



1 **3.17 Indirect and Cumulative Effects**

2 This section describes the potential indirect and cumulative effects from the Build Corridor  
3 Alternatives in the vicinity of the I-11 Project Area. It evaluates the extent to which the No Build  
4 Alternative and Build Corridor Alternatives would have indirect and cumulative effects and  
5 identifies mitigation strategies to avoid or minimize these impacts.

6 While the I-11 Corridor has the potential to influence changes in land use, development, and  
7 travel patterns, regulation of land use occurs at the local level. Local jurisdictions are  
8 responsible for, and citizens approve, local plans that identify planned land use. Transportation  
9 improvements generally follow the resulting growth that occurs from local planning. After  
10 transportation infrastructure improvements are made, additional effects can occur. Therefore,  
11 potential mitigation strategies proposed in the Final Tier 1 EIS are limited to those within the  
12 context of this Tier 1 Study. However, the indirect impact analysis may aid local governments in  
13 managing potential induced development in their jurisdictions.

14 **3.17.1 Summary of Draft Tier 1 EIS**

15 **3.17.1.1 Indirect Effects**

16 The initial step in the evaluation of indirect effects is to identify an area of influence for each  
17 Build Corridor Alternative where indirect, or project-induced, effects could occur. This was  
18 accomplished through the consideration of the following:

- 19 • **Where would faster travel times occur?** Faster travel times benefit freight carriers, for  
20 whom costs are sensitive to travel time, and faster routes may shift the movement of freight  
21 away from congested areas. Faster travel times also would benefit the traveling public  
22 through improved access to employment and economic centers, which in turn may affect  
23 land uses in terms of location and density. More convenient commute times to employment  
24 centers can promote residential development farther from those employment centers. In  
25 addition, better access to the transportation network may promote employment centers in  
26 new locations.
- 27 • **Where would new access occur?** Interchanges provide direct access to interstate  
28 facilities. The locations of new interchanges generally coincide with improved accessibility,  
29 thus increasing the development potential of nearby land along the corridor. Interchange  
30 locations for I-11 would not be determined as part of the Tier 1 process, but rather would be  
31 developed as part of more detailed alignments subject to project-level or Tier 2  
32 environmental review. However, the AZTDM includes interchange assumptions based on  
33 current regional transportation plan networks that would warrant connections to a new high-  
34 capacity transportation facility.
- 35 • **Where would growth occur?** Improved access could induce growth. Developable areas  
36 within 5 miles of existing and potential future interchanges are assumed to have project-  
37 induced growth.

38 To identify the potential for indirect effects within the area of influence, the Project Team  
39 completed the following steps.



- 1 1. Assessed potential for changes in transportation and land use that would result from the  
2 changes in travel patterns and accessibility.
- 3 2. Reviewed resources that are present within the area of influence and considered whether  
4 environmentally sensitive areas may be indirectly affected by changes in land use and  
5 transportation patterns and accessibility, or related economic activity.
- 6 3. Determined whether regulatory restrictions or mitigation strategies could effectively minimize  
7 or avoid the potential for indirect effects, or whether additional measures could be  
8 warranted. These strategies would be used to inform the Tier 2 studies and mitigation  
9 commitments made in future decision documents.

10 Under all Build Corridor Alternatives, the construction of a new transportation facility could affect  
11 the type and pace of land use change in areas that are currently undeveloped or that can  
12 reasonably be anticipated to experience additional development as a result of the undertaking.  
13 The introduction of new access could trigger or accelerate the development of land that would  
14 be better connected to employment and services; result in the development of commercial  
15 services that serve long-distance travel; or promote development of new industrial,  
16 manufacturing, or other businesses that value close access to high-capacity transportation.

17 In general, land around interchanges and areas with increased accessibility would be expected  
18 to experience changes in uses as well as an increased rate of development compared to the No  
19 Build Alternative. Employment (business park, freestanding office, industrial); commercial  
20 (convenience retail/filling stations, convenience food service, community shopping centers,  
21 regional shopping centers); and mid- to high-density residential type uses are likely in urban  
22 locations. Warehousing/distribution, convenience retail, gas stations, and convenience food  
23 service type uses are likely in rural locations. Improvements along the existing corridors would  
24 not be expected to cause major changes in overall land use patterns as land uses would have  
25 already developed within incorporated jurisdictions.

26 In the South Section, developable land around potential future interchange locations along the  
27 Purple and Green Alternatives is mostly planned for residential use. Development here is limited  
28 by the presence of national and local parks, national monuments, and tribal land, as well as  
29 Tucson Water's CAVSARP and SAVSARP facilities.

30 In the Central Section, although the Purple and Green Alternative in this part of the corridor  
31 could attract trips away from the existing network, large parts of the area are not subject to  
32 development, including the Sonoran Desert National Monument and protected areas along the  
33 Gila River. Locations along the I-11 Corridor within incorporated jurisdictions such as Casa  
34 Grande, Goodyear, and Buckeye are more likely to experience land use change compared to  
35 others, based on access to existing utilities/services (water, sanitary sewer storm drainage  
36 private utilities).

37 All the Build Corridor Alternatives in the North Section would provide direct mobility benefits by  
38 improving access to an area that is planned for development by local jurisdictions, improving  
39 travel times by providing a more direct and continuous high-capacity route through this area.

40 Changes in land use could alter air quality, noise patterns, and visual characteristics, and could  
41 affect historic properties, archaeological sites, or traditional cultural properties throughout the  
42 corridor. These changes may also affect recreational uses. This could potentially lead to a



1 decrease in economic contributions from outdoor enthusiasts being deterred by changes in rural  
2 character or an increase in outdoor recreation due to improved access. Induced development  
3 could also introduce or exacerbate the introduction of invasive species, alter habitat  
4 characteristics, and contribute to the overall loss of habitat, causing gradual changes in species  
5 composition, diversity, genetic makeup, overall species health, and mating patterns. The indirect  
6 impacts would be intensified in areas with new transportation corridors where there is no  
7 existing facility.

### 8 3.17.1.2 Cumulative Effects

9 To assess the potential for cumulative effects, the Project Team completed the following steps.

- 10 1. Established a temporal scope for the cumulative impact assessment. The timeframe  
11 established for the cumulative impact analysis extends between 1950 and 2040 to  
12 correspond with adopted demographic data utilized in the AZTDM. The year of 1950 was  
13 the beginning of the interstate era with the construction of I-10 starting in 1956. The year  
14 1950 captures the travel and development patterns associated with the construction of the  
15 interstate system in Arizona.
- 16 2. Established a geographic scope for the cumulative impact assessment. The geographic  
17 Cumulative Effects Study Area varies by resource and is as large as the area of direct and  
18 indirect effects. The Cumulative Effects Study Areas are established to encompass an area  
19 that includes past, present, and reasonably foreseeable actions that have or may contribute  
20 to the trend in the health of the resource.
- 21 3. Determined other actions – past, present, and reasonably foreseeable – and their effect on  
22 each resource. Future actions were identified out to 2040 and beyond, if possible. The  
23 Project Team distributed a memorandum to the Cooperating and Participating Agencies for  
24 comment containing the assumptions for future projects and activities to consider in the I-11  
25 Study Area (FHWA 2018). Past, present, and reasonably foreseeable future actions are  
26 detailed in **Table 3.17-1** and **Table 3.17-2** of the Draft Tier 1 EIS.

### 27 3.17.2 Summary of Changes Since Draft Tier 1 EIS

28 Agency and public feedback on indirect and cumulative impacts focused on edits and additions  
29 to the list of reasonably foreseeable future actions (**Table 3.17-1**). The following changes or  
30 additions respond to these comments:

- 31 • References to the “Tres Rios Corridor” have been corrected to state “Tres Rios Freeway.”
- 32 • The Loop 202 South Mountain Freeway was complete in December 2019, so the action was  
33 moved from the list of reasonably foreseeable future actions to the summary of past and  
34 present actions.
- 35 • References to the *Sonoran Valley Parkway Record of Decision* were updated to reflect its  
36 issue date of April 29, 2019 (BLM 2019).
- 37 • Planned transmission line and irrigation projects in the area were added to the list of  
38 reasonably foreseeable future actions (**Table 3.17-1**).



1 **Table 3.17-1. Additions to Draft Tier 1 EIS Table 3.17-2 (Reasonably Foreseeable**  
2 **Future Actions)**

Draft Tier 1 EIS #	Project Type	Project Name	Description	Location
40	Transmission Line	SunZia Southwest Transmission Project	The SunZia Project has received federal and State of Arizona permits to construct two 500 kV transmission lines and substations from the renewable resource energy zones in central New Mexico to the existing Pinal Central 500 kV Substation in central Arizona. SunZia is divided into three project segments as follows: (1) SunZia East 500 kV to SunZia South 500 kV; (2) SunZia South 500 kV to Willow 500 kV; and (3) Willow 500 kV to Pinal Central 500 kV.	Central New Mexico to central Arizona
41	Transmission Line	Tucson Electric Power (TEP) Kino to DeMoss-Petrie 138-kV Transmission Line	The Kino to DeMoss-Petrie 138-kV transmission line will connect the Kino Substation to the existing DeMoss-Petrie Substation. The line will also interconnect with the planned University of Arizona North Substation.	City of Tucson
42	Transmission Line	TEP Irvington-East Loop Transmission Line	The Irvington-East Loop 138-kV transmission line will connect the Irvington and East Loop substations, and interconnect with the planned Port and Patriot substations.	City of Tucson
43	Transmission Line	TEP Irvington to Kino 138-kV Transmission Line and Kino Substation Projects	The proposed transmission line is the first of several system improvements designed to provide additional transmission capacity in the central portion of the Tucson metro area. Phase 1 will extend approximately 4 miles from TEP's Irvington Campus to the proposed Kino Substation, which would occupy approximately 3.5 acres at the southeast corner of South Kino Parkway and East 36th Street.	City of Tucson



Draft Tier 1 EIS #	Project Type	Project Name	Description	Location
44	Transmission Line	TEP Sonoran Substation to Wilmot Energy Center 138-kV Transmission Line	The Sonoran Substation will connect TEP's existing 138-kV transmission system to the Wilmot Energy Center (WEC) and house transformers and other equipment to reduce voltage. TEP plans to build the Sonoran Substation on about 40 acres at a site located southeast of East Old Vail Connection and South Swan Roads. The Cisne Switchyard will be located within the WEC and will interconnect the new solar and battery storage systems to TEP's electrical system through the proposed 138-kV facilities. A 138-kV transmission line will extend more than a mile to connect the Cisne Switchyard to the new Sonoran Substation, and new 138-kV transmission lines will connect TEP's existing 138-kV transmission system along East Old Vail Connection Road to the Sonoran Substation. The lines will cross private land in Tucson and unincorporated Pima County.	City of Tucson
45	Transmission Line	TEP Rosemont 138-kV	The new 13-mile, 138-kV transmission line would link the proposed Toro Switchyard near Green Valley to the site of the proposed Rosemont Cooper mine in the Santa Rita Mountains southeast of Tucson. The project is contingent on mine approval.	City of Tucson
46	Irrigation	Proposed Rehabilitation: San Carlos Irrigation Project Facilities	The proposed action includes the reconstruction and lining of the Florence-Casa Grande Canal and the Casa Grande Canal, and the construction of cross-drainage features to convey storm water across the canal alignment and new control structures to improve operation of the rehabilitated canals. It would rehabilitate the Florence Canal, and a new canal would be constructed to connect the Florence-Casa Grande Canal with the Casa Grande Canal.	Pinal County

1 KV = Kilovolt, TEP = Tucson Electric Power



1 **3.17.3 No Build Alternative**

2 Under the No Build Alternative, land uses would continue along current trajectories, with  
3 continued growth and development along existing transportation corridors as planned by local  
4 jurisdictions in their mandatory General Plan updates approved by voters. Planned  
5 developments are present in western Maricopa County (particularly Buckeye and Goodyear)  
6 and in the Casa Grande area. The pace of development and subsequent change in land use  
7 patterns would be guided by market forces and availability of public services. No indirect or  
8 cumulative effects to land uses are anticipated.

9 **3.17.4 Recommended Alternative**

10 **3.17.4.1 Indirect Effects**

11 Much of the corridor is already planned as a future transportation corridor in local transportation  
12 and land use plans (e.g., West Pinal Freeway, SR 303L, SR 30/Tres Rios Freeway,  
13 Hassayampa Freeway) and development is planned around the corridor. The Recommended  
14 Alternative may accelerate this planned growth. One exception is the Avra Valley area where  
15 substantial development is not planned; development in this area could require zoning changes.  
16 The Recommended Alternative could affect the type or pace of land use change in areas that  
17 are currently undeveloped by expediting the rate and density of development through new and  
18 improved access. Project-induced land development could increase or change the nature and  
19 location of residential and commercial uses, increase traffic on local roads, increase housing  
20 options and alter property values, and increase demand to public facilities and services.  
21 Improved access to existing employment centers would promote development of new industrial,  
22 manufacturing, or other businesses to the area that value close access to high-capacity  
23 transportation, which would increase local job opportunities. Reductions in travel times would  
24 allow for more efficient freight movement and business productivity, while better access would  
25 support tourism and recreation opportunities.

26 Changes in land use could also alter air quality, noise patterns, and visual characteristics, and  
27 could affect historic properties, archaeological sites, or traditional cultural properties. These  
28 changes may also affect recreational uses. This could potentially lead to a decrease in  
29 economic contributions from outdoor recreation due to urbanization or changes in rural  
30 character or, on the other hand, it could lead to an increase in outdoor recreation due to  
31 improved access. Induced development could also introduce or exacerbate the introduction of  
32 invasive species. It could alter habitat characteristics or lead to substantial habitat loss, causing  
33 gradual changes in species composition, diversity, genetic makeup, overall species health, and  
34 mating patterns. The indirect impacts would be intensified in areas with new transportation  
35 corridors.

36 Within incorporated jurisdictions such as Nogales, Sahuarita, Tucson, Marana, Eloy, Casa  
37 Grande, Goodyear, and Buckeye, land uses have already developed along the Recommended  
38 Alternative. Improvements where the Recommended Alternative is co-located with an existing  
39 facility would not be expected to cause major changes in overall land use patterns; however,  
40 increased access to existing utilities/services could cause adjacent areas to grow at a faster  
41 pace.

1 **Figure 3.17-1** illustrates the future growth areas in the Study Area, as reflected in municipal  
2 general and county comprehensive plans, and supported by interviews with local planning and  
3 economic development staff (**Appendix E6** [Memorandum: Land Use and Economic  
4 Development Interview Summary] of the Draft Tier 1 EIS). This figure also shows generalized  
5 areas where improved accessibility and project-induced growth may occur from the  
6 Recommended Alternative.

#### 7 **3.17.4.2 Cumulative Effects**

8 The implementation of the Recommended Alternative, in combination with other past, present,  
9 and reasonably foreseeable future actions, would contribute to the trend in expanding  
10 development activities throughout southern and central Arizona. It would stimulate economic  
11 growth in Arizona by means of an increase in supplier spending and employee spending across  
12 all sectors of the economy. The implementation of multiple projects in the same region could  
13 have a synergistic effect of accelerating the timing of planned developments. I-11, along with  
14 other reasonably foreseeable transportation projects, would provide added capacity and  
15 congestion relief to the regional transportation network. The projects would result in additional  
16 beneficial cumulative transportation effects while improving regional air quality.

17 Impacts to sensitive environmental resources would also be cumulative. Changes in land use  
18 could also alter noise patterns and visual characteristics throughout the corridor. The continued  
19 urbanization of rural landscapes could impact outdoor recreation and biological resources.  
20 Induced development could introduce or exacerbate the introduction of invasive species. It  
21 could alter habitat characteristics or lead to substantial habitat loss of sensitive or protected  
22 species, causing gradual changes in species composition, diversity, genetic makeup, and  
23 overall species health. The CAP canal, built between 1973 and 1993, is a major linear project  
24 that affected wildlife movement between the Tucson Mountains on the east and Ironwood  
25 Forest National Monument, Roskrige Mountains, and Tohono O’odham Nation to the west.  
26 Mitigation is in place along the CAP canal to improve wildlife movement, but the construction of  
27 the Recommended Alternative would cumulatively add to the impacts to wildlife movement in  
28 this area.

#### 29 **3.17.5 Preferred Alternative**

##### 30 **3.17.5.1 Indirect Effects**

31 The Preferred Alternative would experience similar indirect effects as the Recommended  
32 Alternative; however, the level of induced growth would be less than the Recommended  
33 Alternative due to the greater use of existing transportation corridors. Potential indirect effects  
34 between Nogales and Casa Grande would depend on whether the east or west option in Pima  
35 County is selected. The east option would provide mobility benefits by increasing capacity in  
36 existing transportation corridors, while the west option in Pima County would provide benefits by  
37 diverting traffic from congested areas along existing highways and provide an alternate route to  
38 I-10. Indirect impacts with the west option in Pima County would be the same as Recommended  
39 Alternative impacts.

40 **Figures 3.17-2** illustrates generalized areas where improved accessibility and project-induced  
41 growth may occur from the Preferred Alternative.



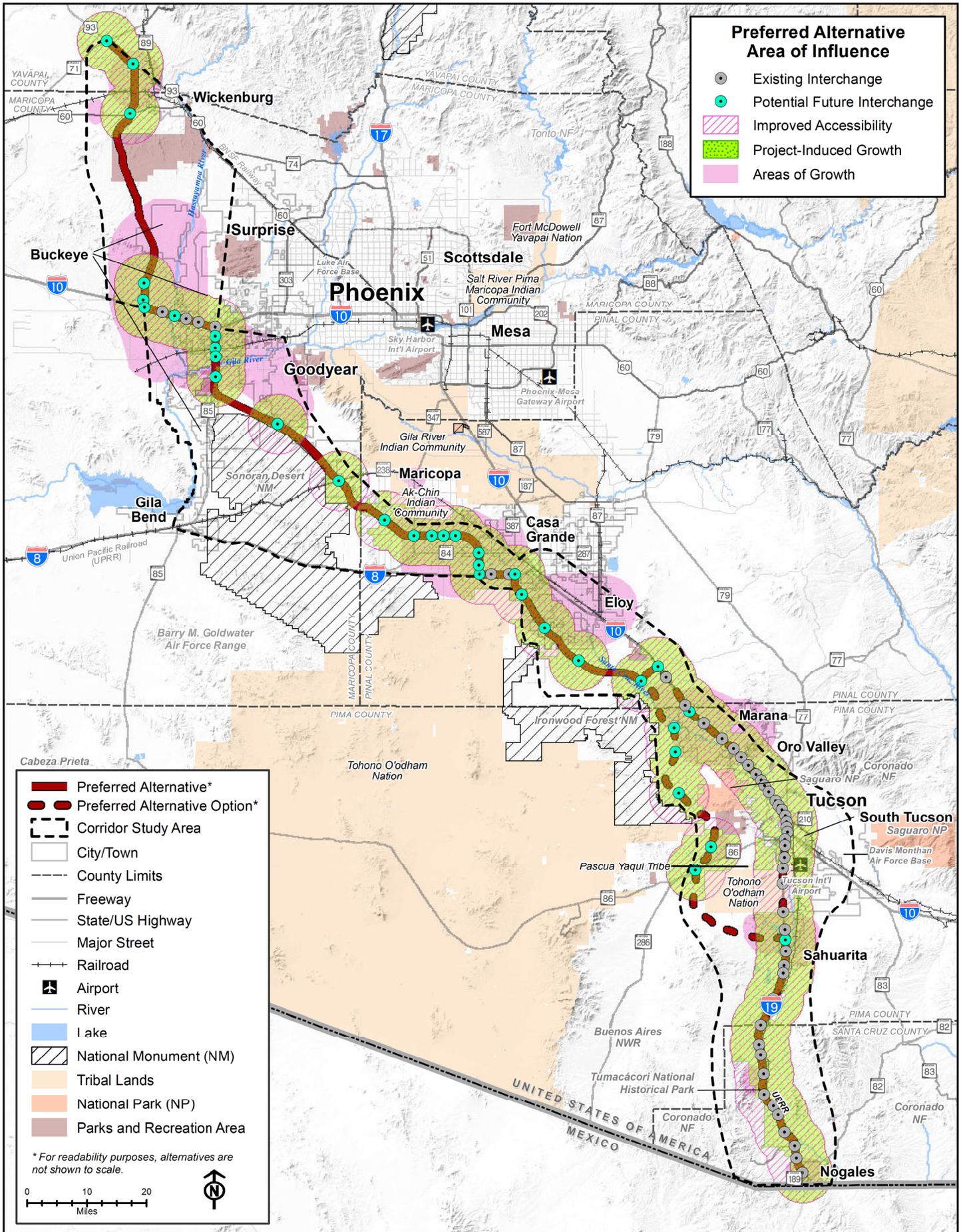


Figure 3.17-2. Preferred Alternative Area of Influence



1 **3.17.5.2 Cumulative Effects**

2 The Preferred Alternative would experience similar cumulative effects as the Recommended  
3 Alternative throughout the corridor; however, the level of cumulative impacts would be less than  
4 the Recommended Alternative, as the indirect impacts would be less due to the use of more  
5 existing transportation corridors. Potential cumulative effects between Nogales and Casa  
6 Grande would depend on whether the east option or the west option in Pima County is selected.

7 The Preferred Alternative with east option in Pima County would improve more existing  
8 corridors with access already in place and would induce less growth, thus adding to fewer  
9 effects overall to areas such as Nogales, Tucson, and Buckeye than the Recommended  
10 Alternative. However, historically in downtown Tucson the construction and subsequent  
11 widenings of I-10 have chipped away at adjacent historic districts. Any additional impacts would  
12 further impact what is remaining of the historic districts. With the west option in Pima County,  
13 impacts to wildlife connectivity would be same as the Recommended Alternative.

14 **3.17.6 Mitigation and Tier 2 Analysis**

15 **3.17.6.1 Tier 2 Analysis Commitments**

16 FHWA and ADOT completed an initial level of analysis in this Final Tier 1 EIS to identify a  
17 2,000-foot-wide preferred Build Corridor Alternative. Additional analysis in Tier 2 will inform  
18 (1) the selection of a specific alignment (approximately 400 feet wide) within the selected  
19 2,000-foot-wide corridor and (2) the selection of the west option or east option in Pima County.  
20 Tier 2 analysis will also identify measures to avoid, minimize, or mitigate indirect and cumulative  
21 impacts.

22 The indirect and cumulative effects would be revisited during the Tier 2 analysis to reflect a  
23 more detailed understanding of a proposed project. A typical analysis used at the project level to  
24 identify and assess cumulative effects would incorporate the following general concepts:  
25 identifying resources, identifying geographic boundaries, discussing current health and historical  
26 context, identifying reasonably foreseeable future actions, assessing effects, and reporting. The  
27 *National Cooperative Highway Research Program Report 466: Desk Reference for Estimating*  
28 *Indirect Effects of Proposed Transportation Projects* is one example of the type of guidance  
29 used to address the complexity of indirect and cumulative effects (Transportation Research  
30 Board 2002). During Tier 2 environmental review, ADOT would revisit the issue in coordination  
31 with applicable agencies to either identify or develop an appropriate methodology for the indirect  
32 and cumulative effects analysis.

33 The Tier 2 analysis would identify interchange locations based on land use patterns, growth,  
34 and specific access needs, and would refine the indirect and cumulative effects based on a  
35 more detailed alignment. Coordination would occur with state, regional, and local agencies to  
36 identify local projects for consideration as part of the cumulative analysis. The Tier 2 analysis  
37 would further refine the mitigation to minimize direct, indirect, and cumulative effects on  
38 resources.



1 **3.17.6.2 Mitigation Commitments**

2 As required by NEPA, FHWA and ADOT considered measures to avoid, minimize, and mitigate  
3 indirect and cumulative impacts from the Project (generally referred to as mitigation measures)  
4 during this Tier 1 process. Specific mitigation that ADOT is committing to implement if a Build  
5 Alternative is selected includes:

- 6 • **MM-Indirect-1:** Participate in continued, long-term planning efforts with metropolitan  
7 planning organizations, local jurisdictions, resource agencies, and private stakeholders to  
8 cooperatively plan development along the I-11 corridor. The effort would coordinate wildlife  
9 connectivity, local land use planning, and context sensitive design for the I-11 facility. Details  
10 regarding long-term planning efforts are dependent on the planning process for each  
11 individual organization, jurisdiction, and/or agency. ADOT commits to participating in these  
12 efforts but does not have the jurisdiction to lead them.
- 13 • **MM-Indirect-2:** If the Preferred Alternative with west option is selected during Tier 2 studies,  
14 avoid building exits or interchanges between West Snyder Hill Road and Manville Road in  
15 the area around the Tucson Mitigation Corridor in order to limit project-induced  
16 development.

17 Mitigation commitments in technical resource areas that address direct and indirect impacts  
18 would also mitigate cumulative impacts.

19 **3.17.6.3 Additional Mitigation to be Evaluated in Tier 2**

20 During the Tier 2 process, ADOT will evaluate mitigation measures in addition to those listed  
21 above, to include best practices, permit requirements, and/or other mitigation strategies  
22 suggested by agencies or the public.

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