



PROJECT DETERMINATION FORM

Project Number and Federal ID	County and ADOT District	Project Name and Highway	Final Project Assessment Date
019 SC 007 H8401 02L	Santa Cruz County	I-19 East Frontage Rd – Ruby Road to Rio Rico Drive	March 2018
019-A(217)A	Southcentral District	Nogales–Tucson Highway	

Project Description:	
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Existing Program	Program Year	Programmed Budget	Operating Partnership Category					
	0							
		PA Construction Cost Estimate						
Yes	No	\$11,153,000 (Alt. D)	S	F	T	D	Z	N/A
	X				X			

Public Hearing: In the Highway Development Process, at least one public hearing or the opportunity for a hearing will be offered for any project that:

<input checked="" type="checkbox"/>	Requires a significant amount of new right-of-way:	<input type="checkbox"/>	Otherwise has a significant social, economic, environmental or other effect
<input type="checkbox"/>	Substantially changes the layout or function of connecting roadway or the facility being improved;	<input type="checkbox"/>	Is controversial on environmental grounds;
<input type="checkbox"/>	Has a significant adverse impact on abutting real property;	<input type="checkbox"/>	Or has significant floodplain encroachment
		<input type="checkbox"/>	None of the above conditions apply

Recommends:

Yes:	No:	Public Forum	Environmental Category		
		Offer a combined Location / Design Hearing	Class 1	Class II	Class III
		Offer Separate Location/Design Hearing		X	
		Hold a Design Public Hearing			


DocuSigned by:

 Asadul Karim
 Project Manager
 Major Projects Group, 605E
 Date: 3/28/2018

DocuSigned by:

 Rod Lane
 District Engineer
 Southcentral District
 Date: 3/30/2018

Concur:

DocuSigned by:

 Gregory Byres, MPD Division Director
 Division Director
 Multimodal Planning, 605E
 Date: 3/30/2018

Comments: None

This PA does not assess the Rio Rico Interchange, which may be required for local agency participation.

ADOT PROJECT NO. 019 SC 007 H8401 02L
FEDERAL PROJECT NO. 019-A(217)A
EAST FRONTAGE ROAD, RUBY ROAD–RIO RICO DRIVE (MP 7.71 – MP 10.88)
NOGALES–TUCSON HIGHWAY
INTERSTATE 19

**FINAL
PROJECT ASSESSMENT**

MARCH 2018

PREPARED FOR:



ARIZONA DEPARTMENT OF TRANSPORTATION

PREPARED BY:



STANLEY CONSULTANTS, INC.
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A. INTRODUCTION

Project 019 SC 007 H8401 02L, I-19 East Frontage Road, Ruby Road – Rio Rico Drive (MP 7.71-MP 10.88) [Federal Project No. 019-A(217)A], is a study to evaluate and recommend operational improvements at the Ruby Road Traffic Interchange (TI) and along the I-19 frontage roads from Ruby Road to Rio Rico Drive.

The project is located approximately eight miles north of the US-Mexico border and the City of Nogales in Santa Cruz County, Arizona, within the Arizona Department of Transportation's (ADOT's) Southcentral District. The study area includes the Ruby Road TI and the I-19 frontage roads from Ruby Road to Rio Rico Drive and is generally bounded by the west frontage road to the west and the Union Pacific Railroad (UPRR) to the east. Ruby Road is also designated as State Route (SR) 289 west of I-19.

The intersection of the east frontage road and Ruby Road experiences high levels of congestion in peak travel periods. An industrial park east of the east frontage road (Rio Rico South Industrial Park) and a Pilot Truck Stop at the northeast corner of Ruby Road and the east frontage road attract a high volume of truck traffic. The left-turn lanes are end-to-end in the center lane of Ruby Road and the queues of left-turning vehicles destined for northbound or southbound I-19 can exceed the available storage space, leading to traffic congestion and delay. Furthermore, the close proximity of the signalized intersections on Ruby Road between the northbound ramps and the east frontage road does not provide space for left-turning queues in peak periods. As such, trucks exiting I-19 in both the northbound and southbound directions can back up on the exit ramps, sometimes extending onto the mainline.

On the west side of I-19, a two-way frontage road exists from Ruby Road approximately 2.3 miles north to its termination at Calle Calabasas. An indirect paved connection from the west frontage road to Rio Rico Drive is provided by local streets (Calle Calabasas, Paseo Venado, and Camino Caralampi). The west frontage road is continuous for over four miles north of Rio Rico Drive and over five miles south of Calle Calabasas.

The project scope consists of preparing a traffic study, preliminary drainage report, preliminary geotechnical report, environmental studies, an ADA compliance report, and Initial and Final Project Assessments and preliminary cost estimates to document the development and evaluation of the alternatives.

The project is not listed in the 2018–2022 Five-Year Transportation Facilities Construction Program.

The estimated construction cost for the recommended improvements ranges from \$6,383,000 (Alternative A), \$11,153,000 (Alternative D), and \$8,565,000 (Alternative E).

B. BACKGROUND DATA

From I-19 milepost (MP) 7.71 to MP 10.08, the east frontage road is two-way and serves an industrial park with relatively dense development, mostly agricultural produce distribution facilities. The frontage road was improved in 2005 with ADOT Project STP-019-A(010)N, which included construction of a one-way (northbound) frontage road connection between Kipper Street (MP 10.08) and the I-19 northbound exit ramp to Rio Rico Drive (10.77). The combined northbound off-ramp/northbound frontage road roadway connects to Rio Rico Drive at MP 10.88.

East of the one-way ramp/frontage road and south of Rio Rico Drive, an access road exists inside ADOT right-of-way from MP 10.63 to MP 10.88. This separate two-way road provides access to Stable Lane, a private roadway which serves an equestrian facility. The access road intersects Rio Rico Drive approximately 400 feet east of the combined ramp/ frontage road intersection.

The west frontage road from Ruby Road to Rio Rico Drive serves mostly residential developments and single family homes; however, there is a US Drug Enforcement Administration facility along the west frontage road near Ruby Road, as well as Peña Blanca Elementary School. Rio Rico Fire District Station #2 is located on the southwest corner of the west frontage road and Calle Calabasas. The west frontage road was constructed along with the Interstate in 1968 and has not been improved (other than pavement rehabilitation) since then.

An I-19 Frontage Road Study completed in August 2008 (by KHA for ADOT) identified the west frontage road from Calle Calabasas to Rio Rico Drive as a high priority project. An initial project assessment was completed for the west frontage road in September 2010 (by TranSystems for ADOT), which considered a combination of one- and two-way options for the west frontage road, as well as a reconfiguration north of Rio Rico Drive.

ADOT's milepost strip map indicates the following projects were constructed within or adjacent to the project limits, sorted by construction date:

TABLE 1 – RECORD DRAWINGS

PROJECT NUMBER	DATE	BEGIN MILEPOST	END MILEPOST	DESCRIPTION
HPP-STP-019-A(010)N	2005	7.02	10.88	I-19, RUBY RD T.I. TO RIO RICO T.I.
IM-10-1(142)	2003	10.50	11.30	CALABASAS T.I. (RIO RICO T.I.)
N-900-0-543	1999	7.70	N/A	MINOR T.I. IMPROVEMENT PROGRAM
IR-19-1(89)	1987	10.40	16.00	NOGALES – TUCSON HIGHWAY
I-19-1(10)	1972	6.08	10.41	NOGALES – TUCSON HIGHWAY
I-19-1(22)	1965	10.42	16.08	NOGALES – TUCSON HIGHWAY

The Milepost Log indicates no milepost equations within the project limits.

Roadway

Roadway functional classifications are as follows:

I-19	Interstate (part of National Highway System)
Ruby Road	Major Collector
Rio Rico Drive	Major Collector
East Frontage Road	Not Classified (local road)(urban)
West Frontage Road	Not Classified (local road)(urban)

ADOT's *Roadway Design Guidelines* indicate that frontage roads without a functional classification should be designed as urban arterials.

The study area consists of level terrain with an average elevation of 3,500 feet.

The east frontage road has 12-foot wide travel lanes, a 2-foot west-side shoulder, and a 6-8 foot east-side shoulder. The east frontage road is paved with asphaltic concrete and crowned at the construction centerline; the cross slope in tangent sections is 2%.

The west frontage road has 12-foot wide travel lanes and one-foot shoulders. The west frontage road is paved with asphaltic concrete and crowned at the construction centerline; the cross slope in tangent sections is 2%.

The posted speed limit of the east frontage road varies. The posted speed is 25 miles per hour (mph) near the Ruby Road intersection, 40 mph through the industrial park, and 30 mph through the one-way northbound segment north of Kipper Street. Ruby Road is posted at 25 mph. Rio Rico Drive is posted at 30 mph.

The posted speed limit on the west frontage road varies. The posted speed is 50 mph north of Ruby Road, with a yellow caution sign posted 35 mph near the Peña Blanca Elementary School, and 25 mph one-half mile south of the west frontage road termination.

An AASHTO Controlling Design Criteria Report has been prepared for the I-19 Ruby Road and Rio Rico Drive traffic interchange (TI) ramps, crossroad, and the frontage roads.

Traffic

The design year is 2040.

ADOT's Multimodal Planning Division (MPD) provided average annual daily traffic (AADT) volumes for 2016, 2020, and 2040 by segment on I-19 as shown in Table 2:

TABLE 2 – ADOT MPD PROJECTIONS

Segment No.	Alignment	Segment	AADT		
			2016	2020	2040
1	I-19	South of Ruby Road	32,560	34,851	48,964
2	I-19	Ruby Road to Rio Rico Drive	27,441	29,372	41,266
3	I-19	North of Rio Rico Drive	17,963	19,227	27,013

The base year 2040 was selected as the design year for this project to evaluate the no-build and build alternatives. A growth factor of 1.7 percent compounded annually was utilized to increase the 2016 peak season traffic to a 2040 base traffic forecast. In the June 2014 I-19 East Frontage Road, Ruby Road to Rio Rico Drive traffic study, a 1.7 percent annual growth rate was approved by ADOT. The same growth rate percentage was approved by the project team for the current traffic projection updates.

Traffic on I-19 uses the East Frontage Road to access the business park, which serves as a transfer facility for trucks originating in Mexico to exchange with trucks based in the United States. Traffic counts were taken November 15, 2016, during the off-peak import season for Mexican produce.

In addition, 24-hour machine classification counts were taken on the East Frontage Road north of Ruby Road and north of Kipper Street. The typical routing of trucks in the area is to travel from the U.S.-Mexico border through the Nogales II Port of Entry, drop off goods in the business park, and either return to Mexico or proceed north on I-19. Other routing includes commercial traffic

accessing the study area from the U.S. side by trucks that drive south on I-19, access the business park to load goods, and return north via I-19. For each truck entering the U.S. through the Mariposa Port of Entry, there are approximately two to three U.S. trucks that drive south to Nogales to load produce items and drive them north into the interior of the U.S. Due to the overall high level of truck traffic, classification-specific traffic counts were also collected.

To address the congestion generated by the trucks utilizing the study area roadway network, a peak seasonal adjustment was made to determine peak season turning movement volumes. The 2016 peak season traffic volumes were calculated using the existing 2016 turning movement counts and peak season adjustment factors for trucks and cars.

The truck season adjustment factor was derived from a review of the commercial trucks entering the Nogales II Port of Entry over the last three years during the month of November and comparing this to the number of trucks entering during the month of May.

The adjustment factor of 1.5 was applied only to the number of trucks at each intersection; the passenger vehicle traffic was estimated to have a peak season adjustment factor of 1.03. This factor was obtained from data on I-19 from the ADOT Transportation Data Management System between November and the peak season (March, April, May).

The AADT and traffic factors (K, D, and T) for the frontage roads are estimated as shown in the following table:

TABLE 3 – TRAFFIC DATA

		AADT		Design Factors (%)		
ROUTE	LOCATION	2016	2040	K (Design Hour Factor)	D (Directional Distribution Factor)	T (Truck and RV Factor)
East Frontage Road	North of Ruby Road	7,657 *	11,515 **	8	59	46
West Frontage Road	North of Ruby Road	3,054 *	4,593 **	9 ***	50 ***	2 ***

* From ADOT's Transportation Data Management System

** 2040 no build volume calculated as described in the traffic study

*** Percentages are estimated – traffic data was not collected along the West Frontage Road

The ADOT *Roadway Design Guidelines*, Table 103.2A, provide level of service (LOS) and capacity performance thresholds for various Arizona state highway classification and terrain combinations. The study area is classified as an urban area. Based on Table 103.2A, the established threshold is LOS D or better.

The traffic study for this project (March 2017) describes the projected 2040 traffic volumes, turning movements, and levels of service for the No Build and build alternatives.

Crash Data

Crash data was obtained from ADOT for the I-19/Ruby Road service interchange ramps and west frontage road intersection, the I-19/Rio Rico Drive service interchange ramps, and the east

frontage road from Ruby Road to Rio Rico Drive. The data covers a five-year period from January 2011 through December 2015; the crash data is detailed in the traffic report.

During the five-year period, a total of 159 collisions were reported within the project limits. These include 3 incapacitating injury, 10 non-incapacitating injury, 11 possible injury, and 135 non-injury collisions. Sixty-nine percent of the collisions occurred during daylight hours. There were no fatal crashes.

Drainage

The drainage data is summarized from data presented in the January 2018 *Preliminary Drainage Report*.

Drainage within the project vicinity generally flows from the southwest to the northeast and discharges into the Santa Cruz River. Ruby Road crosses Potrero Creek, a tributary of the Santa Cruz River, on a two-lane bridge approximately 1,000 feet east of I-19. The study area includes two named washes, Calabasas Canyon Wash at MP 10.28 and Caralampi Canyon Wash at MP 10.77, and several unnamed washes.

Calabasas Canyon Wash flows are conveyed eastward through a 3-12 ft. x 8 ft. reinforced concrete box culvert (RCBC) and Caralampi Canyon Wash flows are conveyed eastward through a 3-10 ft. x 8 ft. RCBC.

In the vicinity of the Ruby Road TI, the washes are unnamed. One wash crosses I-19 just north of Old Tucson Road via a 6 ft. x 7 ft. RCBC. Another wash crosses both Ruby Road and I-19 in the northwest quadrant of the interchange through 2-8 ft. x 7 ft. RCBCs under each roadway.

Existing drainage structures include RCBCs, corrugated metal pipe culverts (CMP), catch basins, and spillways. Table 4 lists major drainage structures within the study area:

TABLE 4 – EXISTING DRAINAGE STRUCTURES

ROADWAY	MP	DESCRIPTION	SIZE (FT.)
I-19	7.49	RCBC	6 x 7
Ruby Road west of I-19	7.80	RCBC	2-8 x 7
I-19	8.00	RCBC	2-8 x 7
I-19	8.36	RCBC	5 x 5
I-19	8.60	RCBC	2-10 x 7
I-19	8.96	RCBC	6 x 3
I-19	9.15	RCBC	6 x 4
I-19	9.73	RCBC	2-8 x 3
I-19	10.28	Calabasas Canyon RCBC	3-12 x 8
I-19	10.77	RCBC NB & Off Ramp	3-10 x 8
I-19	10.77	RCBC SB	3-10 x 8

ADOT Southcentral District plans to improve an existing drainage structure on the east frontage road at MP 8.88 under a separate project. There are no other known drainage problems in the study area.

Structures

Existing major structures shown in Table 5 are listed in the ADOT Bridge Record:

TABLE 5 – EXISTING STRUCTURES

ROUTE	STR NO.	MP	STRUCTURE NAME	WIDTH (FEET)	MAX SPAN LENGTH (FEET)	VERTICAL CLR. (FEET)	YEAR BUILT	SUFFICIENCY RATING
I-19	1240	7.70	Ruby Rd TI UP	70	258	16.26	1967	91.5
I-19	5771	8.60	RCB	2 x 10	12	N/A	1951	80.5
I-19	5773	10.28	Calabasas Canyon RCB	3 x 12	14	N/A	1951	80.5
I-19	5775	10.77	RCB NB & Off Ramp	3 x 10	10	N/A	1951	81.8
I-19	5776	10.77	RCB	3 x 10	10	N/A	1966	96.8
I-19	933	10.96	Rio Rico EB TI UP	26	252	16.41	1967	81.7
I-19	2727	10.97	Rio Rico WB TI UP	39	252	16.47	2000	97.8

Utilities

ADOT's Southcentral District Utility Permit Log, Arizona Blue Stake, record drawings, and field observations indicate the presence of multiple underground and overhead utilities both crossing and alongside the frontage roads, Ruby Road, and Rio Rico Drive:

TABLE 6 – EXISTING UTILITIES

UTILITY	I-19 MP	FACILITY
CenturyLink	7.35 10.88	Aerial crossings
Unisource Energy Services	7.33 7.33 – 7.74 7.43 10.02 – 10.27 7.35 7.35–7.70 9.11 – 10.70	Gas line crossing I-19 Gas line along I-19 Gas line crossing I-19 Gas line along I-19 Overhead power crossing I-19 Overhead power along I-19 Overhead power along I-19
Frontier Communications Co	8.43 10.09	Aerial crossing Aerial crossing
Santa Cruz Unified School District	8.44 – 8.50	Sewer along frontage road and across I-19
Rio Rico Utilities	8.45 10.62	12" water across I-19 Sewer line
GAC Prop Inc of AZ	10.70	8" Sewer

ADOT Utilities & Railroad Section indicated that CenturyLink may have unpermitted utilities in the project area. These facilities are anticipated to be within the existing easements shown on ADOT's right-of-way maps.

Right-of-Way

Within the study area, ADOT's I-19 right-of-way width varies from a minimum of approximately 360 feet to over 1000 feet at the Ruby Road TI and Rio Rico Drive TI. ADOT's right-of-way includes the east frontage road and, where it exists, the west frontage road. North of Calle Calabasas and south of Rio Rico Drive, Santa Cruz County owns 80 feet of right-of-way west of ADOT's right-of-way line.

ADOT's existing access control generally runs between the mainline and frontage roads. Where the west frontage road does not exist, the access control line shifts west and follows the existing right-of-way line. Along the east frontage road and north of Kipper Street, ADOT controls access along the one-way east frontage road/northbound exit ramp. A break in access control is provided on the two-way segment of access road at Stable Lane. At the Ruby Road TI, ADOT's right-of-way plans describe the access control line based on an unconstructed design concept; as such, it is assumed that ADOT's existing access control runs between the I-19 northbound ramps and the east frontage road.

Railroad

To the east of the study area, Union Pacific Railroad (UPRR) tracks run in a north-south alignment between 500 feet and 2,500 feet away from I-19. Ruby Road crosses the railroad at-grade approximately 1,500 feet east of I-19. This project is not anticipated to affect the railroad.

The UPRR tracks cross Ruby Road approximately 920 feet east of the Ruby Road/East Frontage Road intersection. ADOT Utilities & Railroad reports that there are four train crossings each day. Trains can travel between 5 and 40 mph, with speeds generally at the lower end. Train lengths vary, resulting in varying durations for Ruby Road closures. With a considerable amount of eastbound through traffic, it is likely that the traffic could back up on Ruby Road into the East Frontage Road/ramp signalized intersection, even with 920 feet of storage.

The railroad crossing controller is typically connected to the adjacent traffic signal where the tracks are within 100 to 200 feet of the intersection. Because of the greater distance between the railroad tracks and the east frontage road intersection, there is no connection or pre-emption on Ruby Road; the signals continue to operate in a normal fashion when the railroad crossing is in operation and Ruby Road is closed.

C. PROJECT SCOPE

This project assessment includes an evaluation of a No Build alternative, five build alternatives, and two sub-alternatives. The alternatives are listed below with a brief description and are explained and evaluated in more detail on the following pages. An alternative will be selected by the project team in the future for advancement to design and construction.

- The **No Build Alternative** assumes that no major improvements would be made to any of the roadways within the study area.
- **Alternative A** would extend the two-way east frontage road from Kipper Street to Rio Rico Drive. The east frontage road would be disconnected from the northbound I-19 exit ramp, converted to two-way traffic, and realigned to intersect Rio Rico Drive approximately 400 feet east of the existing combined ramp/frontage road intersection. The northbound I-19 ramp intersection would remain in its current location. A figure showing Alternative A is included in Appendix A.

- **Alternative B** would combine the east frontage road and northbound I-19 exit ramp south of Ruby Road into a one-way northbound roadway that intersects Ruby Road west of the existing east frontage road intersection. Southbound traffic south of Ruby Road would travel on a new two-way access road that would connect to the east frontage road south of its gore with the northbound exit ramp and to Ruby Road across from the truck stop canopy. A figure showing Alternative B is included in Appendix B.
- **Alternative B1** is a sub-alternative of Alternative B. Alternative B1 would provide the same features as Alternative 2 except the new access road would not be included. As such, southbound traffic would not be accommodated on the east frontage road south of Ruby Road. Alternative B1 is shown in Appendix B.
- **Alternative B2** is another sub-alternative of Alternative B. Because the land in the southeast quadrant of the I-19/Ruby Road TI is privately owned, it may not be feasible to acquire part of the parcel for the access road included in Alternative B. Alternative B2 provides direct southbound access on the east frontage by braiding the I-19 northbound off-ramp and constructing a new bridge over the southbound east frontage road. Alternative B2 is shown in Appendix B.
- **Alternative C** would reconstruct the I-19/Ruby Road TI with roundabout intersections. Two six-leg roundabouts on Ruby Road, one on each side of I-19, would combine the frontage roads and ramps into the same intersection. A figure showing Alternative C is included in Appendix B.
- **Alternative D** would reconstruct the I-19/Ruby Road TI as a diverging diamond interchange (DDI). The DDI configuration crosses traffic to the opposite side of the road and then crosses it back; this allows the right and left turns to and from the freeway ramps to act as free-flow movements. Alternative D is shown in Appendix A.
- **Alternative E** would extend the west frontage road as a two-way frontage road from Calle Calabasas to Rio Rico Drive. The west frontage road would intersect Rio Rico Drive at the existing intersection with the west frontage road north of Rio Rico Drive. The southbound I-19 ramp intersection would remain in its current location. Alternative E is shown in Appendix A.

The design elements and assumptions used for the conceptual development of each alternative are discussed in the following sections. Although the west frontage road intersection with Ruby Road was not directly impacted by every alternative, Alternatives B, C, and D include reconstruction of the west frontage road intersection to provide an acceptable level of service for the entire Ruby Road TI. Additionally, Alternatives A and E include an additional left-turn lane on the north leg of the west frontage road and Ruby Road intersection rather than full reconstruction. Lastly, Alternatives A, B, C, and D also include an additional left-turn lane on the north leg of the west frontage road and Rio Rico Drive intersection.

No Build Alternative

Under the No Build Alternative, traffic operations would continue to deteriorate as volumes grow, further increasing traffic congestion and delay.

A LOS analysis was performed for design year 2040 peak hour volumes. Based on the existing geometry and 2040 peak hour volumes, the analysis shows that the study intersections would operate at levels of service in the design year as reflected in the following table. Although the

Ruby Road TI and east frontage road intersection are the focus of this study, all of the intersections in the study area are included in the table for comparison to the build alternatives.

TABLE 7 – 2040 AM/PM PEAK LOS

No.	Study Intersection	AM Peak	PM Peak
		LOS	LOS
1	Rio Rico Drive and West Frontage Road	F	F
2	Rio Rico Drive and I-19 SB ramps	B	B
3	Rio Rico Drive and I-19 NB ramps	B	C
4	Rio Rico Drive and East Frontage Road*	F	D
5	Kipper Street and East Frontage Road*	A	B
6	Ruby Road and West Frontage Road (north leg)*	F	C
7	Ruby Road and West Frontage Road (south leg)*	F	F
8	Ruby Road and I-19 SB ramps	B	C
9	Ruby Road and I-19 NB ramps	F	F
10	Ruby Road and East Frontage Road	D	F
11	Ruby Road and Pilot Truck Stop driveway*	A	E

*Two way stop control intersection.

Alternative A – Two-Way East Frontage Road, Kipper Street to Rio Rico Drive

Alternative A would reduce traffic congestion at the east frontage road/Ruby Road intersection by providing additional access to the industrial park from the Rio Rico TI. Alternative A would extend the two-way east frontage road from Kipper Street to Rio Rico Drive. The east frontage road would be disconnected from the northbound I-19 exit ramp, converted to two-way traffic, and realigned to intersect Rio Rico Drive approximately 400 feet east of the existing combined ramp/frontage road intersection.

A LOS analysis was performed for design year 2040 peak hour volumes. Based on the proposed Alternative A geometry and 2040 peak hour volumes, the analysis shows that the study intersections would operate as follows in the design year:

TABLE 8 – ALTERNATIVE A 2040 AM/PM PEAK LOS

No.	Study Intersection	AM Peak	PM Peak
		LOS	LOS
1	Rio Rico Drive and West Frontage Road	B	B
2	Rio Rico Drive and I-19 SB ramps	C	C
3	Rio Rico Drive and I-19 NB ramps	C	C
4	Rio Rico Drive and East Frontage Road	A	C
5	Kipper Street and East Frontage Road *	B	C

No.	Study Intersection	AM Peak	PM Peak
		LOS	LOS
6	Ruby Road and north leg West Frontage Road *	B	B
7	Ruby Road and south leg West Frontage Road *	F	F
8	Ruby Road and I-19 SB ramps	B	C
9	Ruby Road and I-19 NB ramps	D	D
10	Ruby Road and East Frontage Road	D	E
11	Ruby Road and Pilot Truck Stop driveway *	F	D

* Two way stop control intersection.

Major scope items for Alternative A would include the following:

- Widen and reconstruct the existing east frontage road from Kipper Street to Rio Rico Drive and convert the one-way northbound roadway to two-way.
- Obliterate the existing east frontage road connection to the I-19 northbound exit ramp.
- Realign the new two-way frontage road eastward and intersect Rio Rico Drive approximately 400 feet east of the existing northbound I-19 ramp intersection at the same location as the existing two-way access road.
- Install a new traffic signal on Rio Rico Drive at the new two-way east frontage road intersection.
- Install new intersection lighting; this is included in the traffic signal cost.
- Reconnect the driveway to Stable Lane to the realigned two-way east frontage road.
- Minor widening on Rio Rico Drive would be required. No modifications to the I-19/Rio Rico TI UP bridge would be required.
- Construct vertical curb at the east frontage road intersection with Rio Rico Drive. The need for a closed storm drainage system is not anticipated.
- Construct new concrete barrier near the new 3-10 ft. x 12 ft. drainage culvert to shield the roadway from side slopes greater than 4H:1V.
- Obliterate roadway segments no longer needed for traffic operations on Rio Rico Drive at the I-19 ramps.
- Construct a new 3-10 ft. x 8 ft. RCBC under the realigned east frontage road south of Rio Rico Drive. This culvert would be required to preserve the eastward flow path for the Caralampi Canyon Wash crossing I-19 about 0.25 mile south of Rio Rico Drive. No modifications to the existing 3-10 ft. x 8 ft. concrete box culvert approximately 580 feet north of Kipper Street are anticipated. Pipe extensions are required for three other pipes. A new drainage basin is proposed at the southwest corner of Rio Rico Drive and the east frontage road.
- Construct scuppers to drain storm water from the curb returns at the east frontage road/ Rio Rico Drive intersection.

- Install extruded thermoplastic pavement markings.
- Approximately 5.52 acres of new right-of-way would be required with this alternative. The new right-of-way is in the southeast quadrant of the I-19/Rio Rico TI and is currently privately owned.
- The need for temporary construction easements (TCE) is not anticipated.
- Utility relocations would be required. The proposed east frontage road realignment would conflict with an overhead power line that runs along (both within and outside of) the existing ADOT right-of-way.
- Add an additional southbound left-turn lane to the west frontage road at Rio Rico Drive by sawcutting and widening on both sides of the west frontage road. Reconstruct the northeast curb return with new concrete curb, gutter, and sidewalk. Restripe this leg of the intersection.
- Add an additional southbound left-turn lane to the west frontage road at Ruby Road by sawcutting and widening on the west side of the west frontage road. Restripe this leg of the intersection. Restripe the left-turn lane on the west leg of this intersection to increase the length of the left-turn lane.
- Improve non-compliant Americans with Disabilities Act (ADA) features along Rio Rico Drive including reconstructing sidewalk and sidewalk ramps, relocating pedestrian push buttons, replacing safety rail, installing new pedestrian gate, and restriping crosswalks to provide adequate clear space.

Project stakeholders anticipate that a future heavy movement for trucks in this area is northbound east frontage road, left onto westbound Rio Rico Drive, and onto the northbound I-19 on-ramp. With heavy truck volumes making this movement, a slip or dedicated ramp was suggested for these trucks to avoid the ramp intersection and expedite the movement of truck traffic. A slip ramp or dedicated ramp for trucks would be atypical for ADOT and FHWA projects; however, signal timing should be optimized for this movement.

ADOT project 019 SC 007 F0101 01D, Ruby Road TI UP #1240, is an ADOT bridge deck rehabilitation project. Final design for this project is programmed for FY 2018, with construction in FY 2020. The project will require substantial traffic control during bridge construction. One option to relieve Ruby Road congestion during bridge construction would be for the bridge rehabilitation project to construct Alternative A as part of its traffic control plan. Doing this would allow trucks attempting to access the Pilot Truck Stop and warehouses along the east frontage road to ingress and egress via Rio Rico Drive instead of Ruby Road. However, Alternative A is not currently part of the bridge project.

Alternative B – One-Way East Frontage Road South of Ruby Road, New Access Road

Alternative B would convert the east frontage road south of Ruby Road to one-way northbound and combine it with the northbound I-19 exit ramp.

A LOS analysis was performed for design year 2040 peak hour volumes. Based on the proposed Alternative B geometry and 2040 peak hour volumes, the analysis shows that the study intersections would operate as shown in the following table in the design year. The Rio Rico Drive TI and Kipper Street intersections are not included in the LOS results for Alternatives B, C, or D since they are not improved with these alternatives.

TABLE 9 – ALTERNATIVE B 2040 AM/PM PEAK LOS

No.	Study Intersection	AM Peak	PM Peak
		LOS	LOS
6-7	Ruby Road and West Frontage Road	C	C
8	Ruby Road and I-19 SB ramps	C	C
10	Ruby Road and East Frontage Road	C	C
11	Ruby Road and Pilot Truck Stop driveway*	F	F

*Two-way stop control intersection.

Major scope items for Alternative B would include the following:

- Construct a new northbound exit ramp/one-way northbound frontage road that intersects Ruby Road approximately 320 feet east of the I-19/Ruby Road TI bridge. The combined roadway would be four lanes wide south of Ruby Road.
- South of the new I-19 northbound exit ramp/one-way frontage road gore, shift the two-way east frontage road east to provide space for the new I-19 northbound exit ramp.
- Construct a new southbound access road for east frontage road continuity that intersects Ruby Road 780 feet east of the I-19/Ruby Road TI UP bridge. The new access road would intersect the two-way east frontage road south of the northbound exit ramp/frontage road gore. If desired, the new 1200-foot-long access road could accommodate two-way traffic; it would provide one lane in each direction.
- Realign the east frontage road north of Ruby Road to align with the new combined ramp/frontage road south of Ruby Road.
- Install new traffic signals at Ruby Road at the west frontage road, east frontage road, and access road.
- Install new intersection lighting; this is included in the traffic signal cost.
- No modifications to the I-19/Ruby Road TI UP bridge would be required with this alternative.
- Widen Ruby Road to provide additional turn lanes at the new northbound ramp/east frontage road intersection. Construct vertical curb along reconstructed segments of Ruby Road.
- Construct new concrete barrier where needed to match into existing barrier or shield the roadway from side slopes greater than 4H:1V. Concrete barrier will likely be required along the realigned west frontage road to shield tall embankments and along the new northbound exit ramp where adjacent to the realigned east frontage road.
- Obliterate roadway segments no longer needed for traffic operations.
- Extend the existing 6 ft. x 7 ft. RCBC located about 500 feet north of the Old Tucson Road intersection to accommodate the widening of the northbound exit ramp and east frontage

road. In addition, the outlet channel for this RCBC on the east side of I-19 will need to be lined with either wire-tied riprap or concrete. Improvements include the addition of CMP culverts under the access road and frontage road/northbound exit ramp roadways in the southeast quadrant to properly drain infield areas. A pipe extension is required for one pipe. New drainage basins are proposed at the four quadrants of the I-19 and Ruby Road TI.

- Construct catch basins, storm drains, and scuppers to drain storm water from curbed roadway segments.
- Construct a new retaining wall east of the realigned east frontage road beginning approximately 1400 feet south of Ruby Road. The wall would be approximately 150 feet long and would be required to prevent the northbound exit ramp fill slope from encroaching into the new drainage channel. This retaining wall and drainage channel would be within the existing right-of-way.
- No modifications to the existing flood gate and chain link right-of-way fence adjacent to the U.S. Forest Service (USFS) property just north of Old Tucson Road are anticipated.
- Widen Ruby Road to four lanes at the west frontage road intersection and add a traffic signal.
- Widen and realign the west frontage road south of Ruby Road to match the location of the west frontage road north of Ruby Road. The realignment would extend approximately 850 feet south of Ruby Road. The cross section of the west frontage road south of the signalized Ruby Road intersection would consist of four lanes with an additional northbound right-turn lane.
- Widen the west frontage road to four lanes north of the signalized Ruby Road intersection. The widening would taper to match the existing roadway width approximately 750 feet north of Ruby Road.
- Add an additional southbound left-turn lane to the west frontage road at Rio Rico Drive by sawcutting and widening on both sides of the west frontage road. Reconstruct the northeast curb return with new concrete curb, gutter, and sidewalk. Restripe this leg of the intersection.
- Construct a new 2-8 ft. x 7 ft. RCBC under the ramp in the southwest quadrant of the Ruby Road interchange and a new drainage channel between the new RCBC and existing RCBC under Ruby Road. This would maintain the flow path for the wash approaching from the southwest and direct it to the existing RCBC under Ruby Road west of I-19.
- Approximately 3.18 acres of new right-of-way would be required with this alternative. The new right-of-way needs are as follows:
 - Northeast quadrant – 0.01 acres, private ownership (Pilot Truck Stop)
 - Northwest quadrant – 0.22 acres, private ownership
 - Southwest quadrant – 1.26 acres, private ownership
 - Southeast quadrant – 1.64 acres, private ownership; 0.05 acres, public ownership (USFS)
- Install extruded thermoplastic pavement markings.

- This alternative would require relocation of the Unisource Energy Services gas line to accommodate the box culvert extension. This alternative may require relocation of Unisource Energy Services overhead power and CenturyLink communications lines, which run parallel to the east frontage road at the proposed new access road intersection.
- Improve non-compliant ADA features along Rio Rico Drive including reconstructing sidewalk and sidewalk ramps, relocating pedestrian push buttons, replacing safety rail, installing new pedestrian gate, and restriping crosswalks to provide adequate clear space.

Alternative B1 – One-Way East Frontage Road South of Ruby Road, Southbound Access Via I-19

Alternative B1 is a sub-alternative of Alternative B. Because the land in the southeast quadrant of the I-19/Ruby Road TI is privately owned, it may not be feasible to acquire part of the parcel for the access road included in Alternative B. Alternative B1 would not provide direct southbound access in the southeast quadrant of the Ruby Road TI; rather, southbound traffic south of Ruby Road would need to use I-19 or the west frontage road to access homes and businesses south of Ruby Road and east of I-19. All other elements of Alternative B remain the same, including the additional left-turn lane needed on the north leg of west frontage road and Rio Rico Drive.

Based on the proposed Alternative B1 geometry and 2040 peak hour volumes, the analysis shows that the study intersections would operate as follows in the design year:

TABLE 10 – ALTERNATIVE B1 2040 AM/PM PEAK LOS

No.	Study Intersection	AM Peak	PM Peak
		LOS	LOS
6-7	Ruby Road and West Frontage Road	D	C
8	Ruby Road and I-19 SB ramps	C	C
10	Ruby Road and East Frontage Road	C	C
11	Ruby Road and Pilot Truck Stop driveway*	F	D

*Two-way stop control intersection.

In addition to the absence of the access road, the following scope items for Alternative B1 vary from Alternative B:

- Approximately 1.56 acres of new right-of-way would be required with this alternative as follows:
 - Northeast quadrant – 0.01 acres, private ownership (Pilot Truck Stop)
 - Northwest quadrant – 0.22 acres, private ownership
 - Southwest quadrant – 1.26 acres, private ownership
 - Southeast quadrant – 0.02 acres, private ownership; 0.05 acres, public ownership (USFS)

Alternative B2 – Two-Way East Frontage Road South of Ruby Road, Braided I-19 NB Off-Ramp Bridge

Alternative B2 is another sub-alternative of Alternative B. Because the land in the southeast quadrant of the I-19/Ruby Road TI is privately owned, it may not be feasible to acquire part of the parcel for the access road included in Alternative B. Alternative B1 does not provide direct southbound access on the east frontage road. Alternative B2 provides direct southbound access on the east frontage by braiding the I-19 northbound off-ramp and the east frontage road and constructing a new bridge over the southbound east frontage road.

Based on the proposed Alternative B2 geometry and 2040 peak hour volumes, the analysis shows that the study intersections would operate as follows in the design year:

TABLE 11 – ALTERNATIVE B2 2040 AM/PM PEAK LOS

No.	Study Intersection	AM Peak	PM Peak
		LOS	LOS
6-7	Ruby Road and West Frontage Road	C	C
8	Ruby Road and I-19 SB ramps	C	C
10	Ruby Road and East Frontage Road	C	C
11	Ruby Road and Pilot Truck Stop driveway*	F	F

*Two-way stop control intersection.

The following Alternative B2 scope items vary from Alternative B:

- Construct a new braided, southbound east frontage road that intersects with the Ruby Road and northbound ramp/northbound east frontage road intersection. The braided section of the southbound east frontage road would be approximately 1300 feet long, crossing under the I-19 Ruby Road northbound off-ramp, then reconnecting with the northbound east frontage road just north of Old Tucson Road.
- Construct new I-19 Ruby Road northbound off-ramp bridge over the southbound east frontage road. This bridge would span the 20-foot wide southbound east frontage road; however, the crossing of these two roads is highly skewed, requiring a 230-foot long bridge as measured along the southbound east frontage road.
 - This severely skewed crossing precludes a conventional girder bridge layout with girders parallel to the roadway alignment. High skews can be reduced or eliminated but this usually involves longer spans, deeper sections, and/or use of straddle bents – all of which require more space and increase costs. The preferred option is to place the girders perpendicular to the southbound frontage road so they are spanning in the “short” direction. This allows for a bridge with a shallower section depth and a corresponding reduction in grade separation. Achieving this requires construction of “surplus” bridge deck as shown on Exhibit B2 in Appendix B. This is common practice and has been used in Arizona at both canal and braided ramp crossings with severe skews.
 - Two viable structure types were evaluated for this situation: a short span precast prestressed concrete girder span and a cast-in-place slab span. Because of the horizontal curvature of the southbound east frontage road, the precast girder span would require a “flared” framing plan. While possible, this makes for more difficult

deck forming. Therefore, the preferred option is a cast-in-place slab span. A slab span can be configured either as simply supported with bearings and deck joints or as a monolithic three-sided box. The three-sided box has a shallower section depth and eliminates the long-term maintenance costs associated with bearings and deck joints. It has the added advantage of single-phase construction (monolithic) versus the two-phase “girder + deck” approach. Both alternatives have full height retaining abutment walls founded on either spread footings or drilled shafts.

- Approaching the I-19 Ruby Road northbound off-ramp bridge, new concrete approach slabs would abut the bridge on both sides. The shortest length of the approach slab is 15 feet, but due to the severe skew of this bridge, the long side of the approach slab is 170 feet on the approach and 110 feet on the departure.
- Construct new concrete barrier where needed to match into existing barrier or shield the roadway from side slopes greater than 4H:1V. Concrete barrier will likely be required along the realigned west frontage road to shield tall embankments and along the new northbound exit ramp where adjacent to the realigned east frontage road. Concrete barrier is also needed entering and exiting the I-19 Ruby Road northbound off-ramp bridge on the ramp and southbound east frontage road. Concrete barrier will be required along the northbound east frontage road as it vertically and horizontally converges with the northbound off-ramp.
- Several new retaining walls are needed in conjunction with the braided northbound off-ramp and southbound east frontage road crossing. As the northbound off-ramp climbs and the southbound east frontage descends to cross each other, a retaining wall is needed along the west side of the southbound frontage road in advance of the off-ramp bridge. This wall is approximately 400 feet long. Additionally, retaining walls are required along both sides of the northbound off-ramp bridge to protect the southbound and northbound east frontage roads. Both of these walls are approximately 165 feet long.
- Some modifications to the existing chain link right-of-way fence adjacent to the USFS property just north of Old Tucson Road are anticipated.
- Because truck traffic exiting northbound I-19 at Ruby Road may desire to travel south on the east frontage road, a U-turn movement was evaluated. The concept has several major shortcomings, including difficult signing of the U-turn movement for off-ramp traffic, limitations on the number of trucks making the movement, lack of acceleration and deceleration lengths for the maneuver, sight lines for the U-turning driver, and, potentially, access control criteria.
- Approximately 1.68 acres of new right-of-way would be required with this alternative as follows:
 - Northeast quadrant – 0.01 acres, private ownership (Pilot Truck Stop)
 - Northwest quadrant – 0.22 acres, private ownership
 - Southwest quadrant – 1.26 acres, private ownership
 - Southeast quadrant – 0.08 acres, private ownership; 0.11 acres, public ownership (USFS)

Alternative C – Roundabout Interchange

Alternative C would reconstruct the I-19/Ruby Road TI with roundabout intersections.

A LOS analysis was performed for design year 2040 peak hour volumes. Based on the proposed Alternative C geometry and 2040 peak hour volumes, the analysis shows that the study intersections would operate as follows in the design year:

TABLE 12 – ALTERNATIVE C 2040 AM/PM PEAK LOS

No.	Study Intersection	AM Peak	PM Peak
		LOS	LOS
6-8	Ruby Road and west roundabout	A	A
9-10	Ruby Road and east roundabout	A	B
11	Ruby Road and Pilot Truck Stop driveway*	C	B

*Two way stop control intersection.

Major scope items for Alternative C would include the following:

- Construct a new multi-lane, six-leg roundabout on Ruby Road east of I-19 that would connect to the northbound I-19 ramps and east frontage road. The center of the east roundabout intersection would be approximately 230 feet east of the bridge over I-19.
- Construct a new multi-lane, six-leg roundabout on Ruby Road west of I-19 that would connect to the southbound I-19 ramps and west frontage road. The center of the west roundabout intersection would be approximately 210 feet west of the bridge over I-19.
- No substantial modifications to the I-19/Ruby Road TI UP bridge would be required with this alternative. New vertical curb would be added in the center of the bridge to channelize the eastbound and westbound roadways.
- Realign all intersecting roadways for proper roundabout approach and departure spacing, horizontal curvature, and skew angles. The approximate limits of reconstruction would be as follows:

East Roundabout

- Ruby Road – 600 feet east and 230 feet west of roundabout
- I-19 northbound exit ramp – 850 feet south of roundabout
- I-19 northbound entrance ramp – 550 feet north of roundabout
- East frontage road – 950 feet south and 850 feet north of roundabout

West Roundabout

- Ruby Road – 210 feet east and 700 feet west of roundabout
- I-19 southbound entrance ramp – 500 feet south of roundabout
- I-19 southbound exit ramp – 1000 feet north of roundabout
- West frontage road – 1000 feet south and 750 feet north of roundabout
- Provide two to three lanes in the circular roadway with an inscribed circle diameter of 220 feet. The number of lanes is based on the traffic analysis described in the traffic report for this project. The roundabouts would provide a 12-foot concrete truck apron and would accommodate a WB-67 design vehicle. Due to the high truck volumes in the project area,

special consideration should be given to the roundabout geometrics during final design. Designing the approach legs and the circulatory roadway to accommodate trucks navigating the roundabout side-by-side should be considered to allow for optimal roundabout operations.

- A third lane approaching the roundabout on the northbound exit ramp at Ruby Road may be needed in the future to improve traffic flow.
- Evaluate the need for bypass ramps in all four quadrants of the TI for vehicles making 180-degree movements between ramps and frontage roads. “Overtracking blisters” may be added for truck turning movements.
- Near the roundabout intersections, construct channelizing vertical curb along each intersecting roadway and, where two-way traffic is accommodated, splitter islands between opposing directions of traffic.
- Construct new concrete barrier where needed to match into existing barrier or shield the roadway from side slopes greater than 4H:1V.
- Obliterate roadway segments no longer needed for traffic operations and remove the existing traffic signals on Ruby Road at the I-19 ramps and east frontage road.
- Construct a retaining wall along the southbound exit ramp to contain embankment material from encroaching into the drainage channel.
- Construct a new 2-8 ft. x 7 ft. RCBC that extends from the southwest quadrant of the interchange to the northwest quadrant. This would preserve the path for flows approaching from the southwest that are routed to the RCBC under I-19 located about 0.25 mile north of Ruby Road. At the outlet of the RCBC, a riprap basin would be required to replace the riprap basin removed for the construction of the frontage road in the northwest quadrant of the interchange. New drainage basins are proposed at the four quadrants of the I-19 and Ruby Road TI.
- Extend the 2-8 ft. x 7 ft. RCBC under I-19 north of the interchange to accommodate the widened southbound off-ramp.
- For the roundabouts, a system of catch basins and a small-diameter storm drain pipe would be required to drain the curb and gutter section at the core of the roundabout. Other drainage improvements include small diameter (24-inch) CMP culverts under the frontage roads and ramps in the southwest and southeast quadrants of the interchange.
- Install extruded thermoplastic pavement markings for roundabout and approaches. Additional striping near the east roundabout should be considered due to possible back-up associated with the nearby railroad tracks.
- Install new roundabout lighting.
- Add an additional southbound left-turn lane to the west frontage road at Rio Rico Drive by sawcutting and widening on both sides of the west frontage road. Reconstruct the northeast curb return with new concrete curb, gutter, and sidewalk. Restripe this leg of the intersection.

- Approximately 1.37 acres of new right-of-way would be required with this alternative, plus TCEs at several driveways onto the east frontage road north of Ruby Road. The new right-of-way needs are as follows:
 - Northeast quadrant – 0.01 acres, private ownership (Pilot Truck Stop)
 - Northwest quadrant – 0.12 acres, private ownership
 - Southwest quadrant – 1.24 acres, private ownership
- Improve non-compliant ADA features along Rio Rico Drive including reconstructing sidewalk and sidewalk ramps, relocating pedestrian push buttons, replacing safety rail, installing new pedestrian gate, and restriping crosswalks to provide adequate clear space.

Alternative D – Diverging Diamond Interchange

Alternative D would reconstruct the I-19/Ruby Road TI to a DDI configuration. With a DDI, crossroad traffic crosses to the opposite side of the roadway within the limits of the interchange to allow free right and left turns to and from the I-19 ramps.

A LOS analysis was performed for design year 2040 peak hour volumes. Based on the proposed Alternative D geometry and 2040 peak hour volumes, the analysis shows that the study intersections would operate as follows in the design year:

TABLE 13 – ALTERNATIVE D 2040 AM/PM PEAK LOS

No.	Study Intersection	AM Peak	PM Peak
		LOS	LOS
6-7	Ruby Road and West Frontage Road	C	B
8	EB Ruby Road and WB Ruby Road	B	B
82	I-19 SB left turns	A	A
9	EB Ruby Road and WB Ruby Road	B	B
10	Ruby Road and East Frontage Road	C	C
91	I-19 NB left turns	A	A
11	Ruby Road and Pilot Truck Stop driveway*	D	E

*Two way stop control intersection.

Major scope items for Alternative D would include the following:

- Construct a new signalized crossover intersection on Ruby Road east of I-19 that would shift eastbound and westbound traffic to the opposite sides of the roadway. The center of the east crossover intersection would be approximately 150 feet east of the bridge over I-19.
- Construct a new signalized crossover intersection on Ruby Road west of I-19 that would shift eastbound and westbound traffic to the opposite sides of the roadway. The center of the west crossover intersection would be approximately 150 feet west of the bridge over I-19.

- No substantial modifications to the I-19/Ruby Road TI UP bridge would be required with this alternative. New vertical curb would be added in the center of the bridge for channelization of eastbound and westbound roadways.
- Realign the east frontage road approximately 100 feet east at Ruby Road to increase the separation between the frontage road and the adjacent crossover intersection. The approximate reconstruction limits of the east frontage road are as follows:
 - South of Ruby Road – 950 feet
 - North of Ruby Road – 1150 feet
- Realign the west frontage road to form one intersection with Ruby Road 130 feet west of the existing northern leg of the west frontage road. The realignment is necessary to consolidate the intersections on Ruby Road and to increase the separation between the frontage road and western crossover intersection. The approximate reconstruction limits of the east frontage road are as follows:
 - South of Ruby Road – 1050 feet
 - North of Ruby Road – 700 feet
- The reconstructed east frontage road intersection would require additional turn lanes on Ruby Road. The number of lanes is based on the analysis described in the traffic report for this project. The design vehicle is a WB-67 tractor trailer.
- Near the crossover intersections, construct channelizing vertical curb along each intersecting roadway and, where two-way traffic is accommodated, median islands between opposing directions of traffic.
- Construct new concrete barrier where needed to match into existing barrier or shield the roadway from side slopes steeper than 4H:1V.
- Obliterate roadway segments no longer needed for traffic operations.
- Extend the 2-8 ft. x 7 ft. RCBC under the west leg of Ruby Road to the north and south to accommodate the widened roadway section. The riprap basin located on the north end of the RCBC would be modified to accommodate the RCBC extension. The new west frontage road configuration would require a new 2-8 ft. x 7 ft. RCBC to maintain the flow path for flows approaching from the southwest. A pipe extension is required for one pipe. New drainage basins are proposed at the four quadrants of the I-19 and Ruby Road TI.
- Add catch basins on Ruby Road between the east frontage road and the west frontage road to drain the curb and gutter sections of the interchange. Pavement runoff would be conveyed by small-diameter storm drain pipe and directed to infield areas of the interchange. In addition, a small-diameter CMP culvert would be needed under the east frontage road in the southeast quadrant of the interchange to drain the southeast infield area.
- Install extruded thermoplastic pavement markings.
- Intersection lighting costs are included in traffic signal costs.
- Add an additional southbound left-turn lane to the west frontage road at Rio Rico Drive by sawcutting and widening on both sides of the west frontage road. Reconstruct the

northeast curb return with new concrete curb, gutter, and sidewalk. Restripe this leg of the intersection.

- Approximately 4.37 acres of new right-of-way would be required with this alternative. The right-of-way needs are as follows:
 - Northeast quadrant – 0.08 acres, private ownership (Pilot Truck Stop)
 - Northwest quadrant – 1.53 acres, private ownership
 - Southwest quadrant – 2.76 acres, private ownership
- Improve non-compliant ADA features along Rio Rico Drive, including reconstructing sidewalk and sidewalk ramps, relocating pedestrian push buttons, replacing safety rail, installing new pedestrian gate, and restriping crosswalks to provide adequate clear space.

Further consideration is needed during final design to determine whether access from the southbound east frontage road traffic to the Pilot Truck Stop north of Ruby Road can be provided.

Alternative E – Two-Way West Frontage Road, Calle Calabasas to Rio Rico Drive

Alternative E would reduce traffic congestion by extending the west frontage road from Calle Calabasas to Rio Rico Drive. The west frontage road is continuous for over four miles north of Rio Rico Drive and over five miles south of Calle Calabasas.

A LOS analysis was performed for design year 2040 peak hour volumes. Based on the proposed Alternative E geometry and 2040 peak hour volumes, the analysis shows that the study intersections would operate as follows in the design year:

TABLE 14 – ALTERNATIVE E 2040 AM/PM PEAK LOS

No.	Study Intersection	AM Peak	PM Peak
		LOS	LOS
1	Rio Rico Drive and West Frontage Road	B	B
2	Rio Rico Drive and I-19 SB ramps	C	C
3	Rio Rico Drive and I-19 NB ramps	C	C
4	Rio Rico Drive and East Frontage Road	F	D
5	Kipper Street and East Frontage Road *	A	B
6	Ruby Road and north leg West Frontage Road *	A	B
7	Ruby Road and south leg West Frontage Road *	F	D
8	Ruby Road and I-19 SB ramps	B	C
9	Ruby Road and I-19 NB ramps	C	C
10	Ruby Road and East Frontage Road	C	C
11	Ruby Road and Pilot Truck Stop driveway *	D	E

* Two way stop control intersection.

Major scope items for Alternative E would include the following:

- Construct a new two-way west frontage road from Calle Calabasas to Rio Rico Drive.
- North of Calle Calabasas, shift the west frontage road 75 feet farther west to minimize roadway excavation and eliminate possible retaining walls that would be required if the west frontage road were closer to I-19.
- The proposed vertical alignment for the west frontage road rises north of Calle Calabasas to provide adequate clearance of 3-12 ft x 8 ft RCBC and follow existing mountainous terrain.
- Align the new two-way frontage road with Rio Rico Drive approximately 260 feet west of the existing southbound I-19 ramp intersection at the same location as the existing west frontage road north of Rio Rico Drive.
- Install a new traffic signal on Rio Rico Drive at the new two-way frontage road intersection.
- Install new intersection lighting; this is included in the traffic signal cost.
- At the new Rio Rico Drive and west frontage road intersection, construct new left-turn lanes on the west, north, and east legs; construct a new right-turn lane on the east leg.
- No modifications to the I-19/Rio Rico TI UP bridge would be required with this alternative.
- Construct curb and gutter at the west frontage road intersection with Rio Rico Drive. The need for a closed storm drainage system is not anticipated; one existing scupper is impacted and would likely be replaced in-kind to drain storm water from the curb returns at the west frontage road/ Rio Rico Drive intersection.
- Extend an existing 3-12 ft. x 8 ft. RCBC under the new west frontage road north of Calle Calabasas. This extension is required to preserve the eastward flow path for the Calabasas Canyon Wash crossing I-19 about 0.70 mile south of Rio Rico Drive.
- Three new drainage pipes (24-42 inch CMP) are required beneath the new west frontage road, ranging from 0.3 to 0.5 miles south of Rio Rico Drive. A new drainage basin is anticipated for the southeast corner of the west frontage road and Rio Rico Drive.
- Construct a new 3-10 ft. x 8 ft. RCBC under the new west frontage road south of Rio Rico Drive. This culvert would be required to preserve the eastward flow path for the Caralampi Canyon Wash crossing I-19 about 0.25 mile south of Rio Rico Drive. No modifications to the existing 3-10 ft. x 8 ft. concrete box culverts under mainline I-19 or I-19 ramps/east frontage road are anticipated. A new channel is required for offsite flows that are obstructed by the west frontage road. Additional right-of-way is required for this channel.
- Install extruded thermoplastic pavement markings.
- Add an additional southbound left-turn lane to the west frontage road at Ruby Road by sawcutting and widening on the west side of the west frontage road. Restripe this leg of the intersection. Restripe the left-turn lane on the west leg of this intersection to increase the length of the left-turn lane.

- Approximately 17.45 acres of new right-of-way would be required with this alternative. The new right-of-way is along the west side of I-19 and is currently county and privately owned.
- The need for TCEs is not anticipated.
- Improve non-compliant ADA features along Rio Rico Drive including reconstructing sidewalk and sidewalk ramps, relocating pedestrian push buttons, replacing safety rail, installing new pedestrian gate, and restriping crosswalks to provide adequate clear space.
- Resolve utility conflicts. The proposed east frontage road realignment would conflict with an overhead power line that runs along (both within and outside of) the existing ADOT right-of-way.

Previously-Eliminated Alternatives

Other concept-level alternatives were discussed with and eliminated from further consideration by the study team earlier in the project development, including the following:

- Signing, pavement marking, and signal timing improvements to Ruby Road and the east frontage road. Eliminated as a standalone solution because LOS goals were not met.
- Two-way east frontage road just south of Rio Rico Drive, with the northbound east frontage road traffic merging with the I-19 northbound exit ramp and a grade separation for southbound east frontage road traffic over northbound traffic (similar to Alternative B2 and I-19/Continental Road TI).
- Southbound east frontage road to northbound I-19 bypass lane. Eliminated because, when modeled, the bypass didn't draw enough traffic from Ruby Road to substantially improve the LOS.
- One-way east frontage road north of Ruby Road with southbound traffic crossover to west frontage road (slip ramp to west frontage road). Eliminated because a one-way restriction on the east frontage road could undesirably restrict business park access and because solutions involving the construction of major structures were deemed cost prohibitive.
- One-way east frontage road north of Ruby Road with southbound traffic crossover to west frontage road (T-Intersection with west frontage road). Eliminated because a one-way restriction on the east frontage road could undesirably restrict business park access and because solutions involving the construction of major structures were deemed cost prohibitive.
- New interchange on I-19 between Ruby Road and Rio Rico Drive in the median with left-exit ramps. Eliminated because FHWA will not approve left exits in non-HOV conditions and because solutions involving the construction of major structures were deemed cost prohibitive.
- Four roundabouts: The four intersections on Ruby Road with the west frontage road, southbound ramps, northbound ramps, and east frontage road would be converted to roundabouts. Eliminated because of high right-of-way needs and circulation restrictions for Pilot truck stop.

Alternatives Evaluation

The No Build alternative and Alternatives A, B, B1, B2, C, D, and E were evaluated to help differentiate the major features of the various alternatives. The results of the alternative evaluation are summarized in Table 15. The alternatives with the most favorable characteristics for each criterion are identified in the 'Advantage' column.

TABLE 15 – ALTERNATIVES EVALUATION MATRIX

Criterion	No Build	Alternative A Two-way east frontage road extension from Kipper Street to Rio Rico Drive	Alternative B One-way NB ramp/frontage road south of Ruby Road—New SB access road	Alternative B1 One-way NB ramp/frontage road south of Ruby Road, no direct SB access	Alternative B2 Two-way, braided east frontage road south of Ruby Road	Alternative C Ruby Road TI – Two Roundabouts (Combined Ramps/Frontage Roads)	Alternative D Ruby Road TI – Diverging Diamond Interchange (DDI)	Alternative E Two-way west frontage road extension from Calle Calabasas to Rio Rico Drive	Advantage*
Level of Service (LOS) (2040) Ruby Rd/East Frontage Road AM(PM)	F	D (E)	C (C)	C (C)	C (C)	A (B)	C (C)	C (C)	C
Total Delay (Hour) AM Peak PM Peak	66 74	51 53	30 26	41 31	32 26	-- (Total delay for roundabouts calculated differently)	20 16	32 40	D
Potential Impacts from Ruby Rd Train Crossings East of Project Area	No change	No impact to operations on Rio Rico Drive.	Traffic signals generally return to normal operations faster than roundabouts after gridlock.	Traffic signals generally return to normal operations faster than roundabouts after gridlock.	Traffic signals generally return to normal operations faster than roundabouts after gridlock.	Although roundabout intersection is shifted farther away from tracks, roundabouts generally take longer than signalized intersections to return to normal operations after gridlock.	Traffic signals generally return to normal operations faster than roundabouts after gridlock.	No impact to operations on Rio Rico Drive.	B, B1, B2, D
Circulation	No changes to existing circulation.	A two-way east frontage road the entire length between Ruby Rd. and Rio Rico Dr. would allow ingress to the business park from both adjacent I-19 TIs, thereby reducing backtracking. However, the Ruby Rd TI intersections are not improved.	The combined ramp/one-way NB frontage road would allow NB industrial park traffic to cross Ruby Rd. at one traffic signal without otherwise disrupting Ruby Rd. through traffic. Southbound east frontage road traffic would use Ruby Rd. and the new access road to continue south of Ruby Road. However, since the access road would likely be constructed in the future by a developer, there could be a long period during which no SB access is provided.	The combined ramp/one-way NB frontage road would allow NB industrial park traffic to cross Ruby Rd. at one traffic signal without otherwise disrupting Ruby Rd. through traffic. Southbound east frontage road traffic would need to use I-19 or west frontage road to continue south of Ruby Road.	The combined ramp/two-way frontage road would allow NB industrial park traffic to cross Ruby Rd. at one traffic signal without otherwise disrupting Ruby Rd. through traffic. Southbound east frontage road traffic can also use this intersection, traveling south on a one-lane roadway under the NB exit ramp and connecting with the NB east frontage road north of Old Tucson Rd.	No substantial changes to circulation are anticipated; all existing movements would be provided with the roundabout interchange. Large trucks can navigate roundabouts; however, they will impact the speed and number of nearby trucks and passenger vehicles. More crossings required for non-motorized modes (bikes, pedestrians).	No substantial changes to circulation are anticipated; all existing movements would be provided with the diverging diamond interchange.	A two-way west frontage road the entire length between Ruby Rd. and Rio Rico Dr. would complete the missing one-mile link in the west frontage road; the west frontage road would then be continuous for 11 miles. Circulation for emergency vehicles of Rio Rico Fire District Station #2, located at Calle Calabasas and the west frontage, would improve.	B2, D, E
Floodplain	None.	SE quadrant of Rio Rico TI in floodplain (Zone A).	Relocated west frontage road south of Ruby Rd. encroaches on floodplain (Zone A).	Relocated west frontage road south of Ruby Rd. encroaches on floodplain (Zone A).	Relocated west frontage road south of Ruby Rd. encroaches on floodplain (Zone A).	Relocated west frontage road south of Ruby Rd. encroaches on floodplain (Zone A).	Relocated west frontage road south of Ruby Rd. encroaches on floodplain (Zone A).	New west frontage road south of Rio Rico Dr. encroaches on two floodplains (Zone A).	--
Implementation	Not applicable.	Implement as one project.	May implement as one project or two separate projects, one east of I-19 and the other west of I-19.	May implement as one project or two separate projects, one east of I-19 and the other west of I-19.	May implement as one project or two separate projects, one east of I-19 and the other west of I-19.	Implement as one project.	Implement as one project.	Implement as one project.	B, B1, B2

Criterion	No Build	Alternative A Two-way east frontage road extension from Kipper Street to Rio Rico Drive	Alternative B One-way NB ramp/frontage road south of Ruby Road—New SB access road	Alternative B1 One-way NB ramp/frontage road south of Ruby Road, no direct SB access	Alternative B2 Two-way, braided east frontage road south of Ruby Road	Alternative C Ruby Road TI – Two Roundabouts (Combined Ramps/Frontage Roads)	Alternative D Ruby Road TI – Diverging Diamond Interchange (DDI)	Alternative E Two-way west frontage road extension from Calle Calabasas to Rio Rico Drive	Advantage*
Structure Considerations/ Retaining Walls	None.	No changes to major structures are required.	A new retaining wall along the east frontage road would be required.	A new retaining wall along the east frontage road would be required.	A new, skewed bridge would be required for I-19 NB off-ramp traffic traveling over SB east frontage road traffic. Several new retaining walls are required including along the SB east frontage road entering and exiting the I-19 NB off-ramp bridge. Walls are also required along the NB east frontage road and along the I-19 NB off-ramp, beyond the I-19 NB off-ramp bridge.	No major modifications to the existing I-19 Ruby Rd TI UP bridge would be required; however, a new raised island in the center lane and new roadway approaches would be constructed. Would require a new retaining wall along Ramp C to prevent embankment from encroaching into a drainage channel.	No major modifications to the existing I-19 Ruby Rd TI UP bridge would be required; however, a new raised island in the center lane and new roadway approaches would be constructed. No retaining walls would be required.	No changes to major structures are required.	A, D, E
Offsite Drainage	No changes.	New 3-10 ft. x 12 ft. box culvert at Caralampi Canyon (MP 10.77).	Extension of 6 ft. x 7 ft. box culvert under the east frontage road. New 2-8 ft. x 7 ft. box culvert under the realigned west frontage road south of Ruby Rd. Extension of the 2-8 ft. x 7 ft. box culvert under Ruby Rd.	Extension of 6 ft. x 7 ft. box culvert under the east frontage road. New 2-8 ft. x 7 ft. box culvert under the realigned west frontage road south of Ruby Rd. Extension of the 2-8 ft. x 7 ft. box culvert under Ruby Rd.	Extension of 6 ft. x 7 ft. box culvert under the east frontage road. New 2-8 ft. x 7 ft. box culvert under the realigned west frontage road south of Ruby Rd. Extension of the 2-8 ft. x 7 ft. box culvert under Ruby Rd.	New 2-8 ft. x 7 ft. box culvert under Ruby Rd. Extension of the 2-8 ft. x 7 ft. box culvert under I-19 (MP 7.80).	New 2-8 ft. x 7 ft. box culvert under the realigned west frontage road south of Ruby Rd. Extend 2-8 ft. x 7 ft. box culvert under Ruby Rd.	Extension of 3-12 ft. x 8 ft. box under new west frontage road at Calabasas Canyon Wash (MP 10.28). New 3-10 ft. x 12 ft. box culvert at Caralampi Canyon (MP 10.77).	A, then C, D
Utility Impacts	None.	Conflicts with overhead power line outside of ADOT south of Rio Rico Dr. May conflict with additional underground utilities.	Conflicts with overhead power line outside of ADOT south of Ruby Rd. May conflict with additional underground utilities.	Conflicts with overhead power line outside of ADOT south of Ruby Rd. May conflict with additional underground utilities.	Conflicts with overhead power line outside of ADOT south of Ruby Rd. May conflict with additional underground utilities.	No overhead utilities would be impacted. May conflict with underground utilities.	No overhead utilities would be impacted. May conflict with underground utilities.	No overhead utilities would be impacted. May conflict with underground utilities.	C, D, E
Floodplain	None.	SE quadrant of Rio Rico TI in floodplain (Zone A).	Relocated west frontage road south of Ruby Rd. encroaches on floodplain (Zone A).	Relocated west frontage road south of Ruby Rd. encroaches on floodplain (Zone A).	Relocated west frontage road south of Ruby Rd. encroaches on floodplain (Zone A).	Relocated west frontage road south of Ruby Rd. encroaches on floodplain (Zone A).	Relocated west frontage road south of Ruby Rd. encroaches on floodplain (Zone A).	New west frontage road south of Rio Rico Dr. encroaches on two floodplains (Zone A).	--
Implementation	Not applicable.	Implement as one project.	May implement as one project or two separate projects, one east of I-19 and the other west of I-19.	May implement as one project or two separate projects, one east of I-19 and the other west of I-19.	May implement as one project or two separate projects, one east of I-19 and the other west of I-19.	Implement as one project.	Implement as one project.	Implement as one project.	B, B1, B2
Constructability	No restrictions or impacts to traffic.	Minor impacts to traffic during construction.	Major impacts to traffic during construction.	Major impacts to traffic during construction.	Major impacts to traffic during construction.	Major impacts to traffic during construction.	Major impacts to traffic during construction.	No impacts to traffic during construction.	E, then A, then others equal

Criterion	No Build	Alternative A Two-way east frontage road extension from Kipper Street to Rio Rico Drive	Alternative B One-way NB ramp/frontage road south of Ruby Road—New SB access road	Alternative B1 One-way NB ramp/frontage road south of Ruby Road, no direct SB access	Alternative B2 Two-way, braided east frontage road south of Ruby Road	Alternative C Ruby Road TI – Two Roundabouts (Combined Ramps/Frontage Roads)	Alternative D Ruby Road TI – Diverging Diamond Interchange (DDI)	Alternative E Two-way west frontage road extension from Calle Calabasas to Rio Rico Drive	Advantage*
Public and Stakeholder Input	Not favorable; public and stakeholders have indicated current operations often break down.	Mostly positive. Some concerns about overwhelming Rio Rico Drive with truck traffic.	Mixed positive and negative.	Mostly negative responses.	Mostly negative because there is no access is from NB Ruby Road off-ramp to SB east frontage road. SC County likes that NB exit ramp to NB east frontage rd doesn't have to turn onto Ruby and then left onto east frontage road.	Mixed positive and negative.	Mostly positive. Some concerns about queuing of vehicles from NB exit ramp to NB east frontage road on Ruby Rd.	Most comments were positive, indicating that building this missing link could help congestion and incident management.	A, D, E
New Right-of-Way	None	5.52 acres	3.18 acres	1.56 acres Reduces access to parcel in SE quadrant.	1.68 acres	1.37 acres	4.37 acres	17.45 acres	C
Estimated Right-of-Way Cost **	None	\$1,402,260	\$1,092,600	\$539,770	\$565,900	\$498,390	\$1,151,790	\$2,480,370	C
Total Estimated Construction Cost (including R/W)	\$0	\$6,383,000	\$10,219,000	\$8,840,000	\$11,960,000	\$12,374,000	\$11,153,000	\$8,565,000	A, then E, then B1

* If the No Build Alternative ranked highest, the most favorable Build alternative was listed because the No Build alternative does not satisfy the purpose of the project. Similarly, while Alternatives A and E improve Ruby Road operations via improvements at Rio Rico Dr., a Ruby Road improvement alternative is also listed when Alternative A or E is most favorable.

** R/W costs are based on estimates provided by ADOT Right-of-Way Group. Square footage cost includes lump sum severance costs.

Recommendations

Alternative A would provide a two-way connection between Kipper Street and Rio Rico Drive along the east frontage road. This connection would provide relief to the Ruby Road TI by allowing trucks and passenger vehicles to use this route as an alternative to the congested Ruby Road TI. Ideally, this alternative would be constructed in advance of Ruby Road TI roadway improvements or bridge rehabilitation as it could be helpful to traffic control efforts during Ruby Road improvements. It is recommended that this alternative be advanced for further consideration.

Alternative B would improve and consolidate intersections along Ruby Road and provide southbound east frontage road access south of Ruby Road via a new access road. This access road would reduce the developability of the parcel it is on; for that reason, this alternative is not recommended for further consideration.

Alternative B1 would improve and consolidate intersections along Ruby Road; however, it would not provide southbound east frontage road access south of Ruby Road. Southbound access is important to the project stakeholders, including large warehouses along the east frontage road south of Ruby Road. For that reason, this alternative is not recommended for further consideration.

Alternative B2 would improve and consolidate intersections along Ruby Road and provide southbound east frontage road access south of Ruby Road via a new braided southbound east frontage road. However, geometric and ADOT policy requirements do not allow for northbound I-19 off-ramp motorists to make a U-turn onto the southbound east frontage road, making this alternative less desirable.

Alternative C would construct two six-leg roundabouts along Ruby Road and would provide the greatest operational improvement among the alternatives. There are concerns about its viability due to its complexity and operations with heavy truck volumes. Alternative C is not recommended for further consideration.

Alternative D would construct a diverging diamond interchange along Ruby Road. It is recommended that this alternative be advanced for further consideration.

Alternative E would complete a missing link along the west frontage road north of Calle Calabasas and south of Rio Rico Drive. It is recommended that this alternative be advanced for further consideration.

Summary

Based on impacts and benefits associated with each alternative as developed at the conceptual design level, it is recommended that Alternative D, the Diverging Diamond Interchange Alternative, be carried forward for further evaluation. The DDI would provide a good level of service with low delay, all existing turning movements would be provided, agency stakeholders and the public are generally supportive, and the estimated construction and right-of-way costs are moderate compared to the other build alternatives.

Alternatives A and E are recommended for further consideration as supplements to Alternative D. Alternative E would likely be constructed with non-ADOT funding.

Because of access limitations and impacts to properties, Alternatives B, B1, and B2 are not recommended. Because of concerns about operations with heavy truck volumes and the complexity of six-leg roundabouts, Alternative C is not recommended.

D. DEVELOPMENT CONSIDERATIONS**Public and Stakeholder Coordination**

ADOT Communications will coordinate project information with the public and project stakeholders. Coordination to date has included a public scoping meeting (May 2012) and stakeholder meetings with several groups, including Fresh Produce Association of the Americas and Rio Rico community associations.

The study team met with Santa Cruz County on January 14, 2014, and with the City of Nogales and the Fresh Produce Association of the Americas on January 22, 2014, to inform them of the upcoming public meeting and to review the alternatives.

The public meeting was held on Wednesday, January 29, 2014, from 5:00 p.m. to 7:30 p.m. (with a presentation at 5:30 p.m.) at the Esplendor Resort, 1069 Camino Caralampi, Rio Rico, AZ 85648. The purpose of the public meeting was to provide additional information about the study, present the alternatives, and provide the opportunity for attendees to ask questions and submit comments. A total of 60 people attended the public meeting.

Public comments ranged from issues associated with traffic management and business access to suggestions for alternatives and concerns with overall costs. Many similar comments were received from multiple commenters. Comments were classified into the following categories:

Category	Comments Received for this Category*
Traffic Management	33
Safety Concerns	2
Economics	1
Emergency Access	2
Miscellaneous	1
Alternatives	17-Alt A; 2-Alt B; 5-Alt C; 1-Alt D

**Responses may have included more than one issue*

A frequent comment was that school bus circulation and emergency vehicle access should be considered during construction.

An additional meeting with the Fresh Produce Association of the Americas took place on June 29, 2017, to discuss the alternatives in greater detail.

An additional public meeting took place on September 13, 2017. The purpose of the meeting was to provide an update to the public, present additional and refined alternatives, and provide the opportunity for attendees to ask questions and submit comments. A total of 56 people attended the public meeting. The meeting took place between 6:00 p.m. to 7:30 p.m. (with a presentation at 6:30 p.m.) at the Calabasas Middle School, 131 Camino Maricopa, Rio Rico, AZ 85648. Public comments ranged traffic management as well as a strong desire for funding.

Topic	Number of Comments
Alternative A/E – positive	7
Alternative A/E – negative	3

Topic	Number of Comments
Alternative B – positive	1
Alternative B – negative	1
Alternative B2 - positive	0
Alternative B2 – negative	2
Alternative C – positive	2
Alternative C – negative	2
Alternative D – positive	1
Alternative D - negative	0

A final meeting took place during the study phase with the Santa Cruz County Board of Supervisors on November 29, 2017. The purpose of the meeting was to review the alternatives and respond to concerns from board members.

Following the Board of Supervisors meeting, Santa Cruz County provided additional concepts for consideration, as well as comments on Alternative D. Two options were modifications to Alternative B2, including adding a second exit ramp that would serve the southbound east frontage road and adding a braided southbound east frontage road connection for northbound exiting traffic. Comments on Alternative D were concerned with queues for left-turning vehicles onto the northbound east frontage road. If stakeholders are in agreement, the County's concepts may be evaluated further during the next phase of the project.

Adjacent Projects

ADOT has evaluated modifications to the west frontage road between Ruby Road and Rio Rico Drive under a separate project (019 SC 008 H8204 01C); however, the project is not currently active.

ADOT is currently designing bridge rehabilitation options for the Ruby Road bridge over I-19 (ADOT project number 019 SC 007 F0101 01D; the federal project number STP 019-A(236)T). Construction is programmed in FY 2020.

Santa Cruz County is currently preparing a study to consider alternatives for the Ruby Road bridge over Potrero Creek. Recommendations from the study are not yet available; the bridge project is in the County's long-range plans.

Redevelopment of the existing retail plaza in the northwest quadrant of the Rio Rico TI is planned. Projected retail plaza traffic volumes are included in the 2040 volumes for this study.

Design

New roadway elements will be designed in accordance with ADOT's *Roadway Design Guidelines*, 2014 Edition, with current updates, AASHTO's *A Policy on Geometric Design of Roads and Streets*, 2011 6th Edition, and AASHTO's *Roadside Design Guide*, 2011, 4th Edition.

The design speeds used for the preliminary design alternatives are as follows:

I-19	75 mph
Ruby Road	35 mph
Rio Rico Drive	35 mph
East Frontage Road	50 mph*
West Frontage Road	50 mph*

*The east and west frontage road design speed is reduced near the crossroad termini.

A Change of Access Report would be required with Alternatives A, B, B1, or B2. A Change of Access Report likely would not be required with Alternatives C, D, or E since those alternatives would require relatively minor modifications to the ramp/crossroad intersection configurations.

The Americans with Disabilities Act became law in 1990. The ADA is a civil rights law that prohibits discrimination against individuals with disabilities. The ADOT Feature Inventory System indicates that there are ADA features within the project limits; additional features were identified during field reviews. These features have been reviewed for compliance as outlined by the ADA Accessibility Guidelines. Non-compliant features should be improved with this project to achieve compliance with ADA Public Rights-of-Way Guidelines. The cost to improve non-compliant features is included in the cost estimates for each alternative.

A review of the AASHTO Controlling Design Criteria indicates that design exceptions may be required. With Alternatives A and E, the existing west frontage road and Rio Rico Drive profiles and corresponding vertical stopping sight distance would remain as-is. With Alternatives B, B1, C, and D, the reconstructed portions of the east frontage road would conform to current AASHTO criteria; however, the majority of the east frontage road between Ruby Road and Rio Rico Drive would remain as-is. With Alternative E, the extension of the new west frontage road would conform to current AASHTO criteria. A request for design exceptions and design variances will be prepared during final design.

Design-level mapping should be requested early so that it is available at the beginning of final design.

Utility conflicts are anticipated as detailed in the alternatives discussions. Prior rights have not been determined. Final design should include locating the existing utilities to ASCE quality level B/A; this can be done using an ADOT on-call subsurface utility engineering contractor.

Right-of-Way

The need for new right-of-way and temporary construction easements varies by alternative.

ADOT will need to coordinate with private property owners for access changes and driveway connections. Onsite circulation improvements at the Pilot truck stop are recommended to ensure that trucks can circulate to the available routes. Without onsite improvements, a raised median may be considered to restrict left-turns into the farthest-east Pilot driveway. Provisions for southbound left turns from the east frontage road into the Pilot should be evaluated during final design.

Local agency encroachment permits from Santa Cruz County will be required for work outside ADOT's right-of-way.

Existing survey monuments and section corner monuments may be located within the project limits. These locations will be investigated during final design. Provisions should be made to avoid disturbing the monuments. If any monuments are disturbed during construction, they shall be reset to the current standards.

Drainage

With the proposed improvements at one or both of the interchanges, the impact to the flood zone will need to be considered. Filling of the flood zone may trigger the need for a Conditional Letter of Map Revision (CLOMR). A CLOMR would not be needed if it can be shown that: 1) the project provides for an equal compensatory volume than is displaced with improvements or 2) by hydraulic modeling, improvements do not adversely impact the flood zone by causing an increase in the water surface elevation at any particular location.

Drainage design for the intersection improvements shall be completed in accordance with the ADOT hydrologic and hydraulic methodologies and criteria. I-19 is designated with a Drainage Frequency of Class 1, requiring offsite drainage features designed to convey the 50-year storm event. Onsite drainage systems shall be designed to convey the 10-year storm. A preliminary drainage report has been prepared for the recommended alternatives for this study.

Temporary and permanent erosion control and scour mitigation will be incorporated into the project. Temporary erosion control measures will be developed and shown on the Storm Water Pollution Prevention Plans (SWPPP) and details. Permanent scour mitigation will include riprap scour aprons and energy dissipators as needed at the outlets of the new culverts and along the earthen ditches. Riprap sizing and placement will be determined during final design.

Environmental Overview

The project limits and environmental evaluation area included the disturbance footprint of the alternatives (A, B, B1, B2, C, D, and E). When determining the potential environmental impact of the project, a preferred alternative will be identified and the project limits defined by the selected alternative. Once a preferred alternative has been selected, a C-List Categorical Exclusion (CE) Checklist is the anticipated level of National Environmental Policy Act (NEPA) documentation necessary to determine potential project impacts to environmental resources within the project area.

SPECIES INVESTIGATION

The project is situated in a rurally developed area of Santa Cruz County, within the Semidesert Grassland Biotic Community. Surrounding land use is a mixture of residential development, commercial development, and naturally-occurring vegetation. Two large drainages, the Santa Cruz River and Potrero Creek, parallel I-19 in the vicinity of Rio Rico Drive and Ruby Road, respectively.

According to the US Fish and Wildlife Service's (USFWS') Information, Planning, and Conservation (IPaC) System, 11 species listed under the Endangered Species Act (ESA) have been recorded in the geographic vicinity of the project. Designated critical habitat for southwestern willow flycatcher (*Empidonax traillii extimus*) and proposed critical habitat for yellow-billed cuckoo (*Coccyzus americanus*) occur along the Santa Cruz River in the vicinity of Rio Rico Drive. The Arizona Game & Fish Department's Heritage Database Management System shows that three of the 11 ESA-listed species identified by the IPaC System, yellow-billed cuckoo, lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*), and Gila topminnow (*Poeciliopsis occidentalis occidentalis*), have been recorded within two miles of the project limits. A bat colony and records of 12 additional species listed as Species of Concern by the USFWS and/or Sensitive by the US Forest Service have occurred within two miles of the project. The Santa Rita – Tumacacori Wildlife Corridor occurs along the Santa Cruz River adjacent to the project area. Vegetation suitable for other nesting birds protected under the Migratory Bird Treaty Act (MBTA) may occur within the project limits.

A Biological Evaluation will be prepared to address the potential for the project to affect biological resources in the project vicinity. This report will address effects to species regulated by applicable federal and state laws, including the ESA, the MBTA, the Bald and Golden Eagle Protection Act, the Arizona Native Plant Law, and invasive plant species regulated by the Arizona Department of Agriculture.

FLOODPLAINS

The project area is within panels 04023C0462C and 04023C0455C of the Federal Emergency Management Agency Flood Insurance Rate Map. Portions of the project area lie within the designated Special Flood Hazard Area (SFHA) Zone A and Zone AE. The SFHA is the area subject to flooding by the 1.0% annual chance flood. The 1.0% annual (or 100-year), also known as the base

flood, is the flood that has a 1.0% chance of being equaled or exceeded in any given year. Areas designated in Zone A are areas inundated by 1.0% annual chance flooding, for which Base Flood Elevations (BFEs) have not been determined. Areas designated in Zone AE are areas inundated by 1.0% annual chance flooding, for which BFEs have been determined. A small portion of the project area near the Ruby Road TI is located within a moderate flood hazard area, Zone X (shaded). Areas designated in Zone X (shaded) are areas between the limits of the base flood and the 0.2% annual chance (or 500-year) flood. The remainder of the project area lies within a minimal flood hazard area, Zone X (unshaded). Areas designated in Zone X (unshaded) are areas of minimal flood hazard, which are areas outside the SFHA and higher than the elevation of the 0.2% annual chance flood.

SECTION 404 AND SECTION 401 OF THE CLEAN WATER ACT

Several watercourses occur within or immediately adjacent to the project limits. Potrero Creek, an intermittent watercourse, parallels I-19 less than 100 feet from the eastern end of the project limits in the vicinity of Ruby Road; the Santa Cruz River parallels I-19 approximately 800 feet east of the project limits in the vicinity of Rio Rico Drive. Smaller drainage features located within the project area include an unnamed ephemeral wash that parallels the western side of I-19 within the western quadrants of the Ruby Road TI before crossing I-19 and joining Potrero Creek just north of Ruby Road within the project limits. A separate drainage associated with Pesqueira Canyon crosses the I-19 corridor just south of the project limits at Ruby Road. At Rio Rico Drive, ephemeral watercourses associated with Caralampi and Calasbasas canyons cross the I-19 corridor south of the TI and an unnamed ephemeral wash crosses I-19 north of the TI. An additional unnamed ephemeral wash joins the Caralampi drainage at the southwestern quadrant of the interchange.

The 2016 USFWS National Wetlands Inventory has identified riverine systems along each of the aforementioned drainages. Areas identified as Freshwater Forested/Shrub Wetlands occur along the Santa Cruz River east of the project. Based on a review of aerial photographs, wetland and/or true riparian vegetation are not present along the smaller, ephemeral drainages. Riverine wetlands may occur along Potrero Creek and the Santa Cruz River.

If the selected alternative will impact these or other drainages, a Preliminary Jurisdictional Delineation will likely be needed to formally identify jurisdictional waters of the US (WUS) subject to regulation under Section 404 and Section 401 of the Clean Water Act. Project activities that impact jurisdictional WUS will require use of a Section 404 permit authorized by the US Army Corps of Engineers. An individual Section 401 permit may need to be obtained from the Arizona Department of Environmental Quality (ADEQ) due to the proximity of potentially impacted WUS to waters identified as Impaired by the US Environmental Protection Agency (EPA).

AZPDES STORMWATER PERMIT

If more than one acre of land will be disturbed during this project, an Arizona Pollutant Discharge Elimination System permit authorization and a SWPPP will be required. The project is not located within a designated municipal separate stormwater sewer system.

SECTION 4(f) IMPACTS

Section 4(f) of the US Department of Transportation Act of 1966, states that FHWA “may approve a transportation program or project requiring publicly-owned land of a public park, recreation area, or wildlife or waterfowl refuge of national, state or local significance, or land of a historic site of national, state, or local significance (as determined by the federal, state or local officials having jurisdiction over the park, area, refuge or site) only if there is no prudent or feasible alternative to using that land and the program or project includes all possible planning to minimize the harm to the park, recreation area, wildlife and waterfowl refuge, or historic site resulting from the use” (49 U.S.C. 303). A review of the project area does not show any Section 4(f) properties that would be impacted by the project.

POTENTIAL CONTAMINANTS

A review of the 2016 ADOT Photologs (dated May 24, 2016) and Google imagery for the project limits identified TIs, drainage structures, and roadway striping paint as likely targets for asbestos-containing material (ACM) and lead-based paint (LBP) sampling.

A review of the ADEQ eMaps website (<http://gisweb.azdeq.gov/arcgis/emaps/?topic=places>) identified underground storage tank (UST) facilities located within the northern project limits, and adjacent to the southern project limits. The southern UST facility has an associated closed leaking UST (LUST). The EPA's NEPAAssist website (<http://nepassisttool.epa.gov/nepassist/entry>) and the EPA Enforcement and Compliance History Online website (<http://echo.epa.gov/?redirect=echo>) identified a Resource Conservation and Recovery Act (RCRA) small quantity generator adjacent-north to the southern limits. No violations were associated with the RCRA facility.

A review of the Arizona Department of Water Resources Well Registry website (<http://gisweb2.azwater.gov/WellReg>) identified water wells located within the project limits. Should any potentially-impacted wells be identified during construction, the well(s) should be properly abandoned according to regulatory standards prior to disturbance.

In order to maintain consistency with ADOT hazardous materials practices, a Preliminary Initial Site Assessment report should be completed prior to the start of project construction. In addition, sampling and analysis of painted surfaces, including roadway striping paint, should be conducted for both ACM and LBP if these features will be impacted by project construction. Load-bearing structures and other features, including drainage structures, should also be sampled for ACM if these features will be impacted by construction per the current National Emission Standards for Hazardous Air Pollutants guidelines.

SOCIAL OR ECONOMIC IMPACTS

Some traffic congestion and delays may be expected within the construction zone. A traffic control plan will be developed by the contractor to minimize impacts on motorists, pedestrians, and construction personnel, as necessary. Access to businesses will be provided during construction. Final design will include traffic control plans and construction phasing and sequencing plans. No environmental justice concerns are anticipated.

CULTURAL RESOURCES INVESTIGATION

A preliminary online AZSITE Cultural Resource Database, the General Land Office (GLO) plats and survey records on file at the Bureau of Land Management (BLM) Arizona State Office, and the ADOT Historic Preservation Team portal review indicated that the project alignment was subjected to twelve cultural resources surveys between 1964 and 2011, primarily for I-19 and fiber optic line construction. Five sites were identified and two linear structures are within the area of potential effect. The two linear structures include I-19 and SR 289.

The Section 106 Exemption Regarding Effects to the Interstate Highway System (ACHP 2005) specifically excludes consideration of Interstate highways and bridges from the recording and treatment procedures of the Interim Procedures. No further cultural resource work is recommended for the I-19 portion of the APE.

SR 289 is a historic road that was constructed to serve traffic between I-19 and Peña Blanca Lake, which was completed in 1957. The road likely followed an existing road (Ruby Road), and was only partially paved by 1961, according to highway maps. Serious improvements, which included widening of the ROW, occurred after 1965. The proposed project of replacing the bridge decking will

not affect the location or function/design and will not adversely impact SR 289. No further cultural resource work is recommended for the SR 289 portion of the APE.

In this phase of the study, tribal consultation will consist of early consultation letters to the following tribes: the Ak-Chin Indian Community, the Gila River Indian Community, the Hopi Tribe, the Pascua Yaqui Tribe, the Salt River Pima-Maricopa Indian Community, the Tohono O'odham Nation [lead southern tribe as specified in 35 CFR §800.6(a)], and the White Mountain Apache Tribe.

SCENIC AND HISTORIC ROUTES

No scenic highways are located within the project area.

PUBLIC SCOPING

Public scoping for this project consists of sending public and agency scoping letters to adjacent and affected landowners, government agencies and other stakeholders such as nonprofit organizations. Surrounding businesses, residents and landowners have been contacted by letter for comments. In addition, public agencies have been scoped for comments including, but not limited to: Sky Island Alliance, emergency response-hospitals, police, sheriff, Department of Public Safety and fire departments, schools, chamber of commerce, neighborhood associations, and the floodplain administrator.

SOLE SOURCE AQUIFER

The EPA Sole Source Aquifer Program under Section 1424(e) of the US Safe Drinking Water Act allows for EPA environmental review of any project which is financially assisted by federal grants or federal loan guarantees. The project is located in the Upper Santa Cruz and Avra Basin Sole Source Aquifer area. Therefore, EPA environmental review of the project is required.

AIR QUALITY

This project is located in a particulate matter 10 (PM10) nonattainment area. PM10 are inhalable particles with diameters that are generally 10 micrometers and smaller. Sources of PM10 are construction sites, unpaved roads, fields, smokestacks and fires. This project is likely to add capacity and alter existing roadway alignments; however, it is not expected to result in any meaningful changes in traffic volumes or vehicle mixes. Therefore, the project is believed to be exempt from Mobile Source Air Toxics (MSAT) analysis with no significant effects.

This project would generate minimal air quality impacts for Clean Air Act criteria pollutants and has not been linked with any special MSAT concerns. Consequently, this effort is exempt from analysis for MSATs. As such, this project is anticipated to meet the requirements of Transportation Conformity as defined by FHWA.

NOISE/TRAFFIC

If an alternative is developed during final design that adds capacity, a noise analysis will likely be required. A traffic control plan will be developed by the contractor to minimize impacts on motorists, pedestrians, and construction personnel, as necessary. All driveway access points will be maintained or alternative routes will be provided. Construction-related noise will be controlled in accordance with ADOT Standard Specifications (Section 104.08 Prevention of Air and Noise Pollution).

E. OTHER REQUIREMENTS

The CPS ID is MU1L. The project is not listed in the ADOT 2018–2022 Five-Year Transportation Facilities Construction Program. When funding is available, this project is expected to progress to design and construction. A funding source for the project has not been identified.

The Scoping Project Manager is Asadul Karim, (602) 712-6799.

This project will be administered under the FHWA Operating Partnership Agreement under Category T (Delegated/State administered).

The estimated construction duration varies by alternative:

- Alternative A – 120 calendar days
- Alternative B/B1/B2 – 240 calendar days
- Alternative C – 240 calendar days
- Alternative D – 240 calendar days
- Alternative E – 120 calendar days

Implementation/construction phasing will be addressed in a later phase of the project. However, the need for weekend or holiday restrictions on construction is not anticipated. Because industrial park traffic is highest in January through June, construction should be limited to summer and fall months. Short-term lane and shoulder closures will be required for paving operations. Daytime or nighttime work hour restrictions have not been identified.

Traffic control requirements will be in accordance with the current edition of the *Manual on Uniform Traffic Control Devices (MUTCD)* and *Arizona Supplement* to the current edition of the *MUTCD*, and/or by special provisions.

Within two weeks of the design kick-off meeting, the design project manager will develop a customized project schedule that will reflect the full scope of the work. ADOT's Program and Project Management Section will provide the necessary technical support to the design team during the schedule development.

F. ESTIMATED COST

The estimated construction and right-of-way costs for the improvements vary by alternative as follows:

<u>Alternative</u>	<u>Estimated Construction Cost</u>	<u>Estimated Right-of-Way Cost*</u>	<u>Estimated Total Project Cost*</u>
Alternative A	\$4,980,740	\$1,402,260	\$6,383,000
Alternative B	\$9,126,400	\$1,092,600	\$10,219,000
Alternative B1	\$8,300,230	\$539,770	\$8,840,000
Alternative B2	\$11,394,100	\$565,900	\$11,960,000
Alternative C	\$11,875,610	\$498,390	\$12,374,000
Alternative D	\$10,001,210	\$1,151,790	\$11,153,000
Alternative E	\$6,084,630	\$2,480,370	\$8,565,000

* See note below regarding estimated right-of-way costs

Estimated costs are based on the following assumptions and methodology. For items not mentioned, estimated costs are based on unit prices from bid tabs of recently-advertised projects.

- Item No. 2020301, Roadway Excavation – Estimated based on the length of new roadways and an average height of embankment fill. During final design, when topographic mapping is available, a more precise earthwork estimate will be generated.
- The existing roadways will be fully removed and reconstructed within the construction limits. Asphaltic concrete pavement is assumed for all new roadways. The new pavement structural section used in the estimate includes 9" AC on 8" AB (Class 2).
- Item No. 7010001, Maintenance and Protection of Traffic – Calculated at 10% of the detailed estimate subtotal with contingency. A value of 2% was used for Alternative E because the west frontage road will be constructed in an area where no road currently exists, thus requiring less maintenance and protection of traffic.
- Item No. 70800XX, Pavement Marking – Lump sum estimate of pavement marking cost based on the preliminary design and concept-level quantities.
- Item No. 709XX01, Signing – Lump sum estimate of signing cost based on the preliminary design and concept-level quantities.
- Item No. 730XX01, Lighting – Lump sum estimate of lighting cost included for Alternative C based on the preliminary design and concept-level quantities. Other lighting costs are included in the traffic signal item for each alternative.
- Item No. 9240050, Reconstruction of Non-Compliant ADA Features on Rio Rico Drive – lump sum estimate has been included based on non-compliant ADA features that need to be reconstructed along Rio Rico Drive.
- Right-of-way costs are based on an estimate provided by ADOT Right-of-Way Group. Square footage cost includes lump sum severance costs which varies by alternative.
- A cost for utility relocations is estimated based on five percent of Subtotal 4.
- A cost for public involvement is based on one percent of the subtotal with mobilization (Subtotal 3) is included.

G. REQUIRED ACTION BY THE PRIORITY PLANNING ACTION COMMITTEE (PPAC) AND/OR PROJECT REVIEW BOARD (PRB):

This project will be submitted by the ADOT Southcentral District to the Priority Programming Section of the Multimodal Planning Division for inclusion in the Five-Year Transportation Facilities Construction Program.

I-19 East Frontage Road, Ruby Road – Rio Rico Drive
Final Project Assessment

ADOT Project No. 019 SC 007 H8401 02L
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H. INVOLVEMENT SHEET

TRACS No. 019 SC 007 H8401 02L
Project Name: I-19 East Frontage Road, Ruby Road – Rio Rico Drive
Location: Nogales – Tucson Highway

CONTACTED	KICKOFF MEETING	ORGANIZATION	INVOLVEMENT				COMMENTS (ISSUES WHICH MAKE INVOLVEMENT SIGNIFICANT OR MINIMAL)
			SIGNIFICANT	MINIMUM	NONE	UNKNOWN	
X	X	SOUTHCENTRAL DISTRICT	X				CONSTRUCTION ENGINEERING AND ADMINISTRATION
X	X	PROJECT MANAGEMENT	X				MANAGE DESIGN. SCOPING PROJECT MANAGER: ASADUL KARIM (602) 712-6799
X	X	RIGHT-OF-WAY	X				ACQUIRE NEW RIGHT-OF-WAY AND TEMPORARY CONSTRUCTION EASEMENTS IF NEEDED
X	X	ROADWAY DESIGN		X			REVIEW PLANS
X	X	TRAFFIC DESIGN		X			REVIEW PLANS
X	X	BRIDGE DESIGN		X			REVIEW PLANS
X		DRAINAGE DESIGN		X			REVIEW PLANS
X		PAVEMENT DESIGN	X				MATERIALS DESIGN REPORT & PAVEMENT DESIGN SUMMARY
X		GEOTECH SECTION	X				GEOTECHNICAL INVESTIGATION & PAVEMENT DESIGN
X	X	ENVIRONMENTAL PLANNING	X				PREPARE ENVIRONMENTAL DOCUMENTATION AND CLEARANCE
X	X	UTILITIES & RAILROAD	X				COORDINATE UTILITY RELOCATIONS, UTILITY CLEARANCE LETTER
X	X	COMMUNICATIONS		X			COORDINATE WITH PROPERTY OWNERS, PUBLIC.
X		PHOTOGRAMMETRY & MAPPING	X				PREPARE TOPOGRAPHIC MAPPING FOR DESIGN PRIOR TO DESIGN KICKOFF
X		ROADSIDE DEVELOPMENT		X			PREPARE SEEDING SPECIFICATIONS; REVIEW SWPPP
X		CONTRACTS & SPECIFICATIONS	X				PREPARE P S & E PACKAGE; ADVERTISE PROJECT
X		FHWA		X			FEDERAL FUNDING, ADOT/FHWA PARTNERSHIP AGREEMENT, CATEGORY T
X	X	SANTA CRUZ COUNTY		X			COORDINATION
		SANTA CRUZ COUNTY FLOODPLAIN ADMINISTRATOR		X			COORDINATION
X		CITY OF NOGALES		X			COORDINATION

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I. ITEMIZED ESTIMATES OF PROBABLE CONSTRUCTION COST – RECOMMENDED ALTERNATIVES

I-19 EAST FRONTAGE ROAD, RUBY ROAD – RIO RICO DRIVE – ALTERNATIVE A					
ITEM NO.	ITEM DESCRIPTION	UNIT OF	QUANTITY	UNIT PRICE	TOTAL
2020021	REMOVAL OF CONCRETE CURB AND GUTTER	L.F.T.	179	\$ 4.00	\$ 716
2020023	REMOVE EXISTING TRAFFIC SIGNALS	L.SUM		\$ 15,000.00	\$ 0
2020025	REMOVAL OF CONCRETE SIDEWALKS, DRIVEWAYS AND SLABS	SQ.FT.	1,034	\$ 2.50	\$ 2,585
2020027	REMOVAL OF CONCRETE BARRIER	L.F.T.		\$ 15.00	\$ 0
2020036	REMOVAL OF ASPHALTIC CONCRETE PAVEMENT	SQ.YD.	12,541	\$ 5.00	\$ 62,705
2020041	REMOVAL OF PIPE	L.F.T.	6	\$ 50.00	\$ 300
2020045	REMOVAL OF RIPRAP	CU.YD.	100	\$ 10.00	\$ 1,000
2020050	REMOVE DRAINAGE STRUCTURES	L.SUM	3	\$ 300.00	\$ 900
2020153	REMOVE (SIGNS, FOUNDATIONS, AND POSTS)	L.SUM	1	\$ 2,000.00	\$ 2,000
2020154	REMOVE (SIGN STRUCTURE)	EACH	3	\$ 2,500.00	\$ 7,500
2020057	REMOVE AND SALVAGE (END TREATMENTS)	EACH		\$ 300.00	\$ 0
2030301	ROADWAY EXCAVATION	CU.YD.	36,000.00	\$ 10.00	\$ 360,000
2030401	DRAINAGE EXCAVATION	CU.YD.	500.00	\$ 10.00	\$ 5,000
3030022	AGGREGATE BASE, CLASS 2	CU.YD.	5,356	\$ 34.00	\$ 182,104
4040111	BITUMINOUS TACK COAT	TON	13	\$ 400.00	\$ 5,200
4040116	APPLY BITUMINOUS TACK COAT	TON	24	\$ 150.00	\$ 3,600
4040282	ASPHALT BINDER (PG 76-16)	TON	489	\$ 550.00	\$ 268,950
4160004	ASPHALTIC CONCRETE - EP (3/4" MIX)	TON	9,789	\$ 32.00	\$ 313,248
4160031	MINERAL ADMIXTURE (FOR 3/4" MIX)	TON	93	\$ 90.00	\$ 8,370
5010011	PIPE, CORRUGATED METAL, 24"	L.F.T.	25	\$ 70.00	\$ 1,750
5010017	PIPE, CORRUGATED METAL, 30"	L.F.T.	17	\$ 75.00	\$ 1,275
5010017	PIPE, CORRUGATED METAL, 42"	L.F.T.	6	\$ 90.00	\$ 540
5014524	FLARED END SECTION, 24" (C-13.20 OR C-13.25) (PIPE CULVERT)	EACH	1	\$ 500.00	\$ 500
5014530	FLARED END SECTION, 30" (C-13.20 OR C-13.25) (PIPE CULVERT)	EACH	1	\$ 600.00	\$ 600
5014542	FLARED END SECTION, 42" (C-13.20 OR C-13.25) (PIPE CULVERT)	EACH	1	\$ 1,500.00	\$ 1,500
5041901	DRAINAGE STRUCTURE (3 - 10 X 8 RCB CULVERT)	EACH	1	\$ 398,366.00	\$ 398,366
5041903	DRAINAGE STRUCTURE (2 - 8 X 7 RCB CULVERT UNDER FRONTAGE ROAD)	EACH		\$ -	\$ 0
5041904	DRAINAGE STRUCTURE (RCB CULVERT UNDER RUBY ROAD)	EACH		\$ -	\$ 0
5041905	DRAINAGE STRUCTURE (RCB CULVERT EXTENSION UNDER I-19)	EACH		\$ -	\$ 0
5050001	MANHOLE (C-18.10) (NO. 1) (FOR PIPES 6" TO 36")	EACH		\$ 3,500.00	\$ 0
60700XX	SIGNING	L.SUM	1	\$ 3,000.00	\$ 3,000
70800XX	PAVEMENT MARKING	L.SUM	1	\$ 10,000.00	\$ 10,000
73600XX	LIGHTING	L.SUM		\$ 177,000.00	\$ 0
73200XX	FREEWAY MANAGEMENT SYSTEM (FMS)	L.SUM		\$ 30,000.00	\$ 0
73300XX	TRAFFIC SIGNAL	L.SUM	1	\$ 450,000.00	\$ 450,000
9050001	GUARD RAIL, W-BEAM, SINGLE FACE	L.F.T.		\$ 20.00	\$ 0
9050025	GUARD RAIL TERMINAL (ET-PLUS OR SKT-350)	EACH		\$ 2,500.00	\$ 0
9050430	THREE-BEAM GUARD RAIL TRANSITION SYSTEM	EACH		\$ 4,500.00	\$ 0
9080051	CONCRETE CURB AND GUTTER (C-05.10) (TYPE A)	L.F.T.		\$ 16.00	\$ 0
9080084	CONCRETE CURB AND GUTTER (TYPE D OR D-1)	L.F.T.	170	\$ 15.00	\$ 2,550
9080201	CONCRETE SIDEWALK (C-05.20)	SQ.FT.		\$ 4.00	\$ 0
9080201	CONCRETE SIDEWALK (C-05.20)	SQ.FT.	477	\$ 12.00	\$ 5,724
9080245	CONCRETE (TRUCK APRON FOR ROUNDABOUT)	SQ.YD.		\$ 100.00	\$ 0
9080301	CONCRETE DRIVEWAY (C-05.20)	SQ.FT.		\$ 7.00	\$ 0
9080296	CONCRETE SIDEWALK RAMP (C-05.30) (TYPE B)	EACH	1	\$ 3,000.00	\$ 3,000
9100001	CONCRETE BARRIER	L.F.T.		\$ 50.00	\$ 0
9100117	CONCRETE BARRIER TRANSITION (C-10.71)	EACH		\$ 4,000.00	\$ 0
9130008	RIPRAP (DUMPED) (12")	CU.YD.		\$ 140.00	\$ 0
9130051	RIPRAP (DUMPED) (6")	CU.YD.	120	\$ 90.00	\$ 10,800
9140155	RETAINING WALL	SQ.FT.		\$ 50.00	\$ 0
9240050	RECONSTRUCTION OF NON-COMPLIANT ADA FEATURES ON RIO RICO DRIVE	L.SUM	1	\$ 40,500.00	\$ 40,500
DETAILED ESTIMATE SUBTOTAL					\$ 2,154,283
934XX01	MISCELLANEOUS WORK (15%)	COST	15.00%		\$ 323,143
Subtotal 1					\$ 2,477,426
207XX01	DUST PALLIATIVE (1%)	COST	1.00%		\$ 24,775
209XX01	FURNISH WATER (1%)	COST	1.00%		\$ 24,775
7010001	MAINTENANCE AND PROTECTION OF TRAFFIC (10%)	COST	10.00%		\$ 247,743
810XX01	EROSION CONTROL AND POLLUTION PREVENTION (2%)	COST	2.00%		\$ 49,549
924XX02	CONTRACTOR QUALITY CONTROL (2%)	COST	2.00%		\$ 49,549
925XX01	CONSTRUCTION SURVEYING AND LAYOUT (1%)	COST	1.00%		\$ 24,775
Subtotal 2					\$ 2,898,592
9010001	MOBILIZATION (10%)	COST	10.0%		\$ 289,860
Subtotal 3					\$ 3,188,452
951X001	CONSTRUCTION ENGINEERING		15.00%		\$ 478,268
951XXXX	PUBLIC INVOLVEMENT		1.00%		\$ 31,885
951X002	CONSTRUCTION CONTINGENCY		5.00%		\$ 159,423
	ASPHALTIC CONCRETE (3/4" MIX) MATERIALS QUALITY INCENTIVE	TON	9,789	\$ 3.00	\$ 29,367
Subtotal 4					\$ 3,887,395
	FINAL DESIGN COSTS (8%)	COST	8.00%		\$ 310,992
	RIGHT-OF-WAY	ACRES	5.52	\$ 254,032	\$ 1,402,256
	UTILITY RELOCATIONS	COST	5.00%		\$ 194,370
Subtotal 5					\$ 5,795,012
951X010	INDIRECT COST ALLOWANCE (10.14%)		10.14%		\$ 587,614
TOTAL CONSTRUCTION COSTS					\$ 6,383,000

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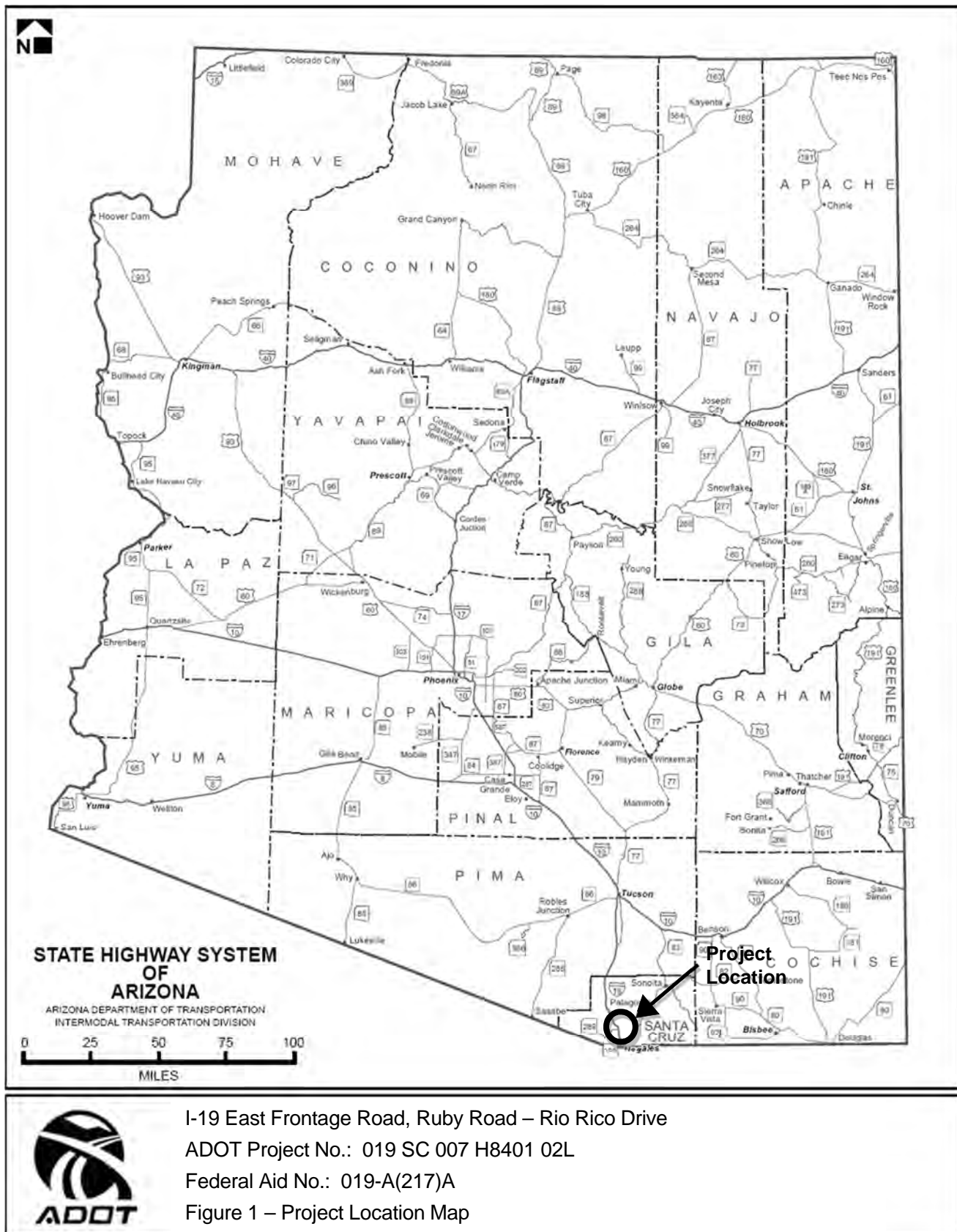
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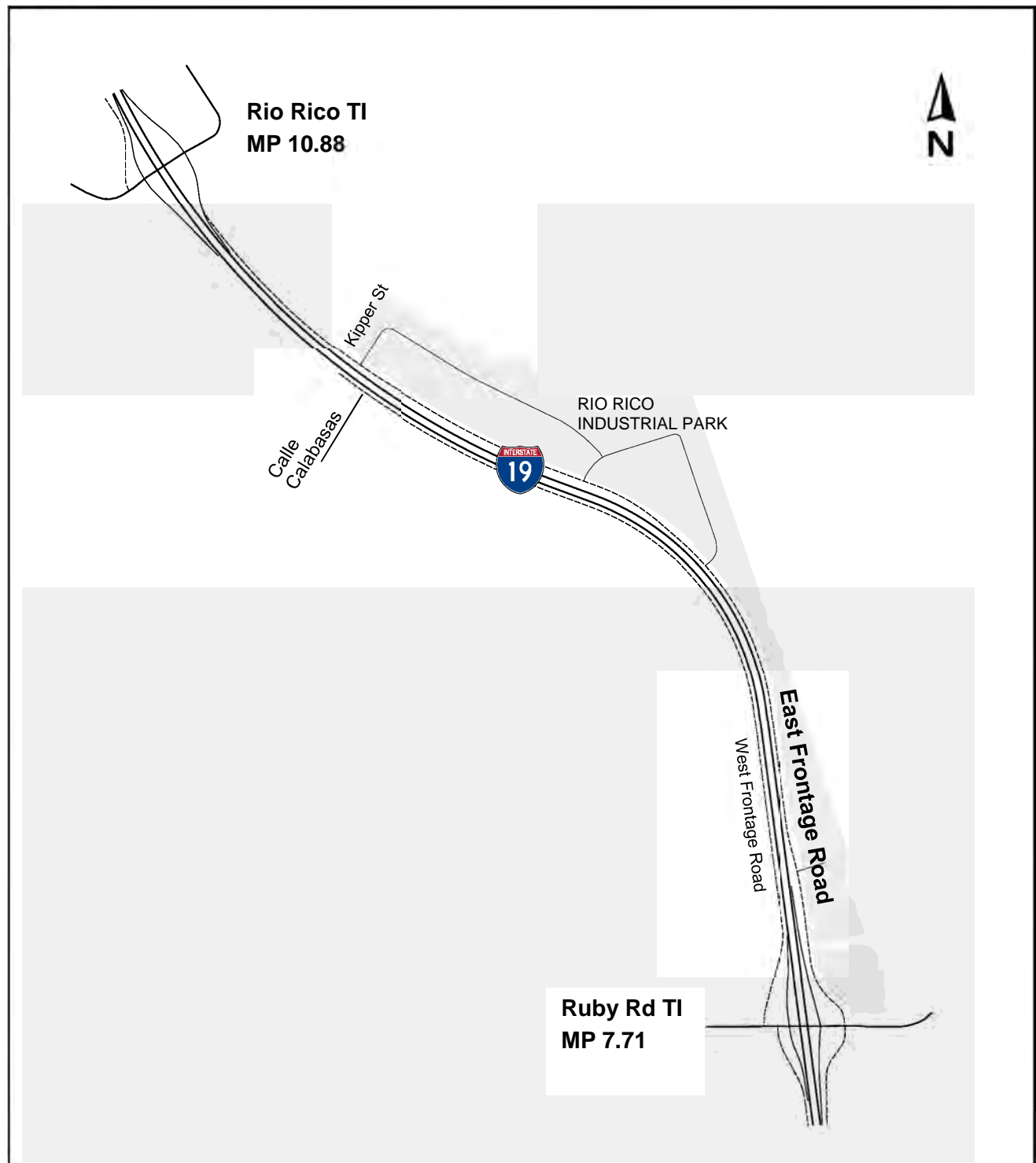
I-19 EAST FRONTAGE ROAD, RUBY ROAD – RIO RICO DRIVE – ALTERNATIVE D					
ITEM NO.	ITEM DESCRIPTION	UNIT OF	QUANTITY	UNIT PRICE	TOTAL
2020021	REMOVAL OF CONCRETE CURB AND GUTTER	L.F.T.	2,205	\$ 4.00	\$ 8,820
2020023	REMOVE EXISTING TRAFFIC SIGNALS	L.SUM	1	\$ 45,000.00	\$ 45,000
2020025	REMOVAL OF CONCRETE SIDEWALKS, DRIVEWAYS AND SLABS	SQ.FT.	16,090	\$ 2.50	\$ 40,225
2020027	REMOVAL OF CONCRETE BARRIER	L.F.T.	2,555	\$ 15.00	\$ 38,325
2020036	REMOVAL OF ASPHALTIC CONCRETE PAVEMENT	SQ.YD.	37,278	\$ 5.00	\$ 186,393
2020041	REMOVAL OF PIPE	L.F.T.	1,088	\$ 50.00	\$ 54,400
2020045	REMOVAL OF RIPRAP	CU.YD.	5	\$ 10.00	\$ 50
2020050	REMOVE DRAINAGE STRUCTURES	L.SUM	1	\$ 25,000.00	\$ 25,000
2020153	REMOVE (SIGNS, FOUNDATIONS, AND POSTS)	L.SUM	1	\$ 20,000.00	\$ 20,000
2020154	REMOVE (SIGN STRUCTURE)	EACH	2	\$ 2,500.00	\$ 5,000
2020057	REMOVE AND SALVAGE (END TREATMENTS)	EACH	4	\$ 300.00	\$ 1,200
2030301	ROADWAY EXCAVATION	CU.YD.	70,000	\$ 10.00	\$ 700,000
2030401	DRAINAGE EXCAVATION	CU.YD.	1,500	\$ 10.00	\$ 15,000
3030022	AGGREGATE BASE, CLASS 2	CU.YD.	10,352	\$ 34.00	\$ 351,968
4040111	BITUMINOUS TACK COAT	TON	28	\$ 400.00	\$ 11,200
4040116	APPLY BITUMINOUS TACK COAT	TON	48	\$ 150.00	\$ 7,200
4040282	ASPHALT BINDER (PG 76-16)	TON	1,041	\$ 550.00	\$ 572,550
4160004	ASPHALTIC CONCRETE - EP (3/4" MIX)	TON	20,825	\$ 32.00	\$ 666,400
4160031	MINERAL ADMIXTURE (FOR 3/4" MIX)	TON	198	\$ 90.00	\$ 17,820
5010011	PIPE, CORRUGATED METAL, 24"	L.F.T.	161	\$ 60.00	\$ 9,660
5012524	STORM DRAIN PIPE, 24"	L.F.T.	1,252	\$ 80.00	\$ 100,160
5014524	FLARED END SECTION, 24" (C-13.20 OR C-13.25) (PIPE CULVERT)	EACH	11	\$ 300.00	\$ 3,300
5030031	CONCRETE CATCH BASIN (C-15.20) SUMP ONLY, H=8' OR LESS	EACH	8	\$ 2,800.00	\$ 22,400
5030141	CONCRETE CATCH BASIN (MEDIAN)	EACH	1	\$ 5,000.00	\$ 5,000
5041901	DRAINAGE STRUCTURE (3 - 10 X 8 RCB CULVERT)	EACH		\$ -	\$ 0
5041902	DRAINAGE STRUCTURE (6 X 7 RCB CULVERT EXTENSION)	EACH		\$ -	\$ 0
5041903	DRAINAGE STRUCTURE (2 - 8 X 7 RCB CULVERT UNDER FRONTAGE ROAD)	EACH	1	\$ 146,979.00	\$ 146,979
5041904	DRAINAGE STRUCTURE (RCB CULVERT UNDER RUBY ROAD)	EACH	1	\$ 58,419.00	\$ 58,419
5041905	DRAINAGE STRUCTURE (RCB CULVERT EXTENSION UNDER I-19)	EACH		\$ -	\$ 0
6016088	HEADWALL	EACH	1	\$ 5,000.00	\$ 5,000
60700XX	SIGNING	L.SUM	1	\$ 260,000.00	\$ 260,000
70800XX	PAVEMENT MARKING	L.SUM	1	\$ 43,000.00	\$ 43,000
73600XX	LIGHTING	L.SUM		\$ 177,000.00	\$ 0
73200XX	FREEWAY MANAGEMENT SYSTEM (FMS)	L.SUM		\$ 30,000.00	\$ 0
73300XX	TRAFFIC SIGNAL	L.SUM	1	\$ 650,000.00	\$ 650,000
9050001	GUARD RAIL, W-BEAM, SINGLE FACE	L.F.T.		\$ 20.00	\$ 0
9050025	GUARD RAIL TERMINAL (ET-PLUS OR SKT-350)	EACH	1	\$ 2,500.00	\$ 2,500
9050430	THREE-BEAM GUARD RAIL TRANSITION SYSTEM	EACH	1	\$ 4,500.00	\$ 4,500
9080051	CONCRETE CURB AND GUTTER (C-05.10) (TYPE A)	L.F.T.	5,236	\$ 16.00	\$ 83,776
9080084	CONCRETE CURB AND GUTTER (TYPE D OR D-1)	L.F.T.	1,035	\$ 15.00	\$ 15,525
9080201	CONCRETE SIDEWALK (C-05.20)	SQ.FT.		\$ 4.00	\$ 0
9080201	CONCRETE SIDEWALK (C-05.20)	SQ.FT.	477	\$ 12.00	\$ 5,724
9080245	CONCRETE (TRUCK APRON FOR ROUNDABOUT)	SQ.YD.		\$ 100.00	\$ 0
9080301	CONCRETE DRIVEWAY (C-05.20)	SQ.FT.		\$ 7.00	\$ 0
9080296	CONCRETE SIDEWALK RAMP (C-05.30) (TYPE B)	EACH	1	\$ 3,000.00	\$ 3,000
9100001	CONCRETE BARRIER	L.F.T.	734	\$ 50.00	\$ 36,700
9100117	CONCRETE BARRIER TRANSITION (C-10.71)	EACH	1	\$ 4,000.00	\$ 4,000
9130008	RIPRAP (DUMPED) (12")	CU.YD.	185	\$ 80.00	\$ 14,800
9170001	EMBANKMENT SPILLWAY (C-4.10)	L.F.T.	76	\$ 60.00	\$ 4,560
9210011	MEDIAN PAVING	SQ.YD.	3,787	\$ 30.00	\$ 113,620
9240050	RECONSTRUCTION OF NON-COMPLIANT ADA FEATURES ON RIO RICO DRIVE	L.SUM	1	\$ 40,500.00	\$ 40,500
				DETAILED ESTIMATE SUBTOTAL	\$ 4,399,674
934XX01	MISCELLANEOUS WORK (15%)	COST	15.00%		\$ 659,952
				Subtotal 1	\$ 5,059,626
207XX01	DUST PALLIATIVE (1%)	COST	1.00%		\$ 50,597
209XX01	FURNISH WATER (1%)	COST	1.00%		\$ 50,597
7010001	MAINTENANCE AND PROTECTION OF TRAFFIC (10%)	COST	10.00%		\$ 505,963
810XX01	EROSION CONTROL AND POLLUTION PREVENTION (2%)	COST	2.00%		\$ 101,193
924XX02	CONTRACTOR QUALITY CONTROL (2%)	COST	2.00%		\$ 101,193
925XX01	CONSTRUCTION SURVEYING AND LAYOUT (1%)	COST	1.00%		\$ 50,597
				Subtotal 2	\$ 5,919,766
9010001	MOBILIZATION (10%)	COST	10.0%		\$ 591,977
				Subtotal 3	\$ 6,511,743
951X001	CONSTRUCTION ENGINEERING		15.00%		\$ 976,762
951XXXX	PUBLIC INVOLVEMENT		1.00%		\$ 65,118
951X002	CONSTRUCTION CONTINGENCY		5.00%		\$ 325,587
	ASPHALTIC CONCRETE (3/4" MIX) MATERIALS QUALITY INCENTIVE	TON	20,825	\$ 3.00	\$ 62,475
				Subtotal 4	\$ 7,941,685
	FINAL DESIGN COSTS (8%)	COST	8.00%		\$ 635,335
	RIGHT-OF-WAY	ACRES	4.37	\$ 263,567	\$ 1,151,786
	UTILITY RELOCATIONS	COST	5.00%		\$ 397,084
				Subtotal 5	\$ 10,125,890
951X010	INDIRECT COST ALLOWANCE (10.14%)		10.14%		\$ 1,026,765
				TOTAL CONSTRUCTION COSTS	\$ 11,153,000

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ADOT Project No. 019 SC 007 H8401 02L
Federal Project No. 019-A(217)A

I-19 EAST FRONTAGE ROAD, RUBY ROAD – RIO RICO DRIVE — ALTERNATIVE E					
ITEM NO.	ITEM DESCRIPTION	UNIT OF	QUANTITY	UNIT PRICE	TOTAL
2020021	REMOVAL OF CONCRETE CURB AND GUTTER	L.FT.	621	\$ 4.00	\$ 2,484
2020023	REMOVE EXISTING TRAFFIC SIGNALS	L.SUM	-	\$ 15,000.00	\$ 0
2020025	REMOVAL OF CONCRETE SIDEWALKS, DRIVEWAYS AND SLABS	SQ.FT.	3,656	\$ 2.50	\$ 9,140
2020027	REMOVAL OF CONCRETE BARRIER	L.FT.	-	\$ 15.00	\$ 0
2020036	REMOVAL OF ASPHALTIC CONCRETE PAVEMENT	SQ.YD.	842	\$ 5.00	\$ 4,210
2020041	REMOVAL OF PIPE	L.FT.	-	\$ 25.00	\$ 0
2020045	REMOVAL OF RIPRAP	CU.YD.	15	\$ 10.00	\$ 150
2020050	REMOVE DRAINAGE STRUCTURES	L.SUM	1	\$ 800.00	\$ 800
2020153	REMOVE (SIGNS, FOUNDATIONS, AND POSTS)	L.SUM	-	\$ 2,000.00	\$ 0
2020154	REMOVE (SIGN STRUCTURE)	EACH	-	\$ 2,500.00	\$ 0
2020057	REMOVE AND SALVAGE (END TREATMENTS)	EACH	-	\$ 300.00	\$ 0
2030301	ROADWAY EXCAVATION	CU.YD.	42,000.00	\$ 15.00	\$ 630,000
2030401	DRAINAGE EXCAVATION	CU.YD.	15,000.00	\$ 10.00	\$ 150,000
2030902	BORROW (CU.YD.	12,000.00	\$ 10.00	\$ 120,000
3030022	AGGREGATE BASE, CLASS 2	CU.YD.	5,567	\$ 34.00	\$ 189,278
4040111	BITUMINOUS TACK COAT	TON	14	\$ 400.00	\$ 5,600
4040116	APPLY BITUMINOUS TACK COAT	TON	24	\$ 150.00	\$ 3,600
4040282	ASPHALT BINDER (PG 76-16)	TON	506	\$ 550.00	\$ 278,300
4160004	ASPHALTIC CONCRETE - EP (3/4" MIX)	TON	10,121	\$ 32.00	\$ 323,872
4160031	MINERAL ADMIXTURE (FOR 3/4" MIX)	TON	97	\$ 90.00	\$ 8,730
5010024	PIPE, CORRUGATED METAL, 24"	L.FT.	84	\$ 65.00	\$ 5,460
5010030	PIPE, CORRUGATED METAL, 30"	L.FT.	87	\$ 110.00	\$ 9,570
5010042	PIPE, CORRUGATED METAL, 42"	L.FT.	96	\$ 90.00	\$ 8,640
5014524	FLARED END SECTION, 24" (C-13.20 OR C-13.25) (PIPE CULVERT)	EACH	3	\$ 500.00	\$ 1,500
5014530	FLARED END SECTION, 30" (C-13.20 OR C-13.25) (PIPE CULVERT)	EACH	1	\$ 600.00	\$ 600
5014542	FLARED END SECTION, 42" (C-13.20 OR C-13.25) (PIPE CULVERT)	EACH	2	\$ 1,500.00	\$ 3,000
5041901	DRAINAGE STRUCTURE (3 - 10 X 8 RCB CULVERT)	EACH	1	\$ 183,100.00	\$ 183,100
5041902	DRAINAGE STRUCTURE (3 - 12 X 8 RCB CULVERT EXTENSION)	EACH	1	\$ 325,400.00	\$ 325,400
5030141	CONCRETE CATCH BASIN (C-15.20) SUMP ONLY, H=8' OR LESS	EACH	1	\$ 3,500.00	\$ 3,500
6016088	HEADWALL (24" & 30")	EACH	1	\$ 5,000.00	\$ 5,000
6110201	METAL HANDRAIL	L.FT.	12	\$ 45.00	\$ 540
60700XX	SIGNING	L.SUM	1	\$ 10,000.00	\$ 10,000
70800XX	PAVEMENT MARKING	L.SUM	1	\$ 10,000.00	\$ 10,000
73200XX	FREEWAY MANAGEMENT SYSTEM (FMS)	L.SUM	-	\$ 30,000.00	\$ 0
73300XX	TRAFFIC SIGNAL	L.SUM	1	\$ 300,000.00	\$ 300,000
9050001	GUARD RAIL, W-BEAM, SINGLE FACE	L.FT.	-	\$ 20.00	\$ 0
9050025	GUARD RAIL TERMINAL (ET-PLUS OR SKT-350)	EACH	-	\$ 2,500.00	\$ 0
9050430	THREE-BEAM GUARD RAIL TRANSITION SYSTEM	EACH	-	\$ 4,500.00	\$ 0
9080051	CONCRETE CURB AND GUTTER (C-05.10) (TYPE A)	L.FT.	-	\$ 16.00	\$ 0
9080084	CONCRETE CURB AND GUTTER (TYPE D OR D-1)	L.FT.	675	\$ 15.00	\$ 10,125
9080201	CONCRETE SIDEWALK (C-05.20)	SQ.FT.	-	\$ 4.00	\$ 0
9080201	CONCRETE SIDEWALK (C-05.20)	SQ.FT.	2,829	\$ 12.00	\$ 33,948
9080301	CONCRETE DRIVEWAY (C-05.20)	SQ.FT.	-	\$ 7.00	\$ 0
9080512	SCUPPER (EACH	-	\$ 2,500.00	\$ 0
9080296	CONCRETE SIDEWALK RAMP (C-05.30) (TYPE B)	EACH	4	\$ 3,000.00	\$ 12,000
9100117	CONCRETE BARRIER TRANSITION (C-10.71)	EACH	-	\$ 4,000.00	\$ 0
9130001	RIPRAP (DUMPED)	CU.YD.	25	\$ 80.00	\$ 2,000
9130002	RIPRAP (WIRE-TIED)	CU.YD.	50	\$ 90.00	\$ 4,500
9130035	RIPRAP (CHANNEL)	CU.YD.	1,390	\$ 80.00	\$ 111,200
9201006	CONCRETE CHANNEL LINING (6")	SQ.YD.	-	\$ 60.00	\$ 0
9240050	RECONSTRUCTION OF NON-COMPLIANT ADA FEATURES ON RIO RICO DRIVE	L.SUM	1	\$ 24,600.00	\$ 24,600
				DETAILED ESTIMATE SUBTOTAL	\$ 2,790,847
934XX01	MISCELLANEOUS WORK (15%)	COST	15.00%		\$ 418,628
				Subtotal 1	\$ 3,209,475
207XX01	DUST PALLIATIVE (1%)	COST	1.00%		\$ 32,095
209XX01	FURNISH WATER (1%)	COST	1.00%		\$ 32,095
7010001	MAINTENANCE AND PROTECTION OF TRAFFIC (2%)	COST	2.00%		\$ 64,190
810XX01	EROSION CONTROL AND POLLUTION PREVENTION (2%)	COST	2.00%		\$ 64,190
924XX02	CONTRACTOR QUALITY CONTROL (2%)	COST	2.00%		\$ 64,190
925XX01	CONSTRUCTION SURVEYING AND LAYOUT (1%)	COST	1.00%		\$ 32,095
				Subtotal 2	\$ 3,498,330
9010001	MOBILIZATION (10%)	COST	10.0%		\$ 349,833
				Subtotal 3	\$ 3,848,163
951X001	CONSTRUCTION ENGINEERING		15.00%		\$ 577,225
951XXXX	PUBLIC INVOLVEMENT		1.00%		\$ 38,482
951X002	CONSTRUCTION CONTINGENCY		5.00%		\$ 192,408
	ASPHALTIC CONCRETE (3/4" MIX) MATERIALS QUALITY INCENTIVE	TON	10,121	\$ 3.00	\$ 30,363
				Subtotal 4	\$ 4,686,641
	FINAL DESIGN COSTS (8%)	COST	8.00%		\$ 374,931
	RIGHT-OF-WAY	ACRES	17.45	\$ 142,141	\$ 2,480,366
	UTILITY RELOCATIONS	COST	5.00%		\$ 234,332
				Subtotal 5	\$ 7,776,270
951X010	INDIRECT COST ALLOWANCE (10.14%)		10.14%		\$ 788,514
				TOTAL CONSTRUCTION COSTS	\$ 8,565,000

J. VICINITY MAP

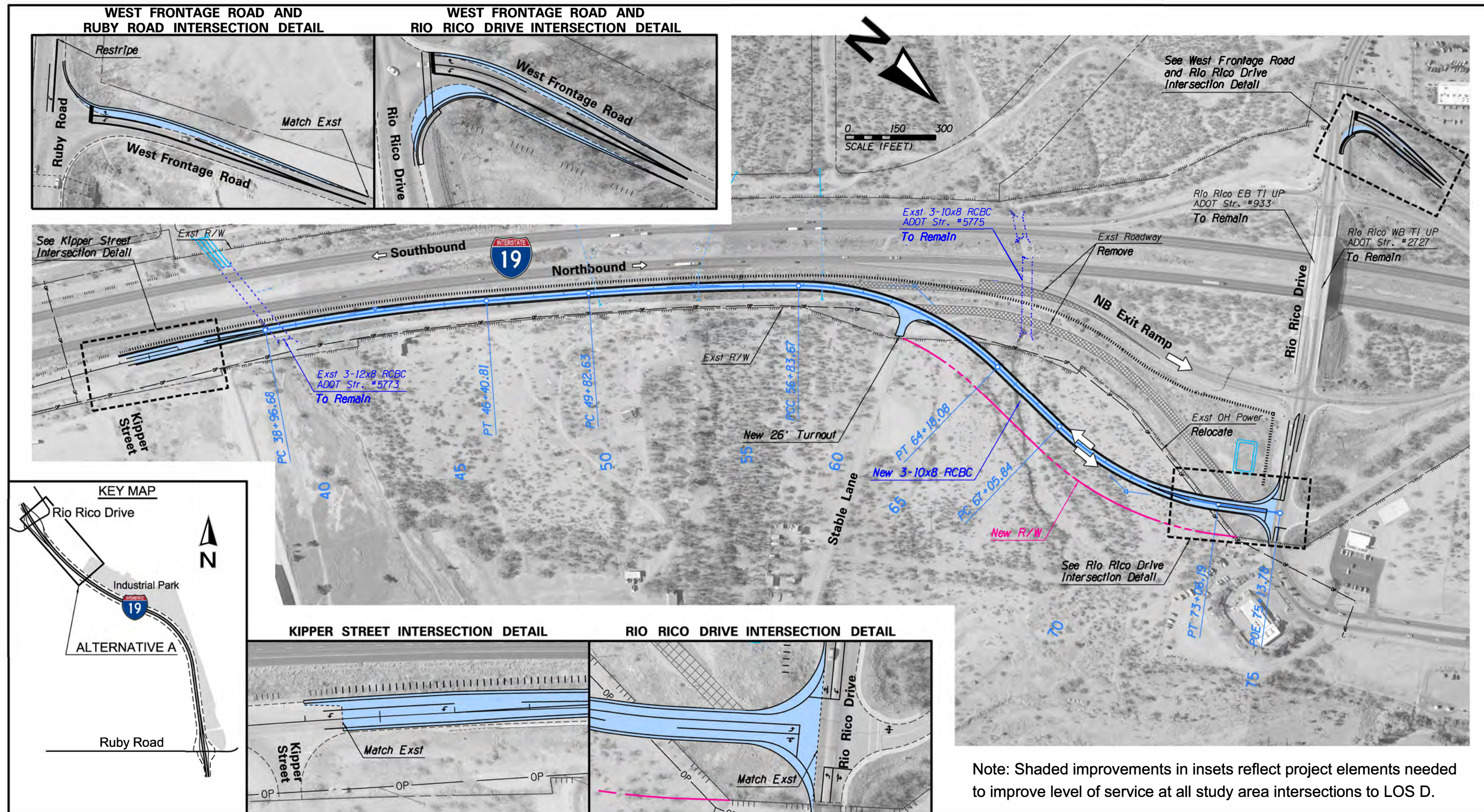
J. VICINITY MAP (CONTINUED)

I-19 East Frontage Road, Ruby Road – Rio Rico Drive
 ADOT Project No.: 019 SC 007 H8401 02L
 Federal Aid No.: 019-A(217)A
 Figure 2 – Project Vicinity Map

APPENDIX A

Concept Exhibits

Recommended Alternatives A, D, and E



ADOT

ALTERNATIVE A

TWO-WAY EAST FRONTAGE ROAD, KIPPER STREET – RIO RICO DRIVE

I-19 East Frontage Road, Ruby Road–Rio Rico Drive
ADOT Project No. 019 SC 007 H8401 02L
Federal Project No. 019-A(217)A

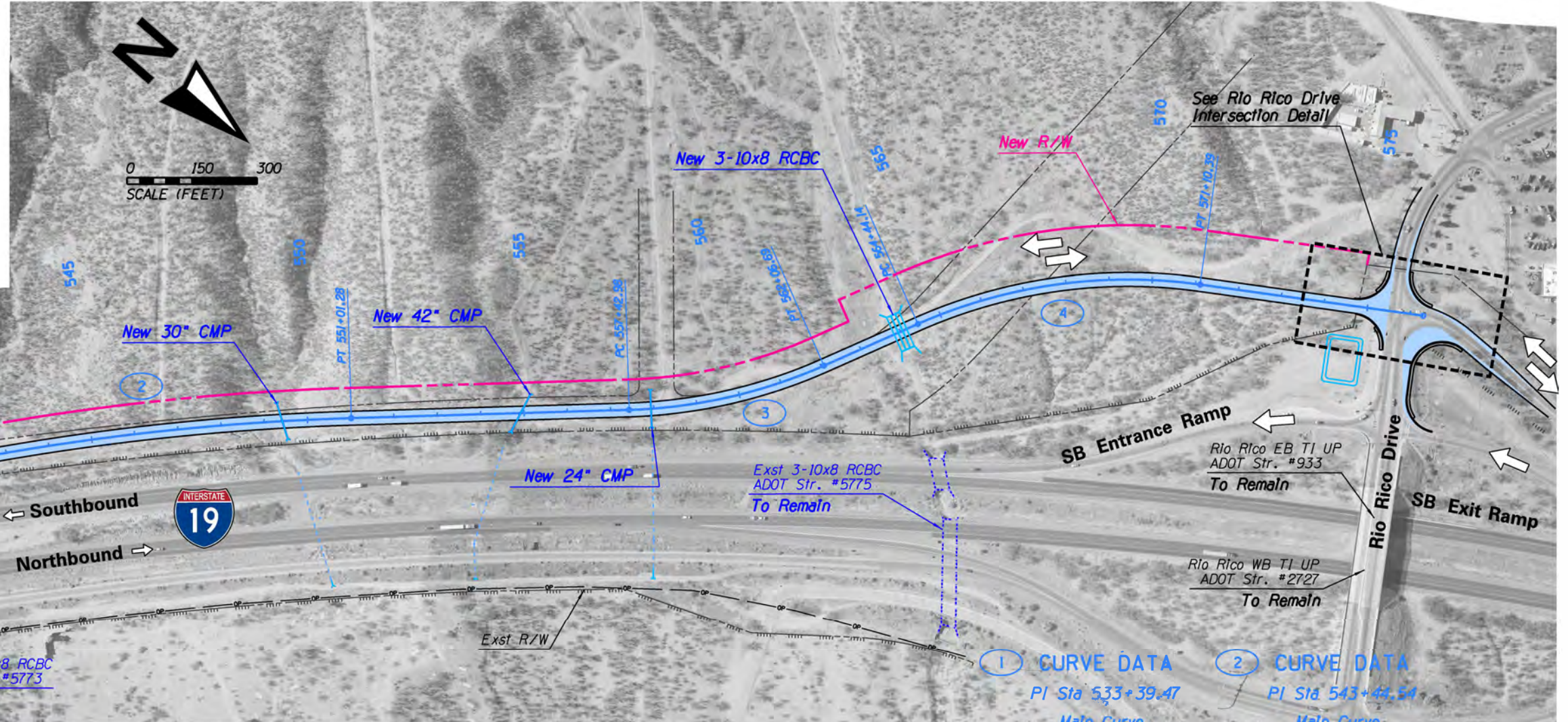
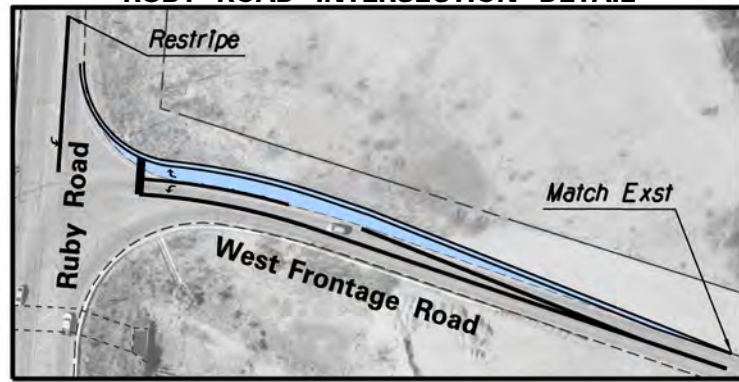


ALTERNATIVE D

DIVERGING DIAMOND INTERCHANGE

ADOT

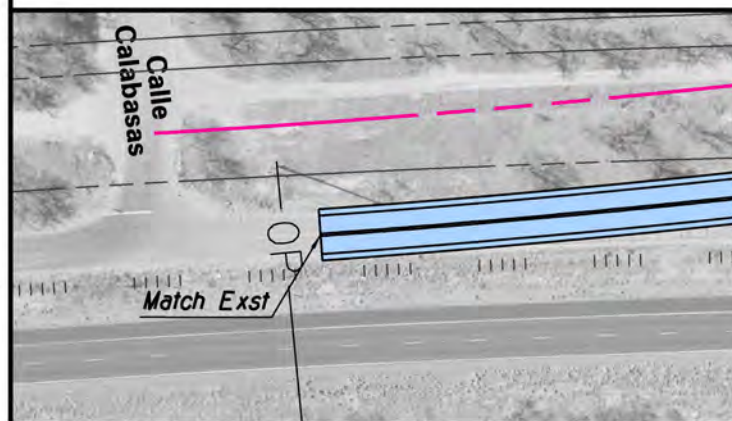
WEST FRONTAGE ROAD AND RUBY ROAD INTERSECTION DETAIL



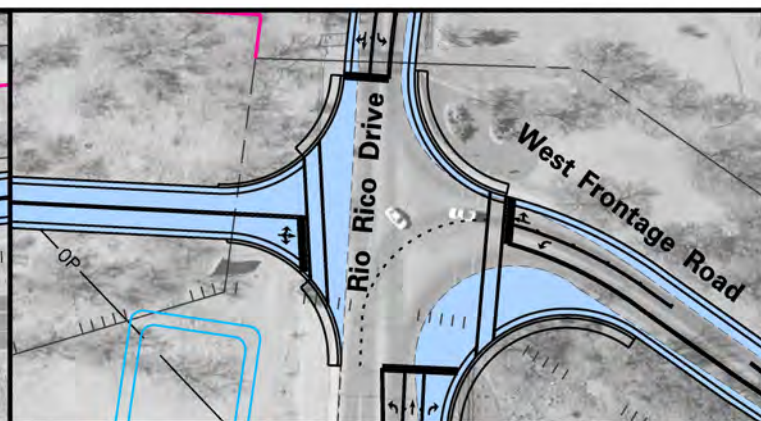
Note: Shaded improvements in insets reflect project elements needed to improve level of service at all study area intersections to LOS D.

1	CURVE DATA	2	CURVE DATA
PI Sta 533+39.47		PI Sta 543+44.54	
Main Curve		Main Curve	
$\Delta=3^{\circ}35'26''$		$\Delta=15^{\circ}13'30''$	
$D=0^{\circ}45'00''$		$D=1^{\circ}00'00''$	
$R=7640.00'$		$R=5729.58'$	
$L=478.79'$		$L=1522.50'$	
$T=239.47'$		$T=765.76'$	
$Ext=3.75'$		$Ext=50.95'$	
$Super=NC$		$Super=0.021/ft$	
3	CURVE DATA	4	CURVE DATA
PI Sta 559+77.76		PI Sta 567+86.09	
Main Curve		Main Curve	
$\Delta=22^{\circ}08'26''$		$\Delta=31^{\circ}48'39''$	
$D=4^{\circ}46'29''$		$D=4^{\circ}46'29''$	
$R=1200.00'$		$R=1200.00'$	
$L=463.71'$		$L=656.25'$	
$T=234.78'$		$T=341.95'$	
$Ext=22.75'$		$Ext=40.77'$	
$Super=0.040/ft$		$Super=0.040/ft$	

CALLE CALABASAS INTERSECTION DETAIL



RIO RICO DRIVE INTERSECTION DETAIL



ADOT

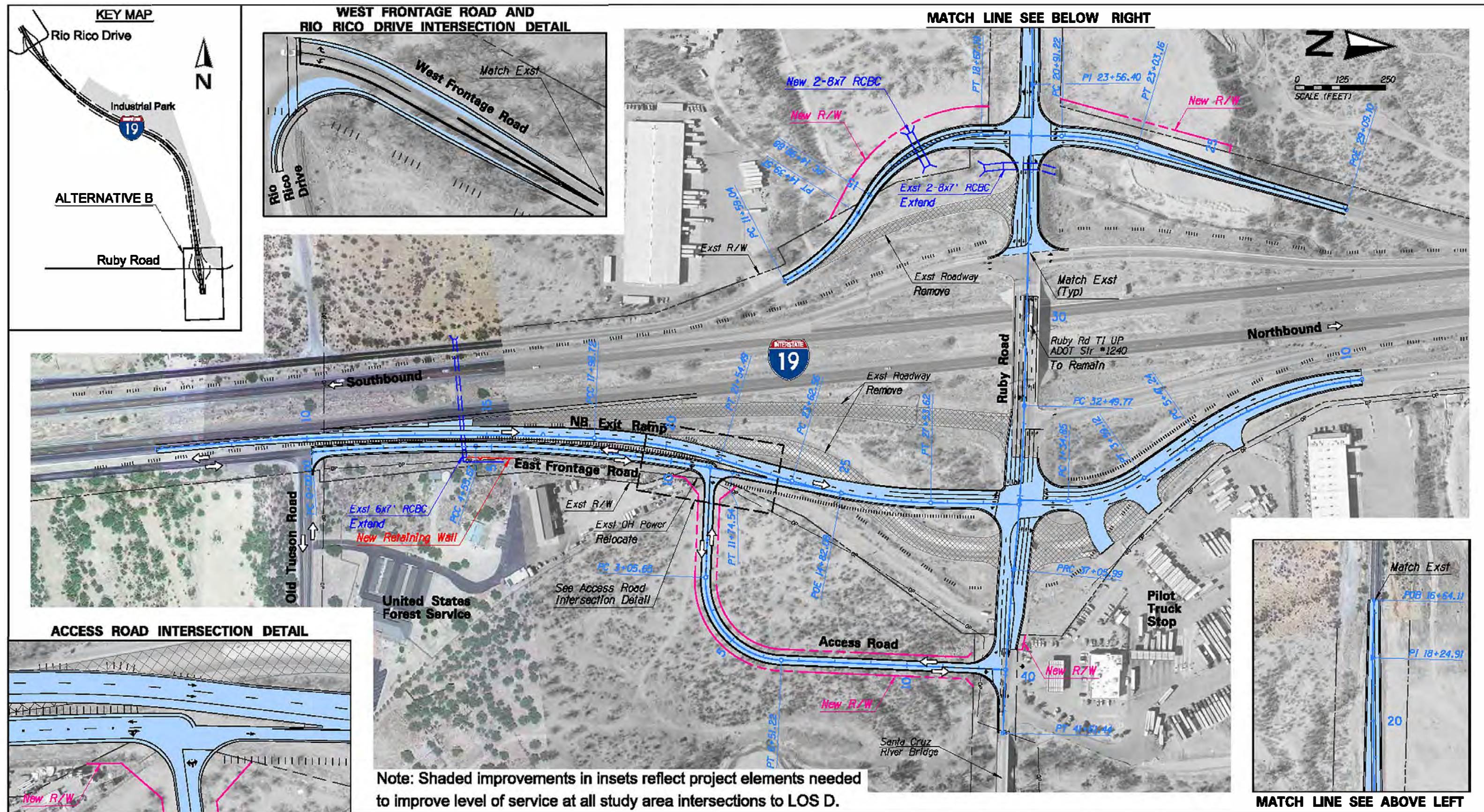
ALTERNATIVE E

TWO-WAY WEST FRONTAGE ROAD, CALLE CALABASAS – RIO RICO DRIVE

I-19 East Frontage Road, Ruby Road–Rio Rico Drive
ADOT Project No. 019 SC 007 H8401 02L
Federal Project No. 019-A(217)A

APPENDIX B

**Non-Selected Alternatives – Concept Exhibits
Alternatives B, B1, B2, and C**

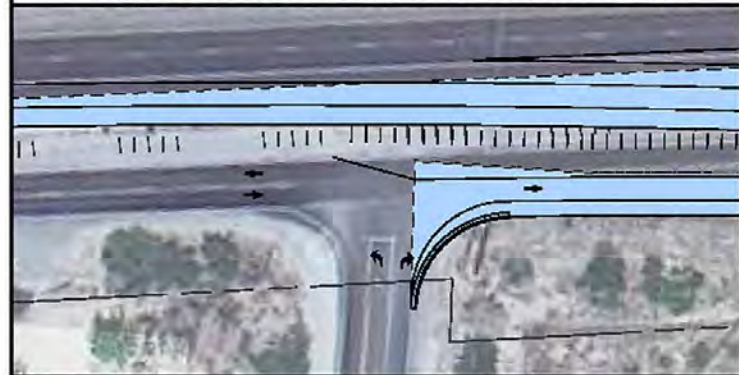


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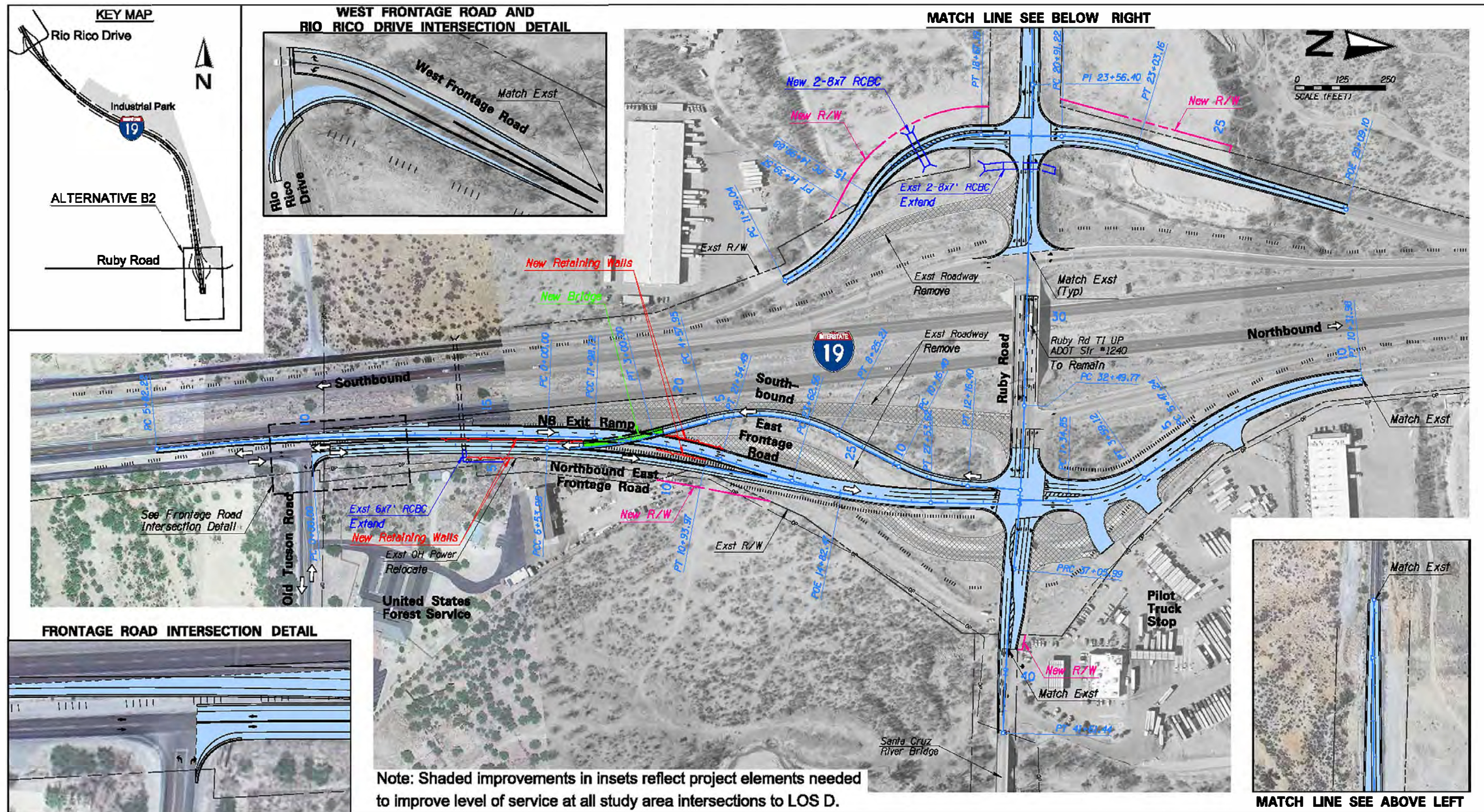
ALTERNATIVE B
ONE-WAY EAST FRONTAGE ROAD SOUTH OF RUBY ROAD

I-19 East Frontage Road, Ruby Road–Rio Rico Drive
ADOT Project No. 019 SC 007 H8401 02L
Federal Project No. 019-A(217)A

MATCH LINE SEE ABOVE LEFT



B-2



ADOT

ALTERNATIVE B2

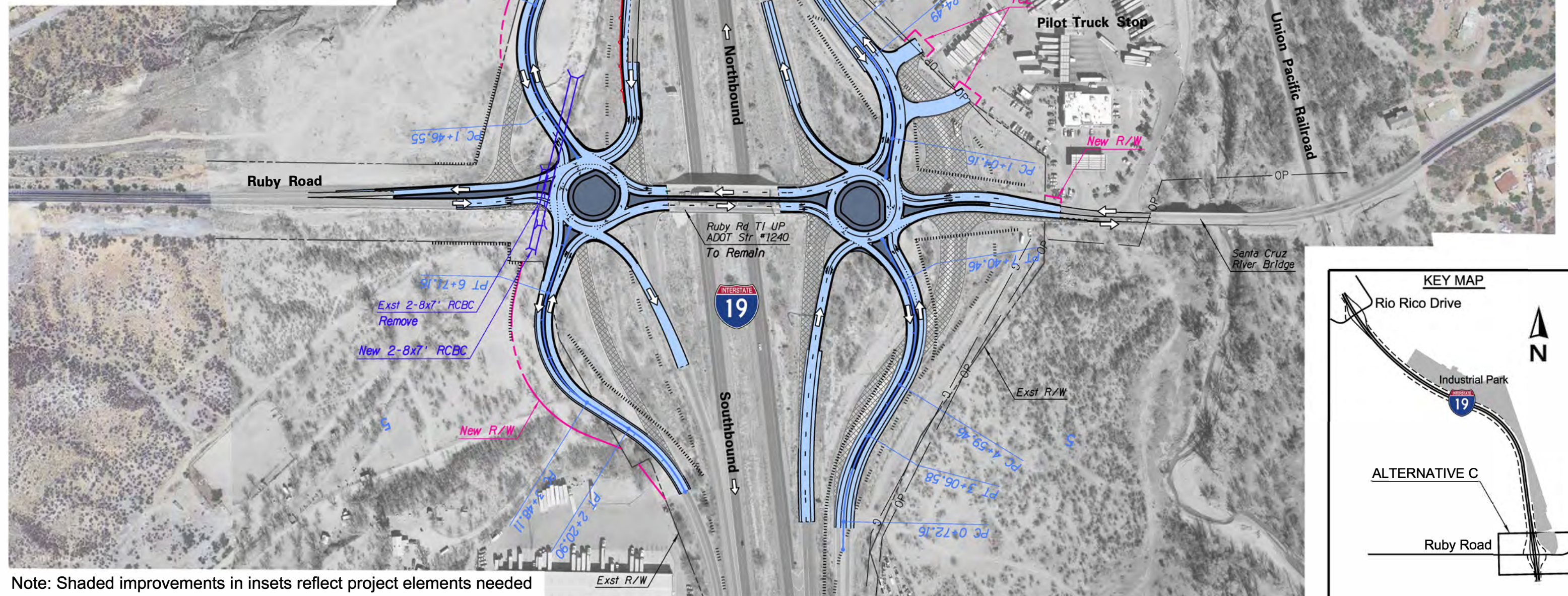
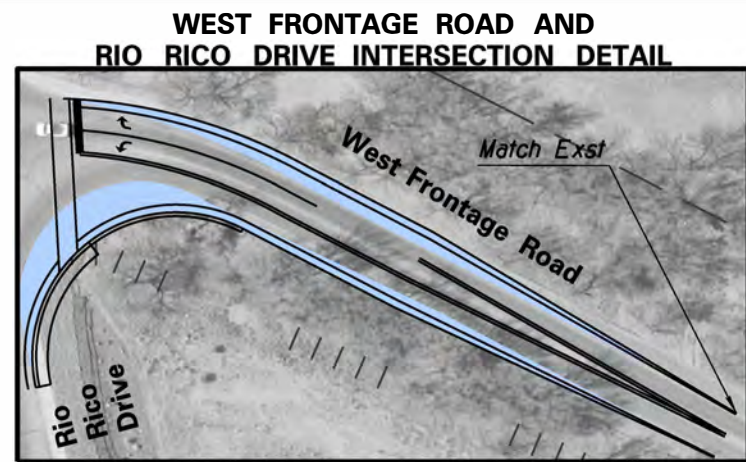
TWO-WAY, BRAIDED EAST FRONTAGE ROAD SOUTH OF RUBY ROAD

I-19 NORTHBOUND OFF-RAMP BRIDGE

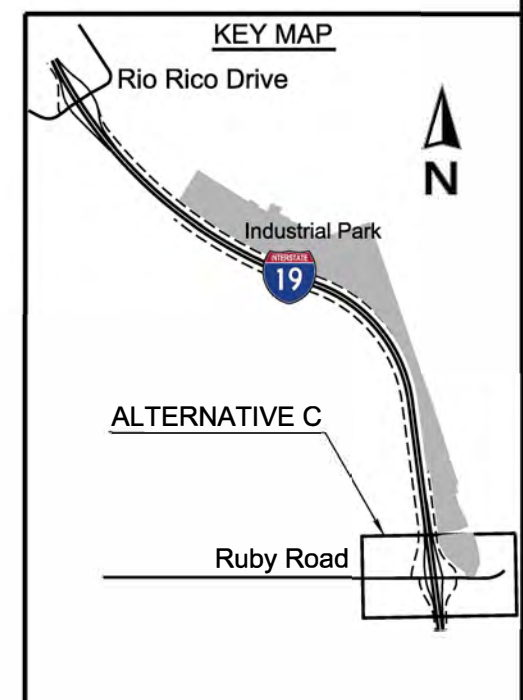
I-19 East Frontage Road, Ruby Road–Rio Rico Drive

ADOT Project No. 019 SC 007 H8401 02L

Federal Project No. 019-A(217)A



Note: Shaded improvements in insets reflect project elements needed to improve level of service at all study area intersections to LOS D.



ADOT

ALTERNATIVE C ROUNDAABOUT INTERCHANGE

I-19 East Frontage Road, Ruby Road–Rio Rico Drive
ADOT Project No. 019 SC 007 H8401 02L
Federal Project No. 019-A(217)A