.0					
Passenger-car equivalents for R	Vs, E _R (Exhibit 20-10)		1.0					
Heavy-vehicle adjustment factor	, $f_{HV}=1/(1+P_{T}(E_{T}-1)+P_{R}(E_{R}-1))$		1.000					
Two-way flow rate ¹ , v _p (pc/h)=V/	/ (PHF * f _G * f _{HV})		1353					
v _p * highest directional split prop	ortion ² (pc/h)		690					
Base percent time-spent-followin	ng, BPTSF(%)=100(1-e ^{-0.000879v} p)		69.6					
Adj. for directional distribution an	id no-passing zone, t _{d/hp} (%)(Exh. 20-12)		0.3 75.0					
Percent time-spent-following, PT	sr(%)=BPTSF+T _{d/np}		75.9					
Level of service, LOS (Exhibit 20	0-3 for Class I or 20-4 for Class II)		D					
Volume to capacity ratio, v/c=V _p /	/ 3,200		0.42					
Peak 15-min veh-miles of travel,	VMT ₁₅ (veh- <i>mi</i>)= 0.25L _t (V/PHF)		338					
Peak-hour vehicle-miles of trave	I, VMT ₆₀ (veh- <i>mi</i>)=V*L _t		1218					
Peak 15-min total travel time, TT	- ₁₅ (veh-h)= VMT ₁₅ /ATS		8.5					
Notes 1. If Vp >= 3,200 pc/h, terminate 2. If highest directional split Vp>=	analysis-the LOS is F. = 1,700 pc/h, terminated anlysis-the LOS	is F.						

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	TWO-WAY TWO-LANE	HIGHWAY	' SEGME	ENT WORKSHEET	
General Information		Site	nformation		
Analyst Agency or Company Date Performed Analysis Time Period	ALB RPM Transportation Consultar 5/22/2009 AM Peak Hour	nts From Juriso Analy	vay /To liction sis Year	SR-56 Between I-40 Ram Putnam Co 2013 Existing w/ Bu	os usiness Park
Project Description: 09-0402 M	line Lick Creek - TDOT OC Planning				
Input Data	Shoulder width Lane width Lane width Shoulder width shoulder width	$\frac{-\overline{t}}{t}$	W North Arrow	Class I highway ✓ Class I Terrain ✓ Level ✓ Ro Two-way hourly volume 924 Directional split 527 Peak-hour factor, PHF 0.90 No-passing zone 100 % Trucks and Buses , P _T 3% % Recreational vehicles, P _R 4%	l highway olling veh/h 48 0 0
Average Travel Speed					
Grade adjustment factor, f _C (Exh	nibit 20-7)			1.00	
Passenger-car equivalents for tru	ucks, E _T (Exhibit 20-9)			1.2	
Passenger-car equivalents for R	Vs, E _R (Exhibit 20-9)			1.0	
Heavy-vehicle adjustment factor,	, f _{HV} =1/ (1+ P _T (E _T -1)+P _R (E _R -1))			0.994	
Two-way flow rate ¹ , v _p (pc/h)=V/	/ (PHF * f _G * f _{HV})			1033	
v _p * highest directional split prop	ortion ² (pc/h)			537	
Free-Flow S	peed from Field Measurement			Estimated Free-Flow Speed	
Field Measured speed, S _{FM} Observed volume, V _f Free-flow speed, FFS FFS=S _{FM}	mi/ veh 1+0.00776(V _f / f _{HV}) mi/	/h Base h/h Adj. fr h/h Adj. fr	free-flow spee or lane width a or access poin	ed, BFFS _{FM} and shoulder width ³ , f_{LS} (Exhibit 20-5) nts, f_A (Exhibit 20-6)	45.0 mi/h 0.4 mi/h 0.0 mi/h 44.6 mi/h
Adi, for no-passing zones, f., (r	<i>ni/h</i>) (Exhibit 20-11)	Fiee-	now speed, Fr	2.5	-+0 m/m
Average travel speed, ATS (mi/l	h) ATS=FFS-0.00776vf			34.1	
Percent Time-Spent-Following	, p iip I				
Grade Adjustment factor, f _G (Ext	nibit 20-8)			1.00	
Passenger-car equivalents for tru	ucks, E _T (Exhibit 20-10)			1.1	
Passenger-car equivalents for R	Vs, E _R (Exhibit 20-10)			1.0	
Heavy-vehicle adjustment factor,	, f _{HV} =1/ (1+ P _T (E _T -1)+P _R (E _R -1))			0.997	
Two-way flow rate ¹ , v _p (pc/h)=V/	(PHF * f _G * f _{HV})			1030	
v _p * highest directional split prop	ortion ² (pc/h)			536	
Base percent time-spent-followin	ng, BPTSF(%)=100(1-e ^{-0.000879v} p)			59.6	
Adj. for directional distribution an	nd no-passing zone, f _{d/hp} (%)(Exh. 20-12	2)		12.4	
Percent time-spent-following, PT	SF(%)=BPTSF+f _{d/np}			72.0	
Level of Service and Other Per	rformance Measures	1		Ν	
Volume to capacity ratio. v/c=V	/ 3,200			0.32	
Peak 15-min veh-miles of travel,	VMT ₁₅ (veh- <i>mi</i>)= 0.25L (V/PHF)			26	
Peak-hour vehicle-miles of trave	I, VMT ₆₀ (veh- <i>mi</i>)=V*L _*			92	
Peak 15-min total travel time, TT				0.8	
Notes 1. If Vp >= 3,200 pc/h, terminate 2. If highest directional split Vp>=	analysis-the LOS is F. = 1,700 pc/h, terminated anlysis-the LO	J. PS is F.			

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-	TWO-WAY TWO-LANE	HIGHW	AY SEGMEN	NT WORKSHEET	
General Information		,	Site Information		
Analyst Agency or Company Date Performed Analysis Time Period	ALB RPM Transportation Consulta 5/22/2009 AM Peak Hour	ants	Highway From/To Jurisdiction Analysis Year	SR-56 South of I-40 EB Ra Putnam Co 2013 Existing w/ Bu	imps siness Park
Project Description: 09-0402 Mir	ne Lick Creek - TDOT OC Planning				
Segment	Shoulder width Lane width Lane width Shoulder width length, L _t mi	t t t	Show North Arrow	Class I highway ✓ Class II Terrain ✓ Level Two-way hourly volume Directional split Peak-hour factor, PHF No-passing zone % Trucks and Buses , P _T % Recreational vehicles, P _R 4%	highway Iling reh/h t6
				Access points/ mi 8	
Average Travel Speed					
Grade adjustment factor, f _G (Exhi	bit 20-7)			1.00	
Passenger-car equivalents for true	cks, E _T (Exhibit 20-9)			1.2	
Passenger-car equivalents for RV	/s, E _R (Exhibit 20-9)			1.0	
Heavy-vehicle adjustment factor,	f _{HV} =1/ (1+ P _T (E _T -1)+P _R (E _R -1))			0.994	
Two-way flow rate ¹ , v _p (pc/h)=V/ ((PHF * f _G * f _{HV})			798	
v _p * highest directional split propo	rtion ² (pc/h)			431	
Free-Flow Sp	eed from Field Measurement			Estimated Free-Flow Speed	
Field Measured speed, S _{FM} Observed volume, V _f Free-flow speed, FFS FFS=S _{FM} ⁴	mi ve/ ⊧0.00776(V _f / f _{HV}) mi	i/h h/h i/h	Base free-flow speed Adj. for lane width and Adj. for access points	, BFFS _{FM} d shoulder width ³ , f _{LS} (Exhibit 20-5) s, f _A (Exhibit 20-6)	45.0 mi/h 1.7 mi/h 2.0 mi/h
Adi for no-passing zones f (m	<i>i/b</i>) (Exhibit 20-11)		Free-llow speed, FFS	3 (FSS=BFFS-I _{LS} -I _A)	41.5 111/11
Average travel speed ATS (<i>m/h</i>)) ATS=FFS-0 00776v -f			32.1	
Percent Time-Spent-Following	, rite it e clocifier p inp			- 	
Grade Adjustment factor, f _G (Exhi	ibit 20-8)			1.00	
Passenger-car equivalents for true	cks, E _T (Exhibit 20-10)			1.1	
Passenger-car equivalents for RV	′s, E _R (Exhibit 20-10)			1.0	
Heavy-vehicle adjustment factor,	f _{HV} =1/ (1+ P _T (E _T -1)+P _R (E _R -1))			0.997	
Two-way flow rate ¹ , v _p (pc/h)=V/ ((PHF * f _G * f _{HV})			796	
v _p * highest directional split propo	rtion ² (pc/h)			430	
Base percent time-spent-following	g, BPTSF(%)=100(1-e ^{-0.000879v} p)			50.3	
Adj. for directional distribution and	d no-passing zone, f _{d/hp} (%)(Exh. 20-1	2)		15.1	
Percent time-spent-following, PTS	SF(%)=BPTSF+f _{d/np}			65.4	
Level of Service and Other Perf	formance Measures				
Level of service, LOS (Exhibit 20-	3 for Class I or 20-4 for Class II)			C	
Peak 15-min vob milos of trovel	$(MT_{1}) = 0.251 (1/DUE)$			110	
Poak hour vehicle miles of trevel	$15 (ver - 111) = 0.23 L_{t}(v/F \Pi F)$			113	
Peak-nour venicle-miles of travel,	$\frac{V_{1}V_{1}V_{1}}{60} (Ven-mi) = V^{L}L_{1}$			428	
Peak 15-min total travel time, TT ₁	₅ (veh-h)= VMT ₁₅ /ATS			3.7	
1. If Vp >= 3,200 pc/h, terminate a 2. If highest directional split Vp>=	analysis-the LOS is F. 1,700 pc/h, terminated anlysis-the LC	DS is F.			

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		RAMF	S AND RA	MP JUNCTI	ONS WOF	RKS	HEET			
General Infor	mation			Site Infor	mation					
Analyst	ALB			Freeway/Dir of Tr	avel I-	40 (Ea	istbound)			
Agency or Company	RPM	Transportatio	n Consultants	Junction	E	Exit Ramp to SR-56				
Date Performed	5/22/2	2009		Jurisdiction	Р	utnam	Со			
Analysis Time Period	PM P	eak Hour		Analysis Year	2	013 E:	kisting w/ B	usiness Park		
Project Description	09-0402 Mine L	Lick Creek - I	DOT OC Planni	ng						
Inputs		Torrain: Low							- .	
Upstream Adj Ramp		Terrain. Lev							Downstrea Ramp	m Adj
	۱ د								Yes	On On
									MNO	ft Off
Lup R			$S_{rr} = 70.0 \text{ mp}$	h	S _{ED} = 35	5.0 mp	h		down	
V _u = veh/h	I	,	Sketc	h (show lanes, L _A ,	L _D ,V _R ,V _f)				V _D =	veh/h
Conversion to	o pc/h Und	der Base	Condition	s	1	1				
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f _{HV}	f _p	v = V/PHF	x f _{HV} x f _p
Freeway	1830	0.90	Level	22	0	0.	901	1.00	225	57
Ramp	291	0.90	Level	22	0	0.	901	1.00	35	9
UpStream					[ļ				
DownStream	<u> </u> N	Merge Areas					 	iverge Areas		
Fstimation of V				Estimation of v ₁₂						
	- 1 Z	(D)					- 1 2			
	$v_{12} = v_F$	(r _{FM})	- 05 0)		1		v ₁₂ =	$v_{R} + (v_{F} - v_{f})$	R ^{JIF} FD	
L _{EQ} =	(⊏qua		[20-3)		L _{EQ} =		(1	equation 25-8	3 OF 25-9)	1 11 05 40)
P _{FM} =	using	Equation (EXNIDIL 25-5)		P _{FD} =		1.0	JUU USINGEQ	luation (Exh	DIT 25-12)
V ₁₂ =	pc/n	-			$V_{12} =$		22	5/ pc/h		
V_3 or V_{av34}	pc/h (Equation 2	5-4 or 25-5)		V ₃ or V _{av34}	$/_{3}$ or V_{av34} 0 pc/h (Equation 25-15 or 25-16)				
Is V_3 or $V_{av34} > 2,70$	0 pc/h? MYes	s 📙 No			Is V ₃ or V _{av34}	> 2,7	00 pc/h?	Yes 🗹 No		
Is V_3 or $V_{av34} > 1.5$ *	[•] V ₁₂ /2 [Yes	s 🔲 No			Is V_3 or V_{av34}	₁ > 1.5	* V ₁₂ /2	Yes 🗹 No		
If Yes, V _{12a} =	pc/h (Equation 2	5-8)		If Yes, V _{12a} =		р	c/h (Equation	25-18)	
Capacity Che	ecks				Capacity	Che	ecks			
	Actual	(Capacity	LOS F?			Actual	Ca	pacity	LOS F?
					V _F		2257	Exhibit 25-1	4 4800	No
V _{FO}		Exhibit 25-7			$V_{FO} = V_{F}$ -	V _R	1898	Exhibit 25-1	4 4800	No
					V _R		359	Exhibit 25-3	3 2000	No
Flow Entering	a Merae In	fluence A	Area	1.	Flow Ent	terin	a Mera	e Influence	e Area	
	Actual	Max	Desirable	Violation?		A	Actual	Max Desirat	ole	Violation?
V _{R12}		Exhibit 25-7			V ₁₂	2	257	Exhibit 25-14	4400:All	No
Level of Serv	ice Detern	nination ((if not F)		Level of	Serv	vice De	terminatio	n (if not l	5)
D _R = 5.475 + 0.	00734 v _R + (0.0078 V ₁₂	- 0.00627 L _A		D _F	_R = 4.	252 + 0.0	0086 V ₁₂ - 0.0	0009 L _D	
D _R = (pc/mi/	ln)				D _R = 20.	7 (pc/	′mi/ln)			
LOS = (Exhibi	t 25-4)				LOS = C (Exhit	oit 25-4)			
Speed Determ	nination				Speed D	eter	minatio	n		
M _S = (Exibit 2	5-19)				$D_{s} = 0.40$	60 (E	xhibit 25-	19)		
$ S_R^{=}$ mph (Exh	ibit 25-19)				S _R = 57.	1 mph	(Exhibit 2	25-19)		
$ S_0 = mph (Exh)$	ibit 25-19)				S ₀ = N/A	h mph	(Exhibit 2	25-19)		
S = mph (Exh	ibit 25-14)				S = 57.	1 mph	(Exhibit 2	25-15)		

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	RAMPS AND RAMP JUNCTIONS WORKSHEET									
General Infor	mation			Site Infor	mation					
Analyst Agency or Company Date Performed Analysis Time Perioc Project Description	ALB RPM 5/22/2 1 PM P 09-0402 Mine I	Transportation 2009 <u>'eak Hour</u> Lick Creek - TE	Freeway/Dir of Travel I-40 (Eastbound) Insportation Consultants Junction Entrance Ramp from SR-56 Jurisdiction Putnam Co Hour Analysis Year 2013 Existing w/ Business Park Creek - TDOT OC Planning Freeway/Dir of Travel Freeway/Dir of Travel							
Inputs				<u> </u>						
Upstream Adj Ramp		Terrain: Leve	I						Downstre Ramp	am Adj
Yes On	1								Yes	🗖 On
🗹 No 🔲 Off	f								Mo No	Cff Off
L _{up} = ft			- 70.0 mp	h	<u> </u>	F 0 mph			L _{down} =	ft
V _u = veh/h	l		FF = 70.0 mp Sketc	h (show lanes, L _A ,	$S_{FR} = 3$ L_{D}, V_{R}, V_{f}	5.0 mpn			V _D =	veh/h
Conversion to	o pc/h Und	der Base (Condition	S	-		-			
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{HV}		f _p	v = V/PHF	x f _{HV} x f _p
Freeway	1539	0.90	Level	22	0	0.901		1.00	1	898
Ramp	180	0.90	Level	22	0	0.901		1.00		222
UpStream					[ļ				
DownStream	<u> </u>									
Merge Areas					Fstimati	ion of v	DIVE	erge Areas		
	• 12	(D)			Lounad		12) 5	
	$v_{12} = v_F$	(P _{FM})	05.0)				$v_{12} = v_R$	+ (V _F - V	R)P _{FD}	
L _{EQ} =	(Equa		25-3))	L _{EQ} =		(EC	Juation 25	0-8 0r 25-8	1) 05 10)
$P_{FM} =$	1.000	using Equat	ion (Exhibit 2	5-5)	P _{FD} =		usi	ng Equati	ion (Exhibit	25-12)
$v_{12} =$	1898 p	DC/N			$v_{12} =$		pc/	n h (Equation	DE 1E or DE	1/)
$v_3 \cup v_{av34}$	0 pc/r 0 pc/b2		25-4 01 25-5)	$v_3 \cup v_{av34}$	> 2 700 1	pc/b2		20-10 01 20	- 10)
$15V_3 \text{ or } V_{av34} > 2.70$					$15 V_3 \text{ or } V_{av34} > 2,700 \text{ pc/n}? Yes No$					
$13 v_3 01 v_{av34} > 1.3$	v ₁₂ /2 i re:	S MINU	()		If $V_{\text{PS}} V =$	4 ~ 1.5 V	12' ²	res 🔲 No b (Equativ) on 25-18)	
Capacity Che	pont		-0)			Choc	pc/		01125-10)	
	Actual		anacity	1.0S F2	Capacity		ns Actual		anacity	1.0S F2
	Actual	Ĭ	apacity		V_	, ,	Actual	Exhibit 25-	14	2001:
V _{FO}	2120	Exhibit 25-7		No	$V_{FO} = V_F$	- V _R		Exhibit 25-	14	
_					V _R	Í		Exhibit 25	-3	
Flow Entering	a Merae In	fluence A	rea		Flow En	terina	Merae	Influen	ce Area	
	Actual	Max	Desirable	Violation?		Actua	al [Max Des	irable	Violation?
V _{R12}	2120	Exhibit 25-7	4600:All	No	V ₁₂		Ext	nibit 25-14		
Level of Serv	ice Detern	nination (if not F)		Level of	Servic	e Dete	rminati	on (if no	ot F)
D _R = 5.475 +	0.00734 v _R + 0).0078 V ₁₂ - 0.0	0627 L _A			_R = 4.25	2 + 0.00	86 V ₁₂ - 0	.0009 L _D	
D _R = 17.6 (pc	/mi/ln)				D _R = (p	c/mi/ln)				
LOS = B (Exhib	oit 25-4)				LOS = (E	xhibit 25	5-4)			
Speed Determination					Speed Determination					
M _S = 0.305 (Exi	bit 25-19)				D _s = (E	xhibit 25-1	9)			
S _R = 61.5 mph ((Exhibit 25-19)				S _R = m	oh (Exhibit	25-19)			
S ₀ = N/A mph (I	Exhibit 25-19)				S ₀ = m	oh (Exhibit	25-19)			
S = 61.5 mph ((Exhibit 25-14)				S = m	oh (Exhibit	25-15)			

	RAMPS AND RAMP JUNCTIONS WORKSHEET									
General Infor	mation			Site Infor	mation					
Analyst	ALB			Freeway/Dir of Tr	ravel I-40 (Westbound)					
Agency or Company	RPM	Transportatio	n Consultants	Junction	E	xit Ra	mp to SR-5	6		
Date Performed	5/22/2	2009		Jurisdiction	P	Putnam	n Co			
Analysis Time Period	PM P	eak Hour		Analysis Year	2	013 E	xisting w/ B	usiness Park		
Project Description	09-0402 Mine I	Lick Creek - I	DOT OC Planni	ng						
Inputs		Torrain: Low	<u>่</u>							
Upstream Adj Ramp		Terrain. Lev							Downstrea Ramp	m Adj
	۱ د								Yes	On On
									Mo	ft Off
Lup R			$S_{rr} = 70.0 \text{ mp}$	h	S _{ED} = 35	5.0 mp	h		down	
V _u = veh/h	I	,	Sketc	h (show lanes, L _A ,	L _D ,V _R ,V _f)				V _D =	veh/h
Conversion to	o pc/h Und	der Base	Condition	s	1	1	1		1	
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f _{HV}	f _p	v = V/PHF	x f _{HV} x f _p
Freeway	1964	0.90	Level	22	0	0.	901	1.00	242	22
Ramp	298	0.90	Level	22	0	0.	901	1.00	36	8
UpStream					1					
DownStream	<u> </u>	Merge Areas						liverge Areas		
Estimation of V to Estimation				timation of v ₁₂						
	- 1 Z	(D)					1 <u></u>			
	$v_{12} = v_F$	(r _{FM})	- 05 0)				v ₁₂ =	$v_R + (v_F - v_F)$	R ^{JF} FD	
L _{EQ} =	(⊏qua		[20-3)		L _{EQ} =		()	=quation 25-8	3 OF 25-9)	
P _{FM} =	using	Equation (EXNIDIL 25-5)		$P_{FD} =$		1.0	JUU USING EC	quation (Exh	idit 25-12)
V ₁₂ =	pc/n	-			$V_{12} = 2422 \text{ pc/n}$					
V_3 or V_{av34}	pc/h (Equation 2	5-4 or 25-5)		$V_3 \text{ or } V_{av34}$ 0 pc/h (Equation 25-15 or 25-16)					
IS V_3 or $V_{av34} > 2,70$	iu pc/n? 📔 Yes	s 🔲 No			Is V ₃ or V _{av34} > 2,700 pc/h? Yes No					
Is V_3 or $V_{av34} > 1.5$	V ₁₂ /2 Yes	s 📕 No			Is V_3 or $V_{av34} > 1.5 * V_{12}/2$ [I Yes IV No					
If Yes,V _{12a} =	pc/h (Equation 2	5-8)		If Yes,V _{12a} =		р	c/h (Equation	1 25-18)	
Capacity Che	ecks			1	Capacity	' Ch	ecks			
	Actual	(Capacity	LOS F?			Actual	Ca	pacity	LOS F?
					V _F		2422	Exhibit 25-1	4 4800	No
V _{FO}		Exhibit 25-7			$V_{FO} = V_{F}$ -	· V _R	2054	Exhibit 25-1	4 4800	No
					V _R		368	Exhibit 25-3	3 2000	No
Flow Entering	g Merge In	fluence A	Area		Flow Ent	terin	g Merg	e Influenc	e Area	
	Actual	Max	Desirable	Violation?			Actual	Max Desiral	ple	Violation?
V _{R12}		Exhibit 25-7			V ₁₂		2422	Exhibit 25-14	4400:All	No
Level of Serv	ice Detern	nination ((if not F)		Level of	Ser	vice De	terminatio	n (if not l	F)
D _R = 5.475 + 0.	00734 v _R + (0.0078 V ₁₂	- 0.00627 L _A		D	_R = 4	.252 + 0.0	0086 V ₁₂ - 0.0	0009 L _D	
D _R = (pc/mi/	ln)				D _R = 21.	8 (pc	/mi/ln)			
LOS = (Exhibi	t 25-4)				LOS = C (Exhil	, bit 25-4)			
Speed Determ	nination				Speed D	eter	minatio	n		
M _S = (Exibit 28	5-19)				$D_{s} = 0.4$	61 (E	xhibit 25-	19)		
S _R = mph (Exh	$S_{R}^{=}$ mph (Exhibit 25-19) $S_{R}^{=}$ 57.1 mph (Exhibit 25-19)									
$S_0 = mph (Exh$	ibit 25-19)				S ₀ = N/A	A mph	(Exhibit 2	25-19)		
S = mph (Exh	ibit 25-14)				S = 57.	1 mph	(Exhibit	25-15)		

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	RA	MPS AND	RAMP JU	NCTIONS W	ORKSH	EET				
General Infor	mation			Site Infor	mation					
Analyst Agency or Company Date Performed Analysis Time Perioc Project Description	ALB RPM 5/22/2 1 PM P 09-0402 Mine I	ALB Freeway/Dir of Travel RPM Transportation Consultants Junction 5/22/2009 Jurisdiction PM Peak Hour Analysis Year 1402 Mine Lick Creek - TDOT OC Planning				I-40 (W Entrand Putnan 2013 E	/estbound) ce Ramp f n Co xisting w/	rom SR-56 Business Parl	(
Inputs										
Upstream Adj Ramp		Terrain: Leve	.						Downstre Ramp	am Adj
Yes Or	1								Tes Yes	Con 🗐
🗹 No 🔽 Off	f								🗹 No	Cff Off
L _{up} = ft			- 70.0 mp	h	<u> </u>	25.0 mr	h		L _{down} =	ft
V _u = veh/h	I		FF = 70.0 mpi Sketc	h (show lanes, L _A ,	$S_{FR} = S_{D_i} V_{R_i} V_{f_i}$	5.0 Mp	11		V _D =	veh/h
Conversion to	o pc/h Und	der Base (Condition	s						
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f _{HV}	f _p	v = V/PHF	= x f _{HV} x f _p
Freeway	1666	0.90	Level	22	0	0.9	901	1.00		2055
Ramp	268	0.90	Level	22	0	0.9	901	1.00		331
UpStream										
DownStream								D'		
Merge Areas					Estimat	ion c	fv	Diverge Area	s	
	* 12	(LStimat		" 12			
	$V_{12} = V_{F}$	(P _{FM})	05.0				V ₁₂ =	V _R + (V _F -	V _R)P _{FD}	
L _{EQ} =	(Equa	ation 25-2 or	· 25-3)	>	L _{EQ} =			(Equation 2	25-8 or 25-9	9) 05 10)
P _{FM} =	1.000	using Equat	ion (Exhibit 25	o-5)	P _{FD} =			using Equa	ition (Exhibit	25-12)
$v_{12} =$	2055 p	oc/n			$V_{12} =$			pc/n		1/
$V_3 \cup V_{av34}$	0 pc/r	n (Equation 2	25-4 or 25-5)		V_3 OF V_{av34}		00 nc/h2	pc/n (Equatio	n 25-15 or 25	-16)
$15V_3 \text{ or } V_{av34} > 2,70$		S M NO			$15V_3 UV_{av}$	34 > Z, I	* V /2		10	
$15 V_3 OI V_{av34} > 1.5$	v ₁₂ /2 res	S 🔟 INO	. 0)		$15 V_3 U V_{av}$	₃₄ > 1.0	v ₁₂ /2		10 tion 25 19)	
$\frac{1112}{12a} = \frac{1112}{12a}$	pc/n ((Equation 23	p-8)		Γ res, v_{12a}	v Ch	aaka	pc/n (Equa	101 25-18)	
Capacity Che	Actual		apacity		Capacit	<u>y Cn</u>	Actual		Conocity	
	Actual		apacity		V		Actual	Evhibit 2	5-14	LUST
VEO	2386	Exhibit 25-7		No	$V_{ro} = V_r$	- V.		Exhibit 2	5-14	
FO					V _R			Exhibit 2	5-3	
Flow Entering	a Merae In	fluence A	rea	J	Flow En	terin	a Mer	ge Influer	ice Area	<u> </u>
	Actual	Max	Desirable	Violation?		Α	ctual	Max De	sirable	Violation?
V _{R12}	2386	Exhibit 25-7	4600:All	No	V ₁₂			Exhibit 25-14		
Level of Serv	ice Detern	nination (if not F)		Level of	^F Ser	vice De	eterminat	ion (if no	ot F)
D _R = 5.475 +	0.00734 v _R + 0).0078 V ₁₂ - 0.0	00627 L _A		[0 _R = 4	.252 + 0	.0086 V ₁₂ -	0.0009 L _D	
D _R = 19.7 (pc	/mi/ln)				D _R = (p	oc/mi/l	n)			
LOS = B (Exhib	oit 25-4)				LOS = (E	Exhibit	25-4)			
Speed Determ	nination				Speed L	Deter	minati	on		
M _S = 0.316 (Exil	bit 25-19)				D _s = (E	xhibit 2	5-19)			
S _R = 61.1 mph ((Exhibit 25-19)				S _R = mph (Exhibit 25-19)					
$S_0 = N/A mph (I)$	Exhibit 25-19)				S ₀ = m	ph (Exł	nibit 25-19)		
S = 61.1 mph ((Exhibit 25-14)				S = m	ph (Exł	nibit 25-15)		

	TW	O-WAY STOP	CONTR	OL SI	UMN	MARY					
General Information	า		Site I	Site Information							
Analyst	ALB		Interse	ection			SR-56 & I	EB I-40 R	amps		
Agency/Co	RPM Trai	nsportation	Jurisd	Jurisdiction				Putnam Co			
	Consultar	nts	Analys	sis Yea	r		2013 Exis	ting w/ Bi	usiness		
Date Performed	5/22/2009 DM Dook	Hour					Park				
Project Description U9	-0402 Mine Lick	Creek - IDOI O	C Planning) Couth (
Intersection Orientation:	North-South		Study	Doriod	(hrs)	· 025					
	d A divetre e		Joluuy	criou	(113)	. 0.20					
Venicle Volumes an	<u>ia Adjustine</u>	Northbound					Southbou	nd			
Movement	1		3			1			6		
		<u>Z</u>	R				<u> </u>		R		
Volume (veh/h)		269	23			157	150				
Peak-Hour Factor, PHF	0.90	0.90	0.90)		0.90	0.90		0.90		
Hourly Flow Rate, HFR	0	208	25			17/	166		0		
(veh/h)		230	25			174	100		0		
Percent Heavy Vehicles	0	22 -									
Median Type		Undivided									
RT Channelized			0						0		
Lanes	0	1	0			0	1		0		
Configuration			TR			LT					
Upstream Signal		0	0 0			0					
Minor Street		Eastbound	1				Westbou	nd			
Movement	7	8	9			10	11		12		
		T	R			L	<u> Т</u>		R		
Volume (veh/h)	220	0.00	/1			0.00	0.00		0.00		
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90		0.90	0.90		0.90		
(veh/h)	244	0	78		0		0		0		
Percent Heavy Vehicles	22	0	22			0	0		0		
Percent Grade (%)		0					0				
Flared Approach		Y					N				
Storage		1					0				
RT Channelized			0						0		
Lanes	0	0	0			0	0		0		
Configuration		IR				•					
Delay Queue Length a	nd Level of Se	rvice	<u> </u>				J				
Approach	Northbound	Southbound		Westh	ound		F	asthound	4		
Movement	1	1	7	8	Jana	٩	10	11	12		
Long Configuration	l			0			10		12		
		LI 474						200			
		1/4		32		322					
し (m) (ven/n)		1132		326		326					
V/C		0.15			0.99						
95% queue length		0.54	10		10.74						
Control Delay (s/veh)		8.8		83.4		83.4					
LOS		A			F						
Approach Delay (s/veh)								83.4			
Approach LOS								F			

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	TWO-WAY STOP CONTROL SUMMARY									
General Information	า		Site I	nform	atic	on				
Analyst	ALB		Interse	ection			SR-56 &	WB I-	40 Ra	amps
Agency/Co	RPM Trai	nsportation	Jurisdi	ction			Putnam Co			
	Consultar	nts	Analys	is Year	-		2013 Existing w/ Business			siness
Date Performed	5/22/2009	Hour					Park			
Project Description 09	-0402 Mine Lick	Creek - IDOI C	OC Planning	l Couth C	troo					
East/west Street: 1-40	North-South	Ramp	Study E	Poriod ((hre)	1: SR-30				
				enou (1113)	. 0.25				
Venicle Volumes an	na Aajustme	Northbound					Southbou	und		
Major Street	1		3	3 4		1		ina		6
		<u>Z</u> T	R			 	<u> </u>			R
Volume (veh/h)	157	332				-	272			111
Peak-Hour Factor, PHF	0.90	0.90	0.90	,		0.90	0.90		(0.90
Hourly Flow Rate, HFR (veh/h)	174	368	0			0	302			123
Percent Heavy Vehicles	22					0				
Median Type				Undiv	ridea	1				
RT Channelized			0							0
Lanes	0	1 0 0 1				1 0		0		
Configuration	LT						TR		TR	
Upstream Signal		0				0				
Minor Street		Eastbound					Westbou	nd		
Movement	7	8	9			10	11			12
	L	Т	R			L	Т			R
Volume (veh/h)						35				263
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90		0.90	0.90		(0.90
Hourly Flow Rate, HFR (veh/h)	0	0	0		38		0			292
Percent Heavy Vehicles	0	0	0			22	0			22
Percent Grade (%)		0					0			
Flared Approach		N					Y			
Storage		0					1			
RT Channelized			0							0
Lanes	0	0	0			0	0			0
Configuration							LR			
Delay, Queue Length, a	nd Level of Se	rvice								
Approach	Northbound	Southbound		Westbo	ound		E	Eastb	ound	
Movement	1	4	7	8		9	10	1	1	12
Lane Configuration	LT			LR						
v (veh/h)	174			330)					
C (m) (veh/h)	1035		606			ĺ				
v/c	0.17			0.54	1					
95% queue lenath	0.60			3.28	3					
Control Delay (s/veh)	9.2			17.8	3					
	A	<u></u>	17.8							
Approach Delay (s/yeh)			17.8				J		<u>]</u>	
Approach LOS				 	•					
				U			1			

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TWO-WAY TWO-LA	NE HIGH	WAY SEGMEN	NT WORKSHEET
General Information		Site Information	
Analyst ALB Agency or Company RPM Transportation Construction Constructin Construction Construction Construction Constructin Cons	sultants	Highway From/To Jurisdiction Analysis Year	SR-56 north of WB I-40 Ramps Putnam Co 2013 Existing w/ Business Park
Project Description: 09-0402 Mine Lick Creek - TDOT OC Plannin	ig		
Input Data		1	
Shoulder width Lane width Lane width Shoulder width Segment length, L _t mi	<u>t</u> <u>t</u> <u>t</u>	Show North Arrow	Class I highway Class II highway Terrain Clevel Rolling Two-way hourly volume 978 veh/h Directional split 61 / 39 Peak-hour factor, PHF 0.90 No-passing zone 45 % Trucks and Buses , P _T 3 % % Recreational vehicles, P _R 4% Access points/ mi 4
Average Travel Speed		1	
Grade adjustment factor, f _G (Exhibit 20-7)			1.00
Passenger-car equivalents for trucks, E_T (Exhibit 20-9)			1.2
Passenger-car equivalents for RVs, E _R (Exhibit 20-9)			1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$			0.994
Two-way flow rate ¹ , v_p (pc/h)=V/ (PHF * f_G * f_{HV})			1093
v_p * highest directional split proportion ² (pc/h)			667
Free-Flow Speed from Field Measurement			Estimated Free-Flow Speed
Field Measured speed, S _{EM}	mi/h	Base free-flow speed,	, BFFS _{FM} 55.0 mi/h
Observed volume, V _f	veh/h	Adj. for lane width and	d shoulder width ³ , f _{LS} (Exhibit 20-5) 2.6 mi/h
Free-flow speed, FFS $$ FFS=S_{FM}+0.00776(V_{f}^{\prime}f_{HV}^{})	mi/h	Adj. for access points Free-flow speed, FFS	f_A (Exhibit 20-6) 1.0 m/n g (FSS=BFFS-f _{LS} -f _A) 51.4 mi/h
Adj. for no-passing zones, f _{np} (<i>mi/h</i>) (Exhibit 20-11)			1.5
Average travel speed, ATS (<i>mi/h</i>) ATS=FFS-0.00776v _p -f _{np}			41.4
Percent Time-Spent-Following		1	
Grade Adjustment factor, f _G (Exhibit 20-8)			1.00
Passenger-car equivalents for trucks, E _T (Exhibit 20-10)			1.1
Passenger-car equivalents for RVs, E _R (Exhibit 20-10)			1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$			0.997
Two-way flow rate ¹ , v _p (pc/h)=V/ (PHF * f _G * f _{HV})			1090
v _p * highest directional split proportion ² (pc/h)			665
Base percent time-spent-following, BPTSF(%)=100(1-e ^{-0.000879v} p)			61.6
Adj. for directional distribution and no-passing zone, f _{d/hp} (%)(Exh. 2	20-12)	ļ	8.5
Percent time-spent-following, PTSF(%)=BPTSF+f d/np			70.1
Level of Service and Other Performance Measures		1	D
Volume to capacity ratio, v/c=V _p / 3,200			0.34
Peak 15-min veh-miles of travel, VMT ₁₅ (veh- <i>mi</i>)= 0.25L _t (V/PHF)			272
Peak-hour vehicle-miles of travel, VMT ₆₀ (veh- <i>mi</i>)=V*L _t			978
Peak 15-min total travel time, TT ₁₅ (veh-h)= VMT ₁₅ /ATS			6.6
Notes			
1. If $v_P \ge 3,200$ pc/n, terminate analysis-the LOS is F. 2. If highest directional split Vp>= 1,700 pc/h, terminated anlysis-th	e LOS is F.		

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	TWO-WAY TWO-LANE	HIGHWA	Y SEGME	ENT WORKSHEET	
General Information		Site	Information		
Analyst Agency or Company Date Performed Analysis Time Period	ALB RPM Transportation Consultar 5/22/2009 PM Peak Hour	nts From Juri: Ana	nway n/To sdiction lysis Year	SR-56 Between I-40 Ramµ Putnam Co 2013 Existing w/ Bu	os Isiness Park
Project Description: 09-0402 M	line Lick Creek - TDOT OC Planning				
Input Data	Shoulder width Lane width Lane width Shoulder width shoulder width	$ \overline{t}$ $ \overline{t}$ $ t$ t t t t t t t t t	how North Arrow	Class I highway ✓ Class II Terrain ✓ Level ✓ Ro Two-way hourly volume 796 Directional split 611 × Peak-hour factor, PHF 0.90 No-passing zone 100 % Trucks and Buses , P _T 3% % Recreational vehicles, P _R 4%	highway olling veh/h 39)
Average Travel Speed					
Grade adjustment factor, f _G (Ext	hibit 20-7)			1.00	
Passenger-car equivalents for tr	ucks, E _T (Exhibit 20-9)			1.2	
Passenger-car equivalents for R	Vs, E _R (Exhibit 20-9)			1.0	
Heavy-vehicle adjustment factor	r, f _{HV} =1/ (1+ P _T (E _T -1)+P _R (E _R -1))			0.994	
Two-way flow rate ¹ , v _p (pc/h)=V/	/ (PHF * f _G * f _{HV})			890	
v _p * highest directional split prop	portion ² (pc/h)			543	
Free-Flow S	peed from Field Measurement			Estimated Free-Flow Speed	
Field Measured speed, S _{FM} Observed volume, V _f Free-flow speed, FFS FFS=S _{FN}	mi/ veh. ₁ +0.00776(V _f / f _{HV}) mi/	/h Bas h/h Adj. h/h Adj.	e free-flow spee for lane width a for access poin	ed, BFFS _{FM} and shoulder width ³ , f _{LS} (Exhibit 20-5) hts, f _A (Exhibit 20-6)	45.0 mi/h 0.4 mi/h 0.0 mi/h
Adi for no-passing zones f (r	<i>mi/h</i>) (Exhibit 20-11)	Free	-now speed, FF	28	44.0 111/11
Average travel speed ATS (mi/	//////////////////////////////////////			34.9	
Percent Time-Spent-Following					
Grade Adjustment factor, f _G (Exl	hibit 20-8)			1.00	
Passenger-car equivalents for tr	ucks, E _T (Exhibit 20-10)			1.1	
Passenger-car equivalents for R	Vs, E _R (Exhibit 20-10)			1.0	
Heavy-vehicle adjustment factor	$f_{HV} = 1/(1 + P_T(E_T - 1) + P_R(E_R - 1))$			0.997	
Two-way flow rate ¹ , v _p (pc/h)=V/	/ (PHF * f _G * f _{HV})			887	
v_p^{*} highest directional split prop	portion ² (pc/h)			541	
Base percent time-spent-followir	ng, BPTSF(%)=100(1-e ^{-0.000879v} p)			54.1	
Adj. for directional distribution ar	nd no-passing zone, f _{d/hp} (%)(Exh. 20-12	2)		13.5	
Percent time-spent-following, PT	rSF(%)=BPTSF+f _{d/np}			67.7	
Level of Service and Other Per	rformance Measures	1		<u>^</u>	
Volume to capacity ratio v/c=V	/ 3.200			0.28	
Peak 15-min veh-miles of travel.	, VMT ₄ , (veh- <i>mi</i>)= 0.25L.(V/PHF)			22	
Peak-hour vehicle-miles of trave	el, VMT _{eo} (veh- <i>mi</i>)=V*L.			80	
Peak 15-min total travel time, TT	τ Γ ₁₅ (veh-h)= VMT ₁₅ /ATS			0.6	
Notes 1. If Vp >= 3,200 pc/h, terminate 2. If highest directional split Vp>:	analysis-the LOS is F. = 1,700 pc/h, terminated anlysis-the LOS	S is F.			

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TWO-WAY TWO-LANE HIGH	WAY SEGMENT WORKSHEET
General Information	Site Information
Analyst ALB Agency or Company RPM Transportation Consultants Date Performed 5/22/2009 Analysis Time Period PM Peak Hour	HighwaySR-56From/ToSouth of I-40 EB RampsJurisdictionPutnam CoAnalysis Year2013 Existing w/ Business Park
Project Description: 09-0402 Mine Lick Creek - TDOT OC Planning	
Shoulder width It	Class I highway Class II highway Terrain Terrain Two-way hourly volume Two-way hourly volume Two-way hourly volume Trochal split Peak-hour factor, PHF No-passing zone No-passing zone No-passing zone % Recreational vehicles, P _R Access points/mi 8
Average Travel Speed	
Grade adjustment factor, f _G (Exhibit 20-7)	1.00
Passenger-car equivalents for trucks, E _T (Exhibit 20-9)	1.7
Passenger-car equivalents for RVs, E _R (Exhibit 20-9)	1.0
Heavy-vehicle adjustment factor, f_{HV} =1/ (1+ $P_T(E_T-1)+P_R(E_R-1)$)	0.979
Two-way flow rate ¹ , v_p (pc/h)=V/ (PHF * f_G * f_{HV})	582
v_{p} * highest directional split proportion ² (pc/h)	332
Free-Flow Speed from Field Measurement	Estimated Free-Flow Speed
Field Measured speed, S _{FM} mi/h Observed volume, V _f veh/h	Base free-flow speed, BFFS FM45.0 mi/hAdj. for lane width and shoulder width3, f_{LS} (Exhibit 20-5)1.7 mi/hAdj. for access points, f_A (Exhibit 20-6)2.0 mi/h
Free-flow speed, FFS FFS=S _{FM} +0.00776(V _P T _{HV})	Free-flow speed, FFS (FSS=BFFS-f _{LS} -f _A) 41.3 mi/h
Adj. for no-passing zones, f _{np} (<i>mi/h</i>) (Exhibit 20-11)	4.0
Average travel speed, ATS (<i>mi/h</i>) ATS=FFS-0.00776v _p -f _{np}	32.8
Percent Time-Spent-Following	
Grade Adjustment factor, f _G (Exhibit 20-8)	1.00
Passenger-car equivalents for trucks, E _T (Exhibit 20-10)	1.1
Passenger-car equivalents for RVs, E _R (Exhibit 20-10)	1.0
Heavy-vehicle adjustment factor, f _{HV} =1/ (1+ P _T (E _T -1)+P _R (E _R -1))	0.997
Two-way flow rate ¹ , v _p (pc/h)=V/ (PHF * f _G * f _{HV})	572
v_p^* highest directional split proportion ² (pc/h)	326
Base percent time-spent-following, BPTSF(%)=100(1-e ^{-0.000879v} p)	39.5
Adj. for directional distribution and no-passing zone, f _{d/hp} (%)(Exh. 20-12)	21.0
Percent time-spent-following, PTSF(%)=BPTSF+f d/np	60.5
Level of Service and Other Performance Measures	
Volume to capacity ratio v/c=V / 3 200	0 18
Peak 15-min veh-miles of travel. VMT (veh- m)= 0.251 (V/PHF)	86
Peak-hour vehicle-miles of travel VMT (veh- $mh=V^{+}$	308
Peak 15-min total travel time TT (veh-b)- VMT (ATS	26
Notes	
 If Vp >= 3,200 pc/h, terminate analysis-the LOS is F. If highest directional split Vp>= 1,700 pc/h, terminated anlysis-the LOS is F. 	

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BASE YEAR 2013 INTERSTATE 40 AT STATE ROUTE 135 (S. WILLOW AVENUE)

		RAMF	S AND RA	MP JUNCTI	ONS WOF	RKS	HEET			
General Infor	mation			Site Infor	mation					
Analyst	ALB			Freeway/Dir of Tr	ravel I-40 (Eastbound)					
Agency or Company	RPM	Transportatio	n Consultants	Junction	Exit Ramp to SR-135					
Date Performed	5/22/2	2009		Jurisdiction	Р	Putnam	n Co			
Analysis Time Period	I AM P	eak Hour		Analysis Year	2	013 E	xisting w/ B	usiness Park		
Project Description	09-0402 Mine I	Lick Creek IJS	- TDOT OC Pla	anning						
Inputs		Torrain, Lou							_	
Upstream Adj Ramp		Terrain: Lev	51						Downstrea Ramp	m Adj
	۱ ۰								Yes	On
	Ĩ								Mo	Off
$L_{up} = \Pi$			$S_{} = 70.0 \text{mp}$	h	S = 35	5 0 mp	h		⁻down ¯	it.
V _u = veh/h			L_{D}, V_{R}, V_{f}	np			V _D =	veh/h		
Conversion to	o pc/h Und	der Base	Condition	S						
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f _{HV}	f _p	v = V/PHF	x f _{HV} x f _p
Freeway	2282	0.90	Level	22	0	0.	901	1.00	282	4
Ramp	956	0.90	Level	22	0	0.	901	1.00	117	79
UpStream						ļ				
DownStream	,	Jorgo Arooc						ivorgo Aroac		
Merge Areas Estimation of v Estimation of v				of v	IVELYE ALEas					
	• 12	(Louman	011 0	12	<u>,, ,, ,,</u>		
	$V_{12} = V_{F}$	(P _{FM})					V ₁₂ =	V _R + (V _F - V _F	_R)P _{FD}	
L _{EQ} =	(Equa	ation 25-2 o	r 25-3)		L _{EQ} =		(E	Equation 25-8	3 or 25-9)	
P _{FM} =	using	Equation (Exhibit 25-5)		P _{FD} =		1.(000 using Eq	uation (Exh	bit 25-12)
V ₁₂ =	pc/h				$V_{12} = 2814 \text{ pc/h}$					
V_3 or V_{av34}	pc/h (Equation 2	5-4 or 25-5)		V ₃ or V _{av34} 0 pc/h (Equation 25-15 or 25-16)					
Is V_3 or $V_{av34} > 2,70$	0 pc/h? 🥅 Yes	s 🔲 No			Is V_3 or $V_{av34} > 2,700$ pc/h? [Yes No					
Is V_3 or $V_{av34} > 1.5$ *	V ₁₂ /2 🔲 Yes	s 🔲 No			Is V ₃ or V _{av34}	₁ > 1.5	* V ₁₂ /2	Yes 🗹 No		
If Yes, V _{12a} =	pc/h (Equation 2	5-8)		If Yes, V _{12a} =		р	c/h (Equation	25-18)	
Capacity Che	cks				Capacity	' Che	ecks			
	Actual	(Capacity	LOS F?			Actual	Ca	pacity	LOS F?
					V _F		2814	Exhibit 25-1	4 4800	No
V _{FO}		Exhibit 25-7			$V_{FO} = V_{F}$ -	· V _R	1635	Exhibit 25-1	4 4800	No
					Vp		1179	Exhibit 25-3	3 2000	No
Flow Entering	n Merge In	fluence /	Area		Flow Ent	terin	a Mera	e Influenci	e Δrea	
	Actual	Max	Desirable	Violation?			Actual	Max Desirat	ole	Violation?
V _{R12}		Exhibit 25-7			V ₁₂	2	2814	Exhibit 25-14	4400:All	No
Level of Serv	ice Detern	nination ((if not F)		Level of	Serv	vice De	terminatio	n (if not l	5)
$D_{R} = 5.475 + 0.$	00734 v _R + (0.0078 V ₁₂	- 0.00627 L _A		D	_R = 4.	.252 + 0.0	0086 V ₁₂ - 0.0	0009 L _D	
D _R = (pc/mi/	ln)				D _R = 25.	8 (pc /	/mi/ln)			
LOS = (Exhibi	t 25-4)				LOS = C (Exhit	oit 25-4)			
Speed Determ	nination				Speed D	eter	minatio	n		
M _S = (Exibit 28	5-19)				D _s = 0.5	34 (E	xhibit 25-	19)		
S _R = mph (Exh	ibit 25-19)				S _R = 55.	0 mph	(Exhibit 2	25-19)		
$ S_0^{=} $ mph (Exh	ibit 25-19)				S ₀ = N/A	A mph	(Exhibit 2	25-19)		
S = mph (Exh	ibit 25-14)				S = 55.	0 mph	(Exhibit 2	25-15)		

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	RA	MPS AND	RAMP JU	INCTIONS W	ORKSH	EET				
General Infor	mation			Site Infor	mation					
Analyst Agency or Company Date Performed Analysis Time Period Project Description	ALB RPM 5/22/2 I AM P 09-0402 Mine I	Transportatior 2009 Yeak Hour	Consultants	Freeway/Dir of Tra Junction Jurisdiction Analysis Year	avel	I-40 (Ea Entrand Putnan 2013 E	astbound ce Ramp n Co xisting w/) from SR-135 ' Business Park		
Inputs				ing						
Upstream Adj Ramp		Terrain: Leve	!						Downstre	am Adj
🗖 Yes 🗖 Or	1								Tes	🗖 On
🗹 No 🔽 Of	f								🗹 No	C Off
L _{up} = ft			– 70.0 mn	h	<u>s - 3</u>	5 0 mr	h		L _{down} =	ft
V _u = veh/h	I		FF - 70.0 mp Sketc	h (show lanes, L _A ,	$U_{FR} - C_{FR}$	10.0 mp			V _D =	veh/h
Conversion to	o pc/h Und	der Base	Condition	S						
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f _{HV}	f _p	v = V/PHF	x f _{HV} x f _p
Freeway	1326	0.90	Level	22	0	0.9	901	1.00	1	635
Ramp	541	0.90	Level	22	0	0.9	901	1.00		667
UpStream					[
DownStream	<u> </u>									
Estimation of	F V12	merge Areas			Estimat	ion c	of V_{12}	Diverge Areas	>	
	V = V	(P)					1 <u>2</u>	- \/ + (\/ - \	/)P	
l =	(Equa	tion 25-2 or	25-3)		=		* 12 ⁻	(Equation 2	' R/' FD 5-8 or 25-0))
P =	1 000	usina Fauat	ion (Exhibit 2)	5-5)	- _{ЕО} Р =				tion (Exhibit	7 25-12)
V =	1.000 1635 r	uoing ⊑quat nc/h		5 5)	V =			nc/h		20 12)
V _o or V _o	0 nc/h	o (Fauation '	25-4 or 25-5)	V _o or V _o			nc/h (Equation	n 25-15 or 25	-16)
I_{av34} Is V ₂ or V ₂₂₄ > 2.70	0 pc/h? 🔽 🗸 🗠			/	Is V _a or V	> 2.7	00 pc/h?		n 20 10 01 20	10)
$I_{av34} = 1.5$					Is V _a or V	34 -/· > 1.5	* V/2			
If Yes, $V_{10} =$	nc/h ((Equation 25	5-8)		If Yes.V ₁₀ =	:	- 12' -	pc/h (Equat	ion 25-18)	
	ocks	(qaaaon	,			v Ch	ecks	p 0/11 (= quar		
	Actual	<u>с</u>	apacity	LOS F?			Actua		Capacity	LOS F?
					V _F			Exhibit 25	5-14	
V _{FO}	2302	Exhibit 25-7		No	$V_{FO} = V_{F}$	- V _D		Exhibit 25	5-14	
10								Exhibit 2	5-3	
Flow Entering	a Merae In	fluence A	rea		Flow Fn	terin	a Mer	ae Influen	ice Area	
<u></u>	Actual	Max	Desirable	Violation?		A	ctual	Max Des	sirable	Violation?
V _{R12}	2302	Exhibit 25-7	4600:All	No	V ₁₂			Exhibit 25-14		
Level of Serv	ice Detern	nination (if not F)		Level of	Ser	vice D	eterminat	ion (if no	ot F)
D _R = 5.475 +	0.00734 v _R + 0).0078 V ₁₂ - 0.0	00627 L _A		C	0 _R = 4	.252 + (0.0086 V ₁₂ -	0.0009 L _D	
D _R = 19.6 (pc	/mi/ln)				D _R = (p	c/mi/l	n)			
LOS = B (Exhib	oit 25-4)				LOS = (E	Exhibit	25-4)			
Speed Deterr	nination				Speed L	Deter	minat	ion		
M _S = 0.321 (Exi	bit 25-19)				D _s = (E	xhibit 2	5-19)			
S _R = 61.0 mph	(Exhibit 25-19)				S _R = m	ph (Exł	nibit 25-19	9)		
$S_0 = N/A mph ($	Exhibit 25-19)				S ₀ = m	ph (Exł	nibit 25-19	9)		
S = 61.0 mph	(Exhibit 25-14)				S = m	ph (Exł	nibit 25-15	ō)		

		RAMP	S AND RA	MP JUNCTI	ONS WOR	RKSHE	ET			
General Infor	rmation			Site Infor	mation					
Analyst	ALB			Freeway/Dir of Tr	avel I-	40 (Westb	ound)	_		
Agency or Company	RPM	I ransportation	n Consultants	Junction	E	xit Ramp :	to SR-13	5		
Analysis Time Perior	ریکارد ۱۸۸۷ ۲	2009 Joak Hour		Julisuicii0Π Δnalvsis Vear	F 2	2013 Evisti	na w/ Ru	sinoss Dark		
Project Description	09-0402 Mine I	Lick Creek US	- TDOT OC Pla	anning	2		ng w Du			
Inputs				3						
Upstream Adj Ramp		Terrain: Leve	el						Downstrea Ramp	m Adj
Yes Or	ו								Tes	Cn 🗐
No Of	f								🗹 No	Cff Off
L _{up} = ft			70.0 mm	h	C 21	- 0 mnh			L _{down} =	ft
V _u = veh/h	1		S _{FF} = 70.0 mp Sketc	h (show lanes, L _A ,	$S_{FR} = 3$ L_{D}, V_{R}, V_{f}	5.0 mpn			V _D =	veh/h
Conversion t	o pc/h Und	der Base	Condition	S						
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{HV}		f _p	v = V/PHF	x f _{HV} x f _p
Freeway	2616	0.90	Level	22	0	0.901		1.00	32	26
Ramp	1450	0.90	Level	22	0	0.901		1.00	17	38
UpStream					1					
DownStream	<u>ا</u> ۲	J Merge Areas					 Div	verne Areas		
Estimation of	f V ₁₂	norgoritous			Estimati	on of v	12	longe ruleus		
	$V_{in} = V_{in}$	(P)					$V_{12} = V$	V_ + (V V_)P	
l =	(Equa	• FM / ation 25-2 o	r 25-3)		=		•12 - (F	"R'\"F "F quation 25-8	R [/] FD	
P_{EQ}	usina	Fauation (Exhibit 25-5)		$P_{EQ} =$		1.00)0 usina Fa	uation (Exh	ihit 25,12)
$V_{10} =$	pc/h				V ₁₀ =		322	6 nc/h		101(2012)
V ₂ or V ₂₂₄	pc/h (Fouation 2	5-4 or 25-5)		V ₂ or V ₂₂₄		0 r	o po/n oc/h (Equatio	on 25-15 or	25-16)
$1 \text{ s } V_2 \text{ or } V_{2224} > 2.70$)0 pc/h? 🔽 Yee		,		Is V ₂ or V ₂₂	, > 2.700 g	oc/h? 🥅	Yes 🔽 No		20 10)
$I_{\rm S} V_{2} \text{ or } V_{2224} > 1.5$	* V ₁₀ /2 🔲 Yee				Is V ₂ or V ₂₂₂	₄ > 1.5 * V.	1/2	Yes Vo		
If Yes, $V_{120} =$	pc/h (Equation 2	5-8)		If Yes, $V_{120} =$	4	DC	/h (Equation	25-18)	
	ecks	(/			/ Chec	ks			
	Actual	(Capacity	LOS F?			Actual	Ca	pacity	LOS F?
					V _F		3226	Exhibit 25-14	4 4800	No
VEO		Exhibit 25-7			$V_{EO} = V_{E}$	- V _P	1438	Exhibit 25-1	4 4800	No
							1788	Exhibit 25-3	2000	No
Flow Entering	n Merae In	fluence A	Area	I		terina	Merae	Influence	Δrea	
	Actual	Max	Desirable	Violation?	11011 211	Actu	al	Max Desirab	le	Violation?
V _{R12}		Exhibit 25-7			V ₁₂	3226	, I	Exhibit 25-14	4400:All	No
Level of Serv	ice Detern	nination ((if not F)		Level of	Servic	e Det	erminatio	n (if not l	F)
D _R = 5.475 + 0.	00734 v _R + (0.0078 V ₁₂	- 0.00627 L _A		D	_R = 4.25	2 + 0.0	086 V ₁₂ - 0.0	009 L _D	-
D _R = (pc/mi/	′ln)				D _R = 29.	5 (pc/mi/	/ln)			
LOS = (Exhibi	it 25-4)				LOS = D ((Exhibit 2	25-4)			
Speed Determ	nination				Speed D	etermi	natio	า		
M _s = (Exibit 2	5-19)				D _s = 0.5	89 (Exhil	bit 25-1	9)		
$ S_{R} = mph (Exh$	nibit 25-19)				S _R = 53.	5 mph (E	xhibit 2	5-19)		
$S_0 = mph (Exh$, nibit 25-19)				S ₀ = N/A	A mph (Ex	chibit 2	5-19)		
S = mph (Exh	nibit 25-14)				S = 53.	5 mph (E	xhibit 2	5-15)		

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	RA	MPS AND	RAMP JU	INCTIONS W	ORKSHE	EET				
General Infor	mation			Site Infor	mation					
Analyst Agency or Company Date Performed Analysis Time Perioc Project Description	ALB RPM 5/22/2 I AM P 09-0402 Mine	Transportation 2009 Peak Hour Lick Creek - TD	Consultants	Freeway/Dir of Tra Junction Jurisdiction Analysis Year	avel	I-40 (V Entrar Putna 2013 I	Vestbound nce Ramp m Co Existing w/	l) from SR-135 Business Park		
Inputs										
Upstream Adj Ramp		Terrain: Leve							Downstrea Ramp	am Adj
Yes Or	1								Ves	Cn On
No Of	f								Mo No	Cff Off
L _{up} = ft		S	= 70.0 mp	h	S _{ED} = 3	5.0 m	ph		L _{down} =	ft
V _u = veh/h			Sketc	h (show lanes, L _A ,	L _D ,V _R ,V _f)				V _D =	veh/h
Conversion to	o pc/h Und	der Base (Condition	s	1	1			1	
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f_{HV}	f _p	v = V/PHF	x f _{HV} x f _p
Freeway	1166	0.90	Level	22	0	0	.901	1.00	1	438
Ramp	287	0.90	Level	22	0	0	.901	1.00		354
UpStream										
DownStream	<u> </u>	 Merge Areas						Diverge Areas	 `	
Estimation of	۷ ₁₂	norgo ruous			Estimat	ion (of v_{12}	Divorgo ra out	, 	
	$V_{in} = V_{in}$	(P)					V =	= V_ + (V \	/_)P	
Lro =	(Equa	ation 25-2 or	25-3)		Lro =		• 12	(Equation 2	5-8 or 25-9)
P _{EM} =	1 000	using Equati	ion (Exhibit 2)	5-5)	Pro =				tion (Exhibit	, 25-12)
$V_{12} =$	1438 r	oc/h		5 07	V ₁₀ =			pc/h		20 12/
V_2 or $V_{0/24}$	0 pc/ł	n (Fouation 2	25-4 or 25-5)	V_2 or $V_{0,24}$			pc/h (Equation	n 25-15 or 25	-16)
$ Is V_3 \text{ or } V_{3\sqrt{34}} > 2,70$	0 pc/h? 🔽 Yes	s 🔽 No	,	, ,	Is V ₂ or V _{2V}	, > 2,	700 pc/h?	Yes N	lo	-7
Is V ₂ or V ₂₄ > 1.5	V ₁₀ /2 Ve	s 🔽 No			Is V ₂ or V ₂	, ⊳₄ > 1.	5 * V ₁₂ /2	Yes N	lo	
If Yes, V _{12a} =	pc/h ((Equation 25	-8)		If Yes, V _{12a} =	:	12	pc/h (Equat	ion 25-18)	
Capacity Che	cks		,		Capacit	y Ch	necks	<u> </u>		
	Actual	C	apacity	LOS F?			Actua		apacity	LOS F?
					V _F			Exhibit 25	5-14	
V _{FO}	1792	Exhibit 25-7		No	$V_{FO} = V_{F}$	- V _R		Exhibit 25	5-14	
					V _R			Exhibit 2	5-3	
Flow Enterine	g Merge In	fluence A	rea		Flow En	teri	ng Mer	ge Influen	ice Area	
	Actual	Max	Desirable	Violation?			Actual	Max Des	sirable	Violation?
V _{R12}	1792	Exhibit 25-7	4600:All	No	V ₁₂			Exhibit 25-14		
Level of Serv	ice Detern	nination (i	if not F)		Level of	⁻ Ser	vice D	eterminat	ion (if no	ot F)
D _R = 5.475 +	0.00734 v _R + 0	0.0078 V ₁₂ - 0.0	0627 L _A			0 _R = 4	4.252 + ().0086 V ₁₂ -	0.0009 L _D	
D _R = 15.3 (pc	/mi/ln)				D _R = (p	oc/mi/	ln)			
LOS = B (Exhib	oit 25-4)				LOS = (E	xhibi	t 25-4)			
Speed Determ	nination				Speed L	Dete	rminat	ion		
M _S = 0.300 (Exi	bit 25-19)				D _s = (E	xhibit	25-19)			
S _R = 61.6 mph	(Exhibit 25-19)				S _R = m	ph (Ex	hibit 25-19	?)		
S ₀ = N/A mph (Exhibit 25-19)				S ₀ = m	ph (Ex	hibit 25-19))		
S = 61.6 mph	(Exhibit 25-14)				S = m	ph (Ex	hibit 25-15	5)		

					нс	S+™ [DE	TAILI	Ξ	D RE	P	ORT									
General Info	rmation								S	Site Ir	nfo	ormati	ion	1							
Analyst	ALB								Ir	nterse	ect	ion		SR-1 ramp	35 s	& I-40 e	eas	tbour	nd		
Agency or Co	. RPM Trans	oortat	tion						A	Area 1	Гур	be	,	All ot	hei	areas					
Date Perform	ed 5/26/2009								J	Jurisd	icti	ion	1	Putna	am	Со					
Time Period	AM Peak He	our							A	Analys	sis	Year	2	2013	Еx	risting w	// B	usine	SS		
													1	Park ∩o₋∩∕	102	Mino I	ick	Croo	k-		
									P	Projec	t II	D		TDO	ΤC	C Plani	nin	g	A		
Volume and	Timing Input								-									<u> </u>			
					EB					WB						NB				SB	
			LT		ΤH	RT		LT	╡	TH		RT		LT		TH	F	RT	LT	ТН	RT
Number of La	nes, N1		1			1		ļ	╡							2		0	1	2	
Lane Group			L			R			4				_							<u>T</u>	
Volume, V (vp	on)		213			693			ᆛ				_			851		548 F	193	1485	
Book Hour Ec	Notor DUE		5			0.00			ᆉ				_			5		<u>00</u>	5	5	
Pretimed (P)	or Δ ctuated (Δ)		0.90			0.90			╉				\dashv			0.90 A	0.	90 A	Δ	Δ	
Start-up Lost	Time I1		20			20			╉				_			20	<u> </u>		20	20	
Extension of F	Effective Greer	n.e	2.0			2.0			┽							2.0	-		2.0	2.0	
Arrival Type,	AT	., e	3			3			╧							3			3	3	
Unit Extension	n, UE		3.0			3.0		1	╡							3.0			3.0	3.0	
Filtering/Mete	ring, I		1.000)		1.00)		1							1.000			1.000	1.000	
Initial Unmet I	Demand, Qb		0.0			0.0										0.0			0.0	0.0	
Ped / Bike / R	Ped / Bike / RTOR Volumes Lane Width				0	0		<u> </u>						0		0	(0	0	0	
Lane Width	_ane Width Parking / Grade / Parking					12.0										12.0			12.0	12.0	
Parking / Grad	Parking / Grade / Parking				0	N		ļ					_	Ν		0	1	V	N	0	N
Parking Mane	euvers, Nm							ļ	╡				_				_				
Buses Stoppi	ng, Nв		0			0		ļ								0			0	0	
Min. Time for	Pedestrians, C	jp I			3.2		1		_							3.2		1		3.2	
Phasing	EB Only		02			3	╡	04	_		<u> </u>	SB Or	<u>lly</u>		<u>N</u>	S Perm			07	0	8
Timing	G = 50.0 Y = 5	G =	0.0		G = Y -	0.0	-	G = 0	.0		V	$\frac{1}{-5}$.0		- v	= 52.0 5		<u> </u>	0.0	G = 0).0
Duration of Ar	nalvsis. T = <i>0.</i> 2	25	0		• -			1 - 0				_ 0				cle Lenc	ath.	C =	130.0		,
Lane Group	Capacity, Con	trol	Delay,	and	d LOS	Deter	mi	nation						Į			<u>, ,</u>	-			
				E	В				V	WВ					,	NB			ļ	SB	
			LT	T	Н	RT		LT	Т	ГН	F	RT	L	T		TH	R	Т	LT	<u>TH</u>	RT
Adjusted Flow	v Rate, v	2	237			770									1	333			214	1650	
Lane Group C	Capacity, c		669			599									1	333			212	1839	
v/c Ratio, X		0	.35		÷	.29									1	.00			1.01	0.90	
Total Green R	Ratio, g/C	0	.39		().39									0	.40			0.53	0.53	
Uniform Delay	y, d ₁	2	8.1		3	89.7									3	8.7			40.5	27.1	
Progression F	Factor, PF	1	.000			1.000									1	.000			1.000	1.000	
Delay Calibra	tion, k	0	.11		().50									0	.50			0.50	0.42	
Incremental D	Delay, d ₂		0.3			140.8									2	24.7			64.3	6.3	
Initial Queue I	nitial Queue Delay, d ₃					0.0									(0.0			0.0	0.0	
Control Delay	Control Delay		28.5			180.5									(63.4			104.8	33.4	
Lane Group L	Lane Group LOS		С			F										E			F	С	
Approach Del		144	.7										6	3.4					41.6		
Approach LO	S		F												E					D	
Intersection D	elay		73.	2				$X_{_{C}} = 1$.1	4			In	terse	cti	on LOS				Е	

					НС	S+™ [DE.	TAILE	ED RI	ΞP	ORT								
General Info	rmation								Site I	nfc	ormati	ion							
Analyst	ALB BBM Tropol	oortot	ion						Inters	ect	tion	S. ra	R-135 amps	5 & <i>1-40</i> 1	wes	tbour	nd		
Agency or Co	· Consultants	Jonai	1011						Area	Тур	be	A	ll othe	r areas					
Date Perform	ed 5/26/2009								Jurisc	licti	ion	P	Putnam	County	, 				
Time Period	AM Peak He	our							Analy	sis	Year	20 P	013 ⊑. Park	xisung w	// D	usine	88		
									Proje	ct I	D	09 T	9-0402 DOT (2 Mine L DC Plan	.ick ning	Cree.	k -		
Volume and	Timing Input																		
					EB				WB					NB				SB	
			LT		TH	RT		LT	TH		RT		LT	TH	F	RΤ	LT	ТН	RT
Number of La	nes, N1					ļ		1			ļ		1	2				2	0
Lane Group						<u> </u>		<u></u>			ļ		L	T	<u> </u>		<u> </u>	TR	
Volume, V (vp	oh)							1149			<u> </u>		136	928	<u> </u>		ļ	529	151
% Heavy Veh	ICIES, %HV							5			ļ		5	5	<u> </u>		ļ	5	5
Peak-Hour Fa	Ctor, PHF							0.90					1.90	0.90	┦—			0.90	0.90
Start up Loct	Time 4)						A 20					A 2.0					A	A
Extension of F	Time, II Effective Green			_				2.0					2.0	2.0				2.0	
Arrival Type		I, C						2.0					3	3				3	<u> </u>
								30	-				30	30			<u> </u>	30	
Filtering/Mete	ring I							1 000			[1	000	1 000				1 000	
Initial Unmet I	Demand, Qb					1		0.0				$-\frac{1}{0}$	0.0	0.0	╎─			0.0	
Ped / Bike / R	TOR Volumes					1		0	0				0	0	1-		0	0	0
Lane Width	ane Width Parking / Grade / Parking					1		12.0			[1.	2.0	12.0				12.0	
Parking / Grad	Parking / Grade / Parking							Ν	0		N		Ν	0	1	V	N	0	N
Parking Mane	Parking / Grade / Parking Parking Maneuvers, Nm																		
Buses Stoppi	ng, Nв							0					0	0				0	
Min. Time for	Pedestrians, G) p							3.2					3.2				3.2	
Phasing	WB Only		02		0	3		04			NB Or	nly	N	S Perm			07	0	8
Timing	G = 76.2	G =	0.0		G = (0.0	0	G = <i>0</i> .	0	G	i = 6.4	4	G	= 32.4		G =	0.0	G = (0.0
	Y = 5	Y =	0		Y = C)	<u>`</u>	Y = 0		Y	= 5		Y =	= 5		Y =	0	Y = ()
Duration of Ar	halysis, $T = 0.2$	25								_			Су	cle Leng	gth,	C =	130.0		
Lane Group	Capacity, Con	trol L	Delay,	and	LOS	Deter	<u>mir</u>	nation				1					1	0.0	
		-	<u>. T</u>		7 R	DT	<u> </u>			1	рт	 	r (D	т		SB Tu	рт
Adjusted Flow	v Rate, v				<u> </u>		12	<u>-</u> 1 277				15	51	1031		1		756	
Lane Group C	Capacity, c						10	008				14	1	1161				830	
v/c Ratio, X							1.2	27				1.07	7 ().89				0.91	
Total Green R	Ratio, g/C						0.5	59				0.34	4 ().34				0.25	
Uniform Delay	/, d ₁						26	.9				48.6	6 4	40.8				47.4	
Progression F	actor, PF						1.0	000				1.00	00	1.000				1.000	
Delay Calibra	tion, k						0.5	50				0.50	0 0).41				0.43	
Incremental D	elay, d ₂						12	8.0		_		96.	.0	8.7				14.1	
Initial Queue I	Delay, d ₃						0.	0		<u> </u>		0.0)	0.0				0.0	
Control Delay							15	4.9				144	4.6	49.4				61.5	
Lane Group L	ane Group LOS						<i>F</i>	-				F		D				E	<u></u>
Approach Del	Approach Delay						<u> </u>	154.	9				61.6	6				61.5	
Approach LO	S						<u> </u>	F					Ε					Е	
Intersection D	elay		98.	6				$X_{c} = 1.$.23			Inte	ersecti	on LOS				F	

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		RAMP	S AND RA	MP JUNCTI	ONS WOP	RKSHE	EET			
General Infor	mation			Site Infor	mation					
Analyst	ALB			Freeway/Dir of Tr	avel I-	-40 (East	cound)			
Agency or Company	RPM	Transportatio	n Consultants	Junction	E	xit Ramp	to SR-1	35		
Date Performed	5/22/2	2009 Jacob Haven		Jurisdiction	F	Putnam Co	0 	usina an Dark		
Analysis Time Period	00.0402 Mino I	eak Hour		Analysis Year	2	UI3 EXIST	ing w/ Bl	JSINESS Park		
Inputs	09-0402 10111101									
Upstream Adj Ramp		Terrain: Leve	el						Downstrea Ramp	m Adj
🗖 Yes 🗖 On	I								Ves	🗖 On
No Off	f								🗹 No	Cff
L _{up} = ft					•				L _{down} =	ft
V _u = veh/h			S _{FF} = 70.0 mp Sketc	n h (show lanes, L _A ,	$S_{FR} = 35$ L_{D}, V_{R}, V_{f}	5.0 mpn			V _D =	veh/h
Conversion to	o pc/h Und	der Base	Condition	s						
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{H\}	/	fp	v = V/PHF	x f _{HV} x f _p
Freeway	1719	0.90	Level	22	0	0.901	1	1.00	212	20
Ramp	444	0.90	Level	22	0	0.901	1	1.00	54	8
UpStream Down Stream										
DownStream	<u> </u>	Merge Areas					 Di	verge Areas		
Estimation of	· V12	norge meus			Estimati	on of v	V12	verge meas		
	1 2	(P)					1 <u>2</u>)P	
1 -	(Equa	('FM) ation 25-2 a	r 25-3)				v ₁₂ –		マパ FD	
$E_{EQ} =$	(Equa	Equation (Evhibit 25 5)		- _{EQ} - Р -		(⊑ 1.0	00 uning Eg	01 20-9)	ihit 2E 12)
FM -	using	Equation (EXHIDIL 20-0)		FD -		1.0	00 using ⊏q	uation (EXII	IUIL 20-12)
V_{12} –	pc/n	Equation 2	E 4 or 2E E)		$v_{12} - v_{12} - v$		212	20 pc/n		05.40)
$v_3 \cup v_{av34}$	0 nc/b2 🗔 Ver		5-4 01 25-5)		$v_3 \cup v_{av34}$	> 2 700	0 nc/h2	pc/n (Equalic	01 25-15 01	25-16)
$13V_3 \text{ or } V_{av34} > 2,70$					$13 v_3 01 v_{av34}$	1 5 * \				
$15 V_3 OI V_{av34} > 1.5$	v ₁₂ /2 res	5 IIINO	E 0)		$\int V_3 \cup V_{av34}$	1 × 1.5 V	^{12²}	Yes MNO	25 19)	
$\frac{1112}{12a} = \frac{1112}{12a}$	pc/n (Equation 2	5-8)		$\mathbf{C}_{\text{ansatt}}$	Char	pc	n (Equation	25-18)	
Capacity Che	Actual	1 (Capacity		Capacity	Cnec	Actual		nacity	
	Actual	(Japacity	LUSF?	V		ACIUAI			LUSF?
N		E. 1.11.11.0E.7			V V		2120		4 4000	
^V FO		EXNIDIL 25-7			$v_{FO} = v_F$	· v _R	1572		4 4800	INO
	<u> </u>				V _R		548	Exhibit 25-3	3 2000	No
Flow Entering	g Merge In	fluence A	Area		Flow Ent	tering	Merge	e Influence	e Area	
	Actual	Max Evhibit 25.7	Desirable	Violation?		ACTI		Max Desirab		Violation?
	iaa Dotorn	exhibit 20-7	(if not E)			Sorvia		exmination	4400.All	
$\frac{\text{Level of Selv}}{D = 5.475 \pm 0}$	$\frac{100734}{100734} = 0$		- 0.006271			- 1 25	2 ± 0.0			
$D_{\rm R} = 0.475 \pm 0.1$	(00704 V R + V	0.0070 v ₁₂	- 0.00027 L _A		D - 10	R - 4.20)2 + 0.0	12 - 0.0		
$I_R = (Exhibi)$	t 25-4)				$I_R = I_{9}$	Fxhibit	25-4)			
Speed Detern	nination				Speed D	eterm	inatio	n		
$M_c = (Fxihit 2)$	5-19)				$D_{s} = 0.4$	77 (Exh	ibit 25-1	19)		
$S_{p=} mnh (Fyh)$	ibit 25-19)				S _R = 56.	6 mph (E	Exhibit 2	, 25-19)		
$S_{a} = mnh (Evh$	ibit 25-19)				$S_0 = N/A$	Amph (E	xhibit 2	, 5-19)		
S = mph (Exh	ibit 25-14)				S = 56	6 mph (F	xhibit 2	25-15)		
J	/					·				

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	RA	MPS AND	RAMP JU	NCTIONS W	ORKSH	EET				
General Infor	mation			Site Infor	mation					
Analyst Agency or Company Date Performed Analysis Time Period Project Description	ALB RPM 5/22/2 M PM P 09-0402 Mine	Transportation 2009 Peak Hour	Consultants	Freeway/Dir of Tra Junction Jurisdiction Analysis Year	avel	I-40 (E Entran Putnar 2013 E	astbound) ce Ramp n Co Existing w/	from SR-135 Business Park		
Inputs				<u>'9</u>						
Upstream Adj Ramp		Terrain: Leve							Downstrea Ramp	am Adj
🗖 Yes 🔲 Or	1								Ves	🗖 On
🗹 No 🕅 Of	f								Mo No	Cff Off
L _{up} = ft		s	$r_{r} = 70.0 \text{ mp}$	h	S _{ED} = 3	35.0 mi	bh		L _{down} =	ft
V _u = veh/h	I		Sketc	h (show lanes, L _A ,	L_{D}, V_{R}, V_{f}				V _D =	veh/h
Conversion to	o pc/h Und	der Base (Condition	s ț	1	1			1	
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f _{HV}	f _p	v = V/PHF	x f _{HV} x f _p
Freeway	1275	0.90	Level	22	0	0.	901	1.00	1	573
Ramp	1353	0.90	Level	22	0	0.	901	1.00	1	669
UpStream		ļļ			ļ					
DownStream	<u> </u>	Morgo Aroac						Divorgo Aroos		
Estimation of	F V .c	werge Areas			Estimat	ion d	of V.	Diverge Areas	<u>></u>	
	• 12	(D)			Lotinat		· · 12			
	$v_{12} = v_F$	(P _{FM})	05.0				v ₁₂ =	= v _R + (v _F - \	^r R) ^P FD	`
L _{EQ} =	(Equa		20-3)	\	L _{EQ} =				5-8 01 25-9))) 1)
P _{FM} =	1.000	using Equati	ion (Exhibit 25	o-5)	P _{FD} =					25-12)
$v_{12} =$	15/3	oc/n			$V_{12} =$			pc/n		1/)
$v_3 \cup v_{av34}$	U pc/r	n (Equation 2	25-4 or 25-5)		v_3 or v_{av34}		700 pc/b2		1 25-15 OF 25	-10)
$15V_3 \text{ or } V_{av34} > 2,70$		S M NO			$15V_3 UV_{av}$	34 ^{> Z,}			10	
$15 V_3 OI V_{av34} > 1.5$	v ₁₂ /2 Yes	S M NO	0)		IS V ₃ OF V _{av}	₃₄ > 1.:	ο ν ₁₂ /Ζ	Yes N	10 ian 05 40)	
$11 \text{ Yes}, v_{12a} =$	pc/n ((Equation 25	-8)		II Yes, V _{12a} =		a a lua	pc/n (Equat	ion 25-18)	
Capacity Che	Actual		anaoltu		Capacit	y Ch	Actual		`anaaltu	
	Actual		apacity	LUSF?	V		Actual	Evhibit 25		LUSF?
N N	2242	Evhibit 2E 7		No	V –V				: 14	
^v FO	3242	EXHIBIT 20-7		NO	V _{FO} – V _F	⁻ ^v R		Exhibit 20	5-14 F 0	
					V R				5-3	
Flow Entering	g Merge In	fluence A	rea Desirable	Violation?	Flow En	iterii	ng Mer	ge Influen		Violation?
V _{P12}	3242	Exhibit 25-7	4600:All	No	V ₁₂	- '	ACIUAI	Exhibit 25-14		VIOIALIOIT?
Level of Serv	ice Detern	nination (i	f not F)	I	Level of	⁻ Ser	vice D	eterminat	ion (if no	tF)
$D_{\rm p} = 5.475 +$	0.00734 v _p + 0).0078 V ₁₂ - 0.0	0627 L			$D_{\rm p} = 4$.252 + 0	0.0086 V ₁₂ - 0	0.0009 L _D	/
$D_{\rm p} = 26.5 ({\rm pc}$	/mi/ln)	12	~		$D_{\rm p} = (\mathbf{r})$	oc/mi/	ln)	12	D	
LOS = C (Exhit	oit 25-4)				LOS = (E	xhibi	t 25-4)			
Speed Detern	nination				Speed L	Deter	rminati	ion		
M _S = 0.382 (Exi	bit 25-19)				D _s = (E	xhibit :	25-19)			
$S_{\rm P} = 59.3 \mathrm{mph}$, (Exhibit 25-19)				S _R = m	ph (Ex	hibit 25-19))		
$S_0 = N/A mph ($, Exhibit 25-19)				S ₀ = m	ph (Ex	hibit 25-19))		
S = 59.3 mph	(Exhibit 25-14)				S = m	ph (Ex	hibit 25-15	5)		

		RAMP	S AND RA	MP JUNCTI	ONS WO	RKS	HEET			
General Infor	mation			Site Infor	mation					
Analyst Agency or Company Date Performed Analysis Time Period	ALB RPM 5/22/2 9 PM P	Transportation 2009 Peak Hour	n Consultants	Freeway/Dir of Tr Junction Jurisdiction Analysis Year	avel I	I-40 (W Exit Ra Putnan 2013 E	/estbound) imp to SR- n Co xisting w/ E	135 Business Park		
Inputs	09-0402 10111111	LICK CIEEK IJS								
Upstream Adj Ramp		Terrain: Leve	el						Downstrea	ım Adj
🗖 Yes 🗖 Or	ı								Tes 1	Cn On
🗹 No 📁 Of	f								Mo No	Cff
L _{up} = ft			70.0	L.	<u> </u>	F 0	L.		L _{down} =	ft
V _u = veh/h	I		s _{FF} = 70.0 mp Sketo	n :h (show lanes, L _A ,	$S_{FR} = 3$ L_{D}, V_{R}, V_{f}	5.0 mp	n		V _D =	veh/h
Conversion to	o pc/h Und	der Base	Condition	S		·				
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f _{HV}	f _p	v = V/PHF	x f _{HV} x f _p
Freeway	1807	0.90	Level	22	0	0.	901	1.00	22	29
Ramp	661	0.90	Level	22	0	0.	901	1.00	8	15
DownStream										
Downouldan	<u>,</u> [Merge Areas					[Diverge Areas		
Estimation of	f v ₁₂				Estimati	ion c	of v ₁₂			
	$V_{12} = V_{F}$	(P _{FM})					V ₁₂ =	= V _R + (V _F - \	/ _R)P _{FD}	
L _{EQ} =	(Equa	ation 25-2 o	r 25-3)		L _{EQ} =		(Equation 25-	8 or 25-9)	
P _{FM} =	using	Equation (Exhibit 25-5)		P _{FD} =		1.	000 using E	quation (Exh	ibit 25-12)
V ₁₂ =	pc/h				V ₁₂ =		22	229 pc/h		
V_3 or V_{av34}	pc/h ((Equation 2	5-4 or 25-5)		V_3 or V_{av34}		0	pc/h (Equat	ion 25-15 oi	⁻ 25-16)
Is V_3 or $V_{av34} > 2,70$	0 pc/h? 🥅 Yes	s 🔲 No			Is V_3 or V_{av3}	₃₄ > 2,7	00 pc/h? 🛽	🛛 Yes 🗹 No)	
Is V_3 or $V_{av34} > 1.5$	* V ₁₂ /2 🔲 Yes	s 🔲 No			Is V_3 or V_{av3}	₈₄ > 1.5	* V ₁₂ /2	🛛 Yes 🔽 No)	
If Yes,V _{12a} =	pc/h ((Equation 2	5-8)		If Yes, V _{12a} =		F	oc/h (Equatio	n 25-18)	
Capacity Che	ecks	1 -			Capacity	y Ch	ecks			
	Actual	(Capacity	LUS F?	V		Actual			LOS F?
N/		Euclide an 7			V F		2229	EXHIDIC 20-	14 4000	NO No
^v FO		EXHIDIL 20-7			V _{FO} – V _F	- v _R	015	EXHIDIC 20-	14 4800	No.
Flow Fratoria		fluence				4 - 11	C18		-3 2000	INO
FIOW Entering	g ivierge in	Max	Area Desirable	Violation?		terin	ig ivierg Actual	Max Desira	se Area	Violation?
V _{R12}	netuar	Exhibit 25-7	Desirable		V ₁₂		2229	Exhibit 25-14	4400:All	No
Level of Serv	ice Detern	nination ((if not F)		Level of	Ser	vice De	terminatio	on (if not	F)
D _R = 5.475 + 0.	00734 v _R + 0	0.0078 V ₁₂	- 0.00627 L _A			0 _R = 4	.252 + 0.	0086 V ₁₂ - 0	.0009 L _D	
D _R = (pc/mi/	ln)				D _R = 20	.9 (pc	/mi/ln)			
LOS = (Exhibi	it 25-4)				LOS = C	(Exhil	bit 25-4)			
Speed Determ	nination				Speed D)eter	minatio	on		
M _S = (Exibit 2	5-19)				$D_{s} = 0.5$	501 (E	xhibit 25	-19)		
S _R = mph (Exh	ibit 25-19)				S _R = 56	.0 mph	i (Exhibit	25-19)		
S ₀ = mph (Exh	ibit 25-19)				$ S_0^{=} = N/2$	A mph	(Exhibit	25-19)		
S = mph (Exh	ibit 25-14)				S = 56	.0 mph	(Exhibit	25-15)		

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	RA	MPS AND	RAMP JU	INCTIONS W	ORKSHE	ET				
General Infor	mation			Site Infor	mation					
Analyst Agency or Company Date Performed Analysis Time Period Project Description	ALB RPM 5/22/2 1 PM P 09-0402 Mine I	Transportation 2009 Lick Creek - TE	Consultants	Freeway/Dir of Tra Junction Jurisdiction Analysis Year ng	avel 	-40 (West Entrance F Putnam C 2013 Exist	bound) Ramp from o ting w/ Bus	SR-135 iness Park		
Inputs										
Upstream Adj Ramp		Terrain: Leve	l						Downstre Ramp	am Adj
Yes Or	1								Tes 🗐	🗖 On
No Of	f								🗹 No	Cff Off
L _{up} = ft		s	= 70.0 mn	h	S = 3	5 0 mnh			L _{down} =	ft
V _u = veh/h	I		FF - V0.0 mp Sketc	:h (show lanes, L _A ,	$U_{FR} = 3$ L_{D}, V_{R}, V_{f}	0.0 mpn			V _D =	veh/h
Conversion to	o pc/h Und	der Base	Condition	S						
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{HV}	,	f _p	v = V/PHF	⁼ x f _{HV} x f _p
Freeway	1146	0.90	Level	22	0	0.901		1.00	1	1413
Ramp	818	0.90	Level	22	0	0.901		1.00	1	1009
UpStream					[ļ				
DownStream	<u> </u>									
Estimation of	FV	vierge Areas			Fstimati	ion of	Div	erge Areas		
	• 12	(D)			Lounad		12			
	$v_{12} = v_F$	(P _{FM})	05.0)				$V_{12} = V_{R}$	+ (V _F - V	R)P _{FD}	
L _{EQ} =	(Equa		25-3)		L _{EQ} =		(E0	quation 25	0-8 0r 25-8) 05 10)
P _{FM} =	1.000	using Equat	ion (Exhibit 2	5-5)	P _{FD} =		us	ing Equati	ion (Exhibit	25-12)
$v_{12} =$	1413 p	DC/N		,	$v_{12} =$		pc	'N h (Faustion	25 15 or 25	1/)
$v_3 \cup v_{av34}$	0 pc/r 0 pc/b2		25-4 01 25-5)	$v_3 \cup v_{av34}$	> 2 700	$pc/b2 \square x$		20-10 01 20	- 10)
$15V_3 \text{ or } V_{av34} > 2.70$					$13 v_3 01 v_{av3}$	4 ~ 2,700 、15*\			5	
$15 V_3 OI V_{av34} > 1.5$	v ₁₂ /2 res	5 MINO	: 0)		$15 V_3 U V_{av3}$	4 ~ 1.5 \	^{12^{/2} no}	res 🔲 No /b (Equativ) on 25 19)	
Copposity Cho		Equation 20	9-0)		$\Gamma_{12a} =$	Chao	pc,	n (Equain	011 25-16)	
			anacity		Capacity		Actual		anacity	1.05 E2
	Actual		арасну		V_		Actual	Exhibit 25-	14	LUJT:
V _{FO}	2422	Exhibit 25-7		No	$V_{FO} = V_F$	- V _R		Exhibit 25-	.14	
					V _R			Exhibit 25	-3	
Flow Entering	a Merae In	fluence A	rea]	Flow En	terina	Merge	Influen	ce Area	
	Actual	Max	Desirable	Violation?		Actu	al	Max Des	irable	Violation?
V _{R12}	2422	Exhibit 25-7	4600:All	No	V ₁₂		Ex	hibit 25-14		
Level of Serv	ice Detern	nination (if not F)		Level of	Servio	ce Dete	rminati	on (if no	ot F)
D _R = 5.475 +	0.00734 v _R + 0).0078 V ₁₂ - 0.0	0627 L _A) _R = 4.25	52 + 0.00	86 V ₁₂ - 0	.0009 L _D	
D _R = 20.0 (pc	/mi/ln)				D _R = (p	c/mi/ln)				
LOS = B (Exhib	oit 25-4)				LOS = (E	xhibit 28	5-4)			
Speed Deterr	nination				Speed D	Determ	ination			
M _S = 0.321 (Exi	bit 25-19)				D _s = (E	xhibit 25-1	9)			
S _R = 61.0 mph	(Exhibit 25-19)				S _R = m	oh (Exhibit	25-19)			
$S_0 = N/A mph ($	Exhibit 25-19)				S ₀ = m	oh (Exhibit	25-19)			
S = 61.0 mph	(Exhibit 25-14)				S = mp	oh (Exhibit	25-15)			

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					HC	S+™ C	E.	TAILE	D RI	EΡ	ORT								
General Info	rmation								Site I	nfo	ormati	ion							
Analyst	ALB								Inters	ec	tion	S ra	SR-13 amps	5 & 1-40	eas	stbour	nd		
Agency or Co	RPM Transi	ortat	ion						Area	Ту	pe	A	\II oth	er areas					
Date Perform	ed 5/26/2009	Jonar							Juriso	dict	ion	F	Putna	n Co					
Time Period	PM Peak H	nur							Analy	cio	Voor	2	013 L	Existing	N/ E	Busine	ss		
	T MT Cak Tk	Jui							Analy	515	real	F	Park			_			
									Proje	ct I	D	0 7	9-040 DOT	02 Mine OC Plar	Lick nnin	c Cree Ig	ek -		
Volume and	Timing Input		4																
					EB				WB					NB				SB	
			LT		TH	RT		LT	TH		RT		LT	TH		RT	LT	TH	RT
Number of La	nes, N1		1			1					ļ			2		0	1	2	
Lane Group			L			R					<u> </u>			TR			L	<u> </u>	
Volume, V (vp	oh)		218			176					<u> </u>			1049	1	023	330	966	ļ
% Heavy Veh	icles, %HV		5			5					<u> </u>			5		5	5	5	ļ
Peak-Hour Fa	ctor, PHF		0.90			0.90					<u> </u>			0.90	0.	.90	0.90	0.90	ļ
Pretimed (P)	or Actuated (A)		A			A	_				ļ			<u>A</u>	4	A	A	A	
Start-up Lost	Time, lı		2.0			2.0					<u> </u>			2.0			2.0	2.0	ļ
Extension of E	Effective Greer	i, e	2.0			2.0					<u> </u>			2.0			2.0	2.0	ļ
Arrival Type,	AT		3			3					ļ			3			3	3	
Unit Extension	n, UE		3.0			3.0					ļ			3.0			3.0	3.0	ļ
Filtering/Mete	ring, I		1.000)		1.000)				ļ			1.000			1.000	1.000	ļ
Initial Unmet I	Demand, Qb		0.0			0.0					ļ			0.0			0.0	0.0	
Ped / Bike / R	Ped / Bike / RTOR Volumes ane Width				0	0					ļ		0	0		0	0	0	ļ
Lane Width	ane Width Parking / Grade / Parking					12.0					ļ			12.0			12.0	12.0	
Parking / Grad	Parking / Grade / Parking Parking Maneuvers, Nm				0	N	_					_	Ν	0		N	N	0	N
Parking Mane							_				<u> </u>								
Buses Stoppin	IG, INB		0		~ ~	0											0		I
Dhasing		יף ו		<u> </u>	3.2	<u> </u>				1				3.2		1	07	3.2	0
Phasing			02			3	-	04	2		SB On	11y		NS Perm			07	0	8
Timing	G = 13.0 Y = 5	G = V -	0.0		3 = 0).0		G = 0.0 V - 0)		y = 1/2 y' = 5	.7		- 5		<u> </u>	0.0	G = 0).0
Duration of Ar	T = 0.2	<u>' -</u> 95	0		<u> </u>	·		1 = 0			- 0			vcle I en	ath	C =	140.0	i = c	,
Lane Group	Capacity, Con	trol I	Delav.	and	105	Deter	niı	nation						<u>yolo Eoli</u>	gan	, 0 -	110.0		
	oupdoity; com		, ciuj,	EE	3	2010/1		lucion	WB			-		NB	-			SB	
			LT	TH		RT	L	T	ΤН		RT	Ľ	Т	TH	F	۲۲	LT	TH	RT
Adjusted Flow	/ Rate, v	2	242		1	196								2303			367	1073	
Lane Group C	Capacity, c		167			149								2135			268	2864	
v/c Ratio, X		1.	.45		1.	.32								1.08			1.37	0.37	
Total Green R	Ratio, g/C	0.	.10		0.	.10								0.67			0.83	0.83	
Uniform Delay	/, d ₁	6	3.2		6	3.2								23.1			53.8	2.9	
Progression F	actor, PF	1.	.000		1.	.000								1.000			1.000	1.000	
Delay Calibra	tion, k	0.	.50		0.	.50								0.50			0.50	0.11	
Incremental D	elay, d ₂	2	32.3		1	81.4								44.6			188.2	0.1	
Initial Queue I	Delay, d ₃	0	0.0		0	0.0								0.0			0.0	0.0	
Control Delay	Control Delay		95.5		2	44.6								67.7			242.0	3.0	
Lane Group L	ane Group LOS					F								Е			F	A	
Approach Del	Approach Delay			7	I			I					67	.7				63.9	,
Approach LO	S		F										E	-				E	
Intersection D	elay		87.	9				$X_{c} = 2.$	50			Int	ersec	tion LOS	3			F	

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					нс	S+™ I	DET	TAILE	ED RI	EP	ORT								
General Info	rmation								Site I	nfo	ormat	ion							
Analyst	ALB								Inters	ect	tion	Si ra	R-135 amps	& <i>I-40</i> v	ves	tbour	nd		
Agency or Co	RPM Trans	oortat	ion						Area	Тур	ре	A	ll othe	r areas					
Dete Derferre	Consultants	3							Juriso	lict	ion	Pl	utnam	County	,				
Time Perform	ed 5/26/2009 PM Poak H	our							Analy	sis	Year	20	013 E	xisting w	// B	usine	SS		
	FINI FEAK H	our							,			Pa O	ark a₋∩⊿∩:	2 Mine I	ick	Cree	k -		
									Proje	ct I	D	T	DOT	C Plan	ning	g			
Volume and	Timing Input						1					1					1		
				- 1	EB	1			WB		<u> </u>			NB				SB	1
Number of Lo					IH	RI					RI					< I			RI
Number of La	nes, N1		1					1					1						0
Volume V (vr))							378					L 600	667	╎─			918	218
% Heavy Veh	icles %HV							5				_	5	5			 	5	5
Peak-Hour Fa	ctor. PHF							0.90				0	.90	0.90	1			0.90	0.90
Pretimed (P)	or Actuated (A)						A					A	A	1			A	A
Start-up Lost	Time, I1							2.0				2	2.0	2.0				2.0	
Extension of E	Effective Greer	n, e	ĺ					2.0			ĺ	2	2.0	2.0			ĺ	2.0	
Arrival Type,	AT							3					3	3				3	
Unit Extension	n, UE							3.0				3	3.0	3.0				3.0	
Filtering/Mete	ring, I							1.000				1.	.000	1.000				1.000	
Initial Unmet I	Demand, Qb		<u> </u>					0.0			<u> </u>	0	0.0	0.0			<u> </u>	0.0	ļ
Ped / Bike / R	Ped / Bike / RTOR Volumes .ane Width							0	0				0	0			0	0	0
Lane Width	ane Width Parking / Grade / Parking						1	12.0			<u> </u>	12	2.0	12.0	<u> </u>		ļ	12.0	ļ
Parking / Grad	Parking / Grade / Parking							Ν	0		N		Ν	0	1	V	N	0	N
Parking Mane	uvers, Nm										<u> </u>						ļ		ļ
Buses Stoppin	ng, Nв							0					0	0				0	
Min. Time for	Pedestrians, C	ј р	<u> </u>						3.2				[3.2		1		3.2	
Phasing	WB Only	(02		0	3		04			NB Or	nly	<u>N</u>	S Perm			07	0	8
Timing	G = 23.1	G =	0.0		G =	0.0		$\frac{0}{0} = 0.$	0		j = 2b	3.2	G	= 33.7		G =	0.0	G = 0	0.0
Duration of Ar	T = 0	<u> =</u> 25	0		1 = 0	0		1 = 0			= 0			cle Leno	nth	$\frac{1}{0}$	100.0	i = t	,
Lane Group	Capacity Cor	trol [)elav.	and	1105	Deter	min	nation		_					<u>jui,</u>	0-	100.0		
	oupuony, con		, ciuy,	E	B	Deter		anon	WB			1		NB			[SB	
			LT	T	Η	RT	Ľ	Т	TH		RT	LT	Г	TH	R	Т	LT	TH	RT
Adjusted Flow	/ Rate, v						42	20				66	7	741				1262	
Lane Group C	Capacity, c						39	97				55	7	2305				1128	
v/c Ratio, X							1.0	6				1.20	o ().32				1.12	
Total Green R	Ratio, g/C						0.2	3				0.67	7 ().67				0.34	
Uniform Delay	/, d ₁						38.	.5		1		14.2	2	7.0				33.1	
Progression F	actor, PF						1.0	000				1.00	00 1	1.000				1.000	
Delay Calibra	tion, k						0.5	50				0.50	0 0	D.11				0.50	
Incremental D	elay, d ₂						61	.3				105	5.4	0.1				65.7	
Initial Queue I	Delay, d ₃						0.0	0				0.0)	0.0				0.0	
Control Delay	Control Delay						99	9.7				119	0.6	7.1				98.8	
Lane Group L	_ane Group LOS						F					F		A				F	
Approach Del	Approach Delay				I_			99.7	7				60.4	4				98.8	
Approach LO	S							F					Е					F	
Intersection D	elay		81.	4)	$X_c = 1.$	67			Inte	ersecti	on LOS				F	












FUTURE YEAR 2033 INTERSTATE 40 MAINLINE

BASIC FREEWAY SEGMENTS WORKSHEET							
80 Free-Flow Speed FIS = 75 milh 70 65 milh 70 milh 70 65 milh 70 milh 80 60 55 milh 80 55 milh 70 milh 80 60 60 milh 80 60 55 milh 80 60 60 milh 80 60 55 milh 80 60 60 milh 80 60 60 milh 80 60 60 milh 90 400 800	1300 1450 C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	<u>Input</u> FFS, N, v _p FFS, LOS, v _p FFS, LOS, N FFS, N, AADT FFS, LOS, AAD FFS, LOS, N	Output LOS, S, D N, S, D v _p , S, D LOS, S, D T N, S, D v _p , S, D	
General Information			Site Infor	mation			
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Eastbo	und)	
Agency or Company	RPM Transporta	ation	From/To		west of SR-5	56	
Date Performed	Consultants		lurisdiction		Putnam Co		
Analysis Time Period	AM Peak Hour		Analysis Yea	ar	2033 Existing	g w/ Business Park	
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning			<u> </u>	
Oper.(LOS)			Des.(N)		🔲 Plannir	ng Data	
Flow Inputs							
Volume, V	2800	veh/h	Peak-Hour F	actor, PHF	0.90		
AADT		veh/day	% I rucks and	d Buses, P _T	22		
Peak-Hr Prop. of AADT, K			%RVs, P _R	inin.	0		
$DDHV = AADT \times K \times D$		veh/h	General Terr Grade %	Length	Levei mi		
Driver type adjustment	1.00			Up/Down %			
Calculate Flow Adjustm	ents						
f _p	1.00		E _R		1.2		
E _T	1.5		f _{HV} = 1/[1+P _T (E	E _T - 1) + P _R (E _R - 1)]	0.901		
Speed Inputs			Calc Spee	ed Adj and FFS			
Lane Width	12.0	ft	f		0.0	mi/b	
Rt-Shoulder Lat. Clearance	6.0	ft	LW f		0.0	mi/h	
Interchange Density	0.50	l/mi	LC		0.0	mi/m	
Number of Lanes, N	2		^T ID		0.0	mi/h	
FFS (measured)		mi/h	f _N		4.5	mi/h	
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h	
LOS and Performance M	leasures		Design (N				
			Design (N)	/			
Operational (LOS)			Design LOS				
$v_p = (V \text{ or DDHV}) / (PHF x N x)$	f _{HV} x f _p) <i>17</i> 27	pc/h/ln	$v_p = (V \text{ or } DE)$	DHV) / (PHF x N x t	f _{uv} x f _a)	pc/h	
S	64.8	mi/h	s	, (πν ρ⁄	mi/h	
$D = v_p / S$	26.6	pc/mi/ln	$D = v_{z} / S$			pc/mi/ln	
LOS	D		Required Nu	mber of Lanes N		Po/11/11	
Glossarv			Factor	cation			
N - Number of lanes	S - Speed						
V - Hourly volume	D - Densitv		E _R - Exhibits	23-8, 23-10	f _{LV}	_v - Exhibit 23-4	
v - Flow rate	FFS - Free-flow s	peed	E _T - Exhibits	23-8, 23-10, 23-11	1 f _{LC}	- Exhibit 23-5	
I OS - Level of service	BFFS - Base free	-flow speed	f _p - Page 23-	·12	f _N	- Exhibit 23-6	
DDHV - Directional design hou	ir volume		LOS, S, FFS	5, v _p - Exhibits 23-2	2, 23-3 f _{ID}	- Exhibit 23-7	

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BASIC FREEWAY SEGMENTS WORKSHEET								
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	B C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, vp FFS, LOS, vp FFS, LOS, N FFS, N, AAD FFS, LOS, AA FFS, LOS, N	<u>Output</u> LOS, S, D N, S, D v _p , S, D T LOS, S, D LDT N, S, D v _p , S, D		
General Information			Site Inform	mation				
Analyst	ALB	- (Highway/Dire	ection of Travel	I-40 (Eastb	ound)		
Agency or Company	Consultants	ation	From/To		Between S	R-56 Ramps		
Date Performed	5/22/2009		Jurisdiction		Putnam Co)		
Analysis Time Period	AM Peak Hour		Analysis Yea	ar	2033 Existi	ing w/ Business Park		
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning		_			
Oper.(LOS)			Des.(N)		Plann	ing Data		
Flow Inputs	0.400	u a la /la	De als Llava D		0.00			
Volume, V	2488	ven/n veh/dav	%Trucks and	actor, PHF Buses P_	0.90			
Peak-Hr Prop. of AADT K		ven/uay	%RVs P	Duses, 1 T	0			
Peak-Hr Direction Prop. D			General Terr	ain:	l evel			
$DDHV = AADT \times K \times D$		veh/h	Grade %	Length	mi			
Driver type adjustment	1.00			Up/Down %				
Calculate Flow Adjustm	nents							
f _p	1.00		E _R		1.2			
E _T	1.5		$f_{HV} = 1/[1+P_T(E)]$	E _T - 1) + P _R (E _R - 1)]	0.901			
Speed Inputs			Calc Spee	ed Adj and FFS				
Lane Width	12.0	ft	f		0.0	mi/h		
Rt-Shoulder Lat. Clearance	6.0	ft	f		0.0	mi/h		
Interchange Density	0.50	I/mi	LC		0.0	1111/11		
Number of Lanes, N	2		^I ID		0.0	mi/n		
FFS (measured)		mi/h	† _N		4.5	mi/h		
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h		
LOS and Performance I	Measures		Desian (N					
			Design (N)	/				
Operational (LOS)			Design LOS					
$v_p = (V \text{ or DDHV}) / (PHF x N x)$	(f _{HV} x f _p) <i>1534</i>	pc/h/ln	$v = (V \text{ or } D\Gamma)$) (PHF x N x t	fxf)	nc/h		
S	65.5	mi/h	s		HV Y 'p'	mi/h		
$D = v_p / S$	23.4	pc/mi/ln	D = v/S			nn/n		
LOS	С		Required No	Imper of Lance N		μο/πι/π		
Glossan			Factor					
	S Speed		Facior LO	cation				
	S - Speed		E _R - Exhibits	23-8, 23-10	f	_{LW} - Exhibit 23-4		
		speed	E _T - Exhibits	23-8, 23-10, 23-11	1 f	_{LC} - Exhibit 23-5		
			f _p - Page 23-	-12	f	_N - Exhibit 23-6		
LUS - Level of service	DFFS - Base free	e-now speed	LOS, S, FFS	8, v _p - Exhibits 23-2	, 23-3 f	_{ID} - Exhibit 23-7		
DDHV - Directional design ho	ur volume			٣				

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	BASIC FREEWAY SEGMENTS WORKSHEET								
80 Free-Flow Speed FIS = 75 milh 70 65 milh 70 60 60 milh 65 milh 50 10 55 milh 30 40 80 60 400 800	BASIC Fr		2400 Site Inforn Highway/Dire	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (M) Planning (v _p)	Input FFS, N, vp FFS, LOS, V FFS, LOS, N FFS, N, AAD FFS, LOS, AA FFS, LOS, N	<u>Output</u> LOS, S, D N, S, D v _p , S, D T LOS, S, D DT N, S, D v _p , S, D			
Agency or Company	RPM Transport	ation	From/To		Between S	R-135 & SR-56			
Date Performed Analysis Time Period Project Description 09-0402	5/22/2009 AM Peak Hour Mine Lick Creek -	TDOT OC Plan	Jurisdiction Analysis Yea ning	ır	Putnam Co 2033 Existi	o ing w∕ Business Park			
Oper.(LOS)			es.(N)		🗖 Plann	ing Data			
Flow Inputs Volume, V AADT Reak Hr Brop, of AADT, K	2975	veh/h veh/day	Peak-Hour F %Trucks and	actor, PHF I Buses, P _T	0.90 22				
Peak-Hr Direction Prop. D DDHV = AADT x K x D Driver type adjustment	1.00	veh/h	General Terr Grade %	ain: Length Up/Down %	Level mi				
	1.00		F		12				
'p F	1.00		FR f _ 1/[1⊥P /F	- 1) + P (F - 1)]	0.001				
Speed Inputs	1.0				0.301				
Lane Width Rt-Shoulder Lat. Clearance Interchange Density Number of Lanes, N FFS (measured) Base free-flow Speed, BFFS	12.0 6.0 0.50 2 70.0	ft ft I/mi mi/h mi/h	f _{LW} f _{LC} f _{ID} f _N FFS		0.0 0.0 0.0 4.5 65.5	mi/h mi/h mi/h mi/h mi/h			
LOS and Performance I	Measures		Design (N)					
$\frac{\text{Operational (LOS)}}{v_p} = (V \text{ or DDHV}) / (PHF x N x)$ S $D = v_p / S$ LOS	x f _{HV} x f _p) 1835 64.0 28.7 D	pc/h/ln mi/h pc/mi/ln	$\frac{\text{Design (N)}}{\text{Design LOS}}$ $v_p = (V \text{ or DE})$ S $D = v_p / S$ Required Nu	DHV) / (PHF x N x the second s	f _{HV} x f _p)	pc/h mi/h pc/mi/ln			
Glossary			Factor Lo	cation					
$\begin{tabular}{lllllllllllllllllllllllllllllllllll$	S - Speed D - Density FFS - Free-flow s BFFS - Base free ur volume	speed e-flow speed	E _R - Exhibits E _T - Exhibits f _p - Page 23- LOS, S, FFS	23-8, 23-10 23-8, 23-10, 23-11 12 [,] , v _p - Exhibits 23-2	f I f f , 23-3 f	_{LW} - Exhibit 23-4 _{LC} - Exhibit 23-5 _N - Exhibit 23-6 _{ID} - Exhibit 23-7			

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BASIC FREEWAY SEGMENTS WORKSHEET								
80 Free-Flow Speed FIS = 75 milh 70 65 milh 70 milh 70 65 milh 60 milh 60 55 milh 10 10 55 milh 10 10 400 200	1200 Flow Rate (pc/h/ln)		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, vp FFS, LOS, vp FFS, LOS, N FFS, N, AAD FFS, LOS, AA FFS, LOS, N	<u>Output</u> LOS, S, D N, S, D v _p , S, D I LOS, S, D LDT N, S, D v _p , S, D		
General Information	• •		Site Infor	mation				
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Eastb	ound)		
Agency or Company	RPM Transport	ation	From/To		Between S	R-135 Ramps		
Date Performed	Consultants 5/22/2009		Jurisdiction		Putnam Co			
Analysis Time Period	AM Peak Hour		Analysis Yea	ar	2033 Existi	ing w/ Business Park		
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning					
Oper.(LOS)			es.(N)		Plann	ing Data		
Flow Inputs	1010		De al Illaur D		0.00			
Volume, V	1916	ven/n veh/dav	%Trucks and	actor, PHF Buses P_	0.90 22			
Peak-Hr Prop. of AADT. K		Ven/day	%RVs. Pp	20000, 1	0			
Peak-Hr Direction Prop, D			General Terr	ain:	Level			
DDHV = AADT x K x D		veh/h	Grade %	Length	mi			
Driver type adjustment	1.00			Up/Down %				
			F		12			
'р ⊏	1.00		⊢R f 4//4→D//		1.2			
	1.5		$H_{\text{HV}} = 1/(1+P_{\text{T}})$	$(E_{\rm T} - 1) + P_{\rm R}(E_{\rm R} - 1)$	0.901			
Speed inputs	12.0	<i>t</i>	Calc Spee	ed Adj and FFS	1			
Lane Width Rt Shoulder Let Clearance	12.0	1L #	f _{LW}		0.0	mi/h		
Interchange Density	0.0	IL I/mi	f _{LC}		0.0	mi/h		
Number of Lance N	0.00	1/1111	f _{ID}		0.0	mi/h		
FES (measured)	Z	mi/b	f _N		4.5	mi/h		
Base free-flow Speed BEES	70.0	mi/h	FFS		65.5	mi/h		
LOS and Performance	Moasures	1111/11	Design (N	١				
LOS and renormance r	viedouleo)				
Operational (LOS)			Design LOS					
$v_p = (V \text{ or DDHV}) / (PHF x N x)$: f _{HV} x f _p) <i>118</i> 2	pc/h/ln	v = (V or D)) HV) / (PHF x N x f	fxf)	nc/h		
S	65.5	mi/h	s		'HV ^ 'p/	mi/h		
$D = v_p / S$	18.0	pc/mi/ln	$D = v_a / S$			nc/mi/ln		
LOS	С		Required Nu	mber of Lanes. N		P-0/111/111		
Glossarv			Factor Lo	cation				
N - Number of lanes	S - Speed							
V - Hourly volume	D - Density		E _R - Exhibits	23-8, 23-10	f	_{LW} - Exhibit 23-4		
v _n - Flow rate	FFS - Free-flow s	speed	E _T - Exhibits	23-8, 23-10, 23-11	1 f	_{LC} - Exhibit 23-5		
LOS - Level of service	BFFS - Base free	e-flow speed	t _p - Page 23-	-12	f	N - Exhibit 23-6		
DDHV - Directional design hou	ur volume	-	LOS, S, FFS	, v_p - Exhibits 23-2	, 23-3 f	_{ID} - Exhibit 23-7		

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BASIC FREEWAY SEGMENTS WORKSHEET								
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	B C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, vp FFS, LOS, vp FFS, LOS, N FFS, N, AAD FFS, LOS, AA FFS, LOS, N	<u>Output</u> LOS, S, D N, S, D v _p , S, D T LOS, S, D LDT N, S, D v _p , S, D		
General Information			Site Inform	mation				
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Eastb	ound)		
Agency or Company	RPM Transport	ation	From/To		East of SR	-135		
Date Performed	5/22/2009		Jurisdiction		Putnam Co)		
Analysis Time Period	AM Peak Hour		Analysis Yea	ar	2033 Existi	ing w/ Business Park		
Project Description 09-0402	Mine Lick Creek I	JS - TDOT OC I	Planning					
Oper.(LOS)			Des.(N)		Plann	ing Data		
Flow Inputs								
Volume, V	2583	veh/h	Peak-Hour F	actor, PHF	0.90			
Rook Hr Bron of AADT K		ven/day		Duses, r _T	22			
Peak-Hr Direction Prop. D			General Ter	ain.	u Level			
$DDHV = AADT \times K \times D$		veh/h	Grade %	Length	mi			
Driver type adjustment	1.00			Up/Down %				
Calculate Flow Adjustr	nents		_					
f _p	1.00		E _R		1.2			
E _T	1.5		$f_{HV} = 1/[1+P_T(E_T)]$	E _T - 1) + P _R (E _R - 1)]	0.901			
Speed Inputs			Calc Spee	ed Adj and FFS	1			
Lane Width	12.0	ft	f _{i w}		0.0	mi/h		
Rt-Shoulder Lat. Clearance	6.0	ft	fue		0.0	mi/h		
Interchange Density	0.50	I/mi	fue		0.0	mi/h		
Number of Lanes, N	2		f		45	mi/h		
FFS (measured)		mi/h	'N		4.0			
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/n		
LOS and Performance I	Measures		Design (N					
Operational (LOS)			<u>Design (N)</u>					
v = (V or DDH)/) / (PHE x N x)	(f x f) 1502	nc/h/ln	Design LOS					
$v_p = (v \circ v \circ b \cdot b \cdot v) / (v \cdot v \cdot v)$	(1 _{HV} × 1 _p) 7593	pc/li/ill	$v_p = (V \text{ or } DI)$	DHV) / (PHF x N x i	f _{HV} x f _p)	pc/h		
5 D-V /S	00.4	nn/n	S			mi/h		
$D = v_p / S$	24.4	pc/m/m	$D = v_p / S$			pc/mi/ln		
			Required Nu	mber of Lanes, N				
Glossary			Factor Lo	cation				
N - Number of lanes	S - Speed		F Exhibite	23-8 23-10	f	- Exhibit 23-4		
V - Hourly volume	D - Density			23-8 23-10 22-11	ו 1 f	- Exhibit 23-5		
v _p - Flow rate	FFS - Free-flow s	speed		- 20-0, 20-10, 20-1	ו I ג			
LOS - Level of service	BFFS - Base free	e-flow speed		12	1 23-3 t	- Exhibit 23-0		
DDHV - Directional design ho	ur volume			$v_p = LATIONS 23-2$., 20-0 I			

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BASIC FREEWAY SEGMENTS WORKSHEET							
Image: second	BASIC FI	REEWAY SEC	2400 Site Inforr Highway/Dire	Application Operational (LOS) Design (N) Design (vp) Planning (LOS) Planning (M) Planning (vp) Planning (vp)	Input FFS, N, vp FFS, LOS, vp FFS, LOS, N FFS, N, AADT FFS, LOS, AAI FFS, LOS, N	Output LOS, S, D N, S, D V _p , S, D LOS, S, D DT N, S, D v _p , S, D	
Agency or Company	Consultants	ation	From/To		East of SR-	135	
Date Performed Analysis Time Period	5/22/2009 AM Peak Hour		Jurisdiction Analysis Yea	ır	Putnam Co 2033 Existir	ng w/ Business Park	
Oper.(LOS)	MILLE LICK CLEEK I		es.(N)		Planni	ng Data	
Flow Inputs							
Volume, V AADT Peak-Hr Prop. of AADT, K	3294	veh/h veh/day	Peak-Hour F %Trucks and %RVs, P _R	actor, PHF I Buses, P _T	0.90 22 0		
Peak-Hr Direction Prop, D DDHV = AADT x K x D Driver type adjustment	1.00	veh/h	General Terr Grade %	ain: Length Up/Down %	Level mi		
Calculate Flow Adjustm	ents						
	1.00		E _R		1.2		
E _T	1.5		$f_{HV} = 1/[1+P_T(E_T)]$	E _T - 1) + P _R (E _R - 1)]	0.901		
Speed Inputs			Calc Spee	ed Adj and FFS			
Lane Width Rt-Shoulder Lat. Clearance Interchange Density	12.0 6.0 0.50	ft ft I/mi	f _{LW} f _{LC}		0.0 0.0 0.0	mi/h mi/h mi/h	
Number of Lanes, N	2		f _N		4.5	mi/h	
FFS (measured)	70.0	mi/h	FFS		65.5	mi/h	
Base free-flow Speed, BFFS	70.0	mi/h	Declary (N	\		,	
Operational (LOS)	leasures		Design (N Design (N))			
$v_p = (V \text{ or DDHV}) / (PHF x N x)$ S D = v_p / S LOS	f _{HV} x f _p) 2031 61.2 33.2 D	pc/h/ln mi/h pc/mi/ln	Design LOS $v_p = (V \text{ or } DE$ S $D = v_p / S$ Required Nu	DHV) / (PHF x N x t mber of Lanes, N	f _{HV} x f _p)	pc/h mi/h pc/mi/ln	
Glossary			Factor Lo	cation			
 N - Number of lanes V - Hourly volume v_p - Flow rate LOS - Level of service DDHV - Directional design hour 	S - Speed D - Density FFS - Free-flow s BFFS - Base free ir volume	speed e-flow speed	E _R - Exhibits E _T - Exhibits f _p - Page 23- LOS, S, FFS	23-8, 23-10 23-8, 23-10, 23-11 12 5, v _p - Exhibits 23-2	f _L f _L f _N 1, 23-3 f _{II}	_{.W} - Exhibit 23-4 _{.C} - Exhibit 23-5 ₁ - Exhibit 23-6 _D - Exhibit 23-7	

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BASIC FREEWAY SEGMENTS WORKSHEET								
80 Free-Flow Speed FIS = 75 milh 70 65 milh 70 milh 70 65 milh 60 milh 60 55 milh 10 10 55 milh 10 10 400 200	1300 1300 1450 8. C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, v _p FFS, LOS, v _p FFS, LOS, N FFS, N, AAD FFS, LOS, N	Output LOS, S, D N, S, D v _p , S, D T LOS, S, D ADT N, S, D v _p , S, D		
General Information	•		Site Infor	nation				
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (West	bound)		
Agency or Company	RPM Transport	ation	From/To		Between S	SR-135 Ramps		
Date Performed	Consultants		lurisdiction		Putnam C			
Analysis Time Period	AM Peak Hour		Analysis Yea	ır	2033 Exist	ing w/ Business Park		
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning					
Moper.(LOS)			Des.(N)		🔲 Planr	ning Data		
Flow Inputs								
Volume, V	1684	veh/h	Peak-Hour F	actor, PHF	0.90			
AADT		veh/day	% I rucks and	l Buses, P _T	22			
Peak-Hr Prop. of AADT, K			%RVs, P _R	olo	0			
$DDHV = AADT \times K \times D$		veh/h	General Terr Grade %	Length	Levei mi			
Driver type adjustment	1.00			Up/Down %				
Calculate Flow Adjustm	nents							
f _p	1.00		E _R		1.2			
E _T	1.5		f _{HV} = 1/[1+P _T (E	- T - 1) + P _R (E _R - 1)]	0.901			
Speed Inputs			Calc Spee	d Adj and FFS				
Lane Width	12.0	ft	f	t	0.0	mi/h		
Rt-Shoulder Lat. Clearance	6.0	ft	LW f		0.0			
Interchange Density	0.50	I/mi	LC		0.0	rni/n		
Number of Lanes, N	2		t _{ID}		0.0	mi/h		
FFS (measured)		mi/h	f _N		4.5	mi/h		
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h		
LOS and Performance	Measures		Design (N)				
			Design (N)					
Operational (LOS)			Design LOS					
v _p = (V or DDHV) / (PHF x N x	: f _{HV} x f _p) <i>10</i> 38	pc/h/ln	$v_n = (V \text{ or } DE)$) (PHF x N x f	fuv x f_)	pc/h		
S	65.5	mi/h	s		ну р	mi/h		
$D = v_p / S$	15.8	pc/mi/ln	$D = v_{\rm L} / S$			pc/mi/ln		
LOS	В		Required Nu	mber of Lanes N		P-2/11/11		
Glossary			Factor Lo	cation				
N - Number of lanes	S - Speed							
V - Hourly volume	D - Densitv		E _R - Exhibits	23-8, 23-10	1	f _{LW} - Exhibit 23-4		
v - Flow rate	FFS - Free-flow s	peed	E _T - Exhibits	23-8, 23-10, 23-11	l 1	f _{LC} - Exhibit 23-5		
I OS - Level of service	BFFS - Base free	-flow speed	f _p - Page 23-	12	1	f _N - Exhibit 23-6		
DDHV - Directional design hou	ur volume		LOS, S, FFS	, v _p - Exhibits 23-2	, 23 - 3 1	f _{ID} - Exhibit 23-7		

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BASIC FREEWAY SEGMENTS WORKSHEET								
80 Free-Flow: Spzed FIS = 75 milh 70 65 milh 70 60 65 milh 60 50 10 S A 10 90 10 S A 10 90 400 200	1300	(600 0 1750 0 1750 0 1750 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (M) Planning (v _p)	Input FFS, N, v _p FFS, LOS, v _f FFS, LOS, N FFS, N, AAD FFS, LOS, N	Output LOS, S, D N, S, D v _p , S, D T LOS, S, D ADT N, S, D v _p , S, D		
General Information	<u> </u>		Site Infor	mation				
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (West	bound)		
Agency or Company	RPM Transporta	ation	From/To		Between S	SR-135 & SR-56		
Date Performed	Consultants		lurisdiction		Putnam C			
Analysis Time Period	3/22/2009 AM Peak Hour		Analysis Yea	ır	2033 Exist	; ing w/ Business Park		
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning					
Coper.(LOS)			es.(N)		🔲 Planr	ning Data		
Flow Inputs								
Volume, V	2031	veh/h	Peak-Hour F	actor, PHF	0.90			
AADT		veh/day	%Trucks and	l Buses, P _T	22			
Peak-Hr Prop. of AADT, K			%RVs, P _R		0			
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terr Grade %	ain: Length	Levei mi			
Driver type adjustment	1.00	Volum		Up/Down %				
Calculate Flow Adjustm	ents							
f _p	1.00		E _R		1.2			
E _T	1.5		f _{HV} = 1/[1+P _T (E	E _T - 1) + P _R (E _R - 1)]	0.901			
Speed Inputs			Calc Spee	d Adj and FFS				
Lane Width	12.0	ft	4		0.0	mi/b		
Rt-Shoulder Lat. Clearance	6.0	ft	LW		0.0	111/11		
Interchange Density	0.50	l/mi	LC		0.0	mi/n		
Number of Lanes, N	2		† _{ID}		0.0	mi/h		
FFS (measured)		mi/h	f _N		4.5	mi/h		
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h		
LOS and Performance	Measures		Desian (N)				
			Design (N)	/				
Operational (LOS)			Design LOS					
$v_p = (V \text{ or DDHV}) / (PHF x N x)$	f _{HV} x f _p) 1252	pc/h/ln	$v_{p} = (V \text{ or } DE)$	DHV) / (PHF x N x f	- μν x f_)	pc/h		
S	65.5	mi/h	s		ну р	mi/h		
$D = v_p / S$	19.1	pc/mi/ln	$D = v_a / S$			nc/mi/ln		
LOS	С		Required Nu	mber of Lanes N		Po(111/111		
Glossarv			Factor Lo	cation				
N - Number of lanes	S - Speed							
V - Hourly volume	D - Density		E _R - Exhibits	23-8, 23-10	t	f _{LW} - Exhibit 23-4		
v - Flow rate	FFS - Free-flow s	peed	E _T - Exhibits	23-8, 23-10, 23-11	1	f _{LC} - Exhibit 23-5		
I OS - Level of service	BFFS - Base free	-flow speed	f _p - Page 23-	12	1	f _N - Exhibit 23-6		
DDHV - Directional design hou	ur volume		LOS, S, FFS	, v _p - Exhibits 23-2	, 23-3	f _{ID} - Exhibit 23-7		

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BASIC FREEWAY SEGMENTS WORKSHEET								
80 Free-Flow Speed FIS = 75 milh 70 65 milh 70 milh 70 65 milh 60 milh 80 55 milh 70 milh 80 60 milh 70 milh 90 100 A 100 milh 90 400 200	1300 1450	1600 1750 0 1750 1750 10 10 10 10 10 10 10 10 10 10 10 10 10	2400	<u>Application</u> Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, vp FFS, LOS, vp FFS, LOS, N FFS, N, AADT FFS, LOS, AA FFS, LOS, N	<u>Output</u> LOS, S, D N, S, D v _p , S, D LOS, S, D DT N, S, D v _p , S, D		
General Information	<u> </u>		Site Infor	mation				
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Westb	oound)		
Agency or Company	RPM Transporta	ation	From/To		Between Si	R-56 Ramps		
Data Barfarmad	Consultants		lurisdiction		Dutnom Co			
Analysis Time Period	5/22/2009 AM Peak Hour		Analysis Yea	ar	2033 Existi	na w/ Business Park		
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning					
Coper.(LOS)			Des.(N)		🔲 Planni	ing Data		
Flow Inputs								
Volume, V	1732	veh/h	Peak-Hour F	actor, PHF	0.90			
AADT		veh/day	%Trucks and	l Buses, P _T	22			
Peak-Hr Prop. of AADT, K			%RVs, P _R		0			
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terr Grade %	ain: Length	Levei mi			
Driver type adjustment	1.00	Volum		Up/Down %				
Calculate Flow Adjustm	ents							
f _p	1.00		E _R		1.2			
E _T	1.5		f _{HV} = 1/[1+P _T (E	E _T - 1) + P _R (E _R - 1)]	0.901			
Speed Inputs			Calc Spee	d Adj and FFS				
Lane Width	12.0	ft	4		0.0	mi/h		
Rt-Shoulder Lat. Clearance	6.0	ft	LW		0.0	1111/11		
Interchange Density	0.50	l/mi	LC		0.0	mi/n		
Number of Lanes, N	2		† _{ID}		0.0	mi/h		
FFS (measured)		mi/h	f _N		4.5	mi/h		
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h		
LOS and Performance	Measures		Desian (N)				
			Design (N)	/				
Operational (LOS)			Design LOS					
$v_p = (V \text{ or DDHV}) / (PHF x N x)$	f _{HV} x f _p) <i>1068</i>	pc/h/ln	$v_{r} = (V \text{ or } DE)$	DHV) / (PHF x N x f	fuv x f_)	pc/h		
S	65.5	mi/h	s s	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	нитр	mi/h		
$D = v_p / S$	16.3	pc/mi/ln	$D = v_a / S$			nc/mi/ln		
LOS	В		Required Nu	mber of Lanes N		Po/111/11		
Glossarv			Factor Lo	cation				
N - Number of lanes	S - Speed							
V - Hourly volume	D - Density		E _R - Exhibits	23-8, 23-10	f _l	_{LW} - Exhibit 23-4		
v Flow rate	FFS - Free-flow s	peed	E _T - Exhibits	23-8, 23-10, 23-11	1 f _l	_{LC} - Exhibit 23-5		
IOS - Level of service	BFES - Base free	-flow speed	f _p - Page 23-	·12	fr	_N - Exhibit 23-6		
DDH\/ - Directional design hou	ir volume		LOS, S, FFS	5, v _p - Exhibits 23-2	, 23-3 f _l	_D - Exhibit 23-7		

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BASIC FREEWAY SEGMENTS WORKSHEET							
80 Free-Flow Speed FIS = 75 milh 70 65 milh 70 milh 70 65 milh 60 milh 50 10 S A 55 milh 40 60 milh 60 milh 90 400 200	1300 1450		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, v _p FFS, LOS, v _p FFS, LOS, N FFS, N, AADT FFS, LOS, AAI FFS, LOS, N	<u>Output</u> LOS, S, D N, S, D v _p , S, D LOS, S, D DT N, S, D v _p , S, D	
General Information			Site Inform	mation			
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Westb	ound)	
Agency or Company	RPM Transport	ation	From/To		West of SR	-56	
Date Performed	Consultants		lurisdiction		Putnam Co		
Analysis Time Period	AM Peak Hour		Analysis Yea	ar	2033 Existir	ng w/ Business Park	
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning				
Oper.(LOS)			es.(N)		🔲 Planni	ng Data	
Flow Inputs							
Volume, V	2002	veh/h	Peak-Hour F	actor, PHF	0.90		
AADI		veh/day	% I rucks and	d Buses, P _T	22		
Peak-Hr Prop. of AAD1, K			%RVS, P _R Conoral Torr	oin.	U Lovol		
DDHV = AADT x K x D		veh/h	Grade %	Length	mi		
Driver type adjustment	1.00			Up/Down %			
Calculate Flow Adjustm	ients						
f _p	1.00		E _R		1.2		
E _T	1.5		f _{HV} = 1/[1+P _T (E	E _T - 1) + P _R (E _R - 1)]	0.901		
Speed Inputs			Calc Spee	ed Adj and FFS	i		
Lane Width	12.0	ft	f		0.0	mi/h	
Rt-Shoulder Lat. Clearance	6.0	ft	'LW f		0.0	mi/h	
Interchange Density	0.50	I/mi	LC		0.0	1111/11	
Number of Lanes, N	2		TID		0.0	mi/h	
FFS (measured)		mi/h	f _N		4.5	mi/h	
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h	
LOS and Performance M	Measures		Design (N				
			Design (N)	/			
Operational (LOS)			Design LOS				
v _p = (V or DDHV) / (PHF x N x	f _{HV} x f _p) 1235	pc/h/ln	$v_n = (V \text{ or } DE)$	DHV) / (PHF x N x t	f _{uv} x f _a)	pc/h	
S	65.5	mi/h	s		ну р⁄	mi/h	
$D = v_p / S$	18.9	pc/mi/ln	$D = v_{\rm L} / S$			pc/mi/ln	
LOS	С		Required Nu	mber of Lanes, N		P0/111/11	
Glossarv			Factor Lo	cation			
N - Number of lanes	S - Speed						
V - Hourly volume	D - Densitv		E _R - Exhibits	23-8, 23-10	f _L	_{.W} - Exhibit 23-4	
v - Flow rate	FFS - Free-flow s	speed	E _T - Exhibits	23-8, 23-10, 23-17	1 f _L	_{.C} - Exhibit 23-5	
I OS - Level of service	BFFS - Base free	-flow speed	f _p - Page 23-	·12	f _N	_N - Exhibit 23-6	
DDHV - Directional design hou	ur volume		LOS, S, FFS	5, v _p - Exhibits 23-2	, 23-3 f _{II}	_D - Exhibit 23-7	

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BASIC FREEWAY SEGMENTS WORKSHEET								
(i) iiii) 70 Free-Flow Speed FIS = 75 milh 70 milh 60 65 milh 50 105 A 10 10 400 200 General Information	BASIC FF	REEWAY SE(GMENTS W	VORKSHEET Application Operational (LOS) Design (N) Design (vp) Planning (LOS) Planning (M) Planning (vp)	Input FFS, N, vp FFS, LOS, vp FFS, LOS, N FFS, N, AAD FFS, LOS, AA FFS, LOS, N	<u>Output</u> LOS, S, D N, S, D v _p , S, D I LOS, S, D LDT N, S, D v _p , S, D		
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Eastb	ound)		
Agency or Company	RPM Transport	ation	From/To		west of SR	-56		
Data Darformed	Consultants		luriadiation					
Analysis Time Period	5/22/2009 PM Peak Hour		Analysis Yea	ır	2033 Exist) ing w/ Business Park		
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning	u	2000 Exiol	ng w Busilious Fulk		
Oper.(LOS)			Des.(N)		🗏 Plann	ing Data		
Flow Inputs								
Volume, V	2521	veh/h	Peak-Hour F	actor, PHF	0.90			
AADT		veh/day	%Trucks and	l Buses, P _T	22			
Peak-Hr Prop. of AADT, K			%RVs, P _R		0			
		veh/h	General Terr	ain:	Level mi			
Driver type adjustment	1.00	Ven/m	Orace 70	Up/Down %				
Calculate Flow Adjustm	nents			· ·				
f	1.00		E _R		1.2			
É _T	1.5		f _{ыv} = 1/[1+Р _т (Е	_T - 1) + P _R (E _R - 1)]	0.901			
Speed Inputs				d Adi and FFS				
Lane Width	12.0	ft	4		0.0	mi/h		
Rt-Shoulder Lat. Clearance	6.0	ft	T _{LW}		0.0	mi/n		
Interchange Density	0.50	I/mi	[†] LC		0.0	mi/h		
Number of Lanes. N	2		f _{ID}		0.0	mi/h		
FFS (measured)	_	mi/h	f _N		4.5	mi/h		
Base free-flow Speed BEES	70.0	mi/h	FFS		65.5	mi/h		
LOS and Performance I	Measures		Design (N	1				
	incasures)				
Operational (LOS)								
$v_p = (V \text{ or DDHV}) / (PHF x N x)$	(f _{HV} x f _p) <i>15</i> 55	pc/h/ln	$V = (V \text{ or } D\Gamma)$		f v f)	nc/h		
S	65.4	mi/h	$v_p = (v \ 0 \ DL)$		HV ^ ' p)	pc/n mi/h		
$D = v_p / S$	23.8	pc/mi/ln						
LOS	С		$D = v_p / S$			pc/mi/in		
Glassan								
	C Crocd			Cation				
	5 - Speed		E _R - Exhibits	23-8, 23-10	f	_{LW} - Exhibit 23-4		
v - Hourry volume		rood	E _T - Exhibits	23-8, 23-10, 23-11	1 f	_{LC} - Exhibit 23-5		
v _p - riuw late			f _p - Page 23-	12	f	_N - Exhibit 23-6		
LUS - Level of service	BFFS - Base free	e-now speed	LOS, S, FFS	, v _p - Exhibits 23-2	., 23-3 f	_{ID} - Exhibit 23-7		
DDHV - Directional design ho	ur volume			٢		-		

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BASIC FREEWAY SEGMENTS WORKSHEET							
80 Free-Flow Speed FIS = 75 milh 70 65 milh 70 milh 70 65 milh 60 milh 60 55 milh 60 milh 10 55 milh 60 milh 30 0 400 200	1300 1300 145 25 Vetroition 15 Vetroition 1200 Flow Rate (pc/h/ln)		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, vp FFS, LOS, vp FFS, LOS, N FFS, N, AAD FFS, LOS, AA FFS, LOS, N	<u>Output</u> LOS, S, D N, S, D v _p , S, D I LOS, S, D LDT N, S, D v _p , S, D	
General Information			Site Inform	mation			
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Eastb	ound)	
Agency or Company	RPM Transport	ation	From/To		Between S	R-56 Ramps	
Date Performed	Consultants 5/22/2009		Jurisdiction		Putnam Co	, ,	
Analysis Time Period	PM Peak Hour		Analysis Yea	ır	2033 Existi	ing w/ Business Park	
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning				
Oper.(LOS)			es.(N)		🔲 Plann	ing Data	
Flow Inputs							
Volume, V	2148	veh/h	Peak-Hour F	actor, PHF	0.90		
		ven/day		Buses, P _T	22		
Peak-Hr Prop. of AAD1, K			%RVS, P _R General Terr	ain.	U Lovel		
$DDHV = AADT \times K \times D$		veh/h	Grade %	Length	mi		
Driver type adjustment	1.00			Up/Down %			
Calculate Flow Adjustm	ients						
f _p	1.00		E _R		1.2		
E _T	1.5		$f_{HV} = 1/[1+P_T(E)]$	E _T - 1) + P _R (E _R - 1)]	0.901		
Speed Inputs			Calc Spee	d Adj and FFS			
Lane Width	12.0	ft	f		0.0	mi/h	
Rt-Shoulder Lat. Clearance	6.0	ft	f.		0.0	mi/h	
Interchange Density	0.50	l/mi	LC		0.0	1111/11 	
Number of Lanes, N	2		'ID		0.0	mi/n	
FFS (measured)		mi/h	† _N		4.5	mi/h	
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h	
LOS and Performance M	Measures		Design (N)			
			Design (N)	-			
Operational (LOS)			Design LOS				
$v_p = (V \text{ or } DDHV) / (PHF x N x)$	τ _{HV} x t _p) 1325	pc/h/ln	$v_{p} = (V \text{ or } DE)$	DHV) / (PHF x N x i	f _{HV} x f _p)	pc/h	
S	65.5	mi/h	S		nv p	mi/h	
$D = v_p / S$	20.2	pc/mi/ln	$D = v_p / S$			pc/mi/ln	
LOS	С		Required Nu	mber of Lanes, N			
Glossary			Factor Lo	cation			
N - Number of lanes	S - Speed						
V - Hourly volume	D - Densitv		E _R - Exhibits	23-8, 23-10	f	_{LW} - Exhibit 23-4	
v, - Flow rate	FFS - Free-flow s	speed	E _T - Exhibits	23-8, 23-10, 23-11	l f	_{LC} - Exhibit 23-5	
LOS - Level of service	BFFS - Base free	e-flow speed	f _p - Page 23-	12	f	_N - Exhibit 23-6	
DDHV - Directional design hou	ur volume		LOS, S, FFS	, v _p - Exhibits 23-2	, 23-3 f	_{ID} - Exhibit 23-7	

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BASIC FREEWAY SEGMENTS WORKSHEET										
80 Free-Flow Speed FIS = 75 milh 70 65 milh 70 milh 70 65 milh 60 milh 50 10 55 milh 10 10 10 10 10 10 10 10 10 10 10 10 10 1	1300 1450		2400	<u>Application</u> Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (M) Planning (v _p)	Input FFS, N, v _p FFS, LOS, v _p FFS, LOS, N FFS, N, AAD FFS, LOS, N	Output LOS, S, D N, S, D v _p , S, D T LOS, S, D ADT N, S, D v _p , S, D				
General Information	4		Site Infor	mation						
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Eastb	oound)				
Agency or Company	RPM Transport	ation	From/To		Between S	R-135 & SR-56				
Dete Derformed	Consultants		luriadiction		Dutnom C					
Analysis Time Period	5/22/2009 PM Peak Hour		Analysis Yea	ar	2033 Exist) ing w/ Business Park				
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning	•	2000 2000					
Oper.(LOS)			es.(N)		🔲 Planr	ning Data				
Flow Inputs										
Volume, V	2385	veh/h	Peak-Hour F	actor, PHF	0.90					
AADT		veh/day	%Trucks and	l Buses, P _T	22					
Peak-Hr Prop. of AADT, K			%RVs, P _R		0					
DDHV = AADT $x K x D$		veh/h	General Terr Grade %	Length	Levei mi					
Driver type adjustment	1.00			Up/Down %						
Calculate Flow Adjustm	nents									
f _p	1.00		E _R		1.2					
E _T	1.5		$f_{HV} = 1/[1+P_T(E)]$	E _T - 1) + P _R (E _R - 1)]	0.901					
Speed Inputs			Calc Spee	ed Adj and FFS						
Lane Width	12.0	ft	f		0.0	mi/h				
Rt-Shoulder Lat. Clearance	6.0	ft	f		0.0	mi/h				
Interchange Density	0.50	I/mi	LC f		0.0	mi/h				
Number of Lanes, N	2		'ID		0.0	111/11				
FFS (measured)		mi/h	^T N		4.5	mi/n				
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h				
LOS and Performance	Measures		Design (N)						
Operational (LOS)			<u>Design (N)</u>							
$\frac{Operational(LOS)}{(DUE \times N)}$	f yf) 4 474	n o /b /lu	Design LOS							
$v_p = (v \text{ of } D D \Pi v) / (P \Pi F X N X)$	H _V X I _p) 1471	pc/n/in	$v_p = (V \text{ or } DE)$	DHV) / (PHF x N x i	f _{HV} x f _p)	pc/h				
S D u (O	65.5	mi/h	s		·	mi/h				
$v = v_p / S$	22.5	pc/mi/ln	$D = v_p / S$			pc/mi/ln				
105	C		Required Nu	mber of Lanes, N						
Glossary			Factor Lo	cation						
N - Number of lanes	S - Speed			22-8 22 10		- Exhibit 22.4				
V - Hourly volume	D - Density			22-0, 23-10 22-8 22 10 22 44	1 4	LW - EXHIDIL 23-4				
v _p - Flow rate	FFS - Free-flow s	peed		23-8, 23-10, 23-11 12	۱ I					
LOS - Level of service	BFFS - Base free	e-flow speed	I OS S EFC	1Z	1	N - EXHIDIL 23-0				
DDHV - Directional design hou	ur volume		103, 5, FFS	$v_p = \text{Exhibits } 23-2$., ∠ ა- ა I					

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BASIC FREEWAY SEGMENTS WORKSHEET										
80 Free-Flow Speed FFS = 75 min 70 65 min 70 min 70 65 min 70 min 80 55 min 70 min 80 60 55 min 10 55 min 10 10 65 min 10 10 60 min 10 10 10 min 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10	1300 1300 1450 B. C		2400	<u>Application</u> Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, vp FFS, LOS, vp FFS, LOS, N FFS, N, AAD FFS, LOS, AA FFS, LOS, N	<u>Output</u> LOS, S, D N, S, D v _p , S, D I LOS, S, D DT N, S, D v _p , S, D				
General Information			Site Infor	mation						
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Eastb	ound)				
Agency or Company	RPM Transport	ation	From/To		Between S	R-135 Ramps				
Date Performed	Consultants 5/22/2009		Jurisdiction		Putnam Co					
Analysis Time Period	PM Peak Hour		Analysis Yea	ar	2033 Existi	ng w/ Business Park				
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning							
Oper.(LOS)			Des.(N)		Plann	ing Data				
Flow Inputs	10.44		De al Illaur D		0.00					
Volume, V	1841	ven/n veb/dav	%Trucks and	actor, PHF Buses P_	0.90 22					
Peak-Hr Prop. of AADT. K		Ven/day	%RVs. Pa	20000, 1	0					
Peak-Hr Direction Prop, D			General Terr	ain:	Level					
DDHV = AADT x K x D		veh/h	Grade %	Length	mi					
Driver type adjustment	1.00			Up/Down %						
	1.00		F		10					
'р ⊏	1.00		⊢R f 4//4→D//		1.2					
	1.5		$H_{\text{HV}} = 1/(1+P_{\text{T}})$	$(E_{\rm T} - 1) + P_{\rm R}(E_{\rm R} - 1)$	0.901					
	12.0	<i>t</i> .	Calc Spee	ed Adj and FFS	1					
Lane Width Rt Shoulder Let Clearance	12.0	11 #	f _{LW}		0.0	mi/h				
Interchange Density	0.0	Il I/mi	f _{LC}		0.0	mi/h				
Number of Lance N	0.00	1/1111	f _{ID}		0.0	mi/h				
FES (measured)	Z	mi/b	f _N		4.5	mi/h				
Base free-flow Speed BEES	70.0	mi/h	FFS		65.5	mi/h				
LOS and Performance	Moasures	1111/11	Design (N	١						
LOS and Performance i	vicasules)						
Operational (LOS)										
$v_p = (V \text{ or DDHV}) / (PHF x N x)$: f _{HV} x f _p) <i>113</i> 5	pc/h/ln	$v = (V \text{ or } D\Gamma)$)H\/) / (PHF x N x f	fxf)	nc/h				
S	65.5	mi/h	s		HV Y 'p'	mi/h				
$D = v_p / S$	17.3	pc/mi/ln	$D = v_a / S$			nc/mi/ln				
LOS	В		Required Nu	mber of Lanes. N		P0/111/11				
Glossarv			Factor Lo	cation						
N - Number of lanes	S - Speed									
V - Hourly volume	D - Density		E _R - Exhibits	23-8, 23-10	f _l	_{LW} - Exhibit 23-4				
v _n - Flow rate	FFS - Free-flow s	peed	E _T - Exhibits	23-8, 23-10, 23-11	1 f	_{LC} - Exhibit 23-5				
LOS - Level of service	BFFS - Base free	e-flow speed	t _p - Page 23-	-12	f	N - Exhibit 23-6				
DDHV - Directional design hou	ur volume	-	LOS, S, FFS	, v_p - Exhibits 23-2	, 23-3 f	_{ID} - Exhibit 23-7				

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BASIC FREEWAY SEGMENTS WORKSHEET										
Image: Second First Street Free-Flow Street First Street First Street 70 60 65 min 70 min 70 65 min 60 65 min 50 LOS A 50 60 30 0 400 200	BASIC FI	REEWAY SE	GMENTS W Z400 Site Inforn Highway/Dire	Application Operational (LOS) Design (N) Design (vp) Planning (LOS) Planning (ILOS) Planning (N) Planning (vp) Mation	Input FFS, N, vp FFS, LOS, vp FFS, LOS, N FFS, N, AADT FFS, LOS, AA FFS, LOS, N	Output LOS, S, D N, S, D vp, S, D UOS, S, D DT N, S, D vp, S, D DT vp, S, D				
Agency or Company	RPM Transport	ation	From/To		East of SR-	.135				
Date Performed Analysis Time Period Project Description 09-0402	Consultants 5/22/2009 PM Peak Hour Mine Lick Creek I	JS - TDOT OC F	Jurisdiction Analysis Yea Planning	ır	Putnam Co 2033 Existii	ng w/ Business Park				
Oper.(LOS)			es.(N)		🔲 Planni	ing Data				
Flow Inputs Volume, V AADT Peak-Hr Prop. of AADT, K	3359	veh/h veh/day	Peak-Hour F %Trucks and %RVs, Pp	actor, PHF I Buses, P _T	0.90 22 0					
Peak-Hr Direction Prop, D DDHV = AADT x K x D Driver type adjustment Calculate Flow Adjustm	1.00	veh/h	General Terr Grade %	ain: Length Up/Down %	Level mi					
f_	1.00		En		1.2					
E _T	1.5		к f _{uv} = 1/[1+Р _т (Е	E _T - 1) + P _D (E _D - 1)]	0.901					
Speed Inputs				d Adi and FFS						
Lane Width Rt-Shoulder Lat. Clearance Interchange Density Number of Lanes, N FFS (measured) Base free-flow Speed, BFFS	12.0 6.0 0.50 2 70.0	ft ft I/mi mi/h mi/h	f _{LW} f _{LC} f _{ID} f _N FFS		0.0 0.0 0.0 4.5 65.5	mi/h mi/h mi/h mi/h mi/h				
LOS and Performance I	Measures		Design (N)						
$\frac{\text{Operational (LOS)}}{v_p} = (V \text{ or DDHV}) / (PHF x N x)$ S D = v_p / S LOS	x f _{HV} x f _p) 2071 60.5 34.3 D	pc/h/ln mi/h pc/mi/ln	$\frac{\text{Design (N)}}{\text{Design LOS}}$ $v_p = (V \text{ or DE})$ S $D = v_p / S$ Required Nu	DHV) / (PHF x N x t mber of Lanes, N	f _{HV} x f _p)	pc/h mi/h pc/mi/ln				
Glossary			Factor Lo	cation						
N - Number of lanes V - Hourly volume v_p - Flow rate LOS - Level of service DDHV - Directional design hou	S - Speed D - Density FFS - Free-flow s BFFS - Base free ur volume	speed e-flow speed	E _R - Exhibits E _T - Exhibits f _p - Page 23- LOS, S, FFS	23-8, 23-10 23-8, 23-10, 23-11 12 [,] , v _p - Exhibits 23-2	f _L 1 f _L 1 f _L 1 1 1 1 1 1 1 1	_{.W} - Exhibit 23-4 _{.C} - Exhibit 23-5 _N - Exhibit 23-6 _D - Exhibit 23-7				

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BASIC FREEWAY SEGMENTS WORKSHEET										
80 Free-Flow Spzed FIS = 75 milh 70 65 milh 70 milh 70 65 milh 60 milh 50 55 milh 10 milh 80 60 milh 10 milh 90 10 S A 10 milh 90 40 200	11500 1150 115 115 1200 Flow Rate (pc/h/ln)		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (M) Planning (v _p)	Input FFS, N, vp FFS, LOS, vp FFS, LOS, N FFS, N, AADT FFS, LOS, AA FFS, LOS, N	<u>Output</u> LOS, S, D N, S, D v _p , S, D LOS, S, D DT N, S, D v _p , S, D				
General Information			Site Inform	mation						
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Westb	oound)				
Agency or Company	RPM Transport	ation	From/To		East of SR-	-135				
Date Performed	Consultants 5/22/2009		Jurisdiction		Putnam Co					
Analysis Time Period	PM Peak Hour		Analysis Yea	ar	2033 Existi	ng w/ Business Park				
Project Description 09-0402	Mine Lick Creek I	JS - TDOT OC F	Planning			-				
Oper.(LOS)			es.(N)		🗖 Planni	ing Data				
Flow Inputs										
Volume, V	2466	veh/h	Peak-Hour F	actor, PHF	0.90					
		ven/day		i Buses, P _T	22					
Peak-Hr Prop. of AAD1, K			%RVS, P _R General Terr	ain.	U					
$DDHV = AADT \times K \times D$		veh/h	Grade %	Length	mi					
Driver type adjustment	1.00			Up/Down %						
Calculate Flow Adjustm	ients									
f _p	1.00		E _R		1.2					
E _T	1.5		$f_{HV} = 1/[1+P_T(B)]$	E _T - 1) + P _R (E _R - 1)]	0.901					
Speed Inputs			Calc Spee	ed Adj and FFS						
Lane Width	12.0	ft	f		0.0	mi/h				
Rt-Shoulder Lat. Clearance	6.0	ft	f.		0.0	mi/h				
Interchange Density	0.50	l/mi	LC		0.0	1111/11 				
Number of Lanes, N	2		^I ID		0.0	mi/n				
FFS (measured)		mi/h	† _N		4.5	mi/h				
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h				
LOS and Performance M	Measures		Design (N)						
			Design (N)	-						
Operational (LOS)			Design LOS							
$v_p = (V \text{ or DDHV}) / (PHF x N x)$	f _{HV} x f _p) <i>1521</i>	pc/h/ln	$v_{p} = (V \text{ or } DE)$	DHV) / (PHF x N x i	f _{HV} x f _n)	pc/h				
S	65.5	mi/h	s		···• P.	mi/h				
$D = v_p / S$	23.2	pc/mi/ln	$D = v_p / S$			pc/mi/ln				
LOS	С		Required Nu	mber of Lanes, N						
Glossary			Factor Lo	cation						
N - Number of lanes	S - Speed									
V - Hourly volume	D - Densitv		E _R - Exhibits	23-8, 23-10	f	_{_W} - Exhibit 23-4				
v, - Flow rate	FFS - Free-flow s	speed	E _T - Exhibits	23-8, 23-10, 23-11	1 f _l	_{_C} - Exhibit 23-5				
LOS - Level of service	BFFS - Base free	e-flow speed	f _p - Page 23-	·12	f,	_N - Exhibit 23-6				
DDHV - Directional design hou	ur volume		LOS, S, FFS	5, v _p - Exhibits 23-2	., 23-3 f _l	_D - Exhibit 23-7				

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BASIC FREEWAY SEGMENTS WORKSHEET										
80 Free-Flow Speed FFS = 75 min 70 65 min 70 min 70 65 min 70 min 80 50 50 min 10 55 min 70 min 90 10 55 min 10 55 min 10 10 55 min 10 10 10 min 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10	1300 1300 1450 B. C		2400	<u>Application</u> Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, v _p FFS, LOS, V _p FFS, LOS, N FFS, N, AAD FFS, LOS, AA FFS, LOS, N	<u>Output</u> LOS, S, D N, S, D v _p , S, D I LOS, S, D LDT N, S, D v _p , S, D				
General Information			Site Infor	mation						
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Westl	bound)				
Agency or Company	RPM Transport	ation	From/To		Between S	R-135 Ramps				
Date Performed	Consultants 5/22/2009		Jurisdiction		Putnam Co					
Analysis Time Period	PM Peak Hour		Analysis Yea	ar	2033 Existi	ing w/ Business Park				
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning							
Oper.(LOS)			es.(N)		Plann	ing Data				
Flow Inputs	1050		De al Illaur D		0.00					
Volume, V	1656	ven/n veb/dav	%Trucks and	actor, PHF Buses P_	0.90 22					
Peak-Hr Prop. of AADT K		Ven/day	%RVs. Pp	20000, 1	0					
Peak-Hr Direction Prop, D			General Terr	ain:	Level					
DDHV = AADT x K x D	(veh/h	Grade %	Length	mi					
Driver type adjustment	1.00			Up/Down %						
	1.00		F		12					
'р ⊏	1.00		⊢R f 4//4→D//		1.2					
	1.5		$H_{\text{HV}} = 1/(1+P_{\text{T}})$	$(E_{\rm T} - 1) + P_{\rm R}(E_{\rm R} - 1)$	0.901					
	12.0	<i>t</i> .	Calc Spee	ed Adj and FFS	1					
Lane Width Rt Shoulder Let Clearance	12.0	11 ff	f _{LW}		0.0	mi/h				
Interchange Density	0.0	Il I/mi	f _{LC}		0.0	mi/h				
Number of Lance N	0.00	1/1111	f _{ID}		0.0	mi/h				
FES (measured)	Z	mi/b	f _N		4.5	mi/h				
Base free-flow Speed BEES	70.0	mi/h	FFS		65.5	mi/h				
LOS and Performance	Moasures	1111/11	Design (N	1						
LOS and Performance i	vicasules)						
Operational (LOS)			Design LOS							
$v_p = (V \text{ or DDHV}) / (PHF x N x)$: f _{HV} x f _p) <i>1021</i>	pc/h/ln	v = (V or D))HV) / (PHF x N x f	fxf)	nc/h				
S	65.5	mi/h	s		'HV ^ 'p/	mi/h				
$D = v_p / S$	15.6	pc/mi/ln	$D = v_a / S$			nc/mi/ln				
LOS	В		Required Nu	mber of Lanes. N		P-0/111/111				
Glossarv			Factor Lo	cation						
N - Number of lanes	S - Speed									
V - Hourly volume	D - Density		E _R - Exhibits	23-8, 23-10	f	_{LW} - Exhibit 23-4				
v _n - Flow rate	FFS - Free-flow s	peed	E _T - Exhibits	23-8, 23-10, 23-11	1 f	_{LC} - Exhibit 23-5				
LOS - Level of service	BFFS - Base free	e-flow speed	t _p - Page 23-	-12	f	N - Exhibit 23-6				
DDHV - Directional design hou	ur volume		LOS, S, FFS	, v_p - Exhibits 23-2	., ∠3-3 f	ID - Exhidit 23-7				

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BASIC FREEWAY SEGMENTS WORKSHEET										
80 Free-Flow Speed FIS = 75 milh 70 65 milh 70 milh 70 65 milh 60 milh 50 55 milh 10 milh 80 10 milh 10 milh 90 400 200	1300 1450		2400	<u>Application</u> Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (M) Planning (v _p)	Input FFS, N, vp FFS, LOS, vp FFS, LOS, N FFS, N, AADI FFS, LOS, AA FFS, LOS, N	<u>Output</u> LOS, S, D N, S, D v _p , S, D I LOS, S, D DT N, S, D v _p , S, D				
General Information	<u> </u>		Site Infor	mation						
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Westl	bound)				
Agency or Company	RPM Transporta	ation	From/To		Between S	R-135 & SR-56				
Data Barfarmad	Consultants		lurisdiction		Dutnom Co					
Analysis Time Period	5/22/2009 PM Peak Hour		Analysis Yea	ar	2033 Existi	' 'ng w/ Business Park				
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning							
Coper.(LOS)			es.(N)		🔲 Plann	ing Data				
Flow Inputs										
Volume, V	2558	veh/h	Peak-Hour F	actor, PHF	0.90					
AADT		veh/day	%Trucks and	l Buses, P _T	22					
Peak-Hr Prop. of AADT, K			%RVs, P _R		0					
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terr	ain: Length	Levei mi					
Driver type adjustment	1.00	Volum		Up/Down %						
Calculate Flow Adjustm	ents									
f _p	1.00		E _R		1.2					
E _T	1.5		f _{HV} = 1/[1+P _T (E	E _T - 1) + P _R (E _R - 1)]	0.901					
Speed Inputs			Calc Spee	d Adj and FFS						
Lane Width	12.0	ft	4		0.0	mi/b				
Rt-Shoulder Lat. Clearance	6.0	ft	LW		0.0	1111/11				
Interchange Density	0.50	l/mi	LC		0.0	mi/n				
Number of Lanes, N	2		† _{ID}		0.0	mi/h				
FFS (measured)		mi/h	f _N		4.5	mi/h				
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h				
LOS and Performance	Measures		Design (N)						
			Design (N)	/						
Operational (LOS)			Design LOS							
$v_p = (V \text{ or DDHV}) / (PHF x N x)$	f _{HV} x f _p) 1577	pc/h/ln	$v_{r} = (V \text{ or } DE)$	DHV) / (PHF x N x f	fuy x f_)	pc/h				
S	65.4	mi/h	s (* 11 – 1	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	нитр	mi/h				
$D = v_p / S$	24.1	pc/mi/ln	$D = v_a / S$			nc/mi/ln				
LOS	С		Required Nu	mber of Lanes N		P0/11/11				
Glossarv			Factor Lo	cation						
N - Number of lanes	S - Speed									
V - Hourly volume	D - Densitv		E _R - Exhibits	23-8, 23-10	f	_{LW} - Exhibit 23-4				
v - Flow rate	FFS - Free-flow s	peed	E _T - Exhibits	23-8, 23-10, 23-11	1 f	_{LC} - Exhibit 23-5				
I OS - Level of service	BEES - Base free	-flow speed	f _p - Page 23-	·12	f	_N - Exhibit 23-6				
DDHV - Directional design hou	ur volume		LOS, S, FFS	5, v _p - Exhibits 23-2	, 23-3 f	_{ID} - Exhibit 23-7				

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BASIC FREEWAY SEGMENTS WORKSHEET										
80 Free-Flow Spzed FFS = 75 milh 70 60 65 milh 60 55 milh 50 10 90 55 milh 40 55 milh 90 400 90 400 60 10 60 10 90 400 90 400 90 400 90 400	BASIC FI	REEWAY SE	GMENTS W 2400 Site Inform Highway/Dire	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (N) Planning (v _p)	Input FFS, N, vp FFS, LOS, vp FFS, LOS, N FFS, N, AADI FFS, LOS, AA FFS, LOS, N	<u>Output</u> LOS, S, D N, S, D v _p , S, D Γ LOS, S, D LDT N, S, D v _p , S, D				
Agency or Company	RPM Transport	tation	From/To		Between S	R-56 Ramps				
Date Performed Analysis Time Period Project Description 09-0402	5/22/2009 PM Peak Hour Mine Lick Creek -	TDOT OC Plan	Jurisdiction Analysis Yea	ar	Putnam Co 2033 Existi) ing w/ Business Park				
Moper.(LOS)			Des.(N)		🗖 Plann	ing Data				
<i>Flow Inputs</i> Volume, V	2167	veh/h	Peak-Hour F	actor, PHF	0.90					
AADT Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D Driver type adjustment	1.00	veh/day veh/h	%Trucks and %RVs, P _R General Terr Grade %	t Buses, P _T rain: Length Up/Down %	22 0 Level mi					
Calculate Flow Adjustr	nents		-							
	1.00		E _R		1.2					
E _T	1.5		$f_{HV} = 1/[1+P_T(E_T)]$	E _T - 1) + P _R (E _R - 1)]	0.901					
Speed Inputs	10.0	•	Calc Spee	ed Adj and FFS						
Rt-Shoulder Lat. Clearance Interchange Density Number of Lanes, N FFS (measured)	6.0 0.50 2	rt ft I/mi mi/h	f _{LW} f _{LC} f _{ID} f _N FFS		0.0 0.0 0.0 4.5 65.5	mi/h mi/h mi/h mi/h mi/h				
Base free-flow Speed, BFFS	70.0	mi/h		N		,				
<u>Operational (LOS)</u> v _p = (V or DDHV) / (PHF x N x	x f _{HV} x f _p) <i>13</i> 36	pc/h/ln	Design (N) Design LOS $v_{p} = (V \text{ or } DE$) DHV) / (PHF x N x 1	f _{uv} x f _c)	pc/h				
S D = v _p / S LOS	65.5 20.4 C	mi/h pc/mi/ln	S D = v_p / S Required Nu	mber of Lanes, N	нутр	pc/mi/ln				
Glossary			Factor Lo	cation						
N - Number of lanes V - Hourly volume v_p - Flow rate LOS - Level of service DDHV - Directional design hou	S - Speed D - Density FFS - Free-flow s BFFS - Base free ur volume	speed e-flow speed	E _R - Exhibits E _T - Exhibits f _p - Page 23- LOS, S, FFS	23-8, 23-10 23-8, 23-10, 23-1 [,] 12 5, v _p - Exhibits 23-2	f 1 f 2, 23-3 f	_{LW} - Exhibit 23-4 _{LC} - Exhibit 23-5 _N - Exhibit 23-6 _{ID} - Exhibit 23-7				

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BASIC FREEWAY SEGMENTS WORKSHEET										
80 Free-Flow Speed FIS = 75 milh 70 65 milh 70 milh 70 65 milh 60 milh 50 55 milh 60 milh 10 55 milh 60 milh 30 0 400 200	1300 1450 C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (M) Planning (v _p)	Input FFS, N, v _p FFS, LOS, v _p FFS, LOS, N FFS, N, AADT FFS, LOS, AAD FFS, LOS, N	Output LOS, S, D N, S, D V _P , S, D LOS, S, D DT N, S, D V _P , S, D				
General Information			Site Inform	mation						
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Westb	ound)				
Agency or Company	RPM Transport	ation	From/To		West of SR-	-56				
Date Performed	Consultants		lurisdiction		Putnam Co					
Analysis Time Period	PM Peak Hour		Analysis Yea	ar	2033 Existin	g w/ Business Park				
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning							
Oper.(LOS)			es.(N)		🔲 Plannii	ng Data				
Flow Inputs										
Volume, V	2475	veh/h	Peak-Hour F	actor, PHF	0.90					
AADI		veh/day	% I rucks and	d Buses, P _T	22					
Peak-Hr Prop. of AAD1, K			%RVS, P _R Conoral Torr	oin.	0 Lovol					
DDHV = AADT x K x D		veh/h	Grade %	Length	mi					
Driver type adjustment	1.00			Up/Down %						
Calculate Flow Adjustm	ents									
f _p	1.00		E _R		1.2					
E _T	1.5		$f_{HV} = 1/[1+P_T(E)]$	E _T - 1) + P _R (E _R - 1)]	0.901					
Speed Inputs			Calc Spee	ed Adj and FFS	1					
Lane Width	12.0	ft	f		0.0	mi/h				
Rt-Shoulder Lat. Clearance	6.0	ft	'LW f		0.0	mi/h				
Interchange Density	0.50	I/mi	LC		0.0					
Number of Lanes, N	2		^T ID		0.0	mi/h				
FFS (measured)		mi/h	f _N		4.5	mi/h				
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h				
LOS and Performance M	leasures		Design (N							
			Design (N)	/						
Operational (LOS)			Design LOS							
$v_p = (V \text{ or DDHV}) / (PHF x N x)$	f _{HV} x f _p) <i>15</i> 26	pc/h/ln	$v_{p} = (V \text{ or } DE)$	DHV) / (PHF x N x t	f _{uv} x f _n)	pc/h				
S	65.5	mi/h	S		ну р	mi/h				
$D = v_p / S$	23.3	pc/mi/ln	$D = v_{\rm L} / S$			pc/mi/ln				
LOS	С		Required Nu	mber of Lanes N		P0/111/111				
Glossarv			Factor Lo	cation						
N - Number of lanes	S - Speed									
V - Hourly volume	D - Density		E _R - Exhibits	23-8, 23-10	f _L	_W - Exhibit 23-4				
v - Flow rate	FFS - Free-flow s	speed	E _T - Exhibits	23-8, 23-10, 23-11	1 f _L	_C - Exhibit 23-5				
I OS - Level of service	BFFS - Base free	-flow speed	f _p - Page 23-	·12	f _N	- Exhibit 23-6				
DDHV - Directional design hou	ir volume		LOS, S, FFS	5, v _p - Exhibits 23-2	e, 23-3 f _{IE}	- Exhibit 23-7				

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FUTURE YEAR 2033 INTERSTATE 40 AT STATE ROUTE 56 (BAXTER ROAD)

		RAMP	S AND RA	MP JUNCTI	ONS WO	RKS	HEET			
General Infor	mation			Site Infor	mation					
Analyst	ALB			Freeway/Dir of Tr	ravel I-40 (Eastbound)					
Agency or Company	RPM	Transportatio	n Consultants	Junction	I	Exit Ra	imp to SR-	56		
Date Performed	5/22/2	2009		Jurisdiction	l	Putnan	n Co			
Analysis Time Period	I AM P	eak Hour		Analysis Year		2033 E	xisting w/ E	Business Park		
Project Description	09-0402 Mine I	Lick Creek - T	DOT OC Planni	ng						
Inputs		Torrain, Low							_	
Upstream Adj Ramp		Terrain: Leve	÷I						Downstrea Ramp	m Adj
	1								Ves	Con
	Γ								No	ft Off
			$S_{rr} = 70.0 \text{ mp}$	h	S _{EP} = 3	5.0 mr	h		down	it.
V _u = veh/h			Sketc	h (show lanes, L _A ,	L_{D}, V_{R}, V_{f}				V _D =	veh/h
Conversion to	o pc/h Und	der Base	Condition	s	1		1			
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f _{HV}	fp	v = V/PHF	x f _{HV} x f _p
Freeway	2800	0.90	Level	22	0	0.	.901	1.00	345	53
Ramp	312	0.90	Level	22	0	0.	.901	1.00	38	5
UpStream Down Stream										
DownStream	r	Merge Areas					I)iverne Areas		
Estimation of	· V.a	norgornous			Estimati	ion c	of V_{40}	siver go raious		
	- 1 2	(D)					1 <u></u>			
1	$v_{12} = v_F$	(r _{FM})	- 05 0)				v ₁₂ =	• v _R + (v _F - v _I	R ^{JF} FD	
	(⊏qua		[20-3)		L _{EQ} =		(Equation 25-8	3 OF 25-9)	
P _{FM} =	using	Equation (Exhidit 25-5)		P _{FD} =		1.	000 using Ed	quation (Exhi	bit 25-12)
v ₁₂ =	pc/n		,		V ₁₂ =		34	453 pc/h		
V ₃ or V _{av34}	pc/h (Equation 2	5-4 or 25-5)		V ₃ or V _{av34}		0	pc/h (Equatio	on 25-15 or	25-16)
Is V_3 or $V_{av34} > 2,70$	0 pc/h? Yes	s 🔲 No			Is V_3 or V_{av3}	₃₄ > 2,1	00 pc/h?	Yes Mo		
Is V_3 or $V_{av34} > 1.5$ *	[•] V ₁₂ /2 Yes	s 🔲 No			Is V_3 or V_{av3}	₈₄ > 1.5	5 * V ₁₂ /2	🛛 Yes 🔽 No		
If Yes,V _{12a} =	pc/h (Equation 2	5-8)		If Yes, V _{12a} =		p	c/h (Equation	1 25-18)	
Capacity Che	cks				Capacity	y Ch	ecks			
	Actual	(Capacity	LOS F?			Actual	Ca	pacity	LOS F?
					V		3453	Exhibit 25-1	4 4800	No
V _{FO}		Exhibit 25-7			$V_{FO} = V_{F}$	- V _R	3068	Exhibit 25-1	4 4800	No
					V _R		385	Exhibit 25-3	3 2000	No
Flow Entering	g Merge In	fluence A	Area	1	Flow En	terir	ng Merg	e Influenc	e Area	
	Actual	Max	Desirable	Violation?			Actual	Max Desiral	ole	Violation?
V _{R12}		Exhibit 25-7			V ₁₂		3453	Exhibit 25-14	4400:All	No
Level of Serv	ice Detern	nination ((if not F)		Level of	Ser	vice De	terminatio	n (if not l	=)
D _R = 5.475 + 0.	00734 v _R + (0.0078 V ₁₂	- 0.00627 L _A		C) _R = 4	.252 + 0.	0086 V ₁₂ - 0.0	0009 L _D	
D _R = (pc/mi/	ln)				D _R = 31	.0 (pc	/mi/ln)		_	
LOS = (Exhibi	t 25-4)				LOS = D	(Exhi	, bit 25-4)			
Speed Determ	nination				Speed D	Deter	minatio	on		
M _S = (Exibit 2	5-19)				D _s = 0.4	463 (E	xhibit 25	-19)		
S _R = mph (Exh	ibit 25-19)				S _R = 57	.0 mpł	n (Exhibit	25-19)		
$S_0 = mph (Exh$	ibit 25-19)				$ S_0 = N/2$	A mph	(Exhibit 2	25-19)		
S = mph (Exh	ibit 25-14)				S = 57	.0 mph	i (Exhibit	25-15)		

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RAMPS AND RAMP JUNCTIONS WORKSHEET										
General Infor	mation			Site Infor	mation					
Analyst Agency or Company Date Performed Analysis Time Perioc Project Description	ALB RPM 5/22/2 1 AM P 09-0402 Mine I	Transportation 2009 <u>'eak Hour</u> Lick Creek - TE	Freeway/Dir of Travel I-40 (Eastbound) ransportation Consultants Junction Entrance Ramp from SR-56 109 Jurisdiction Putnam Co ak Hour Analysis Year 2033 Existing w/ Business I ck Creek - TDOT OC Planning Entrance Ramp from SR-56				SR-56 iness Park			
Inputs				3						
Upstream Adj Ramp		Terrain: Leve	l						Downstrea Ramp	am Adj
Yes On	1								Tes 🗐	🗖 On
No Off	f								🗹 No	Cff Off
L _{up} = ft			= 70.0 mn	h	S = 3	5 0 mnh			L _{down} =	ft
V _u = veh/h	h/h Sketch (show lanes, L _A					0.0 mpn			V _D =	veh/h
Conversion to	o pc/h Und	der Base (Condition	s	-					
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{HV}	,	f _p	v = V/PHF	^F x f _{HV} x f _p
Freeway	2488	0.90	Level	22	0	0.901		1.00	3	069
Ramp	487	0.90	Level	22	0	0.901		1.00	1	601
UpStream										
DownStream	<u> </u>									
Estimation of	FV	Merge Areas			Fstimati	ion of	Div	erge Areas		
	• 12	(D)			Lounad		12			
	$v_{12} = v_F$	(P _{FM})	05.0)				$V_{12} = V_{R}$	+ (V _F - V	R)PFD	N
L _{EQ} =	(Equa		25-3)		L _{EQ} =		(E0	quation 25	5-8 OF 25-9) 05 10)
P _{FM} =	1.000	using Equat	ion (Exhibit 2	5-5)	P _{FD} =		us	ing Equati	ion (Exhibit	25-12)
$v_{12} =$	3069 p	DC/N			$v_{12} =$		pc	'N h (Faustion	DE 1E or DE	1/)
$v_3 \cup v_{av34}$	0 pc/r 0 pc/b2		25-4 01 25-5)	$v_3 \cup v_{av34}$	> 2 700	$pc/b2 \square x$		20-10 01 20	-10)
$15V_3 \text{ or } V_{av34} > 2.70$					$13 V_3 O V_{av3}$	4 ~ 2,700 、15*\			5	
$13 v_3 01 v_{av34} > 1.3$	$v_{12}/2$ in res	S MINU	-8)		If $V_{\text{PS}} V =$	4 ~ 1.5 \	'12' ²	res 🔲 No /b (Equativ) on 25-18)	
Capacity Che	pont		-0)			Choc	pc,	II (Equali	01123-10)	
	Actual		anacity	1.05.F2	Capacity		Actual		anacity	1.0S F2
	Actual	Ĭ	apacity		V_		Actual	Exhibit 25-	.14	2001:
V _{FO}	3670	Exhibit 25-7		No	$V_{FO} = V_F$	- V _R		Exhibit 25-	.14	
_					V _R			Exhibit 25	-3	
Flow Entering	a Merae In	fluence A	rea		Flow En	terina	Merae	Influen	ce Area	
	Actual	Max	Desirable	Violation?		Actu	al [Max Des	irable	Violation?
V _{R12}	3670	Exhibit 25-7	4600:All	No	V ₁₂		Ex	hibit 25-14		
Level of Serv	ice Detern	nination (if not F)		Level of	Servio	ce Dete	rminati	on (if no	ot F)
D _R = 5.475 +	0.00734 v _R + 0).0078 V ₁₂ - 0.0	0627 L _A			_R = 4.25	52 + 0.00	86 V ₁₂ - 0	.0009 L _D	
D _R = 29.5 (pc	/mi/ln)				D _R = (p	c/mi/ln)				
LOS = D (Exhib	oit 25-4)				LOS = (E	xhibit 25	5-4)			
Speed Determ	nination				Speed D	Determ	ination			
M _S = 0.426 (Exi	bit 25-19)				D _s = (E	xhibit 25-1	9)			
S _R = 58.1 mph ((Exhibit 25-19)				S _R = m	oh (Exhibil	25-19)			
$S_0 = N/A mph (l)$	Exhibit 25-19)				S ₀ = m	oh (Exhibit	25-19)			
S = 58.1 mph ((Exhibit 25-14)				S = m	oh (Exhibit	25-15)			

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	RAMPS AND RAMP JUNCTIONS WORKSHEET									
General Infor	rmation			Site Infor	ormation					
Analyst	ALB			Freeway/Dir of Tr	ravel I-40 (Westbound)					
Agency or Company	RPM	Transportatio	n Consultants	Junction	E	Exit Ramp to SR-56				
Date Performed	5/22/2	2009		Jurisdiction	F	Putnam Co				
Analysis Time Period	d AM P	Peak Hour		Analysis Year	2	033 Existing	g w/ Business	Park		
Project Description	09-0402 Mine I	Lick Creek - I	DOT OC Planni	ng						
Inputs		Torrain: Low								
Upstream Adj Ramp								Do Ra	wnstrea mp	m Adj
	I F								Yes	On On
	I							×	No =	ft Off
			$S_{rr} = 70.0 \text{ mp}$	h	S _{ED} = 35	5.0 mph			WN	
V _u = veh/h	1		Sketc	h (show lanes, L _A ,	L _D ,V _R ,V _f)			V _D	, =	veh/h
Conversion to	o pc/h Und	der Base	Condition	s						
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{HV}	fŗ	, v =	= V/PHF	x f _{HV} x f _p
Freeway	2031	0.90	Level	22	0	0.901	1.00)	250)5
Ramp	299	0.90	Level	22	0	0.901	1.00)	36	9
UpStream					<u> </u>					
DownStream		Morgo Arooc					Divorgo	\raac		
Estimation of	fv	werge Areas			Fstimati	on of v.	Diverger	aleas		
	12	(D)			Lounar		2			
	$V_{12} = V_{F}$	(P _{FM})				\ \	$V_{12} = V_R + (V_{12} + V_R)$	V _F - V _R)P	FD	
L _{EQ} =	(Equa	ation 25-2 o	r 25-3)		L _{EQ} =		(Equatio	n 25-8 or	r 25-9)	
P _{FM} =	using	Equation (Exhibit 25-5)		P _{FD} =		1.000 us	ing Equa	tion (Exhi	bit 25-12)
V ₁₂ =	pc/h				V ₁₂ =		2505 pc/l	٦		
V ₃ or V _{av34}	pc/h ((Equation 2	5-4 or 25-5)		V ₃ or V _{av34}		0 pc/h (E	Equation	25-15 or	25-16)
Is V_3 or $V_{av34} > 2,70$	0 pc/h? 🥅 Yes	s 🥅 No			Is V_3 or V_{av34}	₄ > 2,700 pc	/h? 🥅 Yes 🛛	🗹 No		
Is V_3 or $V_{av34} > 1.5$	* V ₁₂ /2 🔲 Yes	s 🔲 No			Is V_3 or V_{av34}	₁ > 1.5 * V ₁₂	/2 🥅 Yes	🗹 No		
If Yes,V _{12a} =	pc/h ((Equation 2	5-8)		If Yes, V _{12a} =		pc/h (Eq	uation 25	5-18)	
Capacity Che	ecks				Capacity	Check	s			
	Actual	(Capacity	LOS F?		A	ctual	Capac	city	LOS F?
					V _F	25	i05 Exhi	bit 25-14	4800	No
V _{FO}		Exhibit 25-7			$V_{FO} = V_F$	• V _R 21	36 Exhi	bit 25-14	4800	No
					Vp	3	69 Exh	ibit 25-3	2000	No
Flow Entering	a Merae In	fluence A	Area	I	Flow En	terina M	lerae Infli	uence A	Area	
	Actual	Max	Desirable	Violation?	11011 211	Actual	Max	Desirable		Violation?
V _{R12}		Exhibit 25-7			V ₁₂	2505	Exhibit	25-14 4	400:All	No
Level of Serv	ice Detern	nination ((if not F)		Level of	Service	Determi	nation ((if not l	=)
$D_{R} = 5.475 + 0.$	00734 v _R + (0.0078 V ₁₂	- 0.00627 L _A		D	_R = 4.252	+ 0.0086 V	₁₂ - 0.000)9 L _D	
D _p = (pc/mi/	íln)				$D_{p} = 22.$	5 (pc/mi/lr	1)		5	
LOS = (Exhibi	it 25-4)				LOS = C (Exhibit 25	, 5-4)			
Speed Detern	nination				Speed D	etermin	ation			
M _S = (Exibit 2	5-19)				D _s = 0.4	61 (Exhibi	t 25-19)			
S _R = mph (Exh	nibit 25-19)				S _R = 57.	1 mph (Exi	nibit 25-19)			
$S_0 = mph (Exh$	nibit 25-19)				$S_0 = N/A$	Amph (Exh	ibit 25-19)			
S = mph (Exh	nibit 25-14)				S = 57.	1 mph (Exl	nibit 25-15)			

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RAMPS AND RAMP JUNCTIONS WORKSHEET										
General Infor	mation			Site Infor	mation					
Analyst Agency or Company Date Performed Analysis Time Perioc Project Description	ALB RPM 5/22/2 1 AM P 09-0402 Mine I	Transportation 2009 <u>eak Hour</u> Lick Creek - TD	Freeway/Dir of Travel I-40 (Westbound) ansportation Consultants Junction Entrance Ramp from SR-5 J9 Jurisdiction Putnam Co k Hour Analysis Year 2033 Existing w/ Business < Creek - TDOT OC Planning				i SR-56 siness Park			
Inputs				3						
Upstream Adj Ramp		Terrain: Leve							Downstrea Ramp	am Adj
Yes On	1								Tes 🗐	🗖 On
🗹 No 🔽 Off	f								🗹 No	Cff Off
L _{up} = ft			- 70.0 mp	h	<u> </u>	5.0 mph			L _{down} =	ft
V _u = veh/h	l	3	$S_{FR} = 3$ L_{D}, V_{R}, V_{f}	5.0 mpn			V _D =	veh/h		
Conversion to	o pc/h Und	der Base (Condition	s	-					
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{H\}	,	f _p	v = V/PHF	x f _{HV} x f _p
Freeway	1732	0.90	Level	22	0	0.901		1.00	2	136
Ramp	270	0.90	Level	22	0	0.901		1.00		333
UpStream		ļļ			[ļ				
DownStream	<u> </u>									
Estimation of	FV	vierge Areas			Fstimat	ion of		erge Areas		
	• 12	(D)			Lotinati		• 12			
	$v_{12} = v_F$	(P _{FM})	05.0				$V_{12} = V_{F}$	2 + (V _F - V	R)PFD	`
L _{EQ} =	(Equa	ation 25-2 or	25-3)		L _{EQ} =		(E	quation 2:	5-8 OF 25-9)
$P_{FM} =$	1.000	using Equati	on (Exhibit 2	5-5)	P _{FD} =		us	ing Equat	ion (Exhibit	25-12)
$v_{12} =$	2130 p	DC/N			$v_{12} =$		pc	/N /h (Equation	DE 1E or DE	1/)
$v_3 \cup v_{av34}$	0 pc/r 0 pc/b2		25-4 01 25-5)	v_3 or v_{av34}	> 2 700	nc/h2 III y		20-10 01 20	-10)
$15V_3 \text{ or } V_{av34} > 2.70$					$13 V_3 O V_{av3}$	34 ~ 2,700 ~ 1 5 * 1			5	
$13 v_3 01 v_{av34} > 1.3$	$v_{12}/2$ in res	Equation 25	-8)		If Yes V –	34 ~ 1.5	^{12'2}	res ⊫ No /b (Equati) on 25-18)	
Capacity Che	pont		-0)			v Chor	pc •ke	/ii (Equali	01123-10)	
	Actual		anacity	1.05.F2	Capach		Actual		anacity	1.0S F2
	Actual		apacity		V_		Actual	Exhibit 25	.14	2001:
V _{FO}	2469	Exhibit 25-7		No	$V_{FO} = V_F$	- V _R		Exhibit 25	.14	
_					V _R			Exhibit 25	-3	
Flow Entering	a Merae In	fluence A	rea		Flow En	terina	Merge	Influen	ce Area	
	Actual	Max	Desirable	Violation?		Actu	ial 📔	Max Des	irable	Violation?
V _{R12}	2469	Exhibit 25-7	4600:All	No	V ₁₂		Ex	hibit 25-14		
Level of Serv	ice Detern	nination (i	f not F)		Level of	Servi	ce Dete	erminati	on (if no	t F)
D _R = 5.475 +	0.00734 v _R + 0	0.0078 V ₁₂ - 0.0	0627 L _A) _R = 4.25	52 + 0.00	086 V ₁₂ - 0	.0009 L _D	
D _R = 20.3 (pc	/mi/ln)				D _R = (p	c/mi/ln)				
LOS = C (Exhib	oit 25-4)				LOS = (E	xhibit 2	5-4)			
Speed Determ	nination				Speed D	Determ	ination	1		
M _S = 0.320 (Exil	bit 25-19)				D _s = (E	xhibit 25-	19)			
S _R = 61.0 mph ((Exhibit 25-19)				S _R = m	oh (Exhibi	t 25-19)			
$S_0 = N/A mph (l)$	Exhibit 25-19)				S ₀ = m	oh (Exhibi	t 25-19)			
S = 61.0 mph ((Exhibit 25-14)				S = m	oh (Exhibi	t 25-15)			

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TWO-WAY STOP CONTROL SUMMARY											
General Information	n		Site I	nforn	natio	n					
Analyst	ALB		Interse	ection			SR-56 & I	EB I-40 R	amps		
Agency/Co.	RPM Trai	nsportation	Jurisdi	ction			Putnam C	ю			
Data Parformad	Consultar	nts ว	Analys	sis Yea	ar		2033 Exis	sting w/ Bi	usiness		
Analysis Time Period	AM Peak	, Hour					Faik				
Project Description 09	-0402 Mine Lick	Creek - TDOT O	C Planning	1							
East/West Street: 1-40 I	EB Exit Ramp		North/S	south S	Street	: SR-56					
Intersection Orientation:	North-South		Study I	Study Period (hrs): 0.25							
Vehicle Volumes ar	nd Adiustme	nts	1		· ·						
Major Street		Northbound					Southbou	ind			
Movement	1	2	3			4	5		6		
	L	Т	R			L	Т		R		
Volume (veh/h)		447	57			430	199				
Peak-Hour Factor, PHF	0.90	0.90	0.90			0.90	0.90		0.90		
Hourly Flow Rate, HFR (veh/h)	0	496	63			477	221	221 (
Percent Heavy Vehicles	0					22					
Median Type		4.		Undi	ivided						
RT Channelized			0						0		
Lanes	0	1	0	0		0	1		0		
Configuration			TR			LT					
Upstream Signal		0					0				
Minor Street		Eastbound					Westbou	nd			
Movement	7	8	9			10	11		12		
	L	Т	R			L	Т		R		
Volume (veh/h)	131		181								
Peak-Hour Factor, PHF	0.90	0.90	0.90)		0.90	0.90		0.90		
Hourly Flow Rate, HFR	145	0	201			0	0		0		
Percent Heavy Vehicles	22	0	22			0	0		0		
Percent Grade (%)		0				-	0	Į			
Flared Approach		Y					N				
Storage		1					0				
RT Channelized			0						0		
Lanes	0	0	0			0	0		0		
Configuration		LR				0					
Delay, Queue Length, a	nd Level of Se	rvice					<u>I</u>				
Approach	Northbound	Southbound	,	Westb	ound		F	astbound	1		
Movement	1	4	7	8		9	10	11	12		
Lane Configuration		LT						LR			
v (veh/h)		477						346			
C (m) (veh/h)		919						95			
v/c		0.52					<u></u>	3.64			
95% queue length		3.07						35.07			
Control Delay (s/yob)		12.1						1222			
		лз. г Р						- 1202 F			
Approach Dalay (- ()		Ď	-					1000			
Approach Delay (s/veh)							<u> </u>	1282			
Approach LOS								F			

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TWO-WAY STOP CONTROL SUMMARY										
General Information	า		Site I	nform	atio	on				
Analyst	ALB		Interse	ection			SR-56 &	WB I-	40 Ra	mps
Agency/Co.	RPM Trai	nsportation	Jurisdi	ction			Putnam Co			
	Consultar	nts	Analys	Analysis Year			2033 Existing w/ Business			
Date Performed	5/22/2009	Hour					Park			
	Alvi Peak	HOUR								
Project Description 09	-0402 Mine Lick	Creek - IDOI O	North/South Street: SP 56							
East/west Street: 1-40	North-South	Ramp	Study I	Doriod ((bre)	1: SR-30 · 0.25				
	North-South			- enou ((1115)	. 0.23				
Venicle Volumes an	na Aajustme	Northbound		0						
Movement	1		3			1		ina		6
INDVEITIETIL		Z				4	<u> </u>			R
Volume (veh/h)	65	513					606			205
Peak-Hour Factor, PHF	0.90	0.90	0.90	,		0.90	0.90		().90
Hourly Flow Rate, HFR		570	0			0	670			007
(veh/h)	12	570	0			0	073			227
Percent Heavy Vehicles	22					0				
Median Type		Undivided								
RT Channelized			0							0
Lanes	0	1	0	0		0	1		0	
Configuration	LT									TR
Upstream Signal		0					0			
Minor Street		Eastbound					Westbou	nd		
Movement	7	8	9			10	11			12
	L	T	R			L	T		R	
Volume (veh/h)						23				276
Peak-Hour Factor, PHF	0.90	0.90	0.90			0.90	0.90		(0.90
Hourly Flow Rate, HFR	0	0	0			25	0			306
(Venini) Percent Heavy Vehicles	0	0	0			22	0			22
Percent Grade (%)		0	0				0			
Flared Approach										
							1			
Storage		0					1			0
			0							0
Lanes	0	0	0			0	0			0
Configuration							LR			
Delay, Queue Length, a	ind Level of Se	rvice	[-			
Approach	Northbound	Southbound		Westbo	ound	1	E	Eastb	ound	1
Movement	1	4	7	8		9	10	1	1	12
Lane Configuration	LT			LR						
v (veh/h)	72			331						
C (m) (veh/h)	678			431						
v/c	0.11		0.77							
95% queue lenath	0.35		6.52		<u> </u>					
Control Delay (s/veh)	10.9			36 1	1					
	B		ļ	50.1 F			<u> </u>			ļ
Approach Dolay (s/yah)	<u> </u>			 ⊃6 1	1			<u> </u>		<u> </u>
Approach LOO				50.1	1					
Approach LOS				E						

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	TWO-WAY TWO-LANE H	IIGHWAY SEGMEN	NT WORKSHEET	
General Information		Site Information		
Analyst Agency or Company Date Performed Analysis Time Period	ALB RPM Transportation Consultants 5/22/2009 AM Peak Hour	Highway From/To Jurisdiction Analysis Year	SR-56 north of WB I-40 Ran Putnam Co 2033 Existing w/ Busı	nps iness Park
Project Description: 09-0402 M	line Lick Creek - TDOT OC Planning			
Input Data				
	Shoulder width Lane width Lane width Shoulder width nt length, L _t mi	The show North Arrow	Class I highway ✓ Class II h Terrain ✓ Level ✓ Rolli Two-way hourly volume 1600 v Directional split 511 49 Peak-hour factor, PHF 0.90 No-passing zone 45 % Trucks and Buses , P _T 3 % % Recreational vehicles, P _R 4% Access points/ mi 4	ighway ng eh/h
Average Travel Speed				
Grade adjustment factor, f _G (Ex	hibit 20-7)		1.00	
Passenger-car equivalents for tr	rucks, E _T (Exhibit 20-9)		1.1	
Passenger-car equivalents for R	RVs, E _R (Exhibit 20-9)		1.0	
Heavy-vehicle adjustment factor	r, f _{HV} =1/ (1+ P _T (E _T -1)+P _R (E _R -1))		0.997	
Two-way flow rate ¹ , v _p (pc/h)=V	/ (PHF * f _G * f _{HV})		1783	
v _p * highest directional split prop	portion ² (pc/h)		909	
Free-Flow S	peed from Field Measurement		Estimated Free-Flow Speed	
Field Measured speed, S _{FM} Observed volume, V _f Free-flow speed, FFS FFS=S ₋₁ ,	mi/h veh/h veh/h mi/h	Base free-flow speed, Adj. for lane width and Adj. for access points,	, BFFS _{FM} d shoulder width ³ , f _{LS} (Exhibit 20-5) , f _A (Exhibit 20-6)	55.0 mi/h 2.6 mi/h 1.0 mi/h
	VI 1 IIV /	Free-flow speed, FFS	(FSS=BFFS-f _{LS} -f _A)	51.4 mi/h
Adj. for no-passing zones, f _{np} (/	<i>mi/h</i>) (Exhibit 20-11)		0.8	
Average travel speed, ATS (mi/	/h) ATS=FFS-0.00776v _p -f _{np}		36.8	
Grade Adjustment factor f. (Ex	bibit 20-8)		1 00	
Passenger-car equivalents for tr	ucks E (Exhibit 20-10)		10	
Passenger-car equivalents for R	$PV_{s} = (Exhibit 20-10)$		1.0	
Heavy-vehicle adjustment factor	f = -1/(1 + P (E - 1) + P (E - 1))		1,000	
Two-way flow rate ¹ y (pc/b)-V	//(PHF * f * f)		1778	
v * highest directional split prop	' \' ''' 'G 'HV'		0/7	
Page parcent time apart followi	a BDTSE(%()_100(1 c ^{-0.000879v} _)		79.0	
Adi, for directional distribution ar	nd no-passing zone, f (%)(Exh. 20-12)		4.1	
Percent time-spent-following PT	TSF(%)=BPTSF+f		83.2	
Level of Service and Other Pe	rformance Measures			
Level of service, LOS (Exhibit 20	0-3 for Class I or 20-4 for Class II)		D	
Volume to capacity ratio, v/c=Vp	/ 3,200		0.56	
Peak 15-min veh-miles of travel,	, VMT ₁₅ (veh- <i>mi</i>)= 0.25L _t (V/PHF)		444	
Peak-hour vehicle-miles of trave	el, VMT ₆₀ (veh- <i>mi</i>)=V*L _t		1600	
Peak 15-min total travel time, T	Γ ₁₅ (veh-h)= VMT ₁₅ /ATS		12.1	
Notes 1. If Vp >= 3,200 pc/h, terminate 2. If highest directional split Vp>	e analysis-the LOS is F. = 1,700 pc/h, terminated anlysis-the LOS i	is F.		

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•	TWO-WAY TWO-LANE H	HIGHWAY SEGME	NT WORKSHEET						
General Information		Site Information							
Analyst Agency or Company Date Performed Analysis Time Period	ALB RPM Transportation Consultant 5/22/2009 AM Peak Hour	Highway s From/To Jurisdiction Analysis Year	SR-56 Between I-40 Ramp Putnam Co 2033 Existing w/ BL	os Isiness Park					
Project Description: 09-0402 Min	ne Lick Creek - TDOT OC Planning								
Input Data			Class I highway	highway					
Segment	Shoulder width Lane width Lane width Shoulder width length, L	The show North Arrow	TerrainImage: LevelRoTwo-way hourly volume1207Directional split52 / 4Peak-hour factor, PHF0.90No-passing zone1000% Trucks and Buses , PT3 %% Recreational vehicles, PR4%Access points/ mi0	lling Veh/h 8					
Average Travel Speed									
Grade adjustment factor, f _G (Exhi	bit 20-7)		1.00						
Passenger-car equivalents for tru	cks, E _T (Exhibit 20-9)		1.1						
Passenger-car equivalents for RV	/s, E _R (Exhibit 20-9)		1.0						
Heavy-vehicle adjustment factor,	f _{HV} =1/ (1+ P _T (E _T -1)+P _R (E _R -1))		0.997						
Two-way flow rate ¹ , v _p (pc/h)=V/	(PHF * f _G * f _{HV})		1345						
v _p * highest directional split propo	rtion ² (pc/h)		699						
Free-Flow Sp	eed from Field Measurement		Estimated Free-Flow Speed						
Field Measured speed, S _{FM} Observed volume, V _f	mi/h veh/h	Base free-flow speed Adj. for lane width ar Adj. for access point	d, BFFS _{FM} nd shoulder width ³ , f _{LS} (Exhibit 20-5) s. f. (Exhibit 20-6)	45.0 mi/h 0.4 mi/h 0.0 mi/h					
Free-flow speed, FFS FFS=S _{FM} -	+0.00776(V _f / f _{HV}) mi/h	Free-flow speed, FF	S (FSS=BFFS-f _{LS} -f _A)	44.6 mi/h					
Adj. for no-passing zones, f _{np} (m	<i>i/h</i>) (Exhibit 20-11)		1.8						
Average travel speed, ATS (mi/h) ATS=FFS-0.00776v _p -f _{np}		32.4						
Grade Adjustment factor f. (Exh	ihit 20-8)		1.00						
Passenger-car equivalents for tru	cks. E ₊ (Exhibit 20-10)		1.0						
Passenger-car equivalents for RV	/s, E _P (Exhibit 20-10)		1.0						
Heavy-vehicle adjustment factor,	f _{HV} =1/ (1+ P _T (E _T -1)+P _R (E _R -1))		1.000						
Two-way flow rate ¹ , v _p (pc/h)=V/	(PHF * f _G * f _{HV})		1341						
v _p * highest directional split propo	ortion ² (pc/h)		697						
Base percent time-spent-following	g, BPTSF(%)=100(1-e ^{-0.000879v} p)		69.2						
Adj. for directional distribution and	d no-passing zone, f _{d/hp} (%)(Exh. 20-12)		8.7						
Percent time-spent-following, PTS	SF(%)=BPTSF+f _{d/np}		77.9						
Level of Service and Other Peri	formance Measures		D						
Volume to capacity ratio. v/c=V /	3,200		0.42						
Peak 15-min veh-miles of travel.	VMT ₁₅ (veh- <i>mi</i>)= 0.25L(V/PHF)		34						
Peak-hour vehicle-miles of travel,	VMT ₆₀ (veh- <i>mi</i>)=V*L.		121						
Peak 15-min total travel time, TT ₁	₁₅ (veh-h)= VMT ₁₅ /ATS		1.1						
Notes 1. If Vp >= 3,200 pc/h, terminate a 2. If highest directional split Vp>=	analysis-the LOS is F. 1,700 pc/h, terminated anlysis-the LOS	is F.							

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•	TWO-WAY TWO-LANE	HIGHW	AY SEGME	NT WORKSHEET					
General Information		S	Site Information						
Analyst Agency or Company Date Performed Analysis Time Period	ALB RPM Transportation Consulta 5/22/2009 AM Peak Hour	nnts F J A	lighway From/To urisdiction analysis Year	SR-56 South of I-40 EB Ra Putnam Co 2033 Existing w/ Bu	imps siness Park				
Project Description: 09-0402 Mi	ne Lick Creek - TDOT OC Planning								
	Shoulder width Lane width Lane width Shoulder width	t t t	Show North Arrow	Class I highway ☐ Class II Terrain ☐ Level ☐ Ro Two-way hourly volume 884 v Directional split 57/4 Peak-hour factor, PHF 0.90 No-passing zone 100 % Trucks and Buses , P _T 3%	highway Iling reh/h 13				
Segment	nengui, y nn			% Recreational vehicles, P _R 4% Access points/ <i>mi</i> 8					
Average Travel Speed		1							
Grade adjustment factor, f _G (Exhi	ibit 20-7)			1.00					
Passenger-car equivalents for tru	icks, E _T (Exhibit 20-9)			1.2					
Passenger-car equivalents for R	/s, E _R (Exhibit 20-9)			1.0					
Heavy-vehicle adjustment factor,	f _{HV} =1/ (1+ P _T (E _T -1)+P _R (E _R -1))			0.994					
Two-way flow rate ¹ , v _p (pc/h)=V/	(PHF * f _G * f _{HV})			988					
v _n * highest directional split propo	ortion ² (pc/h)		563						
Free-Flow Sp	eed from Field Measurement			Estimated Free-Flow Speed					
Field Measured speed, S _{FM} Observed volume, V _f Free-flow speed, FFS_FS=S _{FN} -	mi veh +0.00776(V/ f) mi	i/h A h/h A i/h	Base free-flow speed, BFFS FM45.0 mi/h Adj. for lane width and shoulder width3, f_{LS} (Exhibit 20-5)1.7 mi/h Adj. for access points, f_A (Exhibit 20-6)2.0 mi/h						
	T T T T T T T T T T T T T T T T T T T	F	ree-flow speed, FFS	S (FSS=BFFS-f _{LS} -f _A)	41.3 mi/h				
Adj. for no-passing zones, f _{np} (m	<i>ni/h</i>) (Exhibit 20-11)			2.6					
Average travel speed, ATS (mi/h) ATS=FFS-0.00776v _p -f _{np}			31.0					
Grade Adjustment factor f (Exh	ibit 20-8)	1		1.00					
Passanger car equivalents for tru	(E_{1}, E_{2}, E_{2})			1.1					
Passenger-car equivalents for RV	(s. E. (Exhibit 20-10)			10					
Heavy-vehicle adjustment factor	f = -1/(1 + P (E - 1) + P (E - 1))			0.997					
Two-way flow rate ¹ y (pc/b)-1//	'HV-'' ('+ ' T(LT'))* R(LR'))			0,997					
v * highoat direction	VIII G HV			90J E61					
	~ PDTOE(0() 400(40.000879V)			57.0					
Adi for directional distribution and	g, BPTSF(%)=100(1-e $(\%)(5)(7)$)	2)		12.6					
Porcent time operat following DT	CE(0()_DDTCE.f	<u> </u>		70.6					
Level of Service and Other Per	formance Measures			70.0					
Level of service, LOS (Exhibit 20-	-3 for Class I or 20-4 for Class II)			D					
Volume to capacity ratio, v/c=V _p /	3,200			0.31					
Peak 15-min veh-miles of travel,	VMT ₁₅ (veh- <i>mi</i>)= 0.25L _t (V/PHF)			147					
Peak-hour vehicle-miles of travel,	, VMT ₆₀ (veh- <i>mi</i>)=V*L _t			530					
Peak 15-min total travel time, TT	₁₅ (veh-h)= VMT ₁₅ /ATS			4.7					
Notes 1. If Vp >= 3,200 pc/h, terminate 2. If highest directional split Vp>=	analysis-the LOS is F. 1,700 pc/h, terminated anlysis-the LO)S is F.							

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RAMPS AND RAMP JUNCTIONS WORKSHEET										
General Infor	rmation			Site Infor	ormation					
Analyst Agency or Company Date Performed Analysis Time Period	ALB RPM 5/22/2 d PM P	Transportatior 2009 'eak Hour	n Consultants	Freeway/Dir of Tr Junction Jurisdiction Analysis Year	avel I- E P 2	40 (Ea xit Ra Putnam 033 E	astbound) mp to SR-56 n Co xisting w/ Bu	siness Park		
Project Description	09-0402 Mine I	Lick Creek - TE	OT OC Planni	ng						
Inputs		Torrain: Lovo	.1					[-		•
Upstream Adj Ramp			-1					F	Downstrea Ramp	m Adj
	f								Yes	On
L _m = ft								L	M NO	ft
-up It		S	_{FF} = 70.0 mp	h	S _{FR} = 35	5.0 mp	h		uowii	
V _u = veh/h	1		Sketo	ch (show lanes, L _A ,	L_{D}, V_{R}, V_{f}	-			/ _D =	veh/h
Conversion t	o pc/h Und	der Base	Condition	S						
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f _{HV}	f _p	/ = V/PHF	x f _{HV} x f _p
Freeway	2521	0.90	Level	22	0	0.	901	1.00	31	09
Ramp	373	0.90	Level	22	0	0.	901	1.00	46	0
UpStream						ļ				
DownStream	<u> </u>	Morgo Aroas						Jorgo Aroas		
Estimation of	f V ₄₀	Morge Areas			Estimati	on o	of V ₄₀	renge Areas		
	12 V - V	(D)					<u>··12</u>			
	v ₁₂ - v _F	(^r FM)	· 0E 2)				v ₁₂ = v) ^F FD	
$L_{EQ} =$	(Equa		20-3)		L _{EQ} =		(E	quation 25-8	OF 25-9)	1)
F _{FM} =	using	Equation (i	EXHIDIL 20-0)		F _{FD} =		1.00	JU USING EQU	Jation (Exh	IDIL 25-12)
$v_{12} - v_{12}$	pc/n	(Faultion Of			$v_{12} = 1000$		310	9 pc/n		
$v_3 \cup v_{av34}$	pc/n (0 nc/b2 □ v		5-4 01 25-5)		$v_3 \cup v_{av34}$	<u>\</u> 27	µ∪ ■ 2d/pc/b2	xaa ⊡ Na	11 25-15 01	25-16)
$15V_3 OV_{av34} > 2,70$					$ SV_{a} = 15^{*} V_{a}/2$					
$15 V_3 OI V_{av34} > 1.5$	v ₁₂ /2 res	S III INO	- 0)		Is v_3 of $v_{av34} > 1.5$ $v_{12}/2$ F Yes M No					
$\frac{1}{12a}$			5-0)		$\Gamma_{12a} =$	Ch.	pc.		20-10)	
Capacity Che			anacity		Capacity		Actual	Car	acity	1.0S E2
	Actual		арасну		V_		2100	Evhihit 25-1/	1 1800	LUST:
V		Evhibit 25.7			V = V	. V	2440	Evhibit 25 14	4000	No
* FO		EXHIBIT 23-7			VFO VF	* R	2049		4000	No
							460	EXTIDIT 25-3	2000	INO
Flow Entering	g Merge In	fluence A	Irea Decirable	Violation?	Flow Ent	terin	g Merge	Max Decirabl	Area	Violation?
V _{R12}	Actual	Exhibit 25-7	Desilanie		V ₁₂	3	s109	Exhibit 25-14	4400:All	No
Level of Serv	ice Detern	nination (if not F)		Level of	Serv	ice Det	erminatior	ı (if not	F)
$D_{p} = 5.475 + 0.$	00734 v _P + 0	0.0078 V ₁₂ -	0.00627 L		D	_D = 4	.252 + 0.0	086 V ₁₂ - 0.0	009 Lp	/
$D_{\rm p} = (\rm pc/mi/ln)$					$D_{p} = 28$	ς 0 (ρς	/mi/ln)	12	D	
LOS = (Exhibit 25-4)					LOS = D (Exhi	oit 25-4)			
Speed Determination					Speed D	eter	minatior	า		
$M_{\rm S}$ = (Exibit 2	5-19)				D _s = 0.469 (Exhibit 25-19)					
$ S_{p} = mph (Exh$	nibit 25-19)				S _R = 56.9 mph (Exhibit 25-19)					
$S_0 = mph (Exh$, nibit 25-19)				S ₀ = N/A	A mph	(Exhibit 2	5-19)		
S = mph (Exh	nibit 25-14)				S = 56.	9 mph	(Exhibit 2	5-15)		

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RAMPS AND RAMP JUNCTIONS WORKSHEET										
General Infor	mation			Site Infor	mation					
Analyst Agency or Company Date Performed Analysis Time Period Project Description	ALB RPM 5/22/2 M PM P 09-0402 Mine I	Transportation 2009 Jeak Hour	n Consultants	Freeway/Dir of Tra Junction Jurisdiction Analysis Year	avel I	-40 (East Entrance Putnam C 2033 Exis	bound) Ramp from o ting w/ Bus	n SR-56 siness Park		
Inputs	0,01021111101			.9						
Upstream Adj Ramp		Terrain: Leve	<u>ġ</u> l						Downstre Ramp	am Adj
Yes Or	1								Ves	Cn On
🗹 No 🕅 Of	f								🗹 No	Cff Off
L _{up} = ft			$L_{down} = ft$						ft	
V _u = veh/h			Sketc	h (show lanes, L _A ,	$U_{FR} = 3$ $L_{D'}V_{R'}V_{f}$	5.0 mpn			V _D =	veh/h
Conversion t	o pc/h Und	der Base	Condition	s						
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _H	/	f _p	v = V/PHI	= x f _{HV} x f _p
Freeway	2148	0.90	Level	22	0 0.901 1.00			2649		
Ramp	237	0.90	Level	22	0	0.901		1.00		292
UpStream										
DownStream								A		
Estimation of		Estimati	ion of		erge Areas					
	• 12	(2)			LSumau		• 12			
	$V_{12} = V_{F}$	(P _{FM})	a- a)				$V_{12} = V_{F}$	_R + (V _F - V	R)P _{FD}	
L _{EQ} =	(Equa	ation 25-2 o	r 25-3)		L _{EQ} =		(E	quation 25	5-8 or 25-9)));
P _{FM} =	1.000	using Equa	tion (Exhibit 25	o-5)	P _{FD} =		us	ing Equati	on (Exhibit	25-12)
$v_{12} =$	2649 p	oc/h			$V_{12} =$		рс	/n //	05.45 05	
V_3 OF V_{av34}	0 pc/r	n (Equation	25-4 or 25-5)		V_3 OF V_{av34}	. 2 700	pc	/n (Equation	25-15 OF 25	-16)
$15 V_3 OI V_{av34} > 2,70$		s 🗹 No			Is V or V \rightarrow 15 * V /2 V Yes No					
$15 V_3 OI V_{av34} > 1.5$	v ₁₂ /2 ■ Yes	s 🔟 No	- 0)		IS V ₃ OF V _{av3}	4 > 1.5	v ₁₂ /2	Yes 🔲 No		
$ Yes, V_{12a} =$	pc/h (Equation 2	5-8)		If Yes, $V_{12a} =$		рс	/h (Equati	on 25-18)	
Capacity Che	CKS	1			Capacity	y Chec	CKS			100 50
	Actual			LUS F?	V		Actual			LUS F?
N/	20.41			No	V V				14	
^V FO	2941	EXHIDIL 20-7		NO	$v_{FO} = v_F$	- v _R		Exhibit 25	-3	
Elow Entoring	n Morgo In	fluonco	Iroa			toring	Morgo			
	Actual	Max	Desirable	Violation?		Actu	ivierge	Max Des	irable	Violation?
V _{R12}	2941	Exhibit 25-7	4600:All	No	V ₁₂		Ex	hibit 25-14		
Level of Serv	ice Detern	nination (if not F)	1	Level of	Servi	ce Dete	erminati	on (if no	ot F)
D _R = 5.475 +	0.00734 v _R + 0).0078 V ₁₂ - 0.	00627 L _A		C	_R = 4.2	52 + 0.00)86 V ₁₂ - 0	.0009 L _D	
$D_{\rm R} = 24.0 (\rm pc/mi/ln)$					D _R = (p	c/mi/ln)				
LOS = C (Exhibit 25-4)					LOS = (E	xhibit 2	5-4)			
Speed Determination					Speed D)eterm	ination	1		
M _S = 0.347 (Exi	bit 25-19)				D _s = (E	xhibit 25-	19)			
S _R = 60.3 mph	(Exhibit 25-19)				S _R = mph (Exhibit 25-19)					
$S_0 = N/A mph ($	Exhibit 25-19)				S ₀ = m	oh (Exhibi	t 25-19)			
S = 60.3 mph	(Exhibit 25-14)				S = m	oh (Exhibi	t 25-15)			

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RAMPS AND RAMP JUNCTIONS WORKSHEET										
General Infor	mation			Site Infor	ormation					
Analyst Agency or Company Date Performed Analysis Time Perioo	ALB RPM 5/22/2 d PM P	Transportatior 2009 Peak Hour	n Consultants	Freeway/Dir of Tr Junction Jurisdiction Analysis Year	avel I I	-40 (W Exit Ra Putnam 2033 E	'estbound) mp to SR-5 າ Co xisting w/ B	56 Business Park		
Project Description	09-0402 Mine I	Lick Creek - TI	DOT OC Plann	ing		_				
Inputs		Tamata, Laur	-1							
Upstream Adj Ramp		Tenain: Leve	1						Downstrea Ramp	ım Adj
) f								Yes	Con On
	I								MNO	ft Off
		5	$S_{EE} = 70.0 \text{ mp}$	h	S _{EP} = 3	5.0 mp	h		down	
V _u = veh/h	l		Sketo	ch (show lanes, L _A ,	L_{D}, V_{R}, V_{f}				V _D =	veh/h
Conversion to	o pc/h Und	der Base	Condition	s	1	1	1			
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f _{HV}	f _p	v = V/PHF	x f _{HV} x f _p
Freeway	2558	0.90	Level	22	0	0.	901	1.00	31	55
Ramp	391	0.90	Level	22	0	0.	901	1.00	48	32
UpStream										
DownStream	<u> </u>	Merge Areas					I C)iverge Areas		
Estimation of V ₁₂					Estimati	ion o	of V ₁₂	5		
	$V_{12} = V_{\Gamma}$	(P _{FM})					V40 =	V _D + (V _E - V _E		
L _{FO} =	(Equa	ation 25-2 o	r 25-3)		L _{FO} =		12	Equation 25-8	3 or 25-9)	
P _{EM} =	using	Equation (, Exhibit 25-5)		$P_{ED} =$		1.0	000 usina Ea	uation (Exh	ibit 25-12)
V ₁₂ =	pc/h				$V_{12} =$		31	55 pc/h		,
V_3 or V_{av34}	pc/h ((Equation 2	5-4 or 25-5)		V_3 or V_{av34}		0	pc/h (Equation	on 25-15 or	25-16)
Is V_3 or $V_{av34} > 2,70$	10 pc/h? 🥅 Yes	s 🔲 No			Is V ₃ or V _{av3}	₄ > 2,7	00 pc/h? 盾	Yes 🗹 No		,
Is V_3 or $V_{av34} > 1.5$	* V ₁₂ /2 🔲 Yes	s 🔲 No			Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 \square Yes \square No					
If Yes,V _{12a} =	pc/h ((Equation 2	5-8)		If Yes,V _{12a} = pc/h (Equation 25-18)					
Capacity Che	ecks				Capacity	/ Ch	ecks			
	Actual		Capacity	LOS F?			Actual	Са	pacity	LOS F?
					V _F		3155	Exhibit 25-1	4 4800	No
V _{FO}		Exhibit 25-7			$V_{FO} = V_{F}$	- V _R	2673	Exhibit 25-1	4 4800	No
					V _R		482	Exhibit 25-3	3 2000	No
Flow Enterine	g Merge In	fluence A	Area		Flow En	terin	ng Merg	e Influence	e Area]]
	Actual	Max	Desirable	Violation?			Actual	Max Desirat	ole	Violation?
V _{R12}		Exhibit 25-7			V ₁₂	3	3155	Exhibit 25-14	4400:All	No
Level of Serv	ice Detern	nination (if not F)		Level of	Ser	vice De	terminatio	n (if not	F)
$D_{R} = 5.475 + 0.$	00734 v _R + 0	0.0078 V ₁₂ ·	- 0.00627 L _A			_R = 4	.252 + 0.	0086 V ₁₂ - 0.0	0009 L _D	
D _R = (pc/mi/ln)					D _R = 28	.1 (pc	/mi/ln)			
LOS = (Exhibit 25-4)					LOS = D	(Exhil	oit 25-4)			
Speed Determination					Speed D)eter	minatic	on		
M _S = (Exibit 2	5-19)				D _s = 0.471 (Exhibit 25-19)					
S _R = mph (Exh	ibit 25-19)				S _R = 56.8 mph (Exhibit 25-19)					
S ₀ = mph (Exh	ibit 25-19)				$ S_0 = N/A$	A mph	(Exhibit 2	25-19)		
S = mph (Exh	nibit 25-14)				S = 56	.8 mph	(Exhibit	25-15)		

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RAMPS AND RAMP JUNCTIONS WORKSHEET										
General Infor	mation			Site Infor	mation					
Analyst Agency or Company Date Performed Analysis Time Perioc Project Description	ALB RPM 5/22/2 I PM P 09-0402 Mine I	Transportatior 2009 eak Hour .ick Creek - TI	n Consultants	Freeway/Dir of Tra Junction Jurisdiction Analysis Year	avel	I-40 (Wes Entrance Putnam (2033 Exis	stbound) Ramp fror Co sting w/ Bu	n SR-56 Isiness Park		
Inputs										
Upstream Adj Ramp		Terrain: Leve	5						Downstre Ramp	am Adj
Yes Or	1								Ves	Con 🗐
No Of	f								🗹 No	Cff Off
L _{up} = ft			L _{down} = ft						ft	
V _u = veh/h			$S_{FF} = 70.0 \text{ mph}$ Sketch (show lanes, $L_{A'} L_{D'} V_{R'} V_{I}$) $V_{D} =$					V _D =	veh/h	
Conversion t	o pc/h Und	der Base	Condition	s						
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _H	v	f _p	v = V/PHI	= x f _{HV} x f _p
Freeway	2167	0.90	Level	22	0	0.90	1	1.00		2673
Ramp	308	0.90	Level	22	0	0.90	1	1.00		380
UpStream										
DownStream	I	J Merge Areas				<u> </u>	 	verge Areas		
Estimation of	^f V ₁₂	<u></u>			Estimat	ion of	V ₁₂	<u> </u>		
	$V_{10} = V_{r}$	(P _{EM})					$V_{40} = V$		DP-D	
L _{ro} =	(Equa	tion 25-2 o	r 25-3)		L _{FO} =		(E	Equation 25	5-8 or 25-9	3)
P _{EM} =	1.000	using Equat	ion (Exhibit 25	5-5)	P _{ED} =		ù	sing Equat	i on (Exhibit	, 25-12)
V ₁₂ =	2673 p	oc/h	·		V ₁₂ =		р	c/h		·
V ₃ or V _{av34}	0 pc/h	n (Equation	25-4 or 25-5)	1	V ₃ or V _{av34}		р	c/h (Equation	25-15 or 25	5-16)
Is V_3 or $V_{av34} > 2,70$	0 pc/h? 🥅 Yes	s 🗹 No			Is V ₃ or V _{av34} > 2,700 pc/h? Yes No					
Is V_3 or $V_{av34} > 1.5$	* V ₁₂ /2 🔲 Yes	s 🗹 No			Is V_3 or $V_{av34} > 1.5 * V_{12}/2$ [F Yes] No					
If Yes,V _{12a} =	pc/h (Equation 2	5-8)		If Yes, V _{12a} =		ро	c/h (Equati	on 25-18)	
Capacity Che	cks	-			Capacity	y Che	cks			
	Actual		Capacity	LOS F?	ļ		Actual	C	apacity	LOS F?
					V _F			Exhibit 25	.14	
V _{FO}	3053	Exhibit 25-7		No	$V_{FO} = V_{F}$	- V _R		Exhibit 25	.14	
					V _R			Exhibit 25	5-3	
Flow Entering	g Merge In	fluence A	Irea		Flow En	tering	Merge	e Influen	ce Area	1
	Actual	Max		Violation?		Act	ual	Max Des	irable	Violation?
	3053		4600:All	NO		Cond		xnidil 25-14	on lif no	
Level of Serv			IT NOT F)		Level of	3 ervi				DT F)
$U_{\rm R} = 5.4/5 + 0.00/34 V_{\rm R} + 0.00/8 V_{12} - 0.0062/L_{\rm A}$						$r_{\rm R} = 4.2$	52 + 0.0	000 v ₁₂ - 0	.0009 L _D	
$D_{R} = 24.9 \text{ (pc/m/n)}$ $LOS = C \text{ (Exhibit 25-4)}$					^D _R = (pc/mi/ln) OS = (Exhibit 25-4)					
Speed Determination					Speed D	Determ	inatio	า		
M _s = 0.356 (Exi	bit 25-19)				$D_s = (Exhibit 25-19)$					
$S_{p} = 60.0 \text{ mph}$	(Exhibit 25-19)				S _R = mph (Exhibit 25-19)					
$S_0 = N/A mph ($	Exhibit 25-19)				S ₀ = m	oh (Exhib	it 25-19)			
S = 60.0 mph	(Exhibit 25-14)				S = m	oh (Exhib	it 25-15)			

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	TW	O-WAY STOP	CONTR	OL SI	UMN	MARY				
General Information	า		Site I	nform	natio	on				
Analyst	ALB		Interse	ection			SR-56 & I	EB I-40 Ra	amps	
Agency/Co	RPM Trai	nsportation	Jurisd	ction			Putnam Co			
	Consultar	nts	Analys	sis Yea	r		2033 Existing w/ Business			
Date Performed	5/22/2009 DM Dook	Hour					Park			
		nour								
Project Description U9	-0402 Mine Lick	Creek - TDOT O	V Manning North/South Street: SR-56							
Intersection Orientation:	North-South		Study	Doriod	(hrs)	· 025				
		nt o	Joluuy	criou	(1113)	. 0.20				
Venicle Volumes an	<u>ia Aajustme</u>	Northbound					Southbou	nd		
Movement	1					1			6	
		<u>Z</u> T	R				<u> </u>		R	
Volume (veh/h)		309	30			207	197			
Peak-Hour Factor, PHF	0.90	0.90	0.90)		0.90	0.90		0.90	
Hourly Flow Rate, HFR	0	343	33			230	218		0	
(veh/h)	0					200	210		0	
Percent Heavy Vehicles	0				<u> </u>	22				
Median Type		1	Undivided							
RT Channelized			0						0	
Lanes	0	1	0			0	1		0	
Configuration						LT				
Upstream Signal		0					0			
Minor Street		Eastbound					Westbou	nd		
Movement	7	8	9			10	11		12	
		I	R R			L	I		R	
Volume (veh/h)	298	0.00	84			0.00	0.00		0.00	
Hourly Flow Pate HEP	0.90	0.90	0.90	<u>'</u>		0.90	0.90		0.90	
(veh/h)	331	0	93			0	0		0	
Percent Heavy Vehicles	22	0	22			0	0		0	
Percent Grade (%)		0					0			
Flared Approach		Y					N			
Storage		1					0			
RT Channelized			0						0	
Lanes	0	0	0			0	0		0	
Configuration		LR				•				
Delay, Queue Length, a	nd Level of Se	rvice	<u>I</u>				J	_		
Approach	Northbound	Southbound		Westb	ound		l F	astbound		
Movement	1	4	7	8		9	10	11	12	
Lane Configuration	•	17					10			
		220								
$\frac{v(v \in I/II)}{C(m)(v \in h/h)}$		230						424		
		1001								
		0.21						1.91		
95% queue length		0.80						30.47		
Control Delay (s/veh)		9.2		ļ				462.3		
LOS		A						F		
Approach Delay (s/veh)								462.3		
Approach LOS								F		

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	TW	O-WAY STOP	CONTR	OL SL	JMN	/ IARY				
General Information	า		Site I	nform	atic	on				
Analyst	ALB RPM Trai	nsportation	Interse Jurisdi	ection ction			SR-56 & Putnam (WB I-4 Co	10 Ra	amps
	Consultar	nts	Analys	sis Year	r		2033 Exi	sting w	/ Bus	siness
Date Performed	5/22/2009)					Park			
Analysis Time Period	PIM Peak	Hour								
Project Description 09	-0402 Mine Lick	Creek - IDOI O	OC Planning) Couth C	troot					
East/west Street: 1-40	North South	Ramp	Study I	South S	(bre)	1: SR-30				
				enou	(115)	. 0.25				
Venicie volumes ar	na Aajustme	No which a sun d					Couthhas			
Major Street	1		2			1		ina I		6
		<u>Z</u>				4	<u> </u>			R R
Volume (veh/h)	163	444					358			145
Peak-Hour Factor, PHF	0.90	0.90	0.90)		0.90	0.90		(0.90
Hourly Flow Rate, HFR (veh/h)	181	493	0			0	397			161
Percent Heavy Vehicles	22					0				
Median Type				Undiv	videa	1				
RT Channelized			0							0
Lanes	0	1	0			0	1			0
Configuration							<u></u>			TR
Upstream Signal		0					0			
Minor Street		Eastbound					Westbou	nd		
Movement	7	8	9			10	11			12
	L	Т	R	R			Т			R
Volume (veh/h)						46				345
Peak-Hour Factor, PHF	0.90	0.90	0.90)		0.90	0.90		(0.90
(veh/h)	0	0	0			51	0			383
Percent Heavy Vehicles	0	0	0	- i		22	0			22
Percent Grade (%)		0					0	I		
Flared Approach		N		i			Y			
Storage		0					1			
RT Channelized			0	†						0
Lanes	0	0	0			0	0			0
Configuration						-	LR			
Delay, Queue Length, a	nd Level of Se	rvice	J	J_			I			
Approach	Northbound	Southbound	-	Westbo	ound		1	Eastbo	und	
Movement	1	4	7	8		9	10	11	1	12
Lane Configuration	LT			LR						
v (veh/h)	181			434	!					
C (m) (veh/h)	920			442	,					
v/c	020		442			<u> </u>				
95% queue length	0.73	<u> </u>	0.98							
Control Dolou (chich)	0.73	12.27							 	
	/veh) 9.9			09.2 E						
DS A										<u> </u>
Approach Delay (s/veh)		69.2								
Approach LOS				F						

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	TWO-WAY TWO-LANE H	IIGHWAY SEGMEN	NT WORKSHEET	
General Information		Site Information		
Analyst Agency or Company Date Performed Analysis Time Period	ALB RPM Transportation Consultants 5/22/2009 PM Peak Hour	Highway From/To Jurisdiction Analysis Year	SR-56 north of WB I-40 Ra Putnam Co 2033 Existing w/ Bu	imps isiness Park
Project Description: 09-0402 M	line Lick Creek - TDOT OC Planning			
Input Data				
Segmer	Shoulder width Lane width Lane width Shoulder width nt length, L _t mi	The state of the s	Class I highway Class II Terrain K Level Ro Two-way hourly volume 1292 Directional split 61 / 3 Peak-hour factor, PHF 0.90 No-passing zone 45 % Trucks and Buses , P _T 3% % Recreational vehicles, P _R 4% Access points/ mi 4	highway lling veh/h 39
Average Travel Speed				
Grade adjustment factor, f _G (Exi	hibit 20-7)		1.00	
Passenger-car equivalents for tr	ucks, E _T (Exhibit 20-9)		1.1	
Passenger-car equivalents for R	Vs, E _R (Exhibit 20-9)		1.0	
Heavy-vehicle adjustment factor	; f _{HV} =1/ (1+ P _T (E _T -1)+P _R (E _R -1))		0.997	
Two-way flow rate ¹ , v _p (pc/h)=V	/ (PHF * f _G * f _{HV})		1440	
v _p * highest directional split prop	portion ² (pc/h)		878	
Free-Flow S	peed from Field Measurement		Estimated Free-Flow Speed	
Field Measured speed, $\mathrm{S_{FM}}$ Observed volume, $\mathrm{V_f}$	mi/h veh/h	Base free-flow speed, Adj. for lane width and Adj. for access points,	BFFS _{FM} d shoulder width ³ , f _{LS} (Exhibit 20-5) , f _A (Exhibit 20-6)	55.0 mi/h 2.6 mi/h 1.0 mi/h
Free-flow speed, FFS FFS=S _{FN}	_/ +0.00776(V _f / f _{HV}) mi/n	Free-flow speed, FFS	(FSS=BFFS-f _{LS} -f _A)	51.4 mi/h
Adj. for no-passing zones, f _{np} (/	<i>mi/h</i>) (Exhibit 20-11)		1.0	
Average travel speed, ATS (mi/	/h) ATS=FFS-0.00776v _p -f _{np}		39.3	
Percent Time-Spent-Following	1			
Grade Adjustment factor, f _G (Ex	hibit 20-8)		1.00	
Passenger-car equivalents for tr	ucks, E _T (Exhibit 20-10)		1.0	
Passenger-car equivalents for R	Vs, E _R (Exhibit 20-10)		1.0	
Heavy-vehicle adjustment factor	; f _{HV} =1/ (1+ P _T (E _T -1)+P _R (E _R -1))		1.000	
Two-way flow rate ¹ , v _p (pc/h)=V	/ (PHF * f _G * f _{HV})		1436	
v _p * highest directional split prop	portion ² (pc/h)		876	
Base percent time-spent-following	ng, BPTSF(%)=100(1-e ^{-0.000879v} p)		71.7	
Adj. for directional distribution ar	nd no-passing zone, f _{d/hp} (%)(Exh. 20-12)		5.7	
Percent time-spent-following, PT	TSF(%)=BPTSF+f _{d/np}		77.4	
Level of Service I OS (Exhibit 20	rformance Measures		O	
Volume to capacity ratio. v/c=V	/ 3,200		0.45	
Peak 15-min veh-miles of travel.	. VMT (veh- <i>mi</i>)= 0.25L.(V/PHF)		359	
Peak-hour vehicle-miles of trave	el, VMT _{co} (veh- <i>mi</i>)=V*L.		1292	
Peak 15-min total travel time. T	(veh-h)= VMT/ATS		9.1	
Notes	15 ^(von-n) - vivi 15 ^{/ATO}		5.1	
1. If Vp >= 3,200 pc/h, terminate 2. If highest directional split Vp>	e analysis-the LOS is F. = 1,700 pc/h, terminated anlysis-the LOS i	is F.		

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	TWO-WAY TWO-LANE	HIGHW	AY SEGME	NT WORKSHEET	
General Information		S	Site Information		
Analyst Agency or Company Date Performed Analysis Time Period	ALB RPM Transportation Consultar 5/22/2009 PM Peak Hour	nts F J A	lighway rom/To urisdiction nalysis Year	SR-56 Between I-40 Ramp Putnam Co 2033 Existing w/ Bu	is siness Park
Project Description: 09-0402 Mi	ne Lick Creek - TDOT OC Planning				
Input Data	\$ Shoulder width	<u> </u>		Class I highway 🔽 Class II Terrain 🔽 Level 📕 Ro	highway Iling
	Lane width Lane width Shoulder width	tt tt	Show Barth Array	Two-way hourly volume 1011 Directional split 60 / 4 Peak-hour factor, PHF 0.90 No-passing zone 100 % Trucks and Buses, P _T 3 %	veh/h {0
Segment	: length, L _t mi			% Recreational vehicles, P _R 4% Access points/ <i>mi</i> 0	
Average Travel Speed					
Grade adjustment factor, f _G (Exh	ibit 20-7)			1.00	
Passenger-car equivalents for tru	ıcks, E _T (Exhibit 20-9)			1.2	
Passenger-car equivalents for R	/s, E _R (Exhibit 20-9)			1.0	
Heavy-vehicle adjustment factor,	f _{HV} =1/ (1+ P _T (E _T -1)+P _R (E _R -1))			0.994	
Two-way flow rate ¹ , v _p (pc/h)=V/	(PHF * f _G * f _{HV})			1130	
vp * highest directional split propo	ortion ² (pc/h)			678	
Free-Flow Sp	peed from Field Measurement			Estimated Free-Flow Speed	
Field Measured speed, S _{FM}	mi/	/h A	ase free-flow speed	d, BFFS _{FM} nd shoulder width ³ , f _{LS} (Exhibit 20-5)	45.0 mi/h 0.4 mi/h
Free-flow speed FFS FFS=S	+0 00776(V/ f) mi/	/h	dj. for access points	s, f _A (Exhibit 20-6)	0.0 mi/h
FM	HV /	F	ree-flow speed, FFS	S (FSS=BFFS-f _{LS} -f _A)	44.6 mi/h
Adj. for no-passing zones, f _{np} (<i>n</i>	<i>ni/h</i>) (Exhibit 20-11)			2.3	
Average travel speed, ATS (mi/h	n) ATS=FFS-0.00776v _p -f _{np}			33.6	
Percent Time-Spent-Following	:-:: 00 0)	1		1.00	
Bassenger oor equivelente for tru	IDI(20-8)			1.00	
Passenger-car equivalents for RV	$I_{\rm CKS}, E_{\rm T}$ (Exhibit 20-10)			1.1	
Heavy-vehicle adjustment factor	f = -1/(1 + P (F - 1) + P (F - 1))			0.997	
Two-way flow rate ¹ y (nc/h)=\//	(PHF * f * f)			1127	
$\frac{1}{\sqrt{p}}$	(1111 - 1G - 1HV)			676	
Base percent time-spent-following	g BPTSF(%)=100(1-e ^{-0.000879v} p)			62.9	
Adj. for directional distribution and	d no-passing zone, f _{d/bp} (%)(Exh. 20-12	2)		11.0	
Percent time-spent-following, PT	SF(%)=BPTSF+f d/np			73.8	
Level of Service and Other Per	formance Measures				
Level of service, LOS (Exhibit 20	-3 for Class I or 20-4 for Class II)			D	
Volume to capacity ratio, v/c=V _p /	3,200			0.35	
Peak 15-min veh-miles of travel,	VMT ₁₅ (veh- <i>mi</i>)= 0.25L _t (V/PHF)			28	
Peak-hour vehicle-miles of travel	, VMT ₆₀ (veh- <i>mi</i>)=V*L _t			101	
Peak 15-min total travel time, TT	₁₅ (veh-h)= VMT ₁₅ /ATS			0.8	
Notes 1. If Vp >= 3,200 pc/h, terminate 2. If highest directional split Vp>=	analysis-the LOS is F. 1,700 pc/h, terminated anlysis-the LO	DS is F.			

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TWO-WAY TWO-LANE HIGH	WAY SEGMENT WORKSHEET
General Information	Site Information
Analyst ALB Agency or Company RPM Transportation Consultants Date Performed 5/22/2009 Analysis Time Period PM Peak Hour	HighwaySR-56From/ToSouth of I-40 EB RampsJurisdictionPutnam CoAnalysis Year2033 Existing w/ Business Park
Project Description: 09-0402 Mine Lick Creek - TDOT OC Planning	
Shoulder width It Chane width It Lane width It Segment length, L _t mi	Class I highway ♥ Class II highway Terrain ♥ Level ■ Rolling Two-way hourly volume 620 veh/h Directional split 55/45 Peak-hour factor, PHF 0.90 No-passing zone 100 % Trucks and Buses , P _T 3% % Recreational vehicles, P _R 4% Access points/ mi 8
Average Travel Speed	1
Grade adjustment factor, f _G (Exhibit 20-7)	1.00
Passenger-car equivalents for trucks, E _T (Exhibit 20-9)	1.2
Passenger-car equivalents for RVs, E _R (Exhibit 20-9)	1.0
Heavy-vehicle adjustment factor, f_{HV} =1/ (1+ $P_T(E_T$ -1)+ $P_R(E_R$ -1))	0.994
Two-way flow rate ¹ , v_p (pc/h)=V/ (PHF * f _G * f _{HV})	693
v_p * highest directional split proportion ² (pc/h)	381
Free-Flow Speed from Field Measurement	Estimated Free-Flow Speed
Field Measured speed, S _{FM} mi/h Observed volume, V _f veh/h Free-flow speed, EES_EES=S=v+0.00776(V/ funct) mi/h	Base free-flow speed, BFFS FM45.0 mi/hAdj. for lane width and shoulder width3, f_{LS} (Exhibit 20-5)1.7 mi/hAdj. for access points, f_A (Exhibit 20-6)2.0 mi/h
	Free-flow speed, FFS (FSS=BFFS-f _{LS} -f _A) 41.3 mi/h
Adj. for no-passing zones, f _{np} (<i>mi/h</i>) (Exhibit 20-11)	3.5
Average travel speed, ATS (<i>mi/h</i>) ATS=FFS-0.00776vp-f _{np}	32.4
Grade Adjustment factor f. (Exhibit 20-8)	1.00
Passenger-car equivalents for trucks E_ (Exhibit 20-10)	1.1
Passenger-car equivalents for RVs, E _p (Exhibit 20-10)	1.0
Heavy-vehicle adjustment factor, $f_{\mu\nu}=1/(1+P_{\tau}(E_{\tau}-1)+P_{D}(E_{D}-1))$	0.997
Two-way flow rate ¹ , v_p (pc/h)=V/ (PHF * f_{C2} * f_{HV})	691
V _p * highest directional split proportion ² (pc/h)	380
Base percent time-spent-following, BPTSF(%)=100(1-e ^{-0.000879v} p)	45.5
Adj. for directional distribution and no-passing zone, f _{d/hp} (%)(Exh. 20-12)	18.0
Percent time-spent-following, PTSF(%)=BPTSF+f d/np	63.5
Level of Service and Other Performance Measures	
Level of service, LOS (Exhibit 20-3 for Class I or 20-4 for Class II)	C 0.22
Posk 15-min veh-miles of travel VMT (veh mil- 0.25L (V/DHE)	102
$\frac{1}{15} \frac{1}{100} \frac{1}{15} \frac{1}{100} \frac{1}{1$	379
	312
Notes	3.2
 If Vp >= 3,200 pc/h, terminate analysis-the LOS is F. If highest directional split Vp>= 1,700 pc/h, terminated anlysis-the LOS is F. 	

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FUTURE YEAR 2033 INTERSTATE 40 AT STATE ROUTE 135 (S. WILLOW AVENUE)

		RAMP	S AND RA	MP JUNCTI	ONS WOR	KSH	IEET						
General Infor	rmation			Site Infor	mation								
Analyst Agency or Company Date Performed Analysis Time Perioo	ALB RPM 5/22/2 d AM P	Transportatior 2009 Peak Hour	Consultants	Freeway/Dir of Tra Junction Jurisdiction Analysis Year	avel I E P 20	40 (Eas xit Ram utnam (033 Exi	stbound) up to SR-13 Co sting w/ Bus	5 siness Park					
Project Description	09-0402 Mine I	Lick Creek IJS	- IDOT OC PI	anning									
Upstream Adj Ramp		Terrain: Leve	1						Downstrea	m Adj			
🗖 Yes 🗖 Or	ı							г 	Tes	🗖 On			
🗹 No 📃 Of	f							1	🗹 No	Cff Off			
L _{up} = ft								L	down =	ft			
V _u = veh/h	1	S	_{FF} = 70.0 mp Sketo	h :h (show lanes, L _A ,	$S_{FR} = 35$ L_{D}, V_{R}, V_{f}	.0 mph		V	/ _D =	veh/h			
Conversion t	S				,								
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _ł	HV	f _p v	' = V/PHF	x f _{HV} x f _p			
Freeway	2975	0.90	Level	22	0	0.9	01	1.00	366	59			
Ramp	1059	0.90	Level	22	0	0.90	01	1.00	130)6			
UpStream													
DownStream	<u> </u>	Merge Areas					Div	erge Areas					
Estimation of	f v ₁₂	<u> </u>			Estimatio	on of	V ₁₂	<u> </u>					
	$V_{12} = V_{\Gamma}$	(P _{FM})					$V_{40} = V_{10}$	/ _D + (V _E - V _D))P _{FD}				
L _{FO} =	(Equa	ation 25-2 or	25-3)		L _{FO} =		12 (Ed	uation 25-8	or 25-9)				
P _{EM} =	usina	Equation (F	, Exhibit 25-5)				1.00	0 usina Fau	uation (Exhi	ibit 25-12)			
$V_{12} =$	pc/h	1	,		V ₁₂ =		3669) pc/h					
V_2 or $V_{2\nu^24}$	pc/h ((Equation 25	5-4 or 25-5)		V_{2}^{12} or V_{2}^{12}		a 0	c/h (Equation	n 25-15 or	25-16)			
$ Is V_3 \text{ or } V_{av34} > 2,70$	0 pc/h? 🔲 Yes	s 🔲 No	,		Is V ₂ or V _{2V24}	> 2,70	0 pc/h? 🥅	Yes 🗹 No		/			
Is V ₃ or V _{21/34} > 1.5	* V ₁₂ /2 V es	s 🔲 No			Is V ₂ or V _{2V24}	> 1.5 *	V ₁₂ /2	Yes 🗹 No					
If Yes, $V_{12a} =$	pc/h ((Equation 25	5-8)		If Yes, V _{12a} =		pc/	h (Equation 2	25-18)				
Capacity Che	ecks				Capacity	Che	cks						
	Actual	C	apacity	LOS F?			Actual	Сар	acity	LOS F?			
					V _F		3669	Exhibit 25-14	4800	No			
V _{FO}		Exhibit 25-7			$V_{FO} = V_{F}$ -	V _R	2363	Exhibit 25-14	4800	No			
					V _R		1306	Exhibit 25-3	2000	No			
Flow Entering	g Merge In	fluence A	rea	1	Flow Ent	ering	Merge	Influence	Area				
	Actual	Max	Desirable	Violation?		Ac	ctual	Max Desirable	e	Violation?			
V _{R12}		Exhibit 25-7			V ₁₂	36	69 E	xhibit 25-14	4400:All	No			
Level of Serv		Level of	Serv	ice Dete	ermination	i (if not l	F)						
$D_{R} = 5.475 + 0.$		D _F	_R = 4.2	252 + 0.00	086 V ₁₂ - 0.00	009 L _D							
D _R = (pc/mi/	′ln)				D _R = 33.2 (pc/mi/ln)								
LOS = (Exhibi	it 25-4)				LOS = D (Exhibi	t 25-4)						
Speed Deterr	nination				Speed Determination								
M _S = (Exibit 2	5-19)				$D_{s} = 0.54$	46 (Ex	hibit 25-1	9)					
S _R = mph (Exh	nibit 25-19)				$S_{R}^{=}$ 54.7	7 mph (Exhibit 2	5-19)					
S ₀ = mph (Exh	nibit 25-19)				S ₀ = N/A mph (Exhibit 25-19)								
S = mph (Exh	nibit 25-14)				S = 54.7 mph (Exhibit 25-15)								

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	RA	MPS AND	RAMP JU	INCTIONS W	ORKSHE	EET							
General Infor	mation			Site Infor	mation								
Analyst Agency or Company Date Performed Analysis Time Perioc Project Description	ALB RPM 5/22/2 1 AM P 09-0402 Mine I	Transportation 2009 <u>eak Hour</u> Lick Creek - TE	Consultants	Freeway/Dir of Tra Junction Jurisdiction Analysis Year	avel	I-40 (Eastb Entrance F Putnam Co 2033 Exist	bound) Ramp from D ing w/ Bus	SR-135 iness Park					
Inputs				<u> </u>									
Upstream Adj Ramp		Terrain: Leve	l						Downstrea Ramp	am Adj			
Yes On	1								Tes	Cn On			
No Off	f								Mo No	Cff Off			
L _{up} = ft		s	= 70.0 mn	h	S = 3	5 0 mph			L _{down} =	ft			
V _u = veh/h	I		FF - V0.0 mp Sketc	h (show lanes, L _A ,	$U_{FR} = 3$ L_{D}, V_{R}, V_{f}	0.0 1101			V _D =	veh/h			
Conversion to	o pc/h Und	S	-	-	-								
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{HV}		f _p	v = V/PHF	x f _{HV} x f _p			
Freeway	1916	0.90	Level	22	0	0.901		1.00	2	363			
Ramp	667	0.90	Level	22	0	0.901		1.00		323			
UpStream					[
DownStream	<u> </u>												
Estimation of	FV	vierge Areas			Fstimat	ion of v		erge Areas					
	• 12	(D)			$\frac{1}{12}$								
	$v_{12} = v_F$	(P _{FM})	05.0)				$v_{12} = v_{R}$	+ (V _F - V	R)PFD	`			
L _{EQ} =	(Equa	ation 25-2 or	25-3))	L _{EQ} =		(EC	juation 2	5-8 OF 25-9)			
P _{FM} =	1.000	using Equat	ion (Exhibit 2	5-5)	P _{FD} =		usi	ng Equati	ION (EXNIDIL)	25-12)			
$v_{12} =$	2303 p	DC/N			$v_{12} =$		pc/	n Faustion	DE 1E or DE	1/)			
$v_3 \cup v_{av34}$	0 pc/r	1 (Equation 2	25-4 OF 25-5)	v_3 or v_{av34}	> 2 700	pc/b2 📼 እ		25-15 01 25	-10)			
$15V_3 \text{ or } V_{av34} > 2.70$					$13 V_3 O V_{av3}$	34 ~ 2,700 > 1 5 * W			-				
$13 v_3 01 v_{av34} > 1.3$	$v_{12}/2$ in res	Equation 25	()		If Yes V –	₃₄ ~ 1.5 V	12' ²	es 🔲 No b (Equati	0 $25-18$				
Capacity Che	pont		-0)			v Choc	pc/	ii (Equaii	01123-10)				
	Actual		anacity	1.0S F2	Capach		Actual	C	anacity	1.0S F2			
	Actual		apacity		V_		Actual	Exhibit 25	-14	2001:			
V _{FO}	3186	Exhibit 25-7		No	$V_{FO} = V_F$	- V _R		Exhibit 25	-14				
					V _R			Exhibit 25	5-3				
Flow Entering	a Merae In	fluence A	rea		Flow En	terina	Merae	Influen	ce Area				
	Actual	Max	Desirable	Violation?		Actu	al j	Max Des	irable	Violation?			
V _{R12}	3186	Exhibit 25-7	4600:All	No	V ₁₂		ExI	nibit 25-14					
Level of Serv		Level of	Servic	e Dete	rminati	on (if no	t F)						
D _R = 5.475 +	0.00734 v _R + 0			0 _R = 4.25	2 + 0.00	86 V ₁₂ - 0	0.0009 L _D						
D _R = 26.5 (pc	/mi/ln)				D _R = (p	c/mi/ln)							
LOS = C (Exhib	oit 25-4)				LOS = (E	xhibit 25	5-4)						
Speed Determ	nination				Speed D	Determi	ination						
M _S = 0.376 (Exi	bit 25-19)				D _s = (E	xhibit 25-1	9)						
S _R = 59.5 mph ((Exhibit 25-19)				S _R = m	ph (Exhibit	25-19)						
S ₀ = N/A mph ($S_0 = $ M/A mph (Exhibit 25-19) $S_0 = $ mph (Exhibit 25-19)												
S = 59.5 mph (Exhibit 25-14) S = mph (Exhibit 25-15)													

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		RAMP	S AND RA	MP JUNCTI	ONS WOF	RKSHE	EET			
General Infor	rmation			Site Infor	mation					
Analyst	ALB			Freeway/Dir of Tr	avel I-	40 (West	bound)			
Agency or Company	RPM	Transportation	n Consultants	Junction	E	xit Ramp	to SR-13	35		
Date Performed	5/22/2	2009		Jurisdiction	F	Putnam Co	D			
Analysis Time Period	d AM P	eak Hour		Analysis Year	2	033 Exist	ing w/ Bu	isiness Park		
Project Description	09-0402 Mine I	Lick Creek IJS	- TDOT OC Pla	anning						
Inputs		Torrain, Low							_	
Upstream Adj Ramp									Downstrea Ramp	ım Adj
	1								Yes	Cn On
	I								Mo No	ft Off
$L_{up} = \Pi$			$S_{rr} = 70.0 \text{ mp}$	h	S _{ED} = 35	5.0 mph			down	
V _u = veh/h	1		Sketc	h (show lanes, L _A ,	L_{D}, V_{R}, V_{f}	ne mpri			V _D =	veh/h
Conversion to	s									
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{H∿}	/	f _p	v = V/PHF	x f _{HV} x f _p
Freeway	22	0	0.901		1.00	40	63			
Ramp	Ramp 1610 0.90 Level 22							1.00	19	86
UpStream		ļ				<u> </u>				
DownStream					uorgo Aroac					
Estimation of	fv	Merge Areas			Fstimati	on of v		verge Areas		
	12	(D)			Louman		12			
	$V_{12} = V_{F}$	(P _{FM})					V ₁₂ =	V _R + (V _F - V _I	R)P _{FD}	
L _{EQ} =	(Equa	ation 25-2 o	r 25-3)		L _{EQ} =		(E	quation 25-8	8 or 25-9)	
P _{FM} =	using	Equation (Exhibit 25-5)		P _{FD} =		1.0	00 using Ec	Juation (Exh	iibit 25-12)
V ₁₂ =	pc/h				V ₁₂ =		406	3 pc/h		
V ₃ or V _{av34}	pc/h ((Equation 2	5-4 or 25-5)		V ₃ or V _{av34}		0	oc/h (Equatio	on 25-15 or	25-16)
Is V_3 or $V_{av34} > 2,70$	0 pc/h? 🥅 Yes	s 🥅 No			Is V_3 or V_{av34}	₁ > 2,700	pc/h? 🥅	Yes 🗹 No		
Is V_3 or $V_{av34} > 1.5$	* V ₁₂ /2 🔲 Yes	s 🔲 No			Is V_3 or V_{av34}	₁ > 1.5 * V	′ ₁₂ /2 🥅	Yes 🔽 No		
If Yes,V _{12a} =	pc/h ((Equation 2	5-8)		If Yes, V _{12a} =		рс	h (Equation	25-18)	
Capacity Che	ecks				Capacity	Chec	ks			
	Actual	(Capacity	LOS F?			Actual	Са	pacity	LOS F?
					V _F		4063	Exhibit 25-1	4 4800	No
V _{FO}		Exhibit 25-7			$V_{FO} = V_F$	· V _R	2077	Exhibit 25-1	4 4800	No
					Vp		1986	Exhibit 25-3	3 2000	No
Flow Entering	a Merae In	fluence A	Irea		Flow En	terina	Merae	Influence	e Area	
	Actual	Max	Desirable	Violation?		Actu	ual	Max Desirat	ble	Violation?
V _{R12}		Exhibit 25-7			V ₁₂	4063	3	Exhibit 25-14	4400:All	No
Level of Serv		Level of	Servic	e Det	erminatio	n (if not	F)			
$D_{R} = 5.475 + 0.$	00734 v _R + (0.0078 V ₁₂	- 0.00627 L _A		D	_R = 4.25	2 + 0.0	086 V ₁₂ - 0.0	0009 L _D	
$D_p = (pc/mi/$	/ln)	12			$D_{p} = 36.$	7 (pc/mi	/ln)	12	U	
LOS = (Exhibi	it 25-4)				LOS = E (Exhibit 2	, 25-4)			
Speed Deterr	nination				Speed D	etermi	inatio	n		
M _S = (Exibit 2	5-19)				D _s = 0.6	07 (Exh i	bit 25-1	9)		
$S_{R}^{=}$ mph (Exh	nibit 25-19)				S _R = 53.	0 mph (E	xhibit 2	5-19)		
S_{a} mph (Exhibit 25-19) S_{0} N/A mph (Exhibit 2								5-19)		
S = mph (Exh	S = 53.0 mph (Exhibit 25-15)									

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	RA	MPS AND	RAMP JU	INCTIONS W	ORKSHE	ET							
General Infor	mation			Site Infor	mation								
Analyst Agency or Company Date Performed Analysis Time Perioc Project Description	ALB RPM 5/22/2 1 AM P 09-0402 Mine I	Transportation 2009 <u>eak Hour</u> Lick Creek - TE	Consultants	Freeway/Dir of Tra Junction Jurisdiction Analysis Year	avel	I-40 (Wes Entrance Putnam C 2033 Exis	tbound) Ramp from o ting w/ Bus	n SR-135 siness Park					
Inputs				<u> </u>									
Upstream Adj Ramp		Terrain: Leve	l						Downstrea Ramp	am Adj			
Yes On	1								Tes	🗖 On			
No Off	f								🗹 No	Cff Off			
L _{up} = ft		s	= 70.0 mn	h	S = 3	5 0 mnh			L _{down} =	ft			
V _u = veh/h	I		FF - V0.0 mp Sketc	h (show lanes, L _A ,	$U_{FR} = 3$ L_{D}, V_{R}, V_{f}	o.o mpri			V _D =	veh/h			
Conversion to	o pc/h Und	S	-		-								
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{H\}	,	f _p	v = V/PHF	x f _{HV} x f _p			
Freeway	1684	0.90	Level	22	0	0.901		1.00	2	077			
Ramp	347	0.90	Level	22	0	0.901		1.00		428			
UpStream					[ļ							
DownStream	<u> </u>												
Estimation of	FV	vierge Areas			Fstimat	ion of		erge Areas					
	• 12	(D)			$\frac{1}{12}$								
	$v_{12} = v_F$	(P _{FM})	05.0)				$V_{12} = V_{R}$	+ (۷ _F - ۷	R)PFD	`			
L _{EQ} =	(Equa		25-3))	L _{EQ} =		(E	quation 2:	5-8 OF 25-9)			
P _{FM} =	1.000	using Equat	ion (Exhibit 2	5-5)	P _{FD} =		us	ing Equat	ion (Exhibit	25-12)			
$v_{12} =$	2077 p	DC/N			$v_{12} =$		pc	/N /h (Equation	DE 1E or DE	1/)			
$v_3 \cup v_{av34}$	0 pc/r 0 pc/b2		25-4 01 25-5)	v_3 or v_{av34}	> 2 700	pc/b2		20-10 01 20	-10)			
$15V_3 \text{ or } V_{av34} > 2.70$					$13 V_3 O V_{av3}$	34 ~ 2,700 ~ 1 5 * 1			5				
$13 v_3 01 v_{av34} > 1.3$	$v_{12}/2$ in res	Equation 25	()		If Yes V –	34 ~ 1.5	^{12'2}	res in No /b (Equati) on 25-18)				
Capacity Che	pont		-0)			v Chor	pc.	/ii (Equali	01123-10)				
	Actual		anacity	1.05.F2	Capach		Actual		anacity	1.0S F2			
	Actual		apacity		V_		Actual	Exhibit 25	.14	2001:			
V _{FO}	2505	Exhibit 25-7		No	$V_{FO} = V_F$	- V _R		Exhibit 25	.14				
					V _R			Exhibit 25	-3				
Flow Entering	a Merae In	fluence A	rea		Flow En	terina	Merge	Influen	ce Area				
	Actual	Max	Desirable	Violation?		Actu	ial	Max Des	irable	Violation?			
V _{R12}	2505	Exhibit 25-7	4600:All	No	V ₁₂		Ex	hibit 25-14					
Level of Serv		Level of	Servi	ce Dete	erminati	on (if no	t F)						
D _R = 5.475 +	0.00734 v _R + 0		C) _R = 4.25	52 + 0.00	086 V ₁₂ - 0	.0009 L _D						
D _R = 20.9 (pc	/mi/ln)				D _R = (p	c/mi/ln)							
LOS = C (Exhib	oit 25-4)				LOS = (E	xhibit 2	5-4)						
Speed Determ	nination				Speed D	Determ	ination	1					
M _S = 0.325 (Exil	bit 25-19)				D _s = (E	xhibit 25-7	19)						
S _R = 60.9 mph ((Exhibit 25-19)				S _R = m	oh (Exhibi	t 25-19)						
S ₀ = N/A mph ($S_0 = N/A mph (Exhibit 25-19)$ $S_0 = mph (Exhibit 25-19)$												
S = 60.9 mph (Exhibit 25-14) $S = mph (Exhibit 25-15)$													

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					нс	S+™ D)E	TAIL	ED) RE	P	ORT									
General Info	rmation								S	ite In	nfo	ormati	on								
Analyst	alyst ALB								In	terse	ecti	ion	S ra	R-13 amps	35 8 S	& <i>Ι-40</i> ε	as	tboun	d		
Agency or Co	. RPM Transp	oortat	ion						A	rea T	yp	e	A	ll oth	ier	areas					
Date Perform	ed 5/26/2009								Ju	urisdi	cti	on	P	Putna	m (Co					
Time Period	AM Peak Ho	our							A	nalys	sis	Year	2	033 i Park	EXI	sting w	/ B	usine	SS		
									P	rojec	t IC	D	, 0 T	9-04 DOT	02	Mine L C Planı	ick nin	Cree a	k -		
Volume and	Timing Input								I				-					<u> </u>			
-			1		EB					WB						NB			1	SB	
			LT		TH	RT		LT		TH		RT		LT		TH	F	RΤ	LT	TH	RT
Number of La	nes, N1		1			1										2	()	1	2	
Lane Group			L			R										TR			L	<u> </u>	
Volume, V (vp	oh)		345			714										1088	4	13	254	1657	
% Heavy Veh	icles, %HV		5			5										5	1	5	5	5	
Peak-Hour Fa	ctor, PHF		0.90			0.90									_(0.90	0.	90	0.90	0.90	
Pretimed (P)	or Actuated (A)		A			A										A	1	4	A	A	
Start-up Lost	Time, lı		2.0			2.0									_	2.0	<u> </u>		2.0	2.0	
Extension of E	Effective Greer	і, e	2.0			2.0										2.0	<u> </u>		2.0	2.0	
Arrival Type,	AT		3			3									_	3	_		3	3	
Unit Extension	n, UE		3.0	_		3.0					_					3.0	<u> </u>		3.0	3.0	
Filtering/Mete	ring, I		1.000)		1.000)				_					1.000	<u> </u>		1.000	1.000	
Initial Unmet I		0.0			0.0					_					0.0	<u> </u>		0.0	0.0		
Ped / Bike / RTOR Volumes			0		0	0		ļ			_			0		0)	0	0	
Lane Width			12.0			12.0					_				;	12.0			12.0	12.0	
Parking / Grad	de / Parking		N		0	N			_		_			Ν	_	0	/	V	N	0	N
Parking Mane	uvers, Nm			_					_		_				_	0	_				
Buses Stoppi	ng, INB Dadaatalaaa C		0		0.0	0										0			0		<u> </u>
Min. Time for	Pedestrians, G	ip I			3.2		1			1	_		<u> </u>	1		3.2		1	<u> </u>	3.2	
Phasing	EB Only		02		0	3	4	04	~			SB On	ly		NS	Perm			07	0	8
Timing	G = 50.6 V = 5	G =	0.0		G = 0	0.0 ว	╉	G = 0.	.0		V	= 11	.8) = /_	52.6		G =	0.0	G = 0).0
Duration of Ar	nalysis. $T = 0.2$	<u> </u> 95	0		1 - (,		1 - 0			-	- 0			- Vc	le l eno	th.	C =	130.0	1 - 0	/
Lane Group	Capacity. Con	trol L	Delav.	and	d LOS	Deter	mi	nation									<u>,</u> ,	<u> </u>			
		1	, ., ,	E	B	201011			W	/B		1			Ν	ΝB				SB	
			LT	Т	Н	RT		LT	Tł	H	F	RΤ	Ľ	Г	٦	ГН	R	Т	LT	TH	RT
Adjusted Flow	/ Rate, v	:	383			793						ĺ			16	668			282	1841	
Lane Group C	Capacity, c	6	669			599									1:	336			212	1839	
v/c Ratio, X		0.	57		1	.32									1.	25			1.33	1.00	
Total Green R	Ratio, g/C	0.	39		0	.39									0.4	40			0.53	0.53	
Uniform Delay	/, d ₁	3	1.2		3	9.7									38	3.7			41.1	30.3	
Progression F	actor, PF	1.	.000		1	.000									1.	000			1.000	1.000	
Delay Calibra	tion, k	0.	17		0	.50									0.:	50			0.50	0.50	
Incremental D	Incremental Delay, d ₂ 1.2 157.1			57.1									11	18.2			177.3	21.2			
Initial Queue Delay, d ₃ 0.0 0.0			0.0									0.	.0			0.0	0.0				
Control Delay	Control Delay 32.4 196.8												15	56.9			218.3	51.5			
Lane Group L	OS		С			F									ŀ	-			F	D	
Approach Del	Approach Delay 143.3										15	6.9					73.7				
Approach LO	S		F											ŀ	-					E	
Intersection D	Approach LOS Intersection Delay 1				118.1 $X_c = 1.7$.74	Namps All other areas Puriam Co 2033 Existing w/ Business Park OP-0402 Mine Lick Creek - TH RT LT TH RT LT TH RT WB NB SB SB TH RT LT TH RT L T T I O 0 0 0 0 0 0 I RT LT TH RT LT RT IT I O N N O N O N <th< td=""></th<>											

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					НС	S+™ I	DET	TAILE	D RE	ΞP	ORT								
General Info	HCS+ [™]									nfo	ormati	ion							
Analyst	ALB								Inters	ect	ion	S. ra	R-135 amps	& I-40 v	ves	tbour	nd		
Agency or Co	RPM Trans	oortati	ion						Area ⁻	Гур	e	A	ll othe	r areas					
Dete Derferre	Consultants								Jurisd	icti	on	Ρ	Putnam	County	,				
Time Period	ed 5/26/2009 AM Peak He	our							Analy	sis	Year	20 P	033 Ex Park	kisting w	// B	usine	SS		
									Projec	ct II	D	09 T	9-0402 DOT (2 Mine L DC Plan	ick. ning	Cree.	k -		
Volume and	Timing Input															,			
					EB				WB	_				NB				SB	
			LT		TH	RT	ĺ	LT	TH		RT		LT	TH	F	RΤ	LT	TH	RT
Number of La	nes, N₁							1					1	2			<u> </u>	2	0
Lane Group								L	<u> </u>				L	<u> </u>	<u> </u>		ļ	TR	
Volume, V (vp	ph)							2089					149	1284	<u> </u>		ļ	696	198
% Heavy Veh	icles, %HV							5	<u> </u>				5	5	<u> </u>		ļ	5	5
Peak-Hour Fa	ctor, PHF		ļ				(0.90	<u> </u>			0	0.90	0.90	<u> </u>		ļ	0.90	0.90
Pretimed (P)	or Actuated (A)						<u>A</u>					<u>A</u>	A			ļ	A	A
Start-up Lost								2.0		_		2	2.0	2.0				2.0	
Extension of E		ı, е		_				2.0					2.0	2.0				2.0	
Arrivar Type, A								3		_			3	3				3	
Unit Extension, UE								3.0		_			3.0	3.0				3.0	<u> </u>
Filtering/wete							1.000		_		$-\frac{1}{2}$	000	1.000				1.000	<u> </u>	
Pod / Biko / P	Ped / Bike / RTOR Volumes						-+	0.0		_			0.0	0.0				0.0	
Lane Width								12.0		_		1	2.0	12.0				12.0	
Parking / Grad	de / Parking							N	0		N		N	0	1	V	N	0	N
Parking Mane	uvers, Nm									_								1	
Buses Stoppin	ng, Nв							0	1				0	0			i	0	
Min. Time for	Pedestrians, G	Эр							3.2					3.2				3.2	J
Phasing	WB Only	()2		0	3		04		1	NB Or	nly	N	S Perm			<u>,</u> 07	0	8
Timing	G = 76.2	G =	0.0		G =	0.0	0	G = 0.0	0	G	= 6.4	4	G	= 32.4		G =	0.0	G = (0.0
	Y = 5	Y =	0		Y = 0	0	Y	Y = 0		Y	= 5		Y =	= 5		Y =	0	Y = 0)
Duration of Ar	nalysis, T = 0.2	?5											Су	cle Leng	gth,	C =	130.0		
Lane Group	Capacity, Cor	ntrol E	<i>Delay,</i>	and	LOS	Deter	min	nation				1					(
			. .	E	B	D T			WB		.		- (_		SB	DT
Adjusted Flow	/ Rate, v			11	1	RI	23	.1 1 121	IH		<u> </u>	16	6	1 1 1427	R	1		993	RI
Lane Group C	Capacity, c						10	08				14	1	1161				830	
v/c Ratio, X							2.3	30		1		1.18	8 1	.23				1.20	
Total Green R	Ratio, g/C						0.5	59		ſ		0.34	4 ().34				0.25	
Uniform Delay	/, d ₁						26.	.9				39.2	2 4	13.1				48.8	
Progression F	actor, PF						1.0	000				1.00	00 1	1.000				1.000	
Delay Calibra	tion, k						0.5	50				0.50	o (0.50				0.50	
Incremental D	Incremental Delay, d ₂					589	9.3		L		131	1.3 1	10.8				100.0		
Initial Queue Delay, d ₃					0.0	0				0.0)	0.0				0.0			
Control Delay					616	6.2				170	0.5	53.9				148.8			
Lane Group L	Lane Group LOS				F	:				F		F				F			
Approach Del	Approach Delay					_	616.2	2			155.7					148.8			
Approach LO	S							F	F F				F						
Intersection D	elay		372	.1	1 $X_{c} = 1$			$X_{_{C}} = 1.$	97			Inte	ersecti	on LOS				F	





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		RAMP	S AND RA	MP JUNCTI	ONS WOF	RKSI	HEET						
General Infor	rmation			Site Infor	mation								
Analyst Agency or Company Date Performed Analysis Time Period	ALB RPM 5/22/2 d PM P	Transportation 2009 Peak Hour	Consultants	Freeway/Dir of Tra Junction Jurisdiction Analysis Year	avel I E P 21	40 (Ea xit Rar utnam 033 E>	istbound) mp to SR-13 Co kisting w/ Bu	5 siness Park					
Project Description	09-0402 Mine I	Lick Creek IJS	- TDOT OC Pl	anning									
Inputs		Torrain: Lovo	1					-					
Upstream Adj Ramp			1					F	Downstrea Ramp	m Adj			
	f								Yes	On			
L _m = ft								L	MNO	ft Off			
-up it		S	_{FF} = 70.0 mp	h	S _{FR} = 35	i.0 mpł	า		down				
V _u = veh/h	1		Sketo	ch (show lanes, L _A ,	L_{D}, V_{R}, V_{f}	-			/ _D =	veh/h			
Conversion t	S		•		1.								
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	1	f _{HV}	f _p v	′ = V/PHF	x f _{HV} x f _p			
Freeway	2385	0.90	Level	22	0	0.9	901	1.00	294	12			
Ramp	544	0.90	Level	22	0	0.9	901	1.00	67	1			
UpStream		<u> </u>											
DownStream	<u> </u>	Morgo Aroas						Jorgo Aroas					
Estimation or	f V ₄₀	Morge Areas			Estimatio	on o	f V ₄₀	renge Areas					
	12 V - V	(D)					· · 12						
	v ₁₂ - v _F	(^r FM)	· 25 2)				v ₁₂ = ·		FD				
$L_{EQ} =$	(Equa		20-3)		L _{EQ} =		(E	quation 25-8	0r 25-9)	LH OF 10)			
F _{FM} =	using	Equation (i	2211011 20-0)		F _{FD} =		1.00)∪ using Equ	lation (Exn	DIL 25-12)			
$v_{12} - v_{12}$	pc/n	(Faultion Of			$v_{12} = 1000$		294	2 pc/n		05.40)			
$v_3 \circ v_{av34}$	pc/n (0 nc/b2 □ v		5-4 01 25-5)		$V_3 \cup V_{av34}$	> 270	۲ U ۱۹ ۵۵ م)c/n (Equalion	125-15 01	25-16)			
$15V_3 OV_{av34} > 2,70$	* V /2 - V				$15V_3 OIV_{av34}$	> 2,70	* V /2 -						
$15 v_3 01 v_{av34} > 1.5$	v ₁₂ /2 res	S III NO	O)		If V_{0} V =	> 1.5	v ₁₂ /2	Yes MINO	05 10)				
$\frac{1}{12a}$			5-0)		Γ_{12a}	Ch	pc pc		25-16)				
			anacity		Capacity		Actual	Can	acity	1 OS E2			
	Actual		арасну		V		20/2	Exhibit 25-14	4800	No			
V		Evhibit 25.7			V - V -	V	2742	Exhibit 25.14	4000	No			
* FO		LATIIDIL 23-7			VFO VF	*R	/71		2000	No			
	<u> </u>						0/1	EXTIDIT 20-3	2000	INO			
Flow Entering	g werge in		Docirable	Violation?	FIOW Ent		g werge	Max Desirabl	Area	Violation?			
V _{R12}	Actual	Exhibit 25-7	Desilable		V ₁₂	2	942	Exhibit 25-14	4400:All	No			
Level of Serv		Level of	Serv	vice Det	ermination	n (if not l	=)						
$D_{R} = 5.475 + 0.$		D	₂ = 4.	252 + 0.0	086 V ₁₂ - 0.0	009 L _D							
$D_p = (pc/mi/$	/ln)	12	~		$D_{p} = 26.9$	、 9 (pc/	mi/ln)	12	D				
LOS = (Exhibi	, it 25-4)				LOS = C (Exhib	oit 25-4)						
Speed Deterr	nination				Speed D	eteri	minatio	า					
M _s = (Exibit 2	5-19)				$D_{s} = 0.48$	88 (E)	khibit 25-1	9)					
$ S_{R} $ mph (Exh		S _R = 56.3	3 mph	(Exhibit 2	5-19)								
$S_0 = mph (Exh$, nibit 25-19)				S ₀ = N/A mph (Exhibit 25-19)								
S = mph (Exh	nibit 25-14)				S = 56.3 mph (Exhibit 25-19)								

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	RA	MPS AND	RAMP JU	INCTIONS W	ORKSHE	ET				
General Infor	mation			Site Infor	mation					
Analyst Agency or Company Date Performed Analysis Time Perioc Project Description	ALB RPM 5/22/2 1 PM P 09-0402 Mine I	Transportation 2009 <u>eak Hour</u> Lick Creek - TE	Consultants	Freeway/Dir of Tra Junction Jurisdiction Analysis Year ng	avel	I-40 (East Entrance Putnam C 2033 Exis	bound) Ramp from o ting w/ Bus	I SR-135 siness Park		
Inputs										
Upstream Adj Ramp		Terrain: Leve	l						Downstrea Ramp	am Adj
Yes On	1								Tes	🗖 On
No Off	f								🗹 No	Cff Off
L _{up} = ft			= 70.0 mn	h	S = 3	5 0 mnh			L _{down} =	ft
V _u = veh/h	I		FF - V0.0 mp Sketc	:h (show lanes, L _A ,	$U_{FR} = 3$ L_{D}, V_{R}, V_{f}	o.o mpri			V _D =	veh/h
Conversion to	o pc/h Und	S	-							
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{H\}	,	f _p	v = V/PHF	⁼ x f _{HV} x f _p
Freeway	1841	0.90	Level	22	0	0.901		1.00	2	2271
Ramp	1518	0.90	Level	22	0	0.901		1.00	1	1872
UpStream					[
DownStream	<u> </u>									
Estimation of	FV	vierge Areas			Fstimat	ion of	V	erge Areas		
	• 12	(D)			Lotinati		• 12			
	$v_{12} = v_F$	(P _{FM})	05.0)				$V_{12} = V_{F}$	2 + (V _F - V	R)PFD	
L _{EQ} =	(Equa		25-3)		L _{EQ} =		(E	quation 28	5-8 OF 25-9) 05 10)
P _{FM} =	1.000	using Equat	ion (Exhibit 2	5-5)	P _{FD} =		us	Ing Equati	ion (Exhibit	25-12)
$v_{12} =$	22/1 p	DC/N		,	$v_{12} =$		pc	/N	DE 1E or DE	1/)
$v_3 \cup v_{av34}$	0 pc/r 0 pc/b2		25-4 01 25-5)	v_3 or v_{av34}	> 2 700	nc/h2 III y		-	- 10)
$15V_3 \text{ or } V_{av34} > 2.70$					$13 V_3 O V_{av3}$	34 ~ 2,700 > 1 5 * 1			-	
$13 v_3 01 v_{av34} > 1.3$	v ₁₂ /2 i re:	Equation 25	()		If Yes V –	34 ~ 1.5	^{12/2}	res 🔲 No /b (Equati	0 $25-18$	
Capacity Che	pont		-0)			v Chor	pc •ke	ni (Lquati	01123-10)	
	Actual		anacity	1.05 F2	Capach		Actual		anacity	1.0S F2
	Actual		apacity		V_		Actual	Exhibit 25	-14	2001:
V _{FO}	4143	Exhibit 25-7		No	$V_{FO} = V_F$	- V _R		Exhibit 25	-14	
					V _R			Exhibit 25	5-3	
Flow Entering	a Merae In	fluence A	rea		Flow En	terina	Merae	Influen	ce Area	
	Actual	Max	Desirable	Violation?		Actu	ial	Max Des	irable	Violation?
V _{R12}	4143	Exhibit 25-7	4600:All	No	V ₁₂		Ex	hibit 25-14		
Level of Serv		Level of	Servi	ce Dete	erminati	on (if no	ot F)			
D _R = 5.475 +	0.00734 v _R + 0			0 _R = 4.25	52 + 0.00	86 V ₁₂ - 0	0.0009 L _D			
D _R = 33.4 (pc	/mi/ln)				D _R = (p	c/mi/ln)				
LOS = D (Exhib	oit 25-4)				LOS = (E	xhibit 2	5-4)			
Speed Determ	nination				Speed D	Determ	ination			
M _S = 0.528 (Exi	bit 25-19)				D _s = (E	xhibit 25-	19)			
S _R = 55.2 mph ((Exhibit 25-19)				S _R = m	ph (Exhibi	t 25-19)			
$S_0 = N/A \text{ mph} (Exhibit 25-19)$ $S_0 = mph (Exhibit 25-19)$										
S = 55.2 mph (Exhibit 25-14) $S = mph (Exhibit 25-15)$										

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RAMPS AND RAMP JUNCTIONS WORKSHEET													
General Infor	mation			Site Infor	rmation								
Analyst Agency or Company Date Performed Analysis Time Period	Analyst ALB Freeway/Dir of Tr Agency or Company RPM Transportation Consultants Junction Date Performed 5/22/2009 Jurisdiction Analysis Time Period PM Peak Hour Analysis Year						ravel I-40 (Westbound) Exit Ramp to SR-135 Putnam Co 2033 Existing w/ Business Park						
Inputs	09-0402 10111111	LICK CIEEK IJS											
Upstream Adj Ramp					Downstrea	ım Adj							
Yes Or	ı								Tes Yes	Cn On			
No Of	f								No No	Off			
L _{up} = ft			70.0	L.	0	F O m m	L_		L _{down} =	ft			
V _u = veh/h	I		S _{FF} = 70.0 mp Sketo	n :h (show lanes, L _A ,	$S_{FR} = 3$ $L_{D'}V_{R'}V_{f}$	5.0 mp	n		V _D =	veh/h			
Conversion to	o pc/h Und	der Base	Condition	S					,				
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f _{HV}	f _p	v = V/PHF	x f _{HV} x f _p			
Freeway	2466	0.90	Level	22	0	0.0	901	1.00	30	41			
Ramp	810	0.90	Level	22	0	0.0	901	1.00	99	99			
UpStream													
DownStream	<u> </u>	Merge Areas					I C	iverge Areas					
Estimation of	f v ₁₂	0			Estimati	on o	f v ₁₂	V					
	$V_{12} = V_{E}$	(P _{EM})					V ₁₂ =	V _P + (V _F - V					
L _{FO} =	Equa	ation 25-2 o	r 25-3)		L _{FO} =		(Equation 25-	8 or 25-9)				
P _{FM} =	using	Equation (Exhibit 25-5)		P _{FD} =		1.0	000 using E	quation (Exh	ibit 25-12)			
V ₁₂ =	pc/h				V ₁₂ =		30	141 pc/h					
V ₃ or V _{av34}	pc/h ((Equation 2	5-4 or 25-5)		V ₃ or V _{av34}		0	pc/h (Equati	ion 25-15 oı	[.] 25-16)			
Is V_3 or $V_{av34} > 2,70$	10 pc/h? 🥅 Yes	s 🔲 No			Is V ₃ or V _{av34} > 2,700 pc/h? [Yes No								
Is V_3 or $V_{av34} > 1.5$	* V ₁₂ /2 🔲 Yes	s 🔲 No			Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 F Yes No								
If Yes,V _{12a} =	pc/h ((Equation 2	5-8)		If Yes,V _{12a} = pc/h (Equation 25-18)								
Capacity Che	ecks				Capacity	/ Che	ecks						
	Actual	(Capacity	LOS F?			Actual	С	apacity	LOS F?			
					V _F		3041	Exhibit 25-	14 4800	No			
V _{FO}		Exhibit 25-7			$V_{FO} = V_{F}$	- V _R	2042	Exhibit 25-	14 4800	No			
					V _R		999	Exhibit 25-	-3 2000	No			
Flow Entering	g Merge In	fluence A	Area		Flow En	terin	g Merg	e Influend	ce Area				
	Actual	Max	Desirable	Violation?		A	Actual	Max Desira	able	Violation?			
V _{R12}		Exhibit 25-7			V ₁₂	3	041	Exhibit 25-14	4400:All	No			
Level of Serv	ice Detern	nination ((if not F)		Level of	Serv	vice De	terminatio	on (if not	F)			
$D_{R} = 5.475 + 0.$	00734 v _R + (0.0078 V ₁₂	- 0.00627 L _A		D	_R = 4.	252 + 0.0	0086 V ₁₂ - 0	.0009 L _D				
$D_R = (pc/mi/$	ln)				$D_R = 27$.9 (pc/	mi/ln)						
LOS = (Exhibit 25-4)							oit 25-4)						
Speed Detern	nination							0 0					
$M_{\rm S} = $ (Exibit 2)	5-19)				$ U_{S} ^{2} = 0.5$	018 (E)	(Evel:e:+	19) 25.10)					
S _R = mph (Exh	nbit 25-19)				S - NV	.o mph		20-19) 05 10)					
$ S_0 = mph (Exh$	ubit 25-19)					- inpn		20-19) 25 45)					
S = mph (Exh	14) (25-14)			S = 55	.5 mph	(Exhibit	25-15)						

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RAMPS AND RAMP JUNCTIONS WORKSHEET												
General Infor	mation			Site Infor	mation							
Analyst Agency or Company Date Performed Analysis Time Perioc Project Description	Freeway/Dir of Tra Junction Jurisdiction Analysis Year	avel I	I-40 (Westbound) Entrance Ramp from SR-135 Putnam Co 2033 Existing w/ Business Park									
Inputs												
Upstream Adj Ramp		Terrain: Leve	5						Downstre Ramp	am Adj		
Yes On	1								Yes	Con 🗐		
No Off	f								🗹 No	Cff Off		
L _{up} = ft			70.0		^				L _{down} =	ft		
V _u = veh/h	veh/h $S_{FF} = 70.0 \text{ mph}$ $S_{FR} = 35.0 \text{ mph}$ Sketch (show lanes, L_A, L_D, V_B, V_f)								V _D =	veh/h		
Conversion to	o pc/h Und	der Base	Condition	s	-				•			
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{H\}	/	f _p	v = V/PHI	F x f _{HV} x f _p		
Freeway	1656	0.90	Level	22	0	0.901		1.00		2042		
Ramp	902	0.90	Level	22	0	0.901		1.00		1112		
UpStream					ļ							
DownStream	<u> </u>	<u> </u> Merge Areas			<u> </u>		/ 	erge Areas				
Estimation of		Estimati	ion of	V ₁₂	<u></u>							
	$V_{10} = V_{r}$	(P _{EM})					$V_{10} = V_1$)P-p			
	(Four	ation 25-2 o	r 25-3)		Lro =		(F	quation 2	5-8 or 25-9	9)		
P _{EM} =	1 000	using Equat	ion (Exhibit 25	5-5)	$P_{FD} =$		us	ing Fauat	ion (Fxhibit	25-12)		
$V_{12} =$	2042 r	oc/h		,	V ₁₂ =		pc	:/h				
V_2 or $V_{2/24}$	0 pc/h	(Equation	25-4 or 25-5)		V_{2}^{12} or V_{2}^{12}		DC	h (Equation	25-15 or 25	5-16)		
$ Is V_2 \text{ or } V_{2V24} > 2,70$	0 pc/h? 🔽 Yes	s 🔽 No	,		Is V ₃ or V _{av34} > 2,700 pc/h? Yes No							
Is V ₂ or V _{21/24} > 1.5 '	[•] V ₁₂ /2 V es	s 🔽 No			$ _{IS} V_3 \text{ or } V_{2n/24} > 1.5 * V_{12}/2$ [Yes No							
If Yes, $V_{122} =$	pc/h (Equation 2	5-8)		$ f _{Yes,V_{12a}} = pc/h$ (Fountion 25-18)							
Capacity Che	cks	<u> </u>	,			v Chec	ks	<u>, i</u>	,			
	Actual	(apacity	LOS F?			Actual	C	apacity	LOS F?		
					V _F			Exhibit 25	-14			
V _{FO}	3154	Exhibit 25-7		No	$V_{FO} = V_{F}$	- V _R		Exhibit 25	-14			
					V _R			Exhibit 25	5-3			
Flow Entering	g Merge In	fluence A	lrea		Flow En	tering	Merge	Influen	ce Area			
	Actual	Max	Desirable	Violation?		Actu	ial 🗌	Max Des	irable	Violation?		
V	3154	Exhibit 25-7	4600:All	No	V ₁₂		E۶	hibit 25-14				
Level of Serv	ice Detern	nination (if not F)		Level of	Servi	ce Dete	erminati	on (if no	ot F)		
D _R = 5.475 +	0.00734 v _R + 0	0.0078 V ₁₂ - 0.	00627 L _A			0 _R = 4.25	52 + 0.00	086 V ₁₂ - 0	0.0009 L _D			
$D_R = 25.6 \text{ (pc/mi/ln)}$						c/mi/ln)						
LOS = C (Exhibit 25-4)						xhibit 2	5-4)					
Speed Determ	nination				Speed D	Determ	inatior	ו				
M _S = 0.368 (Exil	bit 25-19)				$D_s = (E)$	xhibit 25-	19)					
S _R = 59.7 mph ((Exhibit 25-19)				S _R = m	oh (Exhibi	t 25-19)					
S ₀ = N/A mph (I	Exhibit 25-19)				S ₀ = m	oh (Exhibi	t 25-19)					
S = 59.7 mph (S = m	oh (Exhibi	t 25-15)									

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	HCS+ [™] DETAILED REPORT																			
General Info	General Information									Site Information										
Analyst	ALB								Inte	rsec	tion		SR-1 ramp	35 s	& <i>I-40</i> e	eas	tbour	nd		
Agency or Co	. RPM Trans	oortat	ion						Area	а Ту	ре		All of	her	r areas					
Date Perform	ed 5/26/2009								Juris	sdic	tion		Putn	am	Со					
Time Period	PM Peak He	our							Ana	lvsis	s Year		2033	Ex	risting w	// B	usine	SS		
										.,			Park	100	Minal	iak	Croo	le.		
								Proj	Project ID TDOT OC Planning											
Volume and	Volume and Timing Input														<u>e : :a:::</u>		9			
	ining input		1		FB		1		W	B					NB			[SB	
			LT		TH	RT		LT		 H	RT		LT		TH		RT	LT	TH	RT
Number of La	nes, N1		1			1									2	1	0	1	2	
Lane Group	,		L			R									TR		-	L	Т	
Volume, V (vp	oh)		352			192					1				1206	1	085	433	1211	
% Heavy Veh	icles, %HV		5			5									5		5	5	5	
Peak-Hour Fa	ctor, PHF		0.90			0.90									0.90	0.	90	0.90	0.90	
Pretimed (P)	or Actuated (A)		A			A									A		4	A	A	
Start-up Lost	Time, I1		2.0			2.0									2.0			2.0	2.0	
Extension of E	Effective Greer	ı, e	2.0			2.0			1						2.0			2.0	2.0	
Arrival Type,	AT		3			3									3			3	3	
Unit Extension	n, UE		3.0			3.0									3.0			3.0	3.0	
Filtering/Mete	ring, I		1.000)		1.000)								1.000			1.000	1.000	
Initial Unmet I	Demand, Qb		0.0			0.0									0.0			0.0	0.0	
Ped / Bike / RTOR Volumes			0		0	0							0		0	(2	0	0	
Lane Width		12.0			12.0									12.0			12.0	12.0		
Parking / Grade / Parking			N		0	N							Ν		0	1	V	N	0	N
Parking Maneuvers, Nm																				
Buses Stopping, NB			0			0									0			0	0	
Min. Time for Pedestrians, Gp					3.2										3.2			3.2		
Phasing	EB Only		02		0	3		04			SB O	nly		NS	S Perm			07	0	8
Timeline	G = 13.6	G =	0.0		G = (0.0	(G = 0.	0	0	G = 1	7.7		G =	93.7		G =	0.0	G = (0.0
Timing	Y = 5	Y =	0		Y = 0))	Y = 0	Y = 5			Y = 5			Y =	= 0 Y = 0)		
Duration of Ar	nalysis, T = 0.2	5												Сус	cle Leng	gth,	C =	140.0		
Lane Group	Capacity, Con	trol L	Delay,	anc	l LOS	Deter	mir	nation												
				E	В				WB						NB			<u> </u>	SB	
			LT		<u>+ </u>	RT	L	<u>.</u> T	TH		RT		LT		<u>TH</u>	R	Т	LT	<u> </u>	RT
Adjusted Flow	/ Rate, v	:	391			213								2	2546			481	1346	
Lane Group C	Capacity, c		167			149								2	2142			268	2864	
v/c Ratio, X		2.	34		1	.43								1	.19			1.79	0.47	
Total Green R	Ratio, g/C	0.	10		0	.10								0	.67			0.83	0.83	
Uniform Delay	/, d ₁	6	3.2		6	3.2								2	3.1			54.5	3.3	
Progression F	actor, PF	1.	.000		1	.000								1	.000			1.000	1.000	
Delay Calibra	Delay Calibration, k		50		0	.50								0	.50			0.50	0.11	
Incremental D	elay, d ₂	6	21.9		2	27.5								8	39.9			372.2	0.1	
Initial Queue I	Delay, d ₃	0	0.0		0	0.0								(0.0			0.0	0.0	
Control Delay		6	85.1		2	90.7								1	13.0			426.7	3.4	
Lane Group L	OS		F			F									F			F	A	
Approach Del	ау		546	.0									1	13.0)			1	14.8	
Approach LO	S		F											F					F	
Intersection D	elay		166	.2				$X_{c} = 4.$	28			In	terse	ectio	on LOS				F	

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HCS+ [™] DETAILED REPORT																			
General Info	General Information								Site Information										
Analyst	ALB								Inters	ect	ion	S. ra	R-135 amps	5& <i>I-40</i> 1	wes	tbour	nd		
Agency or Co	RPM Trans	portat	ion						Area	Тур	be	A	ll othe	r areas					
Dete Derferre	Consultants								Jurisc	licti	ion	P	utnam	County	,				
Time Period	Time Period PM Peak Hour							Analy	sis	Year	20 P	033 E. Park	xisting w	// B	usine	SS			
					Proje	Project ID 09-0402 Mine Lick Creek - TDOT OC Planning													
Volume and	Volume and Timing Input													,	-				
					EB				WB					NB				SB	
			LT		TH	RT		LT	TH		RT		LT	TH	F	RT	LT	ТН	RT
Number of La	nes, N1							1					1	2	<u> </u>			2	0
Lane Group								L	ļ				L	T	<u> </u>		ļ	TR	
Volume, V (vp	oh)		ļ					438	ļ				616	942	<u> </u>		ļ	1206	286
% Heavy Veh	icles, %HV		ļ					5					5	5	<u> </u>		ļ	5	5
Peak-Hour Fa	ctor, PHF		ļ				(0.90	ļ			0	.90	0.90	<u> </u>		ļ	0.90	0.90
Pretimed (P)	or Actuated (A))	ļ					A	<u> </u>		ļ		A	A	┦		ļ	A	A
Start-up Lost			ļ					2.0	<u> </u>				2.0	2.0	┦		ļ	2.0	
Extension of E	ffective Greer	п, е						2.0			ļ	<u> </u>	2.0	2.0	<u> </u>		 	2.0	ļ
Arrival Type,	41							3					3	3			ļ	3	<u> </u>
Unit Extension	n, UE							3.0	<u> </u>			3	3.0	3.0			ļ	3.0	
Filtering/iviete	ring, i						1	1.000				1	.000	1.000				1.000	
	Jemand, Qb							0.0					0.0	0.0				0.0	
Lano Width								12.0				1	20	12.0				12.0	0
Parking / Grade / Parking						-		N	0		N		<u>2.0</u> N	0		V	N	0	N
Parking Maneuvers, Nm														<u> </u>	<u> </u>	•			
Buses Stopping, NB								0					0	0	1			0	
Min. Time for Pedestrians. Gp			1					-	3.2		I		-	3.2				3.2	<u>I</u>
Phasing	WB Only		02	1	0	3		04		1	NB Or	าไง	N	S Perm			07	0	8
	G = 23.1	G =	0.0		G =	0.0	0	G = 0.0	.0 G = 28		3.2	G	= 33.7		G =	0.0	G =	0.0	
Iming	Y = 5	Y =	0		Y = (0	Y	(= 0	Y = 5			Y :	Y = 5 Y =			0	Y = 0)	
Duration of Ar	nalysis, T = 0.2	25											Су	cle Leng	gth,	C =	100.0		
Lane Group	Capacity, Cor	ntrol D	Delay,	and	l LOS	Deter	min	ation				·							
				E	В		<u> </u>		WB	_				NB				SB	
			LT		-	RT		<u>.T</u>	TH	F	RT	ן נו	Γ	TH	R	T	LT	I TH	RT
Adjusted Flow	/ Rate, v						48	37		<u> </u>		68	4	1047				1658	
Lane Group C	Capacity, c						39	97				55	7	2305				1128	
v/c Ratio, X							1.2	23				1.23	3 ().45				1.47	
Total Green R	Ratio, g/C						0.2	3		\downarrow		0.67	7 (0.67				0.34	
Uniform Delay	/, d ₁						38.	.5		<u> </u>		29.5	5	7.9				33.1	
Progression F	actor, PF						1.0	000				1.00	00	1.000				1.000	
Delay Calibra	tion, k						0.5	50				0.50	0 (D.11				0.50	
Incremental D	elay, d ₂						122	2.5				117	7.8	0.1				216.3	
Initial Queue	Delay, d ₃						0.0	0				0.0)	0.0				0.0	
Control Delay							160	0.9				147	7.3	8.0				249.5	
Lane Group L	OS						F	:				F		Α				F	
Approach Del	ау							160.	9				63.0)			2	49.5	
Approach LO	S							F					Е					SB T TH RT 2 0 TR 1206 286 5 5 0.90 0.90 A A 2.0 2.0 3.0 2.0 3.0 0 1.000 0 0.0 0 12.0 1 0 0 3.0 0 1.000 0 0.0 0 0.0 0 0.0 0 0.0 0 0.0 0 3.2 08 0 0 3.2 08 0 0 3.2 0.0 Y = 0 0 0.0 14128 1128 147 1658 1128 1.47 0.34 33.1 1.000 0.50 216.3 0.0 249.5 F 249.5 F 5<	
Intersection D	elay		155	.1			>	$X_{c} = 1.$	81			Inte	ersecti	on LOS				F	

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LEVEL OF SERVICE ANALYSIS PROPOSED SYSTEM





BASE YEAR 2013 INTERSTATE 40 MAINLINE

BASIC FREEWAY SEGMENTS WORKSHEET										
Image: state	BASIC FF	REEWAY SEC	GMENTS W	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, vp FFS, LOS, vp FFS, LOS, N FFS, N, AADT FFS, LOS, AADT FFS, LOS, N	Output LOS, S, D N, S, D v _p , S, D LOS, S, D N, S, D v _p , S, D				
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Eastbou	ınd)				
Agency or Company	RPM Transport	ation	From/To		west of SR-5	6				
Date Performed Analysis Time Period	5/22/2009 AM Peak Hour		Jurisdiction Analysis Yea	ır	Putnam Co 2013 Proposi Park	ed w/ Business				
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning							
Oper.(LOS)			es.(N)		Planning	g Data				
Flow Inputs Volume, V	2186	veh/h	Peak-Hour F	actor, PHF	0.90					
AADI		veh/day	% I rucks and	i Buses, P _T	22					
Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D Driver type adjustment	1.00	veh/h	%RVs, P _R General Terr Grade %	ain: Length Up/Down %	0 Level mi					
Calculate Flow Adjustm	nents									
f _p	1.00		E _R		1.2					
E _T	1.5		f _{HV} = 1/[1+P _T (E	= _T - 1) + P _R (E _R - 1)]	0.901					
Speed Inputs			Calc Spee	d Adj and FFS						
Lane Width	12.0	ft	f		0.0	mi/h				
Rt-Shoulder Lat. Clearance	6.0	ft	f		0.0	mi/h				
Interchange Density	0.50	l/mi	'LC f		0.0	mi/h				
Number of Lanes, N	2		'ID ¢		0.0 4 F	1111/11 mi/h				
FFS (measured)		mi/h	'N		4.0	rni/n				
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h				
LOS and Performance	Measures		Design (N	1						
<u>Operational (LOS)</u> v _n = (V or DDHV) / (PHF x N x	: f _{HV} x f _p) 1348	pc/h/ln	Design (N) Design LOS							
S	65.5	mi/h	$v_p = (V \text{ or } DE)$	DHV) / (PHF x N x f	HV x t _p)	pc/h				
$D = v_p / S$	20.6	pc/mi/ln	5			mi/h				
LOS	С	•	D = v _p / S Required Nu	mber of Lanes, N		pc/mi/ln				
Glossary			Factor Lo	cation						
N - Number of lanes	S - Speed		E _n - Exhibits	23-8. 23-10	f	, - Exhibit 23-4				
V - Hourly volume	D - Density		E_{τ} - Exhibits	23-8, 23-10, 23-11	·LW f. ~	- Exhibit 23-5				
v _p - Flow rate	FFS - Free-flow s	peed	f Page 23-	-12	·LC f. ··	- Exhibit 23-6				
LOS - Level of service	BFFS - Base free	-flow speed	LOS. S. FFS	. v Exhibits 23-2	'N . 23-3 f.₋	- Exhibit 23-7				
DDHV - Directional design hou	ur volume			, p	, _• • • 'ID					

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BASIC FREEWAY SEGMENTS WORKSHEET										
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	B C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, v _p FFS, LOS, v _p FFS, LOS, N FFS, N, AADT FFS, LOS, AA FFS, LOS, N	<u>Output</u> LOS, S, D N, S, D v _p , S, D LOS, S, D DT N, S, D v _p , S, D				
General Information			Site Inform	mation						
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Eastb	ound)				
Agency or Company	RPM Transport	ation	From/To		Between S	R-56 Ramps				
Date Performed	Consultants 5/22/2009		Jurisdiction		Putnam Co					
Analysis Time Period	AM Peak Hour		Analysis Yea	ır	2013 Propo Park	osed w/ Business				
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning							
Oper.(LOS)			Des.(N)		🗖 Plann	ing Data				
Flow Inputs										
Volume, V	2095	veh/h	Peak-Hour F	actor, PHF	0.90					
		ven/day		Buses, P _T	22					
Peak-Hr Prop. of AAD1, K			%RVS, P _R Conoral Torr	ain:	U Lovol					
$DDHV = AADT \times K \times D$		veh/h	Grade %	Length	mi					
Driver type adjustment	1.00			Up/Down %						
Calculate Flow Adjustn	nents									
f _p	1.00		E _R		1.2					
E _T	1.5		f _{HV} = 1/[1+P _T (E	_T - 1) + P _R (E _R - 1)]	0.901					
Speed Inputs			Calc Spee	d Adj and FFS						
Lane Width	12.0	ft	f		0.0	mi/b				
Rt-Shoulder Lat. Clearance	6.0	ft	'LW f		0.0	mi/h				
Interchange Density	0.50	I/mi	LC		0.0	mi/m				
Number of Lanes, N	2		^T ID		0.0	mi/h				
FFS (measured)		mi/h	f _N		4.5	mi/h				
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h				
LOS and Performance	Measures		Design (N)						
			Design (N)							
Operational (LOS)			Design LOS							
$v_p = (V \text{ or DDHV}) / (PHF x N x)$	(t _{HV} x t _p) <i>129</i> 2	pc/h/ln	$v_{p} = (V \text{ or } DE)$	DHV) / (PHF x N x f	H∖/ x f _n)	pc/h				
S	65.5	mi/h	S	, (nv p	mi/h				
$D = v_p / S$	19.7	pc/mi/ln	$D = v_n / S$			pc/mi/ln				
LOS	С		Required Nu	mber of Lanes, N		p 0,,				
Glossary			Factor Lo	cation						
N - Number of lanes	S - Speed		F ₋ - Exhibite	23-8 23-10	f	- Exhibit 23-4				
V - Hourly volume	D - Density			23-8 22-10 22-14	ן' נ	- Exhibit 23-5				
v _p - Flow rate	FFS - Free-flow s	speed	f - Page 22	.12	ןי ר	- Exhibit 22-6				
LOS - Level of service	BFFS - Base free	e-flow speed		$1 \leq 1 \leq$	23-3 t	- Exhibit 22 7				
DDHV - Directional design ho	ur volume			, v _p - LXIIIDIIS 23-2	, 20-0 I					

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BASIC FREEWAY SEGMENTS WORKSHEET										
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	B C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, vp FFS, LOS, vp FFS, LOS, N FFS, N, AAD FFS, LOS, AA FFS, LOS, N	<u>Output</u> LOS, S, D N, S, D v _p , S, D T LOS, S, D LDT N, S, D v _p , S, D				
General Information			Site Infor	mation						
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Eastb	ound)				
Agency or Company	RPM Transport	ation	From/To		Bt SR-56 &	Mine Lick Creek				
Date Performed	Consultants		Jurisdiction		Putnam Co					
Analysis Time Period	AM Peak Hour		Analysis Yea	ır	2013 Proposed w/ Business					
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning		raik					
Oper.(LOS)			Des.(N)		🔲 Plann	ing Data				
Flow Inputs										
Volume, V	2380	veh/h	Peak-Hour F	actor, PHF	0.90					
AADT		veh/day	%Trucks and	l Buses, P _T	22					
Peak-Hr Prop. of AADT, K			%RVs, P _R		0					
Peak-Hr Direction Prop, D		veh/h	General Terr	ain:	Level					
Driver type adjustment	1.00	Ven/m	Graue /	Up/Down %	1111					
Calculate Flow Adjustm	nents									
f	1.00		E _R		1.2					
E _T	1.5		f _{LIV} = 1/[1+P _T (E	E _T - 1) + P _P (E _P - 1)]	0.901					
Speed Inputs				d Adi and FFS						
Lane Width	12.0	ft								
Rt-Shoulder Lat Clearance	60	ft	t _{LW}		0.0	mi/h				
Interchange Density	0.50	l/mi	f _{LC}		0.0	mi/h				
Number of Lanes N	2	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	f _{ID}		0.0	mi/h				
FES (measured)	2	mi/b	f _N		4.5	mi/h				
Base free-flow Speed BEES	70.0	mi/h	FFS		65.5	mi/h				
LOS and Performance	Moasuros	1111/11	Decign (N	1						
LOS and Performance	vieasui es									
Operational (LOS)										
$v_p = (V \text{ or DDHV}) / (PHF x N x)$	c f _{HV} x f _p) <i>14</i> 68	pc/h/ln			v f \	(h.				
S	65.5	mi/h	$v_p = (v \text{ or } DL)$	יחע) / (PHF X N X f	HV X (p)	pc/n				
$D = v_p / S$	22.4	pc/mi/ln	5			mi/h				
LOS	С		$D = v_p / S$			pc/mi/ln				
	-		Required Nu	mber of Lanes, N						
Glossary			Factor Lo	cation						
N - Number of lanes	S - Speed		E _p - Exhibits	23-8, 23-10	f	Exhibit 23-4				
V - Hourly volume	D - Density		F ₊ - Fxhihite	23-8, 23-10, 23-11	f	- Exhibit 23-5				
v _p - Flow rate	FFS - Free-flow s	speed	f - Page 23-	12	f	- Exhibit 23-6				
LOS - Level of service	BFFS - Base free	e-flow speed		v - Evhibite 22.2)3-3 f	- Exhibit 23-7				
DDHV - Directional design ho	ur volume			, •p - Exhibits 23-2	, 20-0 I					

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BASIC FREEWAY SEGMENTS WORKSHEET							
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	B C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, v _p FFS, LOS, v _p FFS, LOS, N FFS, N, AADT FFS, LOS, AAD FFS, LOS, N	Output LOS, S, D N, S, D v _p , S, D LOS, S, D DT N, S, D v _p , S, D	
General Information			Site Inform	nation			
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Eastbo	ound)	
Agency or Company	RPM Transport	ation	From/To		Bt Mine Lick	Creek Ramps	
Date Performed	Consultants 5/22/2009		Jurisdiction		Putnam Co		
Analysis Time Period	AM Peak Hour		Analysis Yea	ır	2013 Propo Park	sed w/ Business	
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning				
Oper.(LOS)			Des.(N)		🔲 Plannii	ng Data	
Flow Inputs							
Volume, V	1496	veh/h	Peak-Hour F	actor, PHF	0.90		
		ven/day		i Buses, P _T	22		
Peak-Hr Prop. of AAD1, K			%RVS, P _R	oint	0 Loval		
DDHV = AADT x K x D		veh/h	Grade %	Lenath	mi		
Driver type adjustment	1.00			Up/Down %			
Calculate Flow Adjustn	nents						
f _p	1.00		E _R		1.2		
E _T	1.5		f _{HV} = 1/[1+P _T (E	E _T - 1) + P _R (E _R - 1)]	0.901		
Speed Inputs			Calc Spee	d Adj and FFS			
Lane Width	12.0	ft	4		0.0	mi/h	
Rt-Shoulder Lat. Clearance	6.0	ft	LW		0.0	1111/11	
Interchange Density	0.50	I/mi	^T LC		0.0	mi/h	
Number of Lanes. N	2		f _{ID}		0.0	mi/h	
FFS (measured)		mi/h	f _N		4.5	mi/h	
Base free-flow Speed BEES	70.0	mi/h	FFS		65.5	mi/h	
LOS and Performance	Measures		Design (N)			
			Design (N)				
Operational (LOS)			Design LOS				
$v_p = (V \text{ or DDHV}) / (PHF x N x)$	(f _{HV} x f _p) 923	pc/h/ln	$v = (V \text{ or } D\Gamma)$)HV) / (PHF x N x f		nc/h	
S	65.5	mi/h			HV ^ 'p/	pc/n mi/h	
$D = v_p / S$	14.1	pc/mi/ln	D = y/g			111/11 no/mi/ln	
LOS	В		Required Nu	mber of Lanes, N		pc/m/m	
Glossary			Factor Lo	cation			
N - Number of lanes	S - Speed					Full has t	
V - Hourly volume	D - Density		E _R - Exhibits	23-8, 23-10	f _L	W - Exhibit 23-4	
v - Flow rate	FFS - Free-flow s	peed	E _T - Exhibits	23-8, 23-10, 23-11	f _L	_C - Exhibit 23-5	
LOS - Level of service	BFFS - Base free	flow speed	f _p - Page 23-	12	f _N	- Exhibit 23-6	
DDHV - Directional design ho	ur volume		LOS, S, FFS	, v _p - Exhibits 23-2	, 23-3 f _{IC}	_o - Exhibit 23-7	

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BASIC FREEWAY SEGMENTS WORKSHEET							
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	B C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, vp FFS, LOS, vp FFS, LOS, N FFS, N, AAD FFS, LOS, AA FFS, LOS, N	<u>Output</u> LOS, S, D N, S, D v _p , S, D LOS, S, D DT N, S, D v _p , S, D	
General Information			Site Inform	nation			
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Eastb	ound)	
Agency or Company	RPM Transport	ation	From/To		Bt SR-135	& Mine Lick Creek	
Date Performed	Consultants 5/22/2009		Jurisdiction		Putnam Co	,	
Analysis Time Period	AM Peak Hour		Analysis Yea	ır	2013 Propo Park	osed w/ Business	
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning				
Oper.(LOS)			Des.(N)		Plann	ing Data	
Flow Inputs							
Volume, V	1793	veh/h	Peak-Hour F	actor, PHF	0.90		
		ven/day		i Buses, P _T	22		
Peak-Hr Prop. of AAD1, K			%RVS, P _R Conoral Torr	oin:	U Lovol		
$DDHV = AADT \times K \times D$		veh/h	Grade %	Length	mi		
Driver type adjustment	1.00			Up/Down %			
Calculate Flow Adjustn	nents						
f _p	1.00		E _R		1.2		
E _T	1.5		$f_{HV} = 1/[1+P_T(E)]$	_T - 1) + P _R (E _R - 1)]	0.901		
Speed Inputs			Calc Spee	d Adj and FFS			
Lane Width	12.0	ft	f		00	mi/h	
Rt-Shoulder Lat. Clearance	6.0	ft	f		0.0	mi/h	
Interchange Density	0.50	l/mi	LC		0.0	1111/11	
Number of Lanes, N	2		'ID		0.0	mi/n	
FFS (measured)		mi/h	† _N		4.5	mi/h	
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h	
LOS and Performance	Measures		Design (N)			
			Design (N)	-			
Operational (LOS)	f () (())		Design LOS				
$v_p = (V \text{ or } UUHV) / (PHF x N)$	ст _{НV} х т _р) <i>110</i> 6	pc/h/ln	$v_p = (V \text{ or } DE)$	DHV) / (PHF x N x f	HV x fp)	pc/h	
S	65.5	mi/h	S		··· P	mi/h	
$D = v_p / S$	16.9	pc/mi/ln	$D = v_p / S$			pc/mi/ln	
LOS	В		Required Nu	mber of Lanes, N		·	
Glossary			Factor Lo	cation			
N - Number of lanes	S - Speed		F Exhibite	23-8 23-10	f	Exhibit 23-4	
V - Hourly volume	D - Density		F Fxhihite	23-8 23-10 23-11	f	- Exhibit 23-5	
v _p - Flow rate	FFS - Free-flow s	peed	f - Page 22-	12 0, 20-10, 20-11	۱ ۴	- Exhibit 23-6	
LOS - Level of service	BFFS - Base free	e-flow speed		v - Exhibite 23-2	23-3 f	Exhibit 23-7	
DDHV - Directional design ho	ur volume		200, 0, 110	, *p = 20-2	, 200 I		

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BASIC FREEWAY SEGMENTS WORKSHEET							
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	B C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, vp FFS, LOS, vp FFS, LOS, N FFS, N, AADT FFS, LOS, AAI FFS, LOS, N	<u>Output</u> LOS, S, D N, S, D v _p , S, D LOS, S, D DT N, S, D v _p , S, D	
General Information			Site Infor	mation			
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Eastbo	ound)	
Agency or Company	RPM Transport	ation	From/To		Between SF	R-135 Ramps	
Date Performed	5/22/2009		Jurisdiction		Putnam Co		
Analysis Time Period	AM Peak Hour		Analysis Yea	ar	2013 Propo Park	sed w/ Business	
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning				
Oper.(LOS)			Des.(N)		🗖 Planni	ng Data	
Flow Inputs	4507		De al Illaur D		0.00		
	1537	veh/h	Peak-Hour F	actor, PHF	0.90		
Rook Hr Bron of AADT K		ven/day		Duses, F _T	22		
Peak-HI Plop. 01 AAD1, K Peak-Hr Direction Prop. D			General Terr	ain.	U Level		
$DDHV = AADT \times K \times D$		veh/h	Grade %	Length	mi		
Driver type adjustment	1.00			Up/Down %			
Calculate Flow Adjustn	nents						
f _p	1.00		E _R		1.2		
Ε _T	1.5		$f_{HV} = 1/[1+P_T(E)]$	E _T - 1) + P _R (E _R - 1)]	0.901		
Speed Inputs			Calc Spee	ed Adj and FFS			
Lane Width	12.0	ft	f		0.0	mi/h	
Rt-Shoulder Lat. Clearance	6.0	ft	f		0.0	mi/h	
Interchange Density	0.50	I/mi	'LC f		0.0	1111/11 mi/h	
Number of Lanes, N	2		'ID		0.0	mi/n	
FFS (measured)		mi/h	^t N		4.5	mi/h	
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h	
LOS and Performance	Measures		Design (N)			
			Design (N)	-			
Operational (LOS)			Design LOS				
$v_p = (V \text{ or DDHV}) / (PHF x N)$	(t _{HV} x t _p) <i>948</i>	pc/h/ln	$v_{p} = (V \text{ or } DE)$	DHV) / (PHF x N x f	HV X fp)	pc/h	
S	65.5	mi/h	S		nv p	mi/h	
$D = v_p / S$	14.5	pc/mi/ln	$D = v_{p} / S$			pc/mi/ln	
LOS	В		Required Nu	mber of Lanes, N		•	
Glossary			Factor Lo	cation			
N - Number of lanes	S - Speed		F Exhibite	23-8 23-10	f	- Exhibit 23-4	
V - Hourly volume	D - Density			23-8 22-10 22-14	י <u>ר</u> ו <i>ג</i>	- Exhibit 23-5	
v _p - Flow rate	FFS - Free-flow s	peed	f - Page 22	.12	י ו <u>ר</u> ג	- Exhibit 23-6	
LOS - Level of service	BFFS - Base free	e-flow speed		$1 \leq 1 \leq$	23-3 t		
DDHV - Directional design ho	ur volume			$v_p = LAHIDIIS 23-2$, ∠3-3 I _{II}		

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BASIC FREEWAY SEGMENTS WORKSHEET							
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	B C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (M) Planning (v _p)	Input FFS, N, v _p FFS, LOS, v _p FFS, LOS, N FFS, N, AADT FFS, LOS, AAD FFS, LOS, N	Output LOS, S, D N, S, D v _p , S, D LOS, S, D T N, S, D v _p , S, D	
General Information			Site Inform	mation			
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Eastbo	und)	
Agency or Company	RPM Transport	ation	From/To		east of SR-1	35	
Date Performed	5/22/2009		Jurisdiction		Putnam Co		
Analysis Time Period	AM Peak Hour		Analysis Yea	ar	2013 Propos Park	sed w/ Business	
Project Description 09-0402	Mine Lick Creek I	JS - TDOT OC I	Planning				
Oper.(LOS)			Des.(N)		🗖 Plannir	ng Data	
Flow Inputs			<u> </u>				
Volume, V	1867	veh/h	Peak-Hour F	actor, PHF	0.90		
AADT Book Hr Drop of AADT K		ven/day		Duses, r _T	22		
Peak-HI Prop. of AADT, K Peak-Hr Direction Prop. D			General Terr	ain.	U		
$DDHV = AADT \times K \times D$		veh/h	Grade %	Length	mi		
Driver type adjustment	1.00			Up/Down %			
Calculate Flow Adjustn	nents						
f _p	1.00		E _R		1.2		
E _T	1.5		$f_{HV} = 1/[1+P_T(E)]$	E _T - 1) + P _R (E _R - 1)]	0.901		
Speed Inputs			Calc Spee	ed Adj and FFS			
Lane Width	12.0	ft	f		0.0	mi/h	
Rt-Shoulder Lat. Clearance	6.0	ft	f		0.0	mi/h	
Interchange Density	0.50	I/mi	LC		0.0	1111/11	
Number of Lanes, N	2		'ID		0.0	mi/n	
FFS (measured)		mi/h	† _N		4.5	mi/h	
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h	
LOS and Performance	Measures		Design (N)			
			Design (N)				
Operational (LOS)			Design LOS				
$v_p = (V \text{ or DDHV}) / (PHF x N x)$	(f _{HV} x f _p) <i>1151</i>	pc/h/ln	$v_{p} = (V \text{ or } DE)$	DHV) / (PHF x N x f	HV x f	pc/h	
S	65.5	mi/h	S		nv p	mi/h	
$D = v_p / S$	17.6	pc/mi/ln	$D = v_{p} / S$			pc/mi/ln	
LOS	В		Required Nu	mber of Lanes, N		•	
Glossary			Factor Lo	cation			
N - Number of lanes	S - Speed		F _n - Fxhihite	23-8, 23-10	f	Exhibit 23-4	
V - Hourly volume	D - Density		F Fxhihite	23-8 23-10 23-11	'L\ f	- Exhibit 23-5	
v _p - Flow rate	FFS - Free-flow s	peed	f - Page 22-	.12	''''''''''''''''''''''''''''''''''''''	- Exhibit 23-6	
LOS - Level of service	BFFS - Base free	e-flow speed		V - Evhibite 22.2	'N 23-3 f	- Exhibit 23-7	
DDHV - Directional design ho	ur volume			$v_{p} = L \times 10003 \times 20^{-2}$, 20-0 ID		

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BASIC FREEWAY SEGMENTS WORKSHEET							
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	B C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (M) Planning (v _p)	Input FFS, N, v _p FFS, LOS, v _p FFS, LOS, N FFS, N, AADT FFS, LOS, AAL FFS, LOS, N	Output LOS, S, D N, S, D v _p , S, D LOS, S, D DT N, S, D v _p , S, D	
General Information			Site Inform	mation			
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Westb	ound)	
Agency or Company	RPM Transport	ation	From/To		East of SR-	135	
Date Performed	Consultants 5/22/2009		Jurisdiction		Putnam Co		
Analysis Time Period	AM Peak Hour		Analysis Yea	ar	2013 Propo Park	sed w/ Business	
Project Description 09-0402	Mine Lick Creek I	JS - TDOT OC I	Planning				
Oper.(LOS)			Des.(N)		🔲 Plannii	ng Data	
Flow Inputs							
Volume, V	2616	veh/h	Peak-Hour F	actor, PHF	0.90		
AADI		veh/day	% I rucks and	d Buses, P _T	22		
Peak-Hr Prop. of AAD1, K			%RVS, P _R	inin.	0		
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terr Grade %	ain: Length	Levei mi		
Driver type adjustment	1.00		0.000 /0	Up/Down %			
Calculate Flow Adjustm	nents						
f _p	1.00		E _R		1.2		
E _T	1.5		f _{HV} = 1/[1+P _T (E	E _T - 1) + P _R (E _R - 1)]	0.901		
Speed Inputs			Calc Spee	d Adi and FFS			
Lane Width	12.0	ft	4		0.0		
Rt-Shoulder Lat. Clearance	6.0	ft	LW		0.0	mi/n	
Interchange Density	0.50	I/mi	[†] LC		0.0	mi/h	
Number of Lanes, N	2		f _{ID}		0.0	mi/h	
FES (measured)	-	mi/h	f _N		4.5	mi/h	
Base free-flow Speed BEES	70.0	mi/h	FFS		65.5	mi/h	
LOS and Performance	Measures		Design (N)			
	incasures)			
Operational (LOS)							
$v_p = (V \text{ or DDHV}) / (PHF x N x)$	(f _{HV} x f _p) <i>1613</i>	pc/h/ln)H\/) / (DHE v N v f	yf)	no/h	
S	65.3	mi/h	$v_p = (V \cup DL)$		HV * ' p)	pc/n	
$D = v_p / S$	24.7	pc/mi/ln				mi/n	
LOS	С		$D = V_p / S$	mbor of Lanca N		pc/mi/ln	
Glassan							
	C Choose			cation			
	S - Speed		E _R - Exhibits	23-8, 23-10	f	_w - Exhibit 23-4	
v - Houriy volume	D - Density		E _T - Exhibits	23-8, 23-10, 23-11	f,	_C - Exhibit 23-5	
v _p - Flow rate	FFS - Free-flow s	peea	f Page 23-	·12	f	- Exhibit 23-6	
LOS - Level of service	BFFS - Base free	e-flow speed	LOS, S, FFS	s, v _p - Exhibits 23-2	, 23-3 f _{ır}	- Exhibit 23-7	
DDHV - Directional design ho	ur volume			Υ.Υ.Υ.	IL IL	,	

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BASIC FREEWAY SEGMENTS WORKSHEET							
$\begin{array}{c c} (1) \\ (1) \\ (2) \\ (3)$	1200 Flow Rate (pc/h/ln)		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (M) Planning (v _p)	Input FFS, N, v _p FFS, LOS, v _p FFS, LOS, N FFS, N, AADT FFS, LOS, AAD FFS, LOS, N	Output LOS, S, D N, S, D v _p , S, D LOS, S, D T N, S, D v _p , S, D	
General Information			Site Infor	mation			
Analyst	ALB	ation	Highway/Dire	ection of Travel	I-40 (Westbo	ound)	
Agency or Company	Consultants	allon	From/To		Between SR	-135 Ramps	
Date Performed	5/22/2009		Jurisdiction		Putnam Co		
Analysis Time Period	AM Peak Hour		Analysis Yea	r	2013 Propos Park	ed w/ Business	
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning				
Oper.(LOS)			Des.(N)		Plannir 🗌	ng Data	
Flow Inputs	2202	vob/b	Dook Hour E	actor DHE	0.00		
	2202	ven/n veh/dav	%Trucks and	Buses, P-	0.90 22		
Peak-Hr Prop. of AADT K		i on a day	%RVs.P _n		0		
Peak-Hr Direction Prop, D			General Terr	ain:	Level		
DDHV = AADT x K x D		veh/h	Grade %	Length	mi		
Driver type adjustment	1.00			Up/Down %			
					4.0		
'p 	1.00		⊢R f (% D (5		1.2		
	1.5		$I_{HV} = 1/(1+P_T)$	$(E_{\rm T} - 1) + P_{\rm R}(E_{\rm R} - 1)]$	0.901		
Speed Inputs			Calc Spee	d Adj and FFS			
Lane Width	12.0	tt L	f _{LW}		0.0	mi/h	
Rt-Shoulder Lat. Clearance	6.0	π 	f _{LC}		0.0	mi/h	
Interchange Density	0.50	I/mi	f _{ID}		0.0	mi/h	
Number of Lanes, N	2		f _N		4.5	mi/h	
FFS (measured)		mi/h	FES		65.5	mi/h	
Base free-flow Speed, BFFS	70.0	mi/h				,	
LOS and Performance I	Measures		Design (N)			
Operational (LOS)			Design (N)				
$v_{p} = (V \text{ or DDHV}) / (PHF x N x)$	(f _{HV} x f _p) <i>13</i> 58	pc/h/ln	Design LOS				
S	65.5	mi/h	$v_p = (V \text{ or } DD)$	DHV) / (PHF x N x f	HV x f _p)	pc/h	
$D = v_{r} / S$	20.7	pc/mi/ln	S			mi/h	
LOS	<u>с</u>	F -1110 (1)	$D = v_p / S$			pc/mi/ln	
	~		Required Nu	mber of Lanes, N			
Glossary			Factor Lo	cation			
N - Number of lanes	S - Speed		E _p - Exhibits	23-8, 23-10	f	v - Exhibit 23-4	
V - Hourly volume	D - Density		E_{τ} - Exhibits	23-8, 23-10, 23-11	•L\ f. ,	- Exhibit 23-5	
v _p - Flow rate	FFS - Free-flow s	peed	f Page 23-	12	۰LC f	- Exhibit 23-6	
LOS - Level of service	BFFS - Base free	e-flow speed	LOS, S. FFS	v Exhibits 23-2	'N . 23-3 f	- Exhibit 23-7	
DDHV - Directional design ho	ur volume			, p	, _~ 'ID		

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BASIC FREEWAY SEGMENTS WORKSHEET							
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	B C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, vp FFS, LOS, vp FFS, LOS, N FFS, N, AAD FFS, LOS, AA FFS, LOS, N	<u>Output</u> LOS, S, D N, S, D v _p , S, D LOS, S, D DT N, S, D v _p , S, D	
General Information			Site Infor	mation			
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Westl	bound)	
Agency or Company	RPM Transport	ation	From/To		Bt SR-135	& Mine Lick Creek	
Date Performed	Consultants 5/22/2009		Jurisdiction		Putnam Co		
Analysis Time Period	AM Peak Hour		Analysis Yea	ır	2013 Propo Park	osed w/ Business	
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning				
Oper.(LOS)			Des.(N)		Plann	ing Data	
Flow Inputs							
Volume, V	2352	veh/h	Peak-Hour F	actor, PHF	0.90		
AADI		veh/day	% I rucks and	Buses, P _T	22		
Peak-Hr Prop. of AAD1, K			%RVS, P _R		0		
$DDHV = AADT \times K \times D$		veh/h	General Terr Grade %	Length	Levei mi		
Driver type adjustment	1.00			Up/Down %			
Calculate Flow Adjustm	nents						
f _p	1.00		E _R		1.2		
E _T	1.5		f _{HV} = 1/[1+P _T (E	E _T - 1) + P _R (E _R - 1)]	0.901		
Speed Inputs			Calc Spee	d Adj and FFS			
Lane Width	12.0	ft	4		0.0	mi/h	
Rt-Shoulder Lat. Clearance	6.0	ft	LW		0.0	1111/11 	
Interchange Density	0.50	I/mi	LC		0.0	mi/h	
Number of Lanes, N	2		† _{ID}		0.0	mi/h	
FFS (measured)		mi/h	f _N		4.5	mi/h	
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h	
LOS and Performance	Measures		Desian (N)			
			Design (N)	/			
Operational (LOS)			Design LOS				
v _p = (V or DDHV) / (PHF x N x	c f _{HV} x f _p) <i>1450</i>	pc/h/ln	$v_n = (V \text{ or } DE)$) / (PHF x N x f	uv x f_)	pc/h	
S	65.5	mi/h	s	, (πv p [,]	mi/h	
$D = v_p / S$	22.1	pc/mi/ln	$D = v_c / S$			pc/mi/ln	
LOS	С		Required Nu	mber of Lanes, N		P 9/111/111	
Glossary			Factor Lo	cation			
N - Number of lanes	S - Speed		E - Evhibito	23-8 23-10	f	- Exhibit 23-4	
V - Hourly volume	D - Density			20-0, 20-10 22-8 22-10 22 44	ا ۲	- Exhibit 22 5	
v _p - Flow rate	FFS - Free-flow s	speed		20-0, 20-10, 23-11	Ĩ	LC - EXHIDIL 23-5	
LOS - Level of service	BFFS - Base free	e-flow speed	1 - Fage 23-	$\frac{12}{12}$	1 22.2 f		
DDHV - Directional design ho	ur volume		105, 5, FF5	$v_p = \text{Exhibits } 23-2$, 23-3 T		

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BASIC FREEWAY SEGMENTS WORKSHEET							
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	B C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, vp FFS, LOS, vp FFS, LOS, N FFS, N, AADT FFS, LOS, AAI FFS, LOS, N	<u>Output</u> LOS, S, D N, S, D v _p , S, D LOS, S, D DT N, S, D v _p , S, D	
General Information			Site Inforr	mation			
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Westb	ound)	
Agency or Company	RPM Transport	ation	From/To		Bt Mine Lici	k Creek Ramps	
Date Performed	Consultants 5/22/2009		Jurisdiction		Putnam Co		
Analysis Time Period	AM Peak Hour		Analysis Yea	ır	2013 Propo Park	osed w/ Business	
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning				
Oper.(LOS)			Des.(N)		Planni	ng Data	
Flow Inputs							
Volume, V	1262	veh/h	Peak-Hour F	actor, PHF	0.90		
		ven/day		Buses, P _T	22		
Peak-Hr Prop. of AAD1, K			%RVS, P _R		0 Lovol		
DDHV = AADT x K x D		veh/h	Grade %	Length	mi		
Driver type adjustment	1.00			Up/Down %			
Calculate Flow Adjustn	nents						
f _p	1.00		E _R		1.2		
E _T	1.5		f _{HV} = 1/[1+P _T (E	E _T - 1) + P _R (E _R - 1)]	0.901		
Speed Inputs			Calc Spee	d Adj and FFS			
Lane Width	12.0	ft	4		0.0	mi/h	
Rt-Shoulder Lat. Clearance	6.0	ft	LW		0.0	1111/11	
Interchange Density	0.50	I/mi	^T LC		0.0	mi/h	
Number of Lanes. N	2		f _{ID}		0.0	mi/h	
FFS (measured)		mi/h	f _N		4.5	mi/h	
Base free-flow Speed BEES	70.0	mi/h	FFS		65.5	mi/h	
LOS and Performance	Measures		Design (N)			
			Design (N)	/			
Operational (LOS)			Design LOS				
$v_p = (V \text{ or DDHV}) / (PHF x N x)$	(f _{HV} x f _p) 778	pc/h/ln	$v = (V \text{ or } D\Gamma)$)HV) / (PHF x N x f	xf)	nc/h	
S	65.5	mi/h			HV ^ 'p'	pc/h mi/h	
$D = v_p / S$	11.9	pc/mi/ln	D = y/g			no/mi/ln	
LOS	В		Required Nu	mber of Lanes, N		pc/mi/m	
Glossary			Factor Lo	cation			
N - Number of lanes	S - Speed						
V - Hourly volume	D - Density		E _R - Exhibits	23-8, 23-10	fL	W - Exhibit 23-4	
v - Flow rate	FFS - Free-flow s	peed	E _T - Exhibits	23-8, 23-10, 23-11	fL	_{-C} - Exhibit 23-5	
LOS - Level of service	BFFS - Base free	e-flow speed	f _p - Page 23-	12	f _N	_v - Exhibit 23-6	
DDHV - Directional design ho	ur volume		LOS, S, FFS	i, v _p - Exhibits 23-2	, 23-3 f _l	_D - Exhibit 23-7	

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BASIC FREEWAY SEGMENTS WORKSHEET							
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	B C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, v _p FFS, LOS, v _p FFS, LOS, N FFS, N, AADT FFS, LOS, AA FFS, LOS, N	<u>Output</u> LOS, S, D N, S, D v _p , S, D LOS, S, D DT N, S, D v _p , S, D	
General Information			Site Inforr	nation			
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Westl	oound)	
Agency or Company	RPM Transport	ation	From/To		Bt SR-56 &	Mine Lick Creek	
Date Performed	5/22/2009		Jurisdiction		Putnam Co	,	
Analysis Time Period	AM Peak Hour		Analysis Yea	ır	2013 Propo Park	osed w/ Business	
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning				
Oper.(LOS)			Des.(N)		Plann	ing Data	
Flow Inputs	4.405	· · · · · · · · · · · ·	De als Llaver D		0.00		
Volume, V	1405	ven/n veb/dav	%Trucks and	actor, PHF I Buses P_	0.90		
Peak-Hr Prop. of AADT. K		ven/uay		T Duscs, 1 T	0		
Peak-Hr Direction Prop. D			General Terr	ain:	l evel		
$DDHV = AADT \times K \times D$		veh/h	Grade %	Length	mi		
Driver type adjustment	1.00			Up/Down %			
Calculate Flow Adjustn	nents		_				
t _p	1.00		E _R		1.2		
E _T	1.5		$f_{HV} = 1/[1+P_T(E_T)]$	T - 1) + P _R (E _R - 1)]	0.901		
Speed Inputs			Calc Spee	d Adj and FFS			
Lane Width	12.0	ft	f _{LW}		0.0	mi/h	
Rt-Shoulder Lat. Clearance	6.0	ft	f		0.0	mi/h	
Interchange Density	0.50	l/mi	fin		0.0	mi/h	
Number of Lanes, N	2		f		15	mi/b	
FFS (measured)		mi/h	'N		4.0 05 5		
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/n	
LOS and Performance	Measures		Design (N)			
Operational (LOS)			<u>Design (N)</u>				
v = (V or DDH)/) / (PHE x N x)	(f x f) 903	nc/h/ln	Design LOS				
$v_p = (v \circ i b b i v) / (i i i x i v)$	(1 _{HV} x 1 _p) 903		v _p = (V or DD	0HV) / (PHF x N x f	_{HV} x f _p)	pc/h	
	00.0		S			mi/h	
$v = v_p / \delta$	13.8	pc/m/m	$D = v_p / S$			pc/mi/ln	
	В		Required Nu	mber of Lanes, N			
Glossary			Factor Lo	cation			
N - Number of lanes	S - Speed		F - Exhibite	23-8 23-10	f	- Exhibit 23-4	
V - Hourly volume	D - Density			23-8 22-10 22-11	ار ب	- Exhibit 23-5	
v _p - Flow rate	FFS - Free-flow s	peed	f - Page 22	20-0, 20-10, 20-11 12	ا ۱ ۲	- Exhibit 22-6	
LOS - Level of service	BFFS - Base free	e-flow speed		v - Exhibite 22.2	23-3 f	- Exhibit 23-7	
DDHV - Directional design ho	ur volume			$v_p = LAHORS 23-2$, 20-0 I		

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BASIC FREEWAY SEGMENTS WORKSHEET							
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	B C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, vp FFS, LOS, vp FFS, LOS, N FFS, N, AADT FFS, LOS, AAI FFS, LOS, N	Output LOS, S, D N, S, D v _p , S, D LOS, S, D DT N, S, D v _p , S, D	
General Information			Site Infor	mation			
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Westb	ound)	
Agency or Company	RPM Transport	ation	From/To		Between SF	R-56 Ramps	
Date Performed	Consultants		Jurisdiction		Putnam Co		
Analysis Time Period	AM Peak Hour		Analysis Yea	ar	2013 Propo Park	sed w/ Business	
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning				
Oper.(LOS)			Des.(N)		🗖 Planni	ng Data	
Flow Inputs							
Volume, V	1292	veh/h	Peak-Hour F	actor, PHF	0.90		
AADT Book Hr Drop of AADT K		ven/day		Duses, r _T	22		
Peak-HI Prop. of AADT, K Peak-Hr Direction Prop. D			General Terr	ain.	U Lovol		
$DDHV = AADT \times K \times D$		veh/h	Grade %	Length	mi		
Driver type adjustment	1.00			Up/Down %			
Calculate Flow Adjustn	nents						
f _p	1.00		E _R		1.2		
Ε _T	1.5		$f_{HV} = 1/[1+P_T(E)]$	E _T - 1) + P _R (E _R - 1)]	0.901		
Speed Inputs			Calc Spee	ed Adj and FFS			
Lane Width	12.0	ft	f		0.0	mi/h	
Rt-Shoulder Lat. Clearance	6.0	ft	f		0.0	mi/h	
Interchange Density	0.50	I/mi	'LC f		0.0	mi/h	
Number of Lanes, N	2		'ID		0.0	1111/11 	
FFS (measured)		mi/h	т _N		4.5	mi/n	
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h	
LOS and Performance	Measures		Design (N)			
Operational (LOC)			Design (N)				
	(() 7 07		Design LOS				
$v_p = (V OI D D H V) / (PHF X N)$	(1 _{HV} x 1 _p) /9/	pc/n/in	$v_p = (V \text{ or } DE)$	DHV) / (PHF x N x f	f _{HV} x f _p)	pc/h	
S (2	65.5	mi/h	S		···· F	mi/h	
$D = v_p / S$	12.2	pc/mi/ln	$D = v_{D} / S$			pc/mi/ln	
	В		Required Nu	mber of Lanes, N		·	
Glossary			Factor Lo	cation			
N - Number of lanes	S - Speed		F - Exhibite	23-8 23-10	f	- Exhibit 23-4	
V - Hourly volume	D - Density			23-8 22-10 22-14	י <u>ר</u> ו <i>ג</i>	- Exhibit 23-5	
v _p - Flow rate	FFS - Free-flow s	peed	f - Page 22	.12	י ו <u>ר</u> ג	- Exhibit 23-6	
LOS - Level of service	BFFS - Base free	e-flow speed		v - Exhibite 22.2	23-3 f	- Exhibit 23-7	
DDHV - Directional design ho	ur volume			$v_p \sim r_p \sim r_p$, 20-0 I _{II}		

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BASIC FREEWAY SEGMENTS WORKSHEET							
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	B C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (M) Planning (v _p)	Input FFS, N, v _p FFS, LOS, v _p FFS, LOS, N FFS, N, AADT FFS, LOS, AAI FFS, LOS, N	Output LOS, S, D N, S, D v _p , S, D LOS, S, D DT N, S, D v _p , S, D	
General Information			Site Inforr	mation			
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Westb	ound)	
Agency or Company	RPM Transport	ation	From/To		west of SR-	56	
Date Performed	5/22/2009		Jurisdiction		Putnam Co		
Analysis Time Period	AM Peak Hour		Analysis Yea	ır	2013 Propo Park	sed w/ Business	
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning				
Oper.(LOS)			Des.(N)		🔲 Planni	ng Data	
Flow Inputs							
Volume, V	1437	veh/h	Peak-Hour F	actor, PHF	0.90		
		ven/day		i Buses, P _T	22		
Peak-Hr Prop. of AAD1, K			%RVS, P _R Conoral Torr	oin:	U		
$DDHV = AADT \times K \times D$		veh/h	Grade %	Length	mi		
Driver type adjustment	1.00			Up/Down %			
Calculate Flow Adjustn	nents						
f _p	1.00		E _R		1.2		
E _T	1.5		$f_{HV} = 1/[1+P_T(E)]$	_T - 1) + P _R (E _R - 1)]	0.901		
Speed Inputs			Calc Spee	d Adj and FFS			
Lane Width	12.0	ft	f		0.0	mi/h	
Rt-Shoulder Lat. Clearance	6.0	ft	f		0.0	mi/h	
Interchange Density	0.50	I/mi	LC		0.0		
Number of Lanes, N	2		^I ID		0.0	mi/n	
FFS (measured)		mi/h	† _N		4.5	mi/h	
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h	
LOS and Performance	Measures		Design (N)			
			Design (N)	-			
Operational (LOS)	(() 000		Design LOS				
$v_p = (V \text{ or DDHV}) / (PHF x N)$	(f _{HV} x f _p) 886	pc/h/ln	$v_{p} = (V \text{ or } DE)$) / (PHF x N x f	HV x f _n)	pc/h	
S	65.5	mi/h	S		···· P	mi/h	
$D = v_p / S$	13.5	pc/mi/ln	$D = v_n / S$			pc/mi/ln	
LOS	В		Required Nu	mber of Lanes, N		-	
Glossary			Factor Lo	cation			
N - Number of lanes	S - Speed		F Exhibite	23-8 23-10	f	Exhibit 23-4	
V - Hourly volume	D - Density		F Exhibite	23-8 23-10 23-11	'L f	Exhibit 23-5	
v _p - Flow rate	FFS - Free-flow s	peed	f - Page 22	-20-0, 20-10, 20-11 12	۱ _۲	- Exhibit 23-6	
LOS - Level of service	BFFS - Base free	e-flow speed		v - Exhibite 22.2	23-3 f	- Evhibit 22-7	
DDHV - Directional design ho	ur volume			, vp - LAHIDIIS 23-2	, 20-0 I _{II}		

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BASIC FREEWAY SEGMENTS WORKSHEET							
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	B C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, v _p FFS, LOS, v _p FFS, LOS, N FFS, N, AADT FFS, LOS, AAD FFS, LOS, N	Output LOS, S, D N, S, D v _p , S, D LOS, S, D DT N, S, D v _p , S, D	
General Information			Site Inform	mation			
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Eastbo	ound)	
Agency or Company	RPM Transport	ation	From/To		west of SR-	56	
Date Performed	Consultants 5/22/2009		Jurisdiction		Putnam Co		
Analysis Time Period	PM Peak Hour		Analysis Yea	ır	2013 Propo Park	sed w/ Business	
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning				
Oper.(LOS)			es.(N)		🔲 Plannii	ng Data	
Flow Inputs							
Volume, V	1830	veh/h	Peak-Hour F	actor, PHF	0.90		
		ven/day		Buses, P _T	22		
Peak-Hr Prop. of AAD1, K			%RVS, P _R Conoral Torr	ain:	U		
$DDHV = AADT \times K \times D$		veh/h	Grade %	Length	mi		
Driver type adjustment	1.00			Up/Down %			
Calculate Flow Adjustn	nents						
f _p	1.00		E _R		1.2		
E _T	1.5		f _{HV} = 1/[1+P _T (E	E _T - 1) + P _R (E _R - 1)]	0.901		
Speed Inputs			Calc Spee	d Adj and FFS			
Lane Width	12.0	ft	f		0.0	mi/h	
Rt-Shoulder Lat. Clearance	6.0	ft	f		0.0	mi/h	
Interchange Density	0.50	I/mi	LC		0.0	111/11	
Number of Lanes, N	2		^I ID		0.0	mi/n	
FFS (measured)		mi/h	† _N		4.5	mi/h	
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h	
LOS and Performance	Measures		Design (N)			
			Design (N)				
Operational (LOS)			Design LOS				
$v_p = (V \text{ or DDHV}) / (PHF x N)$	(f _{HV} x f _p) <i>1129</i>	pc/h/ln	$v_{p} = (V \text{ or } DE)$	DHV) / (PHF x N x f	HV X f	pc/h	
S	65.5	mi/h	S		nv p	mi/h	
$D = v_p / S$	17.2	pc/mi/ln	$D = v_p / S$			pc/mi/ln	
LOS	В		Required Nu	mber of Lanes, N		P	
Glossary			Factor Lo	cation			
N - Number of lanes	S - Speed		E - Evhibito	23-8 23-10	f	- Exhibit 23-4	
V - Hourly volume	D - Density			20-0, 20-10 22-8 22-10 22 44	۱ _۲	- Exhibit 22 5	
v _p - Flow rate	FFS - Free-flow s	peed		20-0, 20-10, 23-11	TL.	C^{-} EXHIBIT 23-5	
LOS - Level of service	BFFS - Base free	e-flow speed	1 - Fage 23-	$\frac{12}{12}$	IN IN	- EXHIDIL 23-0	
DDHV - Directional design ho	ur volume		105, 5, FF5	$v_p = \text{Exhibits } 23-2$, ∠3-3 T _{IE}) - ⊑xnidit 23-7	

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BASIC FREEWAY SEGMENTS WORKSHEET							
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	B C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, vp FFS, LOS, vp FFS, LOS, N FFS, N, AADT FFS, LOS, AAD FFS, LOS, N	Output LOS, S, D N, S, D V _P , S, D LOS, S, D T N, S, D V _P , S, D	
General Information			Site Infor	mation			
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Eastbo	und)	
Agency or Company	RPM Transport	ation	From/To		Between SR	2-56 Ramps	
Date Performed	Consultants 5/22/2009		Jurisdiction		Putnam Co		
Analysis Time Period	PM Peak Hour		Analysis Yea	ar	2013 Propos Park	sed w/ Business	
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning				
Oper.(LOS)			Des.(N)		🔲 Plannir	ng Data	
Flow Inputs							
Volume, V	1629	veh/h	Peak-Hour F	actor, PHF	0.90		
		ven/day		i Buses, P _T	22		
Peak-Hr Prop. of AAD1, K			%RVS, P _R Conoral Torr	ioin:	U		
DDHV = AADT x K x D		veh/h	Grade %	Length	mi		
Driver type adjustment	1.00			Up/Down %			
Calculate Flow Adjustn	nents						
fp	1.00		E _R		1.2		
E _T	1.5		f _{HV} = 1/[1+P _T (E	E _T - 1) + P _R (E _R - 1)]	0.901		
Speed Inputs			Calc Spee	d Adj and FFS			
Lane Width	12.0	ft	4		0.0	mi/h	
Rt-Shoulder Lat. Clearance	6.0	ft	LW		0.0	1111/11	
Interchange Density	0.50	I/mi	^T LC		0.0	mi/h	
Number of Lanes. N	2		f _{ID}		0.0	mi/h	
FFS (measured)		mi/h	f _N		4.5	mi/h	
Base free-flow Speed, BEES	70.0	mi/h	FFS		65.5	mi/h	
LOS and Performance	Measures		Design (N)			
			Design (N)	1			
Operational (LOS)			Design LOS				
$v_p = (V \text{ or DDHV}) / (PHF x N)$	k f _{HV} x f _p) <i>1005</i>	pc/h/ln	$V = (V \text{ or } D\Gamma)$)HV) / (PHF x N x f	xf)	nc/h	
S	65.5	mi/h			HV ^ 'p'	pc/n mi/h	
$D = v_p / S$	15.3	pc/mi/ln	D = y/g			no/~://>	
LOS	В		Required Nu	mber of Lanes N		pc/m/m	
Glossary			Factor Lo	cation			
N - Number of lanes	S - Sneed						
	D - Density		E _R - Exhibits	23-8, 23-10	f _{L\}	_N - Exhibit 23-4	
v - Flow rate	FFS - Free-flow e	need	E _T - Exhibits	23-8, 23-10, 23-11	f _{LC}	₂ - Exhibit 23-5	
I OS - Loval of convice	REES Boon from		f _p - Page 23-	·12	f _N	- Exhibit 23-6	
DDH// - Directional design ba		-now speed	LOS, S, FFS	5, v _p - Exhibits 23-2	, 23-3 f _{ID}	- Exhibit 23-7	
- Directional design no							

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BASIC FREEWAY SEGMENTS WORKSHEET								
$\begin{array}{c c} 80 & \hline Free-Flow Spzeed FES = 75 minh \\ 70 & 65 minh \\ 60 & 60 \\ 50 & 55 minh \\ 50 & 0 \\ 50 & 0 \\ 80 & 55 minh \\ 70 & 60 \\ 55 & 10 \\ 10 & 55 \\ 10 & 0 \\ 10 & 55 \\ 10 & 0 \\ 10 & 56 \\ 10 & 5$	1300 1300 B. C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (M) Planning (v _p)	Input FFS, N, v _p FFS, LOS, v _p FFS, LOS, N FFS, N, AADT FFS, LOS, AAE FFS, LOS, N	Output LOS, S, D N, S, D V _P , S, D LOS, S, D T N, S, D V _P , S, D		
General Information			Site Inforr	mation				
Analyst	ALB	- (Highway/Dire	ection of Travel	I-40 (Eastbo	und)		
Agency or Company	Consultants	ation	From/To		Bt SR-56 &	Mine Lick Creek		
Date Performed	5/22/2009		Jurisdiction		Putnam Co			
Analysis Time Period	PM Peak Hour		Analysis Yea	ır	2013 Propos Park	sed w/ Business		
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning		_			
Oper.(LOS)			Des.(N)		Plannii	ng Data		
Flow Inputs	1769	voh/h	Dook Hour E	actor DUE	0.00			
	1700	ven/n veh/dav	%Trucks and	Buses, P-	0.90 22			
Peak-Hr Prop. of AADT, K		i on a day	%RVs. P _p		0			
Peak-Hr Direction Prop, D			General Terr	ain:	Level			
DDHV = AADT x K x D		veh/h	Grade %	Length	mi			
Driver type adjustment	1.00			Up/Down %				
					1.0			
'p F	1.00		⊢R f (% D (5		1.2			
	1.5		$I_{HV} = 1/(1+P_T)$	$(E_{\rm T} - 1) + P_{\rm R}(E_{\rm R} - 1)]$	0.901			
Speed Inputs			Calc Spee	ed Adj and FFS				
Lane Width	12.0	tt L	f _{LW}		0.0	mi/h		
Rt-Shoulder Lat. Clearance	6.0	π 	f _{LC}		0.0	mi/h		
Interchange Density	0.50	I/mi	f _{ID}		0.0	mi/h		
Number of Lanes, N	2		f _N		4.5	mi/h		
FFS (measured)		mi/h	FES		65.5	mi/h		
Base free-flow Speed, BFFS	70.0	mi/h				,		
LOS and Performance I	Measures		Design (N)				
Operational (LOS)			Design (N)					
$v_{p} = (V \text{ or } DDHV) / (PHF x N x)$	(f _{HV} x f _p) <i>1090</i>	pc/h/ln	Design LOS			r.		
S	65.5	mi/h	$v_p = (V \text{ or } DD)$	DHV) / (PHF x N x f	_{HV} x f _p)	pc/h		
$D = v_p / S$	16.6	pc/mi/ln	S			mi/h		
LOS	B	L	$D = v_p / S$			pc/mi/ln		
			Required Nu	mber of Lanes, N				
Glossary			Factor Lo	cation				
N - Number of lanes	S - Speed		E _R - Exhibits	23-8, 23-10	f, ,	N - Exhibit 23-4		
V - Hourly volume	D - Density		E _T - Exhibits	23-8, 23-10, 23-11	f, .	- Exhibit 23-5		
v _p - Flow rate	FFS - Free-flow s	peed	f Page 23-	12	f.,	- Exhibit 23-6		
LOS - Level of service	BFFS - Base free	e-flow speed	LOS, S, FFS	, v _p - Exhibits 23-2	، 23-3 f،₋	- Exhibit 23-7		
DDHV - Directional design ho	ur volume		, _, _	. р — — — — — — — — — — — — — — — — — —	· · · · · IL	, -		

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BASIC FREEWAY SEGMENTS WORKSHEET							
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	B C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (M) Planning (v _p)	Input FFS, N, v _p FFS, LOS, v _p FFS, LOS, N FFS, N, AADT FFS, LOS, AAD FFS, LOS, N	Output LOS, S, D N, S, D V _p , S, D LOS, S, D DT N, S, D V _p , S, D	
General Information			Site Inform	mation			
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Eastbo	ound)	
Agency or Company	RPM Transport	ation	From/To		Bt Mine Lick	Creek Ramps	
Date Performed	Consultants 5/22/2009		Jurisdiction		Putnam Co		
Analysis Time Period	PM Peak Hour		Analysis Yea	ır	2013 Propo Park	sed w/ Business	
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning				
Oper.(LOS)			Des.(N)		🗖 Planni	ng Data	
Flow Inputs	1 100		De al Illaur E		0.00		
Volume, V	1482	veh/h veh/dav	Peak-Hour F	actor, PHF	0.90		
Rook Hr Bron of AADT K		ven/uay		1 Duses, 1 T	0		
Peak-HI Plop. 01 AAD1, K Peak-Hr Direction Prop. D			General Terr	ain.	U Level		
$DDHV = AADT \times K \times D$		veh/h	Grade %	Length	mi		
Driver type adjustment	1.00			Up/Down %			
Calculate Flow Adjustn	nents		_				
f _p	1.00		E _R		1.2		
E _T	1.5		$f_{HV} = 1/[1+P_T(E)]$	_T - 1) + P _R (E _R - 1)]	0.901		
Speed Inputs			Calc Spee	ed Adj and FFS			
Lane Width	12.0	ft	f.w		0.0	mi/h	
Rt-Shoulder Lat. Clearance	6.0	ft	f. a		0.0	mi/h	
Interchange Density	0.50	I/mi	LC f		0.0		
Number of Lanes, N	2		'ID		0.0		
FFS (measured)		mi/h	T _N		4.5	mı/n	
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h	
LOS and Performance	Measures		Design (N)			
Operational (LOS)			<u>Design (N)</u>				
		··· • //• // ·	Design LOS				
$v_p = (V OI DDHV) / (PHF X N X)$	(1 _{HV} x 1 _p) 914	pc/n/in	$v_p = (V \text{ or } DE)$	DHV) / (PHF x N x f	HV x f _p)	pc/h	
S (C	65.5	mi/h	s		F	mi/h	
$D = v_p / S$	14.0	pc/mi/ln	$D = v_p / S$			pc/mi/ln	
LOS	В		Required Nu	mber of Lanes, N			
Glossary			Factor Lo	cation			
N - Number of lanes	S - Speed		E _ Evhibita	23-8 23-10	£	- Exhibit 22.4	
V - Hourly volume	D - Density			20-0, 20-10 22-0 22 10 22 44	۱ _۲	- Evhibit 22 5	
v _p - Flow rate	FFS - Free-flow s	speed		20-0, 20-10, 20-11	TL	C - EXHIDIL 23-5	
LOS - Level of service	BFFS - Base free	e-flow speed	¹ _p - Page 23-				
DDHV - Directional design ho	ur volume		LUS, S, FFS	$v_p - Exhibits 23-2$, ∠3-3 f _{I[}) - Exhibit 23-7	

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BASIC FREEWAY SEGMENTS WORKSHEET							
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	B C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (M) Planning (v _p)	Input FFS, N, v _p FFS, LOS, v _p FFS, LOS, N FFS, N, AADT FFS, LOS, AA FFS, LOS, N	<u>Output</u> LOS, S, D N, S, D v _p , S, D LOS, S, D DT N, S, D v _p , S, D	
General Information			Site Infor	mation			
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Eastb	ound)	
Agency or Company	RPM Transport	ation	From/To		Bt SR-135	& Mine Lick Creek	
Date Performed	Consultants		Jurisdiction		Putnam Co	,	
Analysis Time Period	PM Peak Hour		Analysis Yea	ır	2013 Propo Park	osed w/ Business	
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning				
Oper.(LOS)			Des.(N)		Plann	ing Data	
Flow Inputs							
Volume, V	2450	veh/h	Peak-Hour F	actor, PHF	0.90		
		ven/day		Buses, P _T	22		
Peak-Hr Prop. of AAD1, K			%RVS, P _R Conoral Torr	ain:	U Lovol		
$DDHV = AADT \times K \times D$		veh/h	Grade %	Length	mi		
Driver type adjustment	1.00			Up/Down %			
Calculate Flow Adjustn	nents						
f _p	1.00		E _R		1.2		
E _T	1.5		f _{HV} = 1/[1+P _T (E	E _T - 1) + P _R (E _R - 1)]	0.901		
Speed Inputs			Calc Spee	d Adj and FFS			
Lane Width	12.0	ft	f		0.0	mi/h	
Rt-Shoulder Lat. Clearance	6.0	ft	f		0.0	mi/h	
Interchange Density	0.50	l/mi	LC		0.0	1111/11	
Number of Lanes, N	2		'ID		0.0	mi/n	
FFS (measured)		mi/h	† _N		4.5	mi/h	
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h	
LOS and Performance	Measures		Design (N)			
			Design (N)				
Operational (LOS)			Design LOS				
$v_p = (V \text{ or DDHV}) / (PHF x N)$	(t _{HV} x t _p) <i>1511</i>	pc/h/ln	$v_{p} = (V \text{ or } DE)$	DHV) / (PHF x N x f	HV x f _p)	pc/h	
S	65.5	mi/h	S		nv p.	mi/h	
$D = v_p / S$	23.1	pc/mi/ln	$D = v_p / S$			pc/mi/ln	
LOS	С		Required Nu	mber of Lanes, N			
Glossary			Factor Lo	cation			
N - Number of lanes	S - Speed		F Exhibite	23-8 23-10	f	- Exhibit 23-4	
V - Hourly volume	D - Density			23-8 22-10 22-14	ן' נ	- Exhibit 23-5	
v _p - Flow rate	FFS - Free-flow s	speed	If - Page 22	.12	ןי ר	- Exhibit 22-6	
LOS - Level of service	BFFS - Base free	e-flow speed		v - Exhibite 22.2	23-3 f	- Exhibit 23-7	
DDHV - Directional design ho	ur volume			$v_p = LAHIDIG 23-2$, 20-0 I		

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BASIC FREEWAY SEGMENTS WORKSHEET							
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	B C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, vp FFS, LOS, vp FFS, LOS, N FFS, N, AADT FFS, LOS, AAI FFS, LOS, N	Output LOS, S, D N, S, D v _p , S, D LOS, S, D DT N, S, D v _p , S, D	
General Information			Site Inform	mation			
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Eastbo	ound)	
Agency or Company	RPM Transport	ation	From/To		Between Sł	R-135 Ramps	
Date Performed	5/22/2009		Jurisdiction		Putnam Co		
Analysis Time Period	PM Peak Hour		Analysis Yea	ır	2013 Propo Park	sed w/ Business	
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning				
Oper.(LOS)			Des.(N)		🗖 Planni	ng Data	
Flow Inputs			<u> </u>				
Volume, V	2202	veh/h	Peak-Hour F	actor, PHF	0.90		
AADT Book Hr Bron of AADT K		ven/day		i buses, r _T	22		
Peak-HI Prop. of AADT, K Peak-Hr Direction Prop. D			General Terr	ain.	U Lovol		
$DDHV = AADT \times K \times D$		veh/h	Grade %	Length	mi		
Driver type adjustment	1.00			Up/Down %			
Calculate Flow Adjustm	nents						
f _p	1.00		E _R		1.2		
E _T	1.5		f _{HV} = 1/[1+P _T (E	_T - 1) + P _R (E _R - 1)]	0.901		
Speed Inputs			Calc Spee	d Adj and FFS			
Lane Width	12.0	ft	f		0.0	mi/h	
Rt-Shoulder Lat. Clearance	6.0	ft	'LW f		0.0	mi/h	
Interchange Density	0.50	I/mi	LC		0.0	mi/n	
Number of Lanes, N	2		t _{ID}		0.0	mi/h	
FFS (measured)		mi/h	f _N		4.5	mi/h	
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h	
LOS and Performance	Measures		Desian (N)			
			Design (N)				
Operational (LOS)			Design LOS				
$v_p = (V \text{ or DDHV}) / (PHF x N x)$: t _{HV} x f _p) <i>13</i> 58	pc/h/ln	$v_{p} = (V \text{ or } DE)$) / (PHF x N x f	uv x f_)	pc/h	
S	65.5	mi/h	s s		ну р	mi/h	
$D = v_p / S$	20.7	pc/mi/ln	$D = v_a / S$			nc/mi/ln	
LOS	С		Required Nu	mber of Lanes, N		20,111,111	
Glossary			Factor Lo	cation			
N - Number of lanes	S - Speed			<u> </u>	1	Exhibit 22.4	
V - Hourly volume	D - Density			23-0, 23-1U	TL ,	W - EXHIDIL 23-4	
v _p - Flow rate	FFS - Free-flow s	speed		23-δ, 23-10, 23-11	t _L		
LOS - Level of service	BFFS - Base free	e-flow speed	r _p - Page 23-		t _N		
DDHV - Directional design ho	ur volume	-	LUS, S, FFS	, v_p - Exhibits 23-2	, ∠3-3 f _{II}	D - Exhibit 23-7	

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BASIC FREEWAY SEGMENTS WORKSHEET							
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	B C 45 M2 1450 B C 45 M2 1450 B C 45 M2 1450 B C 45 M2 1450 B C 45 M2 1450 1450 B C 45 M2 1450 B C 45 M2 1450 1		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (M) Planning (v _p)	Input FFS, N, v _p FFS, LOS, v _p FFS, LOS, N FFS, N, AADT FFS, LOS, AAD FFS, LOS, N	Output LOS, S, D N, S, D v _p , S, D LOS, S, D T N, S, D v _p , S, D	
General Information			Site Inform	mation			
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Eastbo	und)	
Agency or Company	RPM Transport	ation	From/To		east of SR-1	35	
Date Performed	5/22/2009		Jurisdiction		Putnam Co		
Analysis Time Period	PM Peak Hour		Analysis Yea	ar	2013 Propos Park	sed w/ Business	
Project Description 09-0402	Mine Lick Creek I	JS - TDOT OC I	Planning				
Oper.(LOS)			Des.(N)		🗖 Plannir	ng Data	
Flow Inputs			<u> </u>				
Volume, V	2628	veh/h	Peak-Hour F	actor, PHF	0.90		
AADT Book Hr Drop of AADT K		ven/day		Duses, r _T	22		
Peak-HI Prop. of AADT, K Peak-Hr Direction Prop. D			General Terr	ain.	U		
$DDHV = AADT \times K \times D$		veh/h	Grade %	Length	mi		
Driver type adjustment	1.00			Up/Down %			
Calculate Flow Adjustn	nents						
f _p	1.00		E _R		1.2		
E _T	1.5		$f_{HV} = 1/[1+P_T(E)]$	E _T - 1) + P _R (E _R - 1)]	0.901		
Speed Inputs			Calc Spee	ed Adj and FFS			
Lane Width	12.0	ft	f		0.0	mi/h	
Rt-Shoulder Lat. Clearance	6.0	ft	f		0.0	mi/h	
Interchange Density	0.50	I/mi	LC		0.0	1111/11	
Number of Lanes, N	2		'ID		0.0	mi/n	
FFS (measured)		mi/h	† _N		4.5	mi/h	
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h	
LOS and Performance	Measures		Design (N)			
			Design (N)	-			
Operational (LOS)	(() (oo (Design LOS				
$v_p = (V \text{ or } UUHV) / (PHF x N)$	ст _{НV} х т _р) <i>16</i> 21	pc/h/ln	$v_p = (V \text{ or } DE)$	DHV) / (PHF x N x f	_{HV} x f _p)	pc/h	
S	65.3	mi/h	S		···· p	mi/h	
$D = v_p / S$	24.8	pc/mi/ln	$D = v_p / S$			pc/mi/ln	
LOS	С		Required Nu	mber of Lanes, N			
Glossary			Factor Lo	cation			
N - Number of lanes	S - Speed		F _n - Fxhihite	23-8, 23-10	f	Exhibit 23-4	
V - Hourly volume	D - Density		F Fxhihite	23-8 23-10 23-11	'L\ f	- Exhibit 23-5	
v _p - Flow rate	FFS - Free-flow s	speed	f - Page 22-	.12	''''''''''''''''''''''''''''''''''''''	- Exhibit 23-6	
LOS - Level of service	BFFS - Base free	e-flow speed		V - Evhibite 22.2	'N 23-3 f	- Exhibit 23-7	
DDHV - Directional design ho	ur volume			$v_{p} = L \times 10003 \times 20^{-2}$, 20-0 ID		

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BASIC FREEWAY SEGMENTS WORKSHEET							
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	B C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (M) Planning (v _p)	Input FFS, N, v _p FFS, LOS, v _p FFS, LOS, N FFS, N, AADT FFS, LOS, AAE FFS, LOS, N	Output LOS, S, D N, S, D v _p , S, D LOS, S, D T N, S, D v _p , S, D	
General Information			Site Inform	mation			
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Westbo	ound)	
Agency or Company	RPM Transport	ation	From/To		East of SR-	135	
Date Performed	Consultants 5/22/2009		Jurisdiction		Putnam Co		
Analysis Time Period	PM Peak Hour		Analysis Yea	ar	2013 Propos Park	sed w/ Business	
Project Description 09-0402	Mine Lick Creek I	JS - TDOT OC I	Planning				
Oper.(LOS)			Des.(N)		🗖 Plannir	ng Data	
Flow Inputs							
Volume, V	1807	veh/h	Peak-Hour F	actor, PHF	0.90		
AADT		veh/day	% I rucks and	d Buses, P _T	22		
Peak-Hr Prop. of AADT, K			%RVs, P _R		0		
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terr	ain: Length	Levei mi		
Driver type adjustment	1.00			Up/Down %			
Calculate Flow Adjustm	nents						
f _p	1.00		E _R		1.2		
Έ _τ	1.5		f _{HV} = 1/[1+P _T (E	E _T - 1) + P _R (E _R - 1)]	0.901		
Speed Inputs			Calc Spee	d Adi and FFS			
Lane Width	12.0	ft	4		0.0		
Rt-Shoulder Lat. Clearance	6.0	ft	LW		0.0	mi/n	
Interchange Density	0.50	I/mi	[†] LC		0.0	mi/h	
Number of Lanes. N	2		f _{ID}		0.0	mi/h	
FES (measured)	-	mi/h	f _N		4.5	mi/h	
Base free-flow Speed BEES	70.0	mi/h	FFS		65.5	mi/h	
LOS and Performance	Measures		Design (N)			
	incusures)			
Operational (LOS)							
$v_p = (V \text{ or DDHV}) / (PHF x N x)$	(f _{HV} x f _p) <i>1114</i>	pc/h/ln			yf)	no/h	
S	65.5	mi/h	$v_p = (V \cup DL)$		HV X I p)	pc/n	
$D = v_p / S$	17.0	pc/mi/ln				mi/n	
LOS	В		$D = v_p / S$	when of the state		pc/mi/ln	
Olassam			Required Nu	mper of Lanes, N			
Glossary	0 0 1		Factor Lo	cation			
N - Number of lanes	S - Speed		E _R - Exhibits	23-8, 23-10	f, ,	_N - Exhibit 23-4	
V - Hourly volume	D - Density		E _T - Exhibits	23-8, 23-10, 23-11	f, ,	 Exhibit 23-5	
v _p - Flow rate	FFS - Free-flow s	peed	f - Page 23-	·12	f,	- Exhibit 23-6	
LOS - Level of service	BFFS - Base free	e-flow speed	LOS, S. FFS	5. v., - Exhibits 23-2	. 23-3 f	- Exhibit 23-7	
DDHV - Directional design ho	ur volume		, , , , , , , , , , , , , , , , , , , ,	, p	, 'IĽ	, 	

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BASIC FREEWAY SEGMENTS WORKSHEET							
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	B C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, v _p FFS, LOS, v _p FFS, LOS, N FFS, N, AADT FFS, LOS, AA FFS, LOS, N	<u>Output</u> LOS, S, D N, S, D v _p , S, D LOS, S, D DT N, S, D v _p , S, D	
General Information			Site Inforr	nation			
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Westh	oound)	
Agency or Company	RPM Transport	ation	From/To		Between S	R-135 Ramps	
Date Performed	Consultants 5/22/2009		Jurisdiction		Putnam Co		
Analysis Time Period	PM Peak Hour		Analysis Yea	ır	2013 Propo Park	osed w/ Business	
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning				
Oper.(LOS)			Des.(N)		Plann	ing Data	
Flow Inputs							
Volume, V	1422	veh/h	Peak-Hour F	actor, PHF	0.90		
		ven/day		i Buses, P _T	22		
Peak-Hr Prop. of AAD1, K			%RVS, P _R Conoral Torr	oin:	U Lovol		
$DDHV = AADT \times K \times D$		veh/h	Grade %	Length	mi		
Driver type adjustment	1.00			Up/Down %			
Calculate Flow Adjustn	nents						
f _p	1.00		E _R		1.2		
Ε _T	1.5		f _{HV} = 1/[1+P _T (E	_T - 1) + P _R (E _R - 1)]	0.901		
Speed Inputs			Calc Spee	d Adj and FFS			
Lane Width	12.0	ft	f		0.0	mi/b	
Rt-Shoulder Lat. Clearance	6.0	ft	'LW f		0.0	mi/h	
Interchange Density	0.50	I/mi	LC		0.0	mi/m	
Number of Lanes, N	2		^T ID		0.0	mi/h	
FFS (measured)		mi/h	f _N		4.5	mi/h	
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h	
LOS and Performance	Measures		Design (N)			
			Design (N)				
Operational (LOS)			Design LOS				
$v_p = (V \text{ or DDHV}) / (PHF x N)$	(t _{HV} x t _p) 877	pc/h/ln	$v_{p} = (V \text{ or } DE)$) (PHF x N x f	H∖/ x f _n)	pc/h	
S	65.5	mi/h	S	, (nv p	mi/h	
$D = v_p / S$	13.4	pc/mi/ln	$D = v_n / S$			pc/mi/ln	
LOS	В		Required Nu	mber of Lanes, N		F	
Glossary			Factor Lo	cation			
N - Number of lanes	S - Speed		F ₋ - Exhibite	23-8 23-10	f	- Exhibit 23-4	
V - Hourly volume	D - Density			23-8 22-10 22-11	ן' נ	- Exhibit 23-5	
v _p - Flow rate	FFS - Free-flow s	peed	f - Page 22	20-0, 20-10, 20-11 12	ןי ר	- Exhibit 22-6	
LOS - Level of service	BFFS - Base free	-flow speed		V = Exhibite 22.2	23-3 t	- Exhibit 22 7	
DDHV - Directional design ho	ur volume			, vp - LAHIDIIS 23-2	, 20-0 I		

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BASIC FREEWAY SEGMENTS WORKSHEET							
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	B C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (M) Planning (v _p)	Input FFS, N, vp FFS, LOS, vp FFS, LOS, N FFS, N, AADT FFS, LOS, AA FFS, LOS, N	Output LOS, S, D N, S, D v _p , S, D LOS, S, D DT N, S, D v _p , S, D	
General Information			Site Infor	mation			
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Westb	ound)	
Agency or Company	RPM Transporta	ation	From/To		Bt SR-135	& Mine Lick Creek	
Date Performed	Consultants		Jurisdiction		Putnam Co		
Analysis Time Period	PM Peak Hour		Analysis Yea	ar	2013 Propo	sed w/ Business	
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning		T UIK		
Oper.(LOS)			Des.(N)		🗖 Planni	ng Data	
Flow Inputs							
Volume, V	1631	veh/h	Peak-Hour F	actor, PHF	0.90		
AADT		veh/day	%Trucks and	l Buses, P _T	22		
Peak-Hr Prop. of AADT, K			%RVs, P _R		0		
Peak-Hr Direction Prop, D		veh/h	General Terr	ain:	Level mi		
Driver type adjustment	1.00	Ven/m	Orace 70	Up/Down %	1111		
Calculate Flow Adjustn	nents			•			
f	1.00		E _R		1.2		
Ē _T	1.5		f _{uv} = 1/[1+P _T (E	E _T - 1) + P _P (E _P - 1)]	0.901		
Speed Inputs				d Adi and FES			
Lane Width	12.0	ft					
Rt-Shoulder Lat Clearance	6.0	ft	t _{LW}		0.0	mi/h	
Interchange Density	0.50	l/mi	f _{LC}		0.0	mi/h	
Number of Lanes N	2	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	f _{ID}		0.0	mi/h	
FES (measured)	2	mi/b	f _N		4.5	mi/h	
Pasa free flow Speed REES	70.0	mi/h	FFS		65.5	mi/h	
LOS and Performance	Moasuros	1111/11	Decign (N	١			
LOS and Performance	wiedsuies			/			
Operational (LOS)			Design (N)				
$v_p = (V \text{ or DDHV}) / (PHF x N)$	(f _{HV} x f _p) <i>1006</i>	pc/h/ln	Design LOS				
S	65.5	mi/h	$v_p = (v \text{ or } DL)$	JHV) / (PHF X N X 1	HV X ^r p)	pc/h	
$D = v_p / S$	15.4	pc/mi/ln	S (C			mi/h	
LOS	В		$D = v_p / S$			pc/mi/ln	
			Required Nu	mber of Lanes, N			
Glossary			Factor Lo	cation			
N - Number of lanes	S - Speed		E _p - Exhibits	23-8, 23-10	f.	w - Exhibit 23-4	
V - Hourly volume	D - Density		F ₊ - Fxhihite	23-8, 23-10, 23-11	'L f	Exhibit 23-5	
v _p - Flow rate	FFS - Free-flow s	peed	f - Page 23-	.12	י 'L f	- Exhibit 23-6	
LOS - Level of service	BFFS - Base free	-flow speed		V - Evhibite 22.2	'\ 23_3 f	- Exhibit 23-7	
DDHV - Directional design ho	ur volume			$v_{p} = L \times 10003 \times 20^{-2}$, <u>20-</u> 0 I		

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BASIC FREEWAY SEGMENTS WORKSHEET							
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	B C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, vp FFS, LOS, vp FFS, LOS, N FFS, N, AADT FFS, LOS, AAI FFS, LOS, N	Output LOS, S, D N, S, D v _p , S, D LOS, S, D DT N, S, D v _p , S, D	
General Information			Site Infor	mation			
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Westb	ound)	
Agency or Company	RPM Transporta	ation	From/To		Bt Mine Licl	k Creek Ramps	
Date Performed	5/22/2009		Jurisdiction		Putnam Co		
Analysis Time Period	PM Peak Hour		Analysis Yea	ır	2013 Propo Park	sed w/ Business	
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning				
Oper.(LOS)			Des.(N)		🗖 Planni	ng Data	
Flow Inputs	4005		De al Illaur E		0.00		
Volume, V	1285	veh/h veh/dav	Peak-Hour F	actor, PHF I Buses P	0.90		
Rook Hr Bron of AADT K		ven/uay		1 Duses, 1 T	0		
Peak-HI Plop. 01 AAD1, K Peak-Hr Direction Prop. D			General Terr	ain:	U Level		
$DDHV = AADT \times K \times D$		veh/h	Grade %	Length	mi		
Driver type adjustment	1.00			Up/Down %			
Calculate Flow Adjustn	nents		_				
f _p	1.00		E _R		1.2		
E _T	1.5		$f_{HV} = 1/[1+P_T(E)]$	_T - 1) + P _R (E _R - 1)]	0.901		
Speed Inputs			Calc Spee	d Adj and FFS			
Lane Width	12.0	ft	f.w		0.0	mi/h	
Rt-Shoulder Lat. Clearance	6.0	ft	f. a		0.0	mi/h	
Interchange Density	0.50	l/mi	LC f		0.0	mi/h	
Number of Lanes, N	2		'ID		0.0	rni/n	
FFS (measured)		mi/h	T _N		4.5	mi/n	
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h	
LOS and Performance	Measures		Design (N)			
Operational (LOS)			<u>Design (N)</u>				
	(() 7 00		Design LOS				
$v_p = (v \text{ or } D D H v) / (PHF X N)$	(1 _{HV} x 1 _p) 792	pc/n/in	$v_p = (V \text{ or } DE)$) / (PHF x N x f	_{HV} x f _p)	pc/h	
S	65.5	mi/h	S		··· F	mi/h	
$D = v_p / S$	12.1	pc/mi/ln	$D = v_p / S$			pc/mi/ln	
LOS	В		Required Nu	mber of Lanes, N			
Glossary			Factor Lo	cation			
N - Number of lanes	S - Speed			22 0 22 40	,		
V - Hourly volume	D - Density			20-0, 20-1U	TL ,	W - EXHIDIL 23-4	
v _p - Flow rate	FFS - Free-flow s	peed		23-8, 23-10, 23-11	t _L	C - EXNIDIT 23-5	
LOS - Level of service	BFFS - Base free	-flow speed	r _p - Page 23-		t _N		
DDHV - Directional design ho	ur volume		LUS, S, FFS	, $v_p - Exhibits 23-2$, ∠3-3 f _{II}	_D - Exnibit 23-7	

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BASIC FREEWAY SEGMENTS WORKSHEET								
$\begin{array}{c c} 80 & \hline Free-Flow Space}{FES} = \frac{75}{70} \\ \hline 70 & \hline 65 \\ 60 & \hline 60 \\ \hline 55 \\ 50 & \hline 10 \\ 8 \\ 30 \\ 0 \\ \hline 0 \\ 0 \\ \hline 0 \\ 0 \\ \hline 0 \\ 10 \\ 8 \\ 10 \\ 10 \\ 10 \\ 10 \\ 10 \\ 1$	1300 1450 B. C	1000 2000	2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (M) Planning (v _p)	Input FFS, N, v _p FFS, LOS, v _p FFS, LOS, N FFS, N, AADT FFS, LOS, AADT FFS, LOS, N	Output LOS, S, D N, S, D v _p , S, D LOS, S, D N, S, D v _p , S, D		
General Information			Site Infor	mation				
Analyst	ALB	- (Highway/Dire	ection of Travel	I-40 (Westbou	ınd)		
Agency or Company	Consultants	ation	From/To		Bt SR-56 & M	line Lick Creek		
Date Performed	5/22/2009		Jurisdiction		Putnam Co			
Analysis Time Period	PM Peak Hour		Analysis Yea	ır	2013 Propose Park	ed w/ Business		
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning		_			
Oper.(LOS)			es.(N)		🔲 Planning	Data		
Flow Inputs	2061	veb/b	Dook Hour E	actor DHE	0.00			
	2001	ven/n veh/dav	%Trucks and	Buses, P-	22			
Peak-Hr Prop. of AADT, K		von aug	%RVs. P _p		0			
Peak-Hr Direction Prop, D			General Terr	ain:	Level			
DDHV = AADT x K x D		veh/h	Grade %	Length	mi			
Driver type adjustment	1.00			Up/Down %				
					10			
'p 	1.00		⊢R f (″/ D (1.2			
	1.5		$I_{HV} = 1/(1+P_T)$	$(E_{\rm T} - 1) + P_{\rm R}(E_{\rm R} - 1)]$	0.901			
Speed Inputs		<i>.</i>	Calc Spee	ed Adj and FFS				
Lane Width	12.0	ft fr	f _{LW}		0.0	mi/h		
Rt-Shoulder Lat. Clearance	6.0	tt	f _{LC}		0.0	mi/h		
Interchange Density	0.50	I/mi	f _{ID}		0.0	mi/h		
Number of Lanes, N	2		f _N		4.5	mi/h		
FFS (measured)		mi/h	FFS		65.5	mi/h		
Base free-flow Speed, BFFS	70.0	mi/h				,		
LOS and Performance I	Measures		Design (N)				
Operational (LOS)			Design (N)					
$v_{p} = (V \text{ or DDHV}) / (PHF x N x)$	(f _{HV} x f _p) <i>1271</i>	pc/h/ln	Design LOS					
S	65.5	mi/h	$v_p = (V \text{ or } DE)$	DHV) / (PHF x N x f	_{HV} x t _p)	pc/h		
$D = v_p / S$	19.4	pc/mi/ln	S			mi/h		
LOS	C	I	$D = v_p / S$			pc/mi/ln		
	-		Required Nu	mber of Lanes, N				
Glossary			Factor Lo	cation				
N - Number of lanes	S - Speed		E _R - Exhibits	23-8, 23-10	f, ,,,	- Exhibit 23-4		
V - Hourly volume	D - Density		E _T - Exhibits	23-8, 23-10, 23-11	f _L	- Exhibit 23-5		
v _p - Flow rate	FFS - Free-flow s	peed	f Page 23-	12	<u>ال</u> الار	Exhibit 23-6		
LOS - Level of service	BFFS - Base free	-flow speed	LOS, S, FFS	, v _p - Exhibits 23-2	, 23-3 f _{ı⊳} ·	Exhibit 23-7		
DDHV - Directional design hor	ur volume		, _,	. р — — — — — — — — — — — — — — — — — —	. ID	-		

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80 Free-Flow: Spzed FES = 75 milh 70 60 60 milh 60 60 milh 60 milh 50 10 55 milh 40 55 milh 60 60 400 200	Line for the second sec	1600 2000	2400 Site Inforn Highway/Dire	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (M) Planning (v _p) mation	Input FFS, N, vp FFS, LOS, vp FFS, LOS, N FFS, N, AADT FFS, LOS, AAD FFS, LOS, N	<u>Output</u> LOS, S, D N, S, D V _P , S, D LOS, S, D T N, S, D V _P , S, D	
Agency or Company Date Performed Analysis Time Period	Consultants 5/22/2009 PM Peak Hour		From/To Jurisdiction Analysis Yea	ır	Between SR Putnam Co 2013 Propos Park	-56 Ramps sed w/ Business	
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning			Dete	
Oper.(LOS)			Des.(N)		Plannir	ng Data	
Volume, V AADT Peak-Hr Prop. of AADT, K Peak-Hr Direction Prop, D DDHV = AADT x K x D Driver type adjustment	1835	veh/h veh/day veh/h	Peak-Hour F %Trucks and %RVs, P _R General Terr Grade %	actor, PHF I Buses, P _T ain: Length Up/Down %	0.90 22 0 Level mi		
Calculate Flow Adjustm	nents						
f _p E _T	1.00 1.5		E_R $f_{HV} = 1/[1+P_T(E_T)]$	= _T - 1) + P _R (E _R - 1)]	1.2 0.901		
Speed Inputs			Calc Spee	d Adj and FFS			
Lane Width Rt-Shoulder Lat. Clearance Interchange Density Number of Lanes, N FFS (measured) Base free-flow Speed, BFFS	12.0 6.0 0.50 2 70.0	ft ft I/mi mi/h mi/h	f _{LW} f _{LC} f _{ID} f _N FFS		0.0 0.0 0.0 4.5 65.5	mi/h mi/h mi/h mi/h mi/h	
LOS and Performance I	Measures		Design (N)			
$\frac{\text{Operational (LOS)}}{v_p} = (V \text{ or DDHV}) / (PHF x N x)$ S D = v_p / S LOS	f _{HV} x f _p) 1132 65.5 17.3 B	pc/h/ln mi/h pc/mi/ln	$\frac{\text{Design (N)}}{\text{Design LOS}}$ $v_p = (V \text{ or DE})$ S $D = v_p / S$ Required Nu) DHV) / (PHF x N x f mber of Lanes, N	_{HV} x f _p)	pc/h mi/h pc/mi/ln	
Glossary			Factor Lo	cation			
N - Number of lanes V - Hourly volume v _p - Flow rate LOS - Level of service DDHV - Directional design hou	S - Speed D - Density FFS - Free-flow s BFFS - Base free ur volume	peed e-flow speed	E _R - Exhibits E _T - Exhibits f _p - Page 23- LOS, S, FFS	23-8, 23-10 23-8, 23-10, 23-11 12 , v _p - Exhibits 23-2	f _{LV} f _{LC} f _N , 23-3 f _{ID}	w - Exhibit 23-4 - Exhibit 23-5 - Exhibit 23-6 - Exhibit 23-7	

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BASIC FREEWAY SEGMENTS WORKSHEET									
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	B C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, v _p FFS, LOS, v _p FFS, LOS, N FFS, N, AADT FFS, LOS, AAD FFS, LOS, N	Output LOS, S, D N, S, D v _p , S, D LOS, S, D VT N, S, D v _p , S, D			
General Information			Site Inform	mation					
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Westb	ound)			
Agency or Company	RPM Transport	ation	From/To		west of SR-	56			
Date Performed	Consultants 5/22/2009		Jurisdiction		Putnam Co				
Analysis Time Period	PM Peak Hour		Analysis Yea	ar	2013 Propos Park	sed w/ Business			
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning						
Oper.(LOS)			Des.(N)		🔲 Plannii	ng Data			
Flow Inputs									
Volume, V	1936	veh/h	Peak-Hour F	actor, PHF	0.90				
AADT		veh/day	% I rucks and	d Buses, P _T	22				
Peak-Hr Prop. of AADT, K			%RVs, P _R		0				
Peak-Hr Direction Prop, D DDHV = AADT x K x D		veh/h	General Terr	ain: Length	Levei mi				
Driver type adjustment	1.00			Up/Down %					
Calculate Flow Adjustn	nents								
f _p	1.00		E _R		1.2				
Έ _τ	1.5		f _{HV} = 1/[1+P _T (E	E _T - 1) + P _R (E _R - 1)]	0.901				
Speed Inputs			Calc Spee	d Adi and FFS					
Lane Width	12.0	ft	4		0.0				
Rt-Shoulder Lat. Clearance	6.0	ft	LW		0.0	mi/n			
Interchange Density	0.50	l/mi	[†] LC		0.0	mi/h			
Number of Lanes, N	2		f _{ID}		0.0	mi/h			
FES (measured)	-	mi/h	f _N		4.5	mi/h			
Base free-flow Speed BEES	70.0	mi/h	FFS		65.5	mi/h			
LOS and Performance	Measures		Design (N)					
	incasures)					
Operational (LOS)									
$v_p = (V \text{ or DDHV}) / (PHF x N)$	< f _{HV} x f _p) <i>1194</i>	pc/h/ln)H\/) / (DHE v N v f	yf)	no/h			
S	65.5	mi/h		ZIIV <i>I I</i> (FIII XINXI	HV ^ 'p'	pc/m			
$D = v_p / S$	18.2	pc/mi/ln				1111/[] p.c./m://			
LOS	С		$D = v_p / S$ Required Nu	mber of Lanes, N		pc/mi/in			
Glossary			Factor Lo	cation					
N - Number of lanes	S - Speed								
V - Hourly volume	D - Density		E _R - Exhibits	23-8, 23-10	f _L ,	_W - Exhibit 23-4			
v - Flow rate	FFS - Free-flow e	need	E _T - Exhibits	23-8, 23-10, 23-11	l f _L	_C - Exhibit 23-5			
I OS - Loval of convice	REES Boon from	-flow coocd	f _p - Page 23-	·12	f _N	- Exhibit 23-6			
DDH// - Directional design bo		-now sheen	LOS, S, FFS	8, v _p - Exhibits 23-2	, 23-3 f _{IC}	- Exhibit 23-7			
Serie Encouorial design no									

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BASE YEAR 2013 INTERSTATE 40 AT STATE ROUTE 56 (BAXTER ROAD)

RAMPS AND RAMP JUNCTIONS WORKSHEET										
General Infor	mation			Site Infor	mation					
Analyst	ALB			Freeway/Dir of Tr	avel I	I-40 (E	astbound)			
Agency or Company	RPM	Transportatio	n Consultants	Junction	I	Exit Ra	mp to SR-	56		
Date Performed	5/22/2	2009		Jurisdiction	I	Putnan	n Co			
Analysis Time Period	AM P	eak Hour		Analysis Year	4	2013 P	roposed w	Business Park		
Project Description	09-0402 Mine I	LICK Creek - I	DOT OC Planni	ng						
		Terrain: Leve	의						Deveneting	•• A -l'
									Ramp	n Adj
	f								Yes	On
L _{up} = ft									L _{down} =	ft
up			$S_{FF} = 70.0 \text{ mph}$ $S_{FR} = 35.0 \text{ mph}$. /	
V _u = veh/h			Sketc	h (show lanes, L _A ,	$L_{D'}V_{R'}V_{f}$				V _D =	veh/h
Conversion to	o pc/h Und	der Base	Condition	S						
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f _{HV}	fp	v = V/PHF	x f _{HV} x f _p
Freeway	2186	0.90	Level	22	0	0.	901	1.00	269	6
Ramp	91	0.90	Level	22	0	0.	901	1.00	11	2
UpStream										
DownStream	<u> </u>	Morgo Aroas					r	Jivorgo Aroac		
Estimation of V ₄₀					Estimati	ion c	of V _c	Diverge Areas		
						••	··· 12			
$V_{12} = V_F (P_{FM})$					1		V ₁₂ =	= v _R + (v _F - v _I	R ^{)P} FD	
L _{EQ} =	(Equa	ation 25-2 0	r 25-3)		L _{EQ} =		(Equation 25-8	3 or 25-9)	
P _{FM} =	using	Equation (Exhibit 25-5)		P _{FD} =		1.	000 using Ed	uation (Exhi	bit 25-12)
V ₁₂ =	pc/h				V ₁₂ =		20	696 pc/h		
V ₃ or V _{av34}	pc/h (Equation 2	5-4 or 25-5)		$V_3 \text{ or } V_{av34} = 0 \text{ pc/h} (\text{Equation 25-15 or 25-16})$					
Is V_3 or $V_{av34} > 2,/0$	0 pc/h? 🔲 Yes	s 🔲 No			Is V_3 or $V_{av34} > 2,700$ pc/h? Yes V No					
Is V_3 or $V_{av34} > 1.5$ *	[•] V ₁₂ /2 Yes	s 🔲 No			Is V_3 or $V_{av34} > 1.5 * V_{12}/2$ [Yes V No					
If Yes,V _{12a} =	pc/h (Equation 2	5-8)		If Yes,V _{12a} = pc/h (Equation 25-18)					
Capacity Che	cks	1		1	Capacity	y Ch	ecks	4		
	Actual	(Capacity	LOS F?			Actual	Ca	pacity	LOS F?
					V _F		2696	Exhibit 25-1	4 4800	No
V _{FO}		Exhibit 25-7			$V_{FO} = V_{F}$	- V _R	2584	Exhibit 25-1	4 4800	No
					V _R		112	Exhibit 25-3	3 2000	No
Flow Entering	g Merge In	fluence A	Area		Flow En	terin	ng Merg	je Influenc	e Area	
	Actual	Max	Desirable	Violation?			Actual	Max Desiral	ole	Violation?
V _{R12}		Exhibit 25-7			V ₁₂		2696	Exhibit 25-14	4400:All	No
Level of Serv	ice Detern	nination ((if not F)		Level of	Ser	vice De	terminatio	n (if not l	7)
$D_{R} = 5.475 + 0.$	00734 v _R + (0.0078 V ₁₂	- 0.00627 L _A		D	0 _R = 4	.252 + 0.	0086 V ₁₂ - 0.0	0009 L _D	
D _R = (pc/mi/	ln)				D _R = 24	.5 (pc	/mi/ln)			
LOS = (Exhibi	t 25-4)				LOS = C	(Exhi	bit 25-4)			
Speed Determ	nination				Speed D)eter	minatio	on		
M _S = (Exibit 28	5-19)				$D_{s} = 0.4$	438 (E	xhibit 25	-19)		
S _R = mph (Exh	ibit 25-19)				S _R = 57.7 mph (Exhibit 25-19)					
$ S_0 = mph (Exh$	ibit 25-19)				S ₀ = N/2	A mph	(Exhibit	25-19)		
S = mph (Exh	ibit 25-14)				S = 57	.7 mph	ı (Exhibit	25-15)		

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RAMPS AND RAMP JUNCTIONS WORKSHEET											
General Infor	mation			Site Infor	mation						
Analyst Agency or Company Date Performed Analysis Time Perioc Project Description	ALB RPM 5/22/2 1 AM P 09-0402 Mine I	Transportation 2009 Jeak Hour Lick Creek - TD	Consultants	Freeway/Dir of Tra Junction Jurisdiction Analysis Year	avel	I-40 (Eastb Entrance F Putnam Co 2013 Prop	bound) Ramp from D osed w/ Bu	SR-56 siness Parl	(
Inputs				5							
Upstream Adj Ramp		Terrain: Leve							Downstrea Ramp	am Adj	
Yes On	1								Yes	Cn On	
🗹 No 🕅 Off	f								Mo No	Cff Off	
L _{up} = ft		s	- 70.0 mp	h	<u> </u>	5 0 mnh			L _{down} =	ft	
V _u = veh/h			$V_{\rm D} = V_{\rm D} = V_{\rm$				veh/h				
Conversion to	o pc/h Und	der Base (Condition	s							
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{HV}		f _p	v = V/PHF	x f _{HV} x f _p	
Freeway	2095	0.90	Level	22	0	0.901		1.00	2	2584	
Ramp	285	0.90	Level	22	0	0.901		1.00	:	352	
UpStream		ļļ			[
DownStream	<u> </u>							rao Arooo			
Estimation of V ₄₀					Fstimat	ion of v	Dive	ige Aleas			
					Lotinati		12		<u>, </u>		
$V_{12} = V_F (P_{FM})$							$v_{12} = v_R$	+ (v _F - v	R ^{)P} FD	N	
$L_{EQ} = (Equation 25-2 \text{ or } 25-3)$					L _{EQ} =		(Eq	uation 25	-8 or 25-9) 05 10)	
P _{FM} =	1.000	using Equati	ion (Exhibit 28	o-5)	P _{FD} =		usii ne//	ng Equati	on (Exhibit	25-12)	
$v_{12} =$	2584 p	DC/N			$v_{12} =$		pc/l) (Equation	DE 1E or DE	1/)	
$v_3 \cup v_{av34}$	0 pc/r 0 pc/b2		25-4 01 25-5		$V_3 \text{ or } V_{av34} > 2,700 \text{ pc/h}? Yes No$						
$15V_3 \text{ or } V_{av34} > 2.70$					$ SV_{a} \text{ or } V_{av34} \rangle = 2.760 \text{ pcm} + 748 \text{ FeS} = 100$						
$15 V_3 OI V_{av34} > 1.5$	v ₁₂ /2 res	5 MINO	0)		$15V_3 01V_{av34} > 1.5 V_{12}/2$ Yes No						
Copposity Cha		Equation 25	-0)		pc/h (Equation 25-18)						
			anacity		Capacit		Actual	C;	anacity	1.05 E2	
	Actual		арасну		V		Actual	Exhibit 25-		L031?	
V _{EO}	2936	Exhibit 25-7		No	$V_{EO} = V_E$	- V _P		Exhibit 25-	14		
								Exhibit 25	-3		
Flow Entering	a Merae In	fluence A	rea	I	Flow En	terina	Merge	Influen	ce Area		
	Actual	Max	Desirable	Violation?		Actua	al	Max Desi	rable	Violation?	
V _{R12}	2936	Exhibit 25-7	4600:All	No	V ₁₂		Exh	ibit 25-14			
Level of Serv	ice Detern	nination (i	if not F)	1	Level of	Servic	e Deter	rminati	on (if no	ot F)	
D _R = 5.475 +	0.00734 v _R + 0).0078 V ₁₂ - 0.0	0627 L _A		C	0 _R = 4.25	2 + 0.008	36 V ₁₂ - 0	.0009 L _D		
$D_{\rm p} = 23.9 ({\rm pc/mi/ln})$					D _R = (p	c/mi/ln)					
LOS = C (Exhib	oit 25-4)				LOS = (E	xhibit 25	5-4)				
Speed Determ	nination				Speed L	Determi	ination				
M _S = 0.346 (Exil	bit 25-19)				D _s = (E	xhibit 25-1	9)				
S _R = 60.3 mph ((Exhibit 25-19)				S _R = m	ph (Exhibit	25-19)				
S ₀ = N/A mph (Exhibit 25-19)				S ₀ = m	ph (Exhibit	25-19)				
S = 60.3 mph ((Exhibit 25-14)				S = mph (Exhibit 25-15)						

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RAMPS AND RAMP JUNCTIONS WORKSHEET											
General Infor	mation			Site Infor	ormation						
Analyst Agency or Company Date Performed Analysis Time Perioo	ALB RPM 5/22/2 d AM P	Transportatio 2009 Peak Hour	n Consultants	Freeway/Dir of Tr Junction Jurisdiction Analysis Year	avel	I-40 (W Exit Ra Putnan 2013 P	/estbound) imp to SR-! n Co roposed w	56 / Business Park			
Project Description	09-0402 Mine I	Lick Creek - T	DOT OC Planni	ng							
Inputs		<u> </u>							1		
Upstream Adj Ramp		Terrain: Leve	el						Downstrea Ramp	ım Adj	
Yes Or	ו								Tes Yes	Con On	
IMNO I Of	f								No No	Cff	
L _{up} = ft			$L_{down} = T$					π			
V _u = veh/h	I		$V_{\rm D} = V_{\rm D}$				V _D =	veh/h			
Conversion to	o pc/h Und	der Base	Condition	S							
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f _{HV}	f _p	v = V/PHF	x f _{HV} x f _p	
Freeway	1465	0.90	Level	22	0	0.	.901	1.00	18	07	
Ramp	173	0.90	Level	22	0	0.	.901	1.00	2	13	
UpStream		ļ									
DownStream	<u> </u>	J Merge Areas					ا ۱	Diverge Areas			
Estimation of v ₁₂				Estimat	ion c	of v ₁₂	Jirorgo rinouo				
$V_{\rm v} = V_{\rm v} (P_{\rm v})$							V =	= V _P + (V _F - \	/_)P		
$L_{ro} = (Fquation 25-2 \text{ or } 25-3)$					L _{FO} =		12	Equation 25-	8 or 25-9)		
P _{EM} =	usina	Equation (Exhibit 25-5)		$P_{ED} =$		1.	000 usina E	auation (Ext	nibit 25-12)	
V ₁₂ =	pc/h		,		$V_{12} =$		18	307 pc/h	1	,	
V_3 or $V_{3\sqrt{3}4}$	pc/h ((Equation 2	5-4 or 25-5)		V_{2}^{12} or $V_{2V^{24}}$		0	pc/h (Equat	ion 25-15 oi	[.] 25-16)	
$ _{1S} V_3 \text{ or } V_{av34} > 2,70$	0 pc/h? 🔲 Yes	s 🔲 No	,		Is V ₃ or V _{av34} > 2,700 pc/h? [Yes V No						
Is V_3 or $V_{2V34} > 1.5$	* V ₁₂ /2 Ve s	s 🔲 No			Is V_3 or $V_{av34} > 1.5 * V_{12}/2$ [Yes V No						
If Yes, $V_{12a} =$	pc/h ((Equation 2	5-8)		$ f Yes, V_{12a} = pc/h (Equation 25-18)$						
Capacity Che	cks	<u> </u>	,			v Ch	ecks		,		
	Actual	(Capacity	LOS F?	<u> </u>		Actual	C	apacity	LOS F?	
					V _F		1807	Exhibit 25-	14 4800	No	
V _{FO}		Exhibit 25-7			$V_{FO} = V_{F}$	- V _R	1594	Exhibit 25-	14 4800	No	
					V _R		213	Exhibit 25	-3 2000	No	
Flow Entering	a Merae In	fluence A	Area		Flow En	terir	na Merc	e Influenc	e Area]]	
	Actual	Max	Desirable	Violation?			Actual	Max Desira	able	Violation?	
V _{R12}		Exhibit 25-7			V ₁₂		1807	Exhibit 25-14	4400:All	No	
Level of Serv	ice Detern	nination ((if not F)		Level of	Ser	vice De	terminatio	on (if not	F)	
D _R = 5.475 + 0.	00734 v _R + (0.0078 V ₁₂	- 0.00627 L _A			0 _R = 4	.252 + 0.	0086 V ₁₂ - 0	.0009 L _D		
D _R = (pc/mi/ln)					D _R = 16	.5 (pc	/mi/ln)				
LOS = (Exhibi	it 25-4)				LOS = B	(Exhil	bit 25-4)				
Speed Deterr	nination				Speed D	Deter	minatio	on			
M _S = (Exibit 2	5-19)				$D_{s} = 0.4$	447 (E	xhibit 25	-19)			
S _R = mph (Exh	ibit 25-19)				S _R = 57.5 mph (Exhibit 25-19)						
S ₀ = mph (Exh	ibit 25-19)				$ S_0 = N/$	A mph	(Exhibit 2	25-19)			
S = mph (Exh	nibit 25-14)				S = 57	'.5 mpł	i (Exhibit	25-15)			

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RAMPS AND RAMP JUNCTIONS WORKSHEET										
General Infor	mation			Site Infor	ormation					
Analyst Agency or Company Date Performed Analysis Time Perioc Project Description	ALB RPM 5/22/2 1 AM P 09-0402 Mine I	Transportation 2009 Jeak Hour Lick Creek - TE	Consultants	Freeway/Dir of Tra Junction Jurisdiction Analysis Year	r 2013 Proposed w/ Business Park					
Inputs				3						
Upstream Adj Ramp		Terrain: Leve	l						Downstrea Ramp	am Adj
Yes On	1								Ves	Cn On
🗹 No 🕅 Off	f								Mo No	Cff Off
L _{up} = ft			– 70.0 mn	h	<u> </u>	5 0 mnh			L _{down} =	ft
V _u = veh/h			Sketch (show lanes, L_A , L_D , V_R , V_f) $V_D =$					veh/h		
Conversion to	o pc/h Und	der Base	Condition	S						
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{HV}	,	f _p	v = V/PHF	^F x f _{HV} x f _p
Freeway	1292	0.90	Level	22	0	0.901		1.00	1	593
Ramp	145	0.90	Level	22	0	0.901	ĺ	1.00		179
UpStream					[
DownStream										
Estimation of	FV	verge Areas			Estimati	ion of y	DIVE	erge Areas		
					LSumau		12			
$V_{12} = V_{\rm F} (P_{\rm FM})$							$V_{12} = V_{R}$	+ (V _F - V	_R)P _{FD}	
$L_{EQ} = (Equation 25-2 \text{ or } 25-3)$					L _{EQ} =		(Ec	juation 25	5-8 or 25-9)
P _{FM} =	1.000	using Equat	ion (Exhibit 2	5-5)	P _{FD} =		USI	ng Equati	on (Exhibit	25-12)
$v_{12} =$	1593 p	oc/n			$V_{12} =$		pc/	n . (E	05 15 05	1/)
$V_3 \cup V_{av34}$	0 pc/r	n (Equation 2	25-4 or 25-5)	$V_3 \text{ or } V_{av34}$ pc/fr (Equation 25-16 or 25-16)					
$15 V_3 OI V_{av34} > 2,70$		s 🕅 No			$15 V_3 \text{ or } V_{av34} > 2,700 \text{ pc/m}$ Yes No					
$15 V_3 01 V_{av34} > 1.5$	v ₁₂ /2 ■ Yes	s 🔟 No	. 0)		$ 15V_3 \text{ of } V_{av34} > 1.5 ^{\circ}V_{12}/2 \text{Yes} \text{No}$					
$11 \text{ Yes}, v_{12a} =$	pc/n (Equation 25	o-8)		If Yes, V _{12a} = pc/h (Equation 25-18)					
Capacity Che	CKS			1.00 52	Capacit	y Cnec	KS			
	Actual		арасну	LUSF?	V		Actual	Evhibit 25		LUSF?
V	1772	Exhibit 25-7		No	$V_{} = V_{}$	- V_		Exhibit 25	.14	
*F0	1772	EXHIBIT 20 7			$V_{\rm PO} = V_{\rm P}$	*R		Exhibit 25	-3	
Flow Entering	a Merae In	fluence A	rea]	Flow En	terina	Merae	Influen	ce Area	
	Actual	Max	Desirable	Violation?		Actu	al	Max Des	irable	Violation?
V _{R12}	1772	Exhibit 25-7	4600:All	No	V ₁₂		Ext	nibit 25-14		
Level of Serv	ice Detern	nination (if not F)		Level of	Servic	e Dete	rminati	on (if no	ot F)
D _R = 5.475 +	0.00734 v _R + 0).0078 V ₁₂ - 0.0	0627 L _A			0 _R = 4.25	2 + 0.00	36 V ₁₂ - 0	.0009 L _D	
D _R = 15.0 (pc/mi/ln)					D _R = (p	c/mi/ln)				
LOS = B (Exhibit 25-4)					LOS = (E	xhibit 25	5-4)			
Speed Determ	nination				Speed D	Determi	ination			
M _S = 0.297 (Exil	bit 25-19)				D _s = (E	xhibit 25-1	9)			
S _R = 61.7 mph ((Exhibit 25-19)				S _R = m	oh (Exhibit	25-19)			
S ₀ = N/A mph (I	Exhibit 25-19)				S ₀ = m	oh (Exhibit	25-19)			
S = 61.7 mph ((Exhibit 25-14)				S = mph (Exhibit 25-15)					

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General Information Site Information Analyst ALB Agency/Co. RPM Transportation Date Performed 5/22/2009 Analysis Time Period AM Peak Hour Project Description 09-0402 Mine Lick Creek - TDOT OC Planning East/West Street: I-40 EB Exit Ramp Intersection Orientation: North/South Street: Study Period (hrs): 0.25	nps Isiness 6 8 90	
Analyst ALB Intersection SR-56 & EB I-40 Ram Agency/Co. RPM Transportation Consultants Jurisdiction Putnam Co Date Performed 5/22/2009 Analysis Year 2013 Proposed w/ Bu Park Analysis Time Period AM Peak Hour Amalysis Year Park Project Description 09-0402 Mine Lick Creek - TDOT OC Planning East/West Street: I-40 EB Exit Ramp Intersection Orientation: North-South Study Period (hrs): 0.25	nps Isiness 6 R .90	
Date Performed 5/22/2009 Analysis Year 2013 Proposed w/ Bu Analysis Time Period AM Peak Hour Park Project Description 09-0402 Mine Lick Creek - TDOT OC Planning East/West Street: I-40 EB Exit Ramp North/South Street: Study Period (brs): 0.25	Isiness 6 .90	
Analysis Time Period AM Peak Hour Project Description 09-0402 Mine Lick Creek - TDOT OC Planning East/West Street: I-40 EB Exit Ramp Intersection Orientation: North-South Study Period (brs): 0.25	6 R .90	
Project Description 09-0402 Mine Lick Creek - TDOT OC Planning East/West Street: I-40 EB Exit Ramp North/South Street: SR-56 Intersection Orientation: North-South Study Period (brs): 0.25	6 R 90	
East/West Street: I-40 EB Exit Ramp North/South Street: SR-56	6 R .90	
Intersection Orientation: North-South Study Period (hrs): 0.25	6 R .90	
	6 R .90	
Vehicle Volumes and Adjustments	6 R .90	
Major Street Northbound Southbound	6 R .90	
Movement 1 2 3 4 5	R .90	
	.90	
Volume (veh/h) 319 39 246 148	.90	
Peak-Hour Factor, PHF 0.90		
Houring Flow Rate, HFK 0 354 43 273 164 (veh/h) 0 354 43 273 164	0	
Percent Heavy Vehicles 0 22		
Median Type Undivided		
RT Channelized 0	0	
Lanes 0 1 0 0 1	0	
Configuration TR LT		
Upstream Signal 0 0		
Minor Street Eastbound Westbound		
Movement 7 8 9 10 11	12	
	R	
Volume (veh/h) 75 16 Death Using Fraction DUE 0.00 0.00 0.00 0.00 0.00		
Peak-Hour Factor, PHF 0.90	.90	
Notify Flow Rate, Fir R 83 0 17 0 0 (veh/h) 83 0 17 0 0 0	0	
Percent Heavy Vehicles 22 0 22 0 0	0	
Percent Grade (%) 0 0		
Flared Approach Y N		
Storage 1 O		
RT Channelized 0	0	
Lanes 0 0 0 0 0	0	
Configuration LR		
Delay, Queue Length, and Level of Service		
Approach Northbound Southbound Westbound Eastbound		
Movement 1 4 7 8 9 10 11	12	
Lane Configuration LT LR		
v (veh/h) 273 100		
C (m) (veh/h) 1061 192		
v/c 0.26 0.52		
95% queue length 1.03 2.65		
Control Delay (s/veh) 9.6 42.5		
LOS A E		
Approach Delay (s/veh) 42.5		
Approach LOS E		

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General Information Site Information Analyst ALB Intersection SR-56 & WB I-40 Ramps Agency/Co. RPM Transportation Jurisdiction Putnam Co Date Performed 5/22/2009 Analysis Time Period AM Peak Hour Park Project Description 09-0402 Mine Lick Creek - TDOT OC Planning EastWest Street: SR-56 Intersection EastWest Street: I-40 Westbound Exit Ramp North/South Street: Southbound Morth/South Street: Southbound Movement 1 2 3 4 5 6 Volume (veh/h) 28 366 379 117 Peak-Hour Factor, PHF 0.90 0.90 0.90 0.90 0.90 Percent Heavy Vehicles 22 0 RT Channelized 0 1 0 0 130 Vehicle Vehicles 22 0 Colume (veh/h) 28 366 379 117		TW	O-WAY STOP	CONTR	OL SI	JMN	IARY				
Analyst ALB RPM Transportation Consultants Intersection SR-56 & WB I-40 Ramps Putnam Co Date Performed 5/22/2009 Jurisdiction Putnam Co Analysis Time Period AM Peak Hour Analysis Year 2013 Proposed w/ Business Park Project Description 09-0402 Mine Lick Creek - TDOT OC Planning	General Information	า		Site I	nform	atio	on				
Date Performed 5/22/2009 Park Analysis Time Period AM Peak Hour Park Project Description 09-0402 Mine Lick Creek - TDOT OC Planning East/West Street: SR-56 East/West Street: 1-40 Westbound Exit Ramp North/South Street: SR-56 Intersection Orientation: North-South Study Period (hrs): 0.25 Vehicle Volumes and Adjustments North/South Street: Southbound Movement 1 2 3 4 5 6 L T R L T R Volume (veh/h) 28 366 379 117 Peak-Hour Factor, PHF 0.90 0.90 0.90 0.90 0.90 Hourly Flow Rate, HFR 31 406 0 421 130 Percent Heavy Vehicles 22 0 Median Type Undivided 0 0 0 0 0 Lanes 0 1 0 0 0 <t< td=""><td>Analyst Agency/Co.</td><td>ALB RPM Trar Consultar</td><td>nsportation hts</td><td>Interse Jurisdi</td><td>ection ction</td><td>r</td><td></td><td>SR-56 & Putnam (2013 Pro</td><td>WB I-4 Co posed</td><td>40 Ra</td><td>amps usiness</td></t<>	Analyst Agency/Co.	ALB RPM Trar Consultar	nsportation hts	Interse Jurisdi	ection ction	r		SR-56 & Putnam (2013 Pro	WB I-4 Co posed	40 Ra	amps usiness
Analysis Time Period AM Peak Hour Project Description 09-0402 Mine Lick Creek - TDOT OC Planning East/West Street: I-40 Westbound Exit Ramp North/South Street: SR-56 Intersection Orientation: North-South Study Period (hrs): 0.25 Vehicle Volumes and Adjustments Southbound Southbound Major Street Northbound Southbound Movement 1 2 3 4 5 6 L T R L T R Volume (veh/h) 28 366 379 117 Peak-Hour Factor, PHF 0.90 0.90 0.90 0.90 0.90 Hourly Flow Rate, HFR 31 406 0 0 421 130 Percent Heavy Vehicles 22 - 0 - - RT Channelized 0 1 0 0 1 0 Lanes 0 1 0 0 1 0 Movement	Date Performed	5/22/2009)	Analys	515 I Ea	1		Park			
Project Description 09-0402 Mine Lick Creek - TDOT OC Planning East/West Street: I-40 Westbound Exit Ramp North/South Street: SR-56 Intersection Orientation: North - South Study Period (hrs): 0.25 Vehicle Volumes and Adjustments Morth/South Southbound Movement 1 2 3 4 5 6 L T R L T R Volume (veh/h) 28 366 379 117 Peak-Hour Factor, PHF 0.90 0.90 0.90 0.90 0.90 Hourly Flow Rate, HFR (veh/h) 31 406 0 0 421 130 Percent Heavy Vehicles 22 0 - - RT Channelized 0 1 0 0 1 0 Lanes 0 1 0 0 11 0 Median Type Eastbound Westbound Movement 7 8 9 10 11	Analysis Time Period	AM Peak	Hour								
East/West Street: 1-40 Westbound Exit Ramp North/South Street: SR-56 Intersection Orientation: North-South Study Period (hrs): 0.25 Vehicle Volumes and Adjustments Northbound Southbound Major Street Northbound Southbound Movement 1 2 3 4 5 6 L T R L T R Volume (veh/h) 28 366 379 117 Peak-Hour Factor, PHF 0.90 0.90 0.90 0.90 0.90 Hourly Flow Rate, HFR (veh/h) 31 406 0 421 130 Percent Heavy Vehicles 22 0 Median Type Undivided 0 0 0 0 0 0 Lanes 0 1 0 0 1 0 0 Morent Signal 0 0 0 11 12 0 15 158 <td>Project Description 09</td> <td>-0402 Mine Lick</td> <td>Creek - TDOT O</td> <td><u>C Planning</u></td> <td>7</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	Project Description 09	-0402 Mine Lick	Creek - TDOT O	<u>C Planning</u>	7						
Intersection Orientation: North-South Study Period (hrs): 0.25 Vehicle Volumes and Adjustments Northbound Southbound Movement 1 2 3 4 5 6 L T R L T R 1 7 R Volume (veh/h) 28 366 379 117 Peak-Hour Factor, PHF 0.90 0.90 0.90 0.90 0.90 Hourly Flow Rate, HFR 31 406 0 0 421 130 Percent Heavy Vehicles 22 0 Median Type Undivided Undivided 0 0 0 1 0 0 Lanes 0 1 0 0 1 0 1 12 Minor Street Eastbound Westbound 11 12 15 158 Peak-Hour Factor, PHF 0.90 0.90 0.90 0.90 0.90 <	East/West Street: 1-40 V	Vestbound Exit	Ramp	North/S	South S	Street	t: <u>SR-56</u>				
Vehicle Volumes and Adjustments Major Street Northbound Southbound Movement 1 2 3 4 5 6 L T R L T R Volume (veh/h) 28 366 379 117 Peak-Hour Factor, PHF 0.90 0.90 0.90 0.90 0.90 Hourly Flow Rate, HFR 31 406 0 0 421 130 Percent Heavy Vehicles 22 0 Median Type Undivided 0 0 RT Channelized 0 1 0 0 1 0 0 Lanes 0 1 0 0 1 0 0 Movement 7 8 9 10 11 12 Movement 7 8 9 10 11 12	Intersection Orientation:	North-South		Study I							
Major Street Northbound Southbound Movement 1 2 3 4 5 6 L T R L T R Volume (veh/h) 28 366 379 117 Peak-Hour Factor, PHF 0.90 0.90 0.90 0.90 0.90 Hourly Flow Rate, HFR (veh/h) 31 406 0 0 421 130 Percent Heavy Vehicles 22 0 Median Type Undivided 0 0 1 0 0 Lanes 0 1 0 0 1 0 Lanes 0 1 0 1 0 Movement 7 8 9 10 11 12 Movement 7 8 9 10 11 12 L T R L T R 15 158 <	Vehicle Volumes ar	nd Adjustme	nts								
Movement 1 2 3 4 5 6 L T R L T R Volume (veh/h) 28 366 379 117 Peak-Hour Factor, PHF 0.90 0.90 0.90 0.90 0.90 Hourly Flow Rate, HFR (veh/h) 31 406 0 0 421 130 Percent Heavy Vehicles 22 0 Median Type Undivided 0 0 RT Channelized 0 1 0 0 1 0 Lanes 0 1 0 0 1 0 Configuration LT 0 0 11 12 Upstream Signal 0 0 0 11 12 L T R L T R Volume (veh/h) 15 158 158 Peak-Hour Factor, PHF	Major Street		Northbound					Southbou	und		
L I R L I R Volume (veh/h) 28 366 379 117 Peak-Hour Factor, PHF 0.90 0.90 0.90 0.90 0.90 Hourly Flow Rate, HFR 31 406 0 0 421 130 Percent Heavy Vehicles 22 0 Median Type Undivided 0 0 RT Channelized 0 1 0 0 1 0 Lanes 0 1 0 0 1 0 Upstream Signal 0 1 0 0 Movement 7 8 9 10 11 12 L T R L T R 158 Peak-Hour Factor, PHF 0.90 0.90 0.90 0.90 0.90 Hourly Flow Rate, HFR 0 0 0 16	Movement	1	2 T	3			4	5 T			6 D
Volume (ven/n) 2.0 300 0.90	Volume (veh/h)	L 28	366				L	370			<u>к</u> 117
Normalized Order	Peak-Hour Factor, PHF	0.90	0.90	0.90) (0.90		0.90		(2.90
Percent Heavy Vehicles 22 0 Median Type 0 0 0 0 0 0 0 0 0	Hourly Flow Rate, HFR (veh/h)	31	406	0			0	421			130
Median TypeUndividedRT Channelized000Lanes0100Lanes0100ConfigurationLT001Upstream Signal000Minor StreetEastbound0Movement78910LTRLTVolume (veh/h)15158Peak-Hour Factor, PHF0.900.900.90Hourly Flow Rate, HFR (veh/h)00160Percent Heavy Vehicles000220	Percent Heavy Vehicles	22			0						
RT Channelized 0 0 0 Lanes 0 1 0 0 1 0 Configuration LT 0 0 1 0 7R Upstream Signal 0 0 0 0 0 0 0 Minor Street Eastbound Westbound Number of the second o	Median Type				Undi	/ided					
Lanes 0 1 0 0 1 0 Configuration LT 0 1 0 7R Upstream Signal 0 0 0 0 0 Minor Street Eastbound Westbound 11 12 Movement 7 8 9 10 11 12 Volume (veh/h) L T R L T R Volume (veh/h) 0.90 175 175 175 175 175 175 175 175 175 175 175 175 175 175 175 <td>RT Channelized</td> <td></td> <td></td> <td>0</td> <td></td> <td></td> <td></td> <td colspan="3"></td> <td>0</td>	RT Channelized			0							0
Configuration LT Image: Configuration TR Upstream Signal 0 0 0 0 Minor Street Eastbound Westbound Westbound Movement 7 8 9 10 11 12 Movement 7 8 9 10 11 12 Volume (veh/h) L T R L T R Volume (veh/h) 0.90 0.90 0.90 0.90 0.90 0.90 Hourly Flow Rate, HFR (veh/h) 0 0 0 16 0 175 Percent Heavy Vehicles 0 0 0 22 0 22	Lanes	0	1	0			0	1		0	
Upstream Signal 0 0 Minor Street Eastbound Westbound Movement 7 8 9 10 11 12 Movement 7 8 9 10 11 12 L T R L T R Volume (veh/h) 15 158 Peak-Hour Factor, PHF 0.90 0.90 0.90 0.90 Hourly Flow Rate, HFR (veh/h) 0 0 0 16 0 175 Percent Heavy Vehicles 0 0 0 22 0 22	Configuration	LT									TR
Minor Street Eastbound Westbound Movement 7 8 9 10 11 12 L T R L T R Volume (veh/h) 15 158 Peak-Hour Factor, PHF 0.90 0.90 0.90 0.90 0.90 Hourly Flow Rate, HFR (veh/h) 0 0 0 16 0 175 Percent Heavy Vehicles 0 0 0 22 0 22	Upstream Signal		0					0			
Movement 7 8 9 10 11 12 L T R L T R Volume (veh/h) - - 15 158 Peak-Hour Factor, PHF 0.90 0.90 0.90 0.90 0.90 Hourly Flow Rate, HFR (veh/h) 0 0 0 16 0 175 Percent Heavy Vehicles 0 0 0 22 0 22	Minor Street		Eastbound					Westbou	Ind		
L T R L T R Volume (veh/h) 15 158 158 Peak-Hour Factor, PHF 0.90 0.90 0.90 0.90 0.90 Hourly Flow Rate, HFR (veh/h) 0 0 0 16 0 175 Percent Heavy Vehicles 0 0 0 22 0 22	Movement	7	8	9			10	11			12
Volume (veh/h) 15 158 Peak-Hour Factor, PHF 0.90 0.90 0.90 0.90 0.90 Hourly Flow Rate, HFR (veh/h) 0 0 0 16 0 175 Percent Heavy Vehicles 0 0 0 22 0 22		L	T	R	R		L	<u> Т </u>		R	
Peak-Hour Factor, PHF 0.90	Volume (veh/h)					15				158	
Hourly Flow Rate, HFR (veh/h) 0 0 0 16 0 175 Percent Heavy Vehicles 0 0 0 22 0 22	Peak-Hour Factor, PHF	0.90	0.90	0.90)	0.90		0.90		0.90	
Percent Heavy Vehicles 0 0 0 22 0 22 1	Hourly Flow Rate, HFR (veh/h)	0	0	0		16		0		175	
	Percent Heavy Vehicles	0	0	0		22		0		22	
Percent Grade (%) 0 0	Percent Grade (%)		0					0			
Flared Approach N Y	Flared Approach		N					Y			
Storage 0 1	Storage		0					1			
RT Channelized 0 0	RT Channelized			0	ĺ						0
Lanes 0 0 0 0 0 0	Lanes	0	0	0			0	0			0
Configuration LR	Configuration							LR			
Delay, Queue Length, and Level of Service	Delay, Queue Length, a	nd Level of Se	rvice								
Approach Northbound Southbound Westbound Eastbound	Approach	Northbound	Southbound		Westbo	ound			Eastbo	ound	
Movement 1 4 7 8 9 10 11 12	Movement	1	4	7	8		9	10	1	1	12
Lane Configuration LT LR	Lane Configuration	LT			LR						
v (veh/h) 31 191	v (veh/h)	31			191	1					
C (m) (veh/h) 926 600	C (m) (veh/h)	926			600)			ĺ		
v/c 0.03 0.32	v/c	0.03			0.32	2					
95% queue length 0.10 1.36	95% queue lenath	0.10			1.36	6					
Control Delay (s/yeb) 9.0 13.8	Control Delay (s/veh)	9.0			132	3					
		<u>A</u>			R	-					
Approach Delay (s/yeh) 13.8	Approach Delay (s/veh)				132	3			I		<u></u>
Approach LOS	Approach LOS					-		<u> </u>			

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	TWO-WAY TWO-LANE H	HIGHWAY SEGME	NT WORKSHEET						
General Information		Site Information							
Analyst Agency or Company Date Performed Analysis Time Period	ALB RPM Transportation Consultant: 5/22/2009 AM Peak Hour	Highway s From/To Jurisdiction Analysis Year	SR-56 north of WB I-40 Ran Putnam Co 2013 Proposed w/ Bu	ıps ısiness Park					
Project Description: 09-0402 M	Aine Lick Creek - TDOT OC Planning								
	Shoulder width		Class I highway Class II h Terrain Class II h Two-way hourly volume 1020 v	ighway ng reh/h					
	Lane width	tt Show North Arrow	Directional split 51 / 49 Peak-hour factor, PHF 0.90 No-passing zone 45 % Trucks and Buses , P _T 3 %	1					
		- L	% Recreational vehicles, P _R 4% Access points/ <i>mi</i> 4						
Average Travel Speed									
Grade adjustment factor, f _G (Ex	hibit 20-7)		1.00						
Passenger-car equivalents for the	rucks, E _T (Exhibit 20-9)		1.2						
Passenger-car equivalents for F	RVs, E _R (Exhibit 20-9)		1.0						
Heavy-vehicle adjustment facto	r, f _{HV} =1/ (1+ P _T (E _T -1)+P _R (E _R -1))		0.994						
Two-way flow rate ¹ , v _p (pc/h)=V	// (PHF * f _G * f _{HV})		1140						
v _p * highest directional split prop	portion ² (pc/h)		581						
Free-Flow S	Speed from Field Measurement	-	Estimated Free-Flow Speed						
Field Measured speed, S _{FM} Observed volume, V	mi/h veh/t	Base free-flow speed Adj. for lane width ar	Base free-flow speed, BFFS FM55.0 mi/hAdj. for lane width and shoulder width3, f LS (Exhibit 20-5)2.6 mi/h						
Free-flow speed, FFS FFS=S _{FI}	M+0.00776(V _f / f _{HV}) mi/h	Adj. for access points Free-flow speed, FFS	Adj. for access points, f_A (Exhibit 20-6)1.0 mi/hFree-flow speed, FFS (FSS=BFFS- f_{LS} - f_A)51.4 mi/h						
Adj. for no-passing zones, f _{np} (<i>mi/h</i>) (Exhibit 20-11)		1.4						
Average travel speed, ATS (mi	<i>i/h</i>) ATS=FFS-0.00776v _p -f _{np}		41.1						
Percent Time-Spent-Following	g								
Grade Adjustment factor, f _G (Ex	khibit 20-8)		1.00						
Passenger-car equivalents for the	rucks, E _T (Exhibit 20-10)		1.1						
Passenger-car equivalents for F	RVs, E _R (Exhibit 20-10)		1.0						
Heavy-vehicle adjustment facto	r, f _{HV} =1/ (1+ P _T (E _T -1)+P _R (E _R -1))		0.997						
Two-way flow rate ¹ , v _p (pc/h)=V	// (PHF * f _G * f _{HV})		1137						
v_p^{*} highest directional split prop	portion ² (pc/h)		580						
Base percent time-spent-followi	ng, BPTSF(%)=100(1-e ^{-0.000879v} p)		63.2						
Adj. for directional distribution a	nd no-passing zone, f _{d/hp} (%)(Exh. 20-12)		8.8						
Percent time-spent-following, P	TSF(%)=BPTSF+f _{d/np}		72.0						
Level of Service and Other Pe	erformance Measures								
Level of service, LOS (Exhibit 2	/ 3 200		D 26						
Pook 15 min yob miles of terms	/ 0,200		0.30 						
Peak 15-min ven-miles of travel	$1, vivi = \frac{15}{15} (ven - mi) = 0.25 L_t (v/PHF)$		283						
Peak-hour vehicle-miles of trave	ei, vixi i ₆₀ (ven- <i>mi</i>)=V*L _t		1020						
Peak 15-min total travel time, T	T ₁₅ (veh-h)= VMT ₁₅ /ATS		6.9						
1. If Vp >= 3,200 pc/h, terminate 2. If highest directional split Vp>	e analysis-the LOS is F. == 1,700 pc/h, terminated anlysis-the LOS	is F.							

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7	TWO-WAY TWO-LANE	E HIGHW	VAY SEGMEN	NT WORKSHEET					
General Information			Site Information						
Analyst Agency or Company Date Performed Analysis Time Period	ALB RPM Transportation Consulta 5/22/2009 AM Peak Hour	ants	Highway From/To Jurisdiction Analysis Year	SR-56 Between I-40 Ramp Putnam Co 2013 Proposed w/ E	is Business Park				
Project Description: 09-0402 Mir	ne Lick Creek - TDOT OC Planning								
	Shoulder width Lane width Lane width Shoulder width	t t t	Show North Arrow	Class I highway ☐ Class II Terrain ☐ Level ☐ Ro Two-way hourly volume Directional split 50/5 Peak-hour factor, PHF 0.90 No-passing zone 100 % Trucks and Buses , P _T 3%	highway Iling reh/h 50				
Jegment	nengui, 4 iii			% Recreational vehicles, P _R 4% Access points/ <i>mi</i> 0					
Average Travel Speed		1							
Grade adjustment factor, f _G (Exhil	bit 20-7)			1.00					
Passenger-car equivalents for true	cks, E _T (Exhibit 20-9)			1.2					
Passenger-car equivalents for RV	's, E _R (Exhibit 20-9)		1.0						
Heavy-vehicle adjustment factor, f	f _{HV} =1/ (1+ P _T (E _T -1)+P _R (E _R -1))		0.994						
Two-way flow rate ¹ , v _p (pc/h)=V/ ((PHF * f _G * f _{HV})		881						
v _p * highest directional split propo	rtion ² (pc/h)	441							
Free-Flow Sp	eed from Field Measurement		Estimated Free-Flow Speed						
Field Measured speed, S _{FM} Observed volume, V _f Free-flow speed, FFS FFS=S _{EM} +	m ve ⊦0.00776(V∉/ f _{⊔v}) m	ni/h eh/h	Base free-flow speed, $BFFS_{FM}$ 45.0 mi/hAdj. for lane width and shoulder width3, f_{LS} (Exhibit 20-5)0.4 mi/hAdj. for access points, f_A (Exhibit 20-6)0.0 mi/h						
			Free-flow speed, FFS	S (FSS=BFFS-f _{LS} -f _A)	44.6 mi/h				
Adj. for no-passing zones, f _{np} (m	i/h) (Exhibit 20-11)			2.8					
Average travel speed, ATS (mi/n) Percent Time-Spent-Following) ATS=FFS-0.00776v _p -t _{np}			34.9					
Grade Adjustment factor, f _G (Exhi	bit 20-8)			1.00					
Passenger-car equivalents for true	cks, E _T (Exhibit 20-10)			1.1					
Passenger-car equivalents for RV	/s, E _R (Exhibit 20-10)		1.0						
Heavy-vehicle adjustment factor, f	f _{HV} =1/ (1+ P _T (E _T -1)+P _R (E _R -1))		0.997						
Two-way flow rate ¹ , v _p (pc/h)=V/ ((PHF * f _G * f _{HV})			878					
v _p * highest directional split propo	rtion ² (pc/h)			439					
Base percent time-spent-following	g, BPTSF(%)=100(1-e ^{-0.000879v} p)			53.8					
Adj. for directional distribution and	l no-passing zone, f _{d/hp} (%)(Exh. 20-1	12)		14.4					
Percent time-spent-following, PTS	SF(%)=BPTSF+f _{d/np}	ĺ		68.2					
Level of Service and Other Perf	ormance Measures								
Volume to capacity ratio y/c=V//	3 101 Class I of 20-4 for Class II)			0.28					
Peak 15-min veh-miles of travel	$/MT$ (veh- m)- 0.25! (\//DHE)			220					
Poak hour vehicle miles of travel	$15 (ven - 1/1) = 0.23 L_t (V/PHP)$			70					
Pool 15 min total travel time. TT	$v_{101} = 0 (v_{e11} - n_{11}) = v_{t}$			19					
Реак 15-min total travel time, TT ₁	₅ (ven-h)= VMI ₁₅ /ATS			0.6					
1. If Vp >= 3,200 pc/h, terminate a 2. If highest directional split Vp>=	analysis-the LOS is F. 1,700 pc/h, terminated anlysis-the L0	OS is F.							

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TWO-WAY TWO-LANE HIGHWAY SEGMENT WORKSHEET										
General Information	Site Information									
Analyst ALB Agency or Company RPM Transportation Consultants Date Performed 5/22/2009 Analysis Time Period AM Peak Hour	HighwaySR-56From/ToSouth of I-40 EB RampsJurisdictionPutnam CoAnalysis Year2013 Proposed w/ Business Park									
Project Description: 09-0402 Mine Lick Creek - TDOT OC Planning										
Segment length, L ₁ mi	Image: Class I highway Image: Class I highway Image: Class I high									
Average Travel Speed										
Grade adjustment factor, f _G (Exhibit 20-7)	1.00									
Passenger-car equivalents for trucks, E _T (Exhibit 20-9)	1.7									
Passenger-car equivalents for RVs, E _R (Exhibit 20-9)	1.0									
Heavy-vehicle adjustment factor, f_{HV} =1/ (1+ $P_T(E_T-1)+P_R(E_R-1)$)	0.979									
Two-way flow rate ¹ , v_p (pc/h)=V/ (PHF * $f_G * f_{HV}$)	592									
v_p * highest directional split proportion ² (pc/h)	408									
Free-Flow Speed from Field Measurement	Estimated Free-Flow Speed									
Field Measured speed, S _{FM} mi/h Observed volume, V _f veh/h	Base free-flow speed, BFFS FM45.0 mi/h Adj. for lane width and shoulder width3, f_{LS} (Exhibit 20-5)1.7 mi/h Adj. for access points, f_A (Exhibit 20-6)2.0 mi/h									
Free-flow speed, FFS_FFS=S _{FM} +0.00776(V _p /t _{HV}) mi/n	Free-flow speed, FFS (FSS=BFFS-f _{LS} -f _A) 41.3 mi/h									
Adj. for no-passing zones, f _{np} (<i>mi/h</i>) (Exhibit 20-11)	3.9									
Average travel speed, ATS (<i>mi/h</i>) ATS=FFS-0.00776v _p -f _{np}	32.8									
Percent Time-Spent-Following	100									
Grade Adjustment factor, I _G (Exhibit 20-8)	1.00									
Passenger-car equivalents for frucks, E _T (Exhibit 20-10)	1.1									
Passenger-car equivalents for RVS, E _R (Exhibit 20-10)	1.0									
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.997									
Two-way flow rate ¹ , v _p (pc/h)=V/ (PHF * f _G * f _{HV})	582									
v _p * highest directional split proportion ² (pc/h)	402									
Base percent time-spent-following, BPTSF(%)=100(1-e ^{-0.000879v} p)	40.0									
Adj. for directional distribution and no-passing zone, f _{d/hp} (%)(Exh. 20-12)	21.1									
Percent time-spent-following, PTSF(%)=BPTSF+f d/np	61.1									
Level of Service and Other Performance Measures Level of service, LOS (Exhibit 20-3 for Class I or 20-4 for Class II)	С									
Volume to capacity ratio, v/c=V _p / 3,200	0.19									
Peak 15-min veh-miles of travel, VMT ₁₅ (veh- <i>mi</i>)= 0.25L _t (V/PHF)	87									
Peak-hour vehicle-miles of travel, VMT _{en} (veh- <i>mi</i>)=V*L,	313									
Peak 15-min total travel time, TT ₁₅ (veh-h)= VMT ₁₅ /ATS	2.7									
Notes	1.									
 If Vp >= 3,200 pc/h, terminate analysis-the LOS is F. If highest directional split Vp>= 1,700 pc/h, terminated anlysis-the LOS is F. 										

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RAMPS AND RAMP JUNCTIONS WORKSHEET											
General Infor	rmation			Site Infor	ormation						
Analyst Agency or Company Date Performed Analysis Time Perioo	ALB RPM 5/22/2 d PM P	Transportation 2009 Yeak Hour	n Consultants	Freeway/Dir of Tr Junction Jurisdiction Analysis Year	avel I	-40 (Ea Exit Ra Putnan 2013 P	astbound) mp to SR-! n Co roposed w	56 / Business Park			
Project Description	09-0402 Mine I	Lick Creek - T	DOT OC Planni	ng							
Inputs		T	-1						1		
Upstream Adj Ramp		Terrain: Leve	21						Downstrea Ramp	ım Adj	
Yes Or	1								Yes	Cn On	
	T								No	ft Off	
$L_{up} = \Pi$			$S_{rr} = 70.0 \text{ mph}$ $S_{rr} = 35.0 \text{ mph}$					it.			
V _u = veh/h	1		Sketo	ch (show lanes, L _A ,	L_{D}, V_{R}, V_{f}				V _D =	veh/h	
Conversion to	o pc/h Und	der Base	Condition	S	1				1		
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f _{HV}	f _p	v = V/PHF	x f _{HV} x f _p	
Freeway	1830	0.90	Level	22	0	0.	901	1.00	22	57	
Ramp	201	0.90	Level	22	0	0.	901	1.00	24	48	
UpStream						-					
DownStream	<u> </u>	J Merge Areas					[Diverge Areas			
Estimation of v ₁₂				Estimati	ion c	of v ₁₂	J				
	$V_{12} = V_{F}$	(P _{FM})					V ₁₂ =	= V _R + (V _F - \	/ _B)P _{ED}		
$L_{co} =$ (Equation 25-2 or 25-3)					L _{EO} =		12	Equation 25-	8 or 25-9)		
P _{FM} =	using	Equation (Exhibit 25-5)		P _{FD} =		1.	000 using E	quation (Ext	nibit 25-12)	
V ₁₂ =	pc/h				V ₁₂ =		22	257 pc/h			
V_3 or V_{av34}	pc/h ((Equation 2	5-4 or 25-5)		V ₃ or V _{av34}		0	pc/h (Equat	ion 25-15 oi	[.] 25-16)	
Is V_3 or $V_{av34} > 2,70$	0 pc/h? 🥅 Yes	s 🔲 No			Is V ₃ or V _{av34} > 2,700 pc/h? Yes No						
Is V_3 or $V_{av34} > 1.5$	* V ₁₂ /2 🔲 Yes	s 🔲 No			Is V_3 or $V_{av34} > 1.5 * V_{12}/2$ [Yes V No						
If Yes,V _{12a} =	pc/h ((Equation 2	5-8)		If Yes,V _{12a} = pc/h (Equation 25-18)						
Capacity Che	ecks				Capacity	Capacity Checks					
	Actual	(Capacity	LOS F?			Actual	C	apacity	LOS F?	
					V _F		2257	Exhibit 25-	14 4800	No	
V _{FO}		Exhibit 25-7			$V_{FO} = V_{F}$	- V _R	2009	Exhibit 25-	14 4800	No	
					V _R	ĺ	248	Exhibit 25	-3 2000	No	
Flow Entering	g Merge In	fluence A	Area		Flow En	terin	g Merg	e Influenc	ce Area		
	Actual	Max	Desirable	Violation?			Actual	Max Desira	able	Violation?	
V _{R12}		Exhibit 25-7			V ₁₂	2	2257	Exhibit 25-14	4400:All	No	
Level of Serv	rice Detern	nination ((if not F)		Level of	Ser	vice De	terminatio	on (if not	F)	
$D_{R} = 5.475 + 0.$	00734 v _R + 0	0.0078 V ₁₂	- 0.00627 L _A			0 _R = 4	.252 + 0.	0086 V ₁₂ - 0	.0009 L _D		
D _R = (pc/mi/ln)					D _R = 20	.7 (pc	/mi/ln)				
LOS = (Exhibi	it 25-4)				LOS = C	(Exhil	oit 25-4)				
Speed Determ	nination				Speed D)eter	minatio	on			
M _S = (Exibit 2	5-19)				D _s = 0.450 (Exhibit 25-19)						
S _R = mph (Exh	nibit 25-19)				S _R = 57.4 mph (Exhibit 25-19)						
S ₀ = mph (Exh	nibit 25-19)				$ S_0^{=} = N/2$	A mph	(Exhibit)	25-19)			
S = mph (Exh	nibit 25-14)				S = 57	.4 mph	(Exhibit	25-15)			

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RAMPS AND RAMP JUNCTIONS WORKSHEET										
General Infor	mation			Site Infor	mation					
Analyst Agency or Company Date Performed Analysis Time Perioc Project Description	ALB RPM 5/22/2 I PM P 09-0402 Mine I	Transportatior 2009 eak Hour Lick Creek - TI	n Consultants	Freeway/Dir of Tra Junction Jurisdiction Analysis Year	f Travel I-40 (Eastbound) Entrance Ramp from SR-56 Putnam Co 2013 Proposed w/ Business Park					
Inputs										
Upstream Adj Ramp		Terrain: Leve	5						Downstre Ramp	am Adj
Yes Or	1								Ves	Con 🗐
No 🔽 Off	f								🗹 No	Cff Off
L _{up} = ft			$L_{down} = ft$							ft
V _u = veh/h			$S_{FF} = 70.0 \text{ mph}$ $S_{FR} = 35.0 \text{ mph}$ Sketch (show lanes, L_{A} , L_{D} , V_{R} , V_{f}) $V_{D} = \text{vel}$						veh/h	
Conversion to	o pc/h Und	der Base	Condition	s						
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _F	١v	f _p	v = V/PHI	= x f _{HV} x f _p
Freeway	1629	0.90	Level	22	0	0.90)1	1.00		2009
Ramp	139	0.90	Level	22	0	0.90)1	1.00		171
UpStream										
DownStream	I	J Merge Areas)iverge Areas		
Estimation of		Estimat	ion of	V ₁₂	<u></u>					
$V_{in} = V_{in}(P_{ini})$							$V_{40} = $	Vp + (Vp - V	(_)P	
$V_{12} = V_F (V_{FM})$ $V_{12} = (Fguation 25-2 \text{ or } 25-3)$					L _{FO} =		- 12	Equation 2	5-8 or 25-9	3)
P _{EM} =	1.000	using Equat	ion (Exhibit 25	5-5)	P _{ED} =		l	using Equat	ion (Exhibit	, 25-12)
V ₁₂ =	2009 p	oc/h	·		V ₁₂ =		I	oc/h		·
V_3 or V_{av34}	0 pc/h	n (Equation	25-4 or 25-5)	1	V ₃ or V _{av34}			pc/h (Equatior	1 25-15 or 25	-16)
Is V_3 or $V_{av34} > 2,70$	0 pc/h? 🥅 Yes	s 🗹 No			Is V_3 or V_{av3}	₈₄ > 2,70	0 pc/h? ୮	Yes 🗖 N	0	
Is V_3 or $V_{av34} > 1.5$ *	* V ₁₂ /2 🔲 Yes	s 🗹 No			Is V ₃ or V _{av3}	₈₄ > 1.5 *	V ₁₂ /2	Yes 🗖 N	0	
If Yes,V _{12a} =	pc/h (Equation 2	5-8)		If Yes, V _{12a} =		I	oc/h (Equati	on 25-18)	
Capacity Che	cks				Capacity	y Che	cks			
	Actual	<u> </u>	Capacity	LOS F?			Actual	C	apacity	LOS F?
					V _F			Exhibit 25	-14	
V _{FO}	2180	Exhibit 25-7		No	$V_{FO} = V_{F}$	- V _R		Exhibit 25	-14	
					V _R			Exhibit 25	5-3	
Flow Entering	g Merge In	fluence A	Irea	1 1 1 1 1 0	Flow En	tering	<u>y Merg</u>	e Influen	ce Area	
V	Actual	Max Evhibit 25.7		Violation?		AC		Max Des	irable	Violation?
R12	ico Dotorn	nination (if not E	NO		Sorv	ico Do	torminati	on (if no	<u> </u>
$D_{-} = 5.475 +$	0.00734 v = + 0	0078 V - 0	006271			3 = 42	252 ± 0		00091	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
$D_{R} = 3.173$ m		$D_{n} = (n)$	$r_{\rm R} = -1.2$))	12					
LOS = B (Exhib	oit 25-4)				LOS = (Exhibit 25-4)					
Speed Determ	nination				Speed D	Detern	ninatio	on		
M _S = 0.307 (Exi	bit 25-19)				D _s = (E	xhibit 25	-19)			
S _R = 61.4 mph ((Exhibit 25-19)				S _R = m	oh (Exhil	oit 25-19)			
$S_0 = N/A mph (Exhibit 25-19)$					S ₀ = mph (Exhibit 25-19)					
S = 61.4 mph (Exhibit 25-14) S = mph (Exhibit 25-15)										

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RAMPS AND RAMP JUNCTIONS WORKSHEET										
General Infor	rmation			Site Infor	mation					
Analyst Agency or Company Date Performed Analysis Time Perioo	ALB RPM 5/22/2 d PM P	Transportatio 2009 'eak Hour	n Consultants	Freeway/Dir of Tr Junction Jurisdiction Analysis Year	ravel I-40 (Westbound) Exit Ramp to SR-56 Putnam Co 2013 Proposed w/ Business Park					
Project Description	09-0402 Mine I	Lick Creek - T	DOT OC Planni	ng						
Inputs		T	-1						1	
Upstream Adj Ramp		Terrain: Leve	21						Downstrea Ramp	am Adj
Yes Or	1								Yes	Cn On
	T								No	Off
$L_{up} = \Pi$			$S_{rr} = 70.0 \text{ mp}$	h	S _{ED} = 3	5.0 mc	h		down	it.
V _u = veh/h	1		Sketo	ch (show lanes, L _A ,	$L_{D'}V_{R'}V_{f}$				V _D =	veh/h
Conversion to	o pc/h Und	der Base	Condition	S	1	- 1			1	
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f _{HV}	f _p	v = V/PHF	$x f_{HV} x f_{p}$
Freeway	2061	0.90	Level	22	0	0.	.901	1.00	25	42
Ramp	226	0.90	Level	22	0	0.	.901	1.00	2	79
UpStream										
DownStream	<u> </u>	Merge Areas					[Diverge Areas		
Estimation of v ₁₂					Estimati	ion c	of v ₁₂	- 3		
	$V_{12} = V_{F}$	(P _{FM})					V ₁₂ =	= V _R + (V _F - \	/ _P)P _{ED}	
L _{EO} =	(Equa	ation 25-2 o	r 25-3)		L _{EO} =		12	Equation 25-	·8 or 25-9)	
P _{FM} =	using	Equation (Exhibit 25-5)		P _{FD} =			000 using E	quation (Ext	nibit 25-12)
V ₁₂ =	pc/h				V ₁₂ =		25	542 pc/h		
V_3 or V_{av34}	pc/h ((Equation 2	5-4 or 25-5)		V_3 or V_{av34}		0	pc/h (Equat	ion 25-15 o	r 25-16)
Is V_3 or $V_{av34} > 2,70$	0 pc/h? 🥅 Yes	s 🔲 No			Is V ₃ or V _{av3}	₃₄ > 2,7	/00 pc/h? 🛛	Yes 🗹 No)	
Is V_3 or $V_{av34} > 1.5^{\circ}$	* V ₁₂ /2 🔲 Yes	s 🔲 No			Is V_3 or $V_{av34} > 1.5 * V_{12}/2$ [Yes No					
If Yes,V _{12a} =	pc/h ((Equation 2	5-8)		If Yes, V _{12a} =		þ	oc/h (Equatio	n 25-18)	
Capacity Che	ecks				Capacity	y Ch	ecks			
	Actual	(Capacity	LOS F?			Actual	C	apacity	LOS F?
					V _F		2542	Exhibit 25-	14 4800	No
V _{FO}		Exhibit 25-7			$V_{FO} = V_{F}$	- V _R	2263	Exhibit 25-	14 4800	No
					V _R		279	Exhibit 25	-3 2000	No
Flow Entering	g Merge In	fluence A	Area		Flow En	terir	ng Merg	je Influend	ce Area	
	Actual	Max	Desirable	Violation?			Actual	Max Desira	able	Violation?
V _{R12}		Exhibit 25-7			V ₁₂		2542	Exhibit 25-14	4400:All	No
Level of Serv	rice Detern	nination ((if not F)		Level of	⁻ Ser	vice De	terminatio	on (if not	F)
$D_{R} = 5.475 + 0.$			0 _R = 4	.252 + 0.	0086 V ₁₂ - 0	.0009 L _D				
D _R = (pc/mi/	′ln)				D _R = 22	2.8 (pc	/mi/ln)			
LOS = (Exhibi	it 25-4)				LOS = C	(Exhi	bit 25-4)			
Speed Deterr	nination				Speed D	Deter	minatio	on		
M _S = (Exibit 2	5-19)				$D_s = 0.4$	453 (E	xhibit 25	-19)		
S _R = mph (Exh	nibit 25-19)				S _R = 57	7.3 mph	n (Exhibit	25-19)		
$S_0 = mph$ (Exhibit 25-19)					S ₀ = N/A mph (Exhibit 25-19)					
S = mph (Exhibit 25-14) S =						S = 57.3 mph (Exhibit 25-15)				

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RAMPS AND RAMP JUNCTIONS WORKSHEET										
General Infor	mation			Site Infor	mation					
Analyst Agency or Company Date Performed Analysis Time Perioc Project Description	ALB RPM 5/22/2 9 PM P 09-0402 Mine I	Transportation 2009 Jeak Hour Lick Creek - TD	Consultants	Freeway/Dir of Tra Junction Jurisdiction Analysis Year	Travel I-40 (Westbound) Entrance Ramp from SR-56 Putnam Co 2013 Proposed w/ Business Park					
Inputs				3						
Upstream Adj Ramp		Terrain: Leve	l						Downstre Ramp	am Adj
Yes Or	1								Yes	🗖 On
🗹 No 🔲 Of	f								🗹 No	Cff
L _{up} = ft			– 70.0 mn	h	S – 3	5 0 mnh			L _{down} =	ft
V _u = veh/h	I		Sketch (show lanes, L_A , L_D , V_R , V_f) $V_D = veh/$						veh/h	
Conversion t	o pc/h Und	der Base (Condition	S					1	
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _H	v	f _p	v = V/PHF	^F x f _{HV} x f _p
Freeway	1835	0.90	Level	22	0	0.90	1	1.00	2	263
Ramp	101	0.90	Level	22	0	0.90	1	1.00		125
UpStream										
DownStream					ļ					
Estimation of		Ectimoti	ion of	Di	verge Areas					
Estimation of V ₁₂					Esumau		v ₁₂			
$V_{12} = V_F (P_{FM})$							$V_{12} = V$	_R + (V _F - V	′ _R)P _{FD}	
L _{EQ} =	(Equa	ation 25-2 or	25-3)		L _{EQ} =		(E	Equation 2	5-8 or 25-9))
P _{FM} =	1.000	using Equat	ion (Exhibit 2	5-5)	P _{FD} =		u	sing Equat	ion (Exhibit	25-12)
V ₁₂ =	2263 p	oc/h			V ₁₂ =		р	c/h		
V_3 or V_{av34}	0 pc/h	n (Equation 2	25-4 or 25-5)	V_3 or V_{av34}		р	c/h (Equation	n 25-15 or 25	-16)
Is V_3 or $V_{av34} > 2,70$	0 pc/h? 🥅 Yes	s 🔽 No			Is V_3 or $V_{av34} > 2,700$ pc/h? Tes No					
Is V_3 or $V_{av34} > 1.5$	* V ₁₂ /2 🔲 Yes	s 🗹 No			Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 \square Yes \square No					
If Yes,V _{12a} =	pc/h (Equation 25	i-8)		If Yes,V _{12a} = pc/h (Equation 25-18)					
Capacity Che	ecks				Capacity	y Che	cks			
	Actual	C	apacity	LOS F?			Actual	С	apacity	LOS F?
					V _F			Exhibit 25	-14	
V _{FO}	2388	Exhibit 25-7		No	$V_{FO} = V_{F}$	- V _R		Exhibit 25	-14	
					V _R			Exhibit 25	5-3	
Flow Entering	g Merge In	fluence A	rea		Flow En	tering	Merge	e Influen	ce Area	
	Actual	Max	Desirable	Violation?	[Act	ual	Max Des	irable	Violation?
V	2388	Exhibit 25-7	4600:All	No	V ₁₂		E	xhibit 25-14		
Level of Serv	ice Detern	nination (i	if not F)		Level of	Servi	ce Det	erminati	on (if no	ot F)
D _R = 5.475 +			0 _R = 4.2	52 + 0.0	086 V ₁₂ - 0	0.0009 L _D				
D _R = 19.8 (pc	:/mi/ln)				D _R = (pc/mi/ln)					
LOS = B (Exhit	oit 25-4)				LOS = (Exhibit 25-4)					
Speed Deterr	nination				Speed D)etern	ninatio	n		
M _S = 0.316 (Exi	bit 25-19)				$ D_s = (E)$	xhibit 25-	19) 1.05 10)			
S _R = 61.1 mph	(Exhibit 25-19)				S _R = mp	on (Exhib	it 25-19)			
$S_0 = N/A mph ($	Exhibit 25-19)				$S_0 = mp$	oh (Exhib	it 25-19)			
S = 61.1 mph (Exhibit 25-14) S = mph (Exhibit 25-15)										

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TWO-WAY STOP CONTROL SUMMARY										
General Information	า		Site I	nf orn	natio	on				
Analyst	ALB		Interse	ection			SR-56 & I	EB I-40	Ramps	
Agencv/Co.	RPM Trai	nsportation	Jurisdi	ction			Putnam C	ю		
Data Parformad	Consultar	nts	Analys	sis Yea	r		2013 Prop	oosed w	/ Business	
Analysis Time Period	5/22/2003 PM Peak	, Hour					Fdik			
Project Description 00	-0402 Mine Lick		C Planning	Y						
East/West Street: 1-40 l	EB Exit Ramp	COLCER - IDOI O	North/South Street: SR-56							
Intersection Orientation:	North-South		Study I	Study Period (hrs): 0.25						
Vehicle Volumes ar	nd Adiustme	nts	· ·		<u> </u>					
Major Street	j	Northbound		Southbound						
Movement	1	2	3			4	5		6	
	L	Т	R			L	Т		R	
Volume (veh/h)		130	21			118	144			
Peak-Hour Factor, PHF	0.90	0.90	0.90)		0.90	0.90		0.90	
Hourly Flow Rate, HFR (veh/h)	0	144	23			131	160		0	
Percent Heavy Vehicles	0			22						
Median Type]		Undivided						
RT Channelized			0						0	
Lanes	0	1	0			0	1		0	
Configuration			TR	TR		LT				
Upstream Signal		0					0			
Minor Street		Eastbound					Westbou	nd		
Movement	7	8	9			10	11		12	
	L	Т	R			L	Т		R	
Volume (veh/h)	165		36							
Peak-Hour Factor, PHF	0.90	0.90	0.90	0.90 0		0.90	0.90		0.90	
Hourly Flow Rate, HFR	183	0	40			0	0		0	
Percent Heavy Vehicles	22	0	22		0		0		0	
Percent Grade (%)		0					0	I		
Flared Approach		Y					N			
Storage		1					0			
RT Channelized		I	0						0	
	0	0				0	0		0	
Configuration		U IR				0			0	
Delay Queue Length	und Level of Se	nvice	<u> </u>							
Approach	Northbound	Southbound	,	Masth	ound		F	asthou	nd	
Movement	1		7	8	ouna	٩	10	11	12	
	1			0			10		12	
		101						222		
$(V \in II/II)$		1000		ļ				223		
C (m) (ven/n)		1298						400		
V/C		0.10					0.48			
95% queue length		0.34		ļ				2.54		
Control Delay (s/veh)		8.1						19.6		
LOS		A						С		
Approach Delay (s/veh)							19.6			
Approach LOS							С			

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TWO-WAY STOP CONTROL SUMMARY											
General Information	า		Site I	nform	atio	on					
Analyst	ALB		Interse	ection			SR-56 &	WB I-	40 Ra	amps	
	RPM Trai	nsportation	Jurisdi	ction			Putnam C	Со			
	Consultar	nts	Analys	is Year			2013 Pro	posed	d w/ B	usiness	
Date Performed	5/22/2009)	/				Park				
Analysis Time Period	PM Peak	Hour									
Project Description 09	-0402 Mine Lick	<u>Creek - TDOT C</u>	IDUT UC Planning North/South Street: SR-56								
East/West Street: 1-40	North South	катр	North/S	South S	tree bre)	t: <u>SR-50</u>					
				enou (1115)	. 0.23					
Venicie volumes ar	na Aajustme	No which a sun d					Cauthhau				
Major Street	1		2			1		ina		6	
		<u>Z</u>				4	<u> </u>			R	
Volume (veh/h)	18	277				<u> </u>	233			83	
Peak-Hour Factor, PHF	0.90	0.90	0.90)		0.90 0.90		(0.90		
Hourly Flow Rate, HFR (veh/h)	20	20 307 0			0	258			92		
Percent Heavy Vehicles	22	22				0					
Median Type		Undivided									
RT Channelized			0							0	
Lanes	0	1	0			0	1			0	
Configuration	LT								TR		
Upstream Signal		0					0				
Minor Street		Eastbound	,				Westbou	nd			
Movement	7	8	9			10	11			12	
	L	Т	R			L	Т			R	
Volume (veh/h)						29				197	
Peak-Hour Factor, PHF	0.90	0.90	0.90		0.90		0.90			0.90	
Hourly Flow Rate, HFR (veh/h)	0	0	0		32		0			218	
Percent Heavy Vehicles	0	0	0			22	0			22	
Percent Grade (%)		0					0				
Flared Approach		N					Y				
Storage		0		[1				
RT Channelized			0							0	
Lanes	0	0	0			0	0			0	
Configuration							LR				
Delay, Queue Length, a	nd Level of Se	rvice									
Approach	Northbound	Southbound		Westbo	und		E	Eastb	ound		
Movement	1	4	7	8		9	10	1	1	12	
Lane Configuration	LT			LR							
v (veh/h)	20			250)						
C (m) (veh/h)	1106			709)						
v/c	0.02	<u></u>	I	0.35	5						
95% queue length	0.06			1 50						J	
Control Delay (s/yob)	<u> </u>			1.59							
	0.0	<u> </u>	12.8		,	ļ				<u> </u>	
LUO Approach Dalay (- ()	А	<u> </u>		<u> </u>						<u> </u>	
Approach Delay (s/veh)				12.8)						
Approach LOS			B								

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	TWO-WAY TWO-LANE H	HIGHWAY SEGMEI	NT WORKSHEET						
General Information		Site Information							
Analyst Agency or Company Date Performed Analysis Time Period	ALB RPM Transportation Consultants 5/22/2009 PM Peak Hour	Highway s From/To Jurisdiction Analysis Year	SR-56 north of WB I-40 Ra Putnam Co 2013 Proposed w/ B	mps Jusiness Park					
Project Description: 09-0402 M	line Lick Creek - TDOT OC Planning	·							
	Shoulder width Lane width Lane width Shoulder width	tt tt show North Arrow	Class I highway Class II Terrain Level Two-way hourly volume Directional split Peak-hour factor, PHF 0.90 No-passing zone 45 % Trucks and Buses , P _T 3%	highway ling eh/h 0					
Segmen	ւ rengun, ել mi		% Recreational vehicles, P _R 4% Access points/ <i>mi</i> 4						
Average Travel Speed		1							
Grade adjustment factor, f _G (Ex	hibit 20-7)		1.00						
Passenger-car equivalents for tr	ucks, E _T (Exhibit 20-9)		1.2						
Passenger-car equivalents for R	Vs, E _R (Exhibit 20-9)		1.0						
Heavy-vehicle adjustment factor	r, f _{HV} =1/ (1+ P _T (E _T -1)+P _R (E _R -1))		0.994						
Two-way flow rate ¹ , v _p (pc/h)=V	/ (PHF * f _G * f _{HV})		883						
v _p * highest directional split prop	portion ² (pc/h)		530						
Free-Flow S	peed from Field Measurement		Estimated Free-Flow Speed						
Field Measured speed, S _{FM} Observed volume, V _f Free-flow speed, FFS FFS=S _{FM}	mi/h veh/h ₄ +0.00776(V _f / f _{HV}) mi/h	Base free-flow speed Adj. for lane width an Adj. for access points	Base free-flow speed, $BFFS_{FM}$ 55.0 mi/hAdj. for lane width and shoulder width3, f_{LS} (Exhibit 20-5)2.6 mi/hAdj. for access points, f_A (Exhibit 20-6)1.0 mi/h						
		Free-flow speed, FFS	S (FSS=BFFS-f _{LS} -f _A)	51.4 mi/h					
Adj. for no-passing zones, f _{np} (/	<i>mi/h</i>) (Exhibit 20-11)		1.9						
Average travel speed, ATS (mi/	/h) ATS=FFS-0.00776v _p -t _{np}		42.7						
Grade Adjustment factor, f _c (Ex	a hibit 20-8)		1.00						
Passenger-car equivalents for tr	ucks, E _T (Exhibit 20-10)		1.1						
Passenger-car equivalents for R	Vs, E _P (Exhibit 20-10)		1.0						
Heavy-vehicle adjustment factor	, f _{HV} =1/ (1+ P _T (E _T -1)+P _P (E _P -1))		0.997						
Two-way flow rate ¹ , v _n (pc/h)=V	/ (PHF * f _G * f _{HV})		880						
v _p * highest directional split prop	portion ² (pc/h)		528						
Base percent time-spent-followir	ng, BPTSF(%)=100(1-e ^{-0.000879v} p)		53.9						
Adj. for directional distribution ar	nd no-passing zone, f _{d/hp} (%)(Exh. 20-12)		10.3						
Percent time-spent-following, PT	rsF(%)=BPTSF+f _{d/np}		64.1						
Level of Service and Other Pe	rformance Measures	, 	-						
Level of service, LOS (Exhibit 20	0-3 for Class I or 20-4 for Class II)		C						
Pool 15 min yob miles of travel	/ 3,200		0.20						
	, vivi 1 ₁₅ (ven- m) U.25L _t (V/PHF)		219						
Peak-nour venicle-miles of trave	$m_{0}(ven-m_{0})=v^{L}t$		790						
Peak 15-min total travel time, T	I ₁₅ (veh-h)= VMT ₁₅ /ATS		5.1						
1. If Vp >= 3,200 pc/h, terminate 2. If highest directional split Vp>	e analysis-the LOS is F. = 1,700 pc/h, terminated anlysis-the LOS	is F.							

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•	TWO-WAY TWO-LANE	HIGHWA	Y SEGME	NT WORKSHEET					
General Information		Sit	e Information						
Analyst Agency or Company Date Performed Analysis Time Period	ALB RPM Transportation Consultar 5/22/2009 PM Peak Hour	nts Fro Jur Ans	Jhway om/To risdiction alysis Year	SR-56 Between I-40 Ramp Putnam Co 2013 Proposed w/ B	os Business Park				
Project Description: 09-0402 Mi	ne Lick Creek - TDOT OC Planning								
Input Data									
Segment	Shoulder width Lane width Lane width Shoulder width t length, L _t mi		Show North Arrow	Class I highway ✓ Class II Terrain ✓ Level ✓ Ro Two-way hourly volume Directional split 5374 Peak-hour factor, PHF 0.90 No-passing zone 100 % Trucks and Buses , P _T 3% % Recreational vehicles, P _R 4% Access points/ <i>mi</i> 0	highway lling reh/h 17				
Average Travel Speed		1							
Grade adjustment factor, f _G (Exh	ibit 20-7)			1.00					
Passenger-car equivalents for tru	ıcks, E _T (Exhibit 20-9)			1.2					
Passenger-car equivalents for R\	/s, E _R (Exhibit 20-9)			1.0					
Heavy-vehicle adjustment factor,	f _{HV} =1/ (1+ P _T (E _T -1)+P _R (E _R -1))			0.994					
Two-way flow rate ¹ , v _p (pc/h)=V/	(PHF * f _G * f _{HV})			623					
v _p * highest directional split propo	ortion ² (pc/h)		330						
Free-Flow Sp	beed from Field Measurement			Estimated Free-Flow Speed					
Field Measured speed, S _{FM} Observed volume, V _f	mi/ veh	/h Ba: h/h Adj	Base free-flow speed, BFFS FM45.0 mi/hAdj. for lane width and shoulder width3, fLS (Exhibit 20-5)0.4 mi/hAdj. for access points f. (Exhibit 20-6)0.0 mi/h						
Free-flow speed, FFS FFS=S _{FM}	+0.00776(V _f / f _{HV}) mi/	/h Fre	e-flow speed, FFS	S (FSS=BFFS-f _{LS} -f _A)	44.6 mi/h				
Adj. for no-passing zones, f _{np} (m	<i>ni/h</i>) (Exhibit 20-11)			3.8					
Average travel speed, ATS (mi/h	n) ATS=FFS-0.00776v _p -f _{np}			36.0					
Percent Time-Spent-Following									
Grade Adjustment factor, f _G (Exh	ibit 20-8)			1.00					
Passenger-car equivalents for tru	ıcks, E _T (Exhibit 20-10)			1.1					
Passenger-car equivalents for R	/s, E _R (Exhibit 20-10)			1.0					
Heavy-vehicle adjustment factor,	$f_{HV} = 1/(1 + P_T(E_T - 1) + P_R(E_R - 1))$			0.997					
Two-way flow rate ¹ , v _p (pc/h)=V/	(PHF * f _G * f _{HV})			621					
v _p * highest directional split propo	ortion ² (pc/h)			329					
Base percent time-spent-following	g, BPTSF(%)=100(1-e ^{-0.000879v} p)			42.1					
Adj. for directional distribution and	d no-passing zone, f _{d/hp} (%)(Exh. 20-12	2)		20.0					
Percent time-spent-following, PT	SF(%)=BPTSF+f _{d/np}			62.1					
Level of Service and Other Per	formance Measures	1		<u>^</u>					
Volume to capacity ratio v/c=V /	3.200			0.19					
Peak 15-min veh-miles of travel	VMT., (veh- <i>mi</i>)= 0.25L.(V/PHF)			15					
Peak-hour vehicle-miles of travel	. VMT _{eo} (veh- <i>m</i>)=V*I								
Peak 15-min total travel time. TT	$(veh-h) = V/MT / \Delta TS$			0.4					
Notes	15 ^{1/201-11/=} VIVI 15/ATS			····					
1. If Vp >= 3,200 pc/h, terminate 2. If highest directional split Vp>=	analysis-the LOS is F. - 1,700 pc/h, terminated anlysis-the LO	S is F.							

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TWO-WAY TWO-LANE HIGHWAY SEGMENT WORKSHEET										
General Information	Site Information									
Analyst ALB Agency or Company RPM Transportation Consultants Date Performed 5/22/2009 Analysis Time Period PM Peak Hour	HighwaySR-56From/ToSouth of I-40 EB RampsJurisdictionPutnam CoAnalysis Year2013 Proposed w/ Business Park									
Project Description: 09-0402 Mine Lick Creek - TDOT OC Planning										
Shoulder width It Shoulder width It Lane width It Segment length, L _t mi	Class I highway ♥ Class II highway Terrain ♥ Level Rolling Two-way hourly volume 331 veh/h Directional split 54/46 Peak-hour factor, PHF 0.90 No-passing zone 100 % Trucks and Buses , P _T 3% % Recreational vehicles, P _R 4% Access points/ mi 8									
Average Travel Speed	1									
Grade adjustment factor, f _G (Exhibit 20-7)	1.00									
Passenger-car equivalents for trucks, E _T (Exhibit 20-9)	1.7									
Passenger-car equivalents for RVs, E _R (Exhibit 20-9)	1.0									
Heavy-vehicle adjustment factor, f_{HV} =1/ (1+ $P_T(E_T$ -1)+ $P_R(E_R$ -1))	0.979									
Two-way flow rate ¹ , v _p (pc/h)=V/ (PHF * f _G * f _{HV})	376									
v_p * highest directional split proportion ² (pc/h)	203									
Free-Flow Speed from Field Measurement	Estimated Free-Flow Speed									
Field Measured speed, S FMmi/hObserved volume, V fveh/hFree-flow speed, FFS FFS=S FNmi/h	Base free-flow speed, $BFFS_{FM}$ 45.0 mi/hAdj. for lane width and shoulder width3, f_{LS} (Exhibit 20-5)1.7 mi/hAdj. for access points, f_A (Exhibit 20-6)2.0 mi/h									
	Free-flow speed, FFS (FSS=BFFS-f _{LS} -f _A) 41.3 mi/h									
Adj. for no-passing zones, f _{np} (<i>mi/h</i>) (Exhibit 20-11)	4.4									
Average travel speed, ATS (<i>mi/h</i>) ATS=FFS-0.00776vp-f _{np}	34.0									
Grade Adjustment factor for (Exhibit 20-8)	1.00									
Passenger-car equivalents for trucks. E ₊ (Exhibit 20-10)	1.1									
Passenger-car equivalents for RVs, E_{P} (Exhibit 20-10)	1.0									
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.997									
Two-way flow rate ¹ , v _p (pc/h)=V/ (PHF * f _G * f _{HV})	369									
v_p * highest directional split proportion ² (pc/h)	199									
Base percent time-spent-following, BPTSF(%)=100(1-e ^{-0.000879v} p)	27.7									
Adj. for directional distribution and no-passing zone, f _{d/hp} (%)(Exh. 20-12)	23.6									
Percent time-spent-following, PTSF(%)=BPTSF+f _{d/np}	51.3									
Level of Service and Other Performance Measures										
Volume to capacity ratio v/c=V / 3 200	0 12									
Peak 15-min veh-miles of travel VMT (veh- m)= 0.251 (V/PHF)										
Peak-hour vehicle-miles of travel, VMT _{c (veh-m)=V*I}	199									
Peak 15-min total travel time. TT _ (veh-h)= VMT _ /ATS	1.6									
Notes										
 If Vp >= 3,200 pc/h, terminate analysis-the LOS is F. If highest directional split Vp>= 1,700 pc/h, terminated anlysis-the LOS is F. 										

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BASE YEAR 2013 INTERSTATE 40 AT MINE LICK CREEK ROAD

RAMPS AND RAMP JUNCTIONS WORKSHEET										
General Infor	mation			Site Infor	mation					
Analyst	ALB			Freeway/Dir of Tr	avel I	-40 (Ea	stbound)			
Agency or Company	RPM	Transportatio	n Consultants	Junction	E	Exit Rar	mp to SR-	56		
Date Performed	5/22/2	2009		Jurisdiction	F	Putnam	Со			
Analysis Time Period	AM P	Peak Hour		Analysis Year	2	2013 Pr	oposed w	Business Park		
Project Description	09-0402 Mine I	Lick Creek - I	DOT OC Planni	ng						
Inputs		Torrain: Low								
Upstream Adj Ramp									Downstrea Ramp	ım Adj
	I F								Ves	Cn On
	1								MNO	ft Off
-up I			$S_{FF} = 70.0 \text{ mp}$	h	S _{EP} = 3	5.0 mpł	n			
V _u = veh/h	I		Sketc	h (show lanes, L _A ,	L_{D}, V_{R}, V_{f}	•			V _D =	veh/h
Conversion to	o pc/h Und	der Base	Condition	s					-	
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	1	f _{H∨}	f _p	v = V/PHF	x f _{HV} x f _p
Freeway	2380	0.90	Level	22	0	0.9	901	1.00	29	35
Ramp	884	0.90	Level	22	0	0.9	901	1.00	10	90
UpStream		ļ			<u> </u>					
DownStream	<u> </u>				<u> </u>					
Estimation of		Fstimati	ion o	fv	Jiverge Areas					
LSUMATION OF		LSumau		* 12						
$V_{12} = V_F (P_{FM})$							V ₁₂ =	= V _R + (V _F - V	_R)P _{FD}	
L _{EQ} =	(Equa	ation 25-2 o	r 25-3)		L _{EQ} =		(Equation 25-8	8 or 25-9)	
P _{FM} =	using	Equation (Exhibit 25-5)		P _{FD} =		1.	000 using Ed	quation (Exh	nibit 25-12)
V ₁₂ =	pc/h				V ₁₂ =		29	935 pc/h		
V_3 or V_{av34}	pc/h ((Equation 2	5-4 or 25-5)		V_3 or V_{av34}		0	pc/h (Equati	on 25-15 oi	⁻ 25-16)
Is V_3 or $V_{av34} > 2,70$	0 pc/h? 🥅 Yes	s 🔲 No			Is V_3 or $V_{av34} > 2,700 \text{ pc/h}$? Yes Vo					
Is V_3 or $V_{av34} > 1.5$	* V ₁₂ /2 🔲 Yes	s 🔲 No			Is V ₃ or V _{av34} > 1.5 * V ₁₂ /2 [7] Yes [7] No					
If Yes,V _{12a} =	pc/h ((Equation 2	5-8)		If Yes,V _{12a} = pc/h (Equation 25-18)					
Capacity Che	ecks				Capacity	/ Che	ecks			
	Actual	(Capacity	LOS F?			Actual	Ca	apacity	LOS F?
					V _F		2935	Exhibit 25-1	4 4800	No
V _{FO}		Exhibit 25-7			$V_{FO} = V_{F}$	- V _R	1845	Exhibit 25-1	4 4800	No
					Vp		1090	Exhibit 25-	3 2000	No
Flow Entering	a Merae In	fluence A	Irea	I	Flow Fn	terin	a Mero	e Influenc	e Area]]
	Actual	Max	Desirable	Violation?			ctual	Max Desira	ble	Violation?
V _{R12}		Exhibit 25-7			V ₁₂	2	935	Exhibit 25-14	4400:All	No
Level of Serv	ice Detern	nination ((if not F)		Level of	Serv	vice De	terminatio	n (if not	F)
D _R = 5.475 + 0.	00734 v _R + (0.0078 V ₁₂	- 0.00627 L _A		D	_R = 4.	252 + 0.	0086 V ₁₂ - 0.	0009 L _D	
D _p = (pc/mi/	ln)				$D_{p} = 26$.5 (pc/	mi/ln)			
LOS = (Exhibi	it 25-4)				LOS = C	(Exhib	oit 25-4)			
Speed Deterr	nination				Speed D	eteri	minatio	on		
M _S = (Exibit 2	5-19)				D _s = 0.5	526 (E)	khibit 25	-19)		
S _R = mph (Exh	ibit 25-19)				S _R = 55	.3 mph	(Exhibit	25-19)		
$S_0 = mph (Exh$	ibit 25-19)				S ₀ = N//	A mph	(Exhibit 2	25-19)		
S = mph (Exh		S = 55.3 mph (Exhibit 25-15)								

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RAMPS AND RAMP JUNCTIONS WORKSHEET										
General Infor	mation			Site Infor	mation					
Analyst Agency or Company Date Performed Analysis Time Perioc Project Description	ALB RPM 5/22/2 I AM P 09-0402 Mine I	Transportation 2009 'eak Hour Lick Creek - TE	Consultants	Freeway/Dir of Tra Junction Jurisdiction Analysis Year	Travel I-40 (Eastbound) Entrance Ramp from Mine Lick Putnam Co 2013 Proposed w/ Business Park					
Inputs										
Upstream Adj Ramp		Terrain: Leve	l					D	ownstrea amp	am Adj
Yes Or	1							Г	Yes	Cn On
🗹 No 🕅 Off	f							V	🛾 No	Cff Off
L _{up} = ft		s	= 70.0 mp	h	S = 3	5 0 mph		L_d	= nwc	ft
V _u = veh/h	I		Sketch (show lanes, $L_{A'}, L_{D'}, V_{R'}, V_{f}$) $V_{D} = veh/$						veh/h	
Conversion to	o pc/h Und	der Base (Condition	s		1	1			
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{HV}	f,	v	= V/PHF	x f _{HV} x f _p
Freeway	1496	0.90	Level	22	0	0.901	1.00)	1	845
Ramp	297	0.90	Level	22	0	0.901	1.00)		366
UpStream					ļ	ļ				
DownStream	<u> </u>	Morgo Aroas					Divorgo	Aroac		
Estimation of		Estimat	ion of v	Diverge	Altas					
					Lotinat		<u>12</u>			
$v_{12} = v_F (P_{FM})$						1	$v_{12} = v_R + ($	v _F - v _R)		\
$L_{EQ} =$	(Equa		20-3))	L _{EQ} =		(⊑qua	11011 25-8 Familia	· 01 25-9)) - 10)
F _{FM} =	1.000	using Equat	ion (Exhibit 23	0-5)	F _{FD} =		using	Equation	I (EXHIDIL 2	20-12)
$v_{12} =$	1845 p	DC/N			$v_{12} =$		pc/n	austion Of	15 or 05	1/)
$v_3 \cup v_{av34}$	0 pc/r	1 (Equation 2	25-4 OF 25-5)	v_3 or v_{av34}	> 2 700 n	pc/n (E		-15 01 25-	-10)
$15V_3 \text{ or } V_{av34} > 2,70$					$15V_3 OIV_{av3}$	34 > 2,700 p				
$15 V_3 U V_{av34} > 1.5$	v ₁₂ /2 res	5 M INO	. 0)		IS V ₃ UI V _{av3}	$_{34} > 1.5 V_1$	12 ^{/2} Yes		05 40)	
1111000000000000000000000000000000000	pc/n (Equation 25	p-8)		$11 \text{ res}, v_{12a} =$	Chaol	pc/n (t	Equation	25-18)	
Capacity Che	Actual		anacitu		Capacit		(S	Con		
	Actual		арасну		V	<i>F</i>		Udpa 11 05 11		LUSF?
V	2211	Exhibit 25-7		No	$V_{} = V_{}$	- V_	Evi	nihit 25-14	<u> </u>	
*F0	2211	EXHIBIT 20 7			$V_{\rm P}$	<u> </u>	Exi	nibit 25-3	 ,	
Flow Entering	a Merae In	fluence A	rea]	Flow En	terina l	Merge Inf	luence	Area]
	Actual	Max	Desirable	Violation?		Actua	I M	ax Desira	ble	Violation?
V _{R12}	2211	Exhibit 25-7	4600:All	No	V ₁₂		Exhibit	25-14		
Level of Serv	ice Detern	nination (if not F)		Level of	Servic	e Determ	ination	ı (if no	t F)
D _R = 5.475 +	0.00734 v _R + 0).0078 V ₁₂ - 0.0	0627 L _A		C	0 _R = 4.252	2 + 0.0086 '	V ₁₂ - 0.0	009 L _D	
D _R = 18.2 (pc	/mi/ln)				D _R = (p	c/mi/ln)				
LOS = B (Exhib	oit 25-4)				LOS = (E	xhibit 25	-4)			
Speed Detern	nination				Speed L	Determi	nation			
M _S = 0.308 (Exil	bit 25-19)				D _s = (E	xhibit 25-19))			
S _R = 61.4 mph ((Exhibit 25-19)				S _R = m	ph (Exhibit :	25-19)			
S ₀ = N/A mph (Exhibit 25-19)					S ₀ = mph (Exhibit 25-19)					
S = 61.4 mph (Exhibit 25-14) S = mph (Exh						ph (Exhibit :	25-15)			

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RAMPS AND RAMP JUNCTIONS WORKSHEET										
General Infor	mation			Site Infor	mation					
Analyst	ALB			Freeway/Dir of Tr	avel	I-40 (W	/estbound)			
Agency or Company	RPM	Transportatio	n Consultants	Junction	I	Exit Ra	mp to Mine	e Lick Creek		
Date Performed	5/22/2	2009		Jurisdiction	l	Putnam	n Co			
Analysis Time Period	d AM P	eak Hour		Analysis Year		2013 P	roposed w	Business Park		
Project Description	09-0402 Mine I	Lick Creek - T	DOT OC Planni	ng						
Inputs		Torroin, Lou							[
Upstream Adj Ramp		Terrain: Leve	El						Downstrea Ramp	m Adj
	1								Ves	On
	I								Mo	ft Off
			$S_{rr} = 70.0 \text{ mp}$	h	S _{ED} = 3	5.0 mp	h		down	
V _u = veh/h	1		Sketc	h (show lanes, L _A ,	L_{D}, V_{R}, V_{f}				V _D =	veh/h
Conversion to	o pc/h Und	der Base	Condition	s	1	-1			1	
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f _{HV}	f _p	v = V/PHF	x f _{HV} x f _p
Freeway	2352	0.90	Level	22	0	0.	901	1.00	290)1
Ramp	1090	0.90	Level	22	0	0.	901	1.00	134	14
UpStream										
DownStream	r	Merge Areas					I)iverne Areas		
Estimation of		Estimati	ion c	of V_{40}	interge rated					
							··· 12			
$V_{12} = V_F (P_{FM})$							v ₁₂ =	• v _R + (v _F - v _I	R ^{)F} FD	
	(⊏qua		[20-3)		L _{EQ} =		(Equation 25-8	3 OF 25-9)	
P _{FM} =	using	Equation (Exhidit 25-5)		P _{FD} =		1.	000 using Ed	quation (Exh	bit 25-12)
v ₁₂ =	pc/n		,		V ₁₂ =		29	701 pc/h		
V ₃ or V _{av34}	pc/h (Equation 2	5-4 or 25-5)		V ₃ or V _{av34}		0	pc/h (Equatio	on 25-15 or	25-16)
Is V_3 or $V_{av34} > 2,70$	0 pc/h? 📔 Yes	s 📙 No			Is V ₃ or V _{av3}	₃₄ > 2,7	00 pc/h?	Yes Mo		
Is V_3 or $V_{av34} > 1.5$	* V ₁₂ /2 🔲 Yes	s 🔲 No			Is V_3 or $V_{av34} > 1.5 * V_{12}/2$ [Yes V No					
If Yes,V _{12a} =	pc/h (Equation 2	5-8)		If Yes,V _{12a} =		p	c/h (Equation	1 25-18)	
Capacity Che	ecks			1	Capacity	y Ch	ecks	4		
	Actual	(Capacity	LOS F?			Actual	Ca	pacity	LOS F?
					V _F		2901	Exhibit 25-1	4 4800	No
V _{FO}		Exhibit 25-7			$V_{FO} = V_{F}$	- V _R	1557	Exhibit 25-1	4 4800	No
					V _R		1344	Exhibit 25-3	3 2000	No
Flow Entering	g Merge In	fluence A	Area		Flow En	terin	ng Merg	e Influenc	e Area	
	Actual	Max	Desirable	Violation?			Actual	Max Desiral	ole	Violation?
V _{R12}		Exhibit 25-7			V ₁₂		2901	Exhibit 25-14	4400:All	No
Level of Serv	ice Detern	nination ((if not F)		Level of	Ser	vice De	terminatio	n (if not l	F)
$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$ $D_R = 4.252 + 0.0086 V_{12} - 0.0009 L_A$						0009 L _D				
D _R = (pc/mi/	′ln)				D _R = 25	.9 (pc	/mi/ln)			
LOS = (Exhibi	it 25-4)				LOS = C	(Exhil	bit 25-4)			
Speed Deterr	nination				Speed D	Deter	minatio	on		
M _S = (Exibit 2	5-19)				D _s = 0.5	549 (E	xhibit 25	-19)		
$S_{R}^{=}$ mph (Exh	nibit 25-19)				S _R = 54	.6 mph	(Exhibit	25-19)		
$S_0 = mph (Exh$, nibit 25-19)				S ₀ = N/.	A mph	(Exhibit	25-19)		
S = mph (Exh		S = 54.6 mph (Exhibit 25-15)								

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RAMPS AND RAMP JUNCTIONS WORKSHEET										
General Infor	mation			Site Infor	mation					
Analyst Agency or Company Date Performed Analysis Time Perioc Project Description	ALB RPM 5/22/2 I AM P 09-0402 Mine I	Transportation 2009 'eak Hour Lick Creek - TE	Consultants	Freeway/Dir of Tra Junction Jurisdiction Analysis Year	Travel I-40 (Westbound) Entrance Ramp from Mine Lick Putnam Co 2013 Proposed w/ Business Park					
Inputs										
Upstream Adj Ramp		Terrain: Leve	l						Downstrea Ramp	am Adj
Yes Or	1								Ves	🗖 On
No Off	f								🗹 No	Cff Off
L _{up} = ft		s	– 70.0 mn	h	<u> </u>	5 0 mnh			L _{down} =	ft
V _u = veh/h	I		Sketch (show lanes, L_A, L_D, V_R, V_f) $V_D = veh/t$						veh/h	
Conversion to	o pc/h Und	der Base	Condition	s						
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _H	~	f _p	v = V/PHF	x f _{HV} x f _p
Freeway	1262	0.90	Level	22	0	0.90	1	1.00	1	556
Ramp	203	0.90	Level	22	0	0.90	1	1.00		250
UpStream						ļ				
DownStream	<u> </u>									
Estimation of		Fstimat	ion of	V in	erge Areas					
					Lotinati		<u>• 12</u>			
$V_{12} = V_F (P_{FM})$							$V_{12} = V_{F}$	_۲ + (۷ _F - ۷	R)PFD	`
L _{EQ} =	(Equa	ation 25-2 or	25-3)		L _{EQ} =		(E	quation 2:	5-8 OF 25-9)
P _{FM} =	1.000	using Equat	ion (Exhibit 2:	5-5)	P _{FD} =		us	ing Equat	ion (Exhibit	25-12)
$v_{12} =$	1550 p	DC/N			$v_{12} =$		pc	/N	DE 1E or DE	1/)
$v_3 \cup v_{av34}$	0 pc/r	1 (Equation 2	25-4 OF 25-5)	$v_3 \text{ or } v_{av34}$ pc/n (Equation 25-15 of 25-16)					
$15V_3 \text{ or } V_{av34} > 2.70$					Is V or V	4 ~ 2,700 、1.5.**			5	
$15 V_3 OI V_{av34} > 1.5$	v ₁₂ /2 res	5 MINO	: 0)			34 > 1.5	v ₁₂ /2	Yes in No	25 10	
Copposity Cha		Equation 25	9-0)		Consoit	Cha	pc okc	/n (Equali	011 25-16)	
			anacity		Capacit		Actual		anacity	1.05.52
	Actual		арасну	LUST	V		Actual	Exhibit 25	.14	LUST
V _{FO}	1806	Exhibit 25-7		No	$V_{FO} = V_F$	- V _R		Exhibit 25	.14	
					V _R			Exhibit 25	-3	
Flow Entering	a Merae In	fluence A	rea	J	Flow En	terina	Merge	Influen	ce Area	
	Actual	Max	Desirable	Violation?		Act	ual [Max Des	irable	Violation?
V _{R12}	1806	Exhibit 25-7	4600:All	No	V ₁₂		Ex	hibit 25-14		
Level of Serv	ice Detern	nination (if not F)		Level of	Servi	ce Dete	erminati	on (if no	t F)
D _R = 5.475 +	0.00734 v _R + 0).0078 V ₁₂ - 0.0	0627 L _A		[C) _R = 4.2	52 + 0.00)86 V ₁₂ - (.0009 L _D	
D _R = 15.2 (pc	/mi/ln)				D _R = (p	c/mi/ln)				
LOS = B (Exhib	oit 25-4)				LOS = (Exhibit 25-4)					
Speed Determination S					Speed Determination					
M _S = 0.297 (Exil	bit 25-19)				D _s = (E	xhibit 25-	19)			
S _R = 61.7 mph ((Exhibit 25-19)				S _R = m	oh (Exhib	it 25-19)			
S ₀ = N/A mph (Exhibit 25-19)					S ₀ = mph (Exhibit 25-19)					
S = 61.7 mph (S = mph (Exhibit 25-15)								

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	HCS+ [™] DETAILED REPORT																			
General Info	rmation					•	_	[Site	e In	for	matie	on							
									Inte	erse	ctic	on	M	ine L	.ick & I-4	0 E	B ram	nps		
Analyst	ALB								Are	аT	уре	Э	Al	ll oth	er areas					
Agency or Co	. RPM Transp	oortat	ion						Juri	isdi	ctio	n	Pl	utnai	n Co					
Date Perform	ed 5/26/2009								Ana	alvs	is Y	/ear	20	013 F	Proposed	l w/	' Busir	ness		
I ime Period	АМ Реак Но	our							,			- Cui	Pa	ark	12 Mino	ial	Croo	k		
									Pro	ject	ID		TL	5-040 DOT	OC Plar	nin	a	n -		
Volume and	Timing Input													-			<u> </u>			
					EB				W	/B					NB				SB	
			LT		ΤН	RT		LT	Т	Ή		RT		LT	TH		RT	LT	<u> </u>	RT
Number of La	nes, N1		1			2									2		2	1	2	
Lane Group			L			R									<u> </u>		R	L	<u> </u>	
Volume, V (vp	ph)		91			793									256		167	130	1512	
Heavy Veh	icles, %HV		5			5									5		5	5	5	
Peak-Hour Fa	actor, PHF		0.90			0.90					_		_		0.90	0.	.90	0.90	0.90	
Pretimed (P)	or Actuated (A)		A			A									A		A . 0	A	A	
Extension of	Time, n		2.0			2.0									2.0	2	.0	2.0	2.0	
		i, e	2.0	_		2.0	_								2.0	12	3	2.0	2.0	
Unit Extension	n UF		30			30	_								30	3	<u>.</u>	30	30	
Filtering/Mete	ring. I		1.000	7		1.000)				┥				1.000	1	.000	1.000	1.000	
Initial Unmet I	Demand. Qb		0.0			0.0			1		+				0.0		0.0	0.0	0.0	
Ped / Bike / R	TOR Volumes		0		0	0								0	0		0	0	0	
Lane Width			12.0			12.0									12.0	1	2.0	12.0	12.0	
Parking / Grad	de / Parking		Ν		0	N								N	0		N	N	0	N
Parking Mane	euvers, Nm																			
Buses Stoppi	ng, Nв		0			0									0		0	0	0	
Min. Time for	Pedestrians, G	i p			3.2								3.2							
Phasing	EB Only		02		0	3		04			SI	B On	ly	1	NS Perm			07	0	8
Timing	G = 27.5	G =	0.0		G = (0.0		G = 0.	0		G =	= 8.6	6	G	= 28.9		G =	0.0	G = 0	0.0
	Y = 5	Y =	0	,	Y = ()		Y = 0			Y =	= 5		<u> </u>	= 5		Y =	0	Y = 0)
Duration of A	nalysis, $T = 0.2$	25												C	ycle Len	gth	, C =	80.0		
Lane Group	Capacity, Con	trol L	Delay,	and	LOS	Deteri	mil	nation										1	00	
		-	<u>іт (</u>		3 I	RT	_	тІ		<u>}</u>	R.	т	Т	-			2Т		<u>58</u> тн	RT
Adjusted Flow	v Rate. v		101			881	_								284	1	86	144	1680	
Lane Group C	Capacity, c	4	591			936									1245	9	83	568	1830	
v/c Ratio, X		0.	.17		0	.94									0.23	0.1	19	0.25	0.92	
Total Green F	Ratio, g/C	0.	.34		0	.34									0.36	0.:	36	0.53	0.53	
Uniform Delay	y, d ₁	18	8.3		2	5.5									17.8	17	.5	9.7	17.2	
Progression F	actor, PF	1.	.000		1	.000									1.000	1.0	000	1.000	1.000	
Delay Calibra	tion, k	0.	.11		0).45									0.11	0.1	11	0.11	0.44	
Incremental D	elay, d ₂		0.1			17.0									0.1	0	.1	0.2	7.9	
Initial Queue	Delay, d ₃	0	0.0		(0.0									0.0	0.	0	0.0	0.0	
Control Delay		1	8.4		4	42.5									17.9	17	7.6	10.0	25.1	
Lane Group L	.OS		в			D									В	E	3	A	С	
Approach Del	ау		40.	0										17	.8			2	23.9	
Approach LO	S		D											E	}				С	
Intersection D	elay		27.	8				$X_{c} = 0.$	93				Inte	ersec	tion LOS				С	

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	HCS+ [™] DETAILED REPORT																			
General Info	rmation								S	Site Ir	nforma	tio	n							
Analyst	ALB								lr	nterse	ection		Mine	Lic	ck & I-40	0 И	/B ran	nps		
	RPM Trans	portat	ion						A	rea T	уре		All of	the	r areas					
Agency of Co	 Consultants 								J	urisdi	iction		Putn	am	County					
Date Perform	ed 5/26/2009								A	nalys	sis Yea	r	2013 Park	Pr	oposed	W/	Busir	iess		
Time Period	AM Peak He	our											09-04	402	Mine L	ick	Cree	k -		
									Р	rojec	t ID		TDO	ТC	C Plan	nin	g			
Volume and	Timing Input		1										1					1		
				- 1	EB				-	WB					NB	<u> </u>	.		SB	
Number of Le					IH			<u>LI</u>		IH							RI			
	illes, ini							2	+				2		2 T			ļ		R
Volume V (vr	h)							963	+		12	7	126	;	221	╎─		ļ	679	77
% Heavy Veh	nicles. %HV							5			5	,	5	<u> </u>	5	╎─			5	5
Peak-Hour Fa	actor, PHF						0	0.90	┢		0.90)	0.90		0.90	╎─		<u> </u>	0.90	0.90
Pretimed (P)	or Actuated (A))						Α			A		A		Α				A	A
Start-up Lost	Time, l1							2.0			2.0		2.0		2.0				2.0	2.0
Extension of	Effective Greer	n, e						2.0			2.0		2.0		2.0				2.0	2.0
Arrival Type,	AT							3			3		3		3			ļ	3	3
Unit Extensio	n, UE							3.0			3.0		3.0		3.0			ļ	3.0	3.0
Filtering/Mete	Filtering/Metering, I nitial Unmet Demand, Qb Ped / Bike / RTOR Volume						1	1.000			1.00	00	1.00	0	1.000			ļ	1.000	1.000
Initial Unmet	Initial Unmet Demand, Qb Ped / Bike / RTOR Volume Lane Width							0.0			0.0		0.0		0.0				0.0	0.0
Ped / Bike / R	Ped / Bike / RTOR Volumes Lane Width Parking / Grade / Parking							0		0	0		0		0			0	0	0
Lane Width						1	12.0		0	12.0)	12.0		12.0				12.0	12.0	
Parking / Gra							N	_	0			N N		0	<u> '</u>	V		0	N N	
Parking Maneuvers, Nm Buses Stopping, NB									_									ļ		
Buses Stoppi	<u> </u>						0		2.2	0				22			<u> </u>		0	
Phoning		- p	02			02		0/	1	3.2			<u> </u>	NIC	Dorm		1	07	3.2	0
Filasing		G -	02		G -	03		2 - 0	<u>ו</u>			50		G -	- 25.0		G -	01	6-	0
Timing	Y = 5	Y =	0.0		Y =	0.0		l = 0	.0		Y = 5			<u> </u>	- <u>20.0</u> - 5		Y =	0.0	Y = 0	0.0)
Duration of A	nalysis, $T = 0.2$	25	<u> </u>		-	•								Cy	cle Leng	gth.	C =	70.0		
Lane Group	Capacity, Cor	ntrol L	Delay,	and	d LO	S Deter	rmin	ation	1							<u> </u>				
				E	В				V	VB					NB				SB	
			LT	<u> </u> TI	H	RT	<u> </u>	Т	Т	Ή	RT		LT		TH	F	RT	LT	TH	RT
Adjusted Flov	v Rate, v						10	70			141	1	140		246				754	86
Lane Group C	Capacity, c						11	92			549	7	724	1	723				1230	549
v/c Ratio, X							0.9	0			0.26	0.	.19	0	.14				0.61	0.16
Total Green F	Ratio, g/C						0.3	6			0.36	0.	.50	0	.50				0.36	0.36
Uniform Dela	y, d ₁						21.	3			15.9	10	0.4	9	9.4				18.5	15.3
Progression F	Factor, PF						1.0	000			1.000	1.	.000	1	.000				1.000	1.000
Delay Calibra	ition, k						0.4	2			0.11	0.	.11	0	.11				0.20	0.11
Incremental D	Delay, d ₂						9.	3			0.2	1	0.1		0.0				0.9	0.1
Initial Queue	Delay, d ₃						0.0	0			0.0	C).0	(0.0				0.0	0.0
Control Delay	1						30	9.6			16.2	1	0.5		9.5				19.4	15.5
Lane Group L	OS			ĺ			С				В		В		A				В	В
Approach De	lay			,			1	28.	.9				ę	9.8					19.0	
Approach LO	S							С	;					A					В	
Intersection D	Delay		22.	5			>	$X_c = 0$).74	4		Ir	nterse	ectio	on LOS				С	

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	RAMPS AND RAMP JUNCTIONS WORKSHEET											
General Infor	mation			Site Infor	mation							
Analyst	ALB			Freeway/Dir of Tr	avel I-	40 (Ea	astbound)					
Agency or Company	RPM	Transportatio	n Consultants	Junction	E	xit Rai	mp to SR-5	6				
Date Performed	5/22/2	2009		Jurisdiction	Р	utnam	Со					
Analysis Time Period	PM P	eak Hour		Analysis Year	2	013 Pi	roposed w/	Business Park				
Project Description	09-0402 Mine L	Lick Creek - I	DOT OC Planni	ng								
Inputs		Torrain: Low										
Upstream Adj Ramp		Terrain. Lev							Downstrea Ramp	m Adj		
	۱ د								Yes	On On		
									Mo	ft Off		
Lup I			$S_{rr} = 70.0 \text{ mp}$	h	S _{ED} = 35	.0 mp	h		down			
V _u = veh/h	I	,	Sketc	h (show lanes, L _A ,	L_{D}, V_{R}, V_{f}				V _D =	veh/h		
Conversion to	o pc/h Und	der Base	Condition	s	1	1						
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f _{HV}	f _p	v = V/PHF	x f _{HV} x f _p		
Freeway	1768	0.90	Level	22	0	0.0	901	1.00	218	31		
Ramp	286	0.90	Level	22	0	0.0	901	1.00	35	3		
UpStream												
DownStream	<u> </u> N	Merge Areas						iverae Areas				
Estimation of	F V 40	norge meus			Estimatio	on o	f V ₄₀	iverge nicus				
	- 1 Z	(D)					- 1 2					
	$v_{12} = v_F$	(P _{FM})	05.0				V ₁₂ =	$v_{R} + (v_{F} - v_{I})$	R)P _{FD}			
L _{EQ} =	(Equa	ation 25-2 0	r 25-3)		L _{EQ} =		(1	=quation 25-8	3 or 25-9)			
P _{FM} =	using	Equation (Exhibit 25-5)		P _{FD} =		1.0	00 using Ec	uation (Exh	bit 25-12)		
V ₁₂ =	pc/h				V ₁₂ =		21	81 pc/h				
V ₃ or V _{av34}	pc/h (Equation 2	5-4 or 25-5)		V ₃ or V _{av34}		0	pc/h (Equatio	on 25-15 or	25-16)		
Is V_3 or $V_{av34} > 2,70$	0 pc/h? 🥅 Yes	s 🔲 No			Is V_3 or V_{av34}	> 2,70	00 pc/h? 🔽	Yes 🗹 No				
Is V_3 or $V_{av34} > 1.5$	[•] V ₁₂ /2 Yes	s 🗏 No			Is V_3 or V_{av34}	> 1.5	* V ₁₂ /2	Yes 🗹 No				
If Yes, V _{12a} =	pc/h (Equation 2	5-8)		If Yes, V _{12a} =		р	c/h (Equation	25-18)			
Capacity Che	ecks				Capacity	Che	ecks					
	Actual	(Capacity	LOS F?			Actual	Ca	pacity	LOS F?		
					V _F		2181	Exhibit 25-1	4 4800	No		
V _{FO}		Exhibit 25-7			$V_{FO} = V_{F}$ -	V _R	1828	Exhibit 25-1	4 4800	No		
					V _R		353	Exhibit 25-3	3 2000	No		
Flow Entering	a Merae In	fluence /	Area	J	Flow Ent	terin	a Mera	e Influenc	e Area			
	Actual	Max	Desirable	Violation?		L A	Actual	Max Desirat	ble	Violation?		
V _{R12}		Exhibit 25-7			V ₁₂	2	181	Exhibit 25-14	4400:All	No		
Level of Serv	ice Detern	nination	(if not F)		Level of	Serv	/ice De	terminatio	n (if not l	5)		
$D_{R} = 5.475 + 0.$	00734 v _R + (0.0078 V ₁₂	- 0.00627 L _A		D	_R = 4.	252 + 0.0	0086 V ₁₂ - 0.0	0009 L _D			
D _R = (pc/mi/	ln)				D _R = 20.	0 (pc /	/mi/ln)					
LOS = (Exhibi	t 25-4)				LOS = C (Exhit	oit 25-4)					
Speed Deterr	nination				Speed D	eter	minatic	n				
M _S = (Exibit 2	5-19)				$D_{s} = 0.4$	60 (E :	xhibit 25-	19)				
S _R = mph (Exh	ibit 25-19)				S _R = 57.	1 mph	(Exhibit	25-19)				
$S_0 = mph (Exh$	ibit 25-19)				S ₀ = N/A	mph	(Exhibit 2	25-19)				
S = mph (Exh	ibit 25-14)				S = 57.	1 mph	(Exhibit	25-15)				

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	RAMPS AND RAMP JUNCTIONS WORKSHEET												
General Infor	mation			Site Infor	mation								
Analyst Agency or Company Date Performed Analysis Time Perioc Project Description	ALB RPM 5/22/2 1 PM P 09-0402 Mine I	Transportation 2009 <u>eak Hour</u> Lick Creek - TE	Consultants	Freeway/Dir of Tra Junction Jurisdiction Analysis Year	avel	I-40 (East Entrance Putnam C 2013 Proj	bound) Ramp fror Co posed w/ E	n Mine Lick Business Par	k				
Inputs													
Upstream Adj Ramp		Terrain: Leve	I						Downstre Ramp	am Adj			
Yes On	1								Tes 🗐	🗖 On			
🗹 No 🔽 Off	f								🗹 No	Cff Off			
L _{up} = ft			- 70.0 mp	h	<u> </u>	E 0 mph			L _{down} =	ft			
V _u = veh/h	I		FF = 70.0 mp Sketc	:h (show lanes, L _A ,	$S_{FR} = 3$ $L_{D'}V_{R'}V_{f}$	5.0 mpn			V _D =	veh/h			
Conversion to	o pc/h Und	der Base	Condition	S					-				
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _H	v	f _p	v = V/PHF	^F x f _{HV} x f _p			
Freeway	1482	0.90	Level	22	0	0.90	1	1.00	1	828			
Ramp	968	0.90	Level	22	0	0.90	1	1.00	1	194			
UpStream					[
DownStream	<u> </u>												
Estimation of	FV	vierge Areas			Fstimat	ion of	V	Verge Areas					
	• 12	(D)			Lotinati		<u>• 12</u>		() =				
	$v_{12} = v_F$	(P _{FM})	05.0				v ₁₂ = v	_R + (v _F - v	R ^{)P} FD				
L _{EQ} =	(Equa	ation 25-2 or	25-3)		L _{EQ} =		(E	quation 2:	5-8 0r ∠5-8	1) 05 10)			
$P_{FM} =$	1.000	using Equat	ion (Exhibit 2	5-5)	P _{FD} =		us	sing Equat	ion (Exhibit	25-12)			
$v_{12} =$	1828 p	DC/N		,	$v_{12} =$		pc	J/∏ Nh (Equation	25 15 or 25	1/)			
$v_3 \cup v_{av34}$	0 pc/r 0 pc/b2		25-4 01 25-5)	v_3 or v_{av34}	> 2 700	μι μος/b2 🗖		-	- 10)			
$15V_3 \text{ or } V_{av34} > 2.70$					$13 V_3 O V_{av3}$	34 ~ 2,700 ~ 1 5 * '			-				
$15 V_3 OI V_{av34} > 1.5$	v ₁₂ /2 res	5 MINO	: 0)		$15 V_3 OI V_{av3}$	34 ~ 1.5	v ₁₂ /2	Yes 🔲 No	0 on 25 19)				
Copposity Cha		Equation 25	9-0)		Conocit	v Cha	pt akc	an (Equali	01125-16)				
			anacity		Capacity		Actual		anacity	1.05 E2			
	Actual		арасну		V_		Actual	Exhibit 25	-14	L031 :			
VEO	3022	Exhibit 25-7		No	$V_{EO} = V_E$	- V _P		Exhibit 25	-14				
10								Exhibit 25	5-3				
Flow Entering	a Merae In	fluence A	rea		Flow En	terina	Merae	Influen	ce Area				
	Actual	Max	Desirable	Violation?		Actu		Max Des	irable	Violation?			
V _{R12}	3022	Exhibit 25-7	4600:All	No	V ₁₂		E	xhibit 25-14					
Level of Serv	ice Detern	nination (if not F)		Level of	Servi	ce Det	erminati	on (if no	ot F)			
D _R = 5.475 +	0.00734 v _R + 0).0078 V ₁₂ - 0.0	0627 L _A			0 _R = 4.2	52 + 0.0	086 V ₁₂ - 0	0.0009 L _D				
D _R = 24.2 (pc	/mi/ln)				D _R = (p	c/mi/ln)							
LOS = C (Exhib	oit 25-4)				LOS = (E	xhibit 2	5-4)						
Speed Detern	nination				Speed D	Determ	inatior	า					
M _S = 0.353 (Exi	bit 25-19)				D _s = (E	xhibit 25-	19)						
S _R = 60.1 mph ((Exhibit 25-19)				S _R = m	ph (Exhib	it 25-19)						
S ₀ = N/A mph (Exhibit 25-19)				S ₀ = m	ph (Exhib	it 25-19)						
S = 60.1 mph ((Exhibit 25-14)				S = m	ph (Exhib	it 25-15)						

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	RAMPS AND RAMP JUNCTIONS WORKSHEET											
General Infor	mation			Site Infor	mation							
Analyst	ALB			Freeway/Dir of Tr	avel	I-40 (W	/estbound)					
Agency or Company	RPM	Transportatio	n Consultants	Junction		Exit Ra	Imp to Mine	e Lick Creek				
Date Performed	5/22/2	2009		Jurisdiction		Putnan	n Co					
Analysis Time Period	d PM P	eak Hour		Analysis Year		2013 P	roposed w	Business Park				
Project Description	09-0402 Mine L	Lick Creek - T	DOT OC Planni	ng								
Inputs		Torrain, Lou							_			
Upstream Adj Ramp		Tellalli. Levi							Downstrear Ramp	n Adj		
	1 F								Yes	On On		
	1								MNO	ft Off		
-up I			$S_{FF} = 70.0 \text{ mp}$	h	S _{FR} = 3	5.0 mp	h		down			
V _u = veh/h	1		Sketc	h (show lanes, L _A ,	$L_{D'}V_{R'}V_{f}$				V _D =	veh/h		
Conversion to	o pc/h Und	der Base	Condition	s	1	-1						
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f _{HV}	f _p	v = V/PHF :	к f _{HV} х f _p		
Freeway	1631	0.90	Level	22	0	0.	.901	1.00	201	2		
Ramp	346	0.90	Level	22	0	0.	.901	1.00	42	7		
UpStream												
DownStream	<u> </u>	Merge Areas					I)iverge Areas				
Estimation of	f Vaa	norgornous			Estimat	ion c	of V_{42}	in orgo rin ous				
	1 2	(P)					12 V -	(1) + (1) - (1)	\D			
	v ₁₂ - v _F	('FM)	r 05 0)		1 _		v ₁₂ -		R ^{JF} FD			
	(⊏qua	allon 25-2 0	1 20-3)		L _{EQ} =		(5 01 25-9)			
F _{FM} =	using	Equation (EXIIIDIL 20-0)		F _{FD} =		Ι.	000 using Eq	uation (Exhi	DIL 25-12)		
$v_{12} =$	pc/n		- 4 0		$V_{12} =$		20	12 pc/h				
V_3 or V_{av34}	pc/h (Equation 2	5-4 or 25-5)		V_3 or V_{av34}	0.7	0	pc/h (Equatio	on 25-15 or	25-16)		
IS V_3 of $V_{av34} > 2,70$		s 📙 No			IS V ₃ or V _{av3}	₃₄ > 2,7		Yes Mo				
Is V_3 or $V_{av34} > 1.5$	V ₁₂ /2 Yes	s No			Is V ₃ or V _{av3}	₃₄ > 1.5	o^V ₁₂ /2	Yes Mo				
If Yes,V _{12a} =	pc/h ((Equation 2	5-8)		If Yes,V _{12a} =		p	c/h (Equation	25-18)			
Capacity Che	ecks	1			Capacit	y Ch	ecks	1 -		1		
	Actual	(Capacity	LOS F?			Actual	Са	pacity	LOS F?		
					V _F		2012	Exhibit 25-1	4 4800	No		
V _{FO}		Exhibit 25-7			$V_{FO} = V_{F}$	- V _R	1585	Exhibit 25-1	4 4800	No		
					V _R		427	Exhibit 25-3	3 2000	No		
Flow Entering	g Merge In	fluence A	Area		Flow En	terir	ng Merg	e Influence	e Area			
	Actual	Max	Desirable	Violation?			Actual	Max Desirab	ole	Violation?		
V		Exhibit 25-7			V ₁₂		2012	Exhibit 25-14	4400:All	No		
Level of Serv	ice Detern	nination ((if not F)		Level of	⁻ Ser	vice De	terminatio	n (if not l	7)		
D _R = 5.475 + 0.	00734 v _R + (0.0078 V ₁₂	- 0.00627 L _A			0 _R = 4	.252 + 0.	0086 V ₁₂ - 0.0	0009 L _D			
D _R = (pc/mi/	ln)				D _R = 18	3.2 (pc	/mi/ln)					
LOS = (Exhibi	it 25-4)				LOS = B	(Exhi	bit 25-4)					
Speed Determ	nination				Speed L	Deter	minatio	on				
M _S = (Exibit 2	5-19)				$D_s = 0.4$	466 (E	xhibit 25	-19)				
S _R = mph (Exh	ibit 25-19)				S _R = 56	o.9 mph	i (Exhibit	25-19)				
S ₀ = mph (Exh	ibit 25-19)				$S_0 = N/$	'A mph	(Exhibit)	25-19)				
S = mph (Exh	ibit 25-14)				S = 56	5.9 mpł	n (Exhibit	25-15)				

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	RAMPS AND RAMP JUNCTIONS WORKSHEET												
General Infor	mation			Site Infor	mation								
Analyst Agency or Company Date Performed Analysis Time Perioc Project Description	ALB RPM 5/22/2 I PM P 09-0402 Mine I	Transportation 2009 Peak Hour Lick Creek - TE	Consultants	Freeway/Dir of Tra Junction Jurisdiction Analysis Year	avel	I-40 (Westl Entrance R Putnam Co 2013 Propo	bound) Ramp from D Dosed w/ Bu	Mine Lick siness Parl	ĸ				
Inputs													
Upstream Adj Ramp		Terrain: Leve	l						Downstrea Ramp	am Adj			
Yes Or	1								Ves	🗖 On			
🗹 No 🕅 Off	f								Mo No	Cff Off			
L _{up} = ft			= 70.0 mp	h	S = 3	5.0 mph			L _{down} =	ft			
V _u = veh/h	I		Sketc	h (show lanes, L _A ,	$L_{D'}V_{R'}V_{f}$	0.0 mpn			V _D =	veh/h			
Conversion te	o pc/h Und	der Base (Condition	s									
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{HV}		f _p	v = V/PHF	x f _{HV} x f _p			
Freeway	1285	0.90	Level	22	0	0.901		1.00	1	585			
Ramp	776	0.90	Level	22	0	0.901		1.00		957			
UpStream		ļļ			ļ	ļ							
DownStream	<u> </u>	Morgo Aroac			<u> </u>		Divo	rao Aroac					
Estimation of	F V co	MEIGE AIEas			Estimat	ion of v		iye Aleas					
	• 12	(D)			Louman		12	· () () (
1	$v_{12} = v_F$	(P _{FM})					v ₁₂ = v _R	+ (v _F - v	R ^{)P} FD	۸			
L _{EQ} =	(Equa		20-3))	L _{EQ} =		(Eq		0-8 01 25-8) 25 12)			
F _{FM} =	1.000	using Equat	ion (Exhibit 23	0-5)	F _{FD} =		usir ne//	ng ⊑quau ⊾		25-12)			
$v_{12} =$	1585 p	DC/N			$v_{12} =$		pc/i	() (Faultion	DE 1E or DE	1/)			
$v_3 \cup v_{av34}$	0 pc/r	1 (Equation 2	25-4 OF 25-5)	v_3 or v_{av34}	> 2 700	pc/h2 = v		25-15 01 25	-10)			
$15V_3 \text{ or } V_{av34} > 2,70$					$13V_3 OIV_{av3}$	34 > 2,700 p)				
$15 V_3 OI V_{av34} > 1.5$	v ₁₂ /2 res	5 MINO	. 0)		$15 V_3 OI V_{av3}$	₃₄ > 1.5 V	12 ^{/2}	es 🔲 No)				
Copposity Cha		(Equation 20	9-0)		Conocit	Chao		n (Equalio	011 25-16)				
			anacity		Capacity		AS Actual		anacity	1.05 E2			
	Actual		арасну		V		Actual	Evhibit 25		L031:			
Vro	2542	Exhibit 25-7		No	$V_{FO} = V_{F}$	- V _P		Exhibit 25-	14				
10								Exhibit 25	-3				
Elow Entering	n Merge In	fluence A	roa			torina	Merce	Influen	co Area				
	Actual	Max	Desirable	Violation?		Actua	al	Max Desi	irable	Violation?			
V _{R12}	2542	Exhibit 25-7	4600:All	No	V ₁₂		Exh	ibit 25-14					
Level of Serv	ice Detern	nination (if not F)	I.	Level of	Servic	e Deter	rminati	on (if no	ot F)			
D _R = 5.475 +	0.00734 v _R + 0).0078 V ₁₂ - 0.0	0627 L _A		C	0 _R = 4.25	2 + 0.008	36 V ₁₂ - 0	.0009 L _D				
D _R = 20.6 (pc	/mi/ln)				D _R = (p	c/mi/ln)							
LOS = C (Exhib	oit 25-4)				LOS = (E	xhibit 25	-4)						
Speed Determ	nination				Speed D	Determi	ination						
M _S = 0.323 (Exil	bit 25-19)				D _s = (E	xhibit 25-1	9)						
S _R = 60.9 mph ((Exhibit 25-19)				S _R = m	oh (Exhibit	25-19)						
S ₀ = N/A mph (Exhibit 25-19)				S ₀ = m	oh (Exhibit	25-19)						
S = 60.9 mph ((Exhibit 25-14)				S = m	oh (Exhibit	25-15)						

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	HCS+ [™] DETAILED REPORT																		
General Info	rmation								Site I	nfo	ormati	ion							
									Inters	ect	tion	1	Mine	Lick & I-4	40 E	B ram	nps		
Analyst	ALB		•						Area	Ту	ре	/	All otl	ner areas	5				
Agency or Co	. RPM Transp	oortat	ion						Jurisc	lict	tion	ŀ	Putna	m Co					
Time Period	ed 5/26/2009 PM Peak Ho	our							Analy	sis	s Year	2	2013 Park	Propose	d w	/ Busir	ness		
									Proje	ct I	D	(09-04 TDO 1	02 Mine OC Pla	Lici nnir	k Cree 1g	k -		
Volume and	Timing Input		1									1					1		
					EB	1			WB		<u> </u>	_	· _	NB	- 1			SB	
Ni wakan of La	NL				TH	RT		LT	<u> TH</u>		RT	_	LT			RT			RT
Number of La	nes, N1		1				_		<u> </u>		<u> </u>	-				<u>Z</u>			
Volume V (vr	b)		L 122			164	_		<u> </u>			-		1008		<u>к</u> 846	L 122	121	
% Heavy Veh	icles %HV		5			5	_					-+		5	+	5	5	5	
Peak-Hour Fa	actor. PHF		0.90			0.90						\dashv		0.90	10	.90	0.90	0.90	
Pretimed (P)	or Actuated (A))	A			A								A	1	A	A	A	
Start-up Lost	Time, I1		2.0			2.0			1					2.0	2	2.0	2.0	2.0	
Extension of I	Effective Greer	n, e	2.0			2.0			1					2.0	2	2.0	2.0	2.0	
Arrival Type,	AT		3			3								3		3	3	3	
Unit Extension	Unit Extension, UE Filtering/Metering, I					3.0								3.0	3	3.0	3.0	3.0	
Filtering/Mete	are Periormed 5/26/2009 me Period PM Peak Ho olume and Timing Input umber of Lanes, N1 ane Group olume, V (vph) . Heavy Vehicles, %HV eak-Hour Factor, PHF retimed (P) or Actuated (A) tart-up Lost Time, I1 xtension of Effective Greer rrival Type, AT nit Extension, UE Itering/Metering, I itial Unmet Demand, Qb ed / Bike / RTOR Volumes ane Width arking / Grade / Parking arking Maneuvers, Nm uses Stopping, NB in. Time for Pedestrians, G hasing EB Only ming $G = 24.0$ Y = 5 uration of Analysis, T = 0.2 ane Group Capacity, Com djusted Flow Rate, v ane Group Capacity, c c Ratio, X otal Green Ratio, g/C niform Delay, d1					1.000)		<u> </u>		<u> </u>			1.000	1	.000	1.000	1.000	
Initial Unmet I	Demand, Q _b		0.0			0.0							Mine Lick & I-40 EB ramps All other areas Putnam Co 2013 Proposed w/ Business Park 09-0402 Mine Lick Creek - TDOT OC Planning NB SB LT TH RT LT TH 2 2 1 2 T R L T 1098 846 122 421 5 5 5 5 0.90 0.90 0.90 0.90 2.0 2.0 2.0 2.0 2.0 2.0 2.0 2.0 3 3 3 3 3.0 3.0 3.0 3.0 1.000 1.000 1.000 1.000 0 0 0 0 0 0 0 0 0 0 0 0 1.000 1.000 1.000 1.000 0 0 0 0 1.20 12.0 12.0 12.0 NB <td></td>						
Ped / Bike / R	TOR Volumes		0		0	0			ļ		ļ	_	0	0		0	0	0	
Lane Width			12.0			12.0			<u> </u>		<u> </u>	_		12.0	1	2.0	12.0	12.0	
Parking / Gra	de / Parking		N		0	N			ļ		ļ	_	Ν	0		Ν	N	0	N
Parking Mane	euvers, Nm					ļ			ļ		ļ						ļ	ļ	
Parking Maneuvers, Nm Image: Constraint of the second se								0	<u> </u>										
Min. Time for	Pedestrians, G	i p			3.2					1				3.2		1		3.2	-
Phasing	EB Only	(02		0	3		04			SB Or	nly		NS Perm	ו		07	0	8
Timing	G = 24.0 Y = 5	G = Y =	0.0	•) = i Y = (0.0 ว		G = 0.0 Y = 0)	Q V	$\dot{p} = 7.0$	0		b = 84.0 (= 5		G =	0.0	G = 0 Y = 0).0
Duration of A	nalvsis. T = <i>0.2</i>	25	0		<u> </u>	,		1 - 0		<u> </u>	- 0			Cvcle Ler	nath	. C =	130.0		,
Lane Group	Capacity, Con	trol L	Delay,	and	LOS	Deter	mir	nation						<u>,</u>	<u> </u>	.,			
·				EE	3				WB					NB				SB	
			LT	TH		RT	L	<u>_T </u>	TH		RT	L	Τ	ТН	F	RT	LT	<u> TH</u>	RT
Adjusted Flow	v Rate, v	1	136			182								1220	9	40	136	468	
Lane Group C	Capacity, c	3	317			503								2226	1	759	297	2544	
v/c Ratio, X		0.	.43		0	.36								0.55	0.	53	0.46	0.18	
Total Green F	Ratio, g/C	0.	.18		0	.18								0.65	0.	65	0.74	0.74	
Uniform Delay	y, d ₁	46	6.9		4	6.3								12.6	12	2.4	8.5	5.1	
Progression F	Factor, PF	1.	.000		1	.000								1.000	1.	000	1.000	1.000	
Delay Calibra	tion, k	0.	.11		0	.11								0.15	0.	14	0.11	0.11	
Incremental D	elay, d ₂	(0.9			0.4								0.3	0).3	1.1	0.0	
Initial Queue	Delay, d ₃	0	0.0		(0.0								0.0	0	.0	0.0	0.0	
Control Delay	,	4	17.9		4	46.8								12.9	1.	2.8	9.6	5.2	
Lane Group L	.OS		D			D								В	I	3	A	A	
Approach Del	ay		47.	2	1			ł		<u> </u>			12	2.8				6.2	,
Approach LO	S		D											3				Α	
Intersection D	elay		15.	1				$X_{c} = 0.$	55			Int	terse	ction LO	S			В	

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	HCS+ [™] DETAILED REPORT																		
General Info	rmation								Site I	nform	atio	n							
Analyst	AL B								Inters	ection		Mine	e Lic	ck & I-40	о И	/B ran	nps		
	Agency or Co. RPM Transportation Consultants Date Performed 5/26/2009 Time Period PM Peak Hour Volume and Timing Input EB LT TH Number of Lanes, N1							Area	Туре		All o	the	r areas						
	Consultants								Jurisc	liction		Putn	am	County	<u> </u>	_ ,			
Date Perform	ied 5/26/2009								Analy	sis Ye	ar	2013 Park	3 Pr	oposed	W/	Busir	iess		
Time Period	PM Peak He	our							Droio			09-0	402	? Mine L	.ick	Cree	k -		
									Projec			TDO	рт с	C Plan	nin	g			
Volume and	Timing Input		1									-					1		
					EB	1.5-			WB			. .		NB	· ·			SB	
Number of Le					IH				<u> IH</u>		<u>,</u>				<u> </u>	र।			RI
	anes, m						2				2	2					 		I R
	oh)						20	0			\ 37	603	2	527				334	83
% Heavy Veh	nicles. %HV						5	0	1	5	5	5	, 	5				5	5
Peak-Hour Fa	actor, PHF						0.9	0	1	0.9	90	0.90)	0.90	1			0.90	0.90
Pretimed (P)	or Actuated (A))					A		1	A	١	A		A			ĺ	A	A
Start-up Lost	Time, l1						2.0)		2.	0	2.0		2.0				2.0	2.0
Extension of	Effective Greer	n, e					2.0)		2.	0	2.0		2.0			<u> </u>	2.0	2.0
Arrival Type,	AT						3			3	}	3		3				3	3
Unit Extensio	n, UE						3.0)	<u> </u>	3.	0	3.0		3.0			ļ	3.0	3.0
Filtering/Mete	Filtering/Metering, I Initial Unmet Demand, Qь Ped / Bike / RTOR Volume:						1.0	00		1.0	000	1.00	00	1.000			ļ	1.000	1.000
Initial Unmet	Initial Unmet Demand, Qb Ped / Bike / RTOR Volume: Lane Width						0.0)		0.	0	0.0		0.0				0.0	0.0
Ped / Bike / R	Initial Unmet Demand, Qb Ped / Bike / RTOR Volume: Lane Width Parking / Grade / Parking						12	0	0	12	0	12.0)	12.0			0	12.0	12.0
Parking / Gra	Lane Width Parking / Grade / Parking Parking Maneuvers, Nm						1Z. N	0		12	.0 1	12.0 N	, 	12.0		N.		12.0	12.0 N
Parking / Gra													0	+ '	v			11	
Buses Stoppi	Parking Maneuvers, Nm Buses Stopping, NB						0				0	0		0				0	0
Min Time for	ìn									0			32			ļ	32		
Phasing	WB Only		02	1	(03	<u>/</u>	04	0.2	NB	Only	v	NS	S Perm			07		8
	G = 10.0	G =	0.0		G =	0.0	G =	0.0	0	G =	31.3	3	G =	= 13.7		G =	0.0	G = 0	0.0
Timing	Y = 5	Y =	0		Y =	0	Y =	0		Y =	5		Y =	= 5		Y =	0	Y = 0)
Duration of A	nalysis, T = 0.2	?5											Су	cle Lenç	gth,	C =	70.0		
Lane Group	Capacity, Con	trol l	Delay,	and	LOS	S Detei	rminati	on									(
					B	DT		- 1	WB				-	NB		_		SB	
Adjusted Flov	v Rate, v				1	RI	232			152		770		1 T 586	R	. I		371	02
Lane Group C	Capacity, c						477			220		1872		2461				674	301
v/c Ratio, X	- 1 , ,						0.49			0.69	0) 41		24				0.55	0.31
Total Green F	Ratio, g/C						0.14			0.14).71						0.20	0.20
Uniform Dela	y, d₁						27.6			28.5		4.2		3.4				25.4	24.1
Progression F	Factor, PF						1.000			1.000	0 1	1.000	1	.000				1.000	1.000
Delay Calibra	ition, k						0.11			0.26	C).11	0).11				0.15	0.11
Incremental D	Delay, d ₂						0.8			8.9		0.1		0.1				1.0	0.6
Initial Queue	Delay, d ₃						0.0			0.0	1	0.0	1	0.0				0.0	0.0
Control Delay	/						28.4			37.4	!	4.4		3.5				26.3	24.7
Lane Group L	OS						С			D		A		A				С	С
Approach De	lay							32.0)				4.0					26.0	
Approach LO	S							С					Α					С	
Intersection D	Delay		13.	5				= 0.	56		1	Interse	ectio	on LOS				В	

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BASE YEAR 2013 INTERSTATE 40 AT STATE ROUTE 135 (S. WILLOW AVENUE)

	RAMPS AND RAMP JUNCTIONS WORKSHEET												
General Infor	rmation			Site Infor	mation								
Analyst Agency or Company Date Performed Analysis Time Perioo	ALB RPM 5/22/2 d AM P	Transportation 2009 Peak Hour	n Consultants	Freeway/Dir of Tr Junction Jurisdiction Analysis Year	avel	I-40 (Ea Exit Ra Putnan 2013 P	astbound) imp to SR- n Co roposed w	135 / Business Park					
Project Description	09-0402 Mine I	Lick Creek IJS	- TDOT OC Pl	anning									
Inputs		Torrain: Low											
Upstream Adj Ramp			21						Downstrea Ramp	ım Adj			
	f								Yes	□ On			
L _m = ft									L _{down} =	ft Off			
-up ···			S _{FF} = 70.0 mp	h	S _{FR} = 3	5.0 mp	h						
V _u = veh/h	1		Sketo	ch (show lanes, L _A ,	L_{D}, V_{R}, V_{f}				$V_D =$	veh/h			
Conversion t	o pc/h Und	der Base	Condition	S					·				
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f _{HV}	f _p	v = V/PHF	x f _{HV} x f _p			
Freeway	1793	0.90	Level	22	0	0.	901	1.00	22	11			
Ramp	256	0.90	Level	22	0	0.	901	1.00	3	16			
UpStream													
DownStream	<u> </u>	J Merge Areas					1	Diverge Areas					
Estimation of	f v ₁₂	<u> </u>			Estimat	ion c	of V_{12}						
	$V_{10} = V_{\Gamma}$	(P _{EM})					V=	= V _P + (V _F - V	/_)P				
L _{EO} =	(Equa	ation 25-2 o	r 25-3)		L _{EO} =		12	Equation 25-	8 or 25-9)				
P _{EM} =	usina	Equation (Exhibit 25-5)		$P_{ED} =$		1.	.000 usina E	auation (Ext	nibit 25-12)			
V ₁₂ =	pc/h		,		$V_{12} =$		2	211 pc/h	1	,			
V_3 or $V_{3\sqrt{3}4}$	pc/h ((Equation 2	5-4 or 25-5)		V_{2}^{12} or $V_{2V^{24}}$		0	pc/h (Equati	ion 25-15 oi	· 25-16)			
$ _{1S} V_3 \text{ or } V_{av34} > 2,70$	0 pc/h? 🔲 Yes	s 🔲 No	,		Is V ₂ or V _{2V2}	2,7	00 pc/h?	Yes Mo		/			
Is V_3 or $V_{av34} > 1.5$	* V ₁₂ /2 🔲 Yes	s 🔲 No			Is V ₃ or V _{av3}	а м > 1.5	* V ₁₂ /2	Ves 🗹 No	1				
If Yes,V _{12a} =	pc/h ((Equation 2	5-8)		If Yes, V _{12a} =		, F	oc/h (Equatio	n 25-18)				
Capacity Che	ecks				Capacit	y Ch	ecks						
	Actual		Capacity	LOS F?			Actual	C	apacity	LOS F?			
					V _F		2211	Exhibit 25-	14 4800	No			
V _{FO}		Exhibit 25-7			$V_{FO} = V_{F}$	- V _R	1895	Exhibit 25-	14 4800	No			
					V _R		316	Exhibit 25-	-3 2000	No			
Flow Entering	g Merge In	fluence A	Area		Flow En	terin	ng Merg	ge Influenc	ce Area				
	Actual	Max	Desirable	Violation?			Actual	Max Desira	able	Violation?			
V _{R12}		Exhibit 25-7			V ₁₂	4	2211	Exhibit 25-14	4400:All	No			
Level of Serv	rice Detern	nination ((if not F)		Level of	Ser	vice De	eterminatio	on (if not	F)			
$D_{R} = 5.475 + 0.$	00734 v _R + 0	0.0078 V ₁₂	- 0.00627 L _A			0 _R = 4	.252 + 0.	0086 V ₁₂ - 0	.0009 L _D				
D _R = (pc/mi/	′ln)				$D_R = 20$).7 (pc	/mi/ln)						
LOS = (Exhibi	it 25-4)				LOS = C	(Exhi	bit 25-4)						
Speed Determ	nination				Speed D	Deter	minatio	on					
M _S = (Exibit 2	5-19)				$D_s = 0.4$	456 (E	xhibit 25	-19)					
S _R = mph (Exh	nibit 25-19)				S _R = 57	.2 mph	(Exhibit	25-19)					
S ₀ = mph (Exh	nibit 25-19)				$ S_0^{=} $ N/	A mph	(Exhibit	25-19)					
S = mph (Exh	nibit 25-14)				S = 57	.2 mph	(Exhibit	25-15)					

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	RAMPS AND RAMP JUNCTIONS WORKSHEET												
General Infor	mation			Site Infor	mation								
Analyst Agency or Company Date Performed Analysis Time Perioc Project Description	ALB RPM 5/22/2 1 AM P 09-0402 Mine I	Transportation 2009 'eak Hour Lick Creek - TE	Consultants	Freeway/Dir of Tra Junction Jurisdiction Analysis Year	avel	I-40 (Eastb Entrance R Putnam Co 2013 Propo	ound) Camp from Dosed w/ Bu	SR-135 siness Parl	ζ				
Inputs				3									
Upstream Adj Ramp		Terrain: Leve							Downstrea Ramp	am Adj			
Yes On	1								Yes	Cn On			
🗹 No 🕅 Off	f								No No	Cff Off			
L _{up} = ft			- 70.0 mp	h	<u> </u>	5 0 mnh			L _{down} =	ft			
V _u = veh/h			FF - 70.0 mp Sketc	h (show lanes, L _A ,	$U_{FR} = J$ L_{D}, V_{R}, V_{f}	5.0 mpn			V _D =	veh/h			
Conversion to	o pc/h Und	der Base (Condition	S									
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{HV}		f _p	v = V/PHF	x f _{HV} x f _p			
Freeway	1537	0.90	Level	22	0	0.901		1.00	1	896			
Ramp	330	0.90	Level	22	0	0.901		1.00		407			
UpStream					[
DownStream													
Estimation of	FV	vierge Areas			Estimati	ion of v	Dive	rge Areas					
	* 12	(P)			LSumau		12						
	$V_{12} = V_{F}$	(P _{FM})					$V_{12} = V_{R}$	+ (V _F - V	_R)P _{FD}				
L _{EQ} =	(Equa	ation 25-2 or	· 25-3))	L _{EQ} =		(Eq	uation 25	-8 or 25-9)			
P _{FM} =	1.000	using Equat	ion (Exhibit 28	5-5)	P _{FD} =		usir	ng Equati	on (Exhibit	25-12)			
$v_{12} =$	1896 p	oc/n			$V_{12} =$		pc/i	ר ר	0F 1F 0F	1/)			
V_3 OI V_{av34}	0 pc/r	n (Equation 2	25-4 or 25-5))	V_3 OF V_{av34}	. 2 700	pc/r		25-15 OF 25	-16)			
$15 V_3 01 V_{av34} > 2,70$		s 🕅 No			IS V ₃ OI V _{av3}	34 > 2,700 . 1 E * M), 11 (∏ Y	es 🔲 No)				
$15 V_3 01 V_{av34} > 1.5$	v ₁₂ /2 ■ Yes	s 🔟 No	. 0)		IS V ₃ OF V _{av3}	₃₄ > 1.5 V	12/2 Y	es 🔲 No)				
$11 \text{ Yes}, v_{12a} =$	pc/n (Equation 25	o-8)		$11^{4} \text{ Yes}, V_{12a} =$	- O l	pc/i	n (Equatio	on 25-18)				
Capacity Che	CKS			1.00 52	Capacit	y Cnec	KS						
	Actual		араспу	LUSF?	V		Actual	Evhibit 25		LUSF?			
V	2303	Exhibit 25-7		No	$V_{-0} = V_{-}$	- V_		Exhibit 25-	14				
.+0	2000				V _R			Exhibit 25	-3				
Flow Entering	a Merae In	fluence A	rea]	Flow En	terina	Merae	Influen	ce Area				
	Actual	Max	Desirable	Violation?		Actua	al	Max Desi	irable	Violation?			
V _{R12}	2303	Exhibit 25-7	4600:All	No	V ₁₂		Exh	ibit 25-14					
Level of Serv	ice Detern	nination (if not F)		Level of	Servic	e Detei	rminati	on (if no	ot F)			
D _R = 5.475 +	0.00734 v _R + 0).0078 V ₁₂ - 0.0	0627 L _A			0 _R = 4.25	2 + 0.008	86 V ₁₂ - 0	.0009 L _D				
D _R = 19.8 (pc	/mi/ln)				D _R = (p	c/mi/ln)							
LOS = B (Exhib	oit 25-4)				LOS = (E	xhibit 25	-4)						
Speed Determ	nination				Speed D	Determi	nation						
M _S = 0.321 (Exil	bit 25-19)				D _s = (E	xhibit 25-1	9)						
S _R = 61.0 mph ((Exhibit 25-19)				S _R = m	oh (Exhibit	25-19)						
S ₀ = N/A mph (Exhibit 25-19)				S ₀ = m	oh (Exhibit	25-19)						
S = 61.0 mph ((Exhibit 25-14)				S = m	oh (Exhibit	25-15)						

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		RAMP	S AND RA	MP JUNCTI	ONS WOR	RKSHE	ET			
General Infor	mation			Site Infor	mation					
Analyst	ALB			Freeway/Dir of Tr	avel I-	40 (Westb	oound)			
Agency or Company	RPM	Transportation	n Consultants	Junction	E	xit Ramp	to SR-13	35		
Date Performed	5/22/2	2009 Jacob Haven		Jurisdiction	F	Putnam Co) 	Dusiness Dark		
Analysis Time Period	AIVI P	eak Hour		Analysis Year	2	UI3 Propo	osed w/	Business Park		
Inputs	09-0402 10111101									
Upstream Adj Ramp		Terrain: Leve	9l						Downstrea Ramp	m Adj
🗖 Yes 🗖 On	I								Ves	🗖 On
No Off	f								🗹 No	Cff
L _{up} = ft			70.0		•				L _{down} =	ft
V _u = veh/h			s _{FF} = 70.0 mp Sketc	h h (show lanes, L _A ,	$S_{FR} = 3t$ L_{D}, V_{R}, V_{f}	o.0 mph			V _D =	veh/h
Conversion to	o pc/h Und	der Base	Condition	S						
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{HV}		f _p	v = V/PHF	x f _{HV} x f _p
Freeway	2616	0.90	Level	22	0	0.901		1.00	32	26
Ramp	414	0.90	Level	22	0	0.901		1.00	51	1
UpStream										
DownStream	,	Morgo Aroas						vorgo Aroas		
Estimation of	· Via	Nerge Areas			Estimati	on of v	240	Neige Aleas		
	- 1 2	(D)					12			
1	$v_{12} = v_F$	(r _{FM})	- OF 0)				v ₁₂ =	v _R + (v _F - v _f	۶ ^{)۳} FD	
$L_{EQ} =$	(⊏qua	Lauratian (1 20-3) Evhibit 25 5)				(⊏		01 23-9)	10 10)
F _{FM} =	using	Equation (EXHIDIL 20-0)		F _{FD} =		1.0	00 using Eq	luation (Exh	IDIL 25-12)
$v_{12} = 0$	pc/n				$v_{12} =$		322	26 pc/n	05.45	05.40
$V_3 \cup V_{av34}$	pc/n (Equation 2	5-4 or 25-5)		v_3 or v_{av34}	2 700 -	0	pc/h (Equatio	on 25-15 or	25-16)
$15 V_3 OI V_{av34} > 2,70$		S NO			$15V_3UV_{av3}$	1 Γ *) (Yes M No		
$15 V_3 \text{ of } V_{av34} > 1.5$	v ₁₂ /2 ■ Yes	s No			IS V_3 of V_{av34}	₁ > 1.5 V	12/2	Yes M No		
If Yes,V _{12a} =	pc/h (Equation 2	5-8)		If Yes,V _{12a} =	~	pc	c/h (Equation	25-18)	
Capacity Che	CKS	1	<u> </u>	1 1 0 0 5 0	Capacity	Checi	ks			1 1 00 50 1
	Actual	(apacity	LOS F?	V		Actual		pacity	LOS F?
					V _F	· ·	3226		4 4800	NO
V _{FO}		Exhibit 25-7			$V_{FO} = V_F$	· V _R	2715	Exhibit 25-1	4 4800	No
					V _R		511	Exhibit 25-3	2000	No
Flow Entering	g Merge In	fluence A	Area	1	Flow En	tering l	Merge	e Influenco	e Area	
	Actual	Max	Desirable	Violation?		Actu	al	Max Desirab	ble	Violation?
V _{R12}		Exhibit 25-7			V ₁₂	3226		Exhibit 25-14	4400:All	No
Level of Serv	ice Detern	nination (if not F)		Level of	Servic	e Det	erminatio	n (if not i	F)
$D_{\rm R} = 5.475 \pm 0.12$	00734 v _R + (0.0078 V ₁₂	- 0.00627 L _A		D	_R = 4.252	2 + 0.0	086 V ₁₂ - 0.0	0009 L _D	
D _R = (pc/mi/	ln)				$D_{\rm R} = 29.$	5 (pc/mi /	/ln)			
LOS = (Exhibi	t 25-4)				LOS = D	Exhibit 2	25-4)			
Speed Determ	nination				Speed D	etermi	natio	n		
M _S = (Exibit 28	5-19)				$D_{s} = 0.4$	74 (Exhi l	bit 25-1	19)		
S _R = mph (Exh	ibit 25-19)				S _R = 56.	7 mph (E	xhibit 2	25-19)		
S ₀ = mph (Exh	ibit 25-19)				$ S_0 = N/A$	A mph (Ex	chibit 2	5-19)		
S = mph (Exh	ibit 25-14)				S = 56.	7 mph (E	xhibit 2	25-15)		

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	RA	MPS AND	RAMP JU	INCTIONS W	ORKSHE	EET				
General Infor	mation			Site Infor	mation					
Analyst Agency or Company Date Performed Analysis Time Perioc Project Description	ALB RPM 5/22/2 I AM P 09-0402 Mine I	Transportation 2009 'eak Hour Lick Creek - TD	Consultants	Freeway/Dir of Tra Junction Jurisdiction Analysis Year	avel	I-40 (Westt Entrance R Putnam Cc 2013 Propo	bound) Camp from S Dised w/ Busi	R-135 ness Park		
Inputs										
Upstream Adj Ramp		Terrain: Leve							Downstrea Ramp	am Adj
Yes Or	1								Ves	🗖 On
🗹 No 🔽 Off	f								🗹 No	C Off
L _{up} = ft			- 70.0 mp	h	<u> </u>	E 0 mnh		I	-down =	ft
V _u = veh/h	I	3	FF = 70.0 mp Sketc	h (show lanes, L _A ,	$S_{FR} = 3$ $L_{D'}V_{R'}V_{f}$	5.0 mpn		ľ	V _D =	veh/h
Conversion to	o pc/h Und	der Base (Condition	s						
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{HV}		f _p	v = V/PHF	x f _{HV} x f _p
Freeway	2202	0.90	Level	22	0	0.901	1	.00	2	716
Ramp	150	0.90	Level	22	0	0.901	1	.00		185
UpStream		ļļ								
DownStream	<u> </u>						Divor			
Estimation of	FV	vierge Areas			Fstimat	ion of v	Diverg	je Areas		
	• 12	(D)			Lotinati		12	<u> </u>	<u>, </u>	
	$v_{12} = v_F$	(P _{FM})	05.0			,	$v_{12} = v_R + (r_R)$	(V _F - V _F	۶)۲ _{FD}	`
L _{EQ} =	(Equa	ation 25-2 or	25-3)		L _{EQ} =		(Equ	ation 25	-8 OF 25-9)
$P_{FM} =$	1.000	using Equati	ion (Exhibit 28	5-5)	P _{FD} =		usinę na/h	g Equation	on (Exhibit.	25-12)
$v_{12} =$	2/10 p	DC/N			$v_{12} =$		pc/n	Tauation	DE 1E or DE	1/)
$v_3 \cup v_{av34}$	0 pc/r 0 pc/b2		25-4 01 25-5)	v_3 or v_{av34}	> 2 700 r	$pc/h2 \square N_{a}$		20-10 01 20	-10)
$15V_3 \text{ or } V_{av34} > 2.70$					$13 V_3 O V_{av3}$	34 ~ 2,700 p > 1 5 * V				
$13 v_3 01 v_{av34} > 1.3$	$v_{12}/2$ in res	Equation 25	-8)		If Ves V -	₃₄ ~ 1.5 V	12' ² nc/h	(Equation	n 25-18	
Capacity Che	pont		-0)			v Choc	po/n	(Lyuanc	JII 23-10)	
	Actual		anacity	1.05.F2	Capach		Actual	Ca	nacity	1.0S F2
	Actual		apacity		V _E		F	xhibit 25-	14	2001:
V _{FO}	2901	Exhibit 25-7		No	$V_{FO} = V_F$	- V _R	E	xhibit 25-	14	
					V _R		E	xhibit 25	.3	
Flow Entering	a Merae In	fluence A	rea	J	Flow En	terina	Merae Ir	ofluend	e Area	
	Actual	Max	Desirable	Violation?		Actua	al	Max Desi	able	Violation?
V _{R12}	2901	Exhibit 25-7	4600:All	No	V ₁₂		Exhib	oit 25-14		
Level of Serv	ice Detern	nination (i	if not F)		Level of	Servic	e Deteri	ninatio	on (if no	t F)
D _R = 5.475 +	0.00734 v _R + 0	0.0078 V ₁₂ - 0.0	0627 L _A		C	0 _R = 4.25	2 + 0.0086	6 V ₁₂ - 0	.0009 L _D	
D _R = 24.1 (pc	/mi/ln)				D _R = (p	c/mi/ln)				
LOS = C (Exhib	oit 25-4)				LOS = (E	xhibit 25	-4)			
Speed Determ	nination				Speed L	Determi	nation			
M _S = 0.348 (Exil	bit 25-19)				D _s = (E	xhibit 25-1	9)			
S _R = 60.3 mph ((Exhibit 25-19)				S _R = m	ph (Exhibit	25-19)			
S ₀ = N/A mph (Exhibit 25-19)				S ₀ = m	ph (Exhibit	25-19)			
S = 60.3 mph ((Exhibit 25-14)				S = m	ph (Exhibit	25-15)			

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					нс	S+™ D)E	TAILE	ED	RE	Ρ	ORT								
General Info	rmation								Si	ite In	ıfo	rmatie	on							
								Í	Int	terse	ecti	ion	SI	R-13	5 & I-40	eas	tbour	nd		
Analyst	ALB								٨٣				ra Al	mps	or orooo					
Agency or Co	. RPM Transp	oortai	tion							iriedi	yµ cti	on	Ai Di	utnar	er areas n Co					
Date Perform	ed 5/26/2009								Ju				20)13 F	Proposed	dw/	Busir	ness		
I ime Period	АМ Реак Но	bur							Ar	nalys	sis	Year	Pa	ark		,	20.01			
									Pr	rojec	t ID	5	09 TI	9-04(DOT	02 Mine I	Lick	Cree	k -		
Volume and	Timing Input]						201	00110		9			
					EB				١	WB					NB				SB	
			LT		TH	RT		LT		TH		RT		LT	TH		RT	LT	ТН	RT
Number of La	nes, N1		1			1									2		0	1	2	
Lane Group			L			R		<u> </u>	_									L		
Volume, V (vp	oh)		197			59									752	1	185	145	524	
% Heavy Veh	icles, %HV		5			5		ļ							5		5	5	5	
Peak-Hour Fa	ictor, PHF		0.90			0.90		ļ	_						0.90	<u> 0.</u>	90	0.90	0.90	
Pretimed (P)	or Actuated (A)		A			A			_		_		_		A		4	A	A	
Start-up Lost	Time, 11		2.0			2.0			_		_		_		2.0			2.0	2.0	
		i, e	2.0			2.0			+		_				2.0			2.0	2.0	
Linit Extension			20	_		20		1	+						3			30	20	
Filtering/Mete			1.00	2		1.000)		╎		_				1 000			1 000	1 000	
Initial I Inmet I	Demand Ob		0.0	/		0.0	<u> </u>		╎				_		1.000	-		0.0	0.0	
Ped / Bike / R	TOR Volumes		0.0		0	0.0		<u> </u>	╎					0	0.0		0	0	0.0	
Lane Width			12.0		0	12.0		1	╎					0	12.0	+	<u> </u>	12.0	12.0	
Parking / Grad	de / Parking		N		0	N			╎					N	0		N	N	0	N
Parking Mane	uvers, Nm				0				╎				<u> </u>			+	•			
Buses Stoppi	ng, Nв		0			0		1							0			0	0	
Min. Time for	Pedestrians, G	i p			3.2			İ							3.2			[3.2	
Phasing	EB Only		02	[0	3	[04		[5	SB On	ly	N	IS Perm			07	0	8
Timing	G = 50.6	G =	0.0		G =	0.0		G = 0.	0		G	= 11.	.8	G	= 52.6		G =	0.0	G = 0	0.0
	Y = 5	Y =	0		Y = 0)		Y = 0			Υ	= 5		Y	= 5		Y =	0	Y = 0)
Duration of Ar	nalysis, T = 0.2	5					_							C	ycle Len	gth.	, C =	130.0		
Lane Group	Capacity, Con	trol I	Delay,	and	d LOS	Deter	mi	nation		(D								1		
		_	IТ		<u>н </u>	DT	_	IT [<u>ч</u> (/В		т	<u>іт</u>	- 1			т		<u></u> тц	DT
Adjusted Flow	/ Rate, v		219			66				<u> </u>			<u> </u>		1042			161	582	
Lane Group C	apacity, c		669			500									1353	<u> </u>		247	1830	
v/c Ratio X			22			000									0.77	-		0.65	0.22	
Total Green F	Patio a/C	0	20												0.77	<u> </u>		0.00	0.52	
		0	.39			0.39 05.0									0.40	<u> </u>		0.53	0.53	
Progression F	7, u ₁	2	7.8		2	5.3									33.5			22.1	17.0	
		1	.000		1	.000									1.000			1.000	1.000	
		0	.11		(0.11									0.32	<u> </u>		0.23	0.11	
	pelay, d ₂		0.3			0.1									2.8	<u> </u>		6.0	0.1	
	Delay, a ₃		<i></i>			0.0									0.0	<u> </u>		0.0	0.0	
Control Delay		2	28.1			25.4									36.3	_		28.1	17.1	
Lane Group L	05		С			С									D			С	B	
Approach Del	ay		27.	5										36.	3			· · ·	19.5	
Approach LO	S		С											D					В	
Intersection D	elay		29.	0				$X_{c} = 0.$.60)			Inte	rsec	tion LOS	3			С	

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					нс	S+™ I	DET	TAILE	ED RI	EP	ORT	•							
General Info	rmation								Site I	nfo	ormat	ion							
Analyst	ALB								Inters	ect	tion	S ra	SR-135 amps	5 & <i>1-40</i> 1	wes	tbour	nd		
Agency or Co	RPM Trans	oortat	ion						Area	Тур	ре	Α	II othe	r areas					
Dete Derferre	Consultants								Juriso	dict	ion	Ρ	Putnam	County	,				
Time Period	ed 5/26/2009 AM Peak He	our							Analy	/sis	Year	2 P	013 P. Park	roposed	w/	Busir	ness		
									Proje	ct I	D	0 T	9-040 DOT (2 Mine L OC Plan	.ick ninę	Cree. g	k -		
Volume and	Timing Input																		
					EB				WB	,				NB				SB	
			LT		TH	RT		LT	TH		RT		LT	TH	F	RΤ	LT	ТН	RT
Number of La	nes, N1							1			ļ		1	2			ļ	2	0
Lane Group								L			<u> </u>		L	T	<u> </u>		ļ	TR	
Volume, V (vp	ph)							188			<u> </u>		37	912	<u> </u>		ļ	481	113
% Heavy Veh	icles, %HV		ļ					5			ļ		5	5	<u> </u>		ļ	5	5
Peak-Hour Fa	ictor, PHF						(0.90			<u> </u>	0).90	0.90	<u> </u>		ļ	0.90	0.90
Pretimed (P)	or Actuated (A)						<u>A</u>			 		<u>A</u>	A			ļ	A	A
Start-up Lost	Time, 11						_	2.0				- 4	2.0	2.0				2.0	
		і, е				-		2.0	_			4	2.0	2.0				2.0	<u> </u>
Linit Extension	<u>, 11</u> E							30	-				30	30				20	
Filtering/Mete								<u>3.0</u> 1.000				1	1 000	1 000				1 000	
Initial Unmet [Demand Ob					-		0.0	_				<u>0000</u>	0.0				0.0	ļ
Ped / Bike / R	TOR Volumes					-		0.0	0				0.0	0.0			0	0	0
Lane Width						_	- I	12.0				1	12.0	12.0				12.0	
Parking / Grad	de / Parking							Ν	0		N		Ν	0	1	V	N	0	N
Parking Mane	euvers, Nm																		
Buses Stoppin	ng, Nв							0					0	0				0	
Min. Time for	Pedestrians, C	Эp							3.2					3.2				3.2	
Phasing	WB Only	()2		0	3		04			NB Or	nly	N	S Perm			07	0	8
Timing	G = 76.2	G =	0.0		G = (0.0		G = 0.0	0	G	6 = 6.	4	G	= 32.4		G =	0.0	G = 0	0.0
	Y = 5	Y =	0		Y = 0	0	Y	Y = 0		Y	′ = 5		<u> </u>	= 5		Y =	0	Y = 0)
Duration of Ar	$\frac{1}{2}$	25 (D = (= =				_			Cy	cle Leng	gth,	C =	130.0		
Lane Group	Capacity, Con	itroi L	pelay,		1 LU3	Deter	rmin 	ation	W/R			1		NB			[SB	
			Т		<u></u>	RT	<u> </u>	т	TH	Τ	RT	1-	тΙ	TH	R	т	IT	<u>ор</u> Т. тн	RT
Adjusted Flow	/ Rate, v						20	09		1		4	1	1013		-		660	
Lane Group C	Capacity, c						10	08		T		16	64	1161				834	
v/c Ratio, X							0.2	21		1		0.2	5 (0.87				0.79	
Total Green R	Ratio, g/C						0.5	59		1		0.3	4 (0.34				0.25	
Uniform Delay	/, d ₁						12.	.7				31.	5	40.5				45.6	
Progression F	actor, PF						1.0	000				1.0	00	1.000				1.000	
Delay Calibra	tion, k						0.1	11				0.1	1 (0.40				0.34	
Incremental D	elay, d ₂						0.	.1				0.	8	7.5				5.2	
Initial Queue	Delay, d ₃						0.0	0				0.0)	0.0				0.0	
Control Delay							12	2.8				32.	.3	48.0				50.9	
Lane Group L	OS						В	}				С		D				D	
Approach Del	ay							12.8	3				47.4	4				50.9	
Approach LO	S							В					D					D	
Intersection D	elay		44.	8)	$X_{c} = 0.$	45			Inte	ersect	ion LOS				D	



HCS+TM Version 5.21

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Page 1 of 1





HCS+TM Version 5.21

Generated: 5/29/2009 5:00 PM

Page 1 of 1





HCS+TM Version 5.21

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		RAMP	S AND RA	MP JUNCTI	ONS WO	RKS	HEET			
General Infor	mation			Site Infor	mation					
Analyst Agency or Company Date Performed Analysis Time Period	ALB RPM 5/22/2 M PM P	Transportation 2009 Yeak Hour		Freeway/Dir of Tr Junction Jurisdiction Analysis Year	avel I	-40 (E Exit Ra Putnan 2013 P	astbound) imp to SR- n Co Proposed w	135 / Business Park		
Inputs				anning						
Upstream Adj Ramp		Terrain: Leve	el						Downstrea Ramp	ım Adj
Yes Or	ו								Tes Yes	Con On
No Of	f								No No	C Off
L _{up} = ft			<u> </u>	h	c)	F 0 mr	h		L _{down} =	ft
V _u = veh/h	I		s _{FF} = 70.0 mp Sketo	n :h (show lanes, L _A ,	$S_{FR} = 3$ $L_{D'}V_{R'}V_{f}$	5.0 mp	n		V _D =	veh/h
Conversion to	o pc/h Und	der Base	Condition	S					,	
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f _{HV}	f _p	v = V/PHF	x f _{HV} x f _p
Freeway	2450	0.90	Level	22	0	0.	.901	1.00	30	22
Ramp	248	0.90	Level	22	0	0.	.901	1.00	30)6
UpStream										
DownStream	<u> </u>	J Merge Areas					[Diverge Areas		
Estimation of	f v ₁₂				Estimati	ion c	of v ₁₂	<u>J</u>		
	$V_{12} = V_{\Gamma}$	(P _{EM})					V ₁₀ =	= V _D + (V _E - V	/_)P	
L _{EO} =	(Equa	ation 25-2 o	r 25-3)		L _{EO} =		12	Equation 25-	8 or 25-9)	
P _{FM} =	using	Equation (Exhibit 25-5)		P _{FD} =			000 using E	quation (Ext	nibit 25-12)
V ₁₂ =	pc/h				V ₁₂ =		30)22 pc/h		·
V ₃ or V _{av34}	pc/h ((Equation 2	5-4 or 25-5)		V_3 or V_{av34}		0	pc/h (Equati	ion 25-15 oi	[.] 25-16)
Is V_3 or $V_{av34} > 2,70$	0 pc/h? 🥅 Yes	s 🔲 No			Is V ₃ or V _{av3}	4 > 2,7	/00 pc/h? 🛛	Yes 🗹 No	1	
Is V_3 or $V_{av34} > 1.5$	* V ₁₂ /2 🔲 Yes	s 🔲 No			Is V ₃ or V _{av3}	₄ > 1.5	5 * V ₁₂ /2 ▮	Yes 🗹 No	1	
If Yes,V _{12a} =	pc/h ((Equation 2	5-8)		If Yes, V _{12a} =		þ	c/h (Equatio	n 25-18)	
Capacity Che	ecks				Capacity	y Ch	ecks			
	Actual	(Capacity	LOS F?	ļ		Actual	С	apacity	LOS F?
					V _F		3022	Exhibit 25-	14 4800	No
V _{FO}		Exhibit 25-7			$V_{FO} = V_{F}$	- V _R	2716	Exhibit 25-	14 4800	No
					V _R		306	Exhibit 25-	-3 2000	No
Flow Entering	g Merge In	fluence A	Area		Flow En	terin	ng Merg	e Influenc	ce Area	
	Actual	Max	Desirable	Violation?	<u> </u>	<u> </u>	Actual	Max Desira	able	Violation?
V		Exhibit 25-7			V ₁₂		3022	Exhibit 25-14	4400:All	No
Level of Serv	ice Detern	nination ((if not F)		Level of	Ser	vice De	terminatio	on (if not	F)
$D_{R} = 5.475 + 0.$	00734 v _R + (0.0078 V ₁₂	- 0.00627 L _A			_R = 4	.252 + 0.	0086 V ₁₂ - 0	.0009 L _D	
D _R = (pc/mi/	ln)				D _R = 27	.6 (pc	/mi/ln)			
LOS = (Exhibi	it 25-4)				LOS = C	(Exhi	bit 25-4)			
Speed Detern	nination				Speed D	eter	minatio	on		
$M_{\rm S}$ = (Exibit 28)	5-19)				$D_{s} = 0.4$	156 (E	xhibit 25	-19)		
S _R = mph (Exh	nibit 25-19)				S _R = 57	.2 mph	(Exhibit	25-19)		
$S_0 = mph (Exh$	ibit 25-19)				$ _{0}^{S_{0}} = N/2$	A mph	(Exhibit)	25-19)		
S = mph (Exh	nibit 25-14)				S = 57	.2 mph	n (Exhibit	25-15)		

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	RA	MPS AND	RAMP JU	INCTIONS W	ORKSHE	ET				
General Infor	mation			Site Infor	mation					
Analyst Agency or Company Date Performed Analysis Time Perioc Project Description	ALB RPM 5/22/2 I PM P 09-0402 Mine I	Transportation 2009 'eak Hour Lick Creek - TD	Consultants	Freeway/Dir of Tra Junction Jurisdiction Analysis Year	avel	I-40 (East Entrance Putnam C 2013 Proj	bound) Ramp from Co posed w/ B	ı SR-135 usiness Par	k	
Inputs										
Upstream Adj Ramp		Terrain: Leve	l						Downstrea Ramp	am Adj
Yes Or	1								Ves	🗖 On
No Off	f								Mo No	Cff Off
L _{up} = ft			70.0 mp	h	c 2	E 0 mph			L _{down} =	ft
V _u = veh/h		5	FF = 70.0 mp Sketc	n h (show lanes, L _A ,	$S_{FR} = 3$ L_{D}, V_{R}, V_{f}	o.u mpn			V _D =	veh/h
Conversion te	o pc/h Und	der Base (Condition	s	1					
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _H	v	f _p	v = V/PHF	x f _{HV} x f _p
Freeway	2202	0.90	Level	22	0	0.90	1	1.00	2	716
Ramp	426	0.90	Level	22	0	0.90	1	1.00		525
UpStream		ļļ								
DownStream	r	Morgo Aroas			<u> </u>		 	orgo Aroas		
Estimation of	· V42	Nerge Areas			Estimat	ion of	V ₁₀	cige Aicus		
	1 2	(P)					$\frac{12}{12}$	+ ()/ -)/)P	
1 –	(Equa	(' _{FM}) ation 25-2 or	25-3)		I –		v ₁₂ – v _F	$\frac{1}{2} + \frac{1}{2} + \frac{1}$	R ^{/F} FD 5-8 or 25-9)
EQ =	1 000	usina Equat	20-0)	5 5)	$P_{=0} =$		(L	ina Fausti	ion (Evhibit	/ 25_12)
Y =	1.000 2716 r	using ∟quat oc/b		5-5)	' FD -		nc	/h		25-12)
V ₂ or V ₂	2/10 F	(Faustion (25-1 or 25-5	,	V_{12} – V_{20} r V \sim		pc nc	/h (Equation	25-15 or 25	.16)
I_{av34} Is V ₂ or V ₂₂₄ > 2.70	0 pc/h? 🔽 🗸 🗠		20 4 01 20 0	1	Is V _a or V	> 2.700	pc/h?		20 10 01 20 N	10)
$1 \text{ s V}_{a} \text{ or } \text{ V}_{av34} = 1.5$					Is V _a or V	, > 1.5 *	$V_{ab}/2$		5	
If Yes, $V_{12a} =$	pc/h (Fountion 25	5-8)		If Yes, $V_{122} =$	34	-12'- inc	/h (Equati	on 25-18)	
Capacity Che	cks	<u>(</u>				v Cheo	cks			
	Actual	C	apacity	LOS F?	<u> </u>		Actual	Ca	apacity	LOS F?
					V _F			Exhibit 25	.14	
V _{FO}	3241	Exhibit 25-7		No	$V_{FO} = V_F$	- V _R		Exhibit 25-	-14	
					V _R			Exhibit 25	-3	
Flow Entering	g Merge In	fluence A	rea		Flow En	tering	Merge	Influen	ce Area	
	Actual	Max	Desirable	Violation?	[Acti	Jal	Max Des	irable	Violation?
V _{R12}	3241	Exhibit 25-7	4600:All	No	V ₁₂		Ex	hibit 25-14		
Level of Serv	ice Detern	nination (i	if not F)		Level of	Servi	ce Dete	erminati	on (if no	t F)
D _R = 5.475 +	0.00734 v _R + 0).0078 V ₁₂ - 0.0	0627 L _A			0 _R = 4.2	52 + 0.00)86 V ₁₂ - 0	0.0009 L _D	
D _R = 27.0 (pc	/mi/ln)				D _R = (p	c/mi/ln)				
LOS = C (Exhib	oit 25-4)				LOS = (E	xhibit 2	5-4)			
Speed Determ	nination				Speed L	Determ	ination	1		
M _S = 0.382 (Exil	bit 25-19)				$D_s = (E$	xhibit 25-	19)			
S _R = 59.3 mph ((Exhibit 25-19)				S _R = m	oh (Exhib	it 25-19)			
S ₀ = N/A mph (I	Exhibit 25-19)				S ₀ = m	oh (Exhib	it 25-19)			
S = 59.3 mph ((Exhibit 25-14)				S = m	oh (Exhib	it 25-15)			

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		RAMP	S AND RA	MP JUNCTI	ONS WOF	RKS	HEET			
General Infor	mation			Site Infor	mation					
Analyst Agency or Company Date Performed Analysis Time Perioo	ALB RPM 5/22/2 9 PM P	Transportation 2009 Peak Hour	Consultants	Freeway/Dir of Tra Junction Jurisdiction Analysis Year	avel I- E P 2	40 (W xit Ra utnam 013 P	estbound) mp to SR-13 i Co roposed w/ E	5 Business Park		
Project Description	09-0402 Mine I	LICK Creek IJS	- IDOT OC PI	anning						
Upstream Adj Ramp		Terrain: Leve	<u>.</u>						Downstrea	m Adj
🗖 Yes 🗖 Or	ו							ſ	Tes	🗖 On
🗹 No 📁 Of	f								🗹 No	Cff
L _{up} = ft			70.0 mm	h	C 20	0 mn	h	L	-down =	ft
V _u = veh/h	I	3	_{FF} = 70.0 mp Sketo	:h (show lanes, L _A ,	$S_{FR} = 30$ L_{D}, V_{R}, V_{f}	.0 mp	11		/ _D =	veh/h
Conversion t	o pc/h Und	der Base	Condition	s	1					
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f _{HV}	f _p	′ = V/PHF	x f _{HV} x f _p
Freeway	1807	0.90	Level	22	0	0.	901	1.00	222	29
Ramp	385	0.90	Level	22	0	0.	901	1.00	47	5
UpStream Down Stream		ļ								
DownStream	<u> </u>	 Merge Areas					Div	verge Areas		
Estimation of	f V ₁₂	norgo ni ous			Estimatio	on o	f V ₁₂	longo ni ous		
	$V_{\mu\nu} = V_{\mu\nu}$	(P)					$V_{12} = V_{12}$	/_ + (V V_)P	
1 =	(Equa	' FM / ation 25-2 or	25-3)		I =		• ₁₂ - (E	R'\F R	/' FD or 25-9)	
P_{EQ}	usina	Equation (F	-20 0) Exhibit 25-5)		$P_{ro} =$		1.00)0 usina Fai	uation (Evh	ihit 25,12)
$V_{10} =$	nc/h				$V_{40} =$		222	9 nc/h		101(20 12)
V ₂ or V ₂₂	pc/h ((Equation 25	5-4 or 25-5)		V ₂ or V ₂		0 r) po/n oc/h (Equation	n 25-15 or	25-16)
$I_{3} = V_{av34}$ Is V ₂ or V ₂₂₂₄ > 2.70	0 pc/h? 🔽 Yee	s 🔲 No	, 101200)		Is V ₂ or V ₂	> 2.7	۲ و ۲ ?h/cu 00	Yes 🔽 No	1120 10 01	20 10)
$1 \text{ s V}_{2} \text{ or V}_{3} > 1.5$	* V ₁₀ /2				Is V ₂ or V ₂₂	> 1.5	* V10/2			
If Yes, $V_{120} =$	pc/h (Equation 25	5-8)		If Yes, $V_{120} =$		DC	/h (Equation	25-18)	
Capacity Che	ecks	(Ch	ecks			
	Actual	C	apacity	LOS F?	<u> </u> ,	1	Actual	Cap	acity	LOS F?
					V _F		2229	Exhibit 25-14	4800	No
V _{FO}		Exhibit 25-7			$V_{EO} = V_{E}$ -	VR	1754	Exhibit 25-14	4800	No
					V _P		475	Exhibit 25-3	2000	No
Flow Entering	a Merae In	fluence A	rea		Flow Ent	erin	a Merae	Influence	Area	
	Actual	Max	Desirable	Violation?	<u> </u>		Actual	Max Desirabl	e	Violation?
V _{R12}		Exhibit 25-7			V ₁₂	2	229	Exhibit 25-14	4400:All	No
Level of Serv	ice Detern	nination (if not F)		Level of	Serv	vice Det	ermination	n (if not l	F)
$D_{R} = 5.475 + 0.$	00734 v _R + (0.0078 V ₁₂ -	0.00627 L _A		D	₂ = 4	252 + 0.0	086 V ₁₂ - 0.0	009 L _D	
D _R = (pc/mi/	ln)				D _R = 20.	9 (pc/	/mi/ln)			
LOS = (Exhibi	it 25-4)				LOS = C (Exhil	oit 25-4)			
Speed Deterr	nination				Speed D	eter	minatior	า		
M _s = (Exibit 2	5-19)				$D_{s} = 0.4$	71 (E	xhibit 25-1	9)		
$ S_{R}^{=} $ mph (Exh	ibit 25-19)				S _R = 56.	8 mph	(Exhibit 2	5-19)		
$S_0 = mph (Exh$	ibit 25-19)				S ₀ = N/A	mph	(Exhibit 28	5-19)		
S = mph (Exh	ibit 25-14)				S = 56.	8 mph	(Exhibit 2	5-15)		

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	RAM	MPS AND	RAMP JU	INCTIONS W	ORKSHE	ET				
General Infor	mation			Site Infor	mation					
Analyst Agency or Company Date Performed Analysis Time Period Project Description	ALB RPM 5/22/2 d AM P 09-0402 Mine I	Transportation 2009 leak Hour lick Creek - TC	Consultants	Freeway/Dir of Tra Junction Jurisdiction Analysis Year	avel I I	-40 (Wes Entrance Putnam (2013 Pro	stbound) Ramp fror Co posed w/ E	n SR-135 Business Par	k	
Inputs	07 0102 11110									
Upstream Adj Ramp		Terrain: Leve	l						Downstre Ramp	am Adj
Yes Or	1								Tes Yes	🗖 On
🗹 No 🔲 Of	f								🗹 No	Cff
L _{up} = ft			– 70.0 mn	h	S – 3	5 0 mnh			L _{down} =	ft
V _u = veh/h	I		FF - 70.0 mp Sketc	:h (show lanes, L _A ,	$U_{FR} = 3$ L_{D}, V_{R}, V_{f}	5.0 mpn			V _D =	veh/h
Conversion t	o pc/h Und	der Base (Condition	S						
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _H	v	f _p	v = V/PHF	⁼ x f _{HV} x f _p
Freeway	1422	0.90	Level	22	0	0.90	1	1.00	1	754
Ramp	209	0.90	Level	22	0	0.90	1	1.00		258
UpStream										
DownStream	<u> </u>									
Estimation of	Fv	vierge Areas			Fstimati	on of		verge Areas		
LSUMATION OF	* 12	(P))			LSumau		• 12			
	$V_{12} = V_F$	(P _{FM})					$V_{12} = V_{12}$	_R + (V _F - V	΄ _R)Ρ _{FD}	
L _{EQ} =	(Equa	ation 25-2 or	25-3)	,	L _{EQ} =		(E	quation 2	5-8 or 25-9)) 05.40)
P _{FM} =	1.000	using Equat	ion (Exhibit 2	5-5)	P _{FD} =		us	sing Equat	ion (Exhibit	25-12)
$v_{12} =$	1/54 p	oc/h			$V_{12} =$		ро	c/n	05.45 05	4.()
V_3 OF V_{av34}	0 pc/r	n (Equation 2	25-4 or 25-5)	v_3 or v_{av34}	. 2 700	pc		125-15 OF 25	-16)
$15 V_3 OI V_{av34} > 2,70$		s 🔟 No			$15V_3UV_{av3}$	4 > 2,700			0	
$15 V_3 OI V_{av34} > 1.5$	v ₁₂ /2 ■ Yes	s 🔟 No	. 0)			4 > 1.5	v ₁₂ /2	Yes No	0	
$11 \text{ Yes}, v_{12a} =$	pc/n (Equation 25	-8)		II Yes, V _{12a} =	. 01	pc	c/n (Equati	on 25-18)	
Capacity Che	CKS			1.00 52	Capacity		CKS		en e elle :	1.00 52
	Actual		араспу	LUSF?	V		Actual	Evhibit 25		LUSF?
V _{EO}	2012	Exhibit 25-7		No	$V_{\rm EO} = V_{\rm E}$	- V _D		Exhibit 25	-14	
								Exhibit 25	5-3	
Flow Entering	n Merae In	fluence A	rea	,	Flow En	terino	Merae	Influen	ce Area	
	Actual	Max	Desirable	Violation?		Act		Max Des	irable	Violation?
V _{R12}	2012	Exhibit 25-7	4600:All	No	V ₁₂		E	xhibit 25-14		
Level of Serv	ice Detern	nination (i	if not F)		Level of	Servi	ce Det	erminati	on (if no	ot F)
D _R = 5.475 +	0.00734 v _R + 0).0078 V ₁₂ - 0.0	0627 L _A			_R = 4.2	52 + 0.0	086 V ₁₂ - 0	0.0009 L _D	
D _R = 17.1 (pc	:/mi/ln)				D _R = (p	c/mi/ln)				
LOS = B (Exhib	oit 25-4)				LOS = (E	xhibit 2	5-4)			
Speed Determ	nination				Speed D	Determ	ninatior	า		
M _S = 0.306 (Exi	bit 25-19)				D _s = (E	xhibit 25-	19)			
S _R = 61.4 mph	(Exhibit 25-19)				S _R = mp	oh (Exhib	it 25-19)			
S ₀ = N/A mph (Exhibit 25-19)				S ₀ = mp	oh (Exhib	it 25-19)			
S = 61.4 mph	(Exhibit 25-14)				S = mp	oh (Exhib	it 25-15)			

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					НС	S+™ D)E	TAILE	ED F	RE	PC	DRT								
General Info	rmation								Site	e In	for	matio	on							
									Inte	erse	ctic	on	SF	R-135	6 & I-40 e	eas	tboun	d		
Analyst	ALB		(*a						Area	a T	vne	2	ıaı All	nps othe	r areas					
Agency or Co	. RPM Transp ad E/D6/D000	onai	lion						Juri	isdia	, pc	'n	Pu	tnam						
Time Period	BM Dook H								A	- le cart		/	20	13 P	roposed	w/	Busir	ness		
	РМ Реак по	Jui							Ana	aiys	SY	rear	Pa	rk	,					
									Proj	ject	ID)	09 TE	-0402 OOT (2 Mine L CC Plan	.ick nin	[·] Cree g	k -		
Volume and	Timing Input																-			
					EB				W	/B					NB				SB	
			LT		TH	RT		LT	Т	Ή		RT		Т	TH	F	RT	LT	ТН	RT
Number of La	nes, N1		1			1									2	(0	1	2	
Lane Group			L			R									TR	<u> </u>			<u> </u>	
Volume, V (vp	ph)		201			47		ļ	<u> </u>						495	1	79	247	761	
% Heavy Veh	icles, %HV		5			5									5		5	5	5	
Peak-Hour Fa	ictor, PHF		0.90			0.90		ļ							0.90	0.	90	0.90	0.90	
Pretimed (P)	or Actuated (A)		A			A									A	1	4	A	A	
Start-up Lost	Time, I1		2.0			2.0		ļ			_		_		2.0	-		2.0	2.0	
Extension of E		i, e	2.0			2.0					_				2.0	-		2.0	2.0	
Anivar Type, A			3			3							_		3	┢		3	3	
Eiltoring/Moto			3.0			3.0	<u> </u>								3.0			3.0	3.0	
Initial Lamot	ning, i Domond O⊧		1.000	, 		1.000	<i>,</i>								1.000			1.000	1.000	
Pod / Biko / P			0.0		0	0.0								<u>ר</u>	0.0	+	0	0.0		
Lane Width	TOIX Volumes		12.0		0	12.0								, 	12.0	<u> </u>	0	12.0	12.0	
Parking / Grad	do / Parking		N		0	N					_				12.0	+	M	N	0	N
Parking Mane	uvers. Nm				0	11					_			v		+	V			1
Buses Stoppi	na. NB		0			0									0	┢		0	0	
Min. Time for	Pedestrians.	ip g			3.2										3.2	1			3.2	
Phasing	EB Only	<u>.</u>	02	1	03	3	1	04		1	S	B Onl	v	N	S Perm			07	0	8
	G = 41.9	G =	0.0		G = ().0	┤	G = 0.	0		G =	= 8.0		G	= 45.1		G =	0.0	G = ().0
Iiming	Y = 5	Y =	0		Y = 0)		Y = 0			Y =	= 5		Y:	= 5		Y =	0	Y = 0)
Duration of Ar	nalysis, T = 0.2	5												Су	cle Leng	gth,	C =	110.0		
Lane Group	Capacity, Con	trol I	Delay,	anc	LOS	Deter	mi	nation										1		
				<u> </u>	B	DT	_	-	WB	<u> </u>	<u> </u>	-			NB	_			SB	
	Dete			11	-	RI			IH	-	R	<u> </u>	LI		<u>IH</u>					RI
Adjusted Flow	/ Rate, v		223			52									749			274	846	
Lane Group C	Capacity, c	(655			586	_								1356			319	1820	
v/c Ratio, X		0	.34		0	.09								(0.55			0.86	0.46	
Total Green R	Ratio, g/C	0	.38		0	.38								().41			0.53	0.53	
Uniform Delay	/, d ₁	2	4.2		2	1.8								2	24.8			31.0	16.2	
Progression F	actor, PF	1	.000		1	.000									1.000			1.000	1.000	
Delay Calibra	tion, k	0	.11		0	.11								(0.15			0.39	0.11	
Incremental D	elay, d ₂		0.3			0.1									0.5			20.3	0.2	
Initial Queue I	Delay, d ₃	0	0.0		0	0.0									0.0			0.0	0.0	
Control Delay		2	24.5		2	21.9									25.2			51.3	16.4	
Lane Group L	OS		С			С									С			D	В	
Approach Del	ay		24.	0										25.2	2			2	25.0	
Approach LO	S		С											С					С	
Intersection D	elay		24.	9				$X_{c} = 0.$	61				Inter	rsecti	on LOS				С	

HCS+TM Version 5.21

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					нс	S+™	DE.	TAILF	ED F	RE	POF	RT								
General Info	rmation								Site	e In	form	atic	n							
Analyst	ALB								Inte	rse	ction		SR-1 ramp	35 s	& I-40 v	ves	tbour	nd		
Agency or Co	RPM Trans	oortati	ion						Are	a Ty	уре		All ot	hei	r areas					
	Consultants								Juri	sdic	ction		Putna	am	County					
Date Perform	ed 5/26/2009								Ana	lvsi	is Ye	ar	2013	Pr	oposed	w/	Busir	ness		
I ime Period	Рм Реак не	our									010		Park	400	Minal	iale	C ****	1.		
									Pro	ject	ID		TDO	#02 Τ C	C Plani	ning	Gree. A	к-		
Volume and	Timing Input								ı											
					EB				W	/B					NB				SB	
			LT		TH	RT		LT	<u> </u>	Η	R	RT			TH	<u> </u>	RT	LT	<u> </u>	RT
Number of La	nes, N1							1					1		2	<u> </u>		<u> </u>	2	0
Lane Group	<u></u>							_L							1	<u> </u>		ļ		162
	iclos %HV							5					40		5	┦──			5	103
Poak-Hour Ea	actor PHE							000							0.00					
Pretimed (P)	or Actuated (A))						<u>0.90</u> 					0.90 A		0.90 A			 	<u> 0.90</u> <u>A</u>	0.90 A
Start-up Lost	Time. I1	/				_		2.0					2.0		2.0				2.0	
Extension of E	Effective Greer). e	1			_		2.0	_		-		2.0		2.0	1			2.0	
Arrival Type,	AT	., -						3					3		3	1		ł	3	
Unit Extension	n, UE		1					3.0					3.0		3.0			İ	3.0	
Filtering/Mete	ring, I		1					1.000					1.00	0	1.000	1		<u> </u>	1.000	
Initial Unmet I	Demand, Qb							0.0					0.0		0.0			ĺ	0.0	ĺ
Ped / Bike / R	TOR Volumes		1					0	0				0		0			0	0	0
Lane Width								12.0					12.0		12.0				12.0	
Parking / Grad	de / Parking							Ν	0		Ν	Ι	N		0	<u> </u>	V	N	0	N
Parking Mane	euvers, Nm																			
Buses Stoppin	ng, Nв		<u> </u>					0					0		0			<u> </u>	0	
Min. Time for	Pedestrians, G	Эр							3	.2					3.2				3.2	
Phasing	WB Only	(02		C	3		04			NB	Onl	у 📋	NS	S Perm			07	0	8
Timing	G = 10.8	G =	0.0		G =	0.0		G = <i>0</i> .	.0		G =	5.0		G =	= 39.2		G =	0.0	G = (0.0
	Y = 5	Y =	0		Y =	0		Y = 0			Y =	5		Y =	5		Y =	0	Y = 0)
Duration of Ar	$\frac{1}{2} = 0.2$	25 (D - (-)								Су	cle Leng	jth,	C =	70.0		
Lane Group	Capacity, Con	itroi L	Jelay,		R R	Detel	rmir	nation	\//R			1		_	NR			1	<u>SB</u>	
			IT		1	RT		т	TH	1	RT		IT	1	тн (R	т	IT		RT
Adjusted Flow	v Rate, v						19	92					51		722				1109	
Lane Group C	Capacity, c						20	65					319	2	2421				1882	
v/c Ratio, X							0.7	72				0	0.16	0	.30				0.59	
Total Green R	Ratio, g/C						0.1	15				0	0.70	0	.70				0.56	
Uniform Delay	y, d ₁						28	.2					4.9	:	3.9				10.1	
Progression F	actor, PF						1.0	200				÷	1.000	1	.000				1.000	
Delay Calibra	tion, k						0.2	29				0	0.11	0	.11				0.18	
Incremental D	elay, d ₂						9	.5					0.2		0.1				0.5	
Initial Queue I	Delay, d ₃						0.	0					0.0	(0.0				0.0	
Control Delay							37	7.6					5.2		4.0				10.6	
Lane Group L	.OS						D)					Α		A				В	
Approach Del	ay							37.(6				4	4.1					10.6	
Approach LO	S							D						A					В	
Intersection D	elay		10.	7				$X_{c} = 0$.60				Interse	ectio	on LOS				В	

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Page 1 of 1



BASE YEAR 2013 BENNETT ROAD AT LEE SEMINARY ROAD

				ŀ	ICS	+™	DE	ΤΑΙ	LEC	D	REF	20	RT						
General Int	formation								Site	e I	nfor	ma	tion						
Analyst	JH								Inte	ers	ectio	n	Li B	EE SEI ENNET	ЛІNA T RI	RY D	RD &		
Agency or C	Co. RPM T	ranspor	tatio	n					Are	a ⁻	Туре	;	Α	ll other	area	S			
Date Perfor	med 5/26/20	009							Juri	isd	lictio	n	Р	utnam	Со				
Time Period	d AM Pea	ak Hour	-						Ana	alv	sis Y	′ea	r 20	013 Pro	pose	əd v	v/ Busin	less	
										,			P O	ark a_nan2	Mine	lic	k Cree	k.	
									Pro	jeo	ct ID		T	DOT 0	C Pla	anni	ing	n.	
Volume an	d Timing In	put															<u> </u>		
	¥	·		EB					WB					NB				SB	
		LT		TH	R	Г	LT		ΤH		RT		LT	TH	R	Т	LT	TH	RT
Number of I	_anes, N₁	1		1	0		1		1		2		1	1	1		2	1	1
Lane Group)	L	7	R	ļ		L		Τ		R		L	Т	R)	L	Т	R
Volume, V (vph)	56	1	159	3		28		30		342		3	25	19	94	2247	23	35
% Heavy Ve	ehicles, %H	√ 5		0	5		0		0		0	┛	0	5	5		5	5	0
Peak-Hour	Factor, PHF	0.90	0.	.90	0.90	2	0.90	0.	.90		0.90	_(0.90	0.90	0.9	0	0.90	0.90	0.90
Pretimed (P) or Actuated A)AAAAAAAAAAAAStart-up Lost Time, I12.0 <td>A</td>											A								
(A) 2.0 2													2.0						
Start-up Lost Time, I1 2.0 2												2.0							
Extension of Effective Green, e2.0 <td>3</td>												3							
Unit Extens	ion, UE	AT 3 </td																	
Filtering/Me	tering, I	1.00	0 1.	.000			1.00	0 1.	.000)	1.00	0	1.000	1.000	1.0	000	1.000	1.000	1.000
Initial Unme	et Demand, (Qb 0.0	0	0.0			0.0	0	0.0		0.0		0.0	0.0	0.0	0	0.0	0.0	0.0
Ped / Bike / Volumes	RTOR	0		0	0		0		0		0		0	0	40)	0	0	0
Lane Width		12.0	1:	2.0	ĺ		12.0	1	2.0		12.0	ľ	12.0	12.0	12.	0	12.0	12.0	12.0
Parking / G	rade / Parkir	ng N		0	N		Ν		0		Ν		Ν	0	Ν		Ν	0	Ν
Parking Ma	neuvers, Nr	1										Í							
Buses Stop	ping, Nв	0		0			0		0		0	Ĩ	0	0	6)	0	0	0
Min. Time for Pedestrians	or Go		3	3.2					3.2			Ĩ		3.2				3.2	
Phasing	EW Perm		2	T	03		<u> </u>	04	1	ſ	SB	Or	alv	NS Pe	rm	1	07		08
Thaoing	G = 10.0	G = (0	G	= 0	0	G	=	T	╉	G =	85	50	G = 10	0	G	= 0.0	G =	00
Timing	Y = 5	Y = 0)	Ŷ	= 0	0	Ϋ́	=		┢	<u>Y</u> =	5		Y = 5		Y	= 0	Y =	0
Duration of	Analysis, T	= 0.25			-						-	-		Cycle L	eng	th, C	C = 12	0.0	
Lane Grou	p Capacity,	Contro	ol De	elay.	and	LO	S De	eterr	mina	ati	on			,		,			
<i>`</i>			EB	3				W	Β					NB				SB	
		LT	T⊦	1	RT	L	T	T⊦	+	F	RΤ	L	T	TH	R	Γ	LT	TH	RT
Adjusted Flo	ow Rate, v	62	180	2		3	81	33	}	38	30	;	3	28	17	1	2497	26	39
Lane Group c	Capacity,	111	158	8		6	3	158	8	23	82	1	17	151	12	8	2364	1508	1346
v/c Ratio, X		0.56	1.14	4		0.4	49	0.21	1 (0.1	16	0.0	03	0.19	1.34	1	1.06	0.02	0.03
Total Green	Ratio, g/C	0.08	0.08	3		0.0	08	0.08	8 (0.8	33	0.0	08	0.08	0.08	3	0.71	0.83	0.83
Uniform De	lay, d ₁	52.9	55.0	2		52	.6	51.3	3	1.	9	50	9.5	51.2	55.0)	17.5	1.7	1.7
Progression	Factor, PF	1.000	1.00	00		1.(000	1.00	00 ⁻	1.0	000	1.0	000	1.000	1.00	00	1.000	1.000	1.000

Delay Calibration, k	0.16	0.50		0.11	0.11	0.11	0.11	0.11	0.50	0.50	0.11	0.11
Incremental Delay, d ₂	6.2	113.9		5.9	0.7	0.0	0.1	0.6	194.6	35.5	0.0	0.0
Initial Queue Delay, d ₃	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay	59.1	168.9		58.5	52.0	2.0	50.6	51.8	249.6	53.0	1.7	1.7
Lane Group LOS	Е	F		Е	D	A	D	D	F	D	А	Α
Approach Delay	14	0.8		g	9.6		21	9.2			51.7	
Approach LOS	l I	=			A			F		ĺ	D	
Intersection Delay	62	2.3		$X_{c} =$	1.09		Interse	ction LC	DS		Е	
Copyright © 2005 University of F	lorida, All	Rights Re	served			HCS+ [™]	Version 5	5.21	Ger	nerated: 8	3/13/2009	1:19 PN

HCS+TM Version 5.21

	HCS+ [™] DETAILED REPORT																			
General In	formation								Site Information											
Analyst	JH								Inte	ers	ectio	n	LI B	EE SE ENNE	MI TT	NAI RD	RY)	RD &		
Agency or (Co. RPM T	ranspor	tatio	n					Are	a '	Туре	;	A	ll othe	r a	reas	5			
Date Perfor	med 5/26/20	09							Juri	isc	lictio	n	Р	utnam	С	0				
Time Period	d PM Pea	ak Hour	•					Analysis Year 2013 Proposed w/ Business												
								- Park 09-0402 Mine Lick Creek -												
									Pro	jeo	ct ID			9-040 <u>/</u> DOT (2 IV C	nne Pla	гю nni	na creel	r, -	
Volume an	d Timina In	put														1 10		ng		
	<u>.</u>			EB					WB NB SB											
				TH	R	Г	LT	Т	TH	Т	RT	T	LT	TH		R	Г	LT	TH	RT
Number of	Lanes, N1	1		1	0		1		1	T	2		1	1		1		2	1	1
Lane Group)	L	7	R			L		Τ	Ĩ	R		L	Т		R		L	Т	R
Volume, V ((vph)	58		36	5		170		147		1862	2	5	24		41		460	32	93
% Heavy V	ehicles, %H	/ 5		0	5		0		0		0		0	5		5		5	5	0
Peak-Hour	Factor, PHF	0.90	0.	.90	0.90)	0.90	0	.90		0.90		0.90	0.90		0.90)	0.90	0.90	0.90
Pretimed (F (A)) or Actuate	d A		A	A		Α		A		Α		Α	A		Α		А	A	A
Start-up Los	st Time, I1	2.0	2	2.0			2.0	2	2.0		2.0		2.0	2.0		2.0)	2.0	2.0	2.0
Extension o Green, e	f Effective	2.0	2	2.0			2.0	2	2.0		2.0		2.0	2.0		2.0)	2.0	2.0	2.0
Arrival Type	e, AT	3		3			3		3		3		3	3		3		3	3	3
Unit Extens	ion, UE	3.0	3	3.0			3.0	3	3.0	Ĩ	3.0		3.0	3.0		3.0		3.0	3.0	3.0
Filtering/Me	etering, I	1.00	0 1.	.000			1.00	0 1	.000)	1.00	0	1.000	1.00	0	1.00	00	1.000	1.000	1.000
Initial Unme	et Demand, (Qb 0.0	0	0.0			0.0	(0.0		0.0		0.0	0.0		0.0		0.0	0.0	0.0
Ped / Bike / Volumes	RTOR	0		0	0		0		0		0		0	0		0		0	0	0
Lane Width		12.0	1:	2.0			12.0	1.	2.0		12.0	T	12.0	12.0		12.0)	12.0	12.0	12.0
Parking / G	rade / Parkir	ng N		0	Ν		Ν		0	Τ	Ν		Ν	0		Ν		N	0	N
Parking Ma	neuvers, Nr									T		Ĩ						[
Buses Stop	ping, Nв	0		0	1		0		0 0		Ĩ	0 0			0 0		0	0		
Min. Time for Pedestrians	or Gn		3	3.2					3.2 3.2 3.2											
Phasing	FW Perm		>	T	03			04	1	Т	SB	0	nlv	NS P	err	n I		07		08
Thaonig	G = 33.0	G = 0	-).()	G	= 0.	0	G	=			<u>G</u> =	32	2.0	G = 1	0.0	$\frac{1}{2}$	G	= 0.0	G =	0.0
Timing	Y = 5	Y = 0)	Y	= 0	•	Ϋ́	=		┪	<u>Y</u> =	5		$\overline{Y} = 5$;		Y =	= 0	Y =	0
Duration of	Analysis, T	= 0.25					_!					-		Cycle	Le	ngth	n, C	c = 90	.0	-
Lane Grou	p Capacity,	Contro	ol De	elay.	and	LO	S De	eteri	mina	ati	on			,		<u> </u>				
			EE	3				W	'B					NB					SB	
		LT	TH	1	RT	L	T	TH	+	F	RT	Γι	T	TH		RT		LT	TH	RT
Adjusted Fl	ow Rate, v	64	46	;		18	89	16:	3	20	69		6	27		46		511	36	103
Lane Group c	o Capacity,	425	679	9		50	06	697	7	22	24	1	55	201		171		1187	945	843
v/c Ratio, X		0.15	0.07	7		0.3	37	0.23	3 (0.9	93	0.0	04	0.13	С).27		0.43	0.04	0.12
Total Green	n Ratio, g/C	0.37	0.37	7		0.3	37	0.37	7 (0.7	78	0.	11	0.11	С).11		0.36	0.52	0.52
Uniform De	lay, d ₁	19.1	18.5	5		20	.9	19.7	7	8.	0	35	5.7	36.1	3	36.7		22.1	10.5	11.0
Progressior	n Factor, PF	1.000	1.00	20		1.0	000	1.00	00	1.0	000	1.0	000	1.000	1	.00	0	1.000	1.000	1.000
I															1				1	I

Delay Calibration, k	0.11	0.11	0.11	0.11	0.45	0.11	0.11	0.11	0.11	0.11	0.11
Incremental Delay, d_2	0.2	0.0	0.5	0.2	7.7	0.1	0.3	0.9	0.3	0.0	0.1
Initial Queue Delay, d_3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay	19.3	18.6	21.4	19.9	15.8	35.8	36.4	37.5	22.3	10.5	11.0
Lane Group LOS	В	В	С	В	В	D	D	D	С	В	В
Approach Delay	19	0.0	16.5			37.0			19.9		
Approach LOS	E	3		В			D		В		
Intersection Delay	17	7.7	$X_{c} =$	0.85		Intersection LOS			В		

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FUTURE YEAR 2033 INTERSTATE 40 MAINLINE

BASIC FREEWAY SEGMENTS WORKSHEET									
80 Free-Flow Spzed FFS = 75 mith 70 65 mith 70 mith 80 60 65 mith 90 55 mith 60 mith 90 50 10 mith 90 90 mith 90 mith 90 400 800	17300 17500 17		2400	$\label{eq:application} \hline \begin{array}{c} \underline{Application} \\ \hline Design (N) \\ Design (v_p) \\ Planning (LOS) \\ Planning (M) \\ Planning (v_p) \\ \end{array}$	Input FFS, N, v _p FFS, LOS, v _p FFS, LOS, N FFS, N, AADT FFS, LOS, AAD FFS, LOS, N	<u>Output</u> LOS, S, D N, S, D v _p , S, D LOS, S, D T N, S, D v _p , S, D			
Conoral Information	Flow Rate (pc/h/ln)		Site Infor	mation					
Analyst	ALB		Highway/Dire	nation ection of Travel	I-40 (Fastho	und)			
Agonov or Company	RPM Transport	ation	From/To		woot of SP F	56			
Agency of Company	Consultants				west of SR-C	00			
Date Performed	5/22/2009		Jurisdiction		Putnam Co 2033 Propos	ed w/ Business			
Analysis Time Period	AM Peak Hour		Analysis Yea	ır	Park	lea w/ Dusiness			
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning						
Oper.(LOS)			Des.(N)		Plannir 🗌	ig Data			
Flow Inputs	2000	· · · a la /la	De als Llavar D		0.00				
Volume, V	2800	ven/n veb/dav	%Trucks and	actor, PHF I Buses P_	0.90 22				
Peak-Hr Prop. of AADT K		ven/day	%RVs P_	1 Duoco, 1 T	0				
Peak-Hr Direction Prop. D			General Terr	ain:	Level				
$DDHV = AADT \times K \times D$		veh/h	Grade %	Length	mi				
Driver type adjustment	1.00			Up/Down %					
Calculate Flow Adjustr	nents		_						
f _p	1.00		ER		1.2				
ET	1.5		$f_{HV} = 1/[1+P_T(E_T)]$	T - 1) + P _R (E _R - 1)]	0.901				
Speed Inputs			Calc Spee	ed Adj and FFS					
Lane Width	12.0	ft	f _{LW}		0.0	mi/h			
Rt-Shoulder Lat. Clearance	6.0	ft	fic		0.0	mi/h			
Interchange Density	0.50	I/mi	fun		0.0	mi/h			
Number of Lanes, N	2		f		45	mi/h			
FFS (measured)		mi/h			4.0 65 5	mi/h			
Base free-flow Speed, BFFS	70.0	mi/h	ггэ		03.3	mi/n			
LOS and Performance I	Measures		Design (N)					
Operational (LOS)			<u>Design (N)</u>						
v = (V or DDHV) / (PHF x N x)	(f, x f.) 1727	nc/h/ln	Design LOS						
^p	ни тр/ 1/2/ 6/ Р	mi/h	$v_p = (V \text{ or } DE)$	0HV) / (PHF x N x f	_{HV} x f _p)	pc/h			
D = y / S	04.0 26 6	nc/mi/ln	S			mi/h			
los	20.0 N	P0/111/11	$D = v_p / S$			pc/mi/ln			
	U		Required Nu	mber of Lanes, N					
Glossary			Factor Lo	cation					
N - Number of lanes	S - Speed		F - Exhibite	23-8 23-10	f	- Exhibit 23-4			
V - Hourly volume	D - Density			20-0, 20-10 23-8 23-10 22 14	LV f	- Exhibit 23-5			
v _p - Flow rate	FFS - Free-flow s	speed		23-0, 23-10, 23-11 12	LC f	- Exhibit 22-6			
LOS - Level of service	BFFS - Base free	e-flow speed		V - Evhibite 22.2	^I N 23-3 f	- Exhibit 23-7			
DDHV - Directional design hor	ur volume			, •p - Exhibits 23-2	, 20-0 ID				

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BASIC FREEWAY SEGMENTS WORKSHEET										
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	B C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (M) Planning (v _p)	Input FFS, N, v _p FFS, LOS, v _p FFS, LOS, N FFS, N, AADT FFS, LOS, AAD FFS, LOS, N	Output LOS, S, D N, S, D V _p , S, D LOS, S, D DT N, S, D V _p , S, D				
General Information			Site Infor	mation						
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Eastbo	ound)				
Agency or Company	RPM Transport	ation	From/To		Between SF	R-56 Ramps				
Date Performed	Consultants 5/22/2009		Jurisdiction		Putnam Co					
Analysis Time Period	AM Peak Hour		Analysis Yea	ar	2033 Propos Park	sed w/ Business				
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning							
Oper.(LOS)			Des.(N)		🔲 Plannir	ng Data				
Flow Inputs										
Volume, V	2680	veh/h	Peak-Hour F	actor, PHF	0.90					
		ven/day		i Buses, P _T	22					
Peak-Hr Prop. of AAD1, K			%RVS, P _R Conoral Torr	ioin:	U					
$DDHV = AADT \times K \times D$		veh/h	Grade %	Length	mi					
Driver type adjustment	1.00			Up/Down %						
Calculate Flow Adjustm	nents									
fp	1.00		E _R		1.2					
E _T	1.5		f _{HV} = 1/[1+P _T (E	E _T - 1) + P _R (E _R - 1)]	0.901					
Speed Inputs			Calc Spee	d Adj and FFS						
Lane Width	12.0	ft	4		0.0	mi/h				
Rt-Shoulder Lat. Clearance	6.0	ft	LW		0.0	111/11				
Interchange Density	0.50	l/mi	^T LC		0.0	mi/h				
Number of Lanes. N	2		f _{ID}		0.0	mi/h				
FFS (measured)		mi/h	f _N		4.5	mi/h				
Base free-flow Speed BEES	70.0	mi/h	FFS		65.5	mi/h				
LOS and Performance I	Measures		Design (N)						
	liououroo		Design (N)	1						
Operational (LOS)			Design LOS							
$v_p = (V \text{ or DDHV}) / (PHF x N x)$	x f _{HV} x f _p) <i>16</i> 53	pc/h/ln	$V = (V \text{ or } D\Gamma)$)HV) / (PHF x N x f	xf)	nc/h				
S	65.2	mi/h			HV ^ 'p'	pc/n mi/h				
$D = v_p / S$	25.4	pc/mi/ln	D = y/g			1111/11 po/mi/lo				
LOS	С		Required Nu	mber of Lanes, N		ρο/πι/π				
Glossary			Factor Lo	cation						
N - Number of lanes	S - Speed									
V - Hourly volume	D - Densitv		E _R - Exhibits	23-8, 23-10	f _L v	_W - Exhibit 23-4				
v - Flow rate	FFS - Free-flow s	peed	E _T - Exhibits	23-8, 23-10, 23-11	f _L	_C - Exhibit 23-5				
P	BFFS - Base free	-flow speed	f _p - Page 23-	·12	f _N	- Exhibit 23-6				
DDHV - Directional design hor	ur volume	non opecu	LOS, S, FFS	5, v _p - Exhibits 23-2	, 23-3 f _{IC}	_o - Exhibit 23-7				

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BASIC FREEWAY SEGMENTS WORKSHEET										
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	B C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, v _p FFS, LOS, v _p FFS, LOS, N FFS, N, AADT FFS, LOS, AA FFS, LOS, N	<u>Output</u> LOS, S, D N, S, D v _p , S, D LOS, S, D DT N, S, D v _p , S, D				
General Information			Site Inforr	nation						
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Eastb	ound)				
Agency or Company	RPM Transport	ation	From/To		Bt SR-56 &	Mine Lick Creek				
Date Performed	Consultants		Jurisdiction		Putnam Co	,				
Analysis Time Period	AM Peak Hour		Analysis Yea	ır	2033 Propo Park	osed w/ Business				
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning		T UIK					
Oper.(LOS)			Des.(N)		🗖 Plann	ing Data				
Flow Inputs										
Volume, V	3053	veh/h	Peak-Hour F	actor, PHF	0.90					
AADT		veh/day	%Trucks and	l Buses, P _T	22					
Peak-Hr Prop. of AADT, K			%RVs, P _R		0					
Peak-Hr Direction Prop, D		veh/h	General Terr	ain:	Level mi					
Driver type adjustment	1.00	Ven/m	Orace 70	Up/Down %	1111					
Calculate Flow Adjustm	nents			•						
f	1.00		E _R		1.2					
Ē _T	1.5		f _{uv} = 1/[1+P _T (E		0.901					
Speed Inputs				d Adi and FFS						
Lane Width	12.0	ft								
Rt-Shoulder Lat Clearance	60	ft	t _{LW}		0.0	mi/h				
Interchange Density	0.50	l/mi	f _{LC}		0.0	mi/h				
Number of Lanes N	2	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	f _{ID}		0.0	mi/h				
FES (measured)	2	mi/b	f _N		4.5	mi/h				
Base free-flow Speed BEES	70.0	mi/h	FFS		65.5	mi/h				
LOS and Performance	Moasuros	1111/11	Decign (N	1						
LOS and Performance	vieasui es									
Operational (LOS)										
$v_p = (V \text{ or DDHV}) / (PHF x N x)$	(f _{HV} x f _p) <i>18</i> 83	pc/h/ln								
S	63.5	mi/h	$v_p = (v \text{ or } DL)$	יחע) / (PHF X N X f	HV × ľp)	pc/n				
$D = v_p / S$	29.7	pc/mi/ln	5			mi/h				
LOS	D		$D = v_p / S$			pc/mi/ln				
			Required Nu	mber of Lanes, N						
Glossary			Factor Lo	cation						
N - Number of lanes	S - Speed		E _p - Exhibits	23-8, 23-10	f.	w - Exhibit 23-4				
V - Hourly volume	D - Density		F ₊ - Fxhihite	23-8, 23-10, 23-11	'l f					
v _p - Flow rate	FFS - Free-flow s	speed	f - Page 23-	12	'l f	- Exhibit 23-6				
LOS - Level of service	BFFS - Base free	e-flow speed		v - Evhibite 22.2	ו' 23-3 f	- Exhibit 23-7				
DDHV - Directional design ho	ur volume			, •p - Exhibits 23-2	, 20-0 I					

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BASIC FREEWAY SEGMENTS WORKSHEET										
80 Free-Flow Speed FES = 75 milh 70 65 milh 70 milh 70 65 milh 60 milh 50 10 S A 10 milh 80 10 55 milh 10 400 200	1300 1450 2 2 1450 2 1450 2 1450 2 1450 2 1450 2 1450 2 1450 2 1450 2 1450 2 1450 2 1450 2 1450 140		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, vp FFS, LOS, vp FFS, LOS, N FFS, N, AADT FFS, LOS, AAD FFS, LOS, N	Output LOS, S, D N, S, D v _p , S, D LOS, S, D T N, S, D v _p , S, D				
General Information			Site Infor	mation						
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Eastbo	und)				
Agency or Company	RPM Transport	ation	From/To		Bt Mine Lick	Creek Ramps				
Date Performed	5/22/2009		Jurisdiction		Putnam Co					
Analysis Time Period	AM Peak Hour		Analysis Yea	ar	2033 Propos Park	ed w/ Business				
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning							
Oper.(LOS)			Des.(N)		🗖 Plannir	ng Data				
Flow Inputs										
Volume, V	2139	veh/h	Peak-Hour F	actor, PHF	0.90					
		ven/day		i Buses, P _T	22					
Peak-Hr Prop. of AAD1, K			%RVS, P _R		U Loval					
DDHV = AADT x K x D		veh/h	Grade %	Length	mi					
Driver type adjustment	1.00			Up/Down %						
Calculate Flow Adjustm	ients									
f _p	1.00		E _R		1.2					
Ε _T	1.5		f _{HV} = 1/[1+P _T (E	E _T - 1) + P _R (E _R - 1)]	0.901					
Speed Inputs			Calc Spee	d Adj and FFS						
Lane Width	12.0	ft	4		0.0	mi/h				
Rt-Shoulder Lat. Clearance	6.0	ft	LW		0.0	1111/11				
Interchange Density	0.50	I/mi	^T LC		0.0	mi/h				
Number of Lanes. N	2		f _{ID}		0.0	mi/h				
FFS (measured)		mi/h	f _N		4.5	mi/h				
Base free-flow Speed, BEES	70.0	mi/h	FFS		65.5	mi/h				
LOS and Performance	Measures		Design (N)						
			Design (N)	1						
Operational (LOS)			Design I OS							
$v_p = (V \text{ or DDHV}) / (PHF x N x)$	f _{HV} x f _p) 1319	pc/h/ln	$V = (V \text{ or } D\Gamma)$)HV) / (PHF x N x f	, x f)	pc/h				
S	65.5	mi/h			нү 🗥 'р/	mi/b				
$D = v_p / S$	20.1	pc/mi/In	$D = \sqrt{2}$			no/mi/ln				
LOS	С		Required Nu	mber of Lanes, N		pc/mi/m				
Glossary			Factor Lo	cation						
N - Number of lanes	S - Speed									
V - Hourly volume	D - Densitv		E _R - Exhibits	23-8, 23-10	f _{LV}	_V - Exhibit 23-4				
v - Flow rate	FFS - Free-flow s	peed	E _T - Exhibits	23-8, 23-10, 23-11	f _{LC}	₂ - Exhibit 23-5				
P	BEES - Base free	-flow speed	f _p - Page 23-	·12	f _N	- Exhibit 23-6				
DDHV - Directional design hou	ur volume		LOS, S, FFS	5, v _p - Exhibits 23-2	, 23-3 f _{ID}	- Exhibit 23-7				

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BASIC FREEWAY SEGMENTS WORKSHEET									
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	1300 1450 B. C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (M) Planning (v _p)	Input FFS, N, vp FFS, LOS, v FFS, LOS, N FFS, N, AAD FFS, LOS, N FFS, LOS, N	Output LOS, S, D N, S, D v _p , S, D T LOS, S, D ADT N, S, D v _p , S, D			
General Information			Site Inform	mation					
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Eastl	bound)			
Agency or Company	Consultants	ation	From/To		Bt SR-135	& Mine Lick Creek			
Date Performed	5/22/2009		Jurisdiction		Putnam Co	0			
Analysis Time Period	AM Peak Hour		Analysis Yea	ır	2033 Prop Park	osed w/ Business			
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning						
Oper.(LOS)			0es.(N)		Planr	ning Data			
Flow Inputs	0.405		De al Illa de E		0.00				
	2485	veh/h	Peak-Hour F	actor, PHF	0.90				
Rook Hr Bron of AADT K		ven/uay		1 Duses, 1 T	22				
Peak-Hr Direction Prop. D			General Terr	ain.	u Level				
$DDHV = AADT \times K \times D$		veh/h	Grade %	Length	mi				
Driver type adjustment	1.00			Up/Down %					
Calculate Flow Adjustn	nents								
f _p	1.00		E _R		1.2				
E _T	1.5		$f_{HV} = 1/[1+P_T(E)]$	_T - 1) + P _R (E _R - 1)]	0.901				
Speed Inputs			Calc Spee	ed Adj and FFS					
Lane Width	12.0	ft	f.w		0.0	mi/h			
Rt-Shoulder Lat. Clearance	6.0	ft	f. a		0.0	mi/h			
Interchange Density	0.50	I/mi	f		0.0	mi/h			
Number of Lanes, N	2		'ID		0.0	1111/11			
FFS (measured)		mi/h	'N		4.5	mi/n			
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h			
LOS and Performance	Measures		Design (N)					
Operational (LOS)			<u>Design (N)</u>						
$\frac{Operational(LOS)}{(DHE \times N)}$	(f y f) (500	n o /h /ln	Design LOS						
$v_p = (V OI DDHV) / (PHF X N X)$	(1 _{HV} x 1 _p) 7532	pc/n/in	$v_p = (V \text{ or } DD)$	DHV) / (PHF x N x f	HV x f _p)	pc/h			
S D u (O	65.5	mi/h	s		·	mi/h			
$D = v_p / S$	23.4	pc/mi/ln	$D = v_p / S$			pc/mi/ln			
	С		Required Nu	mber of Lanes, N					
Glossary			Factor Lo	cation					
N - Number of lanes	S - Speed		E - Exhibite	23-8 23-10		f - Exhibit 23-4			
V - Hourly volume	D - Density			23-8 22-10 22-11		1_W Exhibit 23-4			
v _p - Flow rate	FFS - Free-flow s	speed	If - Page 22	.12		LC^{-2} Exhibit 23-5			
LOS - Level of service	BFFS - Base free	e-flow speed		v - Exhibite 22.2	23-3	'N - Exhibit 23-7			
DDHV - Directional design ho	ur volume			$v_p = LAIIIDIIS 23-2$, 20-0				

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BASIC FREEWAY SEGMENTS WORKSHEET									
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	1300 1450 B. C. 1450 B. C. 1450 B. C. 1450 B. C. 1450 B. C. 1450 B. C. 1450 B. C. 1450 B. C. 1450	1600 2000	2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (M) Planning (v _p)	Input FFS, N, vp FFS, LOS, vp FFS, LOS, N FFS, N, AADI FFS, LOS, AA FFS, LOS, N	<u>Output</u> LOS, S, D N, S, D v _p . S, D I LOS, S, D DT N, S, D v _p . S, D			
General Information			Site Infor	mation					
Analyst	ALB	otion	Highway/Dire	ection of Travel	I-40 (Eastb	ound)			
Agency or Company	Consultants	ation	From/To		Between S	R-135 Ramps			
Date Performed	5/22/2009		Jurisdiction		Putnam Co				
Analysis Time Period	AM Peak Hour		Analysis Yea	ar	2033 Propo Park	osed w/ Business			
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning						
Oper.(LOS)			Des.(N)		🗌 Plann	ing Data			
Flow Inputs			<u> </u>						
Volume, V	2148	veh/h	Peak-Hour F	actor, PHF	0.90				
AADT Book Hr Bron of AADT K		ven/day		i buses, r _T	22				
Peak-HI Prop. of AAD1, K Peak-Hr Direction Prop. D			General Terr	ain.	U Level				
$DDHV = AADT \times K \times D$		veh/h	Grade %	Length	mi				
Driver type adjustment	1.00			Up/Down %					
Calculate Flow Adjustm	nents								
f _p	1.00		E _R		1.2				
E _T	1.5		$f_{HV} = 1/[1+P_T(E)]$	E _T - 1) + P _R (E _R - 1)]	0.901				
Speed Inputs			Calc Spee	ed Adj and FFS					
Lane Width	12.0	ft	f.w		0.0	mi/h			
Rt-Shoulder Lat. Clearance	6.0	ft	f		0.0	mi/h			
Interchange Density	0.50	l/mi	LC f		0.0	mi/h			
Number of Lanes, N	2		'ID		0.0	mi/n			
FFS (measured)		mi/h	† _N		4.5	mi/h			
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h			
LOS and Performance I	Measures		Design (N)					
Operational (LOS)			Design (N)						
$\frac{Operational (LOS)}{(DHE \times N)}$	(f y f) 4005	n o /h //n	Design LOS						
$v_p = (v \cup DD nv) / (P n r x N x)$	(HV × 1 _p) 1325		$v_p = (V \text{ or } DE)$	DHV) / (PHF x N x f	- _{ΗV} x f _p)	pc/h			
S D (C	65.5	mi/n	S		·	mi/h			
$v = v_p / S$	20.2	pc/mi/ln	$D = v_p / S$			pc/mi/ln			
LOS	С		Required Nu	imber of Lanes, N					
Glossary			Factor Lo	cation					
N - Number of lanes	S - Speed		F _n - Fxhihite	23-8, 23-10	f	Exhibit 23-4			
V - Hourly volume	D - Density		F ₊ - Fxhihite	23-8, 23-10, 23-11	f	- Exhibit 23-5			
v _p - Flow rate	FFS - Free-flow s	speed	f - Pane 22-	-12	f	LC Exhibit 23-6			
LOS - Level of service	BFFS - Base free	e-flow speed		·-	23-3 f	Exhibit 23-7			
DDHV - Directional design ho	ur volume			, p = 2, 1013 20-2	, 200				

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BASIC FREEWAY SEGMENTS WORKSHEET									
80 Free-Flow Speed FIS = 75 milh 70 60 65 milh 60 65 milh 50 10 milh 50 10 milh 980 60 60 55 milh 90 400 90 400 80 60	B C		2400	Application Operational (LOS) Design (N) Design (vp) Planning (LOS) Planning (N) Planning (N) Planning (Vp)	Input FFS, N, vp FFS, LOS, vp FFS, LOS, N FFS, N, AADT FFS, LOS, AAI FFS, LOS, N	Output LOS, S, D N, S, D V _p , S, D LOS, S, D DT N, S, D V _p , S, D			
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Eastbo	ound)			
Agency or Company	RPM Transport	ation	From/To		east of SR-	135			
Date Performed	Consultants		Jurisdiction		Putnam Co				
Analysis Time Period	AM Peak Hour		Analysis Yea	ır	2033 Propo Park	sed w/ Business			
Project Description 09-0402	Mine Lick Creek I	JS - TDOT OC I	Planning						
Oper.(LOS)			Des.(N)		🔲 Planni	ng Data			
Flow Inputs									
Volume, V	2583	veh/h	Peak-Hour F	actor, PHF	0.90				
		veh/day		i Buses, P _T	22				
Peak-Hr Prop. of AAD1, K			%RVS, P _R	oint	0 Loval				
$DDHV = AADT \times K \times D$		veh/h	Grade %	Length	mi				
Driver type adjustment	1.00			Up/Down %					
Calculate Flow Adjustm	nents								
f _p	1.00		E _R		1.2				
E _T	1.5		f _{HV} = 1/[1+P _T (E	_T - 1) + P _R (E _R - 1)]	0.901				
Speed Inputs			Calc Spee	d Adj and FFS					
Lane Width	12.0	ft	f	t	0.0	mi/h			
Rt-Shoulder Lat. Clearance	6.0	ft	'LW f		0.0	mi/h			
Interchange Density	0.50	I/mi	LC		0.0	rni/n .a			
Number of Lanes, N	2		TID		0.0	mi/n			
FFS (measured)		mi/h	† _N		4.5	mi/h			
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h			
LOS and Performance I	Measures		Design (N)					
Operational (LOS)			Design (N)						
$v_n = (V \text{ or DDHV}) / (PHF x N x)$	(f _{uv} x f _a) <i>15</i> 93	pc/h/ln	Design LOS						
S		mi/h	$v_p = (V \text{ or } DE)$	0HV) / (PHF x N x f	_{HV} x f _p)	pc/h			
$D = v_{\rm c} / S$	24.4	pc/mi/ln	S			mi/h			
	<u>с</u> .	P0/11/11	$D = v_p / S$			pc/mi/ln			
			Required Nu	mber of Lanes, N					
Glossary			Factor Lo	cation					
N - Number of lanes	S - Speed		E _n - Fxhihits	23-8, 23-10	f.	w - Exhibit 23-4			
V - Hourly volume	D - Density		F ₊ - Fxhihite	23-8, 23-10, 23-11	'L f	- Exhibit 23-5			
v _p - Flow rate	FFS - Free-flow s	speed	f - Page 23-	12	'L f	- Exhibit 23-6			
LOS - Level of service	BFFS - Base free	e-flow speed	IOS S FFS	·- V - Fxhihite 23-2	23-3 f	Exhibit 23-7			
DDHV - Directional design hor	ur volume			, p	, J				

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BASIC FREEWAY SEGMENTS WORKSHEET									
$\begin{array}{c c} 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 \\ 1 $	1450 B C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (M) Planning (v _p)	Input FFS, N, vp FFS, LOS, vp FFS, LOS, N FFS, N, AAD FFS, LOS, AA FFS, LOS, N	<u>Output</u> LOS, S, D N, S, D v _p , S, D T LOS, S, D ΔDT N, S, D v _p , S, D			
General Information			Site Infor	mation					
Analyst	ALB BBM Transport	ation	Highway/Dire	ection of Travel	I-40 (Westl	bound)			
Agency or Company	Consultants	allon	From/To		East of SR	-135			
Date Performed	5/22/2009		Jurisdiction		Putnam Co)			
Analysis Time Period	AM Peak Hour		Analysis Yea	ar	2033 Propo Park	osed w/ Business			
Project Description 09-0402	Mine Lick Creek I	JS - TDOT OC I	Planning						
Oper.(LOS)			Des.(N)		🗌 Plann	ing Data			
Flow Inputs									
Volume, V	3294	veh/h	Peak-Hour F	actor, PHF	0.90				
		veh/day		d Buses, P _T	22				
Peak-Hr Prop. of AAD1, K			%RVS, P _R		0 Loval				
$DDHV = AADT \times K \times D$		veh/h	Grade %	Length	mi				
Driver type adjustment	1.00			Up/Down %					
Calculate Flow Adjustm	nents								
fp	1.00		E _R		1.2				
E _T	1.5		f _{HV} = 1/[1+P _T (E	E _T - 1) + P _R (E _R - 1)]	0.901				
Speed Inputs			Calc Spee	ed Adj and FFS					
Lane Width	12.0	ft	f		0.0	mi/h			
Rt-Shoulder Lat. Clearance	6.0	ft	LW		0.0	1111/11			
Interchange Density	0.50	I/mi	LC		0.0	mi/n			
Number of Lanes, N	2		^t ID		0.0	mi/h			
FFS (measured)		mi/h	f _N		4.5	mi/h			
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h			
LOS and Performance I	Measures		Desian (N						
Operational (LOS)			Design (N)	/					
$\frac{Operational (LOS)}{(DHE \times N)}$	(f x f) 2024	n o /h /ln	Design LOS						
$v_p = (v \cup D D \Box v) / (P \Box F X N X)$	$HV \times I_p / 2031$	pc/n/m	$v_p = (V \text{ or } DE)$	DHV) / (PHF x N x f	- _{ΗV} x f _p)	pc/h			
5	61.2	mi/n	S		·	mi/h			
$v = v_p / S$	33.2	pc/mi/ln	$D = v_p / S$			pc/mi/ln			
	<i>D</i>		Required Nu	mber of Lanes, N					
Glossary			Factor Lo	cation					
N - Number of lanes	S - Speed		E _P - Exhibits	23-8, 23-10	f	w - Exhibit 23-4			
V - Hourly volume	D - Density		E _T - Exhibits	23-8, 23-10, 23-11	f	Exhibit 23-5			
v _p - Flow rate	FFS - Free-flow s	speed	f Page 23-	·12	f	- Exhibit 23-6			
LOS - Level of service	BFFS - Base free	e-flow speed	LOS, S. FFS	S. v., - Exhibits 23-2	. 23-3 f	- Exhibit 23-7			
DDHV - Directional design ho	ur volume			, p	,	UU			

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BASIC FREEWAY SEGMENTS WORKSHEET							
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	1200 Flow Rate (pc/h/ln)		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (M) Planning (v _p)	<u>Input</u> FFS, N, v _p FFS, LOS, v FFS, LOS, N FFS, N, AAC FFS, LOS, N	Output LOS, S, D N, S, D Vp. S, D T LOS, S, D T Vp. S, D T LOS, S, D T LOS, S, D T LOS, S, D ADT Vp. S, D	
General Information			Site Infor	mation			
Analyst	ALB BBM Transport	otion	Highway/Dire	ection of Travel	I-40 (Wes	tbound)	
Agency or Company	Consultants	allon	From/To		Between S	SR-135 Ramps	
Date Performed	5/22/2009		Jurisdiction		Putnam C	o	
Analysis Time Period	AM Peak Hour		Analysis Yea	ır	2033 Prop Park	oosed w/ Business	
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning				
Oper.(LOS)			Des.(N)		🗖 Plan	ning Data	
Flow Inputs							
Volume, V	2751	veh/h	Peak-Hour F	actor, PHF	0.90		
AADI		veh/day	% I rucks and	i Buses, P _T	22		
Peak-Hr Prop. of AADT, K			%RVs, P _R		0		
Peak-Hr Direction Prop, D DDHV – AADT x K x D		veh/h	General Terr	ain:	Level mi		
Driver type adjustment	1.00	Ven/II	Orace 70	Up/Down %	1111		
Calculate Flow Adjustm	nents						
f	1.00		E _R		1.2		
Ē,	1.5		f _{uv} = 1/[1+P _T (E	E _T - 1) + P _P (E _P - 1)]	0.901		
Speed Inputs				d Adi and FFS			
Lane Width	12.0	ft					
Rt-Shoulder Lat Clearance	60	ft	† _{LW}		0.0	mi/h	
Interchange Density	0.50	l/mi	f _{LC}		0.0	mi/h	
Number of Lanes N	2	1/111	f _{ID}		0.0	mi/h	
FES (measured)	Z	mi/b	f _N		4.5	mi/h	
Page free flow Speed DEES	70.0	mi/h	FFS		65.5	mi/h	
LOS and Derformence	70.0	1111/11	Decise (N	\			
LOS and Performance I	vieasures)			
Operational (LOS)			Design (N)				
$v_p = (V \text{ or } DDHV) / (PHF x N x)$	(f _{HV} x f _n) <i>1696</i>	pc/h/ln	Design LOS				
S	65 0	mi/h	$v_p = (V \text{ or } DE)$	DHV) / (PHF x N x f	_{HV} x f _p)	pc/h	
D = v / S	26.1	pc/mi/lp	S			mi/h	
LOS	20.1 D	P0/11/11	$D = v_p / S$			pc/mi/ln	
			Required Nu	mber of Lanes, N			
Glossary			Factor Lo	cation			
N - Number of lanes	S - Speed			23-8 23-10		f - Exhibit 22 4	
V - Hourly volume	D - Density			20-0, 20-10			
v _p - Flow rate	FFS - Free-flow s	peed		20-0, 20-10, 23-11		LC - EXHIDIT 23-5	
LOS - Level of service	BFFS - Base free	e-flow speed	1p - Page 23-		00.0		
DDHV - Directional design ho	ur volume		105, 5, FFS	v_p - Exhibits 23-2	, 23-3	I _{ID} - Exhibit 23-7	

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BASIC FREEWAY SEGMENTS WORKSHEET								
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	B C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, vp FFS, LOS, vp FFS, LOS, N FFS, N, AAD FFS, LOS, AA FFS, LOS, N	<u>Output</u> LOS, S, D N, S, D v _p , S, D T LOS, S, D LDT N, S, D v _p , S, D		
General Information			Site Infor	nation				
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Westl	bound)		
Agency or Company	RPM Transport	ation	From/To		Bt SR-135	& Mine Lick Creek		
Date Performed	Consultants 5/22/2009		Jurisdiction		Putnam Co)		
Analysis Time Period	AM Peak Hour		Analysis Yea	ır	2033 Propo Park	osed w/ Business		
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning					
Oper.(LOS)			Des.(N)		Plann	ing Data		
Flow Inputs								
Volume, V	2949	veh/h	Peak-Hour F	actor, PHF	0.90			
		ven/day		i Buses, P _T	22			
Peak-Hr Prop. of AAD1, K			%RVS, P _R Conoral Torr	oin:	U Lovol			
$DDHV = AADT \times K \times D$		veh/h	Grade %	Length	mi			
Driver type adjustment	1.00			Up/Down %				
Calculate Flow Adjustm	nents							
f _p	1.00		E _R		1.2			
E _T	1.5		f _{HV} = 1/[1+P _T (E	_T - 1) + P _R (E _R - 1)]	0.901			
Speed Inputs			Calc Spee	d Adj and FFS				
Lane Width	12.0	ft	f		0.0	mi/h		
Rt-Shoulder Lat. Clearance	6.0	ft	f		0.0	mi/h		
Interchange Density	0.50	l/mi	LC		0.0	1111/11		
Number of Lanes, N	2		^I ID		0.0	mi/n		
FFS (measured)		mi/h	† _N		4.5	mi/h		
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h		
LOS and Performance I	Measures		Design (N)				
			Design (N)	•				
Operational (LOS)	• • > • - • -		Design LOS					
$v_p = (V \text{ or DDHV}) / (PHF x N x)$	c f _{HV} x f _p) <i>1819</i>	pc/h/ln	$v_{p} = (V \text{ or } DE)$) (PHF x N x f	ыv x f_)	pc/h		
S	64.1	mi/h	S	, (nv p	mi/h		
$D = v_p / S$	28.4	pc/mi/ln	$D = v_n / S$			pc/mi/ln		
LOS	D		Required Nu	mber of Lanes, N		P		
Glossary			Factor Lo	cation				
N - Number of lanes	S - Speed		F Exhibite	23-8 23-10	f	- Exhibit 23-4		
V - Hourly volume	D - Density			23-8 22-10 22-11	ı t	- Exhibit 23-5		
v _p - Flow rate	FFS - Free-flow s	speed	If - Page 22	20-0, 20-10, 20-11 12	l f	- Exhibit 22-6		
LOS - Level of service	BFFS - Base free	e-flow speed		V = Exhibite 22.2	23-3 t	- Exhibit 22 7		
DDHV - Directional design ho	ur volume			, vp - LAIIIDIIS 23-2	,∠J-J I			

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BASIC FREEWAY SEGMENTS WORKSHEET							
(iiiii) 70 70 70 70 60 60 55 10 10 10 10 10 10 10 10 10 10	1450 B C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (M) Planning (v _p)	<u>Input</u> FFS, N, v _p FFS, LOS, V _p FFS, LOS, N FFS, N, AADT FFS, LOS, AAI FFS, LOS, N	Output LOS, S, D N, S, D v _p , S, D LOS, S, D DT N, S, D v _p , S, D	
	ALB		Highway/Dire	nation of Travel	I-40 (Westh	ound)	
	RPM Transport	ation	r igilway/bile				
Agency or Company	Consultants		From/10		Bt Mine Lick	k Creek Ramps	
Date Performed	5/22/2009		Jurisdiction		Putnam Co		
Analysis Time Period	AM Peak Hour		Analysis Yea	ır	2033 Propo Park	sea w/ Business	
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning				
Oper.(LOS)			Des.(N)		🔲 Planni	ng Data	
Flow Inputs							
Volume, V	1811	veh/h	Peak-Hour F	actor, PHF	0.90		
		ven/day		i duses, P _T	22		
Peak-Hr Prop. of AAD1, K			%RVS, P _R Conoral Torr	ain:	U		
$DDHV = AADT \times K \times D$		veh/h	Grade %	Length	mi		
Driver type adjustment	1.00			Up/Down %			
Calculate Flow Adjustm	nents						
f _p	1.00		E _R		1.2		
E _T	1.5		$f_{HV} = 1/[1+P_T(E)]$	E _T - 1) + P _R (E _R - 1)]	0.901		
Speed Inputs			Calc Spee	d Adj and FFS			
Lane Width	12.0	ft	f		0.0	mi/h	
Rt-Shoulder Lat. Clearance	6.0	ft	f		0.0	mi/h	
Interchange Density	0.50	l/mi	LC		0.0	1111/11	
Number of Lanes, N	2		'ID		0.0	mi/n	
FFS (measured)		mi/h	† _N		4.5	mi/h	
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h	
LOS and Performance I	Measures		Design (N)			
Operational (LOS)			Design (N)				
			Design LOS				
$v_p = (V \text{ or } UUHV) / (PHF X N X)$	(T _{HV} X T _p) 1117	pc/n/ln	$v_p = (V \text{ or } DE)$	DHV) / (PHF x N x f	HV x f _p)	pc/h	
S (2	65.5	mi/h	s		F	mi/h	
$D = v_p / S$	17.1	pc/mi/ln	$D = v_p / S$			pc/mi/ln	
LOS	В		Required Nu	mber of Lanes, N			
Glossary			Factor Lo	cation			
N - Number of lanes	S - Speed		E E	00.0.00.10		Euclid in ord of	
V - Hourly volume	D - Density			23-8, 23-10	fL	W - Exhibit 23-4	
v _p - Flow rate	FFS - Free-flow s	speed	E _T - Exhibits	23-8, 23-10, 23-11	fL	_{.C} - Exhibit 23-5	
LOS - Level of service	BFFS - Base free	e-flow speed	т _р - Раде 23-	12	f _N	- Exhibit 23-6	
DDHV - Directional design ho	ur volume		LOS, S, FFS	, $v_p - Exhibits 23-2$, ∠3-3 f _{II}	_D - Exnidit 23-7	

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BASIC FREEWAY SEGMENTS WORKSHEET							
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	B C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, vp FFS, LOS, vp FFS, LOS, N FFS, N, AAD FFS, LOS, AA FFS, LOS, N	<u>Output</u> LOS, S, D N, S, D v _p , S, D LOS, S, D DT N, S, D v _p , S, D	
General Information			Site Inforr	nation			
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Westl	oound)	
Agency or Company	RPM Transport	ation	From/To		Bt SR-56 &	Mine Lick Creek	
Date Performed	Consultants		Jurisdiction		Putnam Co		
Analysis Time Period	AM Peak Hour		Analysis Yea	ır	2033 Propo	osed w/ Business	
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning		rain		
Oper.(LOS)			Des.(N)		🔲 Plann	ing Data	
Flow Inputs							
Volume, V	2040	veh/h	Peak-Hour F	actor, PHF	0.90		
AADT		veh/day	%Trucks and	l Buses, P _T	22		
Peak-Hr Prop. of AADT, K			%RVs, P _R		0		
Peak-Hr Direction Prop, D		veh/h	General Terr	ain:	Level		
Driver type adjustment	1.00	Ven/m	Graue /	Up/Down %	1111		
Calculate Flow Adjustm	nents						
f	1.00		E _R		1.2		
E _T	1.5		f _{LIV} = 1/[1+P _T (E	E _T - 1) + P _D (E _D - 1)]	0.901		
Speed Inputs				d Adi and FFS			
Lane Width	12.0	ft					
Rt-Shoulder Lat Clearance	60	ft	t _{LW}		0.0	mi/h	
Interchange Density	0.50	l/mi	f _{LC}		0.0	mi/h	
Number of Lanes N	2	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	f _{ID}		0.0	mi/h	
FES (measured)	2	mi/b	f _N		4.5	mi/h	
Base free-flow Speed BEES	70.0	mi/h	FFS		65.5	mi/h	
LOS and Performance	Moasuros	1111/11	Decign (N	1			
LOS and Performance	vieasui es						
Operational (LOS)			Design (N)				
$v_p = (V \text{ or DDHV}) / (PHF x N x)$	(f _{HV} x f _p) <i>1258</i>	pc/h/ln			v f \	U	
S	65.5	mi/h	$v_p = (v \text{ or } DL)$)HV) / (PHF X N X I	_{HV} x r _p)	pc/h	
$D = v_p / S$	19.2	pc/mi/ln	S (C			mi/h	
LOS	С		$D = v_p / S$			pc/mi/ln	
	-		Required Nu	mber of Lanes, N			
Glossary			Factor Lo	cation			
N - Number of lanes	S - Speed		E _p - Exhibits	23-8, 23-10	f	w - Exhibit 23-4	
V - Hourly volume	D - Density		F ₊ - Fxhihite	23-8, 23-10, 23-11	f	- Fxhibit 23-5	
v _p - Flow rate	FFS - Free-flow s	speed	f - Page 23-	12	f	- Exhibit 23-6	
LOS - Level of service	BFFS - Base free	e-flow speed		v - Evhibite 22.2	23-3 t	- Exhibit 23-7	
DDHV - Directional design ho	ur volume			, •p - Exhibits 23-2	, ∠J-J I		

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BASIC FREEWAY SEGMENTS WORKSHEET								
80 Free-Flow Speed FES = 75 milh 70 65 milh 70 milh 70 65 milh 60 milh 50 55 milh 10 milh 80 10 55 milh 10 10 milh 10 milh 30 400 200	1300 1450 2 2 1450 2 1450 2 1450 2 1450 2 1450 2 1450 2 1450 2 1450 2 1450 2 1450 2 1450 2 1450 140		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, v _p FFS, LOS, v _p FFS, LOS, N FFS, N, AADT FFS, LOS, AA FFS, LOS, N	<u>Output</u> LOS, S, D N, S, D v _p , S, D LOS, S, D DT N, S, D v _p , S, D		
General Information			Site Inforr	nation				
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Westh	oound)		
Agency or Company	RPM Transport	ation	From/To		Between S	R-56 Ramps		
Date Performed	5/22/2009		Jurisdiction		Putnam Co	,		
Analysis Time Period	AM Peak Hour		Analysis Yea	ır	2033 Propo Park	osed w/ Business		
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning					
Oper.(LOS)			es.(N)		🗖 Plann	ing Data		
Flow Inputs								
Volume, V	1812	veh/h	Peak-Hour F	actor, PHF	0.90			
		ven/day		i Buses, P _T	22			
Peak-Hr Prop. of AAD1, K			%RVS, P _R	oin:	U Lovol			
DDHV = AADT x K x D		veh/h	Grade %	Lenath	mi			
Driver type adjustment	1.00			Up/Down %				
Calculate Flow Adjustm	ients							
fp	1.00		E _R		1.2			
E _T	1.5		f _{HV} = 1/[1+P _T (E	E _T - 1) + P _R (E _R - 1)]	0.901			
Speed Inputs			Calc Spee	d Adj and FFS				
Lane Width	12.0	ft	4		0.0	mi/h		
Rt-Shoulder Lat. Clearance	6.0	ft	LW		0.0	111/11		
Interchange Density	0.50	I/mi	TLC		0.0	mi/h		
Number of Lanes. N	2		f _{ID}		0.0	mi/h		
FFS (measured)		mi/h	f _N		4.5	mi/h		
Base free-flow Speed, BEES	70.0	mi/h	FFS		65.5	mi/h		
LOS and Performance	Measures		Design (N)				
			Design (N)	/				
Operational (LOS)			Design LOS					
$v_p = (V \text{ or DDHV}) / (PHF x N x)$	f _{HV} x f _p) 1117	pc/h/ln	$V = (V \text{ or } D\Gamma)$)HV) / (PHF x N x f	, x f)	nc/h		
S	65.5	mi/h			HV ^ 'p'	pc/n mi/b		
$D = v_p / S$	17.1	pc/mi/ln				no/~;/lo		
LOS	В		Required Nu	mber of Lanes, N		pc/mi/m		
Glossary			Factor Lo	cation				
N - Number of lanes	S - Speed		_					
V - Hourly volume	D - Densitv		E _R - Exhibits	23-8, 23-10	f _l	_{LW} - Exhibit 23-4		
v Flow rate	FFS - Free-flow s	peed	E _T - Exhibits	23-8, 23-10, 23-11	f _l	_{LC} - Exhibit 23-5		
P LOS - Level of service	BEES - Base free	-flow speed	f _p - Page 23-	12	f	_N - Exhibit 23-6		
DDHV - Directional design hou	ur volume	now opeeu	LOS, S, FFS	, v _p - Exhibits 23-2	, 23-3 f _l	_D - Exhibit 23-7		

HCS+TM Version 5.21

BASIC FREEWAY SEGMENTS WORKSHEET								
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	B C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, vp FFS, LOS, vp FFS, LOS, N FFS, N, AADT FFS, LOS, AA FFS, LOS, N	Output LOS, S, D N, S, D v _p , S, D LOS, S, D DT N, S, D v _p , S, D		
General Information			Site Inform	mation				
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Westb	oound)		
Agency or Company	RPM Transport	ation	From/To		west of SR-	-56		
Date Performed	Consultants 5/22/2009		Jurisdiction		Putnam Co			
Analysis Time Period	AM Peak Hour		Analysis Yea	ır	2033 Propo Park	osed w/ Business		
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning					
Oper.(LOS)			Des.(N)		🔲 Planni	ing Data		
Flow Inputs								
Volume, V	2003	veh/h	Peak-Hour F	actor, PHF	0.90			
		ven/day		Buses, P _T	22			
Peak-Hr Prop. of AAD1, K			%RVS, P _R Conoral Torr	ain:	U Lovol			
$DDHV = AADT \times K \times D$		veh/h	Grade %	Length	mi			
Driver type adjustment	1.00			Up/Down %				
Calculate Flow Adjustm	nents							
f _p	1.00		E _R		1.2			
E _T	1.5		$f_{HV} = 1/[1+P_T(E)]$	_T - 1) + P _R (E _R - 1)]	0.901			
Speed Inputs			Calc Spee	d Adj and FFS				
Lane Width	12.0	ft	f		0.0	mi/b		
Rt-Shoulder Lat. Clearance	6.0	ft	LW		0.0	1111/11		
Interchange Density	0.50	I/mi	LC		0.0	mi/n		
Number of Lanes, N	2		† _{ID}		0.0	mi/h		
FFS (measured)		mi/h	f _N		4.5	mi/h		
Base free-flow Speed. BFFS	70.0	mi/h	FFS		65.5	mi/h		
LOS and Performance	Measures	-	Desian (N)				
			Design (N)	/				
Operational (LOS)			Design LOS					
$v_p = (V \text{ or DDHV}) / (PHF x N x)$	(f _{HV} x f _p) <i>1235</i>	pc/h/ln	$v_{p} = (V \text{ or } DE)$) / (PHF x N x f	uv x f_)	pc/h		
S	65.5	mi/h	s s		ну р	mi/h		
$D = v_p / S$	18.9	pc/mi/ln	$D = v_a / S$			nc/mi/ln		
LOS	С		Required Nu	mber of Lanes, N		P%/11//11		
Glossary			Factor Lo	cation				
N - Number of lanes	S - Speed			<u> </u>	1	Exhibit 22.4		
V - Hourly volume	D - Density			23-0, 23-1U	T _L	W - EXHIDIL 23-4		
v _p - Flow rate	FFS - Free-flow s	speed		23-8, 23-10, 23-11	t.			
LOS - Level of service	BFFS - Base free	e-flow speed	r _p - Page 23-		t _h			
DDHV - Directional design ho	ur volume	-	LOS, S, FFS	, v_p - Exhibits 23-2	, 23-3 f _l	D - Exhibit 23-7		

HCS+TM Version 5.21

BASIC FREEWAY SEGMENTS WORKSHEET								
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	B C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, v _p FFS, LOS, v _p FFS, LOS, N FFS, N, AADT FFS, LOS, AAE FFS, LOS, N	Output LOS, S, D N, S, D V _P , S, D LOS, S, D T N, S, D V _P , S, D		
General Information			Site Inform	nation				
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Eastbo	und)		
Agency or Company	RPM Transport	ation	From/To		west of SR-	56		
Date Performed	5/22/2009		Jurisdiction		Putnam Co			
Analysis Time Period	PM Peak Hour		Analysis Yea	ır	2033 Propos Park	sed w/ Business		
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning					
Oper.(LOS)			Des.(N)		🔲 Plannir	ng Data		
Flow Inputs			<u> </u>					
Volume, V	2521	veh/h	Peak-Hour F	actor, PHF	0.90			
AADT Book Hr Bron of AADT K		ven/day		i buses, r _T	22			
Peak-HI Prop. of AADT, K Peak-Hr Direction Prop. D			General Terr	ain:	U			
$DDHV = AADT \times K \times D$		veh/h	Grade %	Length	mi			
Driver type adjustment	1.00			Up/Down %				
Calculate Flow Adjustm	nents							
f _p	1.00		E _R		1.2			
E _T	1.5		f _{HV} = 1/[1+P _T (E	_T - 1) + P _R (E _R - 1)]	0.901			
Speed Inputs			Calc Spee	d Adj and FFS				
Lane Width	12.0	ft	f		0.0	mi/h		
Rt-Shoulder Lat. Clearance	6.0	ft	f		0.0	mi/h		
Interchange Density	0.50	I/mi	LC		0.0	1111/11		
Number of Lanes, N	2		^I ID		0.0	mi/n		
FFS (measured)		mi/h	† _N		4.5	mi/h		
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h		
LOS and Performance I	Measures		Design (N)				
			Design (N)					
Operational (LOS)			Design LOS					
$v_p = (V \text{ or DDHV}) / (PHF x N x)$	(t _{HV} x t _p) <i>1555</i>	pc/h/ln	$v_{p} = (V \text{ or } DE)$) (PHF x N x f	HV x f	pc/h		
S	65.4	mi/h	s	, (nv p	mi/h		
$D = v_p / S$	23.8	pc/mi/ln	$D = v_r / S$			pc/mi/ln		
LOS	С		Required Nu	mber of Lanes, N		P.0.111/111		
Glossary			Factor Lo	cation				
N - Number of lanes	S - Speed		E - Evhibito	23-8 23-10	f	- Exhibit 23-4		
V - Hourly volume	D - Density			20-0, 20-10 22-8 22-10 22 14	۱ _۲	- Exhibit 22 5		
v _p - Flow rate	FFS - Free-flow s	speed		20-0, 20-10, 20-11	ſL(
LOS - Level of service	BFFS - Base free	e-flow speed	1p - Page 23-		^t N			
DDHV - Directional design ho	ur volume			, $v_p = Exhibits 23-2$, ∠3-3 t _{ie}	- ⊂X111011 23-7		

HCS+TM Version 5.21

BASIC FREEWAY SEGMENTS WORKSHEET								
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	B C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, vp FFS, LOS, vp FFS, LOS, N FFS, N, AADT FFS, LOS, AA FFS, LOS, N	<u>Output</u> LOS, S, D N, S, D v _p , S, D LOS, S, D DT N, S, D v _p , S, D		
General Information			Site Infor	mation				
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Eastb	ound)		
Agency or Company	RPM Transport	ation	From/To		Between Si	R-56 Ramps		
Date Performed	5/22/2009		Jurisdiction		Putnam Co			
Analysis Time Period	PM Peak Hour		Analysis Yea	ır	2033 Propo Park	osed w/ Business		
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning					
Oper.(LOS)			Des.(N)		Planni	ing Data		
Flow Inputs	0050	· · · · · · · · · · · ·	De als Llava D		0.00			
Volume, V	2250	ven/n veb/dav	%Trucks and	actor, PHF Buses P_	0.90 22			
Peak-Hr Prop. of AADT. K		Ven/day	%RVs P-	. Duoco, 1	0			
Peak-Hr Direction Prop. D			General Terr	ain:	Level			
$DDHV = AADT \times K \times D$		veh/h	Grade %	Length	mi			
Driver type adjustment	1.00			Up/Down %				
Calculate Flow Adjustr	nents							
	1.00		E _R		1.2			
ET	1.5		$f_{HV} = 1/[1+P_T(E_T)]$	T - 1) + P _R (E _R - 1)]	0.901			
Speed Inputs			Calc Spee	ed Adj and FFS				
Lane Width	12.0	ft	f _{LW}		0.0	mi/h		
Rt-Shoulder Lat. Clearance	6.0	ft	fic		0.0	mi/h		
Interchange Density	0.50	l/mi	f _{ID}		0.0	mi/h		
Number of Lanes, N	2		f.		45	mi/h		
FFS (measured)		mi/h			65 5	mi/h		
Base free-flow Speed, BFFS	70.0	mi/h	FF3		00.0	1111/11		
LOS and Performance	Measures		Design (N					
Operational (LOS)			<u>Design (N)</u>					
$v_{x} = (V \text{ or } DDHV) / (PHF x N)$	(f _{un} x f _a) 1391	pc/h/ln	Design LOS					
S	HV p, 1551	mi/h	$v_p = (V \text{ or } DE)$	DHV) / (PHF x N x f	HV x f _p)	pc/h		
D = y / S	21.2	nc/mi/ln	S			mi/h		
LOS	C.	Politikiti	$D = v_p / S$			pc/mi/ln		
			Required Nu	mber of Lanes, N				
Glossary			Factor Lo	cation				
N - Number of lanes	S - Speed		E _n - Fxhihits	23-8, 23-10	f.	w - Exhibit 23-4		
V - Hourly volume	D - Density		F_{-} - Exhibits	23-8, 23-10, 23-11	ין f.			
v _p - Flow rate	FFS - Free-flow s	peed	f - Page 23-	-12	'l f	-C Exhibit 23-6		
LOS - Level of service	BFFS - Base free	e-flow speed	I OS S FES	- v - Exhibits 23-2	'≀ 23-3 f	Exhibit 23-7		
DDHV - Directional design ho	ur volume			, p = 2.11010 20-2	, <u> </u>			

HCS+TM Version 5.21

	BASIC FREEWAY SEGMENTS WORKSHEET								
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	B C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, vp FFS, LOS, V FFS, LOS, N FFS, N, AAD FFS, LOS, N FFS, LOS, N	Output LOS, S, D N, S, D v _p , S, D T LOS, S, D ADT N, S, D v _p , S, D			
General Information			Site Inform	mation					
Analyst	ALB	_	Highway/Dire	ection of Travel	I-40 (Eastl	bound)			
Agency or Company	RPM Transport	ation	From/To		Bt SR-56 a	& Mine Lick Creek			
Date Performed	5/22/2009		Jurisdiction		Putnam C	0			
Analysis Time Period	PM Peak Hour		Analysis Yea	ır	2033 Prop Park	osed w/ Business			
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning						
Oper.(LOS)			Des.(N)		Planı	ning Data			
Flow Inputs	0.400		<u> </u>						
	2438	veh/h	Peak-Hour F	actor, PHF	0.90				
Rook Hr Bron of AADT K		ven/uay		1 Duses, 1 T	22				
Peak-Hr Direction Prop. D			General Terr	ain.	u Level				
$DDHV = AADT \times K \times D$		veh/h	Grade %	Length	mi				
Driver type adjustment	1.00			Up/Down %					
Calculate Flow Adjustn	nents								
f _p	1.00		E _R		1.2				
E _T	1.5		$f_{HV} = 1/[1+P_T(E)]$	_T - 1) + P _R (E _R - 1)]	0.901				
Speed Inputs			Calc Spee	ed Adj and FFS					
Lane Width	12.0	ft	fuw		0.0	mi/h			
Rt-Shoulder Lat. Clearance	6.0	ft	f. a		0.0	mi/h			
Interchange Density	0.50	I/mi	'LC f		0.0	mi/h			
Number of Lanes, N	2		'ID		0.0	1111/11			
FFS (measured)		mi/h	т _N		4.5	mi/n			
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h			
LOS and Performance	Measures		Design (N)					
Operational (LOC)			Design (N)						
	(f) (500		Design LOS						
$v_p = (V \text{ or } DDHV) / (PHF X N)$	(1 _{HV} x 1 _p) 1503	pc/n/in	$v_p = (V \text{ or } DE)$	DHV) / (PHF x N x f	HV x f _p)	pc/h			
S (2	65.5	mi/h	S		···· P	mi/h			
$D = v_p / S$	23.0	pc/mi/ln	$D = v_{D} / S$			pc/mi/ln			
LOS	С		Required Nu	mber of Lanes, N		-			
Glossary			Factor Lo	cation					
N - Number of lanes	S - Speed		F _n - Fxhihite	23-8, 23-10		f Exhibit 23-4			
V - Hourly volume	D - Density		F Fxhihite	23-8 23-10 23-11		f Exhibit 23-5			
v _p - Flow rate	FFS - Free-flow s	speed	f - Page 22-	.12		f - Exhibit 23-6			
LOS - Level of service	BFFS - Base free	e-flow speed		·- V - Exhihite 23-2	23-3	f Exhibit 23-7			
DDHV - Directional design ho	ur volume			, p = 20-2	, 20 0				

HCS+TM Version 5.21

BASIC FREEWAY SEGMENTS WORKSHEET							
(iiiii) 70 70 70 70 60 60 60 60 60 60 60 60 60 70 70 60 60 60 60 60 60 60 60 60 6	1450 B C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (M) Planning (v _p)	hput FFS, Ν, ν _p FFS, LOS, ν _p FFS, LOS, Ν FFS, Ν, AADT FFS, LOS, AAI FFS, LOS, Ν	<u>Output</u> LOS, S, D N, S, D v _p , S, D LOS, S, D DT N, S, D v _p , S, D	
	ALB		Highway/Dire	nation of Travel	I-40 (Eastho	ound)	
	RPM Transport	ation	r ignway/bire				
Agency or Company	Consultants		From/10		Bt Mine Lick	Creek Ramps	
Date Performed	5/22/2009		Jurisdiction		Putnam Co		
Analysis Time Period	PM Peak Hour		Analysis Yea	ır	2033 Propo Park	sea w/ Business	
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning				
Oper.(LOS)			Des.(N)		🔲 Planni	ng Data	
Flow Inputs							
Volume, V	2111	veh/h	Peak-Hour F	actor, PHF	0.90		
		ven/day		i duses, P _T	22		
Peak-Hr Prop. of AAD1, K			%RVS, P _R Conoral Torr	ain:	U		
$DDHV = AADT \times K \times D$		veh/h	Grade %	Length	mi		
Driver type adjustment	1.00			Up/Down %			
Calculate Flow Adjustm	nents						
f _p	1.00		E _R		1.2		
E _T	1.5		$f_{HV} = 1/[1+P_T(E)]$	E _T - 1) + P _R (E _R - 1)]	0.901		
Speed Inputs			Calc Spee	d Adj and FFS			
Lane Width	12.0	ft	f		0.0	mi/h	
Rt-Shoulder Lat. Clearance	6.0	ft	f		0.0	mi/h	
Interchange Density	0.50	I/mi	LC		0.0	1111/11	
Number of Lanes, N	2		'ID		0.0	mi/n	
FFS (measured)		mi/h	† _N		4.5	mi/h	
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h	
LOS and Performance I	Measures		Design (N)			
Operational (LOS)			Design (N)				
	(() (Design LOS				
$v_p = (v \text{ or } UUHV) / (PHF X N X)$	ст _{НV} х т _р) <i>130</i> 2	pc/n/in	$v_p = (V \text{ or } DE)$	0HV) / (PHF x N x f	_{HV} x f _ρ)	pc/h	
S (2	65.5	mi/h	s		F	mi/h	
$D = v_p / S$	19.9	pc/mi/ln	$D = v_p / S$			pc/mi/ln	
LOS	С		Required Nu	mber of Lanes, N			
Glossary			Factor Lo	cation			
N - Number of lanes	S - Speed			00.0.00.10			
V - Hourly volume	D - Density			23-8, 23-10	t_	W - Exhibit 23-4	
v _p - Flow rate	FFS - Free-flow s	speed	E _T - Exhibits	23-8, 23-10, 23-11	fL	C - Exhibit 23-5	
LOS - Level of service	BFFS - Base free	e-flow speed	т _р - Раде 23-	12	f _N	- Exhibit 23-6	
DDHV - Directional design ho	ur volume		LOS, S, FFS	, $v_p - Exhibits 23-2$, ∠3-3 f _{I[}	- Exnidit 23-7	

HCS+TM Version 5.21

BASIC FREEWAY SEGMENTS WORKSHEET							
(iiii) 99 10 10 10 10 10 10 10 10 10 10	1450 B C		2400	Application Operational (LOS) Design (N) Design (vp) Planning (LOS) Planning (N) Planning (V) Planning (vp)	Input FFS, N, vp FFS, LOS, vp FFS, LOS, N FFS, N, AADT FFS, LOS, AADT FFS, LOS, N	Output LOS, S, D N, S, D vp, S, D LOS, S, D N, S, D vp, S, D	
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Eastbour	nd)	
Agency or Company	RPM Transport	ation	From/To		Bt SR-135 & A	Aine Lick Creek	
Data Darfarmad	Consultants				De tra arta Ca	In Elek Oreek	
Analysis Time Period	5/22/2009 PM Peak Hour		Analysis Yea	ır	2033 Propose Park	d w/ Business	
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning		1 un		
Oper.(LOS)			es.(N)		🔲 Planning	Data	
Flow Inputs							
Volume, V	3124	veh/h	Peak-Hour F	actor, PHF	0.90		
AADT		veh/day	%Trucks and	l Buses, P _T	22		
Peak-Hr Prop. of AADT, K			%RVs, P _R		0		
Peak-Hr Direction Prop, D		voh/h	General Terr	ain:	Level		
Driver type adjustment	1.00	Ven/m	Glaue /0	Up/Down %	1111		
Calculate Flow Adjustm	nents			•			
f	1.00		E _R		1.2		
Ē,	1.5		f _{uv} = 1/[1+P _T (E	= - 1) + P _P (E _P - 1)]	0.901		
Speed Inputs				d Adi and FFS			
Lane Width	12.0	ft				• 4	
Rt-Shoulder Lat. Clearance	6.0	ft	T _{LW}		0.0	mi/n	
Interchange Density	0.50	l/mi	f _{LC}		0.0	mi/h	
Number of Lanes N	2	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	f _{ID}		0.0	mi/h	
FES (measured)	L	mi/h	f _N		4.5	mi/h	
Base free-flow Speed BEES	70.0	mi/h	FFS		65.5	mi/h	
LOS and Performance	Moasuros		Docian (N	١			
	viedouleo)			
Operational (LOS)							
$v_p = (V \text{ or DDHV}) / (PHF x N x)$	(f _{HV} x f _p) <i>19</i> 26	pc/h/ln			vf)	nc/h	
S	. 62.9	mi/h	$v_p = (v \text{ or } DL)$		HV ^{X I} p)	pc/n	
$D = v_p / S$	30.6	pc/mi/ln				mi/n	
LOS	D		$D = V_p / S$			pc/mi/ln	
			Required Nu	mper of Lanes, N			
Glossary			Factor Lo	cation			
N - Number of lanes	S - Speed		E _R - Exhibits	23-8, 23-10	f _{1 \v/}	- Exhibit 23-4	
V - Hourly volume	D - Density		E _T - Exhibits	23-8, 23-10, 23-11	f _{ic} .	Exhibit 23-5	
v _p - Flow rate	FFS - Free-flow s	peed	f Page 23-	12	f _N -	Exhibit 23-6	
LOS - Level of service	BFFS - Base free	e-flow speed	LOS, S, FFS	, v _p - Exhibits 23-2	, 23-3 f _i -	Exhibit 23-7	
DDHV - Directional design ho	ur volume		. , –	P	U		

HCS+TM Version 5.21

BASIC FREEWAY SEGMENTS WORKSHEET							
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	B C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, vp FFS, LOS, vp FFS, LOS, N FFS, N, AADT FFS, LOS, AAI FFS, LOS, N	Output LOS, S, D N, S, D v _p , S, D LOS, S, D DT N, S, D v _p , S, D	
General Information			Site Inforr	mation			
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Eastbo	ound)	
Agency or Company	RPM Transport	ation	From/To		Between SF	R-135 Ramps	
Date Performed	Consultants 5/22/2009		Jurisdiction		Putnam Co		
Analysis Time Period	PM Peak Hour		Analysis Yea	ır	2033 Propo Park	sed w/ Business	
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning				
Oper.(LOS)			Des.(N)		🔲 Planni	ng Data	
Flow Inputs							
Volume, V	2799	veh/h	Peak-Hour F	actor, PHF	0.90		
		ven/day		Buses, P _T	22		
Peak-Hr Prop. of AAD1, K			%RVS, P _R Conoral Torr	ain:	U		
$DDHV = AADT \times K \times D$		veh/h	Grade %	Length	mi		
Driver type adjustment	1.00			Up/Down %			
Calculate Flow Adjustn	nents						
f _p	1.00		E _R		1.2		
E _T	1.5		f _{HV} = 1/[1+P _T (E	E _T - 1) + P _R (E _R - 1)]	0.901		
Speed Inputs			Calc Spee	d Adj and FFS			
Lane Width	12.0	ft	4		0.0	mi/h	
Rt-Shoulder Lat. Clearance	6.0	ft	LW		0.0	111/11	
Interchange Density	0.50	I/mi	^T LC		0.0	mi/h	
Number of Lanes. N	2		f _{ID}		0.0	mi/h	
FFS (measured)		mi/h	f _N		4.5	mi/h	
Base free-flow Speed, BEES	70.0	mi/h	FFS		65.5	mi/h	
LOS and Performance	Measures		Design (N)			
			Design (N)	/			
Operational (LOS)			Design LOS				
$v_p = (V \text{ or DDHV}) / (PHF x N)$	(f _{HV} x f _p) <i>17</i> 26	pc/h/ln	$V = (V \text{ or } D\Gamma)$)HV) / (PHF x N x f	xf)	nc/h	
S	64.8	mi/h			HV ^ 'p/	mi/b	
$D = v_p / S$	26.6	pc/mi/ln	D = y/g			1111/11 po/mi/lp	
LOS	D		Required Nu	mber of Lanes N		pc/mi/in	
Glossary			Factor Lo	cation			
N - Number of lanes	S - Sneed						
	D - Density		E _R - Exhibits	23-8, 23-10	f _L	_W - Exhibit 23-4	
v - Flow rate	FFS - Free-flow e	need	E _T - Exhibits	23-8, 23-10, 23-11	f _L	_C - Exhibit 23-5	
I OS - Loval of convice	REES Boon from		f _p - Page 23-	12	f _N	ı - Exhibit 23-6	
DDH// - Directional design bo		-now sheen	LOS, S, FFS	, v _p - Exhibits 23-2	, 23-3 f _{II}	_o - Exhibit 23-7	
Serie Encouorial design no							

HCS+TM Version 5.21

BASIC FREEWAY SEGMENTS WORKSHEET										
80 Free-Flow Spzed FES = 75 milh 70 65 milh 70 milh 70 65 milh 60 50 10 55 milh 55 milh 80 50 10 55 milh 90 400 800	1300 1500 B. C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (M) Planning (v _p)	Input FFS, N, vp FFS, LOS, vp FFS, LOS, N FFS, N, AADT FFS, LOS, AAD FFS, LOS, N	Output LOS, S, D N, S, D v _p , S, D LOS, S, D T N, S, D v _p , S, D				
General Information			Site Inform	mation						
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Eastbo	und)				
Agency or Company	RPM Transport	ation	From/To		east of SR-1	35				
Date Performed	Consultants 5/22/2009		Jurisdiction		Putnam Co					
Analysis Time Period	PM Peak Hour		Analysis Yea	ar	2033 Propos Park	ed w/ Business				
Project Description 09-0402	Mine Lick Creek I.	JS - TDOT OC F	Planning							
Oper.(LOS)			Des.(N)		🗖 Plannir	ig Data				
Flow Inputs										
Volume, V	3359	veh/h	Peak-Hour F	actor, PHF	0.90					
		ven/day		i Buses, P _T	22					
Peak-Hr Prop. of AAD1, K			%RVS, P _R Conoral Torr	ioin:	U					
$DDHV = AADT \times K \times D$		veh/h	Grade %	Length	mi					
Driver type adjustment	1.00			Up/Down %						
Calculate Flow Adjustm	nents									
f _p	1.00		E _R		1.2					
E _T	1.5		$f_{HV} = 1/[1+P_T(E)]$	E _T - 1) + P _R (E _R - 1)]	0.901					
Speed Inputs			Calc Spee	ed Adj and FFS						
Lane Width	12.0	ft	f		0.0	mi/h				
Rt-Shoulder Lat. Clearance	6.0	ft	'LW f		0.0	mi/h				
Interchange Density	0.50	l/mi	LC		0.0	mi/m				
Number of Lanes, N	2		^T ID		0.0	mi/h				
FFS (measured)		mi/h	f _N		4.5	mi/h				
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h				
LOS and Performance I	Measures		Design (N							
			Design (N)	,						
Operational (LOS)			Design LOS							
$v_p = (V \text{ or DDHV}) / (PHF x N x)$	c f _{HV} x f _p) 2071	pc/h/ln	$v_{p} = (V \text{ or } DE)$	DHV) / (PHF x N x f	ц _и х f _n)	pc/h				
S	60.5	mi/h	S	, (nv p	mi/h				
$D = v_p / S$	34.3	pc/mi/ln	$D = v_{p} / S$			pc/mi/ln				
LOS	D		Required Nu	mber of Lanes, N						
Glossary			Factor Lo	cation						
N - Number of lanes	S - Speed		F Exhibite	23-8 23-10	f	- Exhibit 23-4				
V - Hourly volume	D - Density			23-8 22-10 22-14	'LV	- Exhibit 23-5				
v _p - Flow rate	FFS - Free-flow s	peed		20-0, 20-10, 20-11 12	الد ال ۲	- Exhibit 22-5				
LOS - Level of service	BFFS - Base free	-flow speed	p - raye 23-	12	22.2 ^I N	- LATIIDIL 20-0				
DDHV - Directional design ho	ur volume			$v_p = Exhibits 23-2$, 20-0 ¹ ID	- EXHIDIL 23-1				

HCS+TM Version 5.21

BASIC FREEWAY SEGMENTS WORKSHEET										
(iiiii) 70 70 70 70 60 60 60 60 60 60 60 60 60 70 70 60 60 60 60 60 60 60 60 60 6	1200 Flow Rate (pc/h/ln)		2400	Application Operational (LOS) Design (N) Design (vp) Planning (LOS) Planning (M) Planning (vp)	hput FFS, N, vp FFS, LOS, vp FFS, LOS, N FFS, N, AADT FFS, LOS, AAD FFS, LOS, N	Output LOS, S, D N, S, D v _p , S, D LOS, S, D DT N, S, D v _p , S, D				
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Westb	ound)				
Agency or Company	RPM Transport	ation	From/To		East of SP-	135				
	Consultants					155				
Date Performed	5/22/2009		Jurisdiction		Putnam Co	od w/ Rusinoss				
Analysis Time Period	PM Peak Hour		Analysis Yea	ır	Park	seu w/ Dusiness				
Project Description 09-0402	Mine Lick Creek I	JS - TDOT OC I	Planning							
Oper.(LOS)			Des.(N)		🗌 Plannii	ng Data				
Flow Inputs	0.400		<u> </u>							
	2466	veh/h	Peak-Hour F	actor, PHF	0.90					
Peak-Hr Prop. of AADT. K		ven/uay		1 Duscs, 1 T	0					
Peak-Hr Direction Prop. D			General Terr	ain:	l evel					
$DDHV = AADT \times K \times D$		veh/h	Grade %	Length	mi					
Driver type adjustment	1.00			Up/Down %						
Calculate Flow Adjustn	nents		_							
f _p	1.00		E _R		1.2					
E _T	1.5		$f_{HV} = 1/[1+P_T(E_T)]$	- 1) + P _R (E _R - 1)]	0.901					
Speed Inputs			Calc Spee	d Adj and FFS						
Lane Width	12.0	ft	f _{i w}		0.0	mi/h				
Rt-Shoulder Lat. Clearance	6.0	ft	f		0.0	mi/h				
Interchange Density	0.50	l/mi	fun		0.0	mi/h				
Number of Lanes, N	2		f		15	mi/h				
FFS (measured)		mi/h	'N		ч. о					
Base free-flow Speed, BFFS	70.0	mi/h	FF5		65.5	mi/n				
LOS and Performance I	Measures		Design (N)						
Operational (LOS)			<u>Design (N)</u>							
v = (V or DDHV) / (PHF x N x)	(f, x f.) 1521	pc/h/ln	Design LOS							
s	ну т.р, 102 1 65 5	mi/b	$v_p = (V \text{ or } DE)$	0HV) / (PHF x N x f	_{HV} x f _p)	pc/h				
D = v / S	22.2	nc/mi/ln	S			mi/h				
LOS	23.2 C		$D = v_p / S$			pc/mi/ln				
			Required Nu	mber of Lanes, N						
Glossary			Factor Lo	cation						
N - Number of lanes	S - Speed		F Exhibits	23-8 23-10	f	Exhibit 23-4				
V - Hourly volume	D - Density		F Exhibite	23-8 23-10 23-11	۲ _۲	Exhibit 23-5				
v _p - Flow rate	FFS - Free-flow s	speed	f - Page 23-	-20 0, 20-10, 20-11 12	۲ f	- Exhibit 23-6				
LOS - Level of service	BFFS - Base free	e-flow speed	IOS S FES	·- v - Exhibits 23-2	'N 23-3 f	- Exhibit 23-7				
DDHV - Directional design ho	ur volume			, p = 21110113 20-2	, <u>200</u> 'I					

HCS+TM Version 5.21

BASIC FREEWAY SEGMENTS WORKSHEET										
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	B C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (M) Planning (v _p)	Input FFS, N, v _p FFS, LOS, v _p FFS, LOS, N FFS, N, AADT FFS, LOS, AAI FFS, LOS, N	Output LOS, S, D N, S, D V _p , S, D LOS, S, D DT N, S, D V _p , S, D				
General Information			Site Inform	mation						
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Westb	ound)				
Agency or Company	RPM Transporta	ation	From/To		Between SF	R-135 Ramps				
Date Performed	Consultants 5/22/2009		Jurisdiction		Putnam Co					
Analysis Time Period	PM Peak Hour		Analysis Yea	ar	2033 Propo Park	sed w/ Business				
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning							
Oper.(LOS)			Des.(N)		🗖 Planni	ng Data				
Flow Inputs	1000		De al Illaur D		0.00					
Volume, V	1960	ven/n	Peak-Hour F	actor, PHF	0.90					
Peak-Hr Prop. of AADT. K		ven/uay	%RVs P	, Duses, 1 T	0					
Peak-Hr Direction Prop. D			General Terr	ain:	l evel					
$DDHV = AADT \times K \times D$		veh/h	Grade %	Length	mi					
Driver type adjustment	1.00			Up/Down %						
Calculate Flow Adjustn	nents		_							
t _p	1.00		E _R		1.2					
E _T	1.5		$f_{HV} = 1/[1+P_T(E_T)]$	E _T - 1) + P _R (E _R - 1)]	0.901					
Speed Inputs			Calc Spee	ed Adj and FFS						
Lane Width	12.0	ft	f _{LW}		0.0	mi/h				
Rt-Shoulder Lat. Clearance	6.0	ft	f		0.0	mi/h				
Interchange Density	0.50	l/mi	fin		0.0	mi/h				
Number of Lanes, N	2		f		45	mi/h				
FFS (measured)		mi/h	'N		ч. о					
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/n				
LOS and Performance	Measures		Design (N)						
Operational (LOS)			<u>Design (N)</u>							
v = (V or DDHV) / (PHF x N x)	(f, x f.) 1209	nc/h/ln	Design LOS							
p = (, , , , , , , , , , , , , , , , , ,	нvp, 1203 65 б	mi/h	$v_p = (V \text{ or } DE)$	DHV) / (PHF x N x f	_{HV} x f _p)	pc/h				
$S = \frac{1}{2}$	19.5	nn/n	S			mi/h				
$v = v_p / S$	10.0 C	pc/111/111	$D = v_p / S$			pc/mi/ln				
	<u>ر</u>		Required Nu	mber of Lanes, N						
Glossary			Factor Lo	cation						
N - Number of lanes	S - Speed		F - Exhibite	23-8 23-10	f	- Exhibit 23-4				
V - Hourly volume	D - Density			23-8 22-10 22-14	י <u>ר</u> ו <i>ג</i>	- Exhibit 23-5				
v _p - Flow rate	FFS - Free-flow s	peed	f - Page 22	.12	ا ال ۲	- Exhibit 23-6				
LOS - Level of service	BFFS - Base free	-flow speed		v - Exhibite 22.2	23-3 f	- Exhibit 23-7				
DDHV - Directional design ho	ur volume			$v_p \sim r_p \sim r_p$, 20-0 I					

HCS+TM Version 5.21

BASIC FREEWAY SEGMENTS WORKSHEET										
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	B C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, vp FFS, LOS, v FFS, LOS, N FFS, N, AAD FFS, LOS, N FFS, LOS, N	Output LOS, S, D N, S, D v _p , S, D T LOS, S, D ADT N, S, D v _p , S, D				
General Information			Site Inforr	mation						
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (West	bound)				
Agency or Company	RPM Transport	ation	From/To		Bt SR-135	& Mine Lick Creek				
Date Performed	5/22/2009		Jurisdiction		Putnam Co	o				
Analysis Time Period	PM Peak Hour		Analysis Yea	ır	2033 Prop Park	osed w/ Business				
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning							
Oper.(LOS)			es.(N)		🔲 Planr	ning Data				
Flow Inputs										
Volume, V	2235	veh/h	Peak-Hour F	actor, PHF	0.90					
		ven/day		Buses, P _T	22					
Peak-Hr Prop. of AAD1, K			%RVS, P _R Conoral Torr	ain:	U					
DDHV = AADT x K x D		veh/h	Grade %	Length	mi					
Driver type adjustment	1.00			Up/Down %						
Calculate Flow Adjustm	nents									
f _p	1.00		E _R		1.2					
E _T	1.5		f _{HV} = 1/[1+P _T (E	E _T - 1) + P _R (E _R - 1)]	0.901					
Speed Inputs			Calc Spee	d Adj and FFS						
Lane Width	12.0	ft	4		0.0	mi/h				
Rt-Shoulder Lat. Clearance	6.0	ft	LW		0.0	1111/11				
Interchange Density	0.50	l/mi	TLC		0.0	mi/h				
Number of Lanes. N	2		f _{ID}		0.0	mi/h				
FFS (measured)		mi/h	f _N		4.5	mi/h				
Base free-flow Speed BEES	70.0	mi/h	FFS		65.5	mi/h				
LOS and Performance I	Measures		Design (N)						
			Design (N)	/						
Operational (LOS)			Design LOS							
$v_p = (V \text{ or DDHV}) / (PHF x N x)$	(f _{HV} x f _p) <i>13</i> 78	pc/h/ln	$V = (V \text{ or } D\Gamma)$)HV) / (PHF x N x f		nc/h				
S	65.5	mi/h			HV ^ 'p'	pi/h				
$D = v_p / S$	21.0	pc/mi/ln	D = y/g			1111/11 pp://mi//p				
LOS	С		Required Nu	mber of Lanes, N		pc/m/m				
Glossary			Factor Lo	cation						
N - Number of lanes	S - Speed									
V - Hourly volume	D - Density		E _R - Exhibits	23-8, 23-10	. 1	r _{LW} - Exhibit 23-4				
v - Flow rate	FFS - Free-flow s	speed	E _T - Exhibits	23-8, 23-10, 23-11	1	t _{LC} - Exhibit 23-5				
LOS - Level of service	BFFS - Base free	e-flow speed	f _p - Page 23-	12	1	f _N - Exhibit 23-6				
DDHV - Directional design ho	ur volume		LOS, S, FFS	i, v _p - Exhibits 23-2	, 23-3 i	f _{ID} - Exhibit 23-7				

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BASIC FREEWAY SEGMENTS WORKSHEET										
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	B C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, v _p FFS, LOS, v _f FFS, LOS, N FFS, N, AAD FFS, LOS, N	Output LOS, S, D N, S, D V _p , S, D T LOS, S, D ADT N, S, D V _p , S, D				
General Information			Site Inform	mation						
Analyst	ALB	_	Highway/Dire	ection of Travel	I-40 (West	tbound)				
Agency or Company	RPM Transport	ation	From/To		Bt Mine Li	ck Creek Ramps				
Date Performed	5/22/2009		Jurisdiction		Putnam C	0				
Analysis Time Period	PM Peak Hour		Analysis Yea	ır	2033 Prop Park	osed w/ Business				
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning							
Oper.(LOS)			Des.(N)		Planı	ning Data				
Flow Inputs			<u> </u>							
	1840	veh/h	Peak-Hour F	actor, PHF	0.90					
Rook Hr Bron of AADT K		ven/uay		1 Duses, 1 T	22					
Peak-Hr Direction Prop. D			General Terr	ain.	u Level					
$DDHV = AADT \times K \times D$		veh/h	Grade %	Length	mi					
Driver type adjustment	1.00			Up/Down %						
Calculate Flow Adjustn	nents									
f _p	1.00		E _R		1.2					
E _T	1.5		$f_{HV} = 1/[1+P_T(E)]$	_T - 1) + P _R (E _R - 1)]	0.901					
Speed Inputs			Calc Spee	ed Adj and FFS						
Lane Width	12.0	ft	fuw		0.0	mi/h				
Rt-Shoulder Lat. Clearance	6.0	ft	f. a		0.0	mi/h				
Interchange Density	0.50	l/mi	'LC f		0.0	mi/h				
Number of Lanes, N	2		'ID		0.0	1111/11				
FFS (measured)		mi/h	т _N		4.5	mi/n				
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h				
LOS and Performance	Measures		Design (N)						
Operational (LOC)			Design (N)							
	(f) (/ 0 F	··· · //· // ·	Design LOS							
$v_p = (V \text{ or } DDHV) / (PHF X N)$	(T _{HV} X T _p) 1135	pc/n/in	$v_p = (V \text{ or } DE)$	DHV) / (PHF x N x f	HV x f _p)	pc/h				
S (2	65.5	mi/h	S		···· F	mi/h				
$D = v_p / S$	17.3	pc/mi/ln	$D = v_{D} / S$			pc/mi/ln				
LOS	В		Required Nu	mber of Lanes, N		-				
Glossary			Factor Lo	cation						
N - Number of lanes	S - Speed		F _n - Fxhihite	23-8, 23-10		f Exhibit 23-4				
V - Hourly volume	D - Density		F Fxhihite	23-8 23-10 23-11		f Exhibit 23-5				
v _p - Flow rate	FFS - Free-flow s	peed	f - Page 22-	.12		f - Exhibit 23-6				
LOS - Level of service	BFFS - Base free	e-flow speed		·- V - Exhihite 23₋2	23-3	f Exhibit 23-7				
DDHV - Directional design ho	ur volume			$v_{p} = L \times 10003 \times 20^{-2}$, 20-0					

HCS+TM Version 5.21

BASIC FREEWAY SEGMENTS WORKSHEET										
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	B C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (M) Planning (v _p)	Input FFS, N, vp FFS, LOS, vp FFS, LOS, N FFS, N, AADT FFS, LOS, AA FFS, LOS, N	<u>Output</u> LOS, S, D N, S, D v _p , S, D LOS, S, D DT N, S, D v _p , S, D				
General Information			Site Inform	mation						
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Westh	oound)				
Agency or Company	RPM Transport	ation	From/To		Bt SR-56 &	Mine Lick Creek				
Date Performed	Consultants		lurisdiction		Putnam Co					
Analysis Time Period	DM Dook Hour			r	2033 Propo	osed w/ Business				
Preiset Description 00.0400	Pin Peak Hour			u	Park					
Project Description 09-0402	Mine Lick Creek -		ning		Diana	ing Data				
) <u> </u> L	Jes.(IN)		Plann	ing Data				
Volume. V	2644	veh/h	Peak-Hour F	actor, PHF	0.90					
AADT		veh/day	%Trucks and	Buses, P _T	22					
Peak-Hr Prop. of AADT, K			%RVs, P _R	·	0					
Peak-Hr Direction Prop, D			General Terr	ain:	Level					
DDHV = AADT x K x D	4.00	veh/h	Grade %	Length	mi					
Calculate Flow Adjustment	1.00			Up/Down %						
	1.00				1.0					
'p	1.00		⊢R f		1.2					
E _T	1.5		$I_{HV} = 1/[1+P_T(E_T)]$	T - 1) + P _R (E _R - 1)]	0.901					
Speed Inputs			Calc Spee	ed Adj and FFS						
Lane Width	12.0	ft	f _{LW}		0.0	mi/h				
Rt-Shoulder Lat. Clearance	6.0	ft	fic		0.0	mi/h				
Interchange Density	0.50	l/mi	fun		0.0	mi/h				
Number of Lanes, N	2		f.		45	mi/h				
FFS (measured)		mi/h			ч. о					
Base free-flow Speed, BFFS	70.0	mi/h	ггэ		00.0	mi/n				
LOS and Performance	Measures		Design (N)						
Operational (LOS)			<u>Design (N)</u>							
$\frac{Operational(LOO)}{V} = (V \text{ or } DDHV) / (BHE x N)$	(f x f) 1620	nc/h/ln	Design LOS							
$v_p = (v \cup D D D V) / (F D F X N Y)$	(1 _{HV} x 1 _p) 7030	pc/n/m	$v_p = (V \text{ or } DE)$	DHV) / (PHF x N x f	_{HV} x f _p)	pc/h				
5	65.3	mi/n	S		·	mi/h				
$v = v_p / S$	25.0	pc/mi/in	$D = v_p / S$			pc/mi/In				
LUS	С		Required Nu	mber of Lanes, N						
Glossary			Factor Lo	cation						
N - Number of lanes	S - Speed		E E.199	00.0.00.10						
V - Hourly volume	D - Density			23-8, 23-10	f _L					
v _p - Flow rate	FFS - Free-flow s	speed	E _T - Exhibits	23-8, 23-10, 23-11	f	_{-C} - Exhibit 23-5				
LOS - Level of service BFFS - Base free-flow speed										
DDHV - Directional design ho	ur volume		LOS, S, FFS	, v _p - Exhibits 23-2	, 23-3 f _l	_D - Exhibit 23-7				

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BASIC FREEWAY SEGMENTS WORKSHEET										
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	B C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (M) Planning (v _p)	Input FFS, N, vp FFS, LOS, v FFS, LOS, N FFS, N, AAD FFS, LOS, N FFS, LOS, N	Output LOS, S, D N, S, D v _p , S, D T LOS, S, D ADT N, S, D v _p , S, D				
General Information			Site Inforr	mation						
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (West	bound)				
Agency or Company	RPM Transport	ation	From/To		Between S	SR-56 Ramps				
Date Performed	5/22/2009		Jurisdiction		Putnam C	0				
Analysis Time Period	PM Peak Hour		Analysis Yea	ır	2033 Prop Park	osed w/ Business				
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning							
Oper.(LOS)			Des.(N)		🔲 Planr	ning Data				
Flow Inputs										
Volume, V	2344	veh/h	Peak-Hour F	actor, PHF	0.90					
AADT Book Hr Drop of AADT K		ven/day		i buses, r _T	22					
Peak-HI Prop. of AADT, K Peak-Hr Direction Prop. D			General Terr	ain.	U Lovol					
$DDHV = AADT \times K \times D$		veh/h	Grade %	Length	mi					
Driver type adjustment	1.00			Up/Down %						
Calculate Flow Adjustm	nents									
f _p	1.00		E _R		1.2					
E _T	1.5		$f_{HV} = 1/[1+P_T(E)]$	E _T - 1) + P _R (E _R - 1)]	0.901					
Speed Inputs			Calc Spee	d Adj and FFS						
Lane Width	12.0	ft	f		0.0	mi/h				
Rt-Shoulder Lat. Clearance	6.0	ft	f		0.0	mi/h				
Interchange Density	0.50	I/mi	'LC f		0.0	m:/h				
Number of Lanes, N	2		'ID		0.0	mi/n				
FFS (measured)		mi/h	^t N		4.5	mi/h				
Base free-flow Speed, BFFS	70.0	mi/h	FFS		65.5	mi/h				
LOS and Performance I	Measures		Design (N)						
			Design (N)	-						
Operational (LOS)	· · · · · · -		Design LOS							
$v_p = (V \text{ or DDHV}) / (PHF x N x)$	(f _{HV} x f _p) <i>144</i> 5	pc/h/ln	$v_{p} = (V \text{ or } DE)$	DHV) / (PHF x N x f	HV x f	pc/h				
S	65.5	mi/h	S		···· P	mi/h				
$D = v_p / S$	22.1	pc/mi/ln	$D = v_n / S$			pc/mi/ln				
LOS	С		Required Nu	mber of Lanes, N		•				
Glossary			Factor Lo	cation						
N - Number of lanes	S - Speed		F _n - Fxhihite	23-8, 23-10		f Exhibit 23-4				
V - Hourly volume	D - Density		F Fyhihite	23-8 23-10 23-11		f Exhibit 23-5				
v _p - Flow rate	FFS - Free-flow s	speed	f - Page 22-	.12		f - Exhibit 23-6				
LOS - Level of service	BFFS - Base free	e-flow speed		v - Evhihite 22.2	23-3	'N Exhibit 23-7				
DDHV - Directional design ho	ur volume			$v_{p} = L \times 10003 \times 20^{-2}$, 20-0					

HCS+TM Version 5.21

BASIC FREEWAY SEGMENTS WORKSHEET										
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	B C		2400	Application Operational (LOS) Design (N) Design (v _p) Planning (LOS) Planning (N) Planning (v _p)	Input FFS, N, v _p FFS, LOS, v _p FFS, LOS, N FFS, N, AADT FFS, LOS, AAD FFS, LOS, N	Output LOS, S, D N, S, D V _P , S, D LOS, S, D MT N, S, D V _P , S, D				
General Information			Site Infor	mation						
Analyst	ALB		Highway/Dire	ection of Travel	I-40 (Westbo	ound)				
Agency or Company	RPM Transport	ation	From/To		west of SR-	56				
Date Performed	Consultants 5/22/2009		Jurisdiction		Putnam Co					
Analysis Time Period	PM Peak Hour		Analysis Yea	ır	2033 Propos Park	sed w/ Business				
Project Description 09-0402	Mine Lick Creek -	TDOT OC Plan	ning							
Oper.(LOS)			es.(N)		🔲 Plannir	ng Data				
Flow Inputs										
Volume, V	2476	veh/h	Peak-Hour F	actor, PHF	0.90					
		ven/day		Buses, P _T	22					
Peak-Hr Prop. of AAD1, K			%RVS, P _R Conoral Torr	ain:	U					
DDHV = AADT x K x D		veh/h	Grade %	Length	mi					
Driver type adjustment	1.00			Up/Down %						
Calculate Flow Adjustn	nents									
f _p	1.00		E _R		1.2					
E _T	1.5		f _{HV} = 1/[1+P _T (E	E _T - 1) + P _R (E _R - 1)]	0.901					
Speed Inputs			Calc Spee	d Adj and FFS						
Lane Width	12.0	ft	4		0.0	mi/h				
Rt-Shoulder Lat. Clearance	6.0	ft	LW		0.0	1111/11				
Interchange Density	0.50	l/mi	TLC		0.0	mi/h				
Number of Lanes. N	2		f _{ID}		0.0	mi/h				
FFS (measured)		mi/h	f _N		4.5	mi/h				
Base free-flow Speed BEES	70.0	mi/h	FFS		65.5	mi/h				
LOS and Performance	Measures		Design (N)						
			Design (N)	/						
Operational (LOS)			Design LOS							
$v_p = (V \text{ or DDHV}) / (PHF x N x)$	(f _{HV} x f _p) <i>15</i> 27	pc/h/ln	$v = (V \text{ or } D\Gamma)$)HV) / (PHF x N x f	xf)	nc/h				
S	65.5	mi/h	s		нү ү үр/	mi/b				
$D = v_p / S$	23.3	pc/mi/ln	D = v / S			nc/mi/ln				
LOS	С		Required Nu	mber of Lanes, N		po/mi/m				
Glossary			Factor Lo	cation						
N - Number of lanes	S - Speed		E E.L.	22 8 22 40						
V - Hourly volume	D - Density			23-8, 23-1U	fLV					
v _p - Flow rate	FFS - Free-flow s	speed		23-8, 23-10, 23-11	fL	- Exhibit 23-5				
LOS - Level of service	BFFS - Base free	e-flow speed	t _p - Page 23-	12	f _N	- Exhibit 23-6				
DDHV - Directional design ho	ur volume		LOS, S, FFS	o, v _p - Exhibits 23-2	, 23-3 f _{IC}	- Exhibit 23-7				

HCS+TM Version 5.21

FUTURE YEAR 2033 INTERSTATE 40 AT STATE ROUTE 56 (BAXTER ROAD)

	RAMPS AND RAMP JUNCTIONS WORKSHEET									
General Infor	mation			Site Infor	ormation					
Analyst	ALB			Freeway/Dir of Tr	ravel I-40 (Eastbound)					
Agency or Company	RPM	Transportatio	n Consultants	Junction	E	Exit Ramp to SR-56				
Date Performed	5/22/2	2009		Jurisdiction	F	Putnam C	Co			
Analysis Time Period	AM P	Peak Hour		Analysis Year	2	2033 Pro	posed w/	Business Park		
Project Description	09-0402 Mine I	LICK Creek - I	DOT OC Planni	ng						
		Terrain: Leve	의						Deverations	
									Ramp	m Aaj
	f								Yes	On
L _{up} = ft									L _{down} =	ft
up			S _{FF} = 70.0 mpl	h	S _{FR} = 35	5.0 mph				. /
V _u = veh/h	veh/h Sketch (show lanes, L								V _D =	veh/h
Conversion to	o pc/h Und	der Base	Condition	s						
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _H	IV	f _p	v = V/PHF	x f _{HV} x f _p
Freeway	2800	0.90	Level	22	0	0.90	1	1.00	34	53
Ramp	120	0.90	Level	22	0	0.90	1	1.00	14	8
UpStream		ļ								
DownStream	,	Morgo Arooc						ivorgo Aroac		
Estimation of	· V.c	Merge Areas			Fstimati	on of	V	IVELYE ALEAS		
	• 12	(D)			Lounar		• 12	<u>,, ,, ,, ,,</u>) 5	
	$V_{12} = V_{F}$	(P _{FM})					V ₁₂ =	V _R + (V _F - V	R)P _{FD}	
L _{EQ} =	(Equa	ation 25-2 o	r 25-3)		L _{EQ} =		(E	Equation 25-8	8 or 25-9)	
P _{FM} =	using	Equation (Exhibit 25-5)		P _{FD} =		1.(000 using Ec	luation (Exh	ibit 25-12)
V ₁₂ =	pc/h				V ₁₂ =		34	53 pc/h		
V_3 or V_{av34}	pc/h ((Equation 2	5-4 or 25-5)		V_3 or V_{av34}		0	pc/h (Equation	on 25-15 or	25-16)
Is V_3 or $V_{av34} > 2,70$	0 pc/h? 🥅 Yes	s 🔲 No			Is V_3 or V_{av3}	₄ > 2,700) pc/h? 🔽	Yes 🗹 No		
Is V_3 or $V_{av34} > 1.5$ *	V ₁₂ /2 🔲 Yes	s 🔲 No			Is V_3 or V_{av3}	₄ > 1.5 * 1	V ₁₂ /2 🔽	Yes 🔽 No		
If Yes,V _{12a} =	pc/h ((Equation 2	5-8)		If Yes, V _{12a} =		р	c/h (Equation	25-18)	
Capacity Che	cks	1			Capacity	Cheo	cks			
	Actual	(Capacity	LOS F?			Actual	Ca	pacity	LOS F?
					V _F		3453	Exhibit 25-1	4 4800	No
V _{FO}		Exhibit 25-7			$V_{FO} = V_{F}$	- V _R	3305	Exhibit 25-1	4 4800	No
					V _R		148	Exhibit 25-3	3 2000	No
Flow Entering	g Merge In	fluence A	Area	i	Flow En	tering	Merg	e Influenc	e Area	
	Actual	Max	Desirable	Violation?		Ac	tual	Max Desiral	ole	Violation?
V _{R12}		Exhibit 25-7			V ₁₂	345	53	Exhibit 25-14	4400:All	No
Level of Serv	ice Detern	nination ((if not F)		Level of	Servi	ce De	terminatio	n (if not	F)
$D_{R} = 5.475 + 0.475 + 0.4125 + 0.4155 + 0.4155 + 0.4125 + 0.4125 + 0.4125 + 0.4125 + 0.4125 + 0.41$	00734 v _R + (0.0078 V ₁₂	- 0.00627 L _A		D	_R = 4.2	52 + 0.0	0086 V ₁₂ - 0.0	0009 L _D	
D _R = (pc/mi/	ln)				D _R = 31.	0 (pc/m	ni/ln)		_	
LOS = (Exhibi	t 25-4)				LOS = D	 (Exhibit	(25-4)			
Speed Detern	nination				Speed D	eterm	inatio	n		
$M_s = $ (Exibit 25	5-19)				D _s = 0.4	41 (Exh	nibit 25-	19)		
$S_{p} = mph (Exh$, ibit 25-19)				S _R = 57.	6 mph (l	Exhibit 2	25-19)		
S _o = mnh (Fxh	ibit 25-19)				$S_0 = N/A$	A mph (E	Exhibit 2	25-19)		
S = mph (Exh	ibit 25-14)				S = 57.	.6 mph (I	Exhibit 2	25-15)		
LOS = (Exhibit 25-4) LOS = D (Exhibit 25-4) Speed Determination Speed Determination M_S = (Exhibit 25-19) D_s = 0.441 (Exhibit 25-19) S_R = mph (Exhibit 25-19) S_R = 57.6 mph (Exhibit 25-19) S_0 = mph (Exhibit 25-19) S_0 = N/A mph (Exhibit 25-19) $S =$ mph (Exhibit 25-14) $S =$ 57.6 mph (Exhibit 25-15)										

HCS+TM Version 5.21

RAMPS AND RAMP JUNCTIONS WORKSHEET										
General Infor	mation			Site Infor	mation					
Analyst Agency or Company Date Performed Analysis Time Perioc Project Description	ALB RPM 5/22/2 d AM P 09-0402 Mine I	Transportation 2009 'eak Hour Lick Creek - TD	Freeway/Dir of Travel I-40 (Eastbound) portation Consultants Junction Entrance Ramp from SR-56 Jurisdiction Putnam Co pur Analysis Year 2033 Proposed w/ Business Park eek - TDOT OC Planning Freeway/Dir of Travel Freeway/Dir of Travel					k		
Inputs										
Upstream Adj Ramp		Terrain: Leve	l						Downstrea Ramp	am Adj
Yes Or	1								Tes Yes	🗖 On
🗹 No 🔲 Of	f								🗹 No	Cff
L _{up} = ft		s	– 70.0 mn	h	S – 3	5 0 mnh			L _{down} =	ft
V _u = veh/h	I	Sketch (show lanes, L							V _D =	veh/h
Conversion t	o pc/h Und									
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _H	/	f _p	v = V/PHF	⁼ x f _{HV} x f _p
Freeway	2680	0.90	Level	22	0	0.901	/	1.00	3	3305
Ramp	373	0.90	Level	22	0	0.901		1.00		460
UpStream										
DownStream	<u> </u>									
Estimation of	Fv	vierge Areas			Fstimati	ion of		erge Areas		
LSUMATION OF	* 12	(LSumau		• 12			
	$V_{12} = V_F$	(P _{FM})					$V_{12} = V_{F}$	_R + (V _F - V	R)P _{FD}	
L _{EQ} =	(Equa	ation 25-2 or	(25-3))	L _{EQ} =		(E	quation 2	5-8 or 25-9)) 05.40)
P _{FM} =	1.000	using Equat	ion (Exhibit 2	5-5)	P _{FD} =		us	ing Equat	ion (Exhibit	25-12)
$v_{12} =$	3305 p	oc/n			$V_{12} =$		pc	/n //. /=	05 15 05	1/)
$V_3 \cup V_{av34}$	0 pc/r	n (Equation 2	25-4 or 25-5)	$V_3 OI V_{av34}$. 2 700	pc/b2	/n (Equation	25-15 OF 25	-16)
$15 V_3 OI V_{av34} > 2,70$		s 🔟 No			$15 V_3 01 V_{av3}$	4 > 2,700		Yes 🔲 No	0	
$15 V_3 OI V_{av34} > 1.5$	v ₁₂ /2 ■ Yes	s 🔟 No	. 0)		IS V ₃ OF V _{av3}	4 > 1.5	v ₁₂ /2	Yes 🔲 No	0	
$\frac{11}{2} \frac{1}{2} 1$	pc/n (Equation 25	-8)		$11 \text{ Yes}, V_{12a} =$		рс	/n (Equati	on 25-18)	
Capacity Che	CKS			1.00 52	Capacity	<u>y Cnec</u>	CKS		it -	100 52
	Actual		араспу	LUSF?	V		Actual	Evhibit 25		LUSF?
Vro	3765	Exhibit 25-7		No	$V_{FO} = V_{F}$	- V _D		Exhibit 25	-14	
FO						<u> </u>		Exhibit 25	5-3	
Elow Entering	n Merae In	fluence A	roa	,		torina	Morao	Influen	co Area	
	Actual	Max	Desirable	Violation?		Actu	ial	Max Des	irable	Violation?
V _{R12}	3765	Exhibit 25-7	4600:All	No	V ₁₂		Ex	hibit 25-14		
Level of Serv	Level of Service Determination (if not F)					Servi	ce Dete	erminati	on (if no	ot F)
D _R = 5.475 +	0.00734 v _R + 0).0078 V ₁₂ - 0.0	0627 L _A			_R = 4.2	52 + 0.00)86 V ₁₂ - 0	0.0009 L _D	
D _R = 30.3 (pc	:/mi/ln)				D _R = (p	c/mi/ln)				
LOS = D (Exhit	oit 25-4)				LOS = (E	xhibit 2	5-4)			
Speed Determ	nination				Speed D)eterm	ination	1		
M _S = 0.441 (Exi	bit 25-19)				$D_s = (E)$	xhibit 25-	19)			
S _R = 57.7 mph	(Exhibit 25-19)				S _R = mp	oh (Exhibi	t 25-19)			
S ₀ = N/A mph (Exhibit 25-19)				S ₀ = mp	oh (Exhibi	t 25-19)			
S = 57.7 mph	(Exhibit 25-14)				S = mp	oh (Exhibi	t 25-15)			

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	RAMPS AND RAMP JUNCTIONS WORKSHEET									
General Infor	mation			Site Infor	rmation					
Analyst	ALB			Freeway/Dir of Tr	avel I-40 (Westbound)					
Agency or Company	RPM	Transportatio	n Consultants	Junction	E	Exit Ramp to SR-56				
Date Performed	5/22/2	2009		Jurisdiction	F	Putnam C	0			
Analysis Time Period	AM P	eak Hour		Analysis Year	2	2033 Prop	osed w/	Business Park		
Project Description	09-0402 Mine I	Lick Creek - I	DOT OC Planni	ng						
inputs		Torrain: Low								.
Upstream Adj Ramp									Downstrea Ramp	m Adj
	ı f								Yes	On
	I.								MNO	ft Off
up	$S_{FF} = 70.0 \text{ mph}$					5.0 mph			down	
V _u = veh/h	u = veh/h Sketch (show lanes,								V _D =	veh/h
Conversion te	o pc/h Und	der Base	Condition	S		÷	÷			
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _H	V	f _p	v = V/PHF	x f _{HV} x f _p
Freeway	2040	0.90	Level	22	0	0.90	1	1.00	25	16
Ramp	228	0.90	Level	22	0	0.90	1	1.00	28	31
UpStream										
DownStream	<u> </u>							Niverge Areas		
Estimation of	fv	verge Areas			Fstimati	on of	V	nverge Areas		
LSUMATION OF	* 12	(2)			LSumau		* 12			
	$V_{12} = V_{F}$	(P _{FM})					V ₁₂ =	V _R + (V _F - V	_R)P _{FD}	
L _{EQ} =	(Equa	ation 25-2 o	r 25-3)		L _{EQ} =		(1	Equation 25-8	3 or 25-9)	
P _{FM} =	using	Equation (Exhibit 25-5)		P _{FD} =		1.(000 using Ec	uation (Exh	ibit 25-12)
V ₁₂ =	pc/h				V ₁₂ =		25	16 pc/h		
V ₃ or V _{av34}	pc/h (Equation 2	5-4 or 25-5)		V_3 or V_{av34}		0	pc/h (Equation	on 25-15 or	25-16)
Is V_3 or $V_{av34} > 2,70$	0 pc/h? 🥅 Yes	s 🔲 No			Is V_3 or V_{av3}	₄ > 2,700	pc/h? ୮	Yes 🔽 No		
Is V_3 or $V_{av34} > 1.5$	* V ₁₂ /2 🔲 Yes	s 🔲 No			Is V ₃ or V _{av3}	₄ > 1.5 * \	V ₁₂ /2 「	Yes 🗹 No		
If Yes,V _{12a} =	pc/h (Equation 2	5-8)		If Yes, V _{12a} =		р	c/h (Equation	25-18)	
Capacity Che	ecks				Capacity	/ Chec	:ks			
-	Actual	(Capacity	LOS F?			Actual	Ca	pacity	LOS F?
					V _F		2516	Exhibit 25-1	4 4800	No
V _{FO}		Exhibit 25-7			$V_{FO} = V_{F}$	- V _R	2235	Exhibit 25-1	4 4800	No
_					Vp		281	Exhibit 25-3	3 2000	No
Flow Entering	a Merae In	fluence	Area		Flow En	terina	Mera	e Influenc	e Area	
<u></u>	Actual	Max	Desirable	Violation?		Act	ual	Max Desiral	ole	Violation?
V _{R12}		Exhibit 25-7			V ₁₂	251	6	Exhibit 25-14	4400:All	No
Level of Serv	ice Detern	nination ((if not F)		Level of	Servi	ce De	terminatio	n (if not	F)
D _R = 5.475 + 0.	00734 v _R + (0.0078 V ₁₂	- 0.00627 L _A		D	_R = 4.25	52 + 0.0	0086 V ₁₂ - 0.0	0009 L _D	
D _R = (pc/mi/	ln)				$D_{p} = 22$.6 (pc/m	i/ln)	.=	2	
LOS = (Exhibi	it 25-4)				LOS = C	(Exhibit	, 25-4)			
Speed Determination Speed Determ					eterm	inatio	on			
M _s = (Exibit 2	5-19)				D _s = 0.4	53 (Exh	ibit 25-	19)		
$ S_{R} = mph (Exh$	ibit 25-19)				S _R = 57.	.3 mph (E	Exhibit	25-19)		
$S_0 = mnh (Fxh)$	nibit 25-19)				$ S_0 = N/4$	A mph (E	xhibit 2	25-19)		
S = mph (Exh	nibit 25-14)				S = 57.	.3 mph (E	Exhibit	25-15)		
	,					1 (-		'		

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RAMPS AND RAMP JUNCTIONS WORKSHEET										
General Infor	mation			Site Infor	mation					
Analyst Agency or Company Date Performed Analysis Time Perioc Project Description	ALB RPM 5/22/2 I AM P 09-0402 Mine I	Transportation 2009 'eak Hour Lick Creek - TD	rtation Consultants Junction Jurisdiction Putnam Co r Analysis Year 2033 Proposed w/ Business Parl				k			
Inputs										
Upstream Adj Ramp		Terrain: Leve							Downstrea Ramp	am Adj
Yes Or	1								Ves	🗖 On
No Off	f								🗹 No	Cff Off
L _{up} = ft		S	= 70.0 mp	h	S = 3	5 0 mph			L _{down} =	ft
V _u = veh/h	veh/h Sketch (show lanes, L,					oro mpri			V _D =	veh/h
Conversion to	o pc/h Und	der Base (Condition	s						
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{H\}	/	f _p	v = V/PHF	x f _{HV} x f _p
Freeway	1812	0.90	Level	22	0	0.901		1.00	2	235
Ramp	191	0.90	Level	22	0	0.901		1.00		236
UpStream		ļļ			ļ					
DownStream	<u> </u>				<u> </u>			orgo Aroas		
Estimation of	F V co	vierge Areas			Estimat	ion of	V re	eige Aleas		
	• 12	(D)			Louman		• <u>12</u>			
1	$v_{12} = v_F$	(P _{FM})	05.0)				$v_{12} = v_{R}$	(v _F - v		۱
L _{EQ} =	(Equa		20-3)	>	L _{EQ} =		(E	quation 2:	0-8 01 25-8))) 1)
F _{FM} =	1.000	using Equati	ion (Exhibit 23	5-5)	F _{FD} =		us	ing Equal		20-12)
$v_{12} =$	2235 p	DC/N			$v_{12} =$		pc	/N /h (Equation	DE 1E or DE	1/)
$v_3 \cup v_{av34}$	0 pc/r	1 (Equation 2	25-4 Of 25-5)	v_3 or v_{av34}	> 2 700	pc/b2 = x		25-15 01 25	-10)
$15V_3 \text{ or } V_{av34} > 2,70$		S M NO			$13V_3 OIV_{av3}$	34 > 2,700			5	
$15 V_3 OI V_{av34} > 1.5$	v ₁₂ /2 res	5 MINO	0)		$15 V_3 OI V_{av3}$	34 > 1.5	^{12/2}	Yes ⊫ No /b (Equati	$\frac{1}{2}$	
Copposity Cha		Equation 25	-0)		\mathbf{C}_{2}	Choc	pc.	/ii (Equali	011 25-16)	
			anacity		Capacity		Actual		anacity	1.05.52
	Actual		арасну		V		Actual	Evhibit 25		LUST
V _{EO}	2471	Exhibit 25-7		No	$V_{\rm EO} = V_{\rm E}$	- V _P		Exhibit 25	.14	
								Exhibit 25	-3	
Flow Entering	a Merae In	fluence A	rea		Flow En	terina	Merge	Influen	ce Area]
	Actual	Max	Desirable	Violation?		Actu	ial	Max Des	irable	Violation?
V _{R12}	2471	Exhibit 25-7	4600:All	No	V ₁₂		Ex	hibit 25-14		
Level of Serv	ice Detern	nination (i	f not F)		Level of	Servie	ce Dete	erminati	on (if no	t F)
D _R = 5.475 +	0.00734 v _R + 0).0078 V ₁₂ - 0.0	0627 L _A		C	0 _R = 4.25	52 + 0.00)86 V ₁₂ - 0	.0009 L _D	
D _R = 20.4 (pc	/mi/ln)				D _R = (p	c/mi/ln)				
LOS = C (Exhib	oit 25-4)				LOS = (E	xhibit 2	5-4)			
Speed Determ	nination				Speed D	Determ	ination	1		
M _S = 0.320 (Exil	bit 25-19)				D _s = (E	xhibit 25-1	19)			
S _R = 61.0 mph ((Exhibit 25-19)				S _R = m	oh (Exhibi	t 25-19)			
S ₀ = N/A mph (I	Exhibit 25-19)				S ₀ = m	oh (Exhibi	t 25-19)			
S = 61.0 mph ((Exhibit 25-14)				S = m	oh (Exhibi	t 25-15)			

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TWO-WAY STOP CONTROL SUMMARY										
General Information	า		Site I	nform	natio	on				
Analyst	ALB RPM Trai	nsportation	Interse Jurisdi	ection ction			SR-56 & I Putnam C	EB I-40 R Co	amps	
	Consultar	nts	Analys	is Yea	ır		2033 Proj	oosed w/	Business	
Date Performed	5/22/2009	Hour					Park			
Project Description	Alvi Feak	Crook TDOT O	C Blonning							
Fast/West Street: 1-401	-0402 Mille Lick -R Fyit Ramp	Creek - TDOT O	North/S	l South S	Stree	t: .SR-56				
Intersection Orientation:	North-South		Study Period (hrs): 0.25							
Vehicle Volumes ar	d Adjustme	nte	<u> </u>		(
Major Street		Northbound		Southbound						
Movement	1	2	3		4		5		6	
	L	 	R			L	T		R	
Volume (veh/h)		419	51			322	197			
Peak-Hour Factor, PHF	0.90	0.90	0.90			0.90	0.90		0.90	
Hourly Flow Rate, HFR (veh/h)	0	465	56			357	218		0	
Percent Heavy Vehicles	0					22				
Median Type		t,	<u> </u>	Undi	videa	1				
RT Channelized			0						0	
Lanes	0	1	0	0		0	1		0	
Configuration			TR			LT				
Upstream Signal		0					0			
Minor Street		Eastbound					Westbou	nd		
Movement	7	8	9			10	11		12	
	L	Т	R		L		Т		R	
Volume (veh/h)	98		22							
Peak-Hour Factor, PHF	0.90	0.90	0.90			0.90	0.90		0.90	
Hourly Flow Rate, HFR (veh/h)	108	0	24			0	0		0	
Percent Heavy Vehicles	22	0	22			0	0		0	
Percent Grade (%)		0					0			
Flared Approach		Y					N			
Storage		1					0			
RT Channelized			0						0	
Lanes	0	0	0			0	0		0	
Configuration		LR								
Delay, Queue Length, a	nd Level of Se	rvice								
Approach	Northbound	Southbound		Westb	ound		E	astbound	k	
Movement	1	4	7	8		9	10	11	12	
Lane Configuration		LT						LR		
v (veh/h)		357						132		
C (m) (veh/h)		951						100		
v/c		0.38						1.32		
95% queue lenath		1.76					<u>.</u>	9.31		
Control Delay (s/veh)		11.0				<u> </u>]	276.0		
		R						£,0.0		
Approach Dolay (c/ych)								276.0		
Approach LOS								270.0 E		
Approach LOS							1	Γ-		

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TWO-WAY STOP CONTROL SUMMARY										
General Information	า		Site I	nform	atic	on				
Analyst Agency/Co.	ALB RPM Trai Consultar	nsportation nts	Interse Jurisdi	ction ction	-		SR-56 & Putnam (2033 Pro	WB I-4 Co posed	40 Ra w/ B	amps Jusiness
Date Performed	5/22/2009)	Analys	is rea	ſ		Park			
Analysis Time Period	AM Peak	Hour								
Project Description 09	-0402 Mine Lick	Creek - TDOT O	C Planning	1						
East/West Street: 1-40 V	Nestbound Exit	Ramp	North/S	South S	Street	:: SR-56				
Intersection Orientation:	North-South		Study Period (hrs): 0.25							
Vehicle Volumes ar	nd Adjustme	nts								
Major Street		Northbound	1				Southbou	und		
Movement	1	2	3			4	5			6
Valuma (vah/h)		490	R			L	409			R 154
Peak-Hour Factor PHF		460	0.00			0.00	490			104 100
Hourly Flow Rate HFR	0.30	0.30	0.30			0.30	0.30			5.50
(veh/h)	41	533	0			0	553			171
Percent Heavy Vehicles	22					0				
Median Type			1	Undi	/idea		1			
RT Channelized			0						0	
Lanes	0	1	0			0	1		0	
Configuration									TR	
Upstream Signal		0					0			
Minor Street		Eastbound					Westbou	nd		
Movement	7	8				10	11			12
	L	T	R			L	<u> </u>			R
Volume (veh/h)			0.00	0.00		21	0.00			207
Peak-Hour Factor, PHF	0.90	0.90	0.90			0.90	0.90		0.90	
(veh/h)	0	0	0			23	0			230
Percent Heavy Vehicles	0	0	0			22	0			22
Percent Grade (%)		0					0			
Flared Approach		N					Y			
Storage		0		[1			
RT Channelized			0	Í						0
Lanes	0	0	0			0	0			0
Configuration							LR			
Delay, Queue Length, a	nd Level of Se	rvice								
Approach	Northbound	Southbound		Westbo	ound			Eastbo	und	
Movement	1	4	7	8		9	10	11	1	12
Lane Configuration	LT			LR						
v (veh/h)	41			253	3			ĺ		
C (m) (veh/h)	794			494	1					
v/c	0.05			0.5	1			1		
95% queue length	0.16			2.88	8			1		
Control Delay (s/veh)	9.8			19.	7					
LOS	A			С						
Approach Delav (s/veh)				19.	7		-	J		·]
Approach LOS				С	C					

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-	TWO-WAY TWO-LANE	HIGHWAY	SEGME	NT WORKSHEET						
General Information		Site I	nformation							
Analyst Agency or Company Date Performed Analysis Time Period	ALB RPM Transportation Consultar 5/22/2009 AM Peak Hour	nts From/ Jurisc Analy	ay To iction sis Year	SR-56 north of WB I-40 R Putnam Co 2033 Proposed w/	amps Business Park					
Project Description: 09-0402 Mir	ne Lick Creek - TDOT OC Planning									
	Shoulder width Lane width Lane width Shoulder width		W North Arrow	Class I highway Class I Terrain CLevel R Two-way hourly volume 133 Directional split 51/ Peak-hour factor, PHF 0.9 No-passing zone 45 % Trucks and Buses , P _T 3 %	I highway olling 9 veh/h 49 0					
Segment	length, L _t mi	4		% Recreational vehicles, P _R 4% Access points/ <i>mi</i> 4						
Average Travel Speed		I								
Grade adjustment factor, f _G (Exhi	bit 20-7)			1.00						
Passenger-car equivalents for true	cks, E _T (Exhibit 20-9)			1.1						
Passenger-car equivalents for RV	′s, E _R (Exhibit 20-9)			1.0						
Heavy-vehicle adjustment factor,	f _{HV} =1/ (1+ P _T (E _T -1)+P _R (E _R -1))			0.997						
Two-way flow rate ¹ , v _p (pc/h)=V/ ((PHF * f _G * f _{HV})			1492						
v _p * highest directional split propo	rtion ² (pc/h)		761							
Free-Flow Sp	eed from Field Measurement			Estimated Free-Flow Speed						
Field Measured speed, S _{FM} Observed volume, V _f Free-flow speed, FFS FFS=S _{EM} +	mi/ veh +0.00776(V _f / f _{HV}) mi/	/h Base h/h Adj. fo Adj. fo	Base free-flow speed, BFFS FM55.0 mi/hAdj. for lane width and shoulder width3, fLS (Exhibit 20-5)2.6 mi/hAdj. for access points, fA (Exhibit 20-6)1.0 mi/h							
	://) (Fubibit 20.44)	Free-	low speed, FF	(FSS=BFFS-t _{LS} -t _A)	51.4 mi/n					
Average travel speed ATS (m/h)	ATS-FES-0.00776y_f			38.9						
Percent Time-Spent-Following	, , , , , , , , , , , , , , , , , , ,									
Grade Adjustment factor, f _G (Exhi	bit 20-8)			1.00						
Passenger-car equivalents for true	cks, E _T (Exhibit 20-10)			1.0						
Passenger-car equivalents for RV	′s, E _R (Exhibit 20-10)			1.0						
Heavy-vehicle adjustment factor,	f _{HV} =1/ (1+ P _T (E _T -1)+P _R (E _R -1))			1.000						
Two-way flow rate ¹ , v_p (pc/h)=V/ ((PHF * f _G * f _{HV})			1488						
v_p^{*} highest directional split propo	rtion ² (pc/h)			759						
Base percent time-spent-following	у, BPTSF(%)=100(1-е ^{-0.000879v} p)			73.0						
Adj. for directional distribution and	l no-passing zone, f _{d/hp} (%)(Exh. 20-12	2)		5.4						
Percent time-spent-following, PTS	SF(%)=BPTSF+f _{d/np}			78.4						
Level of Service and Other Perf	formance Measures	1		0						
Volume to capacity ratio. v/c=V / 3	3,200			0.47						
Peak 15-min veh-miles of travel, \	/MT ₁₅ (veh- <i>mi</i>)= 0.25L.(V/PHF)			372						
Peak-hour vehicle-miles of travel,	VMT ₆₀ (veh- <i>mi</i>)=V*L ₊			1339						
Peak 15-min total travel time, TT₁	₅ (veh-h)= VMT ₁₅ /ATS			9.6						
Notes 1. If Vp >= 3,200 pc/h, terminate a 2. If highest directional split Vp>=	analysis-the LOS is F. 1,700 pc/h, terminated anlysis-the LO	J DS is F.								

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TWO-WAY TWO-LANE HIGHWAY SEGMENT WORKSHEET									
General Information	Site Information								
Analyst ALB Agency or Company RPM Transportation Consultants Date Performed 5/22/2009 Analysis Time Period AM Peak Hour	Highway SR-56 From/To Between I-40 Ramps Jurisdiction Putnam Co Analysis Year 2033 Proposed w/ Business Park								
Project Description: 09-0402 Mine Lick Creek - TDOT OC Planning									
Input Data									
Segment length, L _t mi	Image: Class I highway Image: Class I highway Terrain Image: Class I highway Terrain Image: Class I highway Two-way hourly volume 1036 veh/h Directional split 50 / 50 Peak-hour factor, PHF 0.90 No-passing zone 100 % Recreational vehicles, P _R 4% Access points/ mi 0								
Average Travel Speed									
Grade adjustment factor, f _G (Exhibit 20-7)	1.00								
Passenger-car equivalents for trucks, E _T (Exhibit 20-9)	1.2								
Passenger-car equivalents for RVs, E _R (Exhibit 20-9)	1.0								
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.994								
Two-way flow rate ¹ , v_p (pc/h)=V/ (PHF * $f_G * f_{HV}$)	1158								
v _p * highest directional split proportion ² (pc/h)	579								
Free-Flow Speed from Field Measurement	Estimated Free-Flow Speed								
Field Measured speed, S _{FM} mi/h Observed volume, V _f veh/h	Base free-flow speed, BFFS _{FM} 45.0 mi/h Adj. for lane width and shoulder width ³ , f _{LS} (Exhibit 20-5) 0.4 mi/h Adi. for access points, f ₁ (Exhibit 20-6) 0.0 mi/h								
Free-flow speed, FFS FFS=S _{FM} +0.00776(V _f / f_{HV}) mi/h	Free-flow speed, FFS (FSS=BFFS-f _A) 44.6 mi/h								
Adj. for no-passing zones, f _{np} (<i>mi/h</i>) (Exhibit 20-11)	2.2								
Average travel speed, ATS (<i>mi/h</i>) ATS=FFS-0.00776v _p -f _{np}	33.4								
Percent Time-Spent-Following	1								
Grade Adjustment factor, f _G (Exhibit 20-8)	1.00								
Passenger-car equivalents for trucks, E _T (Exhibit 20-10)	1.1								
Passenger-car equivalents for RVs, E _R (Exhibit 20-10)	1.0								
Heavy-vehicle adjustment factor, f _{HV} =1/ (1+ P _T (E _T -1)+P _R (E _R -1))	0.997								
Two-way flow rate ¹ , v _p (pc/h)=V/ (PHF * f _G * f _{HV})	1155								
v _p * highest directional split proportion ² (pc/h)	578								
Base percent time-spent-following, BPTSF(%)=100(1-e ^{-0.000879v} p)	63.8								
Adj. for directional distribution and no-passing zone, f _{d/hp} (%)(Exh. 20-12)	11.0								
Percent time-spent-following, PTSF(%)=BPTSF+f d/np	74.7								
Level of Service and Other Performance Measures	D								
Volume to capacity ratio, $v/c=V_p/3,200$	0.36								
Peak 15-min veh-miles of travel, VMT ₁₅ (veh- <i>mi</i>)= 0.25L _t (V/PHF)	29								
Peak-hour vehicle-miles of travel, VMT ₆₀ (veh- <i>mi</i>)=V*L _t	104								
Peak 15-min total travel time, TT ₁₅ (veh-h)= VMT ₁₅ /ATS	0.9								
Notes	,								
1. If $Vp \ge 3,200$ pc/h, terminate analysis-the LOS is F. 2. If highest directional split $Vp \ge 1,700$ pc/h, terminated anlysis-the LOS is F.									
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	TWO-WAY TWO-LANE	HIGHWAY SEGN	MENT WORKSHEET							
General Information		Site Information	n							
Analyst Agency or Company Date Performed Analysis Time Period	ALB RPM Transportation Consultar 5/22/2009 AM Peak Hour	hts Highway From/To Jurisdiction Analysis Year	SR-56 South of I-40 EB F Putnam Co 2033 Proposed w/	2amps Business Park						
Project Description: 09-0402 M	line Lick Creek - TDOT OC Planning									
	Shoulder width Lane width Lane width Shoulder width at length, L _t mi	The show North Arro	Class I highway Class Terrain Clevel R Two-way hourly volume 689 Directional split 68 / Peak-hour factor, PHF 0.9 No-passing zone 10 % Trucks and Buses , P _T 3% % Recreational vehicles, P _R 4%	I highway olling veh/h 32 0 0 6						
			Access points/ mi 8							
Average Travel Speed										
Grade adjustment factor, f _G (Ext	nibit 20-7)		1.00							
Passenger-car equivalents for tr	ucks, E _T (Exhibit 20-9)		1.2							
Passenger-car equivalents for R	Vs, E _R (Exhibit 20-9)		1.0							
Heavy-vehicle adjustment factor	$f_{HV} = 1/(1 + P_T(E_T - 1) + P_R(E_R - 1))$		0.994							
Two-way flow rate ¹ , v _p (pc/h)=V/	/ (PHF * f _G * f _{HV})		770							
v _p * highest directional split prop	ortion ² (pc/h)		524							
Free-Flow S	peed from Field Measurement		Estimated Free-Flow Speed							
Field Measured speed, S_{FM} Observed volume, V_f Free-flow speed, FFS FFS= S_{FM}	mi/ veh. ₁ +0.00776(V _f / f _{HV}) mi/	h Base free-flow s h Adj. for lane wid h Adj. for access p	Base free-flow speed, BFFS FM45.0 mi/hAdj. for lane width and shoulder width3, f_{LS} (Exhibit 20-5)1.7 mi/hAdj. for access points, f_A (Exhibit 20-6)2.0 mi/h							
		Free-flow speed	I, FFS (FSS=BFFS-f _{LS} -f _A)	41.3 mi/n						
Adj. for no-passing zones, f _{np} (7	m/n) (Exhibit 20-11)		3.1							
Percent Time-Spent-Following	n) ATS=FFS-0.00776v _p -i _{np}		JZ.Z							
Grade Adjustment factor, f _G (Exl	hibit 20-8)		1.00							
Passenger-car equivalents for tr	ucks, E _T (Exhibit 20-10)		1.1							
Passenger-car equivalents for R	Vs, E _R (Exhibit 20-10)		1.0							
Heavy-vehicle adjustment factor	, f _{HV} =1/ (1+ P _T (E _T -1)+P _R (E _R -1))		0.997							
Two-way flow rate ¹ , v _n (pc/h)=V/	/ (PHF * f _G * f _{HV})		768							
v _p * highest directional split prop	portion ² (pc/h)		522							
Base percent time-spent-followir	ng, BPTSF(%)=100(1-e ^{-0.000879v} p)		49.1							
Adj. for directional distribution ar	nd no-passing zone, f _{d/hp} (%)(Exh. 20-12)	15.6							
Percent time-spent-following, PT	rSF(%)=BPTSF+f d/np		64.7							
Level of Service and Other Pe	rformance Measures									
Level of service, LOS (Exhibit 20	0-3 for Class I or 20-4 for Class II)		С							
Volume to capacity ratio, v/c=V _p	/ 3,200		0.24							
Peak 15-min veh-miles of travel,	VMT ₁₅ (veh- <i>mi</i>)= 0.25L _t (V/PHF)		115							
Peak-hour vehicle-miles of trave	I, VMT ₆₀ (veh- <i>mi</i>)=V*L _t		413							
Peak 15-min total travel time, TT	T ₁₅ (veh-h)= VMT ₁₅ /ATS		3.6							
Notes 1. If Vp >= 3,200 pc/h, terminate 2. If highest directional split Vp>:	analysis-the LOS is F. = 1,700 pc/h, terminated anlysis-the LOS	S is F.								

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		RAMP	S AND RA	MP JUNCTI	ONS WO	RKS	HEET				
General Infor	mation			Site Infor	ormation						
Analyst Agency or Company Date Performed Analysis Time Period	ALB RPM 5/22/2 d PM P	Transportatior 2009 Peak Hour	n Consultants	Freeway/Dir of Tr Junction Jurisdiction Analysis Year	avel I E F 2	-40 (Ea Exit Ra Putnam 2033 P	astbound) mp to SR-5 n Co roposed w/	6 Business Park			
Project Description	09-0402 Mine I	Lick Creek - TI	DOT OC Plann	ing							
Inputs		[_	.1								
Upstream Adj Ramp		Terrain: Leve	51						Downstrea Ramp	m Adj	
Yes Or	1								Yes	On On	
	ſ								Mo	Off	
$L_{up} = \Pi$		5	$S_{rr} = 70.0 \text{mm}$	h	S _{ED} = 3	5.0 mp	h		down	it.	
V _u = veh/h	l		Sketo	ch (show lanes, L _A ,	L_{D}, V_{R}, V_{f}	F			V _D =	veh/h	
Conversion t	o pc/h Und	der Base	Condition	s	1	-1	1				
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f _{HV}	f _p	v = V/PHF	x f _{HV} x f _p	
Freeway	2521	0.90	Level	22	0	0.	901	1.00	31	09	
Ramp	265	0.90	Level	22	0	0.	901	1.00	32	27	
UpStream		ļ									
DownStream	<u> </u>	Morgo Aroac						ivorgo Aroac			
Fstimation of v					Estimati	on o	of V ₄₀	iverge Areas			
	12 V - V	(D)					<u> </u>				
1 _	V ₁₂ - V _F	$(\Gamma_{\rm FM})$	r 0F 0)				v ₁₂ =				
	(⊏qua		1 20-3)		L _{EQ} =		(6	Equation 25-8	5 01 25-9)	1.1.05 10)	
P _{FM} =	using	Equation (EXNIDIL 25-5)		P _{FD} =		1.1	JUU USING EQ	uation (Exh	IDIT 25-12)	
$v_{12} = 0$	pc/n				$V_{12} =$		31	09 pc/h	05.45	05.40	
V_3 OF V_{av34}	pc/n ((Equation 2:	5-4 or 25-5)		V_3 OF V_{av34}		0 00 no/h2 =	pc/h (Equatio	on 25-15 or	25-16)	
$15 V_3 OI V_{av34} > 2,70$		s 🔲 No			Is V or V $\rightarrow 15^{*}$ V /2 V vs V vs						
IS V_3 or $V_{av34} > 1.5$	V ₁₂ /2 Yes	s No			Is V_3 or $V_{av34} > 1.5 V_{12}/2$ Ves V No						
If Yes,V _{12a} =	pc/h ((Equation 2	5-8)		If Yes,V _{12a} = pc/h (Equation 25-18)						
Capacity Che	ecks	1			Capacity		ecks				
	Actual		apacity	LUS F?			Actual		pacity	LOS F?	
					V _F	<u>, , (</u>	3109	Exhibit 25-14	4 4800	NO	
V _{FO}		Exhibit 25-7			$V_{FO} = V_{F}$	- v _R	2782	Exhibit 25-1	4 4800	No	
		<u> </u>			V _R		327	Exhibit 25-3	2000	No	
Flow Entering	g Merge In	fluence A	Area	1	Flow En	terin	g Merg	e Influence	e Area	1	
	Actual	Max Exhibit 25 7	Desirable	Violation?		/	Actual	Max Desirab		Violation?	
	iaa Datarn	Pinotion ((if not E)			Sor 1		EXHIBIT 20-14	4400.All		
$\frac{Level 01 Selv}{D = 5.475 \pm 0}$			0.006271				252 ± 0.0				
$D_{\rm R} = 5.475 \pm 0.1$	00734 V _R + 1	0.0078 v ₁₂	- 0.00027 L _A			R = 4	.232 + 0.0	12 - 0.0	1009 L _D		
$\nu_{\rm R} = ({\rm pc/m})/{\rm in}$					$U_{\rm R} = 28.$.∪ (pc, (Evbil	/mi/in) ait 25-4)				
Speed Determination					Sneed D		minatio	n			
$M_{\rm r} = (\text{Evibit 25-19})$					$D_{\rm s} = 0.457$ (Exhibit 25-19)						
$S_{-} = mnh (Fvh)$	nihit 25-19)				$S_{p} = 57$.2 mph	(Exhibit	, 25-19)			
S_= mnh (Evh	$\frac{1}{10}$ $\frac{1}{10}$				$S_0 = N/A$	A mph	(Exhibit 2	25-19)			
S = mph (Exh	nibit 25-14)				S = 57	.2 mph	(Exhibit	25-15)			
	,				<u></u>		(,			

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	RA	MPS AND	RAMP JU	INCTIONS W	ORKSHE	ET					
General Infor	mation			Site Infor	mation						
Analyst Agency or Company Date Performed Analysis Time Perioc Project Description	ALB RPM 5/22/2 9 PM P 09-0402 Mine I	Transportation 2009 'eak Hour Lick Creek - TD	Consultants	Freeway/Dir of Tra Junction Jurisdiction Analysis Year	avel I I I	-40 (Eas Entrance Putnam (2033 Pro	tbound) Ramp froi Co posed w/ I	m SR-56 Business Par	Park		
Inputs											
Upstream Adj Ramp		Terrain: Leve	l						Downstre Ramp	am Adj	
Yes Or	1								Ves	🗖 On	
No Of	f								🗹 No	Cff Off	
L _{up} = ft			– 70.0 mn	h	S – 3	5 0 mnh			L _{down} =	ft	
V _u = veh/h	I		Sketch (show lanes, L_A , L_D , V_R , V_f)					V _D =	veh/h		
Conversion t	o pc/h Und	der Base (Condition	S					1		
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _H	v	f _p	v = V/PHF	⁼ x f _{HV} x f _p	
Freeway	2256	0.90	Level	22	0 0.901 1.00		2	2782			
Ramp	182	0.90	Level	22	0	0.90	1	1.00		224	
UpStream											
DownStream											
Merge Areas					Fstimati	on of		verge Areas	i		
Estimation of V ₁₂					LSumau		• 12				
$V_{12} = V_F (P_{FM})$							V ₁₂ = V	′ _R + (V _F - V	[′] R)P _{FD}		
L _{EQ} =	(Equa	ation 25-2 or	25-3)	,	L _{EQ} =		(E	=quation 2	5-8 or 25-9)) 05 40)	
P _{FM} =	1.000	using Equat	ion (Exhibit 2	5-5)	P _{FD} =		u	sing Equat	ion (Exhibit	25-12)	
V ₁₂ =	2/82 p	oc/h			$V_{12} =$		p	c/h	05 45 05		
V_3 or V_{av34}	0 pc/h	(Equation 2	25-4 or 25-5)	V_3 or V_{av34}	2 700	р р	c/h (Equation	1 25-15 or 25	-16)	
$15 V_3 OI V_{av34} > 2,70$		s M No			Is V or V $> 15^{*}$ V /2 V vo No						
$15 V_3 OI V_{av34} > 1.5$	v ₁₂ /2 ■ Yes	s 🔟 No	. 0)		IS V_3 or $V_{av34} > 1.5 \text{ V}_{12}/2$ Yes No						
$\frac{11}{2} \frac{1}{2} 1$	pc/n (Equation 25	-8)		If Yes, V _{12a} = pc/h (Equation 25-18)						
Capacity Che	CKS			1.00.52	Capacity Checks						
	Actual		араспу	LUSF?	V		Actual	Evhibit 25		LUSF?	
Vro	3006	Exhibit 25-7		No	$V_{FO} = V_{F}$	- V _D		Exhibit 25	-14		
10					V _R	<u> </u>		Exhibit 25	5-3		
Flow Entering	a Merae In	fluence A	rea		Flow En	terino	Merae	e Influen	ce Area		
	Actual	Max	Desirable	Violation?		Act	ual	Max Des	irable	Violation?	
V _{R12}	3006	Exhibit 25-7	4600:All	No	V ₁₂		E	xhibit 25-14			
Level of Serv	ice Detern	nination (i	if not F)		Level of	Servi	ce Det	erminati	on (if no	ot F)	
D _R = 5.475 +	0.00734 v _R + 0	0.0078 V ₁₂ - 0.0	0627 L _A			_R = 4.2	52 + 0.0	086 V ₁₂ - 0	0.0009 L _D		
D _R = 24.5 (pc/mi/ln)				D _R = (p	c/mi/ln)						
LOS = C (Exhibit 25-4)					LOS = (E	xhibit 2	5-4)				
Speed Determination					Speed D)etern	ninatio	n			
M _S = 0.352 (Exi	bit 25-19)				$D_s = (E)$	xhibit 25-	19)				
S _R = 60.2 mph (Exhibit 25-19)					S _R = mp	oh (Exhib	it 25-19)				
S ₀ = N/A mph (Exhibit 25-19)				S ₀ = mp	oh (Exhib	it 25-19)				
S = 60.2 mph	(Exhibit 25-14)				S = mp	oh (Exhib	it 25-15)				

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RAMPS AND RAMP JUNCTIONS WORKSHEET							
General Information Site Information	ormation						
Analyst ALB Freeway/Dir of Travel I-40 (Westbound)							
Agency or Company RPM Transportation Consultants Junction Exit Ramp to SR-56							
Date Performed 5/22/2009 Jurisdiction Putnam Co							
Analysis Time Period PM Peak Hour Analysis Year 2033 Proposed w/ Busi	ness Park						
Project Description 09-0402 Mine Lick Creek - IDOT OC Planning							
Upstream Adj Ramp	Downstream Adj Ramp						
	Yes On						
	L _{down} = ft						
$S_{FF} = 70.0 \text{ mph}$ $S_{FR} = 35.0 \text{ mph}$							
$V_u = veh/h$ Sketch (show lanes, $L_{A'} L_{D'} V_{R'} V_f$)	V _D = veh/h						
Conversion to pc/h Under Base Conditions							
(pc/h) V PHF Terrain %Truck %Rv f _{HV}	f_p v = V/PHF x f_{HV} x f_p						
Freeway 2644 0.90 Level 22 0 0.901 22	1.00 3261						
Ramp 300 0.90 Level 22 0 0.901	1.00 370						
UpStream							
DownStream Diverge							
Estimation of V	je Aleas						
$V_{12} = V_{\rm F} (P_{\rm FM})$	+ (V _F - V _R)P _{FD}						
$L_{EQ} =$ (Equation 25-2 or 25-3) $L_{EQ} =$ (Equation 25-2 or 25-3)	ation 25-8 or 25-9)						
$P_{FM} =$ using Equation (Exhibit 25-5) $P_{FD} =$ 1.000	using Equation (Exhibit 25-12)						
$V_{12} = pc/h$ $V_{12} = 3261 pc/h$	c/h						
$V_3 \text{ or } V_{av34}$ pc/h (Equation 25-4 or 25-5) $V_3 \text{ or } V_{av34}$ 0 pc/h	า (Equation 25-15 or 25-16)						
$ Is V_3 \text{ or } V_{av34} > 2,700 \text{ pc/h}? Yes No \qquad Is V_3 \text{ or } V_{av34} > 2,700 \text{ pc/h}? Ye$	Is V_3 or $V_{av34} > 2,700$ pc/h? Yes V No						
$ Is V_3 \text{ or } V_{av34} > 1.5 * V_{12}/2 \text{[Is } V_{3} \text{ or } V_{av34} > 1.5 * V_{12}/2 $	Is V_3 or $V_{av34} > 1.5 * V_{12}/2$ [Yes No						
If Yes, V_{12a} = pc/h (Equation 25-8) If Yes, V_{12a} = pc/h (If Yes, V _{12a} = pc/h (Equation 25-18)						
Capacity Checks Capacity Checks							
Actual Capacity LOS F? Actual	Capacity LOS F?						
V _F 3261 E	xhibit 25-14 4800 No						
V_{FO} Exhibit 25-7 $V_{FO} = V_F - V_R$ 2891 E	xhibit 25-14 4800 No						
V _R 370 F	Exhibit 25-3 2000 No						
Flow Entering Merge Influence Area Flow Entering Merge Ir	fluence Area						
Actual Max Desirable Violation? Actual M	Nax Desirable Violation?						
V _{R12} Exhibit 25-7 V ₁₂ 3261 Exhi	ibit 25-14 4400:All No						
Level of Service Determination (if not F) Level of Service Determination	nination (if not F)						
$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$ $D_R = 4.252 + 0.0086$	ծ V ₁₂ - 0.0009 L _D						
$D_{\rm R}$ = (pc/mi/ln) $D_{\rm R}$ = 29.0 (pc/mi/ln)							
LOS = (Exhibit 25-4) LOS = D (Exhibit 25-4)							
Speed Determination Speed Determination							
$M_{s} =$ (Exibit 25-19) $D_{s} = 0.461$ (Exhibit 25-19)	D _s = 0.461 (Exhibit 25-19)						
$ S_{p^{=}} $ mph (Exhibit 25-19) $ S_{R^{=}} $ 57.1 mph (Exhibit 25-1	S _R = 57.1 mph (Exhibit 25-19)						
$S_{-} = N/A mph (Exhibit 25.10)$	S_R^- 57.1 mpr (Exhibit 25-19) S_n^- N/A mph (Exhibit 25-19)						
13_0^{-1} Input (Exhibit 25-19)	9)						

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RAMPS AND RAMP JUNCTIONS WORKSHEET											
General Infor	mation			Site Infor	mation						
Analyst Agency or Company Date Performed Analysis Time Perioc Project Description	ALB RPM 5/22/2 1 PM P 09-0402 Mine I	Transportation 2009 Jeak Hour Lick Creek - TD	Consultants	Freeway/Dir of Tra Junction Jurisdiction Analysis Year	avel	I-40 (Westl Entrance F Putnam Co 2033 Prop	bound) Ramp from o osed w/ Bu	SR-56 siness Parl	Park		
Inputs											
Upstream Adj Ramp		Terrain: Leve	l						Downstrea Ramp	am Adj	
Yes On	1								Ves	🗖 On	
🗹 No 🕅 Off	f								Mo No	Cff Off	
L _{up} = ft			– 70.0 mp	h	<u> </u>	5 0 mnh			L _{down} =	ft	
V _u = veh/h			$V_{\rm D} = \frac{V_{\rm ER} - Solution}{Sketch (show lanes, L_{\rm A'}, L_{\rm D}, V_{\rm R}, V_{\rm f})}$					V _D =	veh/h		
Conversion to	o pc/h Und	der Base (Condition	S							
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{HV}		f _p	v = V/PHF	^F x f _{HV} x f _p	
Freeway	2344	0.90	Level	22	0	0.901		1.00	2		
Ramp	132	0.90	Level	22	0	0.901		1.00		163	
UpStream					[
DownStream	<u> </u>							•			
Fstimation of v					Estimati	ion of s	Dive	rge Areas			
Estimation of V ₁₂					LSumau		12				
$V_{12} = V_F (P_{FM})$						·	$V_{12} = V_{R}$	+ (V _F - V	_R)P _{FD}		
L _{EQ} =	(Equa	ation 25-2 or	25-3))	L _{EQ} =		(Eq	uation 25	-8 or 25-9)	
P _{FM} =	1.000	using Equati	ion (Exhibit 28	5-5)	P _{FD} =		USI	ng Equati	on (Exhidit	25-12)	
$v_{12} =$	2891 p	oc/n			$V_{12} =$		pc/l	n /=	05 15 05	1/)	
V_3 OI V_{av34}	0 pc/r	n (Equation 2	25-4 or 25-5))	V_3 OF V_{av34}	. 2 700	pc/r		25-15 OF 25	-16)	
$15 V_3 01 V_{av34} > 2,70$		s 🕅 No			$15 V_3 01 V_{av34} > 2,700 pc/11? Yes No$						
$15 V_3 01 V_{av34} > 1.5$	v ₁₂ /2 Yes	s 🔟 No	0)		Is V_3 or $V_{av34} > 1.5 V_{12}/2$ Yes No						
$11 \text{ Yes}, v_{12a} =$	pc/n (Equation 25	-8)		If $Yes, V_{12a} = pc/h$ (Equation 25-18)						
Capacity Che	CKS			1.00 52	Capacity Checks						
	Actual		apacity	LUSF?	V		Actual	Evhibit 25		LUSF?	
V	3054	Exhibit 25-7		No	$V_{} = V_{}$	- V_		Exhibit 25-	14		
*F0	3031				$V_{\rm PO} = V_{\rm P}$	<u> </u>		Exhibit 25	-3		
Flow Entering	a Merae In	fluence A	rea		Flow En	terina	Merge	Influen	ce Area]	
	Actual	Max	Desirable	Violation?		Actua	al	Max Desi	rable	Violation?	
V _{R12}	3054	Exhibit 25-7	4600:All	No	V ₁₂		Exh	ibit 25-14			
Level of Serv	ice Detern	nination (i	if not F)		Level of	Servic	e Dete	rminati	on (if no	ot F)	
D _R = 5.475 +	0.00734 v _R + 0).0078 V ₁₂ - 0.0	0627 L _A			0 _R = 4.25	2 + 0.008	36 V ₁₂ - 0	.0009 L _D		
$D_{\rm R} = 25.0 ({\rm pc/mi/ln})$				D _R = (p	c/mi/ln)						
LOS = C (Exhibit 25-4)				LOS = (E	xhibit 25	5-4)					
Speed Determination					Speed D	Determi	ination				
M _S = 0.356 (Exi	bit 25-19)				D _s = (E	xhibit 25-1	9)				
S _R = 60.0 mph (Exhibit 25-19)					S _R = mph (Exhibit 25-19)						
S ₀ = N/A mph (Exhibit 25-19)				S ₀ = m	ph (Exhibit	25-19)				
S = 60.0 mph ((Exhibit 25-14)				S = m	ph (Exhibit	25-15)				

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	TW	O-WAY STOP	CONTR	OL S	UMN	MARY					
General Information	า		Site I	nform	natio	on					
Analyst	ALB		Interse	ection			SR-56 & I	EB I-40 R	amps		
Agency/Co.	RPM Trai	nsportation	Jurisdi	ction			Putnam C	ю			
	Consultar	nts	Analys	sis Yea	r		2033 Proj	bosed w/ l	Business		
Date Performed	5/22/2009 DM Dook	Hour	,				Park				
		noui									
Project Description 09	-0402 Mine Lick	Creek - IDOI O	<u>C Planning</u>) Couth (Ctroo						
Intersection Orientation	North-South		Study Period (hrs): 0.25								
	d A divetre e	101 o									
Venicle Volumes an	<u>ia Adjustine</u>	Northbound					Southbou	nd			
Movement	1		3		4				6		
Wovernent		<u>Z</u>	R				<u> </u>		R		
Volume (veh/h)		169	27			155	192				
Peak-Hour Factor, PHF	0.90	0.90	0.90)		0.90	0.90		0.90		
Hourly Flow Rate, HFR	0	187	30			172	213		0		
(veh/h)		107	50			172	210				
Percent Heavy Vehicles	0				<u> </u>	22					
Median Type		1	1 -	Undi	videc	1	1				
RT Channelized			0	0					0		
Lanes	0	1	0			0	1		0		
Configuration			TR			LT					
Upstream Signal		0					0				
Minor Street		Eastbound					Westbou	nd	10		
Movement		8	9			10	11		12		
			R (0			L	I		<u> </u>		
Volume (ven/n)	217	0.00	48			0.00	0.00		0.00		
	0.90	0.90	0.90	,		0.90	0.90		0.90		
(veh/h)	241	0	53			0	0		0		
Percent Heavy Vehicles	22	0	22			0	0		0		
Percent Grade (%)		0					0				
Flared Approach		Y	1				N				
Storage		1					0				
RT Channelized			0						0		
Lanes	0	0	0			0	0		0		
Configuration		LR				-					
Delay, Queue Length, a	nd Level of Se	rvice	•		,						
Approach	Northbound	Southbound		Westb	ound		E	Eastbound			
Movement	1	4	7	8		9	10	11	12		
Lane Configuration	-	IT						IR			
v (veh/h)		172						204			
		12/2						234			
		0.14						342			
		0.14					0.86				
95% queue length		0.48						7.92			
Control Delay (s/veh)		8.4		ļ				55.1	_ <u>_</u>		
LOS		A						F			
Approach Delay (s/veh)								55.1			
Approach LOS								F			

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TWO-WAY STOP CONTROL SUMMARY										
General Information	า		Site I	nform	atic	on				
Analyst Agency/Co.	ALB RPM Trai Consultar	nsportation	Interse Jurisdi	ection ction			SR-56 & Putnam (WB I-4 Co	40 Ra	mps
Date Performed	5/22/2009)	Analys	sis Year	•		2033 Pro Park	posea	W/B	usiness
Analysis Time Period	PM Peak	, Hour					<i>i</i> un			
Project Description 09	-0402 Mine Lick	Creek - TDOT O	C Planning	y						
East/West Street: 1-40 I	Nestbound Exit	Ramp	North/S	, South S	tree	t: SR-56				
Intersection Orientation:	North-South		Study I	Period ((hrs)	: 0.25				
Vehicle Volumes ar	nd Adiustme	nts								
Major Street	1	Northbound					Southbou	und		
Movement	1	2	3			4	5			6
	L	ТТ	R			L	Т			R
Volume (veh/h)	23	363					306			109
Peak-Hour Factor, PHF	0.90	0.90	0.90)		0.90	0.90		(0.90
Hourly Flow Rate, HFR (veh/h)	25	403	0			0	340			121
Percent Heavy Vehicles	22					0				
Median Type				Undiv	ridea	1	1			
RT Channelized			0							0
Lanes	0	1	0			0	1		0	
Configuration	LT									TR
Upstream Signal		0					0			
Minor Street		Eastbound					Westbou	nd		
Movement	7	7 8				10	11			12
	L	T	R			L	<u> </u>		R ACC	
Volume (veh/h)						41				259
Peak-Hour Factor, PHF	0.90	0.90	0.90)		0.90	0.90		0.90	
(veh/h)	0	0	0			45	0		2	287
Percent Heavy Vehicles	0	0	0			22	0			22
Percent Grade (%)		0					0			
Flared Approach		N					Y			
Storage		0					1			
RT Channelized			0	[0
Lanes	0	0	0			0	0			0
Configuration							LR			
Delay, Queue Length, a	nd Level of Se	rvice								
Approach	Northbound	Southbound		Westbo	ound			Eastbo	ound	
Movement	1	4	7	8		9	10	1	1	12
Lane Configuration	LT			LR						
v (veh/h)	25			332						
C (m) (veh/h)	1003			616	;		<u> </u>			
v/c	0.02			0.54	1					
95% quouo longth	0.02			2 2 2 2	, ,					
Control Dolou (chich)	0.00			3.22			<u> </u>			
Control Delay (S/Ven)	ö./			17.5)					
	A			<u> </u>						
Approach Delay (s/veh)				17.5)					
Approach LOS				С			1			

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Appendix Page 293
	TWO-WAY TWO-LANE	HIGHWAY SEGME	NT WORKSHEET	
General Information		Site Information		
Analyst Agency or Company Date Performed Analysis Time Period	ALB RPM Transportation Consultant 5/22/2009 PM Peak Hour	ts Highway From/To Jurisdiction Analysis Year	SR-56 north of WB I-40 Rar Putnam Co 2033 Proposed w/ Bi	mps usiness Park
Project Description: 09-0402 M	line Lick Creek - TDOT OC Planning			
	Shoulder width Lane width Lane width Shoulder width		Class I highway Class II f Terrain Level Roll Two-way hourly volume 1037 Directional split 60 / 40 Peak-hour factor, PHF 0.90 No-passing zone 45	nighway ing veh/h 2
• Segmer	nt length, L _t mi	Show North Arrow	% Recreational vehicles, P _R 4% Access points/ <i>mi</i> 4	
Average Travel Speed				
Grade adjustment factor, f _G (Ext	nibit 20-7)		1.00	
Passenger-car equivalents for tr	ucks, E _T (Exhibit 20-9)		1.2	
Passenger-car equivalents for R	Vs, E _R (Exhibit 20-9)		1.0	
Heavy-vehicle adjustment factor	, f _{HV} =1/ (1+ P _T (E _T -1)+P _R (E _R -1))		0.994	
Two-way flow rate ¹ , v _p (pc/h)=V	/ (PHF * f _G * f _{HV})		1159	
v _p * highest directional split prop	ortion ² (pc/h)		695	
Free-Flow S	peed from Field Measurement		Estimated Free-Flow Speed	
Field Measured speed, S _{FM} Observed volume, V _f Free-flow speed, FFS FFS=S _{FN}	mi/h veh/i ₁ +0.00776(V _f / f _{HV}) mi/h	Base free-flow spee Adj. for lane width a Adj. for access point	d, BFFS _{FM} nd shoulder width ³ , f _{LS} (Exhibit 20-5) ts, f _A (Exhibit 20-6)	55.0 mi/h 2.6 mi/h 1.0 mi/h
Adi for no possing topos f ()	mi/h) (Eyhihit 20,11)	Free-flow speed, FF	(FSS=BFFS-r _{LS} -r _A)	51.4 mi/n
Average travel speed ATS (mi	(LXIII) (LXIIII) (LXIIII) (LXIIII) (LXIIII) (LXIIII) (LXIIII) (LXIIII) (LXIIIII) (LXIIII) (LXIIIII) (LXIIII) (LXIIII) (LXIIII) (LXIIII) (LXIIIII) (LXIIIII) (LXIIII) (LXIIII) (LXIIII) (LXIIII) (LXIIIII) (LXIIIII) (LXIIII) (LXIIII) (LXIIII) (LXIIIII) (LXIIIII) (LXIIIII) (LXIIIII) (LXIIIIII) (LXIIIII) (LXIIIII) (LXIIIII) (LXIIIII) (LXIIIII) (LXIIIII) (LXIIIIIII) (LXIIIII) (LXIIIII) (LXIIIIIII) (LXIIIIII) (LXIIIII) (LXIIIIIIIII) (LXIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII		41.0	
Percent Time-Spent-Following				
Grade Adjustment factor, f _G (Ex	hibit 20-8)		1.00	
Passenger-car equivalents for tr	ucks, E _T (Exhibit 20-10)		1.1	
Passenger-car equivalents for R	Vs, E _R (Exhibit 20-10)		1.0	
Heavy-vehicle adjustment factor	, f _{HV} =1/ (1+ P _T (E _T -1)+P _R (E _R -1))		0.997	
Two-way flow rate ¹ , v _p (pc/h)=V	/ (PHF * f _G * f _{HV})		1156	
v _p * highest directional split prop	ortion ² (pc/h)		694	
Base percent time-spent-followir	ng, BPTSF(%)=100(1-e ^{-0.000879v} p)		63.8	
Adj. for directional distribution ar	nd no-passing zone, f _{d/hp} (%)(Exh. 20-12)		7.9	
Percent time-spent-following, PT	TSF(%)=BPTSF+f _{d/np}		71.7	
Level of Service and Other Pe	rformance Measures			
Level of service, LOS (Exhibit 20	U-3 TOT Class I or 20-4 for Class II)		U 0.36	
Peak 15-min yeb miles of trevel			288	
Poak hour vohiolo milos of travel	$15 (Verr ///) = 0.25 L_t (V/PHF)$		1007	
Pool 15 min total travel time 77	$_{60}(vert-m) = v L_t$		7.0	
Peak 15-min total travel time, TT	15(ven-n)= VMI ₁₅ /AIS		7.0	
1. If Vp >= 3,200 pc/h, terminate 2. If highest directional split Vp>	analysis-the LOS is F. = 1,700 pc/h, terminated anlysis-the LOS	is F.		

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	TWO-WAY TWO-LANE	HIGHWAY SEGME	NT WORKSHEET	
General Information		Site Information		
Analyst Agency or Company Date Performed Analysis Time Period	ALB RPM Transportation Consultant 5/22/2009 PM Peak Hour	ts From/To Jurisdiction Analysis Year	SR-56 Between I-40 Ramps Putnam Co 2033 Proposed w/ Bi	s usiness Park
Project Description: 09-0402 M	line Lick Creek - TDOT OC Planning			
	Shoulder width Lane width Lane width Shoulder width		Class I highway Class II H Terrain Class II H Two-way hourly volume 733 vd Directional split 53 / 4 Peak-hour factor, PHF 0.90 No-passing zone 100	nighway ing eh/h 7
• Segmen	nt length, L _t mi	Show North Arrow	% Trucks and Buses , PT3 %% Recreational vehicles, PR4%Access points/ mi0	
Average Travel Speed				
Grade adjustment factor, f _G (Ext	hibit 20-7)		1.00	
Passenger-car equivalents for tr	ucks, E _T (Exhibit 20-9)		1.2	
Passenger-car equivalents for R	Vs, E _R (Exhibit 20-9)		1.0	
Heavy-vehicle adjustment factor	r, f _{HV} =1/ (1+ P _T (E _T -1)+P _R (E _R -1))		0.994	
Two-way flow rate ¹ , v _p (pc/h)=V	/ (PHF * f _G * f _{HV})		819	
v _p * highest directional split prop	portion ² (pc/h)		434	
Free-Flow S	peed from Field Measurement		Estimated Free-Flow Speed	
Field Measured speed, S _{FM} Observed volume, V _f Free-flow speed, FFS FFS=S _{E№}	mi/h veh/l ،+0.00776(V _e / f_ر_,) mi/h	Base free-flow speed Adj. for lane width ar Adj. for access points	d, BFFS _{FM} nd shoulder width ³ , f _{LS} (Exhibit 20-5) s, f _A (Exhibit 20-6)	45.0 mi/h 0.4 mi/h 0.0 mi/h
	n · i iiv ·	Free-flow speed, FFS	S (FSS=BFFS-f _{LS} -f _A)	44.6 mi/h
Adj. for no-passing zones, f _{np} (r	<i>mi/h</i>) (Exhibit 20-11)		3.0	
Average travel speed, ATS (mi/	/h) ATS=FFS-0.00776v _p -f _{np}		35.3	
Grade Adjustment factor f- (Ex)	hibit 20-8)		1.00	
Passenger-car equivalents for tr	ucks E_{\pm} (Exhibit 20-10)		1.1	
Passenger-car equivalents for R	Vs. E _p (Exhibit 20-10)		1.0	
Heavy-vehicle adjustment factor	: f _{1ν/=} =1/ (1+ P _T (E _T -1)+P _D (E _D -1))		0.997	
Two-way flow rate ¹ , v _p (pc/h)=V	/ (PHF * f _c * f _{uv})		817	
v _n * highest directional split prop	portion ² (pc/h)		433	
Base percent time-spent-followir	ng, BPTSF(%)=100(1-e ^{-0.000879v} p)		51.2	
Adj. for directional distribution ar	nd no-passing zone, f _{d/hp} (%)(Exh. 20-12)		14.9	
Percent time-spent-following, PT	rsF(%)=BPTSF+f _{d/np}		66.1	
Level of Service and Other Pe	rformance Measures			
Volume to capacity ratio y/a-V	U-3 TOT Class I or 20-4 for Class II)		U 0.26	
Peak 15-min veh miles of trevel	//MT (yeb- mi)- 0.25! ()//PUE)		20	
Poak hour vohiola milao of traves	$\frac{15}{15} (ven - nn) = 0.25 L_t (v/PHF)$		72	
	$_{60}(vert-777) = v L_t$		0.6	
Peak 15-min total travel time, TT	1 ₁₅ (ven-n)= VM1 ₁₅ /ATS		U.b	
1. If Vp >= 3,200 pc/h, terminate 2. If highest directional split Vp>	e analysis-the LOS is F. = 1,700 pc/h, terminated anlysis-the LOS	i is F.		

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	TWO-WAY TWO-LANE	HIGHWAY SEGME	NT WORKSHEET	
General Information		Site Information		
Analyst Agency or Company Date Performed Analysis Time Period	ALB RPM Transportation Consultant 5/22/2009 PM Peak Hour	Highway s From/To Jurisdiction Analysis Year	SR-56 South of I-40 EB Ra Putnam Co 2033 Proposed w/ E	mps Business Park
Project Description: 09-0402 M	Nine Lick Creek - TDOT OC Planning			
Input Data			🔽 Class I highway 🔽 Class II	highway
•	Shoulder width Lane width Lane width Shoulder width nt length, L _t mi	t t t t Show North Arrow	Terrain ✓ Level Ro Two-way hourly volume 436 v Directional split 55 / 4 Peak-hour factor, PHF 0.90 No-passing zone 100 % Trucks and Buses , P _T 3 % % Recreational vehicles, P _R 4% Access points/ mi 8	ling eh/h 5
Average Travel Speed				
Grade adjustment factor, f _G (Ex	hibit 20-7)		1.00	
Passenger-car equivalents for the	rucks, E _T (Exhibit 20-9)		1.7	
Passenger-car equivalents for F	RVs, E _R (Exhibit 20-9)		1.0	
Heavy-vehicle adjustment facto	r, f _{HV} =1/ (1+ P _T (E _T -1)+P _R (E _R -1))		0.979	
Two-way flow rate ¹ , v _p (pc/h)=V	// (PHF * f _G * f _{HV})		495	
v _n * highest directional split prop	portion ² (pc/h)		272	
Free-Flow S	Speed from Field Measurement		Estimated Free-Flow Speed	
Field Measured speed, S_{FM} Observed volume, V_{f}	mi/h veh/ł	Base free-flow speed Adj. for lane width ar Adj. for access point	d, BFFS _{FM} nd shoulder width ³ , f _{LS} (Exhibit 20-5) s, f ₄ (Exhibit 20-6)	45.0 mi/h 1.7 mi/h 2.0 mi/h
Free-flow speed, FFS FFS=S _{FI}	_M +0.00776(V _f / f _{HV}) mi/h	Free-flow speed, FF	S (FSS=BFFS-f _{LS} -f _A)	41.3 mi/h
Adj. for no-passing zones, f _{np} (<i>mi/h</i>) (Exhibit 20-11)		4.2	
Average travel speed, ATS (mi	///) ATS=FFS-0.00776v _p -f _{np}		33.2	
Percent Time-Spent-Following	g			
Grade Adjustment factor, f _G (Ex	(hibit 20-8)		1.00	
Passenger-car equivalents for the	rucks, E _T (Exhibit 20-10)		1.1	
Passenger-car equivalents for F	RVs, E _R (Exhibit 20-10)		1.0	
Heavy-vehicle adjustment facto	r, f _{HV} =1/ (1+ P _T (E _T -1)+P _R (E _R -1))		0.997	
Two-way flow rate ¹ , v _p (pc/h)=V	// (PHF * f _G * f _{HV})		486	
v_p^* highest directional split prop	portion ² (pc/h)		267	
Base percent time-spent-followi	ng, BPTSF(%)=100(1-e ^{-0.000879v} p)		34.8	
Adj. for directional distribution a	nd no-passing zone, f _{d/hp} (%)(Exh. 20-12)		22.3	
Percent time-spent-following, P	TSF(%)=BPTSF+f _{d/np}		57.0	
Level of Service and Other Pe	erformance Measures		<u> </u>	
Volume to capacity ratio v/c-V	/ 3.200		0.15	
Peak 15-min veh-miles of travel	. VMT. (veh- mi)= 0.251 (V/PHF)		73	
Peak-hour vehicle-miles of trave	$\frac{1}{15} (100 m) = 0.20 t(0.00 m)$		262	
Peak 15-min total travel time. T	T(veh-h)= VMT/ATS		202	
Notes	15\v61-11/- v1v115/ATS		<i>L.L</i>	
1. If Vp >= 3,200 pc/h, terminate 2. If highest directional split Vp>	e analysis-the LOS is F. ⊳= 1,700 pc/h, terminated anlysis-the LOS	is F.		

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FUTURE YEAR 2033 INTERSTATE 40 AT MINE LICK CREEK ROAD

RAMPS AND RAMP JUNCTION	IS WORKSHEET				
General Information Site Informa	ation				
Analyst ALB Freeway/Dir of Travel	I-40 (Eastbound)				
Agency or Company RPM Transportation Consultants Junction	Exit Ramp to SR-56				
Date Performed 5/22/2009 Jurisdiction	Putnam Co				
Analysis Time Period AM Peak Hour Analysis Year	2033 Proposed w/ Business Park				
Project Description 09-0402 Mine Lick Creek - IDOT OC Planning					
Inputs	- · · ·				
Upstream Adj Ramp	Downstream Adj Ramp				
	Yes On				
	No Off L _{doup} = ft				
$S_{FF} = 70.0 \text{ mph}$	$S_{\text{ER}} = 35.0 \text{ mph}$				
$V_u = $ veh/h Sketch (show lanes, $L_{A'}, L_{D'}$)	$V_{\rm D} = {\rm veh/h}$				
Conversion to pc/h Under Base Conditions					
(pc/h) V PHF Terrain %Truck	% Rv f_{HV} f_p $v = V/PHF x f_{HV} x f_p$				
Freeway 3053 0.90 Level 22	0 0.901 1.00 3765				
Ramp 914 0.90 Level 22	0 0.901 1.00 1127				
UpStream					
DownStream					
Estimation of v	stimation of v				
$V_{12} = V_F (P_{FM})$	$V_{12} = V_R + (V_F - V_R)P_{FD}$				
$L_{EQ} =$ (Equation 25-2 or 25-3)	2 ⁼ (Equation 25-8 or 25-9)				
$P_{FM} =$ using Equation (Exhibit 25-5) P_{FI}	$_{\rm D}$ = 1.000 using Equation (Exhibit 25-12)				
$V_{12} = pc/h$ V_{12}	₂ = 3765 pc/h				
$V_3 \text{ or } V_{av34}$ pc/h (Equation 25-4 or 25-5) V_3	or V _{av34} 0 pc/h (Equation 25-15 or 25-16)				
Is V_3 or $V_{av34} > 2,700$ pc/h? Yes No Is	$V_{3} \text{ or } V_{av34} > 2,700 \text{ pc/h}? \square \text{ Yes } \square \text{ No}$				
Is V_3 or $V_{av34} > 1.5 * V_{12}/2$ Fyes No Is	$V_3 \text{ or } V_{av34} > 1.5 * V_{12}/2 $ [Yes No				
If Yes,V _{12a} = pc/h (Equation 25-8)	res,V _{12a} = pc/h (Equation 25-18)				
Capacity Checks C	apacity Checks				
Actual Capacity LOS F?	Actual Capacity LOS F?				
	V _F 3765 Exhibit 25-14 4800 No				
V _{FO} Exhibit 25-7	$V_{FO} = V_F - V_R$ 2638 Exhibit 25-14 4800 No				
	V _R 1127 Exhibit 25-3 2000 No				
Flow Entering Merge Influence Area	low Entering Merge Influence Area				
Actual Max Desirable Violation?	Actual Max Desirable Violation?				
V _{R12} Exhibit 25-7	V ₁₂ 3765 Exhibit 25-14 4400:All No				
Level of Service Determination (if not F)	evel of Service Determination (if not F)				
$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$	D _R = 4.252 + 0.0086 V ₁₂ - 0.0009 L _D				
D _R = (pc/mi/ln) D _R	= 33.7 (pc/mi/ln)				
LOS = (Exhibit 25-4) LO	IS = D (Exhibit 25-4)				
Speed Determination St	peed Determination				
$M_s =$ (Exibit 25-19) D_s	D _s = 0.529 (Exhibit 25-19)				
$ S_{p}=$ mph (Exhibit 25-19) $ S_{R} $	S _R = 55.2 mph (Exhibit 25-19)				
S = mph (Eyhibit 25-10)					
	N/A mph (Exhibit 25-19)				

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	RA	MPS AND	RAMP JU	INCTIONS W	ORKSHE	ET				
General Infor	mation			Site Infor	mation					
Analyst Agency or Company Date Performed Analysis Time Period Project Description	ALB RPM 5/22/2 A AM P	Transportation 2009 Jeak Hour	Consultants	Freeway/Dir of Tra Junction Jurisdiction Analysis Year	avel I	-40 (Eas Entrance Putnam (2033 Pro	tbound) Ramp fro Co posed w/	om Mine Lick Business Par	k	
Inputs	07 0402 1011101			ng						
Upstream Adj Ramp		Terrain: Leve	I						Downstre Ramp	am Adj
Yes Or	ı								Tes 1	🗖 On
No Of	f								🗹 No	C Off
L _{up} = ft		S	= 70.0 mp	h	S = 3	5 0 mph			L _{down} =	ft
V _u = veh/h	I		Sketc	h (show lanes, L _A ,	$U_{\rm FR} = 0$ $L_{\rm D'}V_{\rm R'}V_{\rm f}$	0.0 mpri			V _D =	veh/h
Conversion to	o pc/h Und	der Base (Condition	s						
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _F	IV	f _p	v = V/PHF	^F x f _{HV} x f _p
Freeway	2139	0.90	Level	22	0	0.90	1	1.00		2638
Ramp	346	0.90	Level	22	0	0.90	1	1.00		427
UpStream		ļļ								
DownStream	<u> </u>	Morgo Aroas					<u> </u>	ivorgo Aroas		
Estimation of	f Van	Nerge Areas			Estimati	ion of	Van	Iverge Areas	,	
	$\frac{12}{12}$	(P)					$\frac{12}{12}$	$(\pm () / =)$	()P	
	V ₁₂ - V _F	(1_{FM})	25-3)				v ₁₂ – ($R^{-}(V_{F}^{-})$	R ^{JF} FD 5-8 or 25-0	n)
$E_{EQ} =$	(∟qua 1.000	ucina Equat	20-0)	5 5)	EQ -		(Equation 2.	ion (Evhibit	7 25 12)
FM -	1.000 2620 r	using Equal		5-5)	'FD -			ising ∟quat vc/b		ZJ-1Z)
V or V	2030 p	, (Equation (05 1 or 25 5	N N	$V_{12} =$		۲	oc/h (Equation	25 15 or 25	16)
$V_3 = V_{av34}$	0 pc/i 0 nc/h? 🗖 Vor		20-4 01 20-0)	Is V or V	> 2 70	۲ 🗖 nc/h2 ר		o	-10)
$15V_{3} \text{ or } V_{av34} > 2,70$					Is V or V	4 × 2,70	V /2		0	
If Yes V =	nc/h (Equation 25	(-8)		If Yes V =	4 - 1.5	*12'~	c/b (Equati	on 25-18)	
Canacity Che	point		, 0)			/ Cho	rks		011 20 10)	
	Actual		anacity	1.0S.F2			Actual		anacity	10S F2
	/ lotual	Ĩ	apaony		V_		notadi	Exhibit 25	-14	
V _{FO}	3065	Exhibit 25-7		No	$V_{FO} = V_F$	- V _R		Exhibit 25	-14	
					V _R			Exhibit 25	5-3	
Flow Entering	g Merge In	fluence A	rea		Flow En	tering	Merg	e Influen	ce Area	
	Actual	Max	Desirable	Violation?		Ac	tual	Max Des	irable	Violation?
V _{R12}	3065	Exhibit 25-7	4600:All	No	V ₁₂		E	Exhibit 25-14		
Level of Serv	ice Detern	nination (i	if not F)		Level of	Serv	ice De	terminati	on (if no	ot F)
D _R = 5.475 +	0.00734 v _R + 0).0078 V ₁₂ - 0.0	0627 L _A		C	0 _R = 4.2	252 + 0.0	0086 V ₁₂ - 0	0.0009 L _D	
D _R = 24.9 (pc	:/mi/ln)				D _R = (p	c/mi/ln))			
LOS = C (Exhib	oit 25-4)				LOS = (E	xhibit 2	25-4)			
Speed Determ	nination				Speed D)etern	ninatio	n		
M _S = 0.356 (Exi	bit 25-19)				$D_s = (E)$	xhibit 25	-19)			
S _R = 60.0 mph	(Exhibit 25-19)				S _R = m	oh (Exhik	oit 25-19)			
S ₀ = N/A mph (Exhibit 25-19)				S ₀ = mph (Exhibit 25-19)					
S = 60.0 mph		S = mph (Exhibit 25-15)								

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		RAMP	S AND RA	MP JUNCTI	ONS WOF	RKSHEE	Т			
General Infor	mation			Site Infor	mation					
Analyst	ALB			Freeway/Dir of Tr	avel I-	40 (Westbou	ind)			
Agency or Company	RPM	Transportatio	n Consultants	Junction	E	xit Ramp to	Mine Lick Creek			
Date Performed	5/22/2	2009		Jurisdiction	P	Putnam Co				
Analysis Time Period	AM P	Peak Hour		Analysis Year	2	033 Propose	ed w/ Business Park	(
Project Description	09-0402 Mine I	Lick Creek - I	DOT OC Plannii	ng						
Inputs		Torrain: Low							.	
Upstream Adj Ramp								Downstrea Ramp	m Adj	
	ı f							Yes	On	
	1							MNO	ft Off	
Lup I			$S_{EE} = 70.0 \text{ mpl}$	h	$S_{EP} = 35$	5.0 mph		down		
V _u = veh/h	I		Sketc	h (show lanes, L _A ,	L _D ,V _R ,V _f)	I		V _D =	veh/h	
Conversion to	o pc/h Und	der Base	Condition	s	1	4				
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{HV}	f _p	v = V/PHF	x f _{HV} x f _p	
Freeway	2949	0.90	Level	22	0	0.901	1.00	36	37	
Ramp	1138	0.90	Level	22	0	0.901	1.00	14	04	
UpStream										
DownStream	<u> </u>	Morgo Arooc								
Estimation of	fv	werge Areas			Fstimati	on of v	Diverge Areas			
	• 12	(D)			Louman		2	<u></u>		
	$V_{12} = V_{F}$	(P _{FM})				V	$_{12} = V_{R} + (V_{F} - V_{R})$	/ _R)P _{FD}		
L _{EQ} =	(Equa	ation 25-2 o	r 25-3)		L _{EQ} =		(Equation 25-	-8 or 25-9)		
P _{FM} =	using	Equation (Exhibit 25-5)		P _{FD} =		1.000 using E	quation (Exh	ibit 25-12)	
V ₁₂ =	pc/h				V ₁₂ =		3637 pc/h			
V ₃ or V _{av34}	pc/h ((Equation 2	5-4 or 25-5)		V_3 or V_{av34}		0 pc/h (Equat	ion 25-15 or	25-16)	
Is V_3 or $V_{av34} > 2,70$	0 pc/h? 🥅 Yes	s 🥅 No			Is V_3 or V_{av34}	₄ > 2,700 pc/l	h? 🔲 Yes 🗹 No)		
Is V_3 or $V_{av34} > 1.5$	* V ₁₂ /2 🔲 Yes	s 🔲 No			Is V ₃ or V _{av34}	₄ > 1.5 * V ₁₂ /2	2 🔲 Yes 🗹 No)		
If Yes,V _{12a} =	pc/h ((Equation 2	5-8)		If Yes, V _{12a} =		pc/h (Equatio	n 25-18)		
Capacity Che	ecks				Capacity	Checks	;			
	Actual	(Capacity	LOS F?		Ac	tual C	apacity	LOS F?	
					V _F	363	37 Exhibit 25-	14 4800	No	
V _{FO}		Exhibit 25-7			$V_{FO} = V_{F}$ -	- V _R 223	33 Exhibit 25-	14 4800	No	
					Vp	14(04 Exhibit 25	-3 2000	No	
Flow Entering	a Merae In	fluence A	Area	J	Flow Ent	terina M	erae Influenc	ce Area		
	Actual	Max	Desirable	Violation?		Actual	Max Desira	able	Violation?	
V _{R12}		Exhibit 25-7			V ₁₂	3637	Exhibit 25-14	4400:All	No	
Level of Serv	ice Detern	nination ((if not F)		Level of	Service	Determinatio	on (if not	F)	
D _R = 5.475 + 0.	00734 v _R + 0	0.0078 V ₁₂	- 0.00627 L _A		D	_R = 4.252 -	+ 0.0086 V ₁₂ - 0	.0009 L _D		
D _R = (pc/mi/	ln)				D _R = 32.	2 (pc/mi/ln)			
LOS = (Exhibi	it 25-4)				LOS = D (Exhibit 25	-4)			
Speed Determ	nination				Speed D	etermina	ation			
M _S = (Exibit 25-19)					D _s = 0.554 (Exhibit 25-19)					
S _R = mph (Exh	ibit 25-19)				S _R = 54.	5 mph (Exh	ibit 25-19)			
$S_0 = mph (Exh$	ibit 25-19)				S ₀ = N/A mph (Exhibit 25-19)					
$S_0 = mph (Exhibit 25-19)$ S = mph (Exhibit 25-14)					S = 54.5 mph (Exhibit 25-15)					

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	RA	MPS AND	RAMP JU	INCTIONS W	ORKSHE	ET				
General Infor	mation			Site Infor	mation					
Analyst Agency or Company Date Performed Analysis Time Perioc Project Description	ALB RPM 5/22/2 d AM P 09-0402 Mine I	Transportation 2009 leak Hour lick Creek - TC	Consultants	Freeway/Dir of Tra Junction Jurisdiction Analysis Year	avel I I	-40 (Wes Entrance Putnam (2033 Pro	tbound) Ramp fror Co posed w/ E	n Mine Lick Business Par	k	
Inputs										
Upstream Adj Ramp		Terrain: Leve	l						Downstrea Ramp	am Adj
Yes Or	1								Tes Yes	🗖 On
No Of	f								🗹 No	Cff Off
L _{up} = ft		s	= 70.0 mp	h	S = 3	5 0 mph			L _{down} =	ft
V _u = veh/h	I		Sketo	h (show lanes, L _A ,	L _D ,V _R ,V _f)	oro mpri			V _D =	veh/h
Conversion to	o pc/h Und	der Base (Condition	s			4			
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _H	v	f _p	v = V/PHF	^F x f _{HV} x f _p
Freeway	1811	0.90	Level	22	0	0.90	1	1.00	2	234
Ramp	229	0.90	Level	22	0	0.90	1	1.00		282
UpStream		ļļ								
DownStream	<u> </u>	Morgo Aroas						urgo Aroas		
Estimation of	f Vaa	Nerge Areas			Estimati	ion of	Van	renge Areas		
	1 2	(P)					$\frac{12}{12}$	+ ()/ -)/	' \P	
	V ₁₂ - V _F	(1_{FM})	25-3)				v ₁₂ – v	$R = (V_F = V$	R ^{/F} FD	n)
$E_{EQ} =$	(∟qua 1.000	ucina Equat	20-0)	5 5)	- _{EQ} - Р -		(L	ing Equat	ion (Evhibit	7 75 12)
FM -	1.000 2224 r	using Equal		5-5)	'FD -		ua no	sing ∟quat s/b		ZJ-1Z)
V or V	2234 k	(Equation (05 1 or 25 5	N N	V or V		pt pt	/h (Equation	25 15 or 25	16)
$V_3 = V_{av34}$	0 pc/i 0 nc/h? 🗖 Vor		23-4 01 23-3)	Is V or V	> 2 700	nc/h? 🥅		2J-1J 01 2J	-10)
$15V_3 \text{ or } V_{av34} > 2,70$					Is V. or V	4 × 2,700	V/2		5	
If Yes V =	nc/h (Equation 25	(-8)		If Yes V =	4 - 1.0	*12' ²	/h (Fauati	on 25-18)	
Canacity Che	point		, 0)		Canacity	v Cho	rke pr		01120 10)	
	Actual	L C	anacity	1.05.F2			Actual	C	apacity	1.0S F?
	/ lotual	Ĩ	apaony		Vr		riotual	Exhibit 25	-14	
V _{FO}	2516	Exhibit 25-7		No	$V_{FO} = V_F$	- V _R		Exhibit 25	-14	
					V _R			Exhibit 25	5-3	
Flow Entering	g Merge In	fluence A	rea		Flow En	tering	Merge	Influen	ce Area	
	Actual	Max	Desirable	Violation?		Act	Jal	Max Des	irable	Violation?
V _{R12}	2516	Exhibit 25-7	4600:All	No	V ₁₂		E	xhibit 25-14		
Level of Serv	ice Detern	nination (i	if not F)		Level of	Servi	ce Det	erminati	on (if no	ot F)
D _R = 5.475 +	0.00734 v _R + 0).0078 V ₁₂ - 0.0	0627 L _A			0 _R = 4.2	52 + 0.0	086 V ₁₂ - 0	0.0009 L _D	
D _R = 20.7 (pc	:/mi/ln)				D _R = (p	c/mi/ln)				
LOS = C (Exhit	oit 25-4)				LOS = (E	xhibit 2	5-4)			
Speed Determ	nination				Speed D)etern	inatior	า		
M _S = 0.322 (Exi	bit 25-19)				D _s = (E	xhibit 25-	19)			
S _R = 61.0 mph	(Exhibit 25-19)				S _R = mp	oh (Exhib	it 25-19)			
S ₀ = N/A mph (Exhibit 25-19)				S ₀ = mp	oh (Exhib	it 25-19)			
S = 61.0 mph (Exhibit 25-14)					S = mph (Exhibit 25-15)					

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	HCS+ [™] DET								D R	EF	PORT	-								
General Info	rmation					-			Site	Inf	ormat	tior	า							
									Inter	sec	ction		Mine	Lick &	a I-40) E	B ram	nps		
Analyst	ALB								Area	Ту	/pe		All ot	her ar	eas			-		
Agency or Co	. RPM Trans	oortat	ion						Juris	dic	tion		Putna	am Co	,					
Date Perform	ed 5/26/2009								Anal	vsi	s Year		2033	Propo	osed	w/	Busir	ness		
I ime Period	AM Peak He	our							/ linear	, 0.	o rour		Park	100 11	in a l	:	C ****	1.		
									Proje	ect	ID		09-04 TDO	+02 IVII T OC I	ne L Plani	ICK nin	cree a	К-		
Volume and	Timing Input												100		Tarin	<u></u>	9			
	U				EB				WE	3				N	В				SB	
			LT		TH	RT		LT	TH	ł	RT		LT	Т	Ή	F	RΤ	LT	TH	RT
Number of La	nes, N1		1			2								2			2	1	2	
Lane Group			L			R								7	-	ŀ	7	L	<u> </u>	
Volume, V (vp	oh)		119			795			ļ				ļ	2	76	1	75	171	1544	
% Heavy Veh	nicles, %HV		5			5			<u> </u>					5	_	1	5	5	5	
Peak-Hour Fa	actor, PHF		0.90			0.90	_		<u> </u>					0.9	90	0.	90	0.90	0.90	
Pretimed (P)	or Actuated (A)		A			A			<u> </u>							/	4	A	A	
Start-up Lost	Time, I1		2.0			2.0								2.	0	2	.0	2.0	2.0	
Extension of I		i, e	2.0			2.0								<u></u> 2.	0		.0	2.0	2.0	
Linit Extensio	n LIE		30			30								3	0	3	<u>,</u>	30	30	
Filtering/Mete	ring I		1.000	,		1 000)							1 (, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	1	000	1 000	1 000	
Initial Unmet	Demand, Qb		0.0			0.0	<u> </u>							0.	0	0	000	0.0	0.0	
Ped / Bike / R	TOR Volumes		0		0	0			1		_		0	0		()	0	0	
Lane Width			12.0		-	12.0								12	.0	12	2.0	12.0	12.0	
Parking / Gra	de / Parking		N		0	N							N	0		1	V	N	0	N
Parking Mane	euvers, Nm																	[
Buses Stoppi	ng, Nв		0			0									0		0	0	0	
Min. Time for	Pedestrians, G	Ър			3.2									3	.2				3.2	
Phasing	EB Only	(02		0	3		04			SB O	nly		NS P	erm			07	0	8
Timing	G = 27.3	G =	0.0		G = (0.0	(G = 0.0	0	(G = 6.	.5		G = 3	1.2		G =	0.0	G = (0.0
	Y = 5	Y =	0		Y = ()	<u></u>	Y = 0		`	Y = 5			Y = 5			Y =	0	Y = 0)
Duration of A	nalysis, T = 0.2	25												Cycle	Leng	gth,	C =	80.0		
Lane Group	Capacity, Con	trol [Delay,	and	LOS	Deteri	miı	nation				1						1		
			<u>. </u>		<u>в</u>	рт		T	<u>WB</u>	1	DT		<u>іт</u>		1	D			SB	рт
Adjusted Flow	v Rate v		122	11	1	002		-1	П	╎		+		207	,	10	ו. ⊿ר	100	1716	
Lane Group C	Capacity, c		587			929								1.34	4	10	,4 62	541	1839	
v/c Ratio, X		0.	22		0	.95				_				0.23		0.1	8	0.35	0.93	
Total Green F	Ratio, g/C	0.	.34		0	.34								0.39		0.3	9	0.53	0.53	
Uniform Delay	y, d ₁	18	8.8		2	5.7								16.3		16.	0	10.0	17.3	
Progression F	Factor, PF	1.	.000		1	.000								1.00	0	1.0	000	1.000	1.000	
Delay Calibra	ition, k	0.	11		0	.46								0.11		0.1	1	0.11	0.45	
Incremental D	Delay, d ₂	(0.2		;	18.7								0.1		0.	1	0.4	9.3	
Initial Queue	Delay, d ₃	0	0.0		(0.0								0.0	Ī	0.0	0	0.0	0.0	
Control Delay	1	1	9.0		4	14.4								16.4	4	16	5.1	10.3	26.7	
Lane Group L	OS		В			D								В		В		В	С	
Approach Del	lay		41.	1									1	6.3					25.0	
Approach LO	S		D											В					С	
Intersection D	Delay		28.	5				$X_{c} = 0.$	94			Ir	nterse	ction I	OS				С	

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HCS+ [™] DET/									ETAILED REPORT										
General Info	rmation								Si	ite In	format	tion							
Analyst	ALB								Int	terse	ection	Λ	Mine I	.ick & I-4	0 V	/B ran	nps		
	RPM Trans	portat	tion						Ar	ea T	уре	A	All oth	er areas					
Agency of Co	Consultants								Ju	risdi	ction	F	Putna	m County	/				
Date Perform	ed 5/26/2009								An	nalys	is Year	 	2033 I Park	Proposed	1 W/	Busir	ness		
Time Period	AM Peak He	our										, ()9-04	02 Mine L	Lick	Cree	k -		
										ojec		7	TDOT	OC Plan	nin	g			
Volume and	Timing Input		1														1		
					EB		.		<u> </u>			_						SB	
Number of La	nos N1							2	+			-	2			K I			
Lane Group								1	+				1		_				R
Volume, V (vr	oh)							970	+		168		128	267			ļ	745	101
% Heavy Veh	icles, %HV							5	1		5		5	5				5	5
Peak-Hour Fa	actor, PHF						C	0.90			0.90	(0.90	0.90				0.90	0.90
Pretimed (P)	or Actuated (A))						Α			A		Α	A			ļ	A	A
Start-up Lost	Time, lı							2.0	\perp		2.0		2.0	2.0				2.0	2.0
Extension of	Effective Greer	п, е	ļ					2.0			2.0		2.0	2.0				2.0	2.0
Arrival Type,								3			3	_	3	3				3	3
								3.0			3.0		3.0	3.0			ļ	3.0	3.0
Initial Unmet	Demand Ob							<u>0.000</u>	+-		1.000		0.000	0.0				0.0	1.000
Ped / Bike / R	TOR Volumes							0.0	+-	0	0.0		0.0	0.0			0	0.0	0.0
Lane Width							1	12.0	+	-	12.0	·	12.0	12.0	1			12.0	12.0
Parking / Gra	de / Parking							Ν		0	N		Ν	0		N	N	0	N
Parking Mane	euvers, Nm																		
Buses Stoppi	ng, Nв							0			0		0	0				0	0
Min. Time for	Pedestrians, C	Эp								3.2				3.2			<u></u>	3.2	
Phasing	WB Only		02			03		04	•		NB O	nly		NS Perm			07	0	8
Timing	G = 29.7	<u>G =</u>	0.0		G =	0.0	G	b = 0	.0		G = 5.	0		i = 30.3		G =	0.0	G =	0.0
Duration of A	Y = 5	Y =	0		Y =	0	ľ	= 0			Y = 5			= 5	ath	$\Gamma = \Gamma$	80.0	Y = 0	5
	$\frac{112}{Capacity} Cor$	trol I	Delav	and	410	S Doto	rmin	ation							yın	. 0 -	80.0		
	oupucity, con		ociay,	E	B	O Dette		ation	W	B	-	1	-	NB		-	1	SB	
			LT	TI	Н	RT	Ľ	T	TH	1	RT	L	.Т	TH	F	RT.	LT	TH	RT
Adjusted Flov	v Rate, v						107	78			187	14	42	297				828	112
Lane Group C	Capacity, c						123	39			571	67	70	1735				1305	583
v/c Ratio, X							0.8	7			0.33	0.2	21	0.17				0.63	0.19
Total Green F	Ratio, g/C						0.3	7			0.37	0.5	50	0.50				0.38	0.38
Uniform Dela	y, d ₁						23.4	4			18.0	12.	.0	10.8				20.3	16.6
Progression F	Factor, PF						1.0	00			1.000	1.0	000	1.000				1.000	1.000
Delay Calibra	ition, k						0.4	0			0.11	0.1	11	0.11				0.21	0.11
Incremental D	Delay, d ₂						6.	9			0.3	0.	.2	0.0			<u> </u>	1.0	0.2
Initial Queue	Delay, d ₃						0.0)			0.0	0.0	0	0.0				0.0	0.0
Control Delay	/						30.	.3			18.3	12	2.1	10.8				21.3	16.8
Lane Group L	OS						С				В	В	3	В				С	В
Approach De	lay							28.	5				11	.3				20.8	
Approach LO	S							С					E	}				С	
Intersection D	Delay		22.	9			X	$\zeta_c = 0$).75	75			Intersection LOS C						

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F	AMPS AND RAI	MP JUNCTI	ONS WOR	KSHEET			
General Information		Site Infor	mation				
Analyst ALB		Freeway/Dir of Tr	avel I-4	40 (Eastbound)			
Agency or Company RPM Trans	portation Consultants	Junction	E	xit Ramp to SR-	56		
Date Performed 5/22/2009		Jurisdiction	P	utnam Co			
Analysis Time Period PM Peak He	our	Analysis Year	20	033 Proposed w	/ Business Park		
Project Description 09-0402 Mine Lick Cr	reek - TDOT OC Planning	g					
Terra	in: Level					Deveneting a	
						Ramp	m Aaj
						Ves	On
L _{up} = ft						L _{down} =	ft
uμ	S _{FF} = 70.0 mph		S_{FR} = 35	.0 mph			. /
V _u = veh/h	Sketch	(show lanes, L _A ,	L_{D}, V_{R}, V_{f}			V _D =	veh/h
Conversion to pc/h Under I	Base Conditions	;)	
(pc/h) V P	HF Terrain	%Truck	%Rv	f _{HV}	f _p	v = V/PHF	x f _{HV} x f _p
Freeway 2438 0.	90 Level	22	0	0.901	1.00	300	07
Ramp 327 0.	90 Level	22	0	0.901	1.00	40	13
UpStream							
DownStream	Aroos			<u></u>	Divorgo Aroac		
Estimation of V to	Aleas		Estimatio	on of v.	Diverge Areas		
			Louman	12	<u> </u>	() =	
$v_{12} = v_F (P_{FM})$				V ₁₂ =	= V _R + (V _F - V	(_R)P _{FD}	
L _{EQ} = (Equation :	25-2 or 25-3)		L _{EQ} =	(Equation 25-	8 or 25-9)	
P _{FM} = using Equa	ition (Exhibit 25-5)		P _{FD} =	1	.000 using E	quation (Exh	ibit 25-12)
V ₁₂ = pc/h			V ₁₂ =	3	007 pc/h		
V ₃ or V _{av34} pc/h (Equa	ation 25-4 or 25-5)		V ₃ or V _{av34}	0	pc/h (Equat	ion 25-15 or	25-16)
Is V_3 or $V_{av34} > 2,700$ pc/h? Yes	No		Is V_3 or V_{av34}	> 2,700 pc/h?	🗏 Yes 🗹 No		
Is V_3 or $V_{av34} > 1.5 * V_{12}/2$ Fres F	No		Is V_3 or V_{av34}	> 1.5 * V ₁₂ /2	🗏 Yes 🗹 No		
If Yes,V _{12a} = pc/h (Equa	ation 25-8)		If Yes, V _{12a} =	I	oc/h (Equatio	n 25-18)	
Capacity Checks			Capacity	Checks			
Actual	Capacity	LOS F?		Actual	C	apacity	LOS F?
			V _F	3007	Exhibit 25-	14 4800	No
V _{FO} Exhi	bit 25-7		$V_{FO} = V_{F}$ -	V _R 2604	Exhibit 25-	14 4800	No
			V _R	403	Exhibit 25	3 2000	No
Flow Entering Merge Influe	nce Area	,,	Flow Ent	ering Merg	ge Influenc	e Area	
Actual	Max Desirable	Violation?		Actual	Max Desira	ıble	Violation?
V _{R12} Exhil	bit 25-7		V ₁₂	3007	Exhibit 25-14	4400:All	No
Level of Service Determina	tion (if not F)		Level of	Service De	eterminatio	on (if not l	F)
$D_{R} = 5.475 + 0.00734 v_{R} + 0.007$	8 V ₁₂ - 0.00627 L _A		D _F	s = 4.252 + 0	.0086 V ₁₂ - 0.	.0009 L _D	
D _R = (pc/mi/ln)			D _R = 27.1	l (pc/mi/ln)		_	
LOS = (Exhibit 25-4)			LOS = C (I	Exhibit 25-4)			
Speed Determination			Speed De	eterminati	on		
M _s = (Exibit 25-19)	D _s = 0.464 (Exhibit 25-19)						
$S_{n=}$ mph (Exhibit 25-19)			$D_{\rm s} = 0.46$	o4 (Exhibit 25	-19)		
			$D_s = 0.46$ $S_R = 57.0$	0 mph (Exhibit 25	-19) 25-19)		
$S_{0} = mph (Exhibit 25-19)$			$D_{s} = 0.46$ $S_{R} = 57.0$ $S_{0} = N/A$	of (Exhibit 25) mph (Exhibit) mph (Exhibit	25-19) 25-19)		

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	RA	MPS AND	RAMP JU	INCTIONS W	ORKSHE	ET				
General Infor	mation			Site Infor	mation					
Analyst Agency or Company Date Performed Analysis Time Perioc Project Description	ALB RPM 5/22/2 M PM P 09-0402 Mine I	Transportation 2009 eak Hour Lick Creek - TD	Consultants	Freeway/Dir of Tra Junction Jurisdiction Analysis Year	avel I I	-40 (East Entrance Putnam C 2033 Prop	bound) Ramp from o bosed w/ B	n Mine Lick usiness Par	k	
Inputs	07 0102 11110									
Upstream Adj Ramp		Terrain: Leve	l						Downstrea Ramp	am Adj
Yes Or	1								Tes Yes	🗖 On
No Of	f								🗹 No	Cff Off
L _{up} = ft		s	– 70.0 mn	h	S – 3	5 0 mnh			L _{down} =	ft
V _u = veh/h	I		FF - 70.0 mp Sketc	h (show lanes, L _A ,	$U_{FR} = 3$ L_{D}, V_{R}, V_{f}	5.0 mpn			V _D =	veh/h
Conversion t	o pc/h Und	der Base (Condition	S						
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{H\}	/	f _p	v = V/PHF	= x f _{HV} x f _p
Freeway	2111	0.90	Level	22	0	0.901		1.00	2	2604
Ramp	1013	0.90	Level	22	0	0.901		1.00	1	249
UpStream										
DownStream										
Estimation of	Fv	vierge Areas			Fstimati	on of		erge Areas		
LSUMATION OF	* 12	(LSumau		12			
	$V_{12} = V_{F}$	(P _{FM})					$V_{12} = V_{F}$	_R + (V _F - V	R)P _{FD}	
L _{EQ} =	(Equa	ation 25-2 or	(25-3))	L _{EQ} =		(E	quation 2	5-8 or 25-9)) 05.40)
P _{FM} =	1.000	using Equat	ion (Exhibit 2	5-5)	P _{FD} =		us	ing Equat	ion (Exhibit	25-12)
$v_{12} =$	2604 p	oc/n			$v_{12} =$		рс	/n //. /=	05 15 05	1/)
V_3 OF V_{av34}	0 pc/r	n (Equation 2	25-4 or 25-5)	v_3 or v_{av34}	. 2 700		/n (Equation	25-15 OF 25	-16)
$15 V_3 OI V_{av34} > 2,70$		s 🔟 No			$15V_3UV_{av3}$	4 > 2,700		Yes 🔲 No	0	
$15 V_3 OI V_{av34} > 1.5$	v ₁₂ /2 ■ Yes	s 🔟 No	. 0)			₄ > 1.5	/ ₁₂ /2	Yes 🔲 No	0	
$\frac{11}{2} \frac{1}{2} 1$	pc/n (Equation 25	-8)		II Yes, V _{12a} =	. 01	рс	/n (Equati	on 25-18)	
Capacity Che	CKS				Capacity	/ Cnec	KS		it -	100 52
	Actual		араспу	LUSF?	V		Actual	Evhibit 25		LUSF?
V _{EO}	3853	Exhibit 25-7		No	$V_{\rm EO} = V_{\rm E}$	- V _D		Exhibit 25	-14	
FO								Exhibit 25	5-3	
Flow Entering	n Merge In	fluence A	rea	<u>,</u>	Flow En	terina	Merce	Influen	ce Area	
	Actual	Max	Desirable	Violation?		Actu	ial	Max Des	irable	Violation?
V _{R12}	3853	Exhibit 25-7	4600:All	No	V ₁₂		Ex	hibit 25-14		
Level of Serv	ice Detern	nination (i	if not F)		Level of	Servi	ce Dete	erminati	on (if no	ot F)
D _R = 5.475 +	0.00734 v _R + 0).0078 V ₁₂ - 0.0	0627 L _A			_R = 4.28	52 + 0.00)86 V ₁₂ - 0).0009 L _D	
D _R = 30.6 (pc	:/mi/ln)				D _R = (p	c/mi/ln)				
LOS = D (Exhil	oit 25-4)				LOS = (E	xhibit 2	5-4)			
Speed Deterr	nination				Speed D)eterm	ination	1		
M _S = 0.457 (Exi	bit 25-19)				$D_s = (E)$	xhibit 25-7	19)			
S _R = 57.2 mph (Exhibit 25-19)					S _R = mp	oh (Exhibi	t 25-19)			
$S_0 = N/A mph ($	Exhibit 25-19)				S ₀ = mp	oh (Exhibi	t 25-19)			
S = 57.2 mph (Exhibit 25-14)					S = mph (Exhibit 25-15)					

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RA	MPS AND RA	MP JUNCTI	ONS WOF	RKSHEET			
General Information		Site Infor	mation				
Analyst ALB		Freeway/Dir of Tr	avel I-	40 (Westbound)			
Agency or Company RPM Transpor	tation Consultants	Junction	E	xit Ramp to Min	e Lick Creek		
Date Performed 5/22/2009		Jurisdiction	Р	Putnam Co			
Analysis Time Period PM Peak Hour		Analysis Year	2	033 Proposed w	/ Business Park		
Project Description 09-0402 Mine Lick Cree	k - TDOT OC Plannin	g					
Terrain:	l evel					Deverence	
						Ramp	m Adj
						Ves	On
L _{up} = ft						L _{down} =	ft
up	S _{FF} = 70.0 mph		S _{FR} = 35	5.0 mph			. /
V _u = veh/h	Sketch	i (show lanes, L _A ,	L _D ,V _R ,V _f)			$V_D =$	veh/h
Conversion to pc/h Under Ba	se Conditions	;					
(pc/h) V PHF	Terrain	%Truck	%Rv	f _{HV}	f _p	v = V/PHF	x f _{HV} x f _p
Freeway 2235 0.90	Level	22	0	0.901	1.00	27	57
Ramp 395 0.90	Level	22	0	0.901	1.00	48	37
UpStream							
DownStream Marga Av					Divorgo Aroac		
Estimation of V to	cas		Estimatio	on of v.	Diverge Areas		
			Lotination	511 OF 12	<u> </u>	() D	
$V_{12} = V_F (P_{FM})$				V ₁₂ =	= v _R + (v _F - v	(_R)P _{FD}	
L _{EQ} = (Equation 25	-2 or 25-3)		L _{EQ} =		(Equation 25-	8 or 25-9)	
P _{FM} = using Equation	n (Exhibit 25-5)		P _{FD} =	1	.000 using E	quation (Exh	ibit 25-12)
V ₁₂ = pc/h			V ₁₂ =	2	757 pc/h		
$V_3 \text{ or } V_{av34}$ pc/h (Equation	n 25-4 or 25-5)		V_3 or V_{av34}	0	pc/h (Equati	ion 25-15 or	25-16)
Is V_3 or $V_{av34} > 2,700$ pc/h? Yes No			Is V_3 or V_{av34}	₁ > 2,700 pc/h?	🗏 Yes 🗹 No		
Is V_3 or $V_{av34} > 1.5 * V_{12}/2$ [Yes [No			Is V_3 or V_{av34}	₁ > 1.5 * V ₁₂ /2	🗏 Yes 🗹 No		
If Yes,V _{12a} = pc/h (Equation	n 25-8)		If Yes, V _{12a} =		oc/h (Equation	n 25-18)	
Capacity Checks			Capacity	Checks	1		
Actual	Capacity	LOS F?		Actual	C	apacity	LOS F?
			V _F	2757	Exhibit 25-	14 4800	No
V _{FO} Exhibit	25-7		$V_{FO} = V_{F}$ -	• V _R 2270	Exhibit 25-	14 4800	No
			V _R	487	Exhibit 25-	3 2000	No
Flow Entering Merge Influence	e Area	t	Flow Ent	tering Mer	ge Influend	e Area	
Actual	Max Desirable	Violation?		Actual	Max Desira	ıble	Violation?
V _{R12} Exhibit	25-7		V ₁₂	2757	Exhibit 25-14	4400:All	No
Level of Service Determination	on (if not F)		Level of	Service De	eterminatio	on (if not	F)
$D_{R} = 5.475 + 0.00734 v_{R} + 0.0078$	/ ₁₂ - 0.00627 L _A		D	_R = 4.252 + 0	.0086 V ₁₂ - 0.	.0009 L _D	
D _R = (pc/mi/ln)			D _R = 24.	6 (pc/mi/ln)		_	
LOS = (Exhibit 25-4)			LOS = C (Exhibit 25-4)			
Speed Determination			Speed D	eterminati	on		
M _s = (Exibit 25-19)	D _s = 0.472 (Exhibit 25-19)						
S = mph(Exhibit 25-10)			$D_{\rm s} = 0.4$	72 (Exhibit 25	-19)		
			$D_{s} = 0.4$ $S_{R} = 56.3$	72 (Exhibit 25 8 mph (Exhibit	: 25-19)		
S_R^- mph (Exhibit 25-19) S_0^- mph (Exhibit 25-19)			$D_{s} = 0.4$ $S_{R} = 56.1$ $S_{0} = N/A$	72 (Exhibit 25 8 mph (Exhibit A mph (Exhibit	: 25-19) 25-19)		

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	RA	MPS AND	RAMP JU	INCTIONS W	ORKSHE	ET									
General Infor	mation			Site Infor	mation										
Analyst Agency or Company Date Performed Analysis Time Period Project Description	ALB RPM 5/22/2 M PM P 09-0402 Mine I	Transportation 2009 Jeak Hour	Consultants	Freeway/Dir of Tra Junction Jurisdiction Analysis Year	avel I F	-40 (West Entrance F Putnam C 2033 Prop	bound) Ramp from o osed w/ Bi	Mine Lick usiness Par	k						
Inputs															
Upstream Adj Ramp		Terrain: Leve	l						Downstrea Ramp	am Adj					
Yes Or	1								Ves	🗖 On					
No Of	f								Mo No	Cff Off					
L _{up} = ft		s	= 70.0 mp	h	S = 3	5 0 mph			L _{down} =	ft					
V _u = veh/h	I		Sketc	h (show lanes, L _A ,	L _D ,V _R ,V _f)	oro mpri			V _D =	veh/h					
Conversion to	o pc/h Und	der Base (Condition	s		4									
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{H∿}	,	f _p	v = V/PHF	x f _{HV} x f _p					
Freeway	1840	0.90	Level	22	0	0.901		1.00	2	269					
Ramp	804	0.90	Level	22	0	0.901		1.00		992					
UpStream		ļļ													
DownStream	<u> </u>	Morgo Aroas						orgo Aroas							
Estimation of	f Vaa	Nerge Areas			Estimati	on of	V ₄₀	cryc Arcus							
	$\frac{12}{12}$	(P)			$V_{12} = V_R + (V_F - V_R)P_{FD}$										
	V ₁₂ - V _F	(1_{FM})	25-3)				v ₁₂ – v _R	$+ (v_F - v_F)$	R ^{/F} FD)					
$E_{EQ} =$	(∟qua 1.000	ucina Equat	20-0)	5 5)	- _{EQ} - Р -			ina Equati	ion (Evhibit	7 25 12)					
FM -	1.000 2260 r	using Equal		5-5)	FD -		us	ing ∟quati /b		23-12)					
V or V	2207 k	(Equation (05 1 or 25 5	N N	V or V		pc/	h (Equation	25 15 or 25	16)					
$V_3 = V_{av34}$	0 pc/i 0 nc/h? 🗖 Vor		20-4 01 20-0)	Is V or V	> 2 700	nc/h?		20-10 01 20	10)					
$15V_3 \text{ or } V_{av34} > 2,70$					Is V. or V	4 × 2,700	//2 []		5						
If Yes V =	nc/h (Equation 25	(-8)		If Yes V =	4 - 1.5	^{12'2}	/b (Equati	on 25-18)						
Canacity Che	point		, 0)		Canacity	/ Cher	eks		01120 10)						
	Actual		anacity	1.05.F2			Actual	C	anacity	1.0S F2					
	/ lotual	Ĩ	apaony		Vr		riotaar	Exhibit 25	.14	20011					
V _{FO}	3261	Exhibit 25-7		No	$V_{FO} = V_F$	- V _R		Exhibit 25	-14						
					V _R			Exhibit 25	-3						
Flow Entering	g Merge In	fluence A	rea		Flow En	tering	Merge	Influen	ce Area						
	Actual	Max	Desirable	Violation?		Actu	al	Max Des	irable	Violation?					
V	3261	Exhibit 25-7	4600:All	No	V ₁₂		Ex	hibit 25-14							
Level of Serv	ice Detern	nination (i	if not F)		Level of	Servio	ce Dete	rminati	on (if no	ot F)					
D _R = 5.475 +	0.00734 v _R + 0).0078 V ₁₂ - 0.0	0627 L _A		$D_R = 4.252 + 0.0086 V_{12} - 0.0009 L_D$										
D _R = 26.2 (pc	:/mi/ln)				D _R = (p	c/mi/ln)									
LOS = C (Exhib	oit 25-4)				LOS = (E	xhibit 25	5-4)								
Speed Detern	nination				Speed D)eterm	ination	1							
M _S = 0.375 (Exi	bit 25-19)				D _s = (Ex	xhibit 25-1	9)								
S _R = 59.5 mph	(Exhibit 25-19)				S _R = mph (Exhibit 25-19)										
S ₀ = N/A mph (Exhibit 25-19)				S ₀ = mp	oh (Exhibil	25-19)								
S = 59.5 mph	(Exhibit 25-14)				S = mp	oh (Exhibit	25-15)								

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	HCS+ [™] DETAILED REPORT General Information Site Information																		
General Info	HCS+ [™] DE [™] ieneral Information nalyst ALB											ion	1						
	General Information Analyst ALB Agency or Co. RPM Transportation								Inters	sec	ction		Mine	Lick & I-	40 E	EB ran	nps		
Analyst	ALB					Area	Ту	/pe		All ot	her area	s							
Agency or Co	. RPM Transp						Juris	dic	tion		Putna	am Co							
Time Period	ed 5/26/2009 PM Peak Ho	ามา							Analy	ysis	s Year	2	2033 Park	Propose	d w	/ Busir	ness		
		541							Proje	ect	ID	(09-04 700	102 Mine T OC Pla	Lic	k Cree	ek -		
Volume and	Timing Input												100	00110		<u>ig</u>			
					EB				WE	3				NB				SB	
			LT		TH	RT		LT	TH	ł	RT		LT	TH		RT	LT	TH	RT
Number of La	nes, N1		1			2								2		2	1	2	
Lane Group			L			R								<u> </u>		R	<u> </u>	T	
Volume, V (vr	oh)		160			167								1151		853	160	479	
% Heavy Veh	nicles, %HV		5			5								5		5	5	5	
Peak-Hour Fa	actor, PHF		0.90			0.90								0.90	0	.90	0.90	0.90	
Pretimed (P)	or Actuated (A)		A			A								A		A	A	A	
Start-up Lost	Time, l1		2.0			2.0								2.0		2.0	2.0	2.0	
Extension of I	Effective Greer	n, e	2.0			2.0								2.0		2.0	2.0	2.0	
Arrival Type,	AT		3			3								3		3	3	3	
Unit Extensio	n, UE		3.0			3.0								3.0	:	3.0	3.0	3.0	
Filtering/Mete		1.000)		1.000)							1.000) 1	.000	1.000	1.000		
Initial Unmet		0.0)		0.0								0.0	(0.0	0.0	0.0		
Ped / Bike / R		0	0		0							0	0		0	0	0		
Lane Width		12.0			12.0								12.0	1	2.0	12.0	12.0	ļ	
Parking / Gra	Parking / Grade / Parking				0	N							N	0		Ν	N	0	N
Parking Mane	euvers, Nm																ļ	ļ	
Buses Stoppi	ng, Nв		0			0							0		0	0	0		
Min. Time for	Pedestrians, G) p			3.2									3.2				3.2	
Phasing	EB Only		02		0	3		04			SB Or	nly		NS Pern	n		07	0	8
Timina	G = 25.0	G =	0.0		G = 0	0.0	(G = 0.0	2	(G = 8.	0		G = 82.0)	G =	0.0	G = 0	0.0
	Y = 5	Y =	= 0 Y =			0 Y = 0					Y = 5			Y = 5		<u>Y =</u>	0	Y = 0)
Duration of Al	$\frac{1}{2} \frac{1}{2} \frac{1}$.5	Dalay	.		Deter	:-	nation						Jycie Le	ngtr	1, C =	130.0		
Lane Group	Capacity, Con		Jelay,		D	Deteri	nır	nation	\//D			1		ND			1	CD.	
		-	IT			RT		т	TH	1	RT		т		1	RT	 IT	<u></u> тн	RT
Adjusted Flov	v Rate, v		178			186								1279	5	948	178	532	
Lane Group C	Capacity, c	3	331			523				1				2173	1	717	283	2517	
v/c Ratio, X		0.	54		0	.36								0.59	0.	55	0.63	0.21	
Total Green F	Ratio, g/C	0.	19		0	.19								0.63	0.	63	0.73	0.73	
Uniform Delay	y, d ₁	47	7.3		4	5.5								14.1	13	3.6	11.0	5.6	
Progression F	Factor, PF	1.	.000		1	.000								1.000	1.	000	1.000	1.000	
Delay Calibra	ition, k	0.	14		0	.11								0.18	0.	15	0.21	0.11	
Incremental D	Incremental Delay, d ₂					0.4						Ļ		0.4	().4	4.4	0.0	
Initial Queue Delay, d ₃			0.0		(0.0								0.0	0	.0	0.0	0.0	
Control Delay	Control Delay				4	45.9								14.5	1	4.0	15.4	5.6	
Lane Group L	Lane Group LOS					D								В		В	В	A	
Approach Del	Approach Delay												1	4.3				8.1	
Approach LO	pproach LOS											В					A		
Intersection D	ntersection Delay							$X_{c} = 0.$	61			In	terse	ction LO	S			В	

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HCS+™ DETAILED REPORT General Information Site Information																			
General Info	rmation								Site	Info	ormati	ion							
Analyst	ALB			Inters	sect	ion	N	∕line L	ick & I-4.	0 V	/B ran	nps							
Agency or Co	RPM Trans				Area	Тур	be	A	\II oth	er areas									
Agency of Co	 Consultants 				Juris	dicti	ion	P	Putnar	n County	/								
Date Perform	ed 5/26/2009								Analy	/sis	Year	2	2033 F Park	roposed	1 W/	Busir	ness		
Time Period	PM Peak H	our							D		-	0	9-040)2 Mine I	Lick	Cree	k -		
									Proje	Ct II	D	Т	DOT	OC Plan	nin	g			
Volume and	Timing Input		1														1		
	EB LT TH RT Number of Lanes, N1 Image: Component of Component													NB		.		SB	DT
Number of Le					IH			<u>- </u>								RI			RI
	illes, ini						- 2				R		2						I R
Volume V (vr	h)						2	16			179		696	615	-		ļ	423	108
% Heavy Veh	nicles. %HV						5	5	-		5		5	5				5	5
Peak-Hour Fa	actor, PHF						0.9	90			0.90	0).90	0.90	1			0.90	0.90
Pretimed (P)	or Actuated (A))					A	١			A		Α	A	1			A	A
Start-up Lost	Time, l1						2.	2.0			2.0	ź	2.0	0 2.0				2.0	2.0
Extension of	Effective Greer	п, e					2.	0			2.0	2.0		2.0				2.0	2.0
Arrival Type,	AT						3	3			3		3	3			ļ	3	3
Unit Extensio	n, UE						3.	0	ļ		3.0	;	3.0	3.0				3.0	3.0
Filtering/Mete	ering, I						1.000				1.000) 1	1.000	1.000				1.000	1.000
Initial Unmet	Initial Unmet Demand, Qb Ped / Bike / RTOR Volumes						0.	0.0			0.0	(0.0	0.0				0.0	0.0
Ped / Bike / R						10	0			12.0		0	0	-		0	0	0	
Lane Width						12	.0			12.0	'	12.0 N	12.0	+	N		12.0	12.0 N	
Parking / Gra							/			11		IN	0		V			11	
Parking Marie	Parking Maneuvers, Nm							<u> </u>					0						
Min Time for	Pedestrians (, 	32	,			0	32				32	0
Phasing	WB Only	<u> </u>	02	1		03		04	0.2	r	NB Or	 hlv		JS Perm			07	0.2	18
Thasing	G = 11.5	G =	00		G =	00	G	= 0	0	G	i = .30	<u>) 0</u>	G	= 13.5		G =	00	G =	00
Timing	Y = 5	Y =	0		Y = 0 Y =			= 0	•	Y	= 5		Y	= 5		Y =	0	Y = 0	0
Duration of A	nalysis, T = 0.2	25											С	ycle Len	gth	C =	70.0		
Lane Group	Capacity, Con	ntrol L	Delay,	and	d LO	S Deter	rminat	tion											
				E	В				WB					NB	1 -			SB	
			LT		-	RT			TH	<u> F</u>	RT		T	TH	F	<u>. T</u>		TH	RT
Adjusted Flow	v Rate, v						240			1	99	77	73	683	_			470	120
Lane Group C	Capacity, c						548			2	253	18-	42	2387	_			664	297
V/C Ratio, X							0.44			0.	79	0.4	2	0.29				0.71	0.40
Total Green F	Ratio, g/C						0.16			0.	16	0.6	9	0.69	_			0.19	0.19
Uniform Dela	y, d ₁						26.3			28	3.1	5.1	1	4.1	_			26.4	24.7
Progression F	Factor, PF						1.000	2		1.	000	1.0	00	1.000			ļ	1.000	1.000
Delay Calibra	Delay Calibration, k						0.11			0.	33	0.1	1	0.11				0.27	0.11
Incremental Delay, d ₂							0.6			1.	5.1	0.1	2	0.1			ļ	3.5	0.9
Initial Queue Delay, d ₃							0.0			0.	.0	0.0)	0.0	_			0.0	0.0
Control Delay					26.9	,		4	3.2	5.2	2	4.2				29.9	25.6		
Lane Group LOS						С			L	D	A		Α				С	С	
Approach De	Approach Delay							34.3	3				4.	7				29.0	
Approach LO	pproach LOS							С					A					С	
Intersection D	Approach LOS ntersection Delay						X _c	= 0.	.63			Inte	ersec	tion LOS				В	

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FUTURE YEAR 2033 INTERSTATE 40 AT STATE ROUTE 135 (S. WILLOW AVENUE)

RAMPS AND RAMP JUNCTIONS WORKSHEET General Information Site Information Analyst ALB Freeway/Dir of Travel I-40 (Eastbound)																
General Infor	rmation			Site Infor	mation											
Analyst Agency or Company Date Performed Analysis Time Period	ALB RPM 5/22/3 d AM P	Transportatior 2009 Peak Hour	Consultants	Freeway/Dir of Tra Junction Jurisdiction Analysis Year	avel I- E P 2	40 (Ea xit Rai utnam 033 Pr	nstbound) mp to SR-13 i Co roposed w/ E	5 Business Park								
Project Description	09-0402 Mine I	Lick Creek IJS	- TDOT OC PI	anning												
Inputs		Torrain: Lovo	1					[-								
Upstream Adj Ramp			1					F	Downstrea Ramp	m Adj						
	f								Yes	On						
L _m = ft	•							L		ft						
up		S	_{FF} = 70.0 mp	h	S _{FR} = 35	i.0 mp	h									
V _u = veh/h	1		Sketo	ch (show lanes, L _A ,	L _D ,V _R ,V _f)				/ _D =	veh/h						
Conversion t	o pc/h Und	der Base (Condition	s				, ,								
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f _{HV}	f _p	/ = V/PHF	x f _{HV} x f _p						
Freeway	2485	0.90	Level	22	0	30	65									
Ramp	337	0.90	Level	22	0	0.0	901	1.00	41	6						
UpStream		<u> </u>														
DownStream	<u> </u>	Morgo Aroas						Verge Areas								
Estimation of	f V ₄₀	Morge Areas			Estimatio	on o	f V ₄₀	reige Areas								
	12 V - V	(D)			$V_{12} = V_{p} + (V_{r} - V_{p})P_{rp}$											
	v ₁₂ - v _F	(Γ_{FM})	· 25 2)		$v_{12} = v_R + (v_F - v_R) P_{FD}$ $L_{EQ} =$ (Equation 25-8 or 25-9)											
	(⊏qua	Equation /	20-3				(E) 1.00	ualion 25-0	01 20-9)	(h)+ 0F 10)						
FM -	using		EXHIDIT 20-0)		FD -		1.00	l∪ using ⊏qu ⊑ na/h	Jation (EXI)	IDIL 20-12)						
V_{12}	po/h	(Equation 26	(or 25 5)		$V_{12} - V_{12}$		300 0 m	o pc/n	n 05 15 or	25 16)						
$V_3 \circ V_{av34}$	pc/h 0 nc/h2 🗖 Ver		5-4 01 25-5)		Is V or V	> 2 7	∪ µ 00.nc/h2 ा	Vee Value	11 25-15 01	25-16)						
$15V_3 \text{ or } V_{av34} > 2,70$					Is V or V	< 1.5	* V /2									
If $V_{es}V =$	^{12/2}	S III NO	5-8)			- 1.5	^v 12' ²	h (Equation	25-18)							
Capacity Che			5-0)		Canacity	Ch	pc.		23-10)							
	Actual		anacity	1.05.F2	Capacity		Actual	Car	acity	1.05 F2						
	/ lotual	Ĭ	apacity		V_		3065	Exhibit 25-14	4800	No						
V		Exhibit 25-7			$V_{-2} = V_{-}$	V_	2640	Exhibit 25-14	1800	No						
. FO		EXHIBIT 20 7			V V	<u> </u>	/16	Exhibit 25.2	2000	No						
Elow Entoring	a Marga In	fluonoo	*00			orin			2000	110						
FIOW Entering	Actual		Desirable	Violation?			g werge Actual	Max Desirabl	P AIEd	Violation?						
V _{R12}	riotadi	Exhibit 25-7	Desirable		V ₁₂	3	065	Exhibit 25-14	4400:All	No						
Level of Serv	ice Detern	nination (if not F)		Level of Service Determination (if not F)											
$D_{R} = 5.475 + 0.$.00734 v _R + (0.0078 V ₁₂ -	0.00627 L ₄		D	₂ = 4.	252 + 0.00	086 V ₁₂ - 0.0	009 L _D							
$D_p = (pc/mi/$	/ln)	12	, A		$D_{\rm p} = 28.0 (\rm pc/mi/ln)$											
LOS = (Exhibi	, it 25-4)				LOS = D (Exhib	oit 25-4)									
Speed Deterr	nination				Speed D	eter	minatior	1								
$M_s = $ (Exibit 2)	5-19)				$D_{s} = 0.4$	65 (E:	xhibit 25-1	9)								
$S_{p} = mph (Exh$	nibit 25-19)				S _R = 57.0 mph (Exhibit 25-19)											
$S_0 = mph (Exh$	nibit 25-19)				S _R = 57.0 mph (Exhibit 25-19) S ₀ = N/A mph (Exhibit 25-19)											
S = mph (Exh	nibit 25-14)				S = 57.	0 mph	(Exhibit 2	5-15)								

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	RAM	MPS AND	ET												
General Infor	mation			Site Infor	mation										
Analyst Agency or Company Date Performed Analysis Time Period Project Description	ALB RPM 5/22/2 d AM P	Transportation 2009 Jeak Hour	Consultants	Freeway/Dir of Tra Junction Jurisdiction Analysis Year	avel I	-40 (East Entrance Putnam C 2033 Proj	bound) Ramp fron Co posed w/ E	n SR-135 Business Par	k						
Inputs				ing											
Upstream Adj Ramp		Terrain: Leve	I						Downstrea Ramp	am Adj					
Yes Or	ı								Tes 1	🗖 On					
No Of	f								🗹 No	Cff Off					
L _{up} = ft		S	$r_{r} = 70.0 \text{ mp}$	h	S = 3	5.0 mph			L _{down} =	ft					
V _u = veh/h	I		Sketc	h (show lanes, L _A ,	L _D ,V _R ,V _f)	oro mpri			V _D =	veh/h					
Conversion t	o pc/h Und	der Base (Condition	s	1		4		1						
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _H	v	f _p	v = V/PHF	x f _{HV} x f _p					
Freeway	2148	0.90	Level	22	0	0.90	1	1.00	2	649					
Ramp	435	0.90	Level	22	0	0.90	1	1.00	537						
UpStream		ļ													
DownStream	<u> </u> N	J Merge Areas				<u> </u>	 	ierae Δreas							
Estimation of	f V ₁₂	nerge nicus			Estimati	ion of	V ₁₂	renge micus	•						
	$V_{12} = V_{12}$	(P)			$V_{12} = V_R + (V_F - V_R)P_{FD}$										
l =	(Equa	tion 25-2 or	25-3)		== =		• ₁₂ = •	auation 2	R ⁷ FD 5-8 or 25-9)					
P _{EM} =	1 000	using Equati	ion (Exhibit 2)	5-5)	$P_{\rm EQ} =$		(<u>-</u> 115	sing Equat	ion (Exhibit	7 25-12)					
$V_{10} =$	2649 r	oc/h		5 07	V10 =		nc	:/h		20 12)					
V_2 or V_{au24}	0 pc/r	n (Equation 2	25-4 or 25-5)	V_2 or V_{2224}		מ	h (Fauation	25-15 or 25	-16)					
$ Is V_2 \text{ or } V_{21/24} > 2.70$	0 pc/h? 🔽 Yes	s 🔽 No		/	Is V_2 or V_{av2}	, > 2,700) pc/h? 📁	Yes 🔲 N	0)					
$I_{\rm S} V_{2} \text{ or } V_{24} > 1.5$	* V ₁₀ /2 Ve s	s 🔽 No			Is V ₂ or V _{av2}	4 4 > 1.5 * 1	V ₁₀ /2	Yes N	0						
If Yes, $V_{122} =$	pc/h (Equation 25	-8)		If Yes, $V_{122} =$	14	12 – DC	:/h (Equati	on 25-18)						
Capacity Che	cks	(1	- /			v Cheo	cks		,						
	Actual	C	apacity	LOS F?			Actual	C	apacity	LOS F?					
					V _F			Exhibit 25	-14						
V _{FO}	3186	Exhibit 25-7		No	$V_{FO} = V_{F}$	- V _R		Exhibit 25	-14						
					V _R			Exhibit 25	5-3						
Flow Entering	g Merge In	fluence A	rea		Flow En	tering	Merge	Influen	ce Area						
	Actual	Max	Desirable	Violation?		Acti	ual 📃	Max Des	irable	Violation?					
V _{R12}	3186	Exhibit 25-7	4600:All	No	V ₁₂		E	hibit 25-14							
Level of Serv	ice Detern	nination (i	if not F)		Level of	Servi	ce Dete	erminati	on (if no	ot F)					
D _R = 5.475 +	0.00734 v _R + 0).0078 V ₁₂ - 0.0	0627 L _A		$D_{R} = 4.252 \pm 0.0086 V_{12} - 0.0009 L_{D}$										
$D_R = 26.6$ (pc	:/mi/ln) hit 25-4)				D _R = (p	c/mi/ln)	5-4)								
Speed Deterr	nination				Speed D		o -, inatior	2							
$M_{\rm c} = 0.376 (\text{Evi})$	hit 25-10)				$D_c = (E)$	xhibit 25-	19)								
S = 50.5 mph	(Evhibit 25.10)				$ S_{p} = mr$	oh (Exhih	, it 25-19)								
$S_{R}^{-} = N/A mmb ($	(=11) Evhihit 25 10)				$S_0 = mr$	oh (Exhih	it 25-19)								
S = 59.5 mph	(Exhibit 25-14)				S = mp	oh (Exhib	it 25-15)								

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RAMPS AND RAMP JUNCTIONS WORKSHEET General Information Site Information Analyst ALB Freeway/Dir of Travel I-40 (Westbound)															
General Infor	rmation			Site Infor	mation										
Analyst	ALB			Freeway/Dir of Tr	avel I	-40 (Wes	tbound)								
Agency or Company	RPM	Transportation	n Consultants	Junction	E	Exit Ram	o to SR-1	35							
Date Performed	5/22/2	2009		Jurisdiction	F	Putnam C	Co								
Analysis Time Period	d AM P	Peak Hour		Analysis Year	2	2033 Proj	posed w/	Business Park							
Project Description	09-0402 Mine I	Lick Creek IJS	- IDOT OC Pla	anning											
Inputs		Torrain: Low	2						_	.					
Upstream Adj Ramp			51						Downstrea Ramp	m Adj					
	I F								Yes	On On					
	I								MNO	ft Off					
			$S_{rr} = 70.0 \text{ mp}$	h	S _{ED} = 3	5.0 mph			aown						
V _u = veh/h	1		Sketc	h (show lanes, L _A ,	L _D ,V _R ,V _f)				V _D =	veh/h					
Conversion to	o pc/h Und	der Base	Condition	s	1	-									
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _H	V	f _p	v = V/PHF	x f _{HV} x f _p					
Freeway	3294	0.90	Level	22	0	40	63								
Ramp	543	0.90	Level	22	0	0.90	1	1.00	67	0					
UpStream		ļ													
DownStream		Morgo Aroas				,		ivorgo Aroas							
Estimation of	fv	Merge Areas			Fstimati	on of	V	IVELYE ALEas							
	12	(D)			$\frac{1}{2} = \frac{1}{2} + \frac{1}$										
	$V_{12} = V_{F}$	(P _{FM})			$V_{12} = V_R + (V_F - V_R)P_{FD}$ L _{FO} = (Equation 25-8 or 25-9)										
L _{EQ} =	(Equa	ation 25-2 o	r 25-3)		L _{EQ} =		(E	Equation 25-8	8 or 25-9)						
P _{FM} =	using	Equation (Exhibit 25-5)		P _{FD} =		1.0	000 using Ec	luation (Exh	ibit 25-12)					
V ₁₂ =	pc/h				V ₁₂ =		40	63 pc/h							
V ₃ or V _{av34}	pc/h ((Equation 2	5-4 or 25-5)		V_3 or V_{av34}		0	pc/h (Equation	on 25-15 or	25-16)					
Is V_3 or $V_{av34} > 2,70$	0 pc/h? 🥅 Yes	s 🥅 No			Is V_3 or V_{av3}	₄ > 2,700) pc/h? 🔽	Yes 🗹 No							
Is V_3 or $V_{av34} > 1.5$	* V ₁₂ /2 🔲 Yes	s 🔲 No			Is V_3 or V_{av3}	₄ > 1.5 * '	V ₁₂ /2 🔽	Yes 🔽 No							
If Yes,V _{12a} =	pc/h ((Equation 2	5-8)		If Yes, V _{12a} =		р	c/h (Equation	25-18)						
Capacity Che	ecks				Capacity	/ Chec	cks								
	Actual	(Capacity	LOS F?			Actual	Ca	pacity	LOS F?					
					V _F		4063	Exhibit 25-1	4 4800	No					
V _{FO}		Exhibit 25-7			$V_{FO} = V_{F}$	- V _R	3393	Exhibit 25-1	4 4800	No					
					Vp		670	Exhibit 25-3	3 2000	No					
Flow Entering	a Merae In	fluence A	Irea		Flow En	terina	Mera	e Influenc	e Area						
	Actual	Max	Desirable	Violation?	11011 211	Act	tual	Max Desirat	ble	Violation?					
V _{R12}		Exhibit 25-7			V ₁₂	406	53	Exhibit 25-14	4400:All	No					
Level of Serv	ice Detern	nination ((if not F)		Level of	Servi	ce De	terminatio	n (if not	F)					
$D_{R} = 5.475 + 0.$	00734 v _R + (0.0078 V ₁₂	- 0.00627 L _A		D	_R = 4.2	52 + 0.0	0086 V ₁₂ - 0.0	0009 L _D						
D _p = (pc/mi/	íln)				$D_{\rm R} = 36.7 (\rm pc/mi/ln)$										
LOS = (Exhibi	it 25-4)				LOS = E	Exhibit	, 25-4)								
Speed Determ	nination			Speed D	eterm	inatio	n								
M _s = (Exibit 2	5-19)				D _s = 0.4	88 (Exh	nibit 25-	19)							
$S_{R}^{=}$ mph (Exh	nibit 25-19)				S _R = 56.	3 mph (I	Exhibit 2	25-19)							
$S_0 = mph (Exh$, nibit 25-19)				$S_0 = N/A \text{ mph} (Exhibit 25-19)$										
S = mph (Exh	nibit 25-14)				S = 56.	3 mph (I	Exhibit 2	25-15)							

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	RAMPS AND RAMP JUNCTIONS WORKSHEET General Information Site Information nalvst ALB Freeway/Dir of Travel I-40 (Westbound)												
General Infor	mation			Site Infor	mation								
Analyst Agency or Company Date Performed Analysis Time Perioc Project Description	ALB RPM 5/22/2 I AM P 09-0402 Mine I	Transportation 2009 eak Hour Lick Creek - TE	Consultants	Freeway/Dir of Tra Junction Jurisdiction Analysis Year	avel	I-40 (Westb Entrance R Putnam Co 2033 Propo	ound) amp from SR- sed w/ Busine	135 ss Park					
Inputs	0,01021111101												
Upstream Adj Ramp		Terrain: Leve	l					Do Ra	wnstrea	am Adj			
Yes Or	1								Yes	🗖 On			
No Off	f							×	No	Cff Off			
L _{up} = ft		s	= 70.0 mp	h	S = 3	5 0 mph		L _{dc}	wn =	ft			
V _u = veh/h	I		Sketc	h (show lanes, L _A ,	L_{D}, V_{R}, V_{f}	olo mpri		V _C	, =	veh/h			
Conversion to	o pc/h Und	der Base (Condition	s	1	1			1				
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{HV}	f _p	, v =	= V/PHF	x f _{HV} x f _p			
Freeway	2751	0.90	Level	22	0	0.901	1.00)	3	393			
Ramp	198	0.90	Level	22	0	0.901)	244					
UpStream					<u> </u>								
DownStream	<u> </u>	Morgo Aroas				Aroas							
Estimation of	F V co	NEIGE AIEas			Estimat	ion of v	Diverge	Altas					
	• 12	(D)			Loumat		<u>12</u>						
1	$v_{12} = v_F$	(P _{FM})			1	1	$v_{12} = v_R + (v_R)$	v _F - v _R)r	FD	\			
L _{EQ} =	(Equa		20-3))	L _{EQ} =		(Equal	1011 25-8 	01 20-9))) 10)			
P _{FM} =	1.000	using Equat	ion (Exhibit 2:	5-5)	P _{FD} =		using t	quation	(EXNIDIL 2	25-12)			
$v_{12} =$	3393 F	DC/N			$v_{12} =$		pc/n	wetten DE	15 or 25	1/)			
$v_3 \cup v_{av34}$	0 pc/r	1 (Equation 2	25-4 OF 25-5)	$v_3 \cup v_{av34}$	> 2 700 n	pc/n (EC		-15 01 25-	-10)			
$15V_3 \text{ or } V_{av34} > 2,70$					$15V_3 OV_{av3}$	34 > 2,700 p							
$15 V_3 OI V_{av34} > 1.5$	v ₁₂ /2 res	5 MINO	. 0)		If Vos V	$_{34} > 1.5 V_{1}$	12 ^{/2} Yes		25 10)				
Copposity Cha		Equation 25	9-0)		Consoit	v Chool		quation	25-16)				
			anacity		Capacit		to Instructural	Cana	city	1 OS E2			
	Actual		арасну		V	<i>F</i>	Fvh	ubit 25-14		LUST			
V _{FO}	3637	Exhibit 25-7		No	$V_{FO} = V_F$	- V _R	Exh	ibit 25-14					
					V _P		Exh	ibit 25-3					
Flow Entering	a Merae In	fluence A	rea		Flow Fn	terina l	Merae Inf	luence	Area				
	Actual	Max	Desirable	Violation?		Actua	I Ma	ax Desirab	le	Violation?			
V _{R12}	3637	Exhibit 25-7	4600:All	No	V ₁₂		Exhibit	25-14					
Level of Serv	ice Detern	nination (if not F)	I.	Level of	Servic	e Determ	ination	íf no	t F)			
D _R = 5.475 +	0.00734 v _R + 0).0078 V ₁₂ - 0.0	0627 L _A		C	0 _R = 4.252	2 + 0.0086 \	/ ₁₂ - 0.00	009 L _D				
D _R = 29.8 (pc	/mi/ln)		c/mi/ln)										
LOS = D (Exhib	oit 25-4)				LOS = (E	xhibit 25	-4)						
Speed Detern	nination		Speed L	Determi	nation								
Speed DeterminationSpeed Determination $M_s = 0.425$ (Exibit 25-19) $D_s = (Exhibit 25-19)$													
S _R = 58.1 mph ((Exhibit 25-19)				S _R = m	ph (Exhibit :	25-19)						
S ₀ = N/A mph (Exhibit 25-19)				S ₀ = m	ph (Exhibit :	25-19)						
S = 58.1 mph ((Exhibit 25-14)				S = m	ph (Exhibit :	25-15)						

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					НС	S+™ D	θE	TAILE	D F	RE	PC	ORT								
General Info	HCS+ [™] DET eneral Information nalyst ALB											matic	on							
	General Information Inalyst ALB Igency or Co. RPM Transportation										ctic	on	SF	R-135	5 & 1-40 €	eas	tbour	nd		
Analyst	Analyst ALB Agency or Co. RPM Transportation Date Performed 5/26/2009 Time Period AM Peak Hour										LED REPORT Site Information SR-135 & I-40 eastbound ramps Area Type All other areas Jurisdiction Putnam Co 2033 Proposed w/ Business Park Project ID 09-0402 Mine Lick Creek - TDOT OC Planning WB NB SI TH RT LT TH RT LT Image: Ima									
Agency or Co	ate Performed 5/26/2009 ime Period AM Peak Hour										ype rtin	'n	Pi	itnan						
Date Perform	ed 5/26/2009											, ,	20	33 P	roposed	w/	Busir	ness		
Time Period	АМ Реак но	bur							Ana	lysi	IS Y	rear	Pa	nrk	-,					
									Pro	ject	ID		09 TE	-040. DOT	2 Mine L OC Plan	ick nin	[·] Cree g	k -		
Volume and	Timing Input																<u> </u>			
					EB			ļ	W	/B					NB			ļ	SB	
			LT		TH	RT		LT	Т	Η		RT	l	_T	TH	F	RT	LT	<u> TH</u>	RT
Number of La	nes, N1		1			1									2	(0	1	2	
Lane Group			L			R									TR			L		
Volume, V (vp	oh)		259			78									988	2	244	191	689	
% Heavy Veh	icles, %HV		5			5									5		5	5	5	
Peak-Hour Fa	ictor, PHF		0.90			0.90									0.90	0.	90	0.90	0.90	
Pretimed (P)		A			A									A		4	A	A		
Start-up Lost		2.0			2.0		ļ			_				2.0	-		2.0	2.0		
	i, e	2.0	<u>,</u>		2.0			_						2.0			2.0	2.0		
Anivar Type, A		3			30					_				3	-		3	3		
Eiltoring/Moto		3.0			3.0	<u> </u>		-						1.000			1.000	1 000		
Initial Lomet		1.000	<u> </u>		1.000									1.000			1.000	1.000		
Ped / Bike / R		0.0		0	0.0								<u>ົ</u>	0.0	+	0	0.0	0.0		
Lane Width		12 0		0	12.0								, 	12.0	<u> </u>	<u> </u>	12 0	12.0		
Parking / Grad		N		0	N					_			V	0		N	N	0	N	
Parking Mane	uvers, Nm				0						+		<u> </u>	v		<u> '</u>	v			7.
Buses Stoppin	ng, NB		0			0							1		0			0	0	
Min. Time for	Pedestrians, G	ip.			3.2										3.2			[3.2	
Phasing	EB Only	[02 03			3	1	04		1	S	B Onl	v	N	S Perm		1	07	0	8
U	G = 50.6	G =	0.0 G =			0.0		G = 0.0	0		G =	= 11.	8	G	= 52.6		G =	0.0	G = (0.0
I iming	Y = 5	Y =	$\begin{array}{c} 0.0 \\ 0 \\ \end{array} \begin{array}{c} V = 0 \\ Y = 0 \end{array}$)		Y = 0		1	Y =	= 5		Y	= 5		Y =	0	Y = 0)
Duration of Ar	nalysis, T = 0.2	5												Cy	cle Lenç	gth,	C =	130.0		
Lane Group	Capacity, Con	trol I	Delay,	and	LOS	Deter	ni	nation										1		
		_	· - 1	<u>E</u>	B	DT	_	-	WB	1		-			NB		.		SB	DT
	· Data .v			11	1		_		IH		ĸ		LI							RI
Adjusted Flow			288			87									1369			212	766	
Lane Group C	apacity, c	(669		4	599				_				-+	1353			212	1839	
V/C Ratio, X		0.	.43		0	.15				_					1.01			1.00	0.42	
Total Green R	Ratio, g/C	0.	.39		0	.39				_				(0.40			0.53	0.53	
Uniform Delay	/, d ₁	2	9.1		2	5.7				_					38.7			40.8	18.2	
Progression F	actor, PF	1.	.000		1	.000				_					1.000			1.000	1.000	
Delay Calibra	tion, k	0.	.11		0	.11				_				(0.50			0.50	0.11	
Incremental Delay, d ₂			0.4			0.1				_					27.4			61.8	0.2	
Initial Queue Delay, d ₃ 0.0			0.0		(0.0				_					0.0			0.0	0.0	
Control Delay 29			29.6		2	25.8									66.1			102.6	18.3	
Lane Group LOS C			С			С									E			F	В	
Approach Del	Approach Delay 28.7													66.	1				36.6	
Approach LO	pproach LOS								E					D						
Intersection D	Approach LOS ntersection Delay							$X_{c} = 0.$	76				Intersection LOS					D		

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	HCS+™ DETAILED REPORT General Information SR-135.8. L40 westbound																			
General Info	rmation								Site	Info	ormat	tion								
Analyst	ALB		Inters	sec	tion	s r	SR-13 amps	5 & <i>I-40</i> 1	wes	tbour	nd									
Agency or Co	Analyst ALB Agency or Co. Date Performed 5/26/2009 Fime Period AM Peak Hour											ORT rmation SR-135 & I-40 westbound ramps on SR-135 & I-40 westbound ramps e All other areas on Putnam County 2033 Proposed w/ Business Park OP-0402 Mine Lick Creek - TDOT OC Planning TT TH RT LT TH RT LT Th 1 2 2 2 2 2 1 7 7R 49 1198 633 5 5 5 90 90 90 90 49 1198 633 5 5 5 5 5 5 90 <								
Data Darform	Consultants			Juris	dict	tion	F	Putnan	n County	/										
Time Period	AM Peak H	our							Analy	/sis	S Year	2 F	2033 F Park	Proposed	/ w/	Busir	ness			
									Proje	ct I	D	C 7	09-040 TDOT	2 Mine L OC Plan	ick. ning	Cree. g	k -			
Volume and	Timing Input																1			
					EB				WE	}				NB				SB		
			LT		TH	RT		LT	TH		RT		LT	ТН	F	۲T	LT	<u> TH</u>	RT	
Number of La	nes, N1							1			<u> </u>		1	2				2	0	
Lane Group	. 1.)							_L					L	1			ļ		1.10	
								247					49	1198			ļ	633	149	
Book Hour Ec	ICIES, %HV							0.00			<u> </u>		5	5			ļ	5	5	
Pretimed (P) or Actuated (A)								0.90 A			<u> </u>		0.90 A	0.90				0.90	0.90	
Pretimed (P) or Actuated (A) Start-up Lost Time, I1 Extension of Effective Green, e								20					20	20				20		
Extension of Effective Green, e Arrival Type, AT								2.0					2.0	2.0	┼─			2.0		
Arrival Type, AT Unit Extension, UE						_		3			1		3	3				3		
Unit Extension	n, UE							3.0			1		3.0	3.0			İ	3.0		
Filtering/Mete	Filtering/Metering, I Initial Unmet Demand, Qb							1.000	1		1		1.000	1.000	1		<u> </u>	1.000		
Initial Unmet I							0.0			1		0.0	0.0	1			0.0			
Ped / Bike / R						0	0				0	0			0	0	0			
Lane Width						12.0				:	12.0	12.0				12.0				
Parking / Grad						Ν	0		N		Ν	0	1	V	N	0	N			
Parking Mane	euvers, Nm																			
Buses Stoppi	ng, Nв							0					0	0			ļ	0		
Min. Time for	Pedestrians, C	b p							3.2	?				3.2				3.2		
Phasing	WB Only	()2		0	3		04			NB OI	nly	<u> </u>	IS Perm		(07	0	8	
Timing	G = 76.2	G =	0.0		<u>G =</u>	0.0		G = 0.	0	6	$\beta = 6.$	4	G	= 32.4		G =	0.0	G = (0.0	
Duration of A	Y = 5	Y =	0		Y =	0		Y = 0		Y	' = 5		Y	= 5		Y =	0	Y = ()	
Duration of Al	$\frac{1}{2} \frac{1}{2} \frac{1}$.5)alay			Dete		nation						/cie Leng	gth,	C =	130.0			
Lane Group	Capacity, Con		pelay,		B R	Dete	<u>rmn</u>	nation	W/B			1		NB			[SB		
			LT		ΗI	RT		Т	TH		RT	L	т (TH	R	Т	LT		RT	
Adjusted Flow	v Rate, v						2	74				5	4	1331				869		
Lane Group C	Capacity, c						10	008				14	41	1161				834		
v/c Ratio, X							0.2	27				0.3	38	1.15				1.04		
Total Green F	Ratio, g/C						0.5	59				0.3	34	0.34				0.25		
Uniform Delay	y, d ₁						13	8.2				33.	.9	43.1				48.8		
Progression F	Factor, PF						1.0	000				1.0	000	1.000				1.000		
Delay Calibra	Delay Calibration, k						0.	11				0.1	11	0.50				0.50		
Incremental Delay, d						0).1				1.	.7	76.4				42.6			
Initial Queue Delay, d ₃					0.	0				0.0	0	0.0				0.0				
Lane Group LOS						1:	3.4				35	b.6	119.5				91.4			
Approach Delay							<u>ح</u>)	<i>F</i>							
	Approach Delay							13.4	4			116.2				91.4				
								<u> </u>	50				+					۲ ۲		
	relay		96.	5				$r_c = 0.$.09			Int	ersect	ION LOS			<u> </u>	F		

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		RAMP	S AND RA	AMP JUNCTI	ONS WOP	RKS	HEET			
General Infor	mation			Site Infor	mation					
Analyst Agency or Company Date Performed Analysis Time Perioo	ALB RPM 5/22/2 9 PM P	Transportatior 2009 Peak Hour	Consultants	Freeway/Dir of Tr Junction Jurisdiction Analysis Year	avel I- E F 2	40 (Ea Exit Rai Putnam 033 Pr	istbound) mp to SR-13 Co roposed w/ E	35 Business Park		
Project Description	09-0402 Mine I	Lick Creek IJS	- TDOT OC PI	anning						
Inputs		Terrain: Leve	2					ſ	Downotroo	m Adi
	ı							F	Ramp	ili Auj
No Of	f								Ves	On Off
L _{up} = ft								L	down =	ft
V _u = veh/h	I	S	5 _{FF} = 70.0 mp Sketo	bh ch (show lanes, L.,	$S_{FR} = 35$	5.0 mpl	n		/ _D =	veh/h
Conversion t	o pc/h Und	der Base	Condition	IS	D' K' I'					
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f _{HV}	f _p v	/ = V/PHF	x f _{HV} x f _p
Freeway	3124	0.90	Level	22	0	0.0	901	1.00	38!	53
Ramp	325	0.90	Level	22	0	0.0	901	1.00	40	1
UpStream		ļļ				ļ				
DownStream	<u> </u> ,	Morgo Aroas						wordo Aroas		
Estimation of	f V .co	Merge Areas			Estimati	on o	fv.e	verge Areas		
	· 12	(D)				••	· · 12			
1	$v_{12} = v_F$	(P _{FM})	. 05. 0)				v ₁₂ = 7	v _R + (v _F - v _R)P _{FD}	
$L_{EQ} =$	(⊏qua		(20-3)		L _{EQ} =		(E	quation 25-8	OF 25-9)	10 10)
F _{FM} =	using	Equation (i	EXHIDIL 20-0)		$r_{FD} =$		1.00	JU USING EQU	Jation (Exh	IDIL 25-12)
$v_{12} - v_{12}$	pc/n	(Faultion Of			$v_{12} =$		385	3 pc/n ⊳/h (⊏auratia		05.40)
$v_3 \cup v_{av34}$	pc/n (0 nc/b2 □ Vo		5-4 01 25-5)		$v_3 \cup v_{av34}$	< 2 7I	0 pc/b2	Vac Vac	11 25-15 01	25-16)
$15V_3 OV_{av34} > 2,70$					$15 V_3 01 V_{av3/}$	1 × 2,1	* V /2			
$15 V_3 OI V_{av34} > 1.5$	v ₁₂ /2 res	S III NO	- 0)		$\int V_3 \cup V_{av34}$	1 > 1.5	v ₁₂ /2	Yes MNO	25 19)	
$\frac{1}{12a}$			5-6)		$\Gamma_{12a} =$	Ch	pc pc		20-16)	
Capacity Che			anacity		Capacity		Actual	Car	acity	1.0S E2
	Actual		арасну		V		2052	Evhihit 25-1/	1800	No
V		Evhihit 25.7			V = V	. V	2452	Exhibit 25 14	4000	No
* FO		LATIIDIL 23-7			VFO VF	*R	3432		4000	No
		(] (]					401	EXTINUE 20-3	2000	INO
Flow Entering	g ivierge in	Max	Dosirable	Violation?	FIOW Ent		g werge	Max Docirabl	Area	Violation?
V _{R12}	Actual	Exhibit 25-7	Desilable		V ₁₂	3	853	Exhibit 25-14	4400:All	No
Level of Serv	ice Detern	nination (if not F)	I	Level of	Serv	vice Det	ermination	n (if not l	F)
$D_{R} = 5.475 + 0.$	00734 v _R + (0.0078 V ₁₂ -	• 0.00627 L ₄		D	_R = 4.	252 + 0.0	086 V ₁₂ - 0.0	009 L _D	
$D_p = (pc/mi/$	ln)	12	~		$D_{p} = 34.$	(pc/	mi/ln)	12	D	
LOS = (Exhibi	, it 25-4)				LOS = D (Exhib	oit 25-4)			
Speed Deterr	nination				Speed D	eter	minatio	n		
$M_s = $ (Exibit 2)	5-19)				$D_{s} = 0.4$	64 (E:	khibit 25-1	9)		
$S_{p} = mph (Exh$, nibit 25-19)				S _R = 57.	0 mph	(Exhibit 2	5-19)		
$S_0 = mph (Exh$, ibit 25-19)				S ₀ = N/A	A mph	(Exhibit 2	5-19)		
S = mph (Exh	nibit 25-14)				S = 57.	0 mph	(Exhibit 2	5-15)		

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	RA	MPS AND	RAMP JU	INCTIONS W	ORKSHE	ET				
General Infor	mation			Site Infor	mation					
Analyst Agency or Company Date Performed Analysis Time Period Project Description	ALB RPM 5/22/2 9 PM P	Transportation 2009 Jeak Hour	Consultants	Freeway/Dir of Tra Junction Jurisdiction Analysis Year	avel I	I-40 (Eas Entrance Putnam 2033 Pro	stbound) e Ramp fro Co pposed w/	om SR-135 Business Par	ʻk	
Inputs	07 0402 1011101			ng						
Upstream Adj Ramp		Terrain: Leve	I						Downstre Ramp	am Adj
Yes Or	ı								Tes Yes	🗖 On
No Of	f								🗹 No	Cff Off
L _{up} = ft		S	= 70.0 mp	h	S = 3	5 0 mph			L _{down} =	ft
V _u = veh/h	I		Sketc	h (show lanes, L _A ,	$U_{\rm FR} = 0$ $L_{\rm D'}V_{\rm R'}V_{\rm f}$	0.0 mpn			V _D =	veh/h
Conversion to	o pc/h Und	der Base (Condition	s						
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _F	iv	fp	v = V/PHF	⁼ x f _{HV} x f _p
Freeway	2799	0.90	Level	22	0	0.90)1	1.00	3	3452
Ramp	560	0.90	Level	22	0	0.90)1	1.00		691
UpStream		ļļ								
DownStream	<u> </u>	Morgo Aroas						livorgo Aroas		
Estimation of	f Van	Nerge Areas			Estimati	ion of	Van	nerge Areas	,	
	1 2	(P)						(+ () / -)	/)P	
	V ₁₂ - V _F	(1_{FM})	25-3)				v ₁₂ - v	$R = (V_F = V_F)$	'R ^{/F} FD 5-8 or 25-0))
$E_{EQ} =$	(∟qua 1.000	ucina Equat	20-0)	5 5)	EQ -		(ion (Evhibit	7 25 12)
FM -	1.000 2452 r	using Equal		5-5)	'FD -			using ∟quat bo/b		ZJ-1Z)
V or V	0 pc/k	(Equation (05 1 or 25 5	N N	$V_{12} =$		۲	oc/h (Equation	25 15 or 25	16)
$V_3 = V_{av34}$	0 pc/i 0 nc/h? 🗖 Vor		20-4 01 20-0)	Is V or V	> 2 70	ו ח nc/h? 🗖		o	-10)
$15V_3 \text{ or } V_{av34} > 2,70$					Is V. or V	34 × 2,70	V /2		0	
If Yes V =	nc/h (Equation 25	(-8)		If Yes V =	34 - 1.0	*12′~ r	res in oc/b (Equati	u ion 25-18)	
Canacity Che	point		, 0)			v Cho	cks		1011 20 10)	
	Actual		anacity	1.0S.F2			Actual		anacity	10S F2
	/ lotual	Ĩ	apaony		V_		notaan	Exhibit 25	-14	
V _{FO}	4143	Exhibit 25-7		No	$V_{FO} = V_F$	- V _R		Exhibit 25	-14	
					V _R			Exhibit 25	5-3	
Flow Entering	g Merge In	fluence A	rea		Flow En	tering	g Merg	e Influen	ce Area	
	Actual	Max	Desirable	Violation?		Ac	tual	Max Des	sirable	Violation?
V _{R12}	4143	Exhibit 25-7	4600:All	No	V ₁₂			Exhibit 25-14		
Level of Serv	ice Detern	nination (i	if not F)		Level of	Serv	ice De	terminati	ion (if no	ot F)
D _R = 5.475 +	0.00734 v _R + 0).0078 V ₁₂ - 0.0	0627 L _A			0 _R = 4.2	252 + 0.0	0086 V ₁₂ - (0.0009 L _D	
D _R = 34.0 (pc	:/mi/ln)				D _R = (p	c/mi/ln)			
LOS = D (Exhib	oit 25-4)				LOS = (E	xhibit 2	25-4)			
Speed Detern	nination				Speed D	Detern	ninatio	n		
M _S = 0.528 (Exi	bit 25-19)				$D_s = (E)$	xhibit 25	-19)			
S _R = 55.2 mph	(Exhibit 25-19)				S _R = m	oh (Exhil	oit 25-19)			
S ₀ = N/A mph (Exhibit 25-19)				S ₀ = m	oh (Exhil	oit 25-19)			
S = 55.2 mph	(Exhibit 25-14)				S = m	oh (Exhil	oit 25-15)			

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		RAMP	S AND RA	MP JUNCTI	ONS WOP	RKS	HEET			
General Infor	rmation			Site Infor	mation					
Analyst Agency or Company Date Performed Analysis Time Perioo	ALB RPM 5/22/3 D PM P	Transportation 2009 Jeak Hour	Consultants	Freeway/Dir of Tr Junction Jurisdiction Analysis Year	avel I- E F 2	40 (W Exit Ra Putnam 033 P	estbound) mp to SR-13 n Co roposed w/ E	5 Business Park		
Project Description	09-0402 Mine I	Lick Creek IJS	- IDOT OC Pl	anning						
Inputs		Terrain: Leve	!					ſ	Downstrea	m Adi
Yes Or	ı							F	Ramp	
No Of	f								I Yes ▼ No	On Off
L _{up} = ft								L	down =	ft
V _u = veh/h	1	S	FF = 70.0 mp Sketo	h :h (show lanes, L _A ,	$S_{FR} = 35$ $L_{D'}V_{R'}V_{f}$	5.0 mp	h		/ _D =	veh/h
Conversion t	o pc/h Und	der Base	Condition	s	D IN I			J_		
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv		f _{HV}	f _p v	′ = V/PHF	x f _{HV} x f _p
Freeway	2466	0.90	Level	22	0	0.	901	1.00	304	41
Ramp	506	0.90	Level	22	0	0.	901	1.00	62	4
UpStream						ļ				
DownStream	<u> </u>	Morgo Aroas						Iorgo Aroas		
Estimation of	f Van	Nerge Areas			Estimati	on o	of Van	reige Areas		
	12 V - V	(P)					1 <u>2</u>)P	
	V ₁₂ - V _F	(' _{FM}) ation 25-2 or	· 25-3)		_		v ₁₂ – (E	$R^{+}(VF^{-}VR)$	/ ^F FD	
	(⊑qua	Equation (20-3		EQ -		(⊑ 1.00		01 23-9)	101 10
FM -	using		EXHIBIT 20-0)		FD -		1.00	/∪ using ⊑qu 1. no/h	Jation (EXII	IUIL 20-12)
$V_{12} =$	pc/n	Equation 25	5 4 or 25 5)		$v_{12} - v_{12}$		304	ι pc/n	- OF 15 er	05.40)
$V_3 \circ V_{av34}$	pc/h 0 nc/h2 🗖 Ver		5-4 01 25-5)		$v_3 \circ v_{av34}$	<pre>> 2 7</pre>	ין U 00 pc/b2 🗔	Vee <u></u> Ne	1 25-15 01	25-16)
$15V_3 \text{ or } V_{av34} > 2,70$					$15V_3 Or V_{av32}$	1 ~ 2,7 ~ 1 5	* V/ /2			
If $V_{es}V =$	^v ₁₂ ^{/2} i tes	Equation 25	5-8)			1 ~ 1.5	12 ^{/2}	/b (Equation	25-18)	
Capacity Che	pont		5-0)		Canacity	Ch	pc.		23-10)	
	Actual		anacity	1.05.E2	Capacity		Actual	Car	acity	1.05 F2
	/ lotual	Ĩ	apacity		V _E		3041	Exhibit 25-14	4800	No
V		Exhibit 25-7			$V_{-2} = V_{-}$. V_	2/17	Exhibit 25-14	1800	No
. FO					V	- R	624	Exhibit 25.2	2000	No
Elow Entoring	a Morao In	fluonoo	raa			torin	oz4			NO
FIOW Entering	Actual		Desirable	Violation?				Max Desirabl	AIEa	Violation?
V _{R12}	riotadi	Exhibit 25-7	Desirable		V ₁₂	3	8041	Exhibit 25-14	4400:All	No
Level of Serv	ice Detern	nination (if not F)		Level of	Ser	vice Det	ermination	ı (if not l	F)
$D_{R} = 5.475 + 0.$.00734 v _R + (0.0078 V ₁₂ -	0.00627 L _A		D	_R = 4.	.252 + 0.0	086 V ₁₂ - 0.0	009 L _D	
$D_p = (pc/mi/$	/ln)	12	~		$D_{p} = 27.$	9 (pc)	/mi/ln)	12	D	
LOS = (Exhibi	, it 25-4)				LOS = C (Exhi	oit 25-4)			
Speed Deterr	nination				Speed D	eter	minatior	1		
$M_{\rm S} =$ (Exibit 2	5-19)				D _s = 0.4	84 (E	xhibit 25-1	9)		
$S_{p} = mph (Exh$, nibit 25-19)				S _R = 56.	4 mph	(Exhibit 2	5-19)		
$S_0 = mph (Exh$, nibit 25-19)				S ₀ = N/A	A mph	(Exhibit 2	5-19)		
S = mph (Exh	nibit 25-14)				S = 56.	4 mph	(Exhibit 2	5-15)		

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	RA	MPS AND	RAMP JU	NCTIONS W	ORKSHE	ET				
General Infor	mation			Site Infor	mation					
Analyst Agency or Company Date Performed Analysis Time Perioc Project Description	ALB RPM 5/22/2 I AM P 09-0402 Mine I	Transportation 2009 'eak Hour Lick Creek - TD	Consultants	Freeway/Dir of Tra Junction Jurisdiction Analysis Year	avel	I-40 (West Entrance F Putnam Co 2033 Prop	bound) Ramp from o osed w/ Bu	SR-135 usiness Par	k	
Inputs										
Upstream Adj Ramp		Terrain: Leve							Downstrea Ramp	am Adj
Yes Or	1								Ves	🗖 On
No Off	f								Mo No	Cff Off
L _{up} = ft		s	= 70.0 mp	h	S = 3	5 0 mnh			L _{down} =	ft
V _u = veh/h	I		Sketc	h (show lanes, L _A ,	$L_{D'}V_{R'}V_{f}$	0.0 mpn			V _D =	veh/h
Conversion to	o pc/h Und	der Base (Condition	s						
(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f _{H∨}	,	f _p	v = V/PHF	x f _{HV} x f _p
Freeway	1960	0.90	Level	22	0	0.901		1.00	2	417
Ramp	275	0.90	Level	22	0	0.901		1.00		339
UpStream		ļļ			ļ					
DownStream	<u> </u>				<u> </u>			orgo Aroac		
Estimation of	F V co	vierge Areas			Estimat	ion of v	Via	erge Areas		
	• 12	(D)			Louman		12	. 07 . 17		
	$v_{12} = v_F$	(P _{FM})	05.0				$v_{12} = v_R$	+ (v _F - v	R ^{)P} FD	\
L _{EQ} =	(Equa		20-3)	\	L _{EQ} =		(E0	Juation 28	0-8 01 23-9))) 1)
F _{FM} =	1.000	using Equati	ion (Exhibit 25	D-5)	F _{FD} =		usi	ng ⊑quau /⊾		20-12)
$v_{12} =$	2417 p	DC/N			$v_{12} =$		pc/	'n h (Faustion	DE 1E or DE	1/)
$v_3 \cup v_{av34}$	0 pc/r	1 (Equation 2	25-4 Of 25-5)		v_3 or v_{av34}	> 2 700	pc/b2		25-15 01 25	-10)
$15V_3 \text{ or } V_{av34} > 2,70$		S M NO			$13V_3 OIV_{av3}$	34 > 2,700		res Ind	5	
$15 V_3 OI V_{av34} > 1.5$	v ₁₂ /2 res	5 MINO	0)		$15 V_3 OI V_{av3}$	34 ~ 1.5 1	'12' ²	res 🔲 No /b (Equati	$\frac{1}{2}$	
Copposity Cha		Equation 25	-0)		\mathbf{C}_{2}	v Choo	pc/	n (Equaii	01125-16)	
			anacity		Capacity		Actual		anacity	1.05.52
	Actual		арасну		V		Actual	Exhibit 25.	.14	LUST
V _{FO}	2756	Exhibit 25-7		No	$V_{FO} = V_F$	- V _R		Exhibit 25	.14	
								Exhibit 25	-3	
Flow Entering	a Merae In	fluence A	rea	I	Flow En	terina	Merge	Influen	ce Area]
	Actual	Max	Desirable	Violation?		Actu	al	Max Des	irable	Violation?
V _{R12}	2756	Exhibit 25-7	4600:All	No	V ₁₂		Ex	hibit 25-14		
Level of Serv	ice Detern	nination (i	if not F)	1	Level of	Servio	ce Dete	rminati	on (if no	t F)
D _R = 5.475 +	0.00734 v _R + 0).0078 V ₁₂ - 0.0	0627 L _A		C	0 _R = 4.25	52 + 0.00	86 V ₁₂ - 0	.0009 L _D	
D _R = 22.9 (pc	/mi/ln)				D _R = (p	c/mi/ln)				
LOS = C (Exhib	oit 25-4)				LOS = (E	xhibit 25	5-4)			
Speed Detern	nination				Speed D	Determ	ination			
M _S = 0.338 (Exil	bit 25-19)				D _s = (E	xhibit 25-1	9)			
S _R = 60.5 mph ((Exhibit 25-19)				S _R = m	oh (Exhibit	25-19)			
S ₀ = N/A mph (Exhibit 25-19)				S ₀ = m	oh (Exhibit	25-19)			
S = 60.5 mph ((Exhibit 25-14)				S = m	oh (Exhibit	25-15)			

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					нс	S+™ D)E	TAILE	ED	RE	Ρ	ORT								
General Info	rmation								Si	ite In	ıfo	rmatie	on							
								Í	Int	terse	ecti	ion	SF	R-13	5 & <i>I-40</i>	eas	tbour	nd		
Analyst	ALB								٨r				ra.	mps Loth	or orooo					
Agency or Co	. RPM Transp	oortat	tion							iriedi	yµ cti	on	All Di	i Uli k itnar	n Co					
Date Perform	ed 5/26/2009								Ju				20)33 F	roposec	l w/	Busir	ness		
I ime Period	РМ Реак Но	bur							An	nalys	sis	Year	Pa	ark		,	20.0			
									Pr	rojec	t ID	5	09 TI	9-040 COT	2 Mine I	_ick	Cree	k -		
Volume and	Timing Input						_]			_		12	01		<u></u>	9			
	v				EB				١	WB					NB				SB	
			LT		TH	RT		LT		ΤH		RT		LT	TH		RT	LT	ТН	RT
Number of La	nes, N1		1			1		ļ							2		0	1	2	
Lane Group			L			R		ļ							TR	<u> </u>		L	<u> </u>	
Volume, V (vp	oh)		264			61		ļ							650	2	235	325	1000	
% Heavy Veh	icles, %HV		5			5		ļ							5		5	5	5	
Peak-Hour Fa	ctor, PHF		0.90			0.90		ļ							0.90	0.	<u>90</u>	0.90	0.90	
Pretimed (P)	or Actuated (A)		A			A		ļ							A	1	4	A	A	
Start-up Lost	Time, I1		2.0			2.0		ļ	_		_				2.0			2.0	2.0	
Extension of E	ffective Greer	і, е	2.0			2.0		ļ			_				2.0			2.0	2.0	
Arrival Type,	41		3			3		<u> </u>	_		_				3			3	3	
Unit Extension	n, UE		3.0			3.0									3.0	-		3.0	3.0	
Filtering/Wete	ring, i		1.000	,		1.000	<u> </u>		_						1.000			1.000	1.000	
			0.0		0	0.0		ļ			_				0.0	+	0	0.0	0.0	
Lano Width	Ped / Bike / RTOR Volumes _ane Width				0	12.0		<u> </u>			_			0	12.0		0	12.0	12.0	
	_ane Width Parking / Grade / Parking				0	12.0					_			N	12.0		N	12.0	12.0	
Parking / Grad	_ane Width Parking / Grade / Parking Parking Maneuvers. Nm				0	11			╎		_			v		'	v			11
Buses Stoppi	na. Nв		0			0			╎						0	1		0	0	
Min. Time for	Pedestrians. G	in a	-		3.2			1							3.2	_!			3.2	J
Phasing	FB Only	<u> </u>	02	1	0	3	ſ	04		1	ç	SB On	<u> </u>		IS Perm		1	07	0	8
g	G = 12.7	G =	0.0		G = 1	- 0.0	┤	G = 0	0		G	= 10.	.2	G	= 22.1		G =	0.0	G = (-).0
Timing	Y = 5	Y =	0		Y = ()		Y = 0			Υ	= 5		Y	= 5		Y =	0	Y = 0)
Duration of Ar	nalysis, T = 0.2	5												C	cle Len	gth,	C =	60.0		
Lane Group	Capacity, Con	trol I	Delay,	and	d LOS	Deter	mi	ination												
				E	B				W	/B					NB				SB	
			LT		H	RT			TH	4	F	RT	LT		TH		T	LT	<u> TH </u>	RT
Adjusted Flow	/ Rate, v		293			68									983			361	1111	
Lane Group C	Capacity, c		364			326									1218			413	2142	
v/c Ratio, X		0	.80		C	.21									0.81			0.87	0.52	
Total Green R	Ratio, g/C	0	.21		C	.21									0.37			0.62	0.62	
Uniform Delay	/, d ₁	2	2.5		1	9.5									17.0			13.1	6.3	
Progression F	actor, PF	1	.000		1	.000									1.000			1.000	1.000	
Delay Calibra	tion, k	0	.35		C	.11									0.35			0.40	0.12	
Incremental D	elay, d ₂	1	12.4			0.3									4.1			18.4	0.2	
Initial Queue I	Delay, d ₃	0	0.0		(0.0									0.0			0.0	0.0	
Control Delay		3	34.9			19.8									21.2			31.4	6.6	
Lane Group L	OS		С			В									С			С	A	
Approach Del	ау		32.	1	/									21.	2				12.7	
Approach LO	S		С											С					В	
Intersection D	elay		18.	1				$X_{c} = 0.$.85	5			Inte	rsec	ion LOS	i			В	

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					нс	S+™ I	DE	TAIL	ED	RE	PC	DRT								
General Info	rmation				Sit	te In	for	mati	ion											
Analyst	ALB RPM Transi	ortat	ion						Int	erse	ctic	on	S ra	R-135 amps	5& 1-40 1	ves	tbour	nd		
Agency or Co	· Consultants	Jontati	1011						Are		ype	3	A	li otne	r areas					
Date Perform	ed 5/26/2009								Jui	risai	ctio	n	P 2	utnan ∩วว ¤	roposod	·	Dunir	000		
Time Period	PM Peak He	our							An	alys	is Y	<i>l</i> ear	P	Park	oposeu	VV/	Dusii	1000		
									Pro	oject	: ID)	0: T	9-040 DOT (2 Mine L OC Plan	.ick ning	Cree. g	k -		
Volume and	Timing Input																			
					EB				V	NΒ					NB			<u> </u>	SB	
			LT		TH	RT		LT		TH		RT		LT	TH	<u> </u>	RΤ	LT	<u> TH</u>	RT
Number of La	nes, N1							1						1	2			ļ	2	0
Lane Group			ļ								_			L	1			ļ		0.15
Volume, V (Vp	on)		<u> </u>					227						60	854				1098	215
Book Hour Fo	ICIES, %HV							5						5	5				5	5
Peak-Hour Fa	CLOI, PHF		<u> </u>					0.90			_			<u>۸.90 م</u>	0.90			<u> </u>	0.90	0.90
Start-up Lost	Time I							20	_		_			A 20	20				20	A
Extension of F	-ffective Green							2.0			-			2.0	2.0				2.0	
Arrival Type	AT	, 0						3	_				1	3	3	+			3	
Unit Extension	n UF							30						30	30				30	
Filtering/Mete	rina. I					1		1.000					1	1.000	1.000	1			1.000	
Initial Unmet I	Demand. Qb		1					0.0						0.0	0.0	1			0.0	1
Ped / Bike / R	ed / Bike / RTOR Volumes					1		0		0				0	0			0	0	0
Lane Width	ane Width							12.0					1	2.0	12.0	1		<u> </u>	12.0	
Parking / Grad	ane Width Parking / Grade / Parking							N	-	0		Ν		Ν	0	1	V	N	0	N
Parking Mane	uvers, Nm		1												1					
Buses Stoppi	ng, Nв							0						0	0				0	
Min. Time for	Pedestrians, G	i p								3.2					3.2				3.2	
Phasing	WB Only	(02		0	3		04			Ν	B On	nly	N	S Perm			07	0	8
Timing	G = 26.3	G =	0.0		G = (0.0		G = 0.	.0		G =	= 5.0	0	G	= 63.7		G =	0.0	G = 0	0.0
	Y = 5	Y =	0		Y = C)		Y = 0			Y =	= 5		Y :	= 5		Y =	0	Y = ()
Duration of Ar	halysis, $T = 0.2$	25					_				_			Су	cle Leng	gth,	C =	110.0		
Lane Group	Capacity, Con	trol E	Delay,	and	LOS	Deter	rmi	ination					1					1	0.0	
			I T	E Tu	R R	DT		IT		r (R	D.	_	17	-		D	т		SB	DT
Adjusted Flow	/ Rate, v				1		2	252		1	<u> </u>	1	67	7	949		1		1459	
Lane Group C	Capacity, c						4	411					18	80	2308				1946	
v/c Ratio, X							0.	61					0.3	7 (0.41				0.75	
Total Green R	Ratio, g/C						0.	24				Í	0.6	7 (0.67				0.58	
Uniform Delay	/, d ₁						37	7.3					13.0	0	8.3				17.2	
Progression F	actor, PF						1.	000					1.0	00	1.000				1.000	
Delay Calibra	tion, k						0.	20					0.1	1 (D.11				0.30	
Incremental D	elay, d ₂						2	2.7					1.:	3	0.1				1.7	
Initial Queue I	Delay, d ₃						0	.0					0.0)	0.0				0.0	
Control Delay							4	0.0					14.	.3	8.4				18.9	
Lane Group L	OS							D					В		Α				В	
Approach Del	ay						_	40.	0					8.8					18.9	
Approach LO	S						_	D						Α					В	
Intersection D	elay		17.	1				$X_{c} = 0$).72				Inte	ersect	ion LOS				В	

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FUTURE YEAR 2033 BENNETT ROAD AT LEE SEMINARY ROAD

				H	ICS	+™	DE	TAIL	.ED) RE	PC	DRT						
General Int	formation								Site	Infor	ma	ation						
Analyst	JH							1	Inter	rsectio	on	L. B	EE SEN ENNET	1INA T RI	RY D	RD &		
Agency or C	Co. RPM T	ranspor	tatio	n				4	Area	а Туре	Э	A	ll other	area	S			
Date Perfor	med 5/26/20	09							Juris	sdictic	n	Р	utnam (Co				
Time Period	AM Pea	ak Hour							Ana	lvsis	/ea	ar 2	033 Pro	pose	ed v	v/ Busin	ess	
								ľ	, in lo	iyele		~' P	ark	N 1im a				
								1	Proj	ect ID)		9-0402 DOT 00	D Pla	; LIC anni	ina	κ -	
Volume an	d Timina In	put														ng		
	<u> </u>			EB				\	NΒ				NB				SB	
		LT		TH	R	Г	LT	1	ГН	RT	•	LT	ТН	R	Т	LT	TH	RT
Number of I	_anes, N1	1		1	0		1		1	2		1	1	1		2	1	1
Lane Group)	L	7	R			L		Т	R		L	Т	R		L	Т	R
Volume, V (vph)	73	1	59	5		33	3	30	345	5	5	33	19	6	2264	30	45
% Heavy Ve	ehicles, %H	√ 5		0	5		0	()	0		0	5	5		5	5	0
Peak-Hour	Factor, PHF	0.90	0.	90	0.90	2	0.90	0.	90	0.90)	0.90	0.90	0.9	0	0.90	0.90	0.90
Pretimed (P (A)) or Actuate	d A		4	A		A	4	4	A		А	A	A		А	А	А
Start-up Los	st Time, I1	2.0	2	.0			2.0	2.	.0	2.0		2.0	2.0	2.0)	2.0	2.0	2.0
Extension o Green, e	f Effective	2.0	2	.0			2.0	2.	.0	2.0		2.0	2.0	2.0)	2.0	2.0	2.0
Arrival Type	e, AT	3		3			3		3	3		3	3	3		3	3	3
Unit Extens	3.	.0	3.0		3.0	3.0	3.0)	3.0	3.0	3.0							
Filtering/Me	tering, I	1.00	0 1.	000			1.00	0 1.	000	1.00	0	1.000	1.000	1.0	00	1.000	1.000	1.000
Initial Unme	t Demand, (Qb 0.0	0	.0			0.0	0.	.0	0.0		0.0	0.0	0.0)	0.0	0.0	0.0
Ped / Bike / Volumes	RTOR	0		0	0		0	0)	0		0	0	40)	0	0	0
Lane Width		12.0	12	2.0	1		12.0	12	2.0	12.0)	12.0	12.0	12.	0	12.0	12.0	12.0
Parking / G	rade / Parkir	ng N		0	N		N	()	N		N	0	N		Ν	0	N
Parking Ma	neuvers, Nr	1																
Buses Stop	ping, Nв	0		0			0		0	0		0	0	0)	0	0	0
Min. Time for	or		.3	2				.3	2				32				32	
Pedestrians,	, Gp									1			0.2		1	<u> </u>	-1	
Phasing	EW Perm	02	2		03	_		04		SE	30	nly	NS Pe	rm		07		08
Timing	G = 10.0	G = C).0	G	= 0.	0	G	=		G =	8	5.0	G = 10	0.0	G :	= 0.0	<u>G =</u>	0.0
	Y = 5	Y = C)	Y :	= 0		Y	=		Y =	5		Y = 5		Y :	= 0	Y =	0
Duration of	Analysis, I	= 0.25		1	l					<i>t</i>			Cycle L	engt	n, C	J = 12	0.0	
Lane Grou	p Capacity,	Contro		lay,	ana		15 De			τιοπ	Г		NB				SB	
		IT	ГТН		RT		т	ГТН	Ţ	RT	┢	IT I		RT	-	IT	ТН	RT
Adjusted Flo	ow Rate, v	81	183	3		3	37	33		383	Γ	6	37	173	3	 2516	33	50
Lane Group c	Capacity,	111	157	7		6	63	158	2	2382	1	117	151	128	3	2364	1508	1346
v/c Ratio, X		0.73	1.17	,		0.5	59	0.21	C	0.16	0.	05	0.25	1.35	5	1.06	0.02	0.04
Total Green	Ratio, g/C	0.08	0.08	3		0.0	08	0.08	C	.83	0.	08	0.08	0.08	}	0.71	0.83	0.83
Uniform De	lay, d ₁	53.7	55.0)		53	3.0	51.3		1.9	50	0.6	51.5	55.0)	17.5	1.7	1.7
Progression	Factor, PF	1.000	1.00	0		1.(000	1.00	0 1	.000	1.	000	1.000	1.00	0	1.000	1.000	1.000
ļ			1					I			L							I

Delay Calibration, k	0.29	0.50		0.18	0.11	0.11	0.11	0.11	0.50	0.50	0.11	0.11
Incremental Delay, d ₂	21.5	123.3		13.5	0.7	0.0	0.2	0.8	200.8	38.4	0.0	0.0
Initial Queue Delay, d ₃	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay	75.2	5.2 178.3 F			52.0	2.0	50.8	52.3	255.8	55.9	1.7	1.7
Lane Group LOS	Е	F		Е	D	A	D	D	F	Е	А	Α
Approach Delay	14	6.7		1	0.9		21	5.2			54.2	
Approach LOS	l I	=			В			F		ĺ	D	
Intersection Delay	65	5.4		$X_{c} =$	1.10		Interse	ction LC	DS		Е	
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HCS+TM Version 5.21

				H	ICS	+™	DE	ΤΑΙ	ILE	D	REF	۶C	DRT						
General Int	formation								Sit	e	Infor	ma	ation						
Analyst	JH								Inte	ers	sectio	n	L. B	EE SEI ENNET	MINA TT R	IRY D	RD &		
Agency or C	Co. RPM T	ranspor	tatio	n					Are	ea	Туре	;	A	ll other	area	IS			
Date Perfor	med 5/26/20	09							Jur	iso	dictio	n	Р	utnam	Со				
Time Period	d PM Pea	ak Hour	•						An	aly	/sis Y	′ea	ar 2	033 Pro	pos	ed v	v/ Busin	ess	
													P O	ark 9-0402	Min	⊳ I ir	rk Cree	k -	
									Pro	oje	ct ID		T	DOT O	C Pl	anni	ing		
Volume an	d Timing In	put																	
				EB					WB	}				NB				SB	-
				TH	R	Г	LT		ΤH		RT		LT	ТН	F	T	LT	TH	RT
Number of I	_anes, N1	1		1	0		1		1		2		1	1	1		2	1	1
Lane Group)		7	R			L		Т		R	_	L	T	F	2	L	T	R
Volume, V (vph)	78		36	7		172		147	_	1893	3	7	33	4	2	478	43	125
% Heavy Ve	ehicles, %H	V 5		0	5		0		0	_	0	_	0	5	5		5	5	0
Peak-Hour	Factor, PHF	0.90	0.	90	0.90	2	0.90).90	_	0.90	_	0.90	0.90	0.9	90	0.90	0.90	0.90
(A)) of Actuate		4	A	Α		Α		Α		Α		Α	A	A		A	A	A
Start-up Los	st Time, I1	2.0	2	2.0			2.0		2.0		2.0	┛	2.0	2.0	2.	0	2.0	2.0	2.0
Extension o Green, e	f Effective	2.0	2	2.0			2.0		2.0		2.0		2.0	2.0	2.	0	2.0	2.0	2.0
Arrival Type	e, AT	3		3			3		3		3		3	3	3		3	3	3
Unit Extens	ion, UE	3.0	3	8.0	Í		3.0		3.0		3.0		3.0	3.0	3.	0	3.0	3.0	3.0
Filtering/Me	tering, I	1.00	0 1.	000			1.00	0 1	1.000)	1.00	0	1.000	1.000) 1.(000	1.000	1.000	1.000
Initial Unme	t Demand, (Qb 0.0	0	0.0			0.0		0.0		0.0		0.0	0.0	0.	0	0.0	0.0	0.0
Ped / Bike / Volumes	RTOR	0		0	0		0		0		0		0	0	0)	0	0	0
Lane Width		12.0	12	2.0			12.0	1	12.0		12.0		12.0	12.0	12	.0	12.0	12.0	12.0
Parking / G	rade / Parkir	ng N		0	N		Ν		0		Ν		N	0	Λ	1	N	0	N
Parking Ma	neuvers, Nm	1			Í														
Buses Stop	ping, Nв	0		0			0		0		0		0	0	()	0	0	0
Min. Time for Pedestrians.	or . Go		Э	3.2					3.2					3.2				3.2	
Phasing	EW Perm		2		03			04	4		SB	0	nlv	NS Pe	erm		07		08
	G = 33.0	G = ().0	G	= 0.	0	G	=	-		G =	32	2.0	G = 10	0.0	G	= 0.0	G =	0.0
Timing	Y= 5	Y = 0)	Y	= 0		Y	=			Y =	5		Y = 5		Y:	= 0	Y =	0
Duration of	Analysis, T	= 0.25											ĺ	Cycle I	eng	th, C	C = 90	.0	
Lane Grou	p Capacity,	Contro	ol De	elay,	and	LO)S De	eter	min	at	ion								
			EB	}				W	/B					NB				SB	1
		LT	⊤⊦		RT	L	_T	Tł	Н	F	RT		LT	TH	R	Γ	LT	TH	RT
Adjusted Flo	ow Rate, v	87	48			19	91	16	3	21	103		8	37	47	7	531	48	139
Lane Group c	Capacity,	425	674	4		50	06	69	7	22	224	1	53	201	17	1	1187	945	843
v/c Ratio, X		0.20	0.07	7		0.3	38	0.2	3	0.	95	0.	05	0.18	0.2	7	0.45	0.05	0.16
Total Green	Ratio, g/C	0.37	0.37	7		0.3	37	0.3	7	0.	78	0.	11	0.11	0.1	1	0.36	0.52	0.52
Uniform De	lay, d ₁	19.5	18.5	5		20).9	19.	7	8	.4	35	5.8	36.3	36.	7	22.2	10.6	11.2
Progression	Factor, PF	1.000	1.00	00		1.(000	1.0	00	1.	000	1.	000	1.000	1.0	00	1.000	1.000	1.000
1															I				

Delay Calibration, k	0.11	0.11		0.11	0.11	0.46	0.11	0.11	0.11	0.11	0.11	0.11
Incremental Delay, d ₂	0.2	0.0		0.5	0.2	9.3	0.1	0.4	0.9	0.3	0.0	0.1
Initial Queue Delay, d ₃	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay	19.8	18.6		21.4	19.9	17.7	35.9	36.7	37.6	22.5	10.6	11.3
Lane Group LOS	В	B		С	В	В	D	D	D	С	В	В
Approach Delay	19	9.3	-	1	8.2		3	7.1			19.5	
Approach LOS	E	3			В			D			В	
Intersection Delay	19	9.0		$X_{c} =$	0.86		Interse	ction LC	DS		В	
Copyright © 2005 University of F	lorida, All	Rights Re	eserved			HCS+ [™]	Version 5	5.21	Gei	nerated: 8	3/13/2009	1:17 PN

HCS+TM Version 5.21

COST ESTIMATE DATA

Project: I-40 Interchange at Mine Lick Creek Rd Length: N/A	Cross Section: Variable	
Right-of-Way		
Land, Improvements and Damages (Acres)	54.0±	\$588,000.00
Incidentals (8 Tracts)		\$26,000.00
Relocation Payments (Residentials)	1	\$13,000.00
(Businesses)	0	. ,
(Non-Profit)	0	
Total Right-of-Way Cost		\$627,000.00
Utility Relocation		
Reimbursable		\$17,000.00
		* ~~~ ~~ ~~
Non-Reimbursable		\$200,000.00
Total Adjustment Cost		\$217,000.00
Construction Cost		
Clearing and Grubbing		\$108,000.00
Earthwork		\$1,492,000.00
Pavement Removal		\$97,000.00
Drainage		\$1,843,000.00
Major Items	\$1,507,000.00	
Other Drainage	\$101,000.00	
Erosion Control	\$235,000.00	
Structures		\$1,800,000.00
Railroad Crossing or Separation Structure		\$0.00
Paving		\$2,537,000.00
Retaining Walls		\$0.00
Maintenance of Traffic		\$110,000.00
Topsoil		\$48,000.00
Seeding		\$31,000.00
Sodding		\$51,000.00
Signing		\$114,000.00
Signalization		\$224,000.00
Fence		\$221,000.00
Guardrail		\$180,000.00
Rip-Rap or Slope Protection		\$0.00
Other Const. Items (15%)		\$1,328,000.00
Sub-Total Construction		\$10,184,000.00
Mobilization		\$436,000.00
Sub-Total Construction		\$10.620.000.00
10% Engineering and Contingencies		\$1,062,000.00
Total Construction Cost		\$11,682,000.00
Preliminary Engineering (10%)		\$1,062,000.00
TOTAL PROJECT COST		\$13,588.000.00

TRANSPORTATION PLANNING REPORT

RIGHT-OF-WAY COST ESTIMATE WORKSHEET

	Route No.:	Interchange	A	County:	<u>Putnam</u>		From:	All			To:				
Project	No.	Land Bogu	urod	Improvem	ents Taken	Damages	Total	Incidentals				s	Bus. & Fa	arm Reloc.	Total ROW
Sections	Tracts	Acres	Cost	Number	Cost	Cost	Cost	Cost	Houses	Cost	Trailers	Cost	Number	Cost	Cost
A II	8	54	\$335,000	2	\$68,000	\$8,000	\$588,000	\$26,000	Polido	ati \$13,000 at	on	\$0	0	\$0	\$627,000
All			\$0				\$0	\$0	Reside			\$0		\$0	\$0
			\$0				\$0	\$0		\$0		\$0		\$0	\$0
			\$0				\$0	\$0		\$0		\$0	0	\$0	\$0
			\$0				\$0	\$0		\$0		\$0		\$0	\$0
			\$0				\$0	\$0		\$0		\$0		\$0	\$0
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			\$0				\$0	0		\$0		\$0		\$0	\$0
													ļ		
		Land Cost	\$6,200	/ ACRE				Incidentals	\$3,200	/ Tract			. ,		

UTILITY COST ESTIMATE WORKSHEET

ROUTE: Mine Lick C	Creek int	ALTE	RNATE	А	SECTION	All		
		(Off)	(On)			Reimb.	Non-Reimb.	TOTAL
		ROW	ROW			(Off R/W)	(On R/W)	
Electric								
	Two Phase	5	15	poles @	\$2,400	\$12,000	\$36,000	\$48,000
	Three Phase	0	0	poles @	\$2,900	\$0	\$0	\$0
	Service Drop	0	0	poles @	\$1,500	\$0	\$0	\$0
	Transformer	0	6	@	\$1,600	\$0	\$9,600	\$9,600
	TVA Lines	0	0	tw/poles @	\$96,000	\$0	\$0	\$0
	Luminaire	0	0	poles @	\$700	\$0	\$0	\$0
Telephone		•	0		# 4.000	^		\$ 0
	Owned	0	0	poles @	\$1,600	\$0	\$0	\$0
	Shared	0	5	poles @	\$900	\$0	\$4,500	\$4,500
	Service Drop	0	0	poles @	\$1,500	\$0	\$0	\$0
Underg	pround				0 44			^
	Direct Bury	0	0	feet @	\$11	\$0 ©0	\$0	\$0
		0	1900		\$24 \$250	\$U ©0	<u></u> <u></u> <u></u> <u></u> <u></u> <u></u> <u></u> <u></u> <u></u> <u></u> <u></u> <u></u> <u></u> <u></u>	\$45,600 ¢0
	Closures	U	0) (E	⊅∠5U ¢400	უს რი	\$U	φU ¢0
	Terminais	0	0	@ @	\$400	\$0 ©0	\$0 \$0	\$U ¢0
	Nannoles	0	0	e faat @	\$4,000	\$U ©0	\$U \$0	\$U ¢0
	Jable	0	0	ieet @	\$8U	\$U	\$0	Ф О
Wator								
Walei	2"	0	0	foot @	¢o	¢۵	¢0	¢۵
	<u>ک</u> ۸۳	0	0	foot @	90 \$0	ው ቆር	\$0 \$0	30 \$0
	4 6"	0	0	foot @	ψ9 \$12	φ0 ¢0	04 0	ψ0 Φ0
	30"	0	0	feet @	\$12 \$47	φ0 \$0	ΨU \$28.200	ΨU \$28.200
	Hydrants	0	3		\$2 300	ψ0 \$0	\$6,900	\$6,200
	Meters	0	6	@	\$400	φ0 \$0	\$2,400	\$2,000 \$2,000
	Meters	0	0	9	φ+00	ψυ	φ2,400	ψ2,400
Sanitary Sewer								
	6"	0	0	feet @	\$32	\$0	\$0	\$0
	8"	0	0	feet @	\$35	\$0	\$0	\$0
	15"	0	0	feet @	\$38	\$0	\$0	\$0
	Manholes	0	0	@	\$1,400	\$0	\$0	\$0
			-		+ /			
Natural Gas								
	2"	0	0	feet @	\$13	\$0	\$0	\$0
	4"	0	1260	feet @	\$16	\$0	\$20,160	\$20,160
	6"	0	1340	feet @	\$24	\$0	\$32,160	\$32,160
	Valves/Tap	0	4	@	\$900	\$0	\$3,600	\$3,600
Pipelines (Pe	troleum)							
	12"	0	0	feet @	\$400	\$0	\$0	\$0
Cable TV								
	Owned	0	0	poles @	\$1,600	\$0	\$0	\$0
	Shared	5	12	poles @	\$900	\$4,500	\$10,800	\$15,300
		Tota	I Estim	ated Cost		\$16,500	\$199,920	\$216,000

FUNCTIONAL DRAWINGS



Highlands Business Park

Cookeville, Tennessee February 2009





Index of Sheets



2 3A,4A,5A,6A 3B,4B,5B,6B TITLE SHEET TYPICAL SECTIONS PROPOSED LAYOUTS (ALT."A") PROPOSED LAYOUTS (ALT."B")

DESCRIPTION

STATE OF TENNESSEE DEPARTMENT OF TRANSPORTATION BUREAU OF PLANNING AND DEVELOPMENT

PUTNAM COUNTY

INTERCHANGE JUSTIFICATION STUDY MINE LICK CREEK ROAD

AT

INTERSTATE 40

STATE HIGHWAY NO. 265 F.A.H.S. NO. N/A

N



N.T.S.

SPECIAL NOTES

PROPOSALS MAY BE REJECTED BY THE COMMISSIONER IF ANY OF THE UNIT PRICES CONTAINED THEREIN ARE OBVIOUSLY UNBALANCED, EITHER EXCESSIVE OR BELOW THE REASONABLE COST ANALYSIS VALUE.

THIS PROJECT TO BE CONSTRUCTED UNDER THE STANDARD SPECIFICATIONS OF THE TENNESSEE DEPARTMENT OF TRANSPORTATION DATED MARCH 1, 1995 AND ADDITIONAL SPECIFICATIONS AND SPECIAL PROVISIONS CONTAINED IN THE PLANS AND IN THE PROPOSAL CONTRACT

TDOT CIVIL ENGINEERING MANAGER 1

DESIGNED BY _____NEEL-SCHAFFER, INC.

DESIGNER _____ CHECKED BY _____

P.E. NO. __



APPROVED:

DESIGN DIVISION

DATE:

APPROVED:

COMMISSIONER

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION

APPROVED:

DIVISION ADMINISTRATOR

DATE



TYPE	YEAR	PROJECT NO.	SHEET NO.
APR	2000		2

NOT TO SCALE

STATE OF TENNESSEE Department of transportation

PUTNAM COUNTY

INTERCHANGE JUSTIFICATION STUDY I-40 AT MINE LICK CREEK RD



TYPE	YEAR	PROJECT NO.	SHEET NO.
APR	2000		3A

100 200 300
STATE OF TENNESSEE Department of transportation
INTERCHANGE JUSTIFICATION STUDY I-40 AT MINE LICK CREEK RD. ALTERNATE "A"





TYPE	YEAR	PROJECT NO.	SHEET NO.
APR	2000		5A

100		200	300		
STATE Department	of of	TENNESS Transpo	BEE DRTATION		
INTERCHANGE JUSTIFICATION STUDY I-40 AT MINE LICK CREEK RD.					
	100 STATE DEPARTMENT JUST IF I-40 LICK ALTE	100 STATE OF DEPARTMENT OF INTER(JUST IFICA I-40 A LICK CF ALTERN	100 200 STATE OF TEMMESS DEPARTMENT OF TRANSPO INTERCHANGE JUST IF ICAT ION S I-40 AT MINE LICK CREEK F ALTERNATE		



SHEET	NO.	DESCRIPTION		
1		TITLE SHEET		
2-2B		TYPICAL SECTIONS		
3-5		PROPOSED LAYOUTS	(ALT.	″A″)

STATE OF TENNESSEE DEPARTMENT OF TRANSPORTATION PROJECT PLANNING DIVISION

PUTNAM COUNTY INTERCHANGE JUSTIFICATION STUDY FROM MINE LICK CREEK ROAD AT

INTERSTATE 40

STATE HIGHWAY NO. N/A F.A.H.S. NO. N/A



SPECIAL NOTES

Ν

PROPOSALS MAY BE REJECTED BY THE COMMISSIONER IF ANY OF THE UNIT PRICES CONTAINED THEREIN ARE OBVIOUSLY UNBALANCED, EITHER EXCESSIVE OR BELOW THE REASONABLE COST ANALYSIS VALUE.

THIS PROJECT TO BE CONSTRUCTED UNDER THE STANDARD SPECIFICATIONS OF THE TENNESSEE DEPARTMENT OF TRANSPORTATION DATED MARCH 1, 2006 AND ADDITIONAL SPECIFICATIONS AND SPECIAL PROVISIONS CONTAINED IN THE PLANS AND IN THE PROPOSAL CONTRACT.

TDOT C.E. MANAGER 1	
DESIGNED BY <u>RPM Transportation Consultants</u>	, LLC
DESIGNER	CHECKED BY

P.E. NO.

PIN NO.

		YEAR	SHEET NO.
	I E ININ .	2009	1
	FED. AID PROJ. NO.		
	STATE PROJ. NO.		
AKLEY HENRY TERNAT WORK ODERTSON SUMER A	MCON CLAY PICATE PETRESS SOOT DEXAGO WHITE CLARERLAND ARABEL STORE GUILON CLARERLAND MALIN MATINA MELIN MATINA MELIN MATINA STARE		SULLIVAN OPEENE UND LATER
APF	PROVED:		CHIEF ENGINEEF
APF	PROVED:		
			COMMISSIONER
	U.S. DEPA FEDERAL	RTMENT OF TRANSF HIGHWAY ADMINIS	PORTATION TRATION
	U.S. DEPAI FEDERAL	RTMENT OF TRANSP HIGHWAY ADMINIS	PORTATION TRATION
	U.S. DEPA FEDERAL APPROVED: DIVISION AE	RTMENT OF TRANSF HIGHWAY ADMINIS	PORTATION TRATION



TYPE	YEAR	COUNTY	SHEET NO.
IJS	2009	PUTNAM	2



TYPICAL SECTIONS




	TYPE	VEAD	COUNTY	SHEET
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	IJS	2009	PUTNAM	2A
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5 - 1				
_				
		ST	ATE OF TENNESSEE	I
		DEPARTM	ENT OF TRANSPOR	TATION
		-		
]	NIERCHANGE	
		JUSTI	FICATION S	UDY
		1	-40 AT MINE	
		LIC	K CREEK RO	٩D
		TYP	ICAL SECTIO	NS



SUPERELEVATED SECTION (BASED ON STD. DWG. RD01-TS-3A)

TYPE	YEAR	COUNTY	SHEET NO.
IJS	2009	PUTNAM	2B



INTERCHANGE JUSTIFICATION STUDY I-40 AT MINE LICK CREEK ROAD

TYPICAL SECTIONS



TYPE	YEAR	COUNTY	SHEET NO.
IJS	2009	PUTNAM	3

0	100 200 300
	STATE OF TENNESSEE Department of transportation
	INTERCHANGE JUSTIFICATION STUDY I-40 AT MINE LICK CREEK ROAD
	ALTERNATE "A"



TYPE	YEAR	COUNTY	SHEET NO.
IJS	2009	PUTNAM	4

0	100 200 300
	STATE OF TENNESSEE Department of transportation
	INTERCHANGE JUSTIFICATION STUDY I-40 AT MINE LICK CREEK ROAD
	ALTERNATE "A"



TYPE	YEAR	COUNTY	SHEET NO.
IJS	2009	PUTNAM	5

0	100 200 300
	STATE OF TENNESSEE Department of transportation
	INTERCHANGE JUSTIFICATION STUDY I-40 AT MINE LICK CREEK ROAD
	ALTERNATE "A"