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Draft Tier 1 Environmental Impact Statement and Preliminary Section 4(f) Evaluation

Section 3.13, Water Resources

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3.13 Water Resources

This water quality assessment addresses the potential direct effects of the No Build Alternative and Build Corridor Alternatives on water resources. This analysis pertains to six categories of water resources, as further defined below: sensitive waters (includes Outstanding Arizona Waters [OAWs], Active Management Areas [AMAs], and Sole Source Aquifers [SSAs]), impaired waters, groundwater, waters of the United States (US), wetlands, and floodplains. The impacts assessed include effects of sediment erosion and chemical pollution on surface water resources (e.g., streams, lakes, ponds, wetlands) and groundwater. This assessment also addresses placement of fill material in waters, wetlands, and floodplains, which can result in impacts to surface water and groundwater quality. However, it should be noted that this Tier 1 review is designed to evaluate the impacts at a high level. Design features and actual alignment of the corridor will be defined during Tier 2 studies. For more details, refer to the Water Resources Technical Memorandum (**Appendix E13**).

3.13.1 Regulatory Setting

This section contains a brief explanation of the federal, state, and local regulations pertaining to activities that may impact water quality.

3.13.1.1 Federal

Clean Water Act (CWA). The CWA governs discharge of pollutants into waters of the US. Waters of the US include traditional navigable waters as defined in 33 Code of Federal Regulations (CFR) 328.3(a), which includes relatively permanent tributaries and adjacent wetlands. Jurisdictional wetlands in Arizona also are regulated as special aquatic sites (40 CFR section 230.41). The following regulations fall under the CWA:

- Section 404: Under this regulation, the US Army Corps of Engineers (USACE) regulates discharges of dredged or fill materials (including from construction activities) into waters of the US, including wetlands (33 United States Code [USC] section 1344). Section 404 also is the permitting process that reviews alternatives to determine if the preferred alternative is the least environmentally damaging practicable alternative (LEDPA).
- Section 401: Requires that activities covered by a Section 404 permit are certified per the state's applicable effluent limitations and water quality standards (33 USC part 1341). In Arizona, Section 401 certification is administered by the Arizona Department of Environmental Quality (ADEQ) if the action is entirely on non-Tribal lands. If any portion of the action affects Tribal waters of the US, the Section 401 certification would be obtained from either the US Environmental Protection Agency (USEPA) or the respective Tribe.
- Section 402: This regulation forms the National Pollutant Discharge Elimination System (NPDES), which regulates pollutant discharges, including stormwater, into waters of the US. NPDES permits set specific discharge limits for point-source pollutants and outline special conditions and requirements for projects to reduce water quality impacts (33 USC section 1342). Permits require that projects be designed to protect waters of the US. Construction projects that will disturb more than 1 acre of land must comply with the requirements of the NPDES Construction General Permit, which, among other provisions, requires preparation and implementation of a Storm Water Pollution Prevention Plan (ADEQ 2013). NPDES permits on non-Tribal lands in Arizona are administered by the state under the Arizona

Pollutant Discharge Elimination System (AZPDES). Pollutant discharges on Tribal lands must be permitted through USEPA Region 9.

- Section 402(p): This regulation also falls under the NPDES and requires implementation of controls for discharges from storm sewers. Two permit types, or "phases," are available under this regulation, depending on the size and type of operator. Phase I regulations (64 Federal Register [FR] 68722) require discharges from large construction sites, certain industrial activities, and operators of "medium" or "large" Municipal Separate Stormwater Sewer Systems (MS4s) (MS4s that serve a population of 100,000 or greater), to obtain a permit and implement a stormwater management program. The Phase II Regulations (64 FR 68722) require smaller operators to obtain a permit for their stormwater discharges. Both types of permits require controls to reduce the discharge of pollutants to the maximum extent practicable. ADEQ was delegated authority to implement AZPDES permitting for MS4 operators in 2002.
- Section 303(d): This regulation requires states, territories, and authorized Tribes to develop a list of water quality-impaired segments of waterways (33 USC section 1313(d)). The 303(d) list includes water bodies that do not meet water quality standards, ranks the waterbodies by priority, and establishes Total Maximum Daily Loads to meet water quality standards. Total Maximum Daily Loads are the maximum amount of pollutants a water body can receive and still meet water quality standards.

Rivers and Harbors Appropriation Act. USACE has jurisdiction over flood protection systems under Section 14 of the Rivers and Harbors Appropriation Act (33 USC section 408).

Federal Regulation of Land Development in Flood Control Basins. Under Policy Guidance Letter No. 32 and Regulation 1110-2-240, USACE evaluates land development proposals within reservoirs and flood control basins (USACE 2016, 1993).

National Flood Insurance Program. The Federal Emergency Management Agency (FEMA) issues flood zone maps on a countywide level. Among other provisions, the National Flood Insurance Program regulations state that if an area of construction is located within a regulatory floodway, as delineated on the Flood Insurance Rate Map, it must not increase base flood elevation levels (44 CFR section 59-65).

Floodplain Management Department of Transportation (DOT) Order 5650.2 "Floodplain Management and Protection." The purpose of DOT Order 5650.2 is to ensure that proper consideration is given to the avoidance and mitigation of adverse floodplain impacts by DOT actions, planning programs and budget requests (USDOT 1979).

Executive Order (EO) 11988. *EO 11988*: Floodplain management requires federal agencies "to avoid, to the extent possible, the long- and short-term adverse impacts associated with the occupancy and modification of floodplains, and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative" (42 FR 26951). This EO establishes an eight-step process that agencies should carry out as part of the decision-making process on projects that could impact floodplains.

EO 13690. EO 13690 amended EO 11988 to improve the Nation's resilience to current and future flood risk, and established the Federal Flood Risk Management Standard (80 FR 6425). EO 13690 guides agencies to use a higher flood elevation and expanded flood hazard area than the base flood to ensure that future changes are adequately accounted for in agency decisions.

Another requirement is that federal agencies should use, where possible, natural systems, ecosystem processes, and nature-based approaches in federal actions and alternatives.

EO 11990. As written in 1977, "Each agency shall provide leadership and shall take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities" and, per the National Environmental Policy Act of 1969 (NEPA), "shall avoid undertaking or providing assistance for new construction located in wetlands unless the head of the agency finds (1) that there is no practicable alternative to such construction, and (2) that the proposed action includes all practicable measures to minimize harm to wetlands which may result from such use." (42 FR 26961)

Safe Drinking Water Act (SDWA) of 1974 (42 USC section 300 et seq.). SDWA protects drinking water supplies in areas where there are few or no alternative sources to the groundwater resource and where, if contamination occurred, using an alternative source would be extremely expensive (USEPA 2016). USEPA is authorized by Section 1424(e) of the SDWA to review proposed projects within a SSA that are federally funded. USEPA defines a SSA as one where:

- The aquifer supplies at least 50 percent of the drinking water for its service area.
- There are no reasonably available alternative drinking water sources should the aquifer become contaminated.

Fish and Wildlife Coordination Act. The Fish and Wildlife Coordination Act requires federal agencies to consult with the US Fish and Wildlife Service (USFWS) before undertaking or approving water projects that would control or modify surface water (16 USC section 662).

3.13.1.2 State

Groundwater Management Code. The 1980 Groundwater Code recognized the need to aggressively manage the state's groundwater resources to support the growing economy. Areas with heavy reliance on mined groundwater were identified and designated as AMAs. The 1980 Groundwater Code established five AMAs: Phoenix, Tucson, Prescott, Pinal, and Santa Cruz. In 2016, Arizona Revised Statute 45 Chapter 2 updated the Groundwater Management Code of 1980.

Underground Water Storage and Recovery Program and Underground Water Storage, Savings, and Replenishment Act. The Underground Water Storage and Recovery Program and the Underground Water Storage, Savings, and Replenishment Act were established in 1986 and 1994, respectively, and together define the recharge program for Arizona (Arizona Revised Statute 45-801 et seq.; Arizona Administrative Code [AAC] R12-12-151). The recharge program and associated permits are administered by the Arizona Department of Water Resources (ADWR).

Outstanding Arizona Waters. The AAC section R18-11-112 defines Arizona's OAWs. These are waters that meet the following conditions:

> A surface water that is perennial, free-flowing, has water quality that meets or is better than applicable water quality standards, and meets one or both of the following: (1) the surface water is of "exceptional recreational or ecological significance," or (2) threatened or endangered species are known to be associated with the water body and maintenance and protection of existing water quality is essential to the maintenance of

the threatened or endangered species, or the surface water provides critical habitat (AAC R18-11-112[D]) (ADEQ 2017a).

Aquifer Water Quality Standards. The ADEQ has adopted Aquifer Water Quality Standards (AAC R18-11 Article 4). Groundwater standards in Arizona are the Safe Drinking Water Standards established for Public Water Systems (PWS) and surface water standards for the Domestic Water Source designated use (ADEQ 2017b).

3.13.1.3 Local

County Flood Control Districts require a Floodplain Use Permit (FUP) when a project is within a jurisdictional floodplain. Approval of a FUP typically requires development of a hydraulic computer model to demonstrate that facility components will not result in increased potential for flooding or erosion. This level of detail is not available at this stage of the planning process and will be addressed, as appropriate, during Tier 2 studies. The following county Flood Control Districts would evaluate the need for and review any FUPs during a Tier 2 project assessment:

- Santa Cruz County Flood Control District
- Pima County Regional Flood Control District
- Pinal County Flood Control District
- Flood Control District of Maricopa County
- Yavapai County Flood Control District

ADEQ requires Phase I MS4 permits for operators that serve populations greater than 100,000 (ADEQ 2017c). Operators holding MS4 permits within the Interstate 11 (I-11) Corridor Study Area (Study Area) include the Arizona Department of Transportation (ADOT); Pima County; the City of Phoenix; and the City of Tucson. MS4 permittees must develop individual programs for stormwater management. For example, ADEQ issued the ADOT MS4 Permit on July 17, 2015, with an effective date of August 16, 2015. ADOT's Stormwater Management Plan identifies the program and procedures implemented by ADOT to minimize, to the extent practicable, the release of pollutants to and the discharge of pollutants from the ADOT MS4 (ADOT 2017). Pima County developed a Stormwater Management Program to ensure the quality of stormwater discharges were managed to the maximum extent practicable (Pima County 2013), and the City of Tucson passed Stormwater Management Ordinance Number 10209 in 2005 (City of Tucson 2005).

ADEQ has delegated the authority to enforce applicable requirements of AAC Title 18, Chapters 4 and 5, relating to PWS to the Pima County Department of Environmental Quality. Pima County's PWS Program reviews and approves plans for water line extensions, modifications, or relocations of public water supply systems that serve 15 or more connections, or 25 or more people, for more than 60 days a year (Pima County 2017).

3.13.2 Methodology

The Water Resources Technical Memorandum (**Appendix E13**) provides details on the impact analysis completed for water resources and supporting data, including maps and tables. The following discussion presents an overview of the process used to assess water resource impacts.

This evaluation focuses on direct impacts of the No Build Alternative and Build Corridor Alternatives on sensitive waters (includes OAWs, AMAs, and SSAs), impaired waters, groundwater, waters of the US, wetlands, and floodplains. The Analysis Area for water resources includes the Corridor Options, a 0.5-mile buffer around the Corridor Options, and areas extending beyond the 0.5-mile buffer where water resources have a direct surface connection to those crossed by the Corridor Options (e.g., major rivers, where sediment could be transported more than 0.5 mile under certain conditions). The general 0.5-mile Analysis Area is based on the potential for alternatives to affect surface water flow, sediment transport, and infiltration to groundwater.

Water resources were researched by desktop review of Geographic Information Systems (GIS) data obtained from the US Geological Survey (USGS), FEMA, USFWS, and the ADWR. Information on registered groundwater wells was obtained from ADWR (ADWR 2017a). The locations and names of surface water bodies (e.g., streams, rivers, lakes, and reservoirs) were identified using the USGS National Hydrography Dataset and the USGS 7.5-minute topographic quadrangles. Digital 100-year and 500-year floodplain data were compiled from the FEMA website and Flood Insurance Rate Maps were reviewed to identify floodways and floodplains (FEMA 2015).

The USFWS National Wetland Inventory (NWI) database (USFWS 2017) was used to identify locations of potential wetlands within the Build Corridor Alternatives. The NWI maps use the Cowardin system, which classifies the types of ecosystems related to water resources (Cowardin et al. 1979). It should be noted that the NWI data have been mapped by the USFWS at a desktop level and may not be representative of ground conditions. Formal wetland delineations using the three-part USACE methodology of identifying hydric soils, wetland hydrology, and hydrophytic vegetation would be required to accurately identify wetlands. Such formal delineations are beyond the scope of this Tier 1 analysis (but would be included in the Tier 2 analysis phase). Thus, this analysis refers to the mapped NWI wetlands as "potential wetlands."

Each Corridor Option was overlaid on the GIS data to quantify the resource and to identify its location within the 2,000-foot-wide corridor. The potential for impacts was then qualitatively assessed by examining the location of each resource relative to the Corridor Option and potential for avoidance. Key factors that were assessed in this impact analysis included:

- Mapped quantity of water resources within each Corridor Option
- Configuration of water resources within the I-11 Project Area, which may indicate how easy it would be to avoid water resources (qualitatively assessed)
- Whether the Corridor Option is co-located within an existing transportation right-of-way (ROW), or would require construction within an undisturbed area (qualitatively assessed)

After assessing the above quantitative and qualitative factors, the level of impact for each Corridor Option by section was ranked as low, moderate, or high in comparison to other Corridor Options within the same section. The rankings for the Corridor Options were then compiled for the overall Build Corridor Alternatives, with more "low" rankings of individual corridor segments corresponding to a relatively lower impact for the overall Build Corridor Alternatives and more "high" rankings of individual corridor segments corresponding to a relatively higher impact for the overall Build Corridor Alternatives. **Appendix E13** provides further details on the analysis methodology.

3.13.3 Affected Environment

The following sections summarize the water resources in the Analysis Area.

3.13.3.1 Sensitive Water Resources

There are no OAWs within the Analysis Area (ADEQ 2017a). The Analysis Area crosses four AMAs covering about 14,700 square miles and stretches continuously from the border with Mexico at Nogales through central Arizona to the northern boundary of Maricopa County (ADWR 2008). The Analysis Area is situated within the following AMAs: Santa Cruz (716 square miles), Tucson (3,866 square miles), Pinal (4,100 square miles), and Phoenix (5,646 square miles). The Upper Santa Cruz and Avra Valley SSA is included in the Analysis Area. This SSA underlies 4,591 square miles in southern Arizona (USEPA 2008) and is the only USEPA-designated SSA within the Analysis Area (**Figure 3.13-1** [South Section Sensitive Waters, Impaired Waters, and Groundwater Resources]; **Figure 3.13-2** [Central Section Sensitive Waters, Impaired Waters, and Groundwater Resources]; and **Figure 3.13-3** [North Section Sensitive Waters, Impaired Waters, and Groundwater Resources]).

3.13.3.2 Impaired Waters

Figures 3.13-1 through **3.13-3** depict the locations of impaired waters relative to the Corridor Options. Option A has approximately 26 miles of impaired waters within its Analysis Area, Option B has approximately 8 miles of impaired waters; Option Q2 has approximately 1.7 miles of impaired waters; and Option R has approximately 0.8 mile of impaired waters (**Figures 3.13-1** through **3.13-3**). Other Corridor Options do not have any impaired waters within their Analysis Areas (ADEQ 2016). For further detail and quantification of impaired waters, see **Appendix E13**.

Impaired surface water segments within the Corridor Option Analysis Areas include the following:

- Santa Cruz River (ammonia, dissolved cadmium, chlorine, and *Escherichia coli* [*E. coli*]
- Potrero Creek (chlorine, *E. coli*, and dissolved oxygen)
- Nogales Wash (copper, *E. coli*, and chlorine)
- Hassayampa River (*E. coli* and selenium)
- Gila River (dissolved oxygen, pesticides, metals, inorganics, and nutrients)

3.13.3.3 Groundwater Resources

Groundwater is a major source of potable and irrigation water in the region. Groundwater is underground water found in pore spaces between grains of soil or rock or within fractured rock formations. Groundwater can originate from precipitation that infiltrates through soil and underlying unsaturated geologic materials until reaching the water table.

Each AMA has a management goal to guide the use of groundwater in the AMA. The management goals for the AMAs in the Analysis Area are as follows:

- Santa Cruz AMA: Maintain a safe-yield condition and prevent long-term declines of local water tables (safe-yield is accomplished when no more groundwater is being withdrawn than is annually replaced).

- Tucson AMA: Establish a safe-yield condition by 2025.
- Pinal AMA: Allow development of non-irrigation uses and preserve existing agricultural economies for as long as feasible, consistent with the necessity to preserve future water supplies for non-irrigation uses (ADWR 2016).
- Phoenix AMA: Achieve a safe-yield condition by year 2025 through increased use of renewable water supplies and decreased groundwater withdrawals in conjunction with efficient water use.

Groundwater recharge in the Analysis Area is supported by the CAVSARP. Colorado River water delivered to Tucson via the Central Arizona Project (CAP) canal sinks into the ground and recharges the aquifer in Avra Valley at the CAVSARP and SAVSARP (City of Tucson 2017). Surface ponds for these facilities are located west of Tucson in Avra Valley.

There are 430 private, municipal, utility, and corporate-owned groundwater wells within the Analysis Area. Wells are used for irrigation, livestock watering, private and public water supplies, groundwater monitoring, and geotechnical information. Most wells (133) fall within Option B; the fewest (0) fall within Option M (**Figures 3.13-1** through **3.13-3**). See **Appendix E13** for quantification of wells by Corridor Option.

Groundwater in the Analysis Area is of acceptable quality for most uses and most analytes meet federal and state drinking water standards. Contaminant levels exceed standards in a few areas (ADEQ 2002; Cordy et al. 2000). Water quality data from Pima County drinking water providers for the sampling years from 1998 to 2000 indicate that the most common regulated constituents detected were nitrate, fluoride, arsenic, and chromium; none of these was at a level that exceeded established drinking water maximum contaminant levels (Pima Association of Governments 2002). Groundwater in the Pinal AMA Basin, as measured by ADEQ, is slightly alkaline, fresh, and hard to very hard, as indicated by pH values and total dissolved solids. Of 86 sites sampled for the *Pinal AMA* study, 13 percent met all SDWA primary and secondary water quality standards. ADWR aquifer water quality standards were exceeded at 70 percent of the 86 sites sampled. Sites sampled within the Pinal AMA exceeded SDWA standards for the level of arsenic, fluoride, gross alpha, nitrate, and uranium (ADEQ 2007). Groundwater in the Phoenix AMA and Upper Hassayampa River Basin in the North Section is generally suitable for drinking water uses. While data are limited for the Phoenix AMA, nine sites within the Upper Hassayampa River Basin have exceeded primary maximum contaminant levels for arsenic, gross alpha, and nitrate. Groundwater in the basin typically has calcium or mixed-bicarbonate chemistry and is slightly-alkaline, fresh, and hard to very hard, based on pH levels, total dissolved solids concentrations, and hardness concentrations.

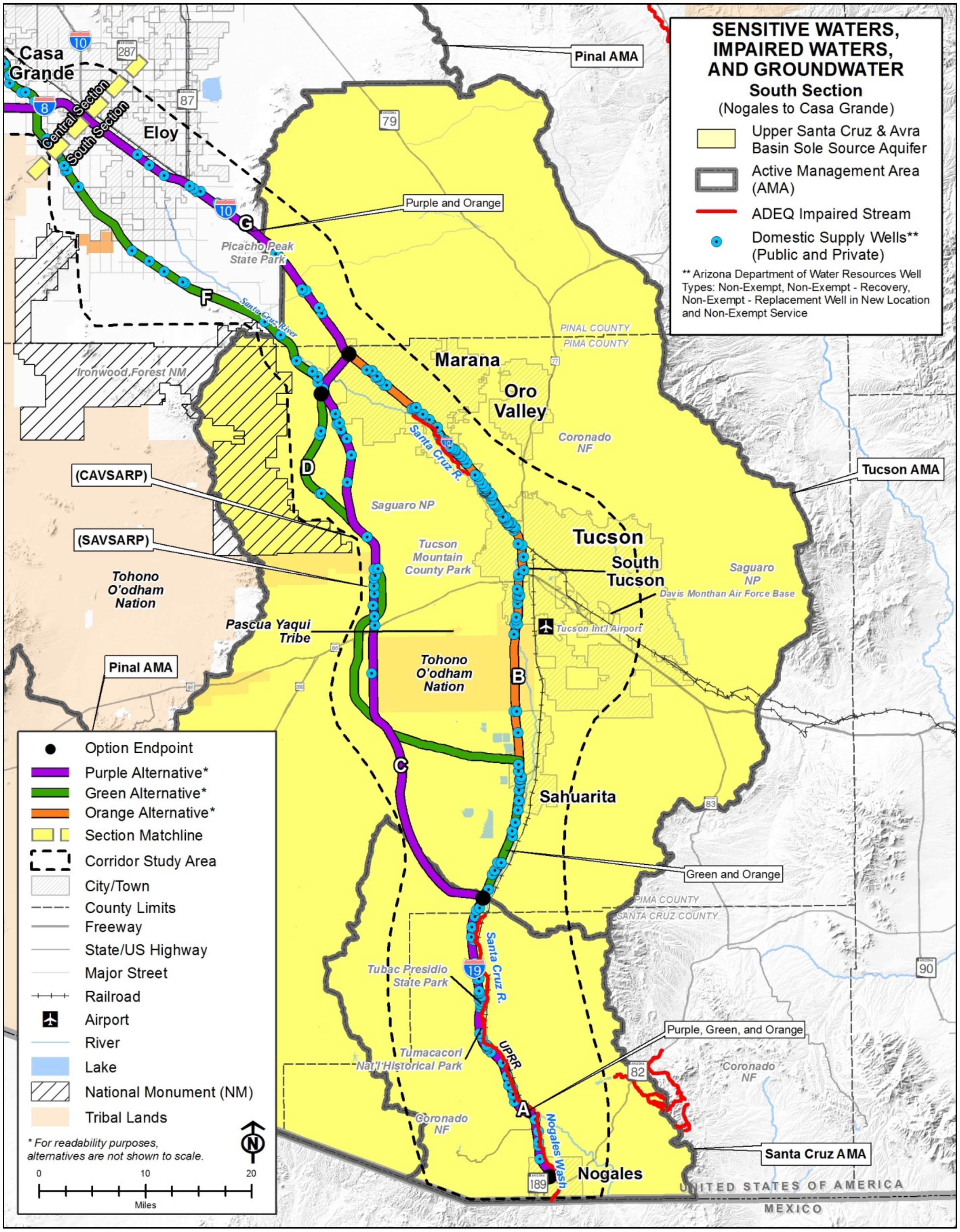

Figure 3.13-1 South Section Sensitive Waters, Impaired Waters, and Groundwater Resources

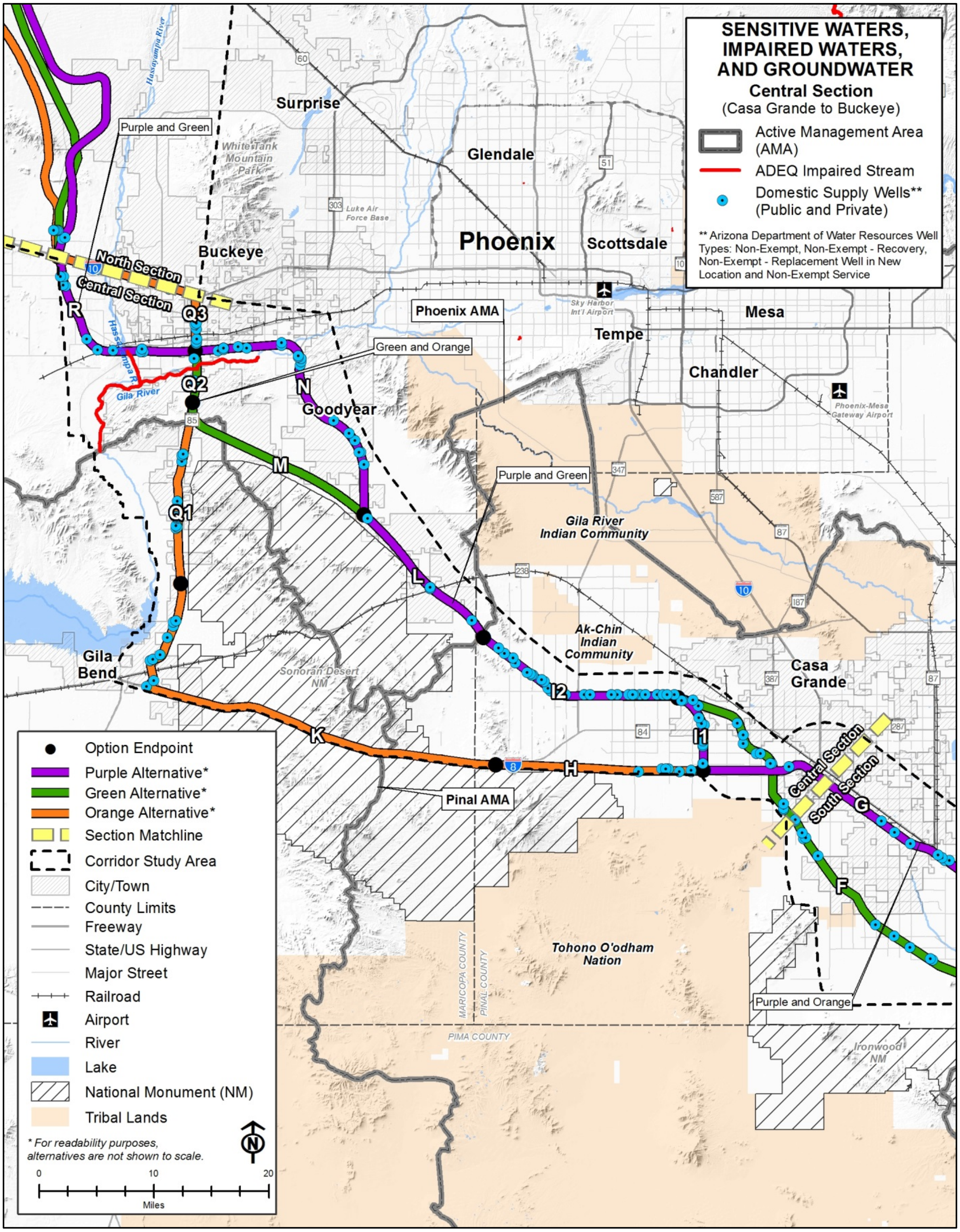

Figure 3.13-2 Central Section Sensitive Waters, Impaired Waters, and Groundwater Resources

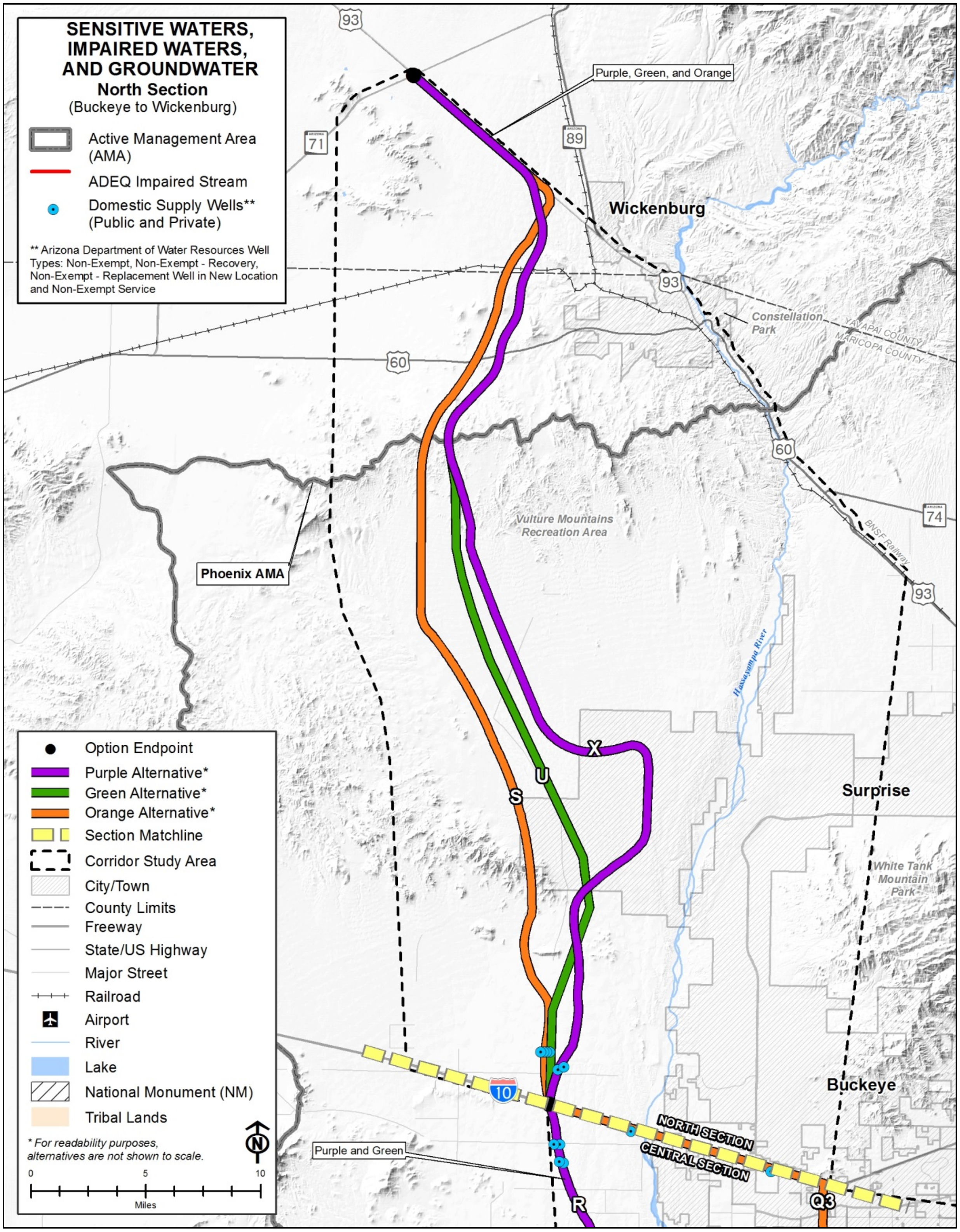

Figure 3.13-3 North Section Sensitive Waters, Impaired Waters, and Groundwater Resources

3.13.3.4 Potential Waters of the US

Major drainages in the Analysis Area, which are likely waters of the US, include the Santa Cruz River, Gila River, Salt River, and Hassayampa River (**Figure 3.13-4** [South Section Potential Waters of the US and Wetlands], **Figure 3.13-5** [Central Section Potential Waters of the US and Wetlands], and **Figure 3.13-6** [North Section Potential Waters of the US and Wetlands]). Runoff from precipitation, mostly rainfall from infrequent winter storms and summer thunderstorms, flows toward these drainages through ephemeral desert washes. Annual precipitation ranges from 8 to 18 inches per year (ADEQ 2016).

The Santa Cruz River flows from Nogales northwest toward Eloy and the Gila River. There are about 20 named ephemeral streams and canals and numerous unnamed ephemeral washes in the South Section Analysis Area. Most ephemeral streams in the area, including the Rillito River, Cañada del Oro, and Julian Wash, are tributaries to the Santa Cruz River. Nogales Wash, a large tributary of the Santa Cruz River, originates in Sonora, Mexico, and then enters Arizona. About 1 mile south of the border, Nogales Wash enters a concrete-covered channel floodway. The South Section also includes several irrigation canals, including the CAP canal, and man-made ponds ranging from 0.25 acre to over 1,000 acres, which are used for livestock water, recharge, and tailings storage.

The Gila River in the Central Section flows during storm events from east to west, and most ephemeral washes that are tributaries to the Gila River flow north to south (ADWR 2017b). The Hassayampa River flows from north to south, and flows into the Gila River about 5 miles west of State Route 85. Within the Lower Gila watershed, most of the Gila River is ephemeral and flows only in response to precipitation events or water releases from upstream dams. Flow in the lower portion of the Gila River would be intermittent if it were not controlled by dams, and most low flow in the river upstream of Gillespie Dam is sewage effluent and irrigation return flow. There are approximately 16 named ephemeral streams and canals, including the CAP canal, and numerous other unnamed ephemeral washes in the Central Section Analysis Area.

An extensive network of perennial and ephemeral watercourses in the North Section flows into the lower Gila and Hassayampa Rivers. Within this area, most of the Salt and Lower Gila Rivers are ephemeral (ADWR 2017b). The Hassayampa River flows into the Gila River during storm events. The Hassayampa River is mostly intermittent, but it is perennial in its upper reaches and south of Wickenburg; some tributaries also have limited perennial stretches. Most of the Hassayampa River is a dry streambed, but water surfaces a few miles north of Wickenburg in Box Canyon and downstream at the Hassayampa Preserve. South and downstream of Wickenburg, the Hassayampa River broadens into a large riparian area. Tributaries to the Hassayampa River include Jackrabbit Wash, Powerline Wash, and Sols Wash. Tributaries to the Gila River include Phillips Wash and Fourmile Wash. The CAP canal flows east to west through the North Section.

See **Appendix E13** for quantification of potential waters of the US by Corridor Option.

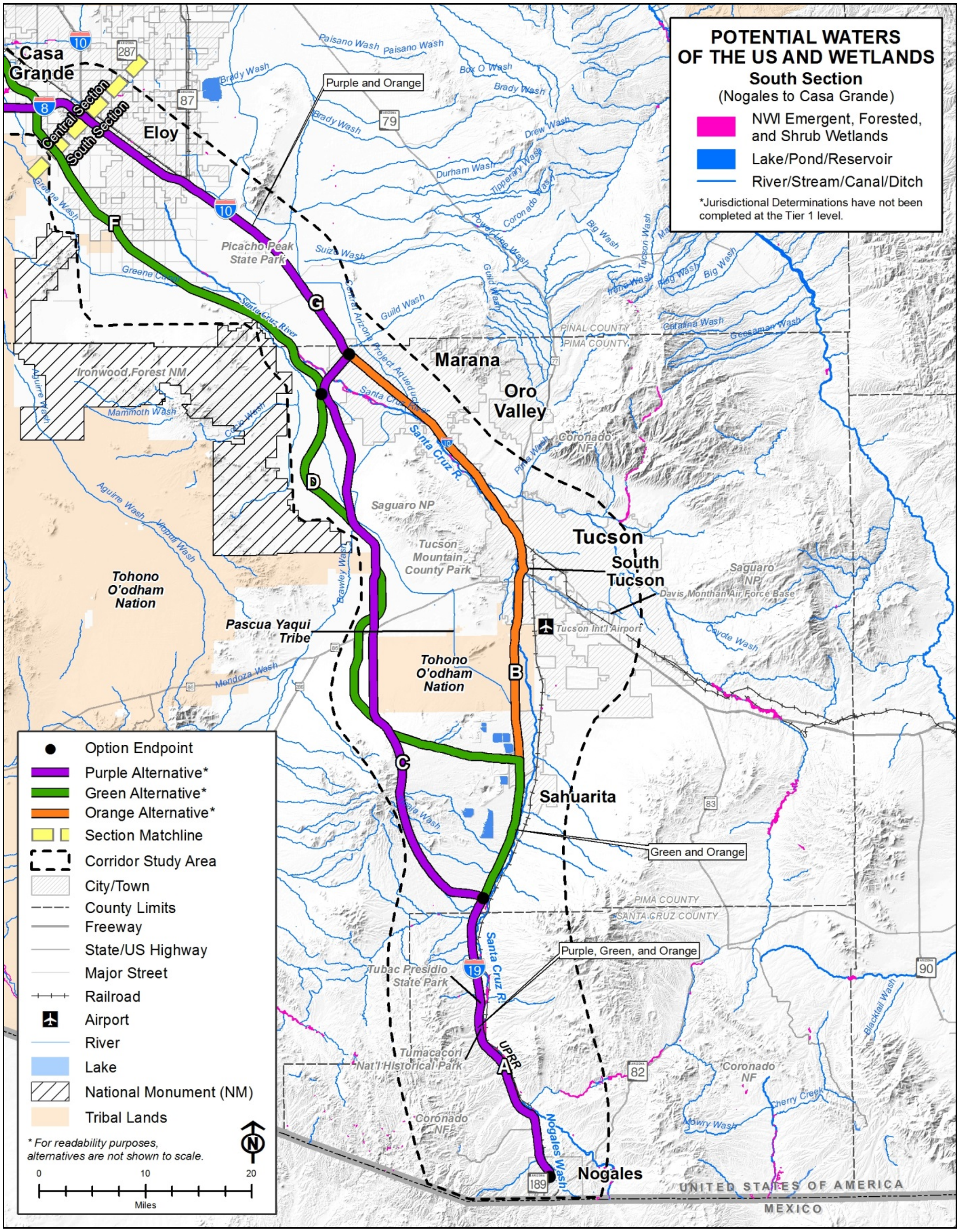

Figure 3.13-4 South Section Potential Waters of the US and Wetlands

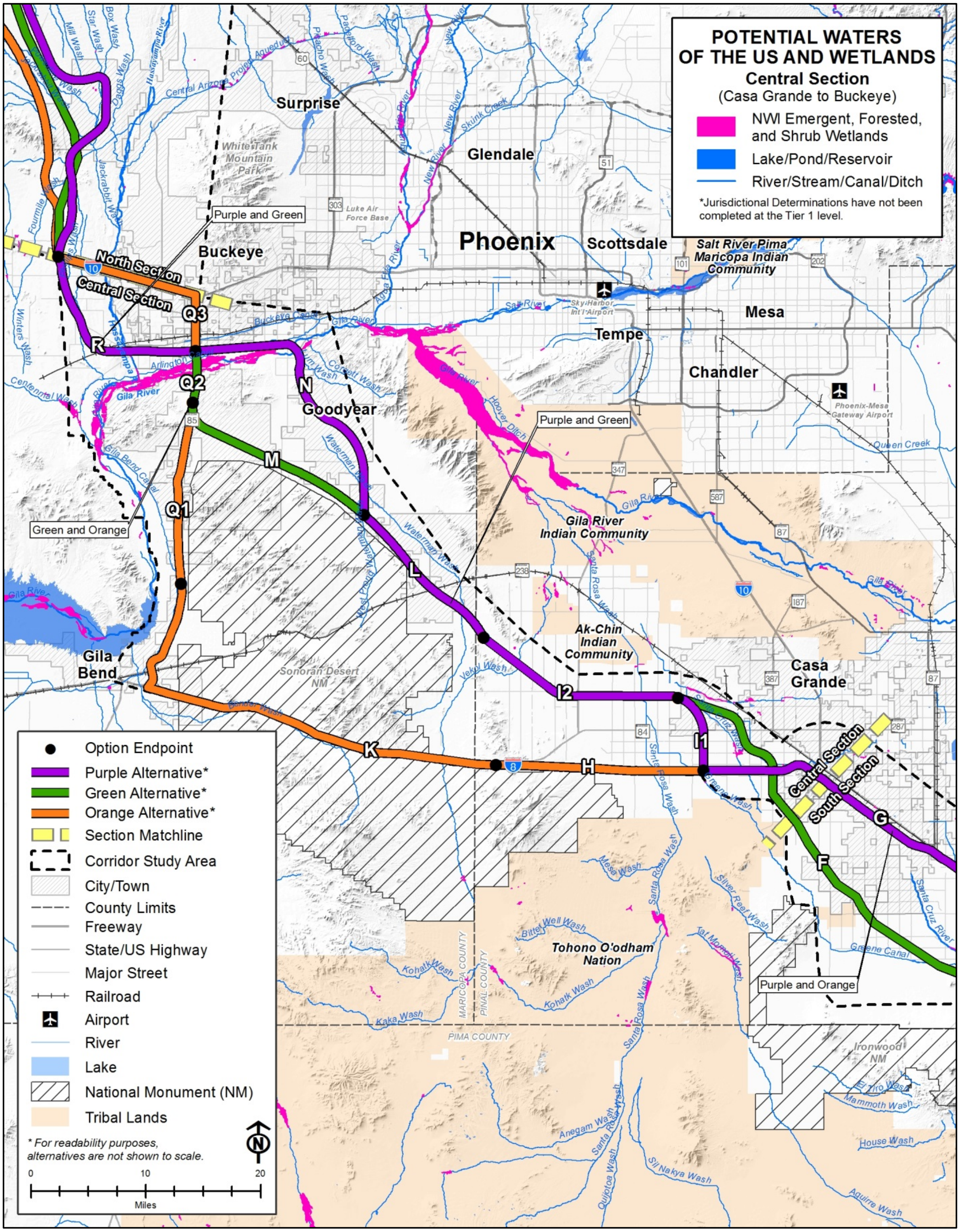

Figure 3.13-5 Central Section Potential Waters of the US and Wetlands

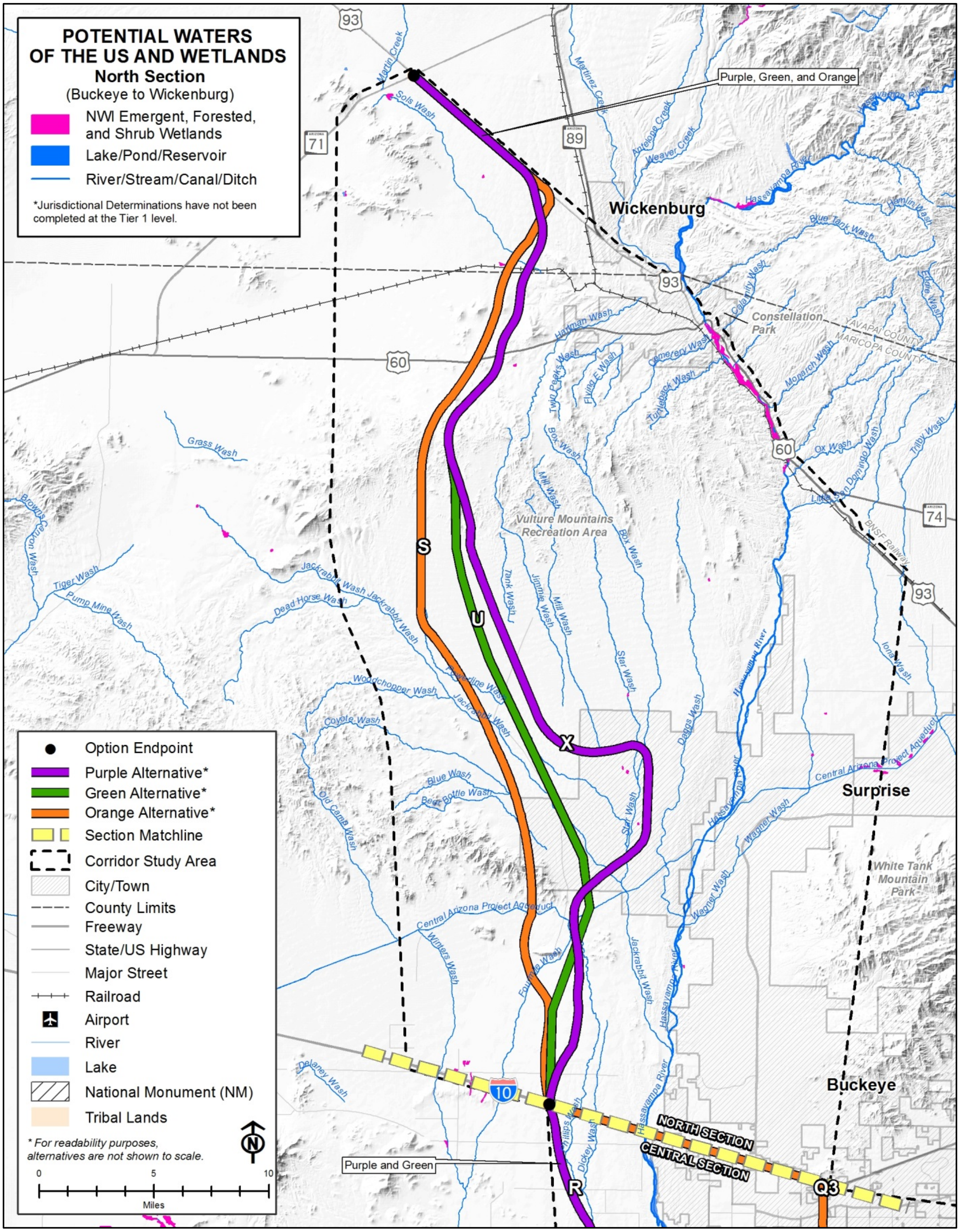

Figure 3.13-6 North Section Potential Waters of the US and Wetlands

3.13.3.5 Wetlands

The Analysis Area includes a number of mapped wetland types, including freshwater forested wetlands, scrub-shrub wetlands, emergent wetlands, riverine wetlands, lakes, and ponds (USFWS 2017). Riverine wetlands are mapped along major drainages, including the Santa Cruz River, Gila River, Hassayampa River, and their major tributaries. Other wetlands are mapped in depressional areas along ephemeral washes, and there are some man-made wetlands in the Analysis Area as well (e.g., constructed wetlands at Sweetwater Wetlands Park and the Tres Rios wetland near the confluence of the Salt, Gila, and Agua Fria Rivers west of Phoenix). NWI-mapped freshwater emergent, forested, and shrub wetlands are shown on **Figures 3.13-4** through **3.13-6**. NWI-mapped riverine wetlands, lakes, and ponds are not displayed on these figures due to the limitations of the map scale; however, many of the NWI-mapped riverine wetlands, lakes, and ponds are near the major waterways, as mapped by ADWR (2017a) and shown on **Figures 3.13-4** through **3.13-6**.

The acreage of mapped potential wetlands in the Analysis Area varies by Corridor Option, with Option K having the highest acreage (399 acres of riverine wetlands) and Option I1 having the lowest (1 acre of freshwater pond). See **Appendix E13** for quantification of mapped wetlands by Corridor Option.

3.13.3.6 Floodplains

Areas mapped by FEMA as 100-year and 500-year floodplains are shown on **Figure 3.13-7** (South Section Floodplains), **Figure 3.13-8** (Central Section Floodplains), and **Figure 3.13-9** (North Section Floodplains). Floodplains are associated with the Santa Cruz River, its tributaries, and other ephemeral streams, such as Arivaca Wash, Brawley Wash, Greene Wash, and Los Robles Wash in the South Section. The Santa Cruz River and its major tributaries also are mapped as floodways. In the Central Section, floodplains are associated with the Santa Cruz, Gila, and Hassayampa Rivers. Floodplains also are mapped along major tributaries, such as Greene Wash, Santa Rosa Wash, Vekol Wash, Bender Wash, and Waterman Wash. Floodways are present along the channel of the Gila River and Waterman Wash. In the North Section, floodplains are associated with the Hassayampa River east of the Build Corridor Alternatives as well as with major tributaries, such as Powerline Wash, Sols Wash, Jackrabbit Wash, Fourmile Wash, and Phillips Wash. Floodways are present along the channels of the Hassayampa River, Jackrabbit Wash, and Star Wash (FEMA 2015).

Sheet flooding occurs in flat or nearly flat areas with few or no well-defined washes. Sheet flow also can occur in areas where washes are not large enough to contain flows during storm events. These areas are included within the areas mapped by FEMA as Special Flood Hazard Areas.

Option F has the highest mapped floodplain acreage within the Analysis Area (5,626 acres), while Option I1 has the least (6 acres). See **Appendix E13** for additional detail and quantification of the floodplains within the Analysis Area.

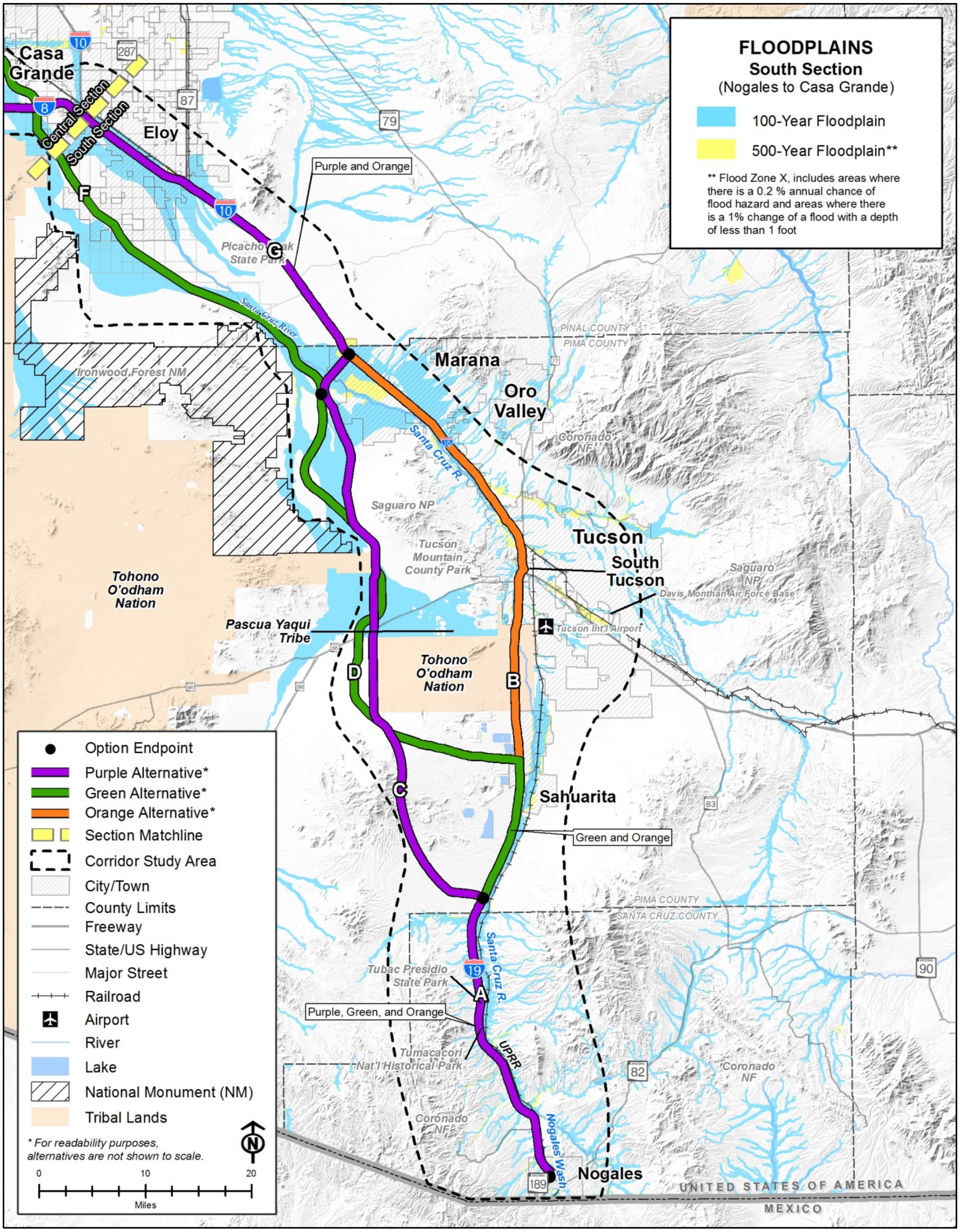

Figure 3.13-7 South Section Floodplains

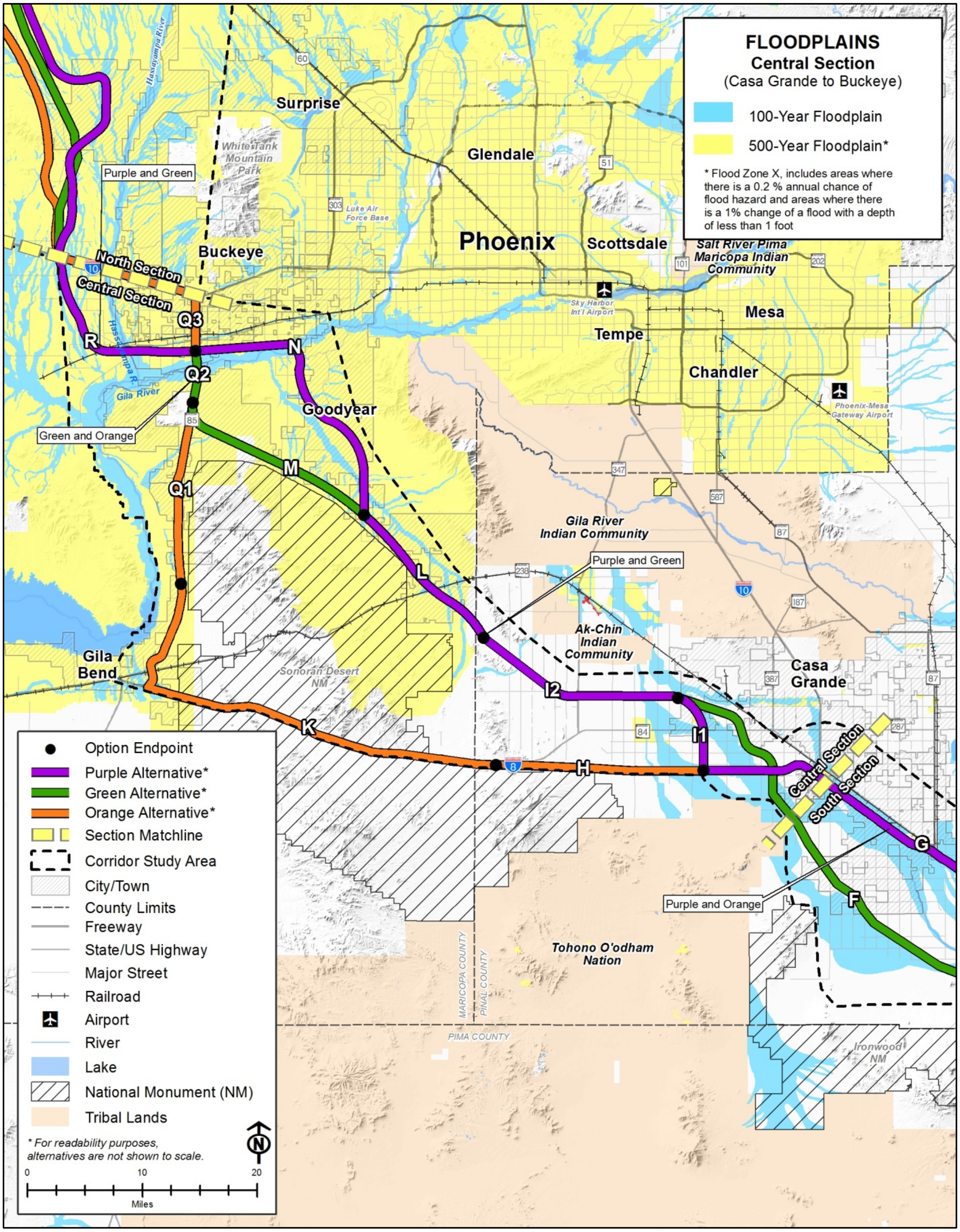

Figure 3.13-8 Central Section Floodplains

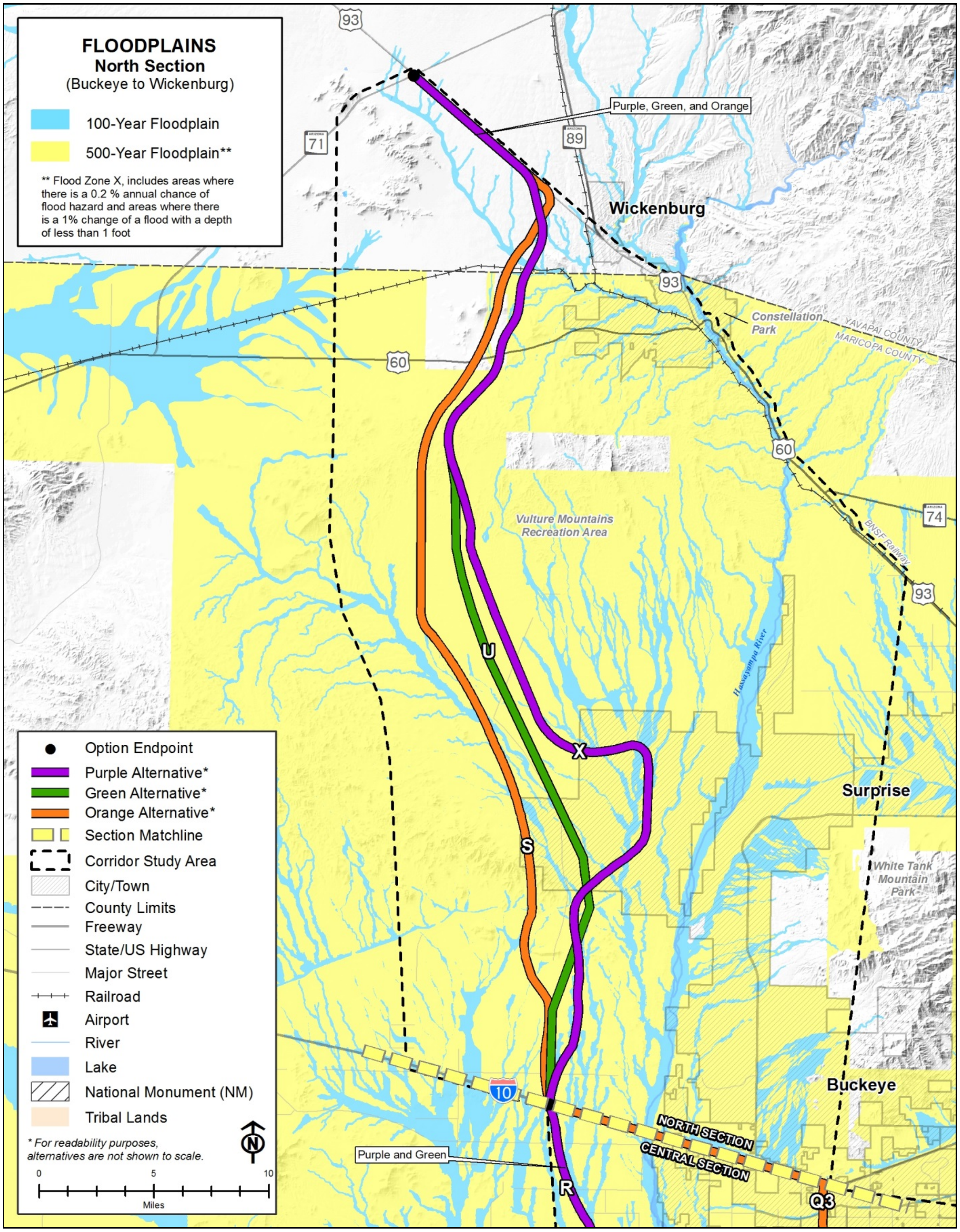

Figure 3.13-9 North Section Floodplains

3.13.4 Environmental Consequences

3.13.4.1 Build Corridor Alternatives

Table 3.13-1 (Water Resource Impacts Common to the Build Corridor Alternatives) summarizes the impacts to water resources that could occur under any of the Build Corridor Alternatives.

Table 3.13-1 Water Resource Impacts Common to the Build Corridor Alternatives

Water Resource Type	Description of Impacts
Sensitive Water Resources	• Construction-phase impacts: stormwater runoff, erosion, and sedimentation due to vegetation removal and soil compaction, as well as temporary fills • Long-term impacts: – Increased impervious surface leading to more runoff, more automotive-based nonpoint source contamination, and less infiltration to groundwater. – Pollutants may impact water resources for several miles downstream during high flows. Pollutants may move farther downstream in canals that carry water more frequently than ephemeral streams or washes. Location of stream crossings in relation to the watershed indicates how much of the watershed may be affected. Discharge of pollutants into the headwaters of a creek could affect the entire creek system, while discharge into lower reaches could impact less of the system and may benefit the system from the dilution effects of higher flows. – Fill material could be placed in water resources due to the construction of bridges, culverts, or culvert extensions. Crossings may constrict or block natural stream flows, which could result in erosion and channelization.
Impaired Waters	• Temporary increases in runoff from construction or permanent increases in runoff from new or widened highways could impact impaired streams. For example, if soils are high in selenium or chlorides (from salts), erosion of soils during or after construction could increase loading in adjacent streams. Cadmium, a common metal in highway storm runoff, is listed as a cause for impairment of a few streams. Nutrients in soils (nitrogen or phosphorous) or use of ammonia-based fertilizers may impact streams listed for ammonia or low dissolved oxygen. At rest stations, *E. coli* from poorly maintained septic systems or, more commonly, from dog waste can be high.
Groundwater Resources	• Potential for impacts to groundwater supply wells depends on well construction, proximity to potential pollutant sources, and geological conditions. Effects may include physical damage to well casings or wellheads, restriction in access to wellheads, restricted use of wells, and/or administrative barriers to wells or the use of wells. Operational impacts on wells may include safety issues associated with access to or use of the well. • Groundwater quantity and quality could be affected by construction activities. Groundwater quality could be degraded by spills or inadvertent discharges during construction. Increasing impermeable ground surface could decrease groundwater recharge. • Where groundwater is the principal source of potable water, stormwater runoff from a new or widened roadway could impact drinking water if it infiltrates into aquifers.

Table 3.13-1 Water Resource Impacts Common to Build Corridor Alternatives (Continued)

Water Resource Type	Description of Impacts
Potential Waters of the United States, including Wetlands	• Construction-phase impacts: stormwater runoff, erosion, and sedimentation due to vegetation removal and soil compaction, as well as temporary fills and diversions (local diversions of surface water flows could alter local sediment deposits). • Long-term impacts: – Changes in runoff and stormwater discharge due to changes in the area of impervious surfaces and automotive-based nonpoint source contamination. – Placement of fill (including structural fill such as bridge piers and culverts) could result in permanent change in stream contours or loss of wetlands (would be subject to permitting by USACE. – Should a Build Corridor Alternative ultimately be selected and constructed, maintenance of culverts or bridges could alter surface flow or introduce sediment.
Floodplains	• Floodplains could be affected by an increase in impervious surface, constriction or blockage of surface water flow, and the placement of fill or structures within a floodplain. Placement of fill within a floodplain could increase base flood elevation and exacerbate flooding downstream.

Table 3.13-3 (Water Resource Impacts of the Build Corridor Alternatives) located at the end of this section, describes the impact differences between the Build Corridor Alternatives. The table provides the total number of acres of potential new impact for each alternative. The acreages vary for individual Corridor Options in relation to co-location with another roadway or the use of an undeveloped corridor. The acreages in this table are based on an assumption of 25 percent of the 2,000-foot-wide corridor (500 feet) for corridors in undeveloped areas and 5 percent of the 2,000-foot-wide corridor (100 feet) for co-located Corridor Options. The acres presented for riparian areas and important birding areas represent the total number of acres within the 2,000-foot-wide corridor. No attempt was made to calculate the acres of impact within a specifically defined and bounded 400-foot-wide corridor. Calculations related to a specific alignment footprint will be made in Tier 2 studies.

The Purple Alternative would have moderate impacts on sensitive waters, groundwater, and floodplains, and the lowest impacts on impaired waters, Waters of the US, and wetlands compared to the other Build Corridor Alternatives. The Green Alternative is generally the most impactful because it primarily follows a new corridor. This results in more overall new impervious surface, which could increase runoff, reduce infiltration to groundwater, and increase the amount of fill being placed within Waters of the US, wetlands, and floodplains. The Orange Alternative would have moderate impacts on impaired waters, Waters of the US, and wetlands, and the lowest impacts on sensitive waters, groundwater, and floodplains compared to the other Build Corridor Alternatives.

Overall, the Green Alternative would have the highest impacts to water quality based on the quantitative and qualitative analysis (**Appendix E13**). In general, this is because the Purple and Orange Alternatives share more Corridor Options with existing transportation facilities. With these alternatives, there would be fewer new water resources impacted and less new impervious surface. Conversely, the Green Alternative is primarily on a new corridor, meaning that a higher number of affected resources were not previously affected by transportation facilities. For example, should the Orange Alternative be selected, bridges over waterways would likely need to be widened. However, should the Green Alternative be selected, there would be more new crossings of waterways in areas that do not currently have a bridge, resulting in larger impacts than the existing conditions.

3.13.4.2 No Build Alternative

Under the No Build Alternative, a new I-11 transportation corridor would not be constructed. Vehicles would continue to use the existing transportation network. Sections of I-10 in Pinal County would be widened and intersections, such as Ina Road, would be improved in the South Section. Pavement preservation and other maintenance projects also would be implemented. These projects could have localized impacts on water resources, such as placement of fill within waters of the US, wetlands, and floodplains, and may increase impervious surface in some areas, which could change patterns of runoff and groundwater infiltration. Additionally, stormwater runoff would continue to affect water resources and their quality. Overall, the effects of the No Build Alternative would likely be more localized and discrete compared to those of the Build Corridor Alternatives.

3.13.4.3 Summary

Table 3.13-2 (Summary of Potential Impacts on Water Resources) ranks the relative impacts to water resources for the three Build Corridor Alternatives as well as the No Build Alternative. As described in Section 3.13.2, these rankings were developed by evaluating individual Corridor Options relative to one another within each Section (South, Central, and North) and then compiling the Corridor Option rankings to obtain an overall relative ranking for each Build Corridor Alternative. See **Appendix E13** for additional details as well as the quantitative data that were considered in this analysis.

Table 3.13-2 Summary of Potential Impacts on Water Resources

Resource	Relative Impact			
	No Build Alternative	Purple Alternative	Green Alternative	Orange Alternative
Surface Water – Sensitive Resources	Negligible	Moderate	High	Low
Surface Water – Impaired Waters	Negligible	Low	High	Moderate
Groundwater	Negligible	Moderate	High	Low
Potential Waters of the US	Negligible	Low	High	Moderate
Wetlands	Negligible	Low	High	Moderate
Floodplains	Negligible	Moderate	High	Low

3.13.5 Potential Mitigation Strategies

Mitigation strategies for all alternatives include avoidance, minimization, and mitigation. Avoidance can be accomplished by shifting the future construction footprint away from sensitive resources to the extent possible. For example, if a riverine wetland is located on one side of the 2,000-foot-wide corridor, shifting the Build Corridor Alternative towards the other side might avoid or could at least minimize impacts to the wetland. Similarly, a shift away from a high-hazard floodplain area could avoid or minimize impacts to the floodplain. Alignment shifts will depend on many other factors, including design standards and balancing impacts to other environmental resources.

Impact minimization could be accomplished through temporary best management practices (BMPs) during construction, permanent BMPs after construction, and adherence to federal and state water quality requirements. AZPDES permits require that projects be designed to protect waters of the US. The AZPDES Construction General Permit requires that erosion control BMPs be implemented, and that a Stormwater Pollution Prevention Plan be prepared for construction activities exceeding 1.0 acre of ground disturbance. In addition to state and federal protections of water quality, Pima County, ADOT, City of Phoenix, and City of Tucson are Phase I MS4 permittees. Each MS4 permittee must develop and enforce a Stormwater Management Program to address stormwater discharge quality. Each program includes control measures (such as the permanent BMPs noted below) to minimize the discharge of pollutants in runoff.

Construction-phase BMPs include both structural and non-structural practices. Examples of structural practices include using perimeter BMPs around the work area to capture sediment, using a tracking pad so that equipment will not carry sediment onto roadway surfaces, slowing runoff to minimize erosion, and limiting the work area to avoid sensitive areas such as wetlands. BMPs to minimize wetland impacts also include placing protective material over wetlands before any temporary fill or equipment crossings occur, and then removing all materials after work is completed to reestablish vegetation. Nonstructural BMPs include daily sweeping of adjacent roadways to pick up sediment that the tracking pads do not catch and stabilizing disturbed areas as soon as possible after work is completed.

Permanent BMPs are mainly structural. They are designed to slow stormwater runoff and retain pollutants. For example, check dams can slow water before it enters waterways or wetlands. Retention ponds hold water long enough to allow sediments to settle out. Sediments commonly carry other pollutants (such as metals), so removing them lowers impacts to water resources.

Long-term measures such as limiting the use of fertilizers along highways or at rest stops also would lower potential impacts on water quality. Locating rest stops away from streams and providing bags (and regulations) for picking up dog waste would limit impacts for both *E. coli* and nutrients.

Where avoidance or minimization are not feasible, mitigation could be implemented. If a groundwater well were affected, well abandonment and compensation (for example, financial compensation, drilling a new well, or providing a municipal connection) might be required. For activities subject to Section 404 permitting, USACE often requires 3-to-1 or greater replacement of permanently impacted jurisdictional wetlands. Mitigation for flooding potential would be addressed where avoidance and minimization of floodplain areas are not feasible. Proposed encroachments in a 100-year floodplain area would require coordination with local floodplain administrators to discuss floodplain development permitting and potential mitigation measures. County Flood Control Districts require a FUP in cases where a project encroaches within a jurisdictional floodplain.

3.13.6 Future Tier 2 Analysis

The purpose of the I-11 Draft Tier 1 Environmental Impact Statement and Preliminary Section 4(f) Evaluation (Draft Tier 1 EIS) is to assess impacts related to three Build Corridor Alternatives and the No Build Alternative. Tier 2 NEPA reviews will require more detailed analysis of water resource impacts within refined roadway alignments. The Tier 2 NEPA analysis will include conceptual design, which will be used to avoid, minimize, and mitigate impacts to water resources. It also will include field delineation of wetlands, determination of which waters and wetlands are jurisdictional under the USACE definition, and identification of Section 404 permitting requirements.

Tier 2 NEPA reviews also will require coordination with USEPA regarding SSA impacts, and will focus on the relative values of different water resources, including water quality, wetlands, and floodplains. The Tier 2 analysis will further evaluate potential avoidance and minimization of impacts on 100-year floodplains and assess impacts to high-hazard flood areas versus low-hazard (500-year-flood zone) areas. In addition, floodplain areas that have not been categorized will be assessed in more detail, for better comparisons. The Tier 1 analysis has noted differences among the three Build Corridor Alternatives for co-location of major river crossings versus new crossings. The Tier 2 analysis will further quantify those impacts. The Tier 1 analysis has listed several Phase I MS4 jurisdictions, each of which may have differing approaches to stormwater management. The Tier 2 analysis will assess which MS4 applies in which area, and whether any small operators (Phase II MS4s) are impacted by the Build Corridor Alternatives.

USACE is a Cooperating Agency in this Draft Tier 1 EIS study. As part of the Tier 2 analysis, USACE will review the project documentation and the alternatives to determine that they are practible and reasonable. USACE will ultimately be responsible for making a LEDPA determination when issuing Section 404 permits. Coordination with USACE has determined that USACE would not make the LEDPA determination during this Tier 1 EIS. USACE has recommended that ADOT and the Federal Highway Administration (FHWA) provide clear documentaiton of the Tier 1 EIS alternatives analysis and selection process so this information can be reviewed during the LEDPA analysis process in Tier 2.

Table 3.13-3 Water Resource Impacts of the Build Corridor Alternatives

Topics	No Build Alternative	Purple Alternative	Green Alternative	Orange Alternative
Major Resource Features	• Three AMAs: the Santa Cruz, Tucson, and Phoenix • A designated area of the Upper Santa Cruz and Avra Basin SSA • Domestic water supply wells within the 1-11 Study Area • Santa Cruz River, Santa Cruz Wash, Gila River, Hassayampa River, and their tributaries • One wastewater treatment plant (Tres Rios Water Reclamation Facility, located near I-10 and Ina Road in Tucson)	• Three AMAs: the Santa Cruz, Tucson, and Phoenix • A designated area of the Upper Santa Cruz and Avra Basin SSA • The CAVSARP/SAVSARP • Domestic water supply wells within the Study Area • Santa Cruz River, Santa Cruz Wash, Gila River, Hassayampa River, and their tributaries	• Three AMAs: the Santa Cruz, Tucson, and Phoenix • A designated area of the Upper Santa Cruz and Avra Basin SSA • The CAVSARP/SAVSARP • Domestic water supply wells within the Study Area • Santa Cruz River, Santa Cruz Wash, Gila River, Hassayampa River, and their tributaries	• Three AMAs: the Santa Cruz, Tucson, and Phoenix • A designated area of the Upper Santa Cruz and Avra Basin SSA • Domestic water supply wells within the Study Area • Santa Cruz River, Santa Cruz Wash, Gila River, Hassayampa River, and their tributaries • One wastewater treatment plant (Tres Rios Water Reclamation Facility, located near I-10 and Ina Road in Tucson)
Sensitive Waters	No I-11 impacts identified. Existing conditions and baseline trends would continue. Other projects in the Study Area would be subject to their own evaluation.	Moderate anticipated impacts among the Build Corridor Alternatives. Edge of corridor is located within 1,000 feet of the CAVSARP and SAVSARP.	Highest anticipated impacts among the Build Corridor Alternatives. Greatest amount of new impervious surface; could increase runoff and decrease infiltration to groundwater. Edge of corridor is located within 1,000 feet of the CAVSARP and SAVSARP.	Lowest anticipated impacts among the Build Corridor Alternatives. Lowest amount of new impervious surface, so fewer impacts anticipated from changes in infiltration and runoff. No major recharge projects within 0.5 mile of corridor.

Table 3.13-3 Water Resource Impacts of the Build Corridor Alternatives (Continued)

Topics	No Build Alternative	Purple Alternative	Green Alternative	Orange Alternative
Impaired Waters	No I-11 impacts identified. Existing conditions and baseline trends would continue. Other projects in the Study Area would be subject to their own evaluation.	Lowest anticipated impacts to impaired waters; intermediate new disturbance and shortest length of impaired waters within 0.5 mile. Impaired segments of Santa Cruz River, Potrero Creek, Nogales Wash, and Hassayampa River are located within 0.5 mile, totaling 140,839 linear feet.	Highest anticipated impacts to impaired waters. Would have the most new disturbance within 0.5 mile of impaired waters and has the greatest number of impaired waterbodies within 0.5 mile. Impaired segments of the Santa Cruz River, Potrero Creek, Nogales Wash, Gila River, and Hassayampa River are located within 0.5 mile, totaling 149,757 linear feet.	Moderate anticipated impacts to impaired waters. Lowest new disturbance within 0.5 mile of impaired waters, but has the greatest length of impaired waters within 0.5 mile. Impaired segments of Santa Cruz River, Potrero Creek, Nogales Wash, and Gila River are located within 0.5 mile, totaling 186,840 linear feet.
Groundwater and Impacts to Wells	No I-11 impacts identified. Existing conditions and baseline trends would continue. Other projects in the Study Area would be subject to their own evaluation.	Moderate anticipated impacts among the Build Corridor Alternatives. Number of groundwater wells within 2,000-foot-wide end-to-end corridor = 170. Edge of corridor is located within 1,000 feet of the CAVSARP and SAVSARP.	Highest anticipated impacts among the Build Corridor Alternatives. Greatest amount of new impervious surface; could decrease infiltration to groundwater. Number of groundwater wells within 2,000-foot-wide end-to-end corridor = 171. Edge of corridor is located within 1,000 feet of the CAVSARP/SAVSARP.	Lowest anticipated impacts among the Build Corridor Alternatives. Highest number of wells (n = 236) within 2,000-foot-wide end-to-end corridor, but most impacts anticipated to occur within existing disturbed areas. No major recharge projects within 0.5 mile of corridor.
Waters of the United States (US)	No I-11 impacts identified. Existing conditions and baseline trends would continue. Other projects in the Study Area would be subject to their own evaluation.	Lowest anticipated impacts among the Build Corridor Alternatives. Corridor partially parallels the Santa Cruz River in the South Section; would have new crossings of Escondido Wash, Tinaja Wash, Brawley	Highest anticipated impacts among the Build Corridor Alternatives. Greatest amount of new impervious surface, which could increase runoff to Waters of the US. Corridor parallels the Santa Cruz River in the	Moderate anticipated impacts among the Build Corridor Alternatives. Corridor parallels the Santa Cruz River in the South Section; parallels Bender Wash and the Gila River in the Central Section; would

Table 3.13-3 Water Resource Impacts of the Build Corridor Alternatives (Continued)

Topics	No Build Alternative	Purple Alternative	Green Alternative	Orange Alternative
		Wash, Los Robles Wash, the Santa Cruz River, Vekol Wash, Waterman Wash, the Gila River, the Hassayampa River, Luke Wash, the CAP Aqueduct, Jackrabbit Wash, Star Wash, Box Wash, Mill Wash, and Sols Wash, as well as other minor drainages. Partially parallels the Gila River.	South Section; would have new crossings of Brawley Wash, Los Robles Wash, Greene Canal, Casa Grande Canal, Santa Cruz Wash, Vekol Wash, Waterman Wash, the CAP Aqueduct, Phillips Wash, Jackrabbit Wash, Powerline Wash, and Sols Wash, as well as other minor drainages. Partially parallels Los Robles Wash and Brawley Wash in the Central Section.	have new crossings of Fourmile Wash, the CAP Aqueduct, Beer Bottle Wash, Jackrabbit Wash, Powerline Wash, and Sols Wash, as well as other minor drainages. Highest linear feet of mapped streams within 2,000-foot-wide end-to-end corridor compared to other alternatives.
Wetlands	No I-11 impacts identified. Existing conditions and baseline trends would continue. Other projects in the Study Area would be subject to their own evaluation.	Lowest anticipated impacts among the Build Corridor Alternatives. Impacts could include placement of fill material and runoff within wetlands associated with waterbodies in previous ROW. Moderate amount of new disturbance within 2,000 feet of potential wetlands. Lowest acreage of potential wetlands in 2,000-foot-wide corridor (1,078 acres). May be difficult to avoid impacts at new crossings and where I-11 parallels waterways.	Highest anticipated impacts among the Build Corridor Alternatives. Impacts could include placement of fill material and runoff within wetlands associated with waterbodies in previous ROW. Highest amount of new disturbance within 2,000 feet of potential wetlands. Moderate acreage of potential wetlands in 2,000-foot-wide corridor (1,364 acres); may be difficult to avoid impacts at new crossings and where I-11 parallels waterways.	Moderate anticipated impacts among the Build Corridor Alternatives. Impacts could include placement of fill material and runoff within wetlands associated with waterbodies in previous ROW. Highest acreage of potential wetlands in 2,000-foot-wide corridor (1,662 acres); may be difficult to avoid impacts at new crossings and where I-11 parallels waterways.

Table 3.13-3 Water Resource Impacts of the Build Corridor Alternatives (Continued)

Topics	No Build Alternative	Purple Alternative	Green Alternative	Orange Alternative
Floodplains	No I-11 impacts identified. Existing conditions and baseline trends would continue. Other projects in the Study Area would be subject to their own evaluation.	Moderate anticipated impacts compared to the other two Build Corridor Alternatives. Moderate acreage of mapped floodplain (14,778 acres) within 2,000-foot-wide corridor. Would be difficult to avoid placement of new structural fill in floodplains along the Santa Cruz River, Gila River, and other intersecting/parallel drainages. Placement of fill could raise flood elevation and new crossings could constrict flood flow.	Highest anticipated impacts among the Build Corridor Alternatives. Highest acreage of mapped floodplain (15,758 acres) within 2,000-foot-wide corridor. Would be difficult to avoid placement of new structural fill in floodplains along the Santa Cruz River, Brawley Wash, Los Robles Wash, and other intersecting/parallel drainages. Placement of fill could raise flood elevation and new crossings could constrict flood flow.	Lowest anticipated impacts among the Build Corridor Alternatives. Lowest acreage of mapped floodplain (11,263 acres) within 2,000-foot-wide corridor. Would be difficult to avoid placement of new structural fill in floodplain along Santa Cruz River and other intersecting/parallel drainages. Placement of fill could raise flood elevation and new crossings could constrict flood flow.
Indirect Effects	Programmed transportation improvements plus projected population and employment growth could: • Generate neutral effects on water quality. • Impact routine operations and maintenance, including stormwater management and compliance with the MS4 permit and applicable local MS4 permits. • Trigger new stormwater controls in areas with programmed	Land development induced by I-11 could: • Change surface water flow, impacting the quality and quantity of water available for uses including recreation, habitat, drinking, and agricultural uses. • Drive new construction to require compliance with MS4 permitting and would include water quality features such as best management practices. • Impact water resources with runoff containing	Similar to the Purple Alternative.	Similar to the Purple Alternative, except: • Potentially less magnitude and intensity in the effects, due to fewer new areas of induced growth. • There is greater potential to improve current water quality, as new construction would require modernization of infrastructure, such as stormwater management features associated with existing transportation facilities.

Table 3.13-3 Water Resource Impacts of the Build Corridor Alternatives (Continued)

Topics	No Build Alternative	Purple Alternative	Green Alternative	Orange Alternative
	improvements along existing facilities (I-10).	pollutants, fragmentation, or changes in hydrology. • Influence design and construction of new structures (bridges and/or culverts) leading to local effects on erosion and sedimentation. • Infringe on floodplains.		
Cumulative Effects	Past, present, and reasonably foreseeable projects could: • Increase incremental effects due to increasing demand for water resources.	Past, present, and reasonably foreseeable projects could: • Increase incremental effects to a greater extent than the No Build Alternative.	Similar to the Purple Alternative.	Similar to the Purple Alternative.

AMA = Active Management Area, CAP = Central Arizona Project, I-11 = Interstate 11, MS4 = Municipal Separate Stormwater Sewer System, ROW = Riight-of-Way, SSA = Sole Source Aquifer, Study Area = I-11 Corridor Study Area.